

General Description

FRONT SUSPENSION

1. General Description

A: SPECIFICATION

Tire size		P205/60R16 P215/50R17	P225/50R17 225/45R18	P225/60R17 P215/70R16
Front	Wheel arch height (Tolerance: $+12\text{ mm}$ -24 mm ($+0.47\text{ in}$ -0.94 in)) mm (in)	403 (15.9)	395 (15.6)	469 (18.5)
	Camber (Tolerance: $\pm 0^\circ 45'$ Differences between RH and LH: 45' or less)	$-0^\circ 30'$	$-0^\circ 15'$	$0^\circ 00'$
	Caster (Referential Value)	$5^\circ 55'$	$6^\circ 00'$	$5^\circ 05'$
	Steering angle (Tolerance: $\pm 1.5^\circ$)	Inner wheel	37.6°	37.4°
		Outer wheel	33.3°	33.0°
	Toe-in mm (in)	0 ± 3 (0 ± 0.12) Toe angle (sum of both wheels): $0^\circ \pm 0^\circ 15'$		
REAR	Kingpin angle (Referential Value)	$14^\circ 00'$	$14^\circ 15'$	$12^\circ 20'$
	Wheel arch height (Tolerance: $+12\text{ mm}$ -24 mm ($+0.47\text{ in}$ -0.94 in)) mm (in)	392 (15.4)	387 (15.2)	474 (18.7)
	Camber (Tolerance: $\pm 0^\circ 45'$ Differences between RH and LH: 45' or less)	$-1^\circ 00'$	$-1^\circ 10'$	$0^\circ 00'$
	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°		

*1: OUTBACK model

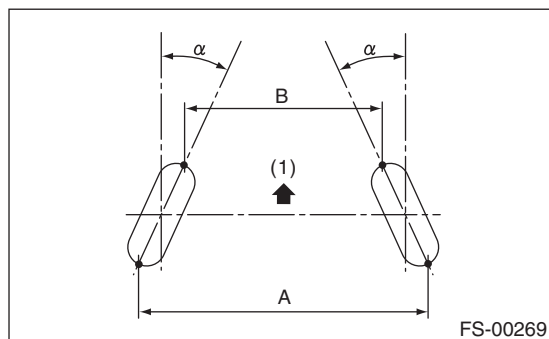
$2 \pm 3\text{ mm}$ ($0.08 - 0.12\text{ in}$) Toe angle (sum of both wheels): $0^\circ 10' \pm 0^\circ 15'$

*2: Except for OUTBACK model

$0 \pm 3\text{ mm}$ ($0 \pm 0.12\text{ in}$) Toe angle (sum of both wheels): $0^\circ \pm 0^\circ 15'$

NOTE:

- Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.
- For other items indicated in the specifications table, there is no adjustment mechanism. If other items exceed specifications, check the suspension parts and connections for deformation, and replace the parts if defective.

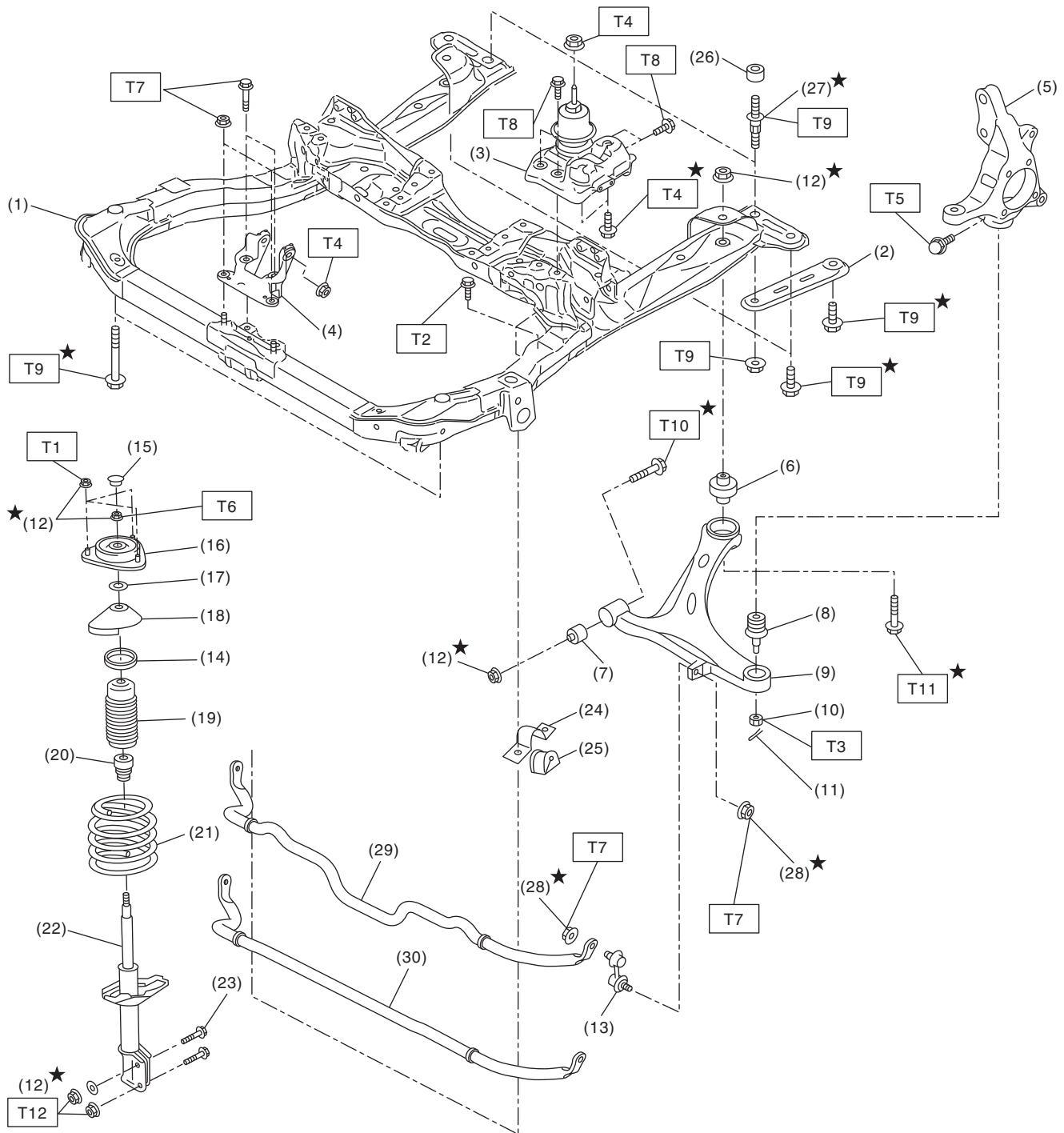


(1) Front

$A - B$ = Positive: Toe-in, Negative: Toe-out

α = Individual toe angles

B: COMPONENT



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FRONT SUSPENSION

(1) Cradle	(16) Strut mount
(2) Stiffener	(17) SPACER
(3) Main mounting bracket	(18) Upper spring seat
(4) Front mounting bracket	(19) Dust cover
(5) Front housing	(20) Helper
(6) Rear bushing	(21) Coil spring
(7) Front bushing	(22) STRUT
(8) Ball joint	(23) Adjusting bolt
(9) Front arm	(24) Stabilizer bracket
(10) Castle nut	(25) Stabilizer bushing
(11) Cotter pin	(26) STOPPER
(12) Self-locking nut	(27) Stud bolt
(13) Stabilizer link	(28) Flange nut
(14) Rubber seat (OUTBACK model only)	(29) Stabilizer (H4 model)
(15) Dust seal	(30) Stabilizer (H6 model)

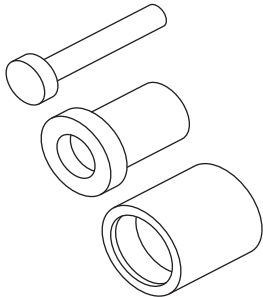
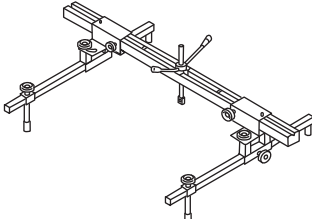
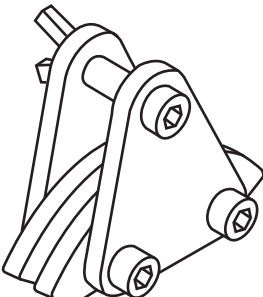
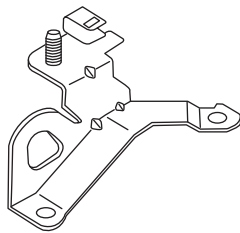
Tightening torque:N·m (kgf-m, ft-lb)

<i>T1:</i>	<i>20 (2.0, 14.8)</i>
<i>T2:</i>	<i>25 (2.5, 18.4)</i>
<i>T3:</i>	<i>39 (4.0, 28.8)</i>
<i>T4:</i>	<i>45 (4.6, 33.2)</i>
<i>T5:</i>	<i>50 (5.1, 36.9)</i>
<i>T6:</i>	<i>55 (5.6, 40.6)</i>
<i>T7:</i>	<i>60 (6.1, 44.3)</i>
<i>T8:</i>	<i>65 (6.6, 47.9)</i>
<i>T9:</i>	<i>75 (7.6, 55.3)</i>
<i>T10:</i>	<i>95 (9.7, 70.1)</i>
<i>T11:</i>	<i>140 (14.3, 103.3)</i>
<i>T12:</i>	<i>155 (15.8, 114.3)</i>

C: CAUTION

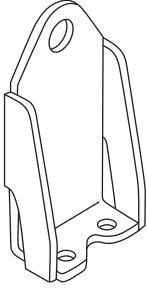
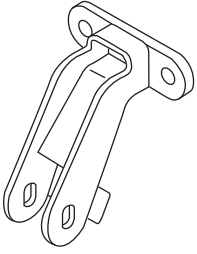
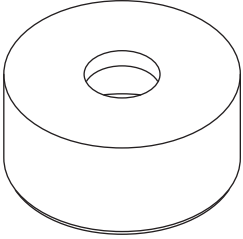
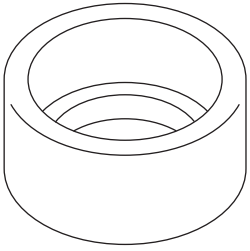
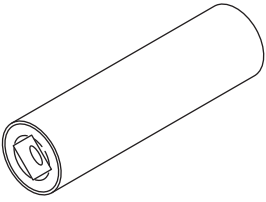
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease etc. or 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.
 ST99099AJ000	99099AJ000 (Newly adopted tool)	ENGINE HANGER	• Used for hanging power unit. • Used together with CHAIN BALANCER (99099AJ010).
 ST99099AJ010	99099AJ010 (Newly adopted tool)	CHAIN BALANCER	• Used for hanging power unit. • Used together with ENGINE HANGER (99099AJ000).
 ST10004AA180	10004AA180 (SUBARU genuine part)	HANGER CP ENGINE RR	• Used for hanging power unit. • For H4 - non-turbo model. • SUBARU genuine part

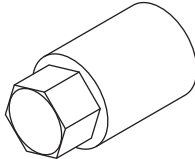
General Description

FRONT SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18360AA020	18360AA020 (Newly adopted tool)	HANGER	- Used for hanging power unit. - For H6 model.
 ST41099AJ000	41099AJ000 (Newly adopted tool)	SPECIAL TOOL H4	Used for removing and installing front stabilizer. (for turbo model)
 ST20299AG000	20299AG000	REMOVER	- Used for replacing front arm rear bushing. - Used together with BASE (20999AG010).
 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.
Chain sling	- Used for hanging power unit. - Diameter: 6 mm (0.24 in) or 6.3 mm (0.25 in) - Length: 0.8 — 1 m (2.6 — 3.3 ft) - Chain inner width: 8.5 mm (0.33 in) or more - Chain external width: 23.5 mm (0.93 in) or less - Load capacity: 1.2 t (2646 lb) or more
Shackle	- Two units used for hanging power unit. - Attached to both end of chain sling and connected to engine hook. - Load capacity: 250 kg (551 lb) or more
Sling belt	- Used to remove and install the cradle. - Width: 35 — 40 mm (1.38 — 1.57 in) - Length: 2 m (6.6 ft) - Load capacity: 1 t (2205 lb) or more
Shackle	- Used to remove and install the cradle. - Load capacity: 500 kg (1103 lb) or more

Wheel Alignment

FRONT SUSPENSION

2. Wheel Alignment

A: INSPECTION

Check the following items before performing the wheel alignment measurement.

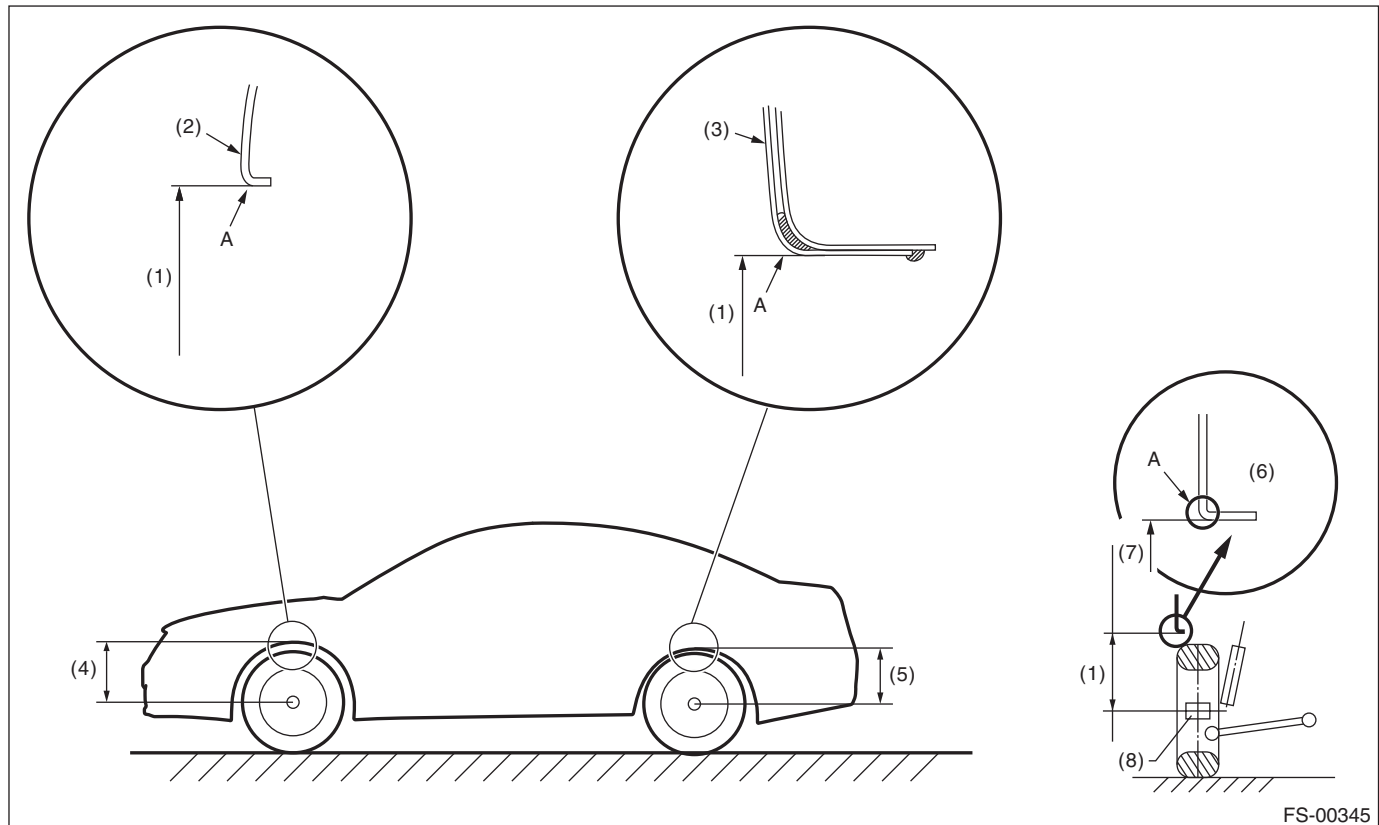
- Tire inflation pressure
- Uneven wear of RH and LH tires, or difference of sizes
- Tire runout
- Excessive play and wear of ball joint
- Excessive play and wear of tie-rod end
- Excessive play of wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play of steering link
- 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-9, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-10, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <Ref. to FS-11, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-11, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-12, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-12, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-14, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

- 1) Park the vehicle on a level surface.
- 2) Empty the vehicle so that it is at “curb weight”.
(Empty the luggage compartment, load the spare tire, jack and service tools, and fill up the fuel tank.)
- 3) Set the steering wheel in a straight-ahead position, and stabilize the 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-00345

- | | | |
|-----------------------|-----------------------------|--------------------------|
| (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))			
Tire size	P205/60R16 P215/50R17	P225/50R17 225/45R18	P225/60R17 P215/70R16
Front	403 (15.9)	395 (15.6)	469 (18.5)
REAR	392 (15.4)	387 (15.2)	474 (18.7)

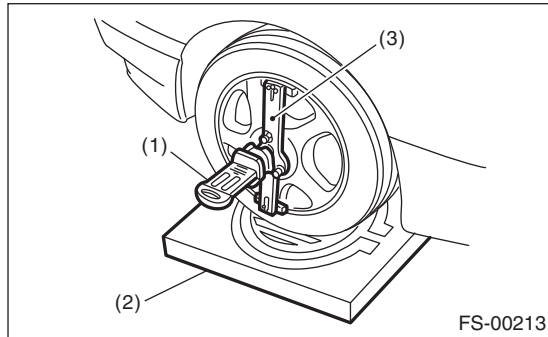
Wheel Alignment

FRONT SUSPENSION

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)
P205/60R16 P215/50R17	$-0^{\circ}30' \pm 0^{\circ}45'$
P225/50R17 225/45R18	$-0^{\circ}15' \pm 0^{\circ}45'$
P225/60R17 P215/70R16	$0^{\circ}00' \pm 0^{\circ}45'$

• FRONT CAMBER ADJUSTMENT

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

Model	Camber (Difference between RH and LH 45' or less)
P205/60R16 P215/50R17	$-0^{\circ}30' \pm 0^{\circ}30'$
P225/50R17 225/45R18	$-0^{\circ}15' \pm 0^{\circ}30'$
P225/60R17 P215/70R16	$0^{\circ}00' \pm 0^{\circ}30'$

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

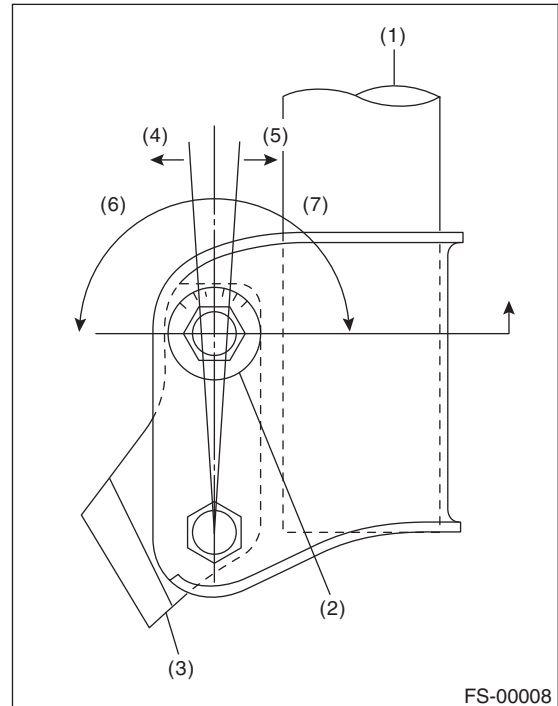
NOTE:

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

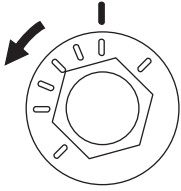
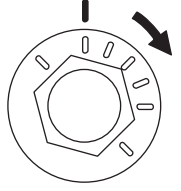
- 3) Turn the camber adjusting bolt so that the camber is set at specification.

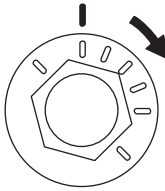
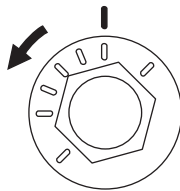
NOTE:

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



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

To increase camber.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
	
FS-00352	FS-00353

To decrease camber.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
	
FS-00353	FS-00352

4) Tighten two new self-locking nuts.

Tightening torque:

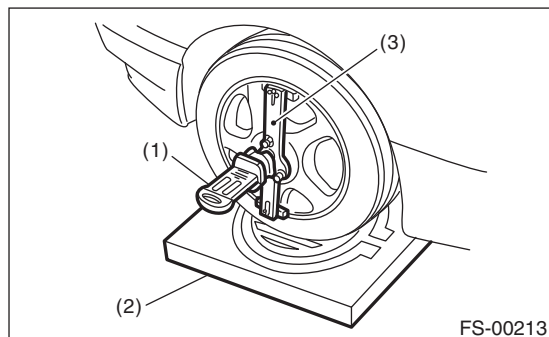
155 N·m (15.8 kgf·m, 114.3 ft·lb)

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
P205/60R16 P215/50R17	5°55'
P225/50R17 225/45R18	6°00'
P225/60R17 P215/70R16	5°05'

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
P205/60R16 P215/50R17	37.6°±1.5°	33.3°±1.5°
P225/50R17 225/45R18	37.4°±1.5°	33.0°±1.5°
P225/60R17 P215/70R16	38.4°±1.5°	34.1°±1.5°

Wheel Alignment

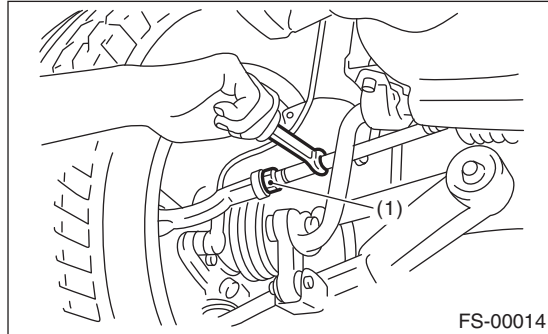
FRONT SUSPENSION

• 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:

$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

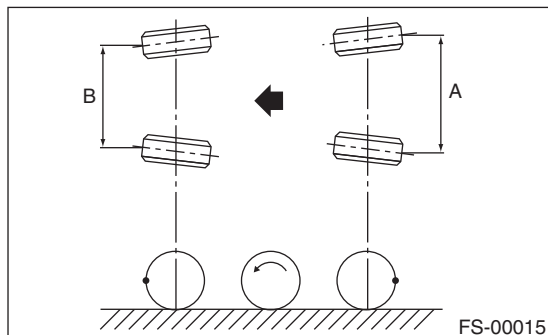
- 1) Set the toe-in gauge in the position at wheel axis center height behind the right and left front tires.
- 2) Place a mark at the center of both left and right tires, and measure distance "A" between the marks.
- 3) Move the vehicle forward to rotate the tires 180° .

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:

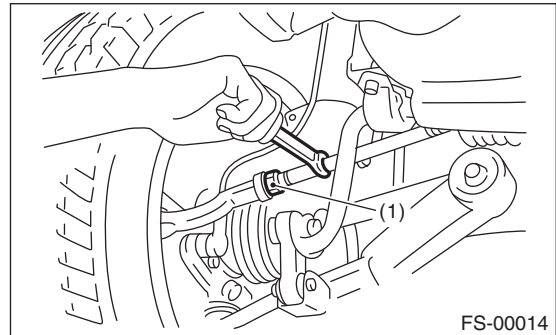
$0 \pm 2 \text{ mm } (0 \pm 0.08 \text{ in})$

- 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:

Except for OUTBACK model

$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

OUTBACK model

$2 \pm 3 \text{ mm } (0.08 \pm 0.12 \text{ in})$

Refer to FRONT WHEEL TOE-IN for rear toe-in inspection procedures.

<Ref. to FS-12, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• ADJUSTMENT

When adjusting, adjust it to the following value.

Toe-in:

Except for OUTBACK model

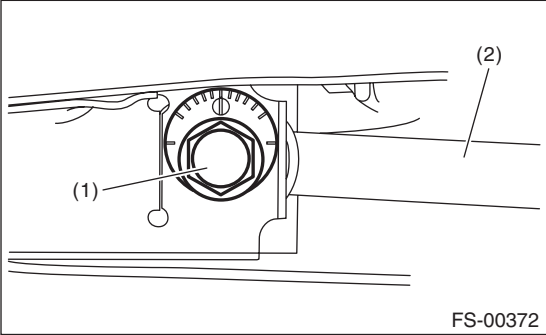
$0 \pm 2 \text{ mm } (0 \pm 0.08 \text{ in})$

OUTBACK model

$2 \pm 2 \text{ mm } (0.08 \pm 0.08 \text{ in})$

- 1) Loosen the self-locking nut on the inner side of front lateral link.

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.
Diagram showing the left side adjusting bolt rotated clockwise, indicated by a curved arrow. The diagram is labeled FS-00018.	Diagram showing the right side adjusting bolt rotated counterclockwise, indicated by a curved arrow. The diagram is labeled FS-00019.

To decrease toe-in.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
Diagram showing the left side adjusting bolt rotated counterclockwise, indicated by a curved arrow. The diagram is labeled FS-00019.	Diagram showing the right side adjusting bolt rotated clockwise, indicated by a curved arrow. The diagram is labeled FS-00018.

Wheel Alignment

FRONT SUSPENSION

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

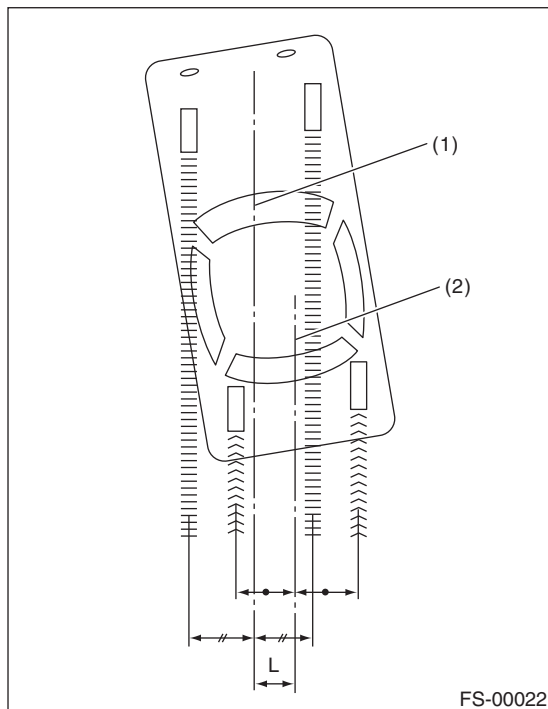
• INSPECTION

- 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

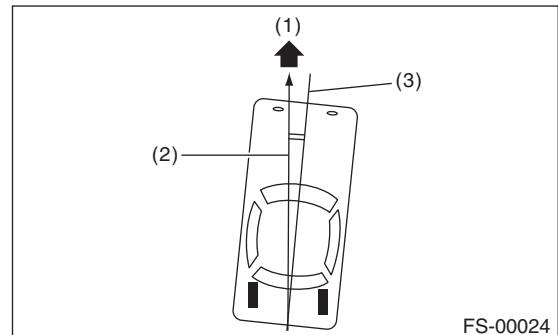
- 1) Make thrust angle adjustments by turning the toe-in adjusting bolts of the rear suspension equally in the same direction.

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.



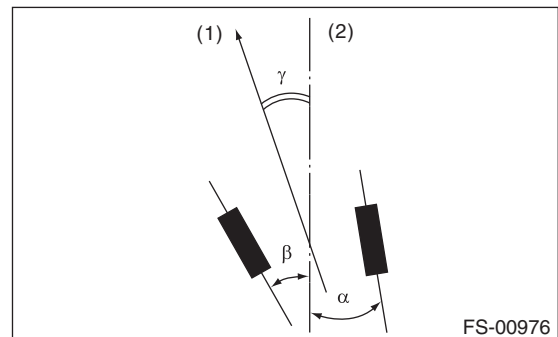
- (1) Front
(2) Thrust angle
(3) Body center line

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.

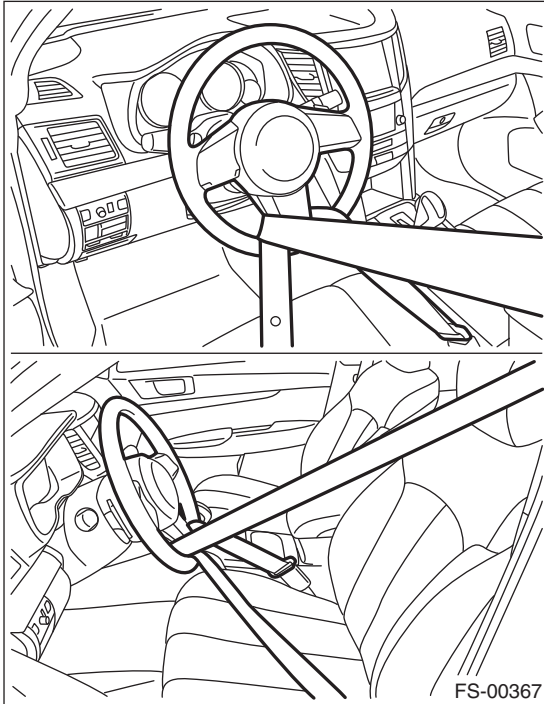


- (1) Front
(2) Body center line

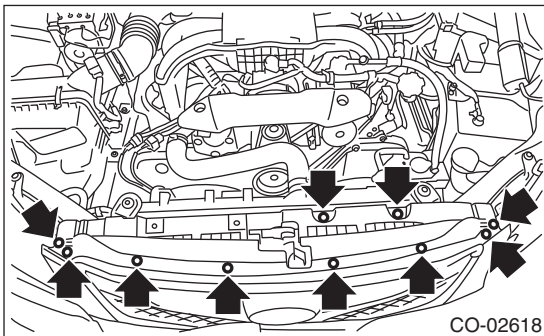
3. Cradle

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Position the tilt position of the steering column to the lowest position, and lock the tilt lever.
- 3) Prevent the steering wheel from turning using the seat belt.



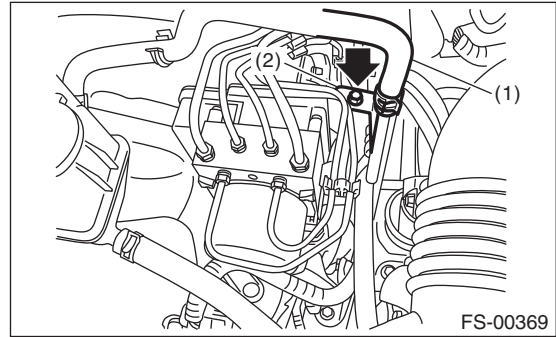
- 4) Remove the front wheels.
- 5) Disconnect the ground cable from battery.
- 6) Remove the air intake duct. <Ref. to IN(H4SO)-9, REMOVAL, Air Intake Duct.>
- 7) Remove the air intake boot assembly. (non-turbo model) <Ref. to IN(H4SO)-8, REMOVAL, Air Intake Boot.> <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Boot.>
- 8) Remove the intercooler and the intercooler stay. (turbo model) <Ref. to IN(H4DOTC)-17, REMOVAL, Intercooler.>
- 9) Remove the clips and remove the grille bracket.



- 10) Remove the power steering hose bracket and power steering hose.

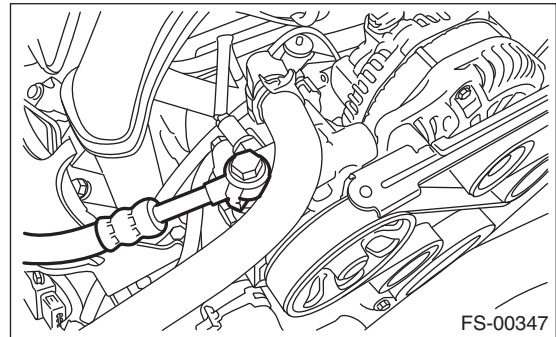
- (1) Remove the clip and disconnect the hose from the pipe.

- (2) Remove the power steering hose bracket.



- (1) Power steering hose
- (2) Power steering hose bracket

- (3) Remove the hose from the power steering pump.



NOTE:

Plug the holes to prevent foreign objects from entering the removed hose and pipe.

11) Remove the throttle body from the intake manifold.

NOTE:

Do not disconnect the inlet and outlet hoses of engine coolant.

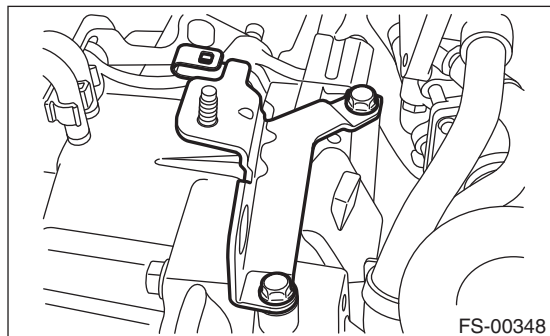
12) Replace the engine hanger installed on the engine with the SUBARU genuine engine hanger (H4 - non-turbo model) or ST (H6 model).

Tightening torque:

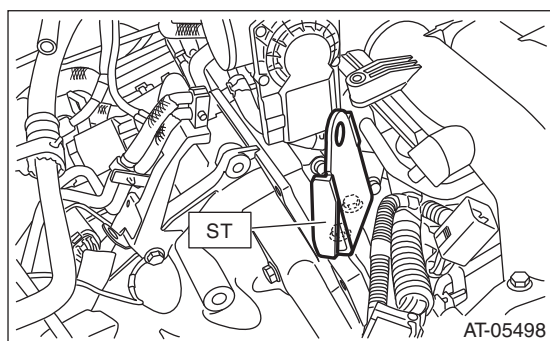
16 N·m (1.6 kgf-m, 11.8 ft-lb)

FRONT SUSPENSION

- H4 non-turbo model
SUBARU genuine part
10004AA180 HANGER CP ENGINE RR



- H6 model
ST 18360AA020 HANGER



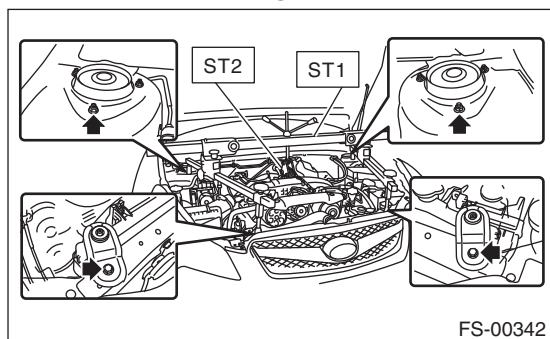
13) Hang the engine using ST, chain sling and shackle.

(1) Set the ST on the vehicle.

- ST1 99099AJ000 ENGINE HANGER
ST2 99099AJ010 CHAIN BALANCER

CAUTION:

Set the arms of ST (ENGINE HANGER) at the locations shown in the figure.

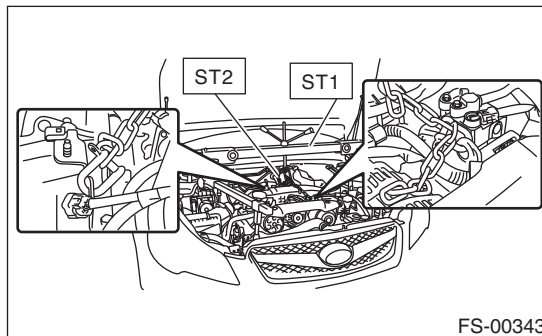


(2) Attach the shackle to the both ends of chain sling.

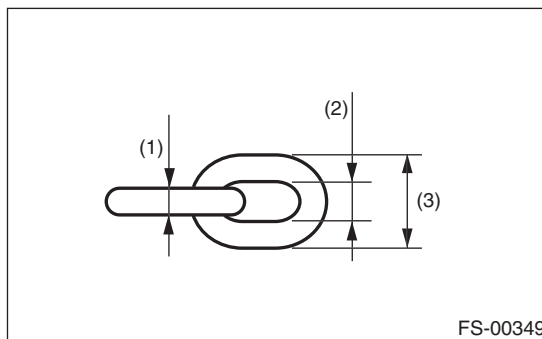
(3) Pass the chain sling through the CHAIN BALANCER and secure the both ends to the hooks on the engine.

CAUTION:

- Set the chain sling so that it does not contact the engine parts.

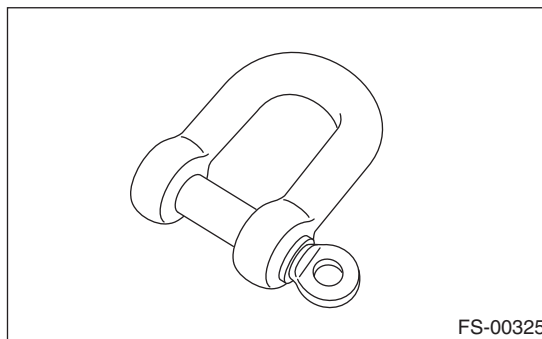


- Use a chain sling with the diameter of 6 mm (0.24 in) or 6.3 mm (0.25 in), the length of 0.8 — 1 m (2.6 — 3.3 ft), the chain inner width of 8.5 mm (0.33 in) or more, the chain outer width of 23.5 mm (0.93 in) or less and the load capacity of 1.2 t (2646 lb) or more.

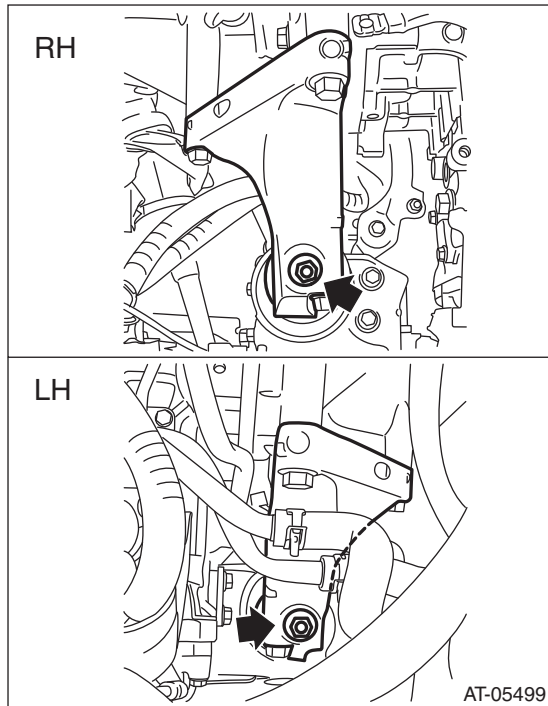


- (1) Wire diameter
(2) Inner width
(3) Outer width

- Use a shackle with the load capacity of 250 kg (551 lb) or more.



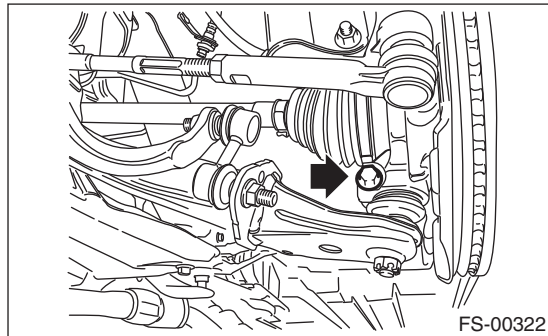
14) Remove the nuts connecting the main mount and the transmission mounting bracket.



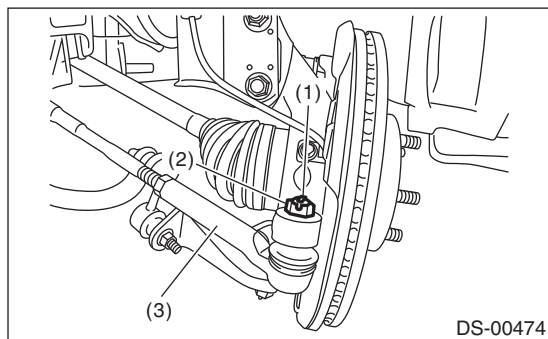
15) Remove the universal joint. <Ref. to PS-18, REMOVAL, Universal Joint.>

16) Remove the front exhaust pipe.

17) Disconnect the front arm.

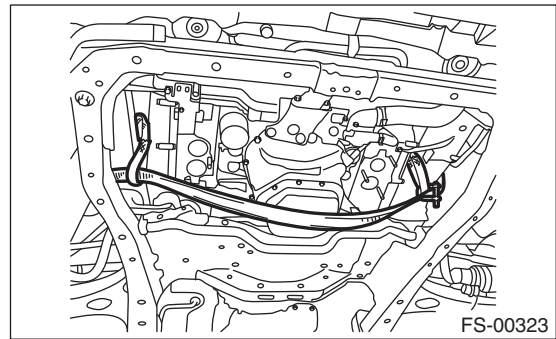


18) Disconnect the tie-rod end.



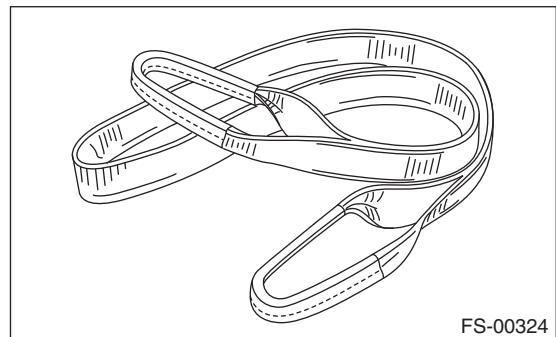
- (1) Cotter pin
- (2) Castle nut
- (3) Tie-rod end

19) Attach the sling belt so that it wraps around the both frames using the shackle.

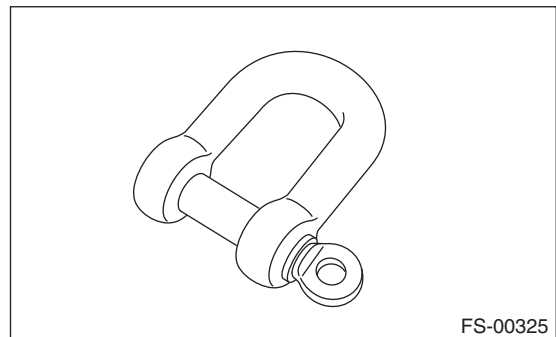


CAUTION:

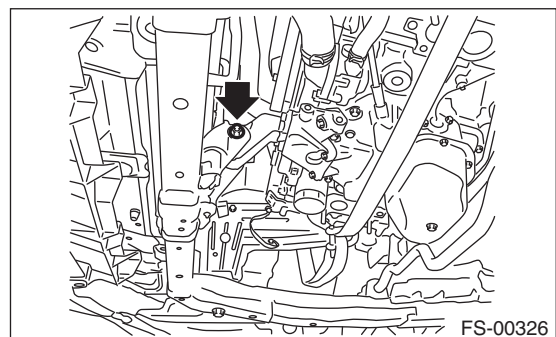
- Be sure to attach the sling belt to ensure safety in operation.
- Use a sling belt with the length of 2 m (6.6 ft), the width of 35 — 40 mm (1.38 — 1.57 in) and the load capacity of 1 t (2205 lb) or more.



- Use a shackle with the load capacity of 0.5 t (1103 lb) or more.



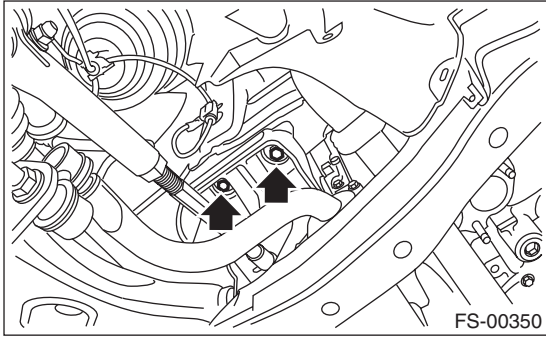
20) Remove the bolt on the front cushion rubber.



Cradle

FRONT SUSPENSION

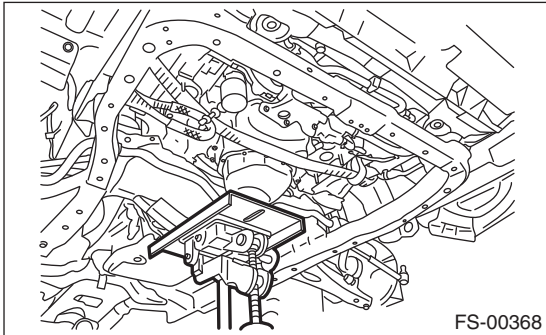
21) Support the cradle with a transmission jack and remove the bolts and nuts.



22) Remove the cradle from the vehicle.

CAUTION:

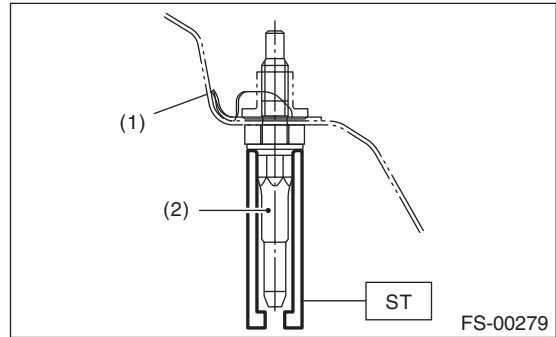
The cradle is heavy. Remove it carefully by paying attention to the balance.



23) 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) Install in the reverse order of removal.

NOTE:

Replace the gasket of the throttle body with a new gasket.

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.>

- Perform installation of the universal joint when the tilt position of the steering column is at the lowest position.

- Tighten the bolts of the universal joint in the order of gearbox side and column shaft side.

Tightening torque:

<Ref. to FS-3, COMPONENT, General Description.>

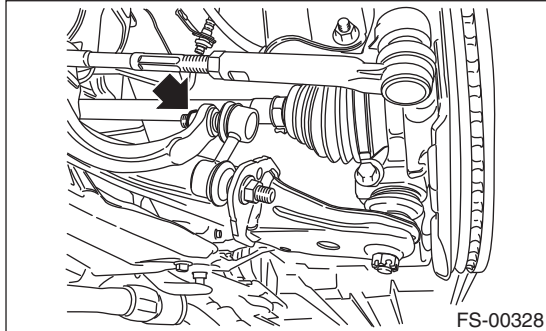
<Ref. to PS-4, COMPONENT, General Description.>

2) Inspect the wheel alignment and adjust if necessary.

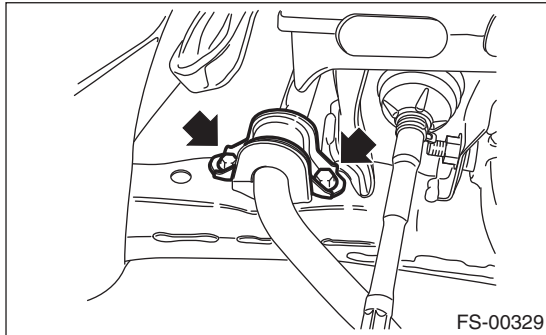
4. Front Stabilizer

A: REMOVAL

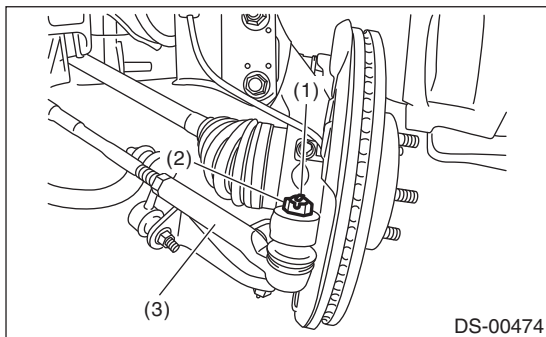
- 1) Lift up the vehicle, and then remove the front wheels.
- 2) Remove the front under cover. <Ref. to EI-35, REMOVAL, Front Under Cover.>
- 3) Remove the exhaust center pipe. (turbo model) <Ref. to EX(H4DOTC)-12, REMOVAL, Center Exhaust Pipe.>
- 4) Remove the stabilizer link.



- 5) Remove the stabilizer bracket.



- 6) Disconnect the tie-rod end.



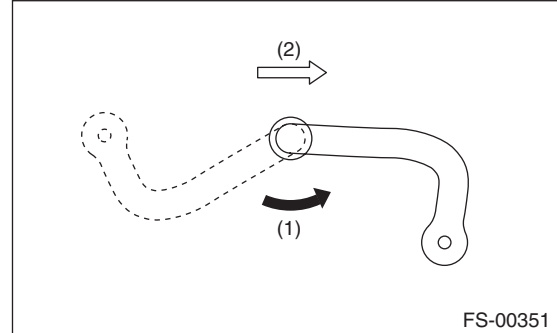
- (1) Cotter pin
- (2) Castle nut
- (3) Tie-rod end

- 7) Hang the engine and replace the front cushion mount with ST. (turbo model) <Ref. to 5AT-38, REMOVAL, Automatic Transmission Assembly.>
ST 41099AJ000 SPECIAL TOOL H4

NOTE:

For turbo model, it is required to secure space for operation to hang the engine and remove the stabilizer.

- 8) Turn the front stabilizer by approximately 180° toward the front of the vehicle and pull out the front stabilizer from the right side of the vehicle.



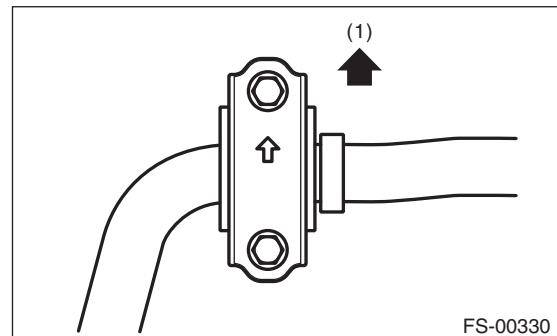
- (1) Turn toward the front of the vehicle.
- (2) Front side of vehicle

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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 bracket:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

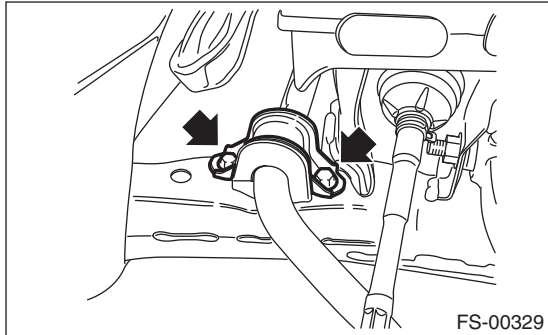
Stabilizer link:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

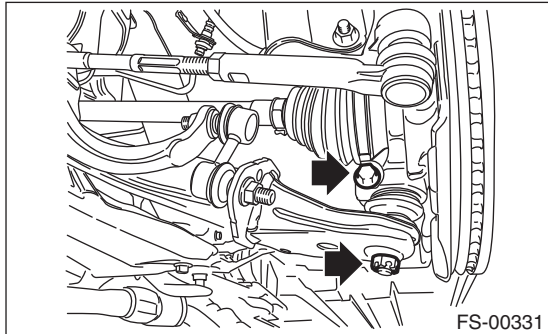
5. Front Ball Joint

A: REMOVAL

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Remove the both sides of stabilizer bracket.



- 3) Pull out the cotter 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

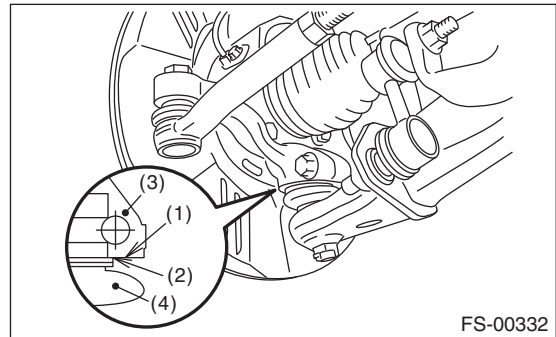
- 1) Install the ball joint into housing.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

CAUTION:

- Do not apply grease to the tapered portion of ball stud.
- Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.



- (1) Housing bottom
- (2) Raised section of ball joint
- (3) Housing
- (4) Ball joint

- 2) Install the ball joint into front arm.

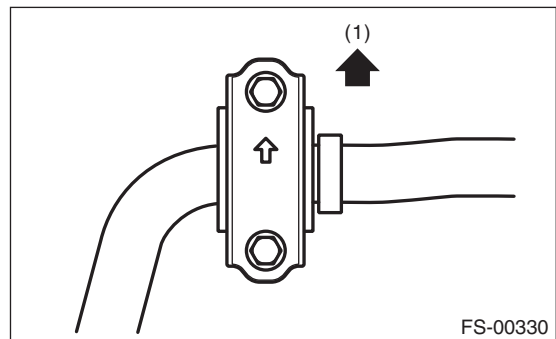
Tightening torque:

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:

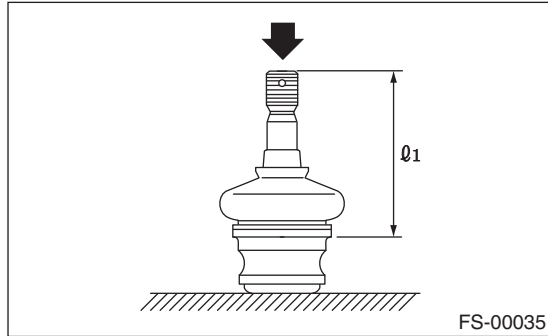
25 N·m (2.5 kgf-m, 18.4 ft-lb)

- 5) Install the front wheels.

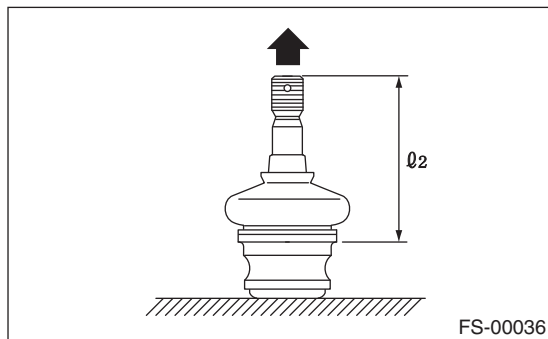
C: INSPECTION

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 Q_1 .



(2) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the length Q_2 .



(3) Determine free play using the following formula.

$$S = Q_2 - Q_1$$

(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)

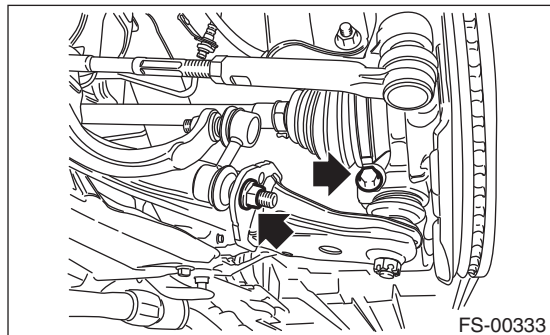
2) If the play is within specification, visually check the dust cover.

3) If the dust cover is damaged, replace with a new ball joint.

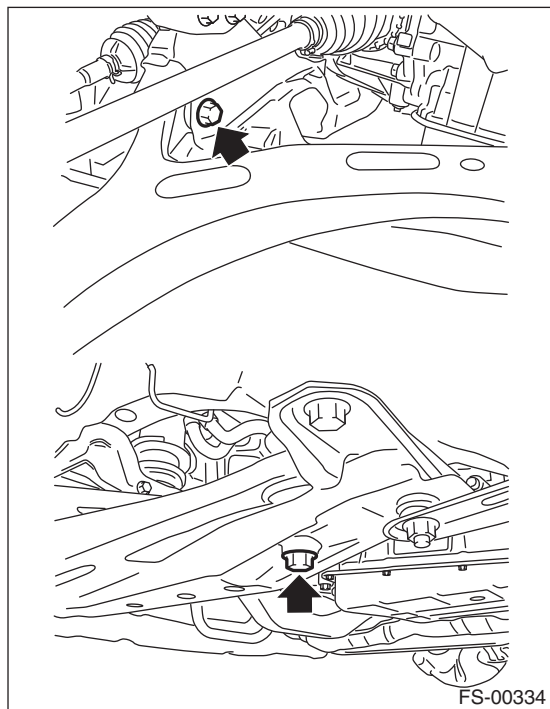
6. Front Arm

A: REMOVAL

- 1) Lift up the vehicle, and then remove the front wheels.
- 2) Remove the front stabilizer link.
- 3) Remove the ball joint of front arm.



- 4) Remove the bolts, then remove the front arm.

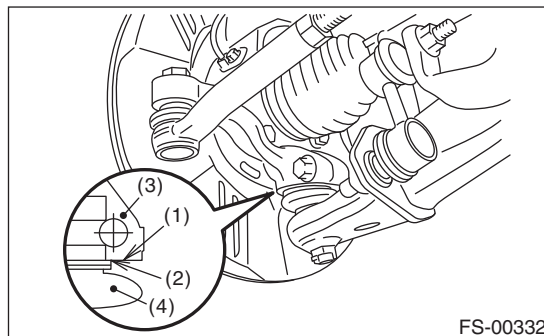


B: INSTALLATION

- 1) Using new self-locking nuts, temporary tighten the front arm.
- 2) Install the ball joint into housing.

CAUTION:

Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.



- (1) Housing bottom
- (2) Raised section of ball joint
- (3) Housing
- (4) Ball joint

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

- 3) Install the stabilizer link.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

- 4) Install the front wheels.
- 5) Unload the vehicle from lift, and tighten the bolt which secures the front arm to cradle with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:

Front bushing side

95 N·m (9.7 kgf-m, 70.1 ft-lb)

Rear bushing side

140 N·m (14.3 kgf-m, 103.3 ft-lb)

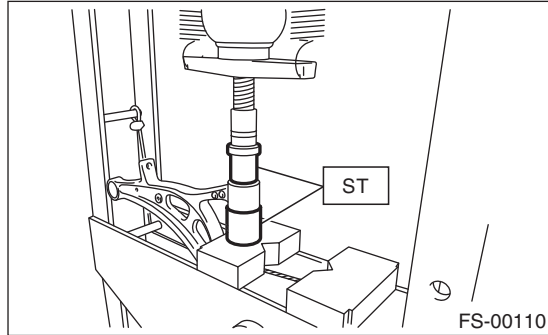
- 6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using the ST and a press, remove the front bushing.

ST 927680000 INSTALLER & REMOVER SET

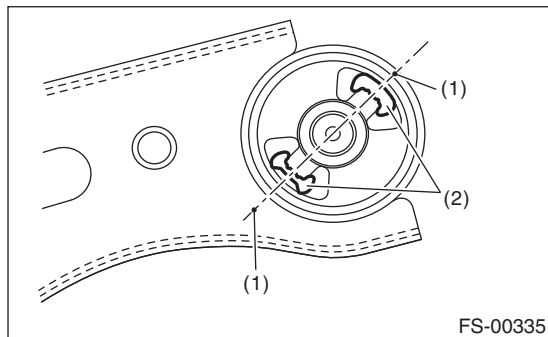


2. REAR BUSHING

1) Put an alignment mark on the front arm based on the center of rear bushing recess portion.

CAUTION:

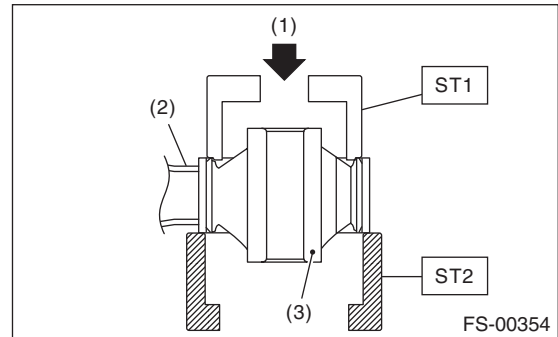
Always put an alignment mark for aligning the position on bushing installation.



- (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

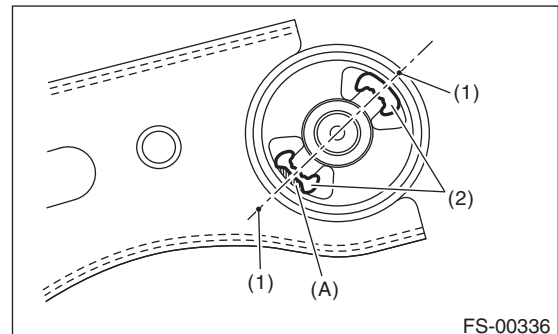
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

2. REAR BUSHING

1) Align the center of recess portion with the alignment mark on the front arm, with the protrusion (A) of recess portion facing the front side of vehicle.



- (1) Alignment mark
- (2) Recess section

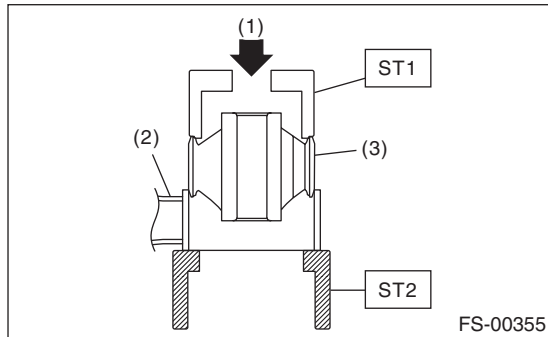
Front Arm

FRONT SUSPENSION

2) 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

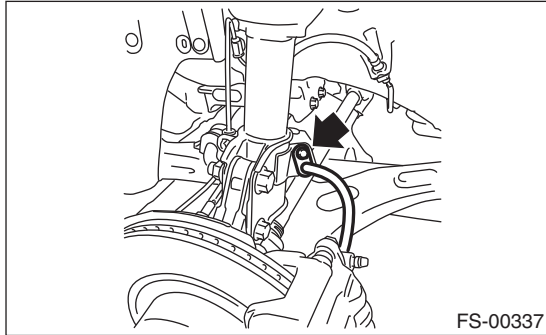
1) Check the front arm for damage or cracks, and replace if defective.

2) Check the bushing for abnormal fatigue or damage.

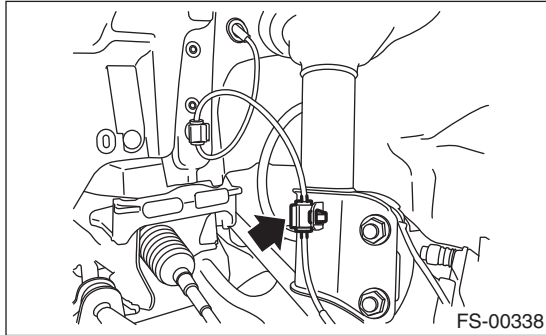
7. Front Strut

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 ABS wheel speed sensor harness.

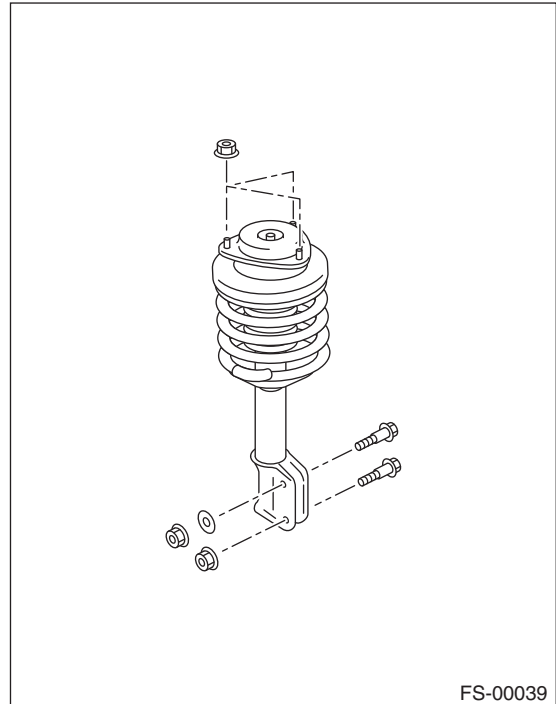


- 5) Remove the two bolts securing the housing to the strut.

NOTE:

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

- 6) Remove the three nuts securing strut mount to body.



B: INSTALLATION

- 1) Install the strut mount at 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 self-locking nuts, install the strut to the housing.

NOTE:

While holding the head of adjusting bolt, tighten the self-locking nut.

Tightening torque:

155 N·m (15.8 kgf-m, 114.3 ft-lb)

- 3) Secure the ABS wheel speed sensor harness bracket to the strut.

- 4) Install the brake hose bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

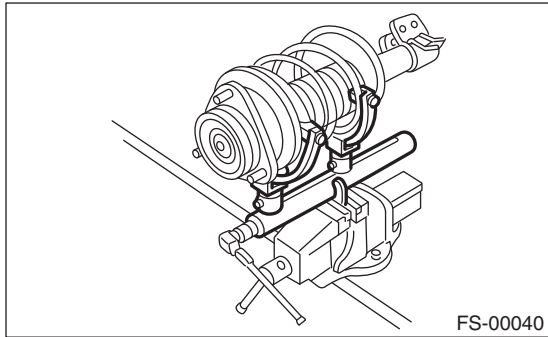
- 5) Install the front wheels.
- 6) Inspect the wheel alignment and adjust if necessary.

Front Strut

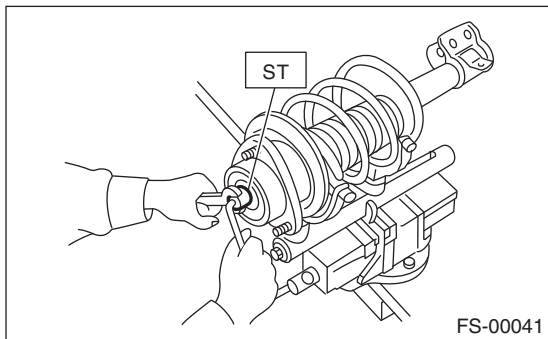
FRONT SUSPENSION

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



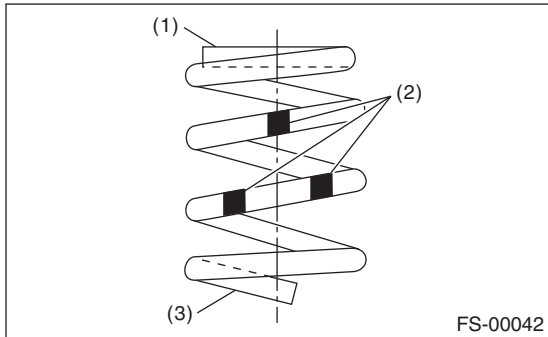
3) Remove the strut mount, spacer and upper spring seat from the strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper.

D: ASSEMBLY

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

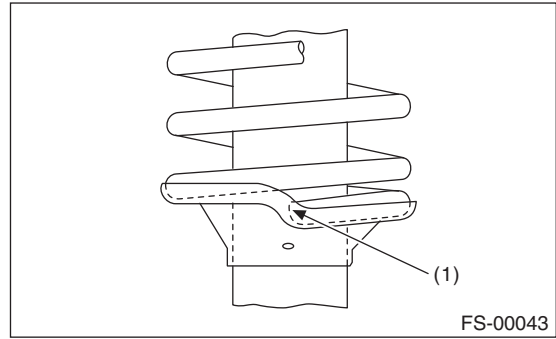
NOTE:

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.



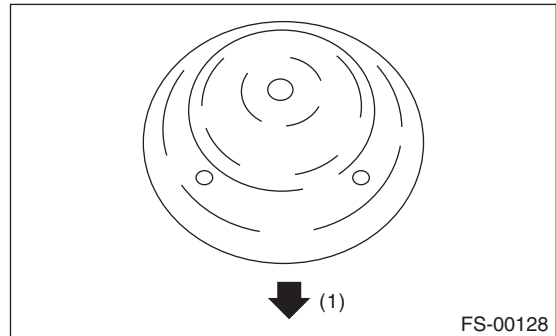
(1) Coil spring end face

3) Install the dust cover and helper 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

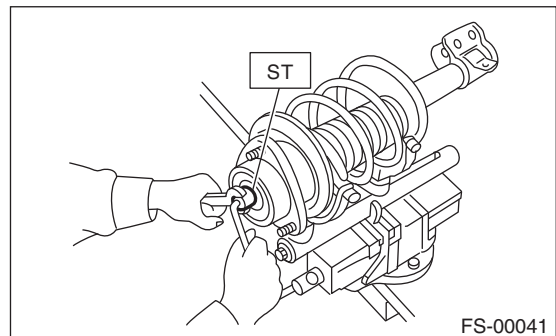
5) Install the spacer and strut mount to the piston rod, and temporarily tighten a new self-locking nut.

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)



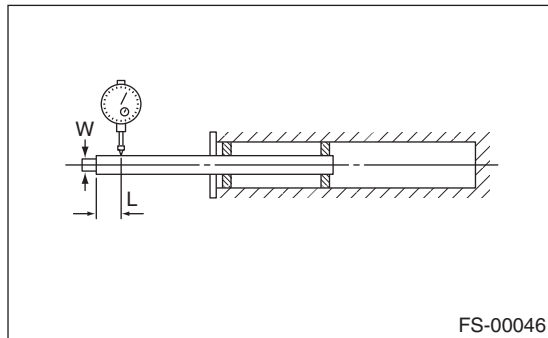
7) Loosen the coil spring compressor carefully.

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, abnormal cracks or deterioration, and then replace it with a new part if defective.

3. DUST COVER

If abnormal cracks or damage are found, replace it with a new part.

4. COIL SPRING

If a permanent strain is found, replaced it with a new part.

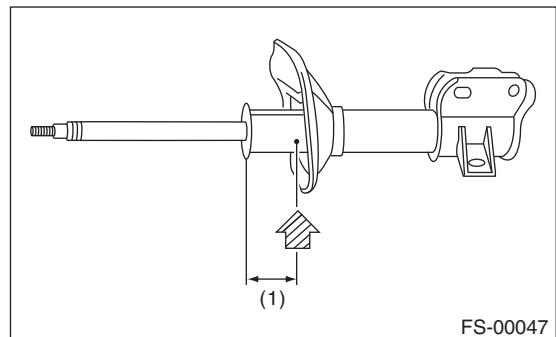
5. HELPER

If abnormal 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)

General Diagnostic Table

FRONT SUSPENSION

8. 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) 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.

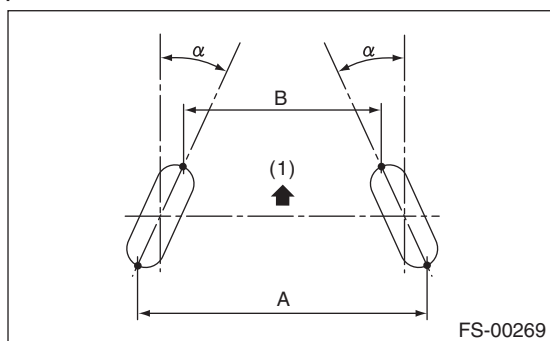
1. General Description

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.
- For other items indicated in the specifications table, there is no adjustment mechanism. If other items exceed specifications, check the suspension parts and connections for deformation, and replace the parts if defective.



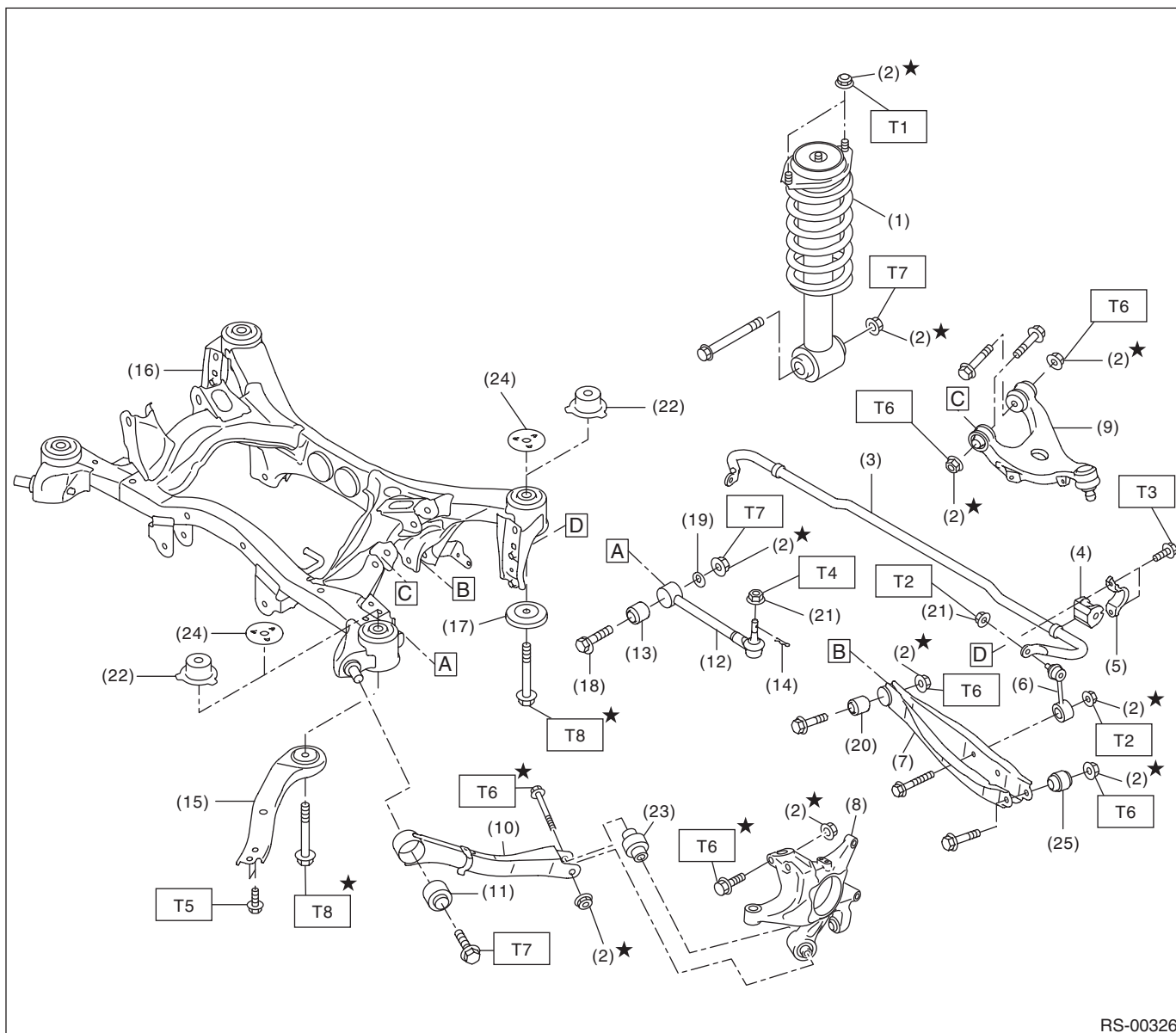
(1) Front

$A - B$ = Positive: Toe-in, Negative: Toe-out

α = Individual toe angles

B: COMPONENT

1. REAR SUSPENSION

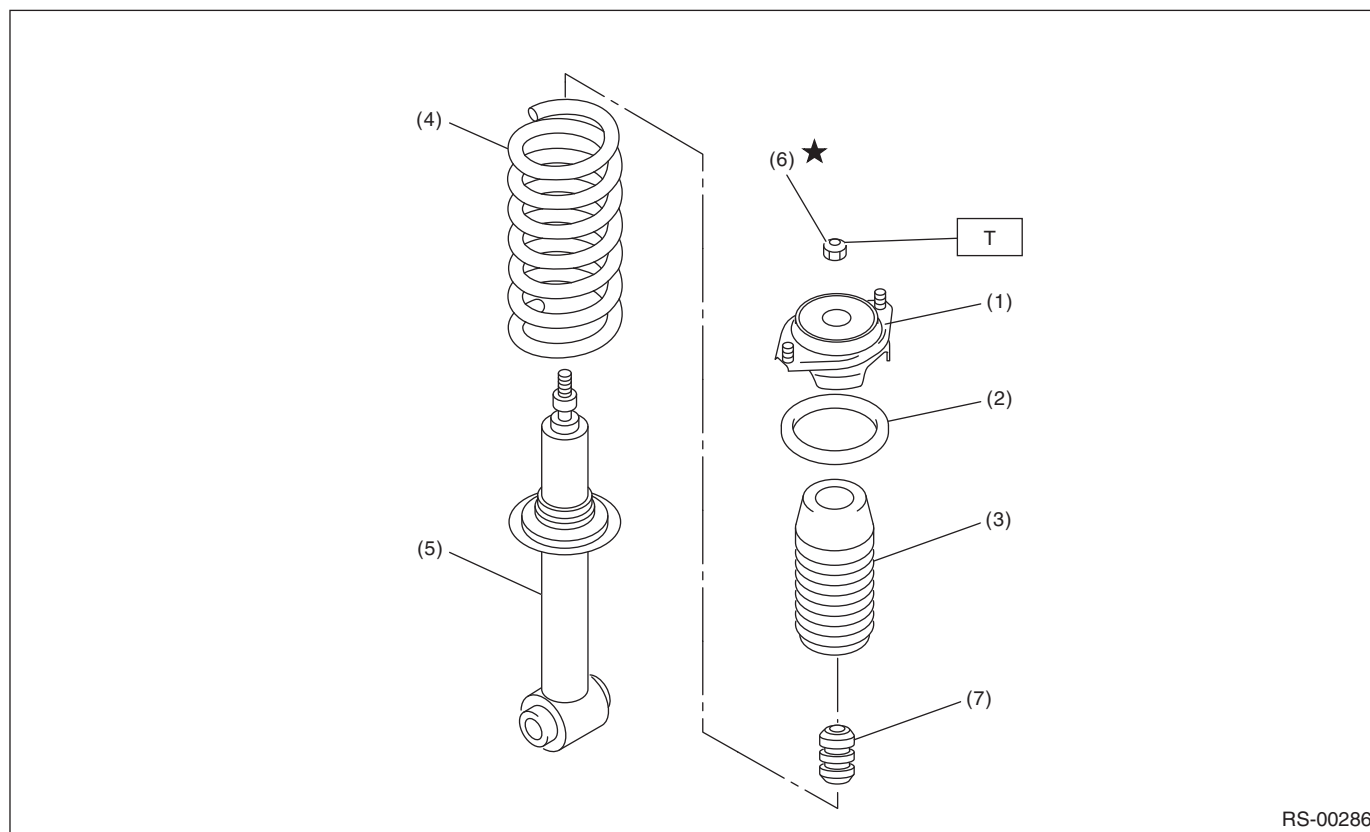


General Description

REAR SUSPENSION

(1) Shock absorber	(14) Snap pin	Tightening torque:N·m (kgf-m, ft-lb)
(2) Self-locking nut	(15) Front sub frame support plate	T1: 30 (3.1, 22.1)
(3) Rear stabilizer	(16) Rear sub frame	T2: 33 (3.4, 24.3)
(4) Stabilizer bushing	(17) Rear sub frame stopper lower	T3: 38 (3.9, 28)
(5) Stabilizer clamp	(18) Adjusting bolt	T4: 60 (6.1, 44.3)
(6) Stabilizer link	(19) Adjusting washer	T5: 70 (7.1, 51.6)
(7) Rear lateral link	(20) Rear lateral link bushing	T6: 80 (8.2, 59)
(8) Rear housing	(21) Flange nut	T7: 120 (12.2, 88.5)
(9) Upper arm	(22) Rear sub frame stopper upper (OUTBACK model)	T8: 200 (20.4, 147.5)
(10) Trailing link	(23) Trailing link rear bushing	
(11) Trailing link bushing	(24) Rear sub frame stopper upper (except for OUTBACK model)	
(12) Front lateral link	(25) Rear housing bushing	
(13) Front lateral link bushing		

2. SHOCK ABSORBER



RS-00286

(1) Mount	(5) Shock absorber	Tightening torque:N·m (kgf-m, ft-lb)
(2) Upper rubber sheet	(6) Self-locking nut	T: 25 (2.5, 18.4)
(3) Dust cover	(7) Helper	
(4) Coil spring		

C: CAUTION

Please clearly understand and observe the following cautions. Please adhere to these cautions to avoid minor or serious injury to the person doing the work or people in the area.

1. EACH PROCEDURE

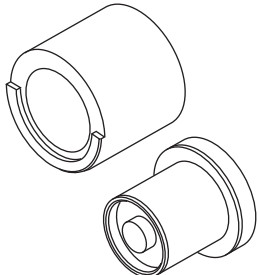
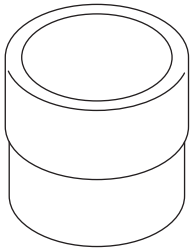
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disposing of shock absorbers, be sure to bleed the gas out completely. Also, do not expose to flames or fire.
- Before removal, installation or disassembly, be sure to clarify 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.

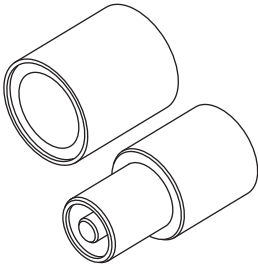
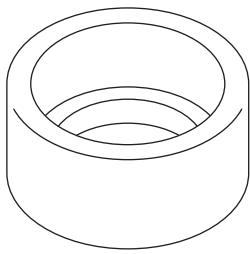
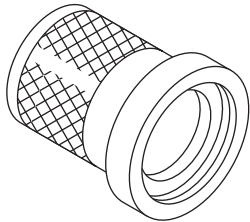
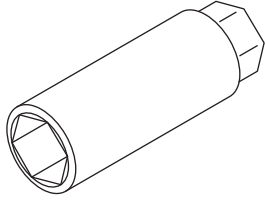
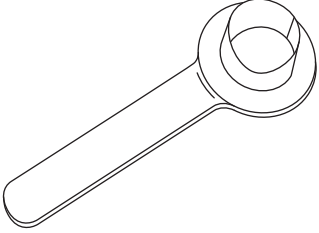
- Prepare a container and cloth when performing work which oil possibly spills. If oil spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government regulations concerning disposal of refuse when disposing.

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.

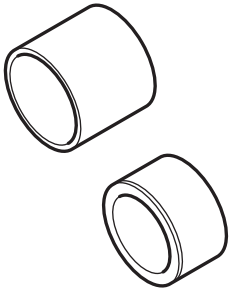
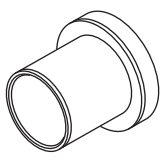
General Description

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 base part of 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

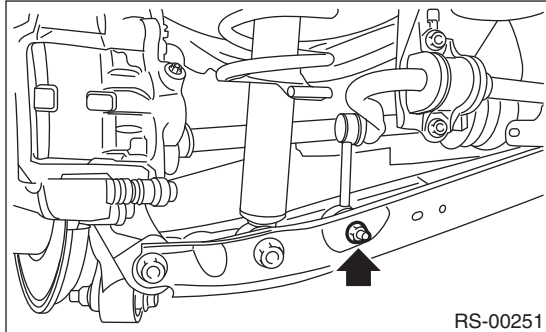
NOTE:

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-8, INSPECTION, Wheel Alignment.>

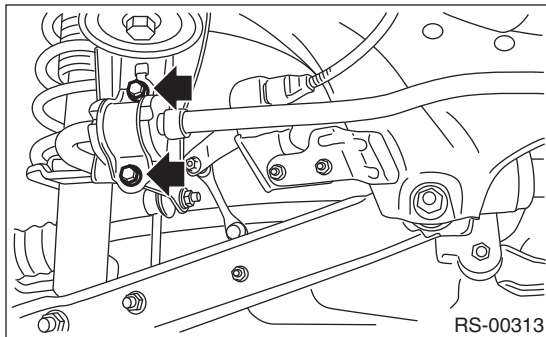
3. Rear Stabilizer

A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Remove the stabilizer link.



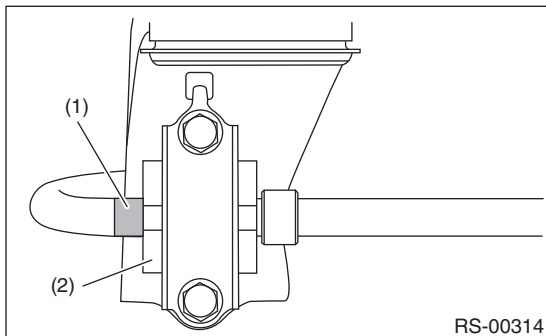
- 3) Remove the stabilizer clamp.



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

33 N·m (3.4 kgf-m, 24.3 ft-lb)

Stabilizer clamp

38 N·m (3.9 kgf-m, 28 ft-lb)

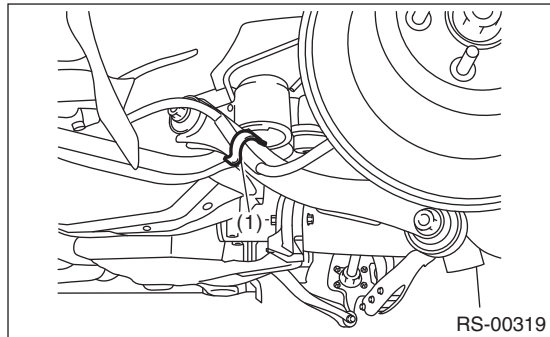
C: INSPECTION

- 1) Check the bushing for abnormal cracks, fatigue or damages.
- 2) Check the stabilizer link for damage.

4. Rear Trailing Link

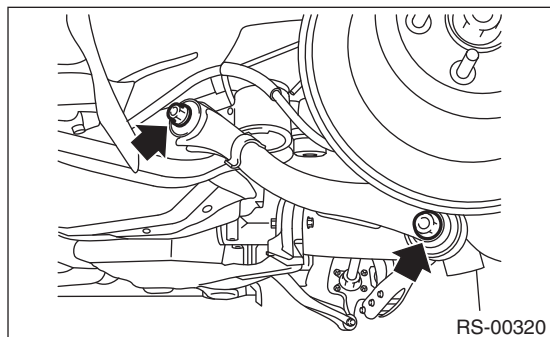
A: REMOVAL

- 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:

Rear trailing link to Rear sub frame

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Rear trailing link to Rear housing

80 N·m (8.2 kgf-m, 59 ft-lb)

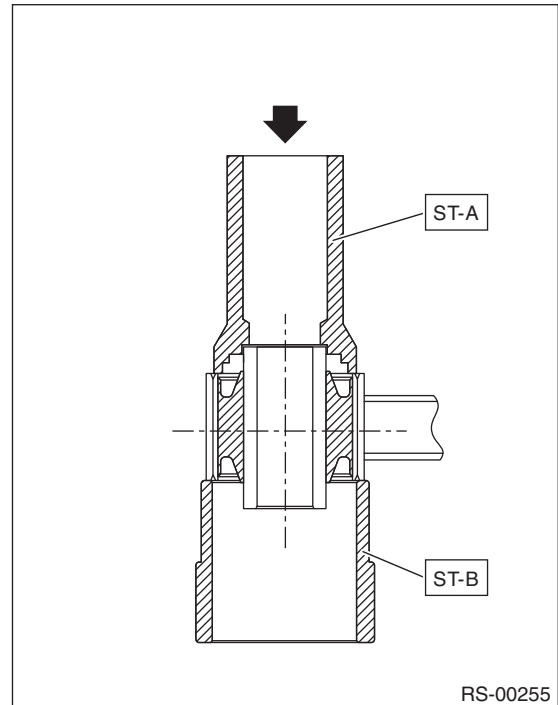
C: DISASSEMBLY

1. REAR TRAILING LINK BUSHING

Using the ST A and ST B, press the bushing out.

STA 8998741000 INSTALLER

STB 499755602 PRESS

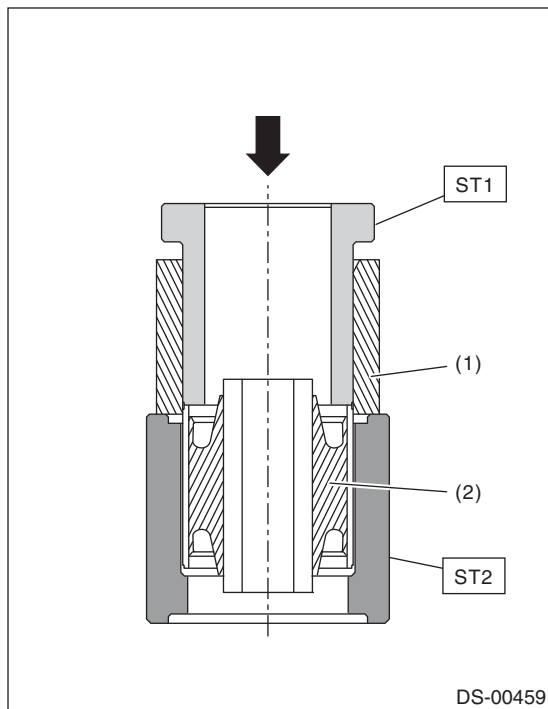
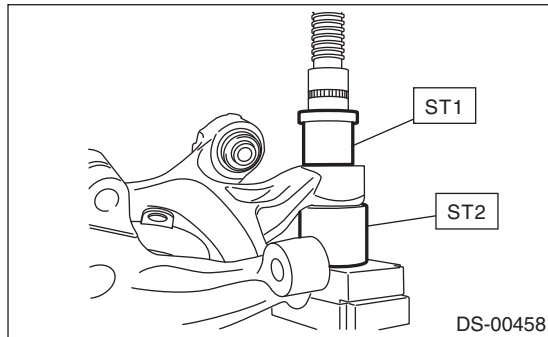


2. REAR HOUSING BUSHING

- 1) Remove the rear housing. <Ref. to DS-18, REMOVAL, Rear Axle.>

2) Using the ST and a hydraulic press, push out the bushing.

ST1 20099FG000 BUSHING REMOVER
ST2 20099PA010 INSTALLER & REMOVER (BASE)



- (1) Rear housing
- (2) Bushing

D: ASSEMBLY

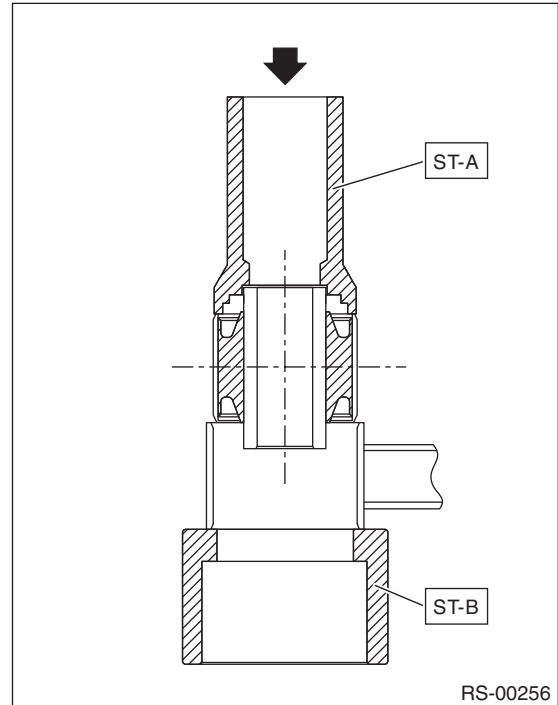
1. REAR TRAILING LINK BUSHING

Using the ST A and ST B, press-fit the bushing.

STA 8998741000 INSTALLER
STB 20299AG010 BASE

CAUTION:

Press-fit the bushing straight.



2. REAR HOUSING BUSHING

Press-fit the bushing using the ST and hydraulic press.

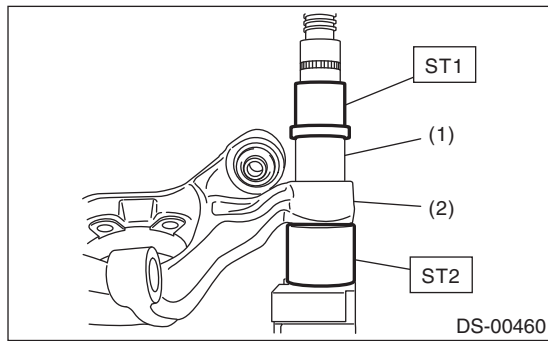
ST1 20099FG000 BUSHING REMOVER
ST2 20099PA010 INSTALLER & REMOVER (BASE)

Rear Trailing Link

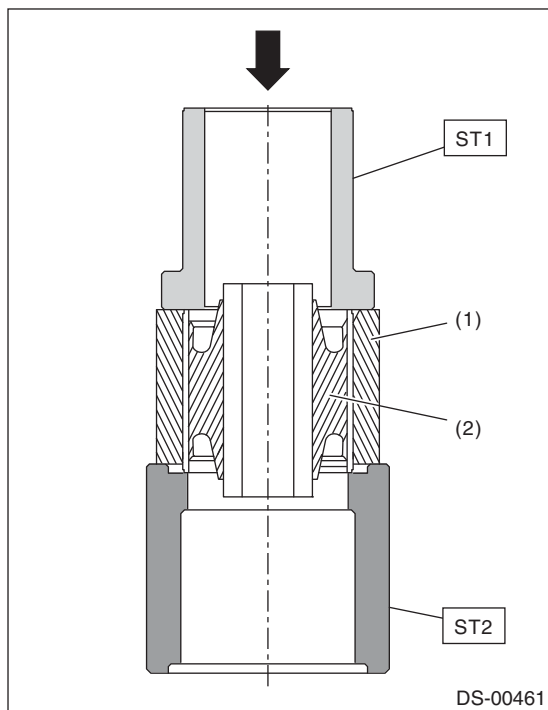
REAR SUSPENSION

CAUTION:

Press-fit the bushing straight.



- (1) Bushing
- (2) Rear housing



- (1) Rear housing
- (2) Bushing

E: INSPECTION

- 1) Visually check the trailing link for damage and deformation.
- 2) Visually check the bushing for abnormal cracks, damages or fatigue.

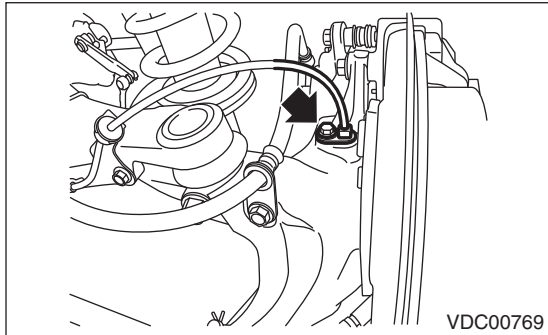
5. Upper Arm

A: REMOVAL

1) Remove the rear ABS wheel speed sensor from the rear axle.

CAUTION:

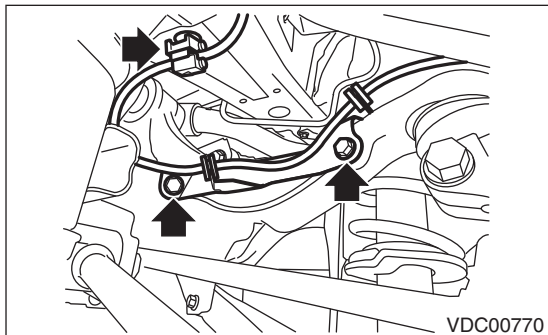
- Be careful not to damage the sensor.
- Do not apply excessive force to the sensor harness.



2) Remove the rear ABS wheel speed sensor bracket from the upper arm.

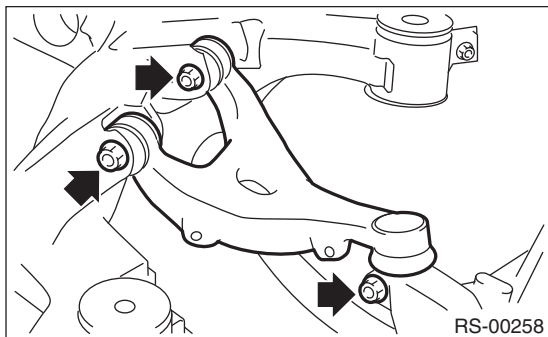
NOTE:

Leave the sensor harness clamp on the vehicle side.



3) Remove the rear sub frame. <Ref. to RS-17, REMOVAL, Rear Sub Frame.>

4) Remove the bolts, then remove the upper arm.



B: INSTALLATION

CAUTION:

- Use a new self-locking nut.
- Always tighten the bushing at the arm position; 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 to Rear sub frame

80 N·m (8.2 kgf-m, 59 ft-lb)

Upper arm to 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

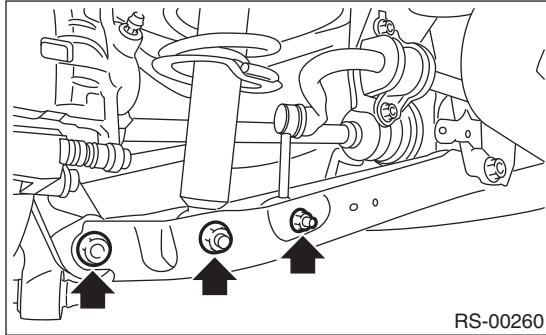
1) Visually check the upper arm for damage and deformation.

2) Visually check the bushing for abnormal cracks, damages or fatigue.

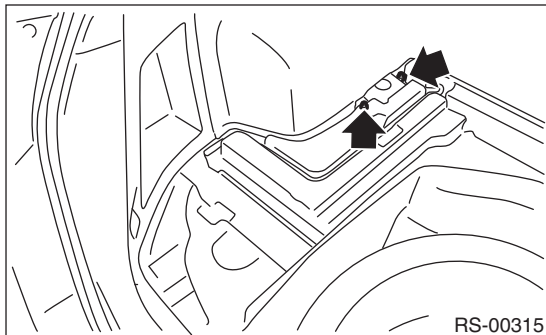
6. Rear Shock Absorber

A: REMOVAL

- 1) Remove the trunk side trim (sedan model) or luggage side mat (OUTBACK model).
- 2) Lift up the vehicle, and then remove the rear wheels.
- 3) Remove the nut, and disconnect the rear stabilizer link.
- 4) Remove the bolts at the bottom of the shock absorber.
- 5) Disconnect the rear lateral link.



- 6) Remove the nuts of the shock absorber mount.



- 7) 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 if necessary.

C: DISASSEMBLY

Refer to “Front Strut” for disassembly procedure. <Ref. to FS-26, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to “Front Strut” for installation procedures. <Ref. to FS-26, ASSEMBLY, Front Strut.>

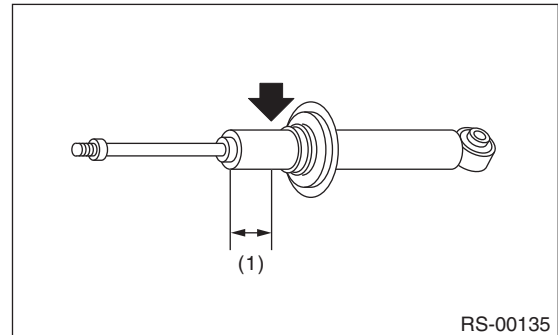
E: INSPECTION

Refer to “Front Strut” for inspection procedures. <Ref. to FS-27, 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.

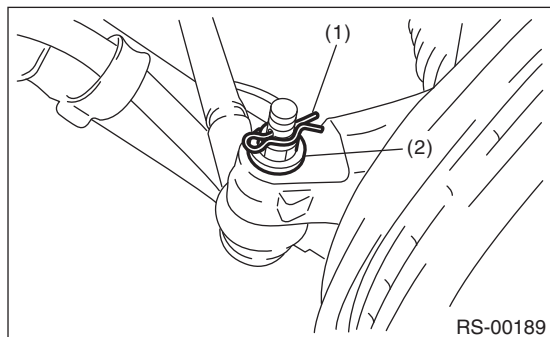


(1) 40 mm (1.57 in)

7. Front Lateral Link

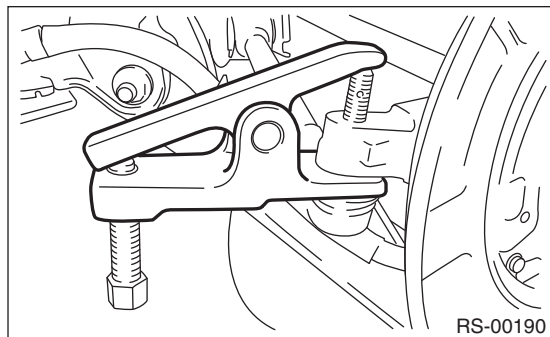
A: REMOVAL

- 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

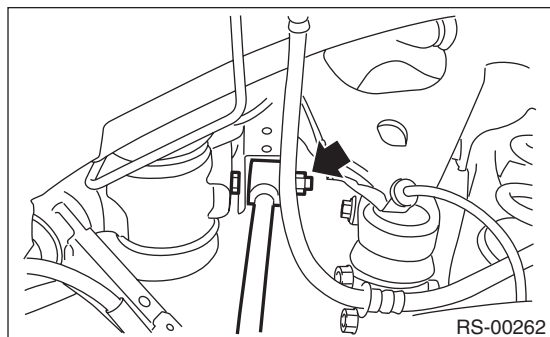
- 4) Using a puller, remove the ball joint.



- 5) Place 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, and loosen 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 to Sub frame
120 N·m (12.2 kgf-m, 88.5 ft-lb)

Front lateral link to Rear axle housing
60 N·m (6.1 kgf-m, 44.3 ft-lb)

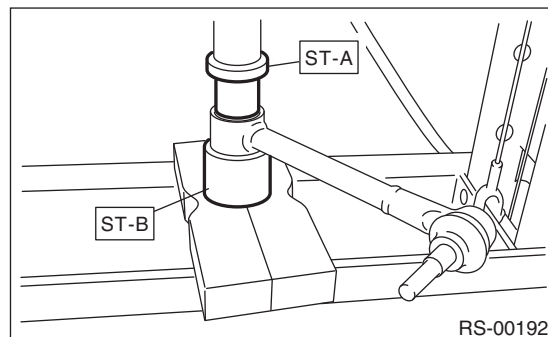
- 2) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Using the ST A and ST B, press the bushing out.

ST A 20099AE000 INSTALLER & REMOVER

ST B 20099AE000 INSTALLER & REMOVER



D: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.

ST A 20099AE000 INSTALLER & REMOVER

ST B 20099AE000 INSTALLER & REMOVER

CAUTION:

Press-fit the bushing straight.

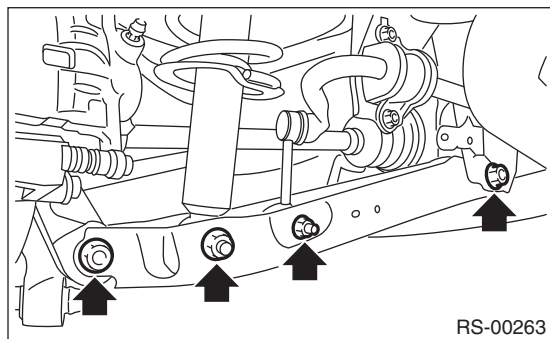
E: INSPECTION

- 1) Visually check the front lateral link for damage and deformation.
- 2) Visually check the bushing for abnormal cracks, damages or fatigue.

8. Rear Lateral Link

A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Remove the nut, and remove the stabilizer link.
- 3) Remove the bolts at the bottom of the shock absorber.
- 4) Remove the bolt, and remove the 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

80 N·m (8.2 kgf-m, 59 ft-lb)

Shock absorber

80 N·m (8.2 kgf-m, 59 ft-lb)

Stabilizer link

33 N·m (3.4 kgf-m, 24.3 ft-lb)

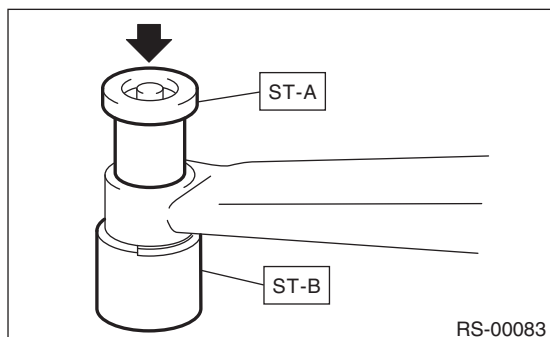
- 2) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Using the ST A and ST B, press the bushing out.

STA 20099AE010 INSTALLER & REMOVER

STB 20099AE010 INSTALLER & REMOVER

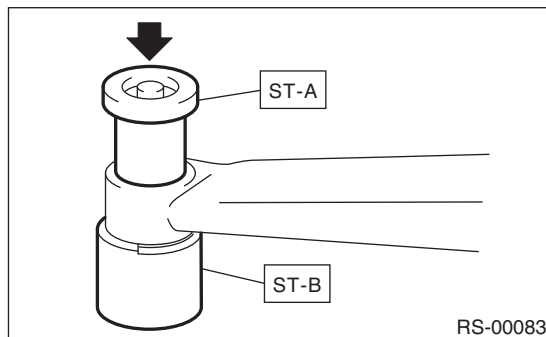


D: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.

STA 20099AE010 INSTALLER & REMOVER

STB 20099AE010 INSTALLER & REMOVER



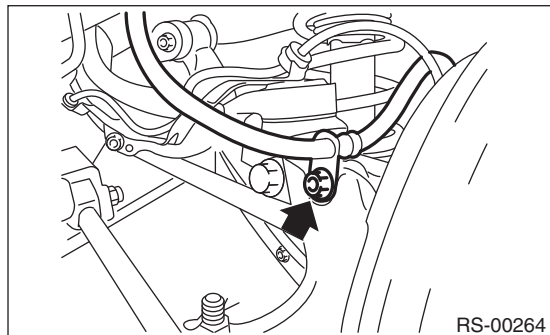
E: INSPECTION

- 1) Visually check the rear lateral link for damage and deformation.
- 2) Visually check the bushing for abnormal cracks, damages or fatigue.

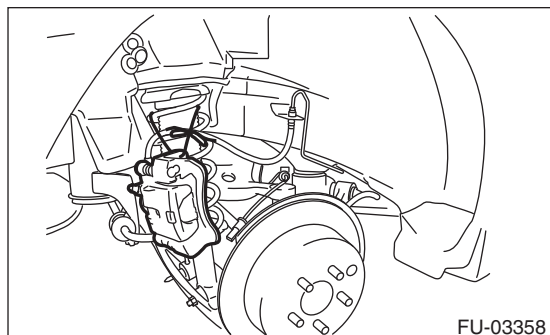
9. Rear Sub Frame

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle, and then remove the rear wheels.
- 3) Separate the front exhaust pipe and rear exhaust pipe.
- 4) Remove the rear exhaust pipe and muffler.
- 5) Remove the propeller shaft.
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 6) Remove the brake hose bracket.



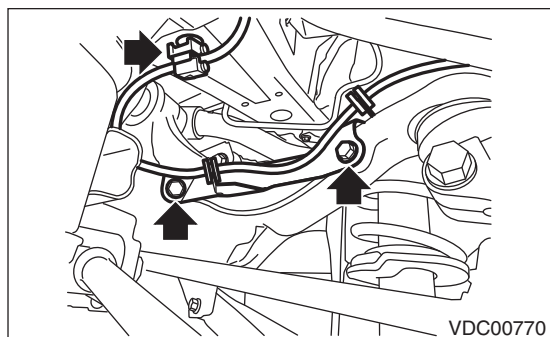
- 7) Remove the rear disc brake caliper, and suspend it to the shock absorber.



- 8) Disconnect the rear parking brake cable from the parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
- 9) Remove the rear ABS wheel speed sensor harness bracket from the upper arm.

NOTE:

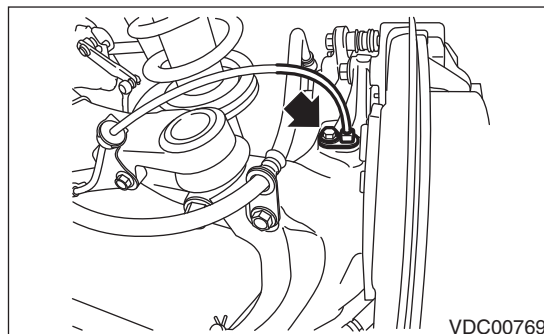
Leave the sensor harness clamp on the vehicle side.



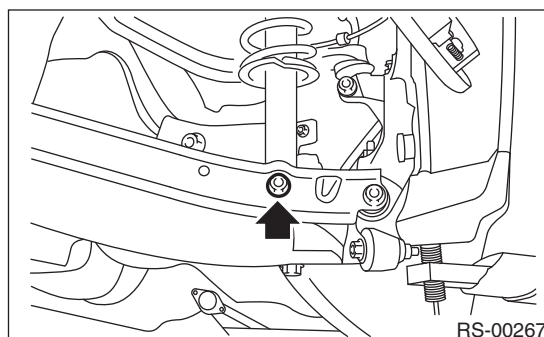
- 10) Remove the rear ABS wheel speed sensor from the rear axle.

CAUTION:

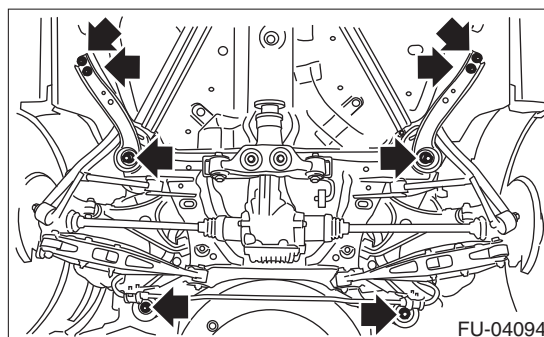
- Be careful not to damage the sensor.
- Do not apply excessive force to the sensor harness.



- 11) Remove the bolts at the bottom of the shock absorber.



- 12) Support the sub frame using a jack.
- 13) 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) Bleed air from brake system.

3) 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 shock absorber	Replace.
(3) Installation of the wrong 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) Defective operation of shock absorber	Replace.
(5) Damage or deformation of shock absorber mount	Replace.
(6) Unsuitable length (maximum or minimum) of shock absorber	Replace with appropriate parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in shock absorber	Replace.
(9) Oil leakage from the shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of shock absorber component parts	Replace.
(2) Loosening of the suspension link or arm installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitable length (maximum or minimum) of 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

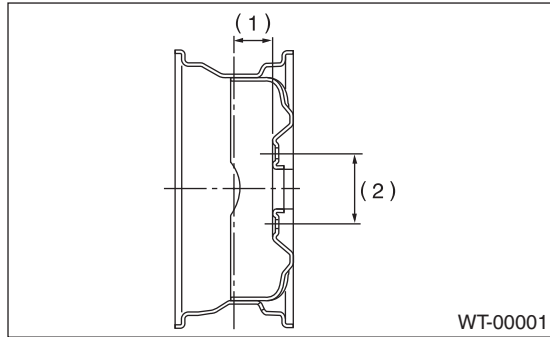
REAR SUSPENSION

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
P205/60R16 91V	16 × 6 ¹ / ₂ JJ 16 × 6 ¹ / ₂ J	48 (1.89)	100 (3.94)	230 (2.3, 33)	220 (2.2, 32)
P215/50R17 90V	17 × 7 ¹ / ₂ J				
P225/50R17 93V	17 × 7 ¹ / ₂ J			220 (2.2, 32)	210 (2.1, 31)
P215/70R16 99S	16 × 6 ¹ / ₂ JJ				
P225/60R17 98T	17 × 7J			230 (2.3, 33)	220 (2.2, 32)
225/45R18 91W	18 × 7 ¹ / ₂ J	55 (2.17)			
T135/80R16 101M	16 × 4T	20 (0.79)		—	420 (4.2, 60)
T135/70R17 102M	17 × 4T				
T145/80R17 97M					

NOTE:

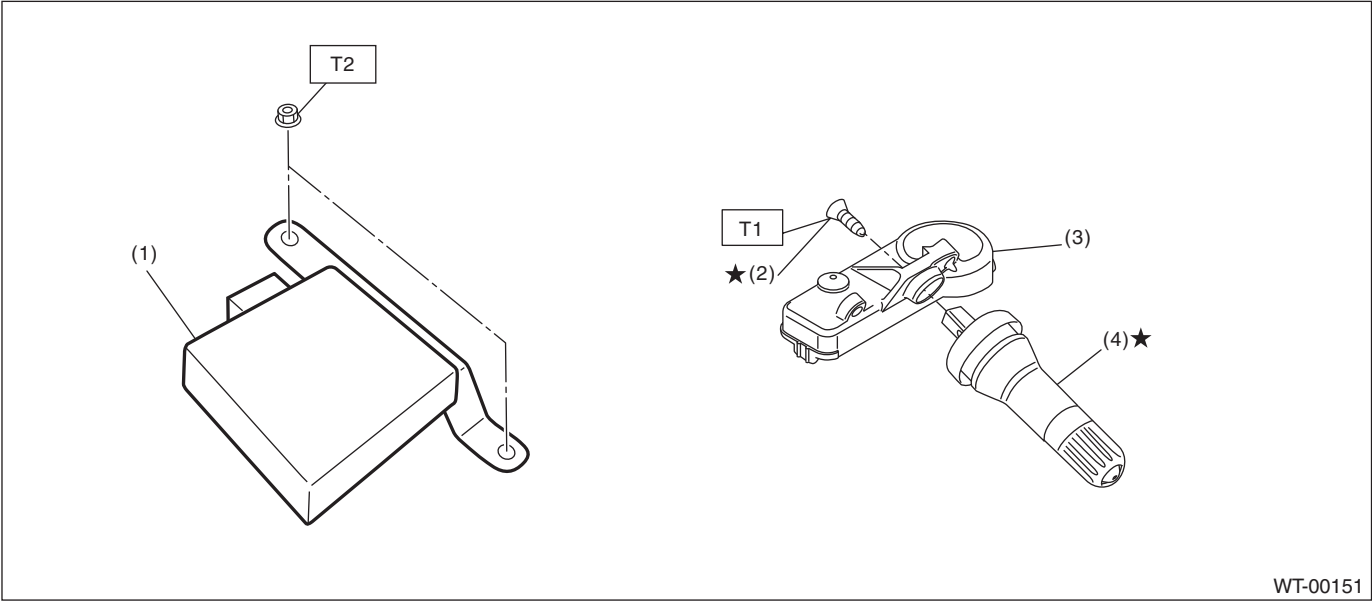
Size and inflation pressure of the standard equipment tire and spare tire for emergency are described on the “Tire inflation pressure” label attached to the body side of the driver’s door.

1. SERVICE DATA

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

Wheel balancing	Standard:	Service limit
Dynamic unbalance	5 g (0.18 oz) or less	

B: COMPONENT



- (1)

Tire inflation pressure monitor 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: 8 (0.8, 5.9)

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.

Tire and Wheel

WHEEL AND TIRE SYSTEM

2. Tire and Wheel

A: REMOVAL

- 1) Remove the hubcap. (model with hubcap)
- 2) Lift up the vehicle.
- 3) Remove the wheel nut.
- 4) Remove the wheels.

NOTE:

When removing the wheels, be careful not to damage the hub bolts.

B: INSTALLATION

- 1) Install the wheels to the vehicle.
- 2) Tighten the wheel nuts to the specified torque.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

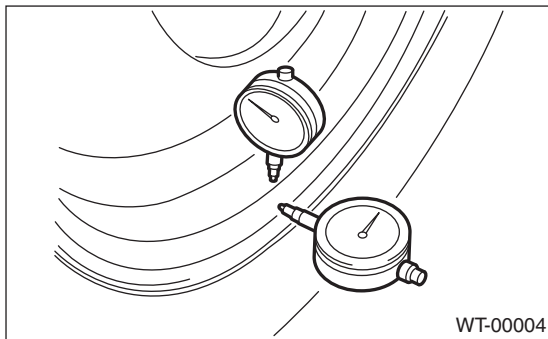
C: INSPECTION

1. TIRE

CAUTION:

When replacing a tire, make sure to use only tires of the same size, construction and load range as originally installed.

- 1) Tire size and tire inflation pressure check <Ref. to WT-2, SPECIFICATION, General Description.>
- 2) Cracks, damage and wear check
- 3) Tire runout check
 - (1) Lift up the vehicle.
 - (2) Slowly rotate the wheel to check rim "runout" using a dial gauge.



- Aluminum wheel

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

- Steel wheel

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

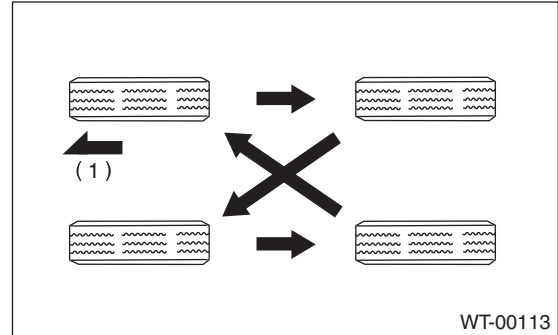
- (3) If the rim runout exceeds service limit, replace the wheel.

2. TIRE ROTATION

NOTE:

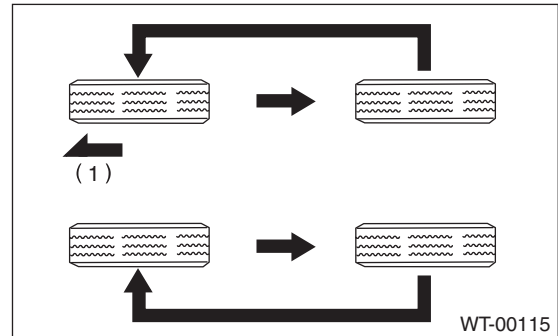
Rotate tires periodically (12,500 km/7,500 miles) in order to prolong life and to prevent uneven wear. Rotate tires as shown in the figure depending on whether or not the direction of the tire rotation is specified.

- When the direction of tire rotation is not specified



(1) Front side of vehicle

- When the direction of tire rotation is specified



(1) Front side of vehicle

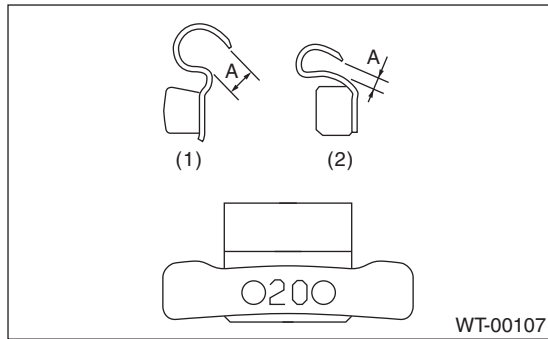
3. WHEEL BALANCING

- 1) Using the wheel balancer, measure wheel balance.
- 2) Adjust the wheel balancing.

NOTE:

- Unbalance after adjusting the wheel balancing should be 5 g (0.18 oz) or less.
- When using the adhesive type weight, degrease the surface where the adhesive type weight will be applied securely.
- After applying the adhesive type weight, apply a force to the weight and attain full adhesion.

- Using the knock-on type weight, check the size of the knock-on part.



- (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)

3. “T-type” Tire

A: NOTE

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

CAUTION:

- The “T-type” tire is only for temporary use. Replace with a conventional tire as soon as possible.
- Do not use tire chains for “T-type” tires. Doing so can damage the vehicle and the tires because the tires are too small in size to attach chains to.
- Do not drive at a speed greater than 80 km/h (50 MPH).
- Drive at as low a speed as possible and avoid bumps on the road.

B: REPLACEMENT

Refer to “Tire & Wheel” for removal and installation of the “T-type” tire. <Ref. to WT-4, Tire and Wheel.>

C: INSPECTION

Refer to “Tire & Wheel” for inspection of the “T-type” tire. <Ref. to WT-4, TIRE, INSPECTION, Tire and Wheel.>

4. Tire Pressure Monitoring System

A: REMOVAL

1. TRANSMITTER (TIRE INFLATION PRESSURE SENSOR)

- 1) Remove the wheels from the vehicle. <Ref. to WT-4, REMOVAL, Tire and Wheel.>
- 2) Remove the tire from the wheel.

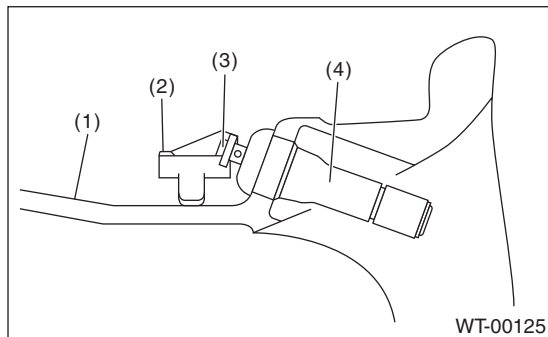
CAUTION:

When removing the tire from the wheel, use the tire changer.

- 3) Remove the screw, and remove the transmitter from the valve stem.

NOTE:

When reusing the transmitter, replace the valve and screw with new parts.

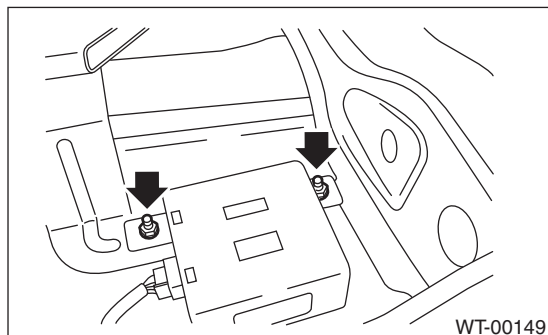


- (1) Wheel
- (2) Transmitter
- (3) Screw
- (4) Valve

- 4) Remove the valve from the wheel.

2. TIRE PRESSURE MONITORING CONTROL MODULE

- 1) Remove the driver's seat. <Ref. to SE-10, REMOVAL, Front Seat.>
- 2) Turn over the floor mat.
- 3) Remove the connector, and remove the tire inflation pressure monitor control module.



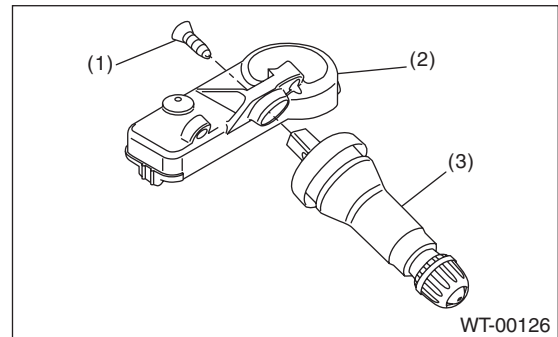
B: INSTALLATION

1. TRANSMITTER (TIRE INFLATION PRESSURE SENSOR)

CAUTION:

When installing, use new transmitter assembly or the transmitter equipped with new valve and screw.

- 1) When reusing the transmitter, replace the valve and screw with new parts and install.



- (1) Screw
- (2) Transmitter
- (3) Valve

Tightening torque:

1.4 N·m (0.14 kgf-m, 1 ft-lb)

- 2) Align the transmitter with the valve hole, and install.

NOTE:

When using the jig which is used by hitching the root of the valve cap and pulling it out, use different short cap.

- 3) Install the tire to the wheel.

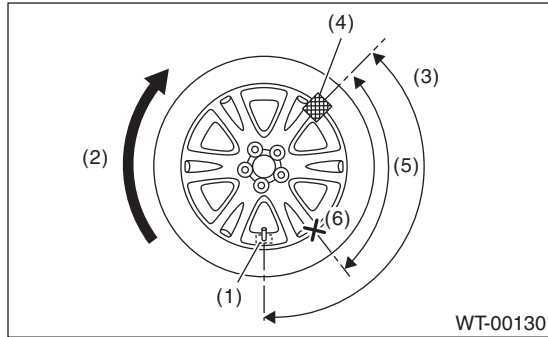
CAUTION:

- When installing the tire to the wheel, use the tire changer.

Tire Pressure Monitoring System

WHEEL AND TIRE SYSTEM

- Set the tire changer boom to the position shown in the figure so as not to damage the transmitter.



- (1) Transmitter
- (2) Direction of the turn table rotation
- (3) 135°
- (4) Tire changer boom
- (5) 90°
- (6) Starting point where bead is inserted into the rim

4) Install the wheels to the vehicle. <Ref. to WT-4, INSTALLATION, Tire and Wheel.>

5) Register the transmitter ID to the tire inflation pressure monitor control module. <Ref. to TPM(diag)-14, Register Transmitter (ID).>

2. TIRE PRESSURE MONITORING CONTROL MODULE

Install in the reverse order of removal.

Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)

C: ADJUSTMENT

If the transmitter is replaced, re-register the transmitter ID. <Ref. to TPM(diag)-14, Register Transmitter (ID).>

5. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
The vehicle wobbles.	Improper tire air pressure	Adjust the tire pressure.
	Tire uneven wear	Check according to the "Abnormal wear of tire", and repair it after performing action.
	Front wheel alignment	Check the front wheels alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheels alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front struts. <Ref. to FS-27, 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-15, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearings. <Ref. to DS-17, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearings. <Ref. to DS-24, INSPECTION, Rear Hub Unit Bearing.>
The vehicle swings abnormally.	Improper tire air pressure	Adjust the tire pressure.
	Tire uneven wear	Check according to the "Abnormal wear of tire", and repair it after performing action.
	Front stabilizer	Check the front stabilizer.
	Front wheel alignment	Check the front wheels alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheels alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improper tire air pressure	Adjust the tire pressure.
	Tire uneven wear	Check according to the "Abnormal wear of tire", and repair it after performing action.
	Improper wheel balancing	Check the wheel balancing. <Ref. to WT-4, WHEEL BALANCING, INSPECTION, Tire and Wheel.>
	Front axle	Check the front axle. <Ref. to DS-15, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearings. <Ref. to DS-17, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearings. <Ref. to DS-24, INSPECTION, Rear Hub Unit Bearing.>
Abnormal wear of tire	Improper tire air pressure	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balancing. <Ref. to WT-4, WHEEL BALANCING, INSPECTION, Tire and Wheel.>
	Front wheel alignment	Check the front wheels alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheels alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>

General Diagnostic Table

WHEEL AND TIRE SYSTEM

Basic Diagnostic Procedure

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

When removing or installing, remove all foreign matter (dust, water, and oil) from the tire inflation pressure monitoring control module connectors.

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) Ask the user from when the warning light is lit or blinking. 2) Before performing diagnostics, check the component which might affect the problems of tire inflation pressure monitoring system. <Ref. to TPM(diag)-4, INSPECTION, General Description.>	Is the component that might influence the tire inflation pressure monitoring system problem 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 properly, check the communication circuit. <Ref. to TPM(diag)-9, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to TPM(diag)-11, 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)-34, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to TPM(diag)-12, OPERATION, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to TPM(diag)-16, Inspection Mode.> 4) Read the DTC. <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).> Check the DTC is not displayed.	Does the inflation pressure warning light turn on upon IG ON and go off after approx. 2 seconds?	Finish the diagnosis.	Check the tire inflation pressure warning light. <Ref. to TPM(diag)-17, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

Basic Diagnostic Procedure

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step		Check	Yes	No
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)-12, OPERATION, Clear Memory Mode.> 4) Perform a driving test. Drive the vehicle at a speed of 40 km/h (25 MPH) or more for at least 10 minutes. 5) Read the DTC. <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat the 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. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the TPM control module.

CAUTION:

- Do not use electrical test devices on any airbag system wiring harness circuits.
- Be careful not to damage the airbag system wiring harness when servicing the tire inflation pressure monitoring control module.

2. TIRE PRESSURE MONITORING CONTROL MODULE

- If a transmitter is replaced, the ID of the new transmitter must be registered. <Ref. to TPM(diag)-14, OPERATION, Register Transmitter (ID).>
- When adjusting tire inflation 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 inflation 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 inflation pressure to the high side in consideration of the difference in temperature between inside and outside according to the following table.

a. Sedan model

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Outdoor temperature	-1 (30)	-12 (10)	-23 (-10)
Tire inflation pressure kPa (psi)	Front	250 (36)	265 (38)	280 (40)
	Rear	240 (35)	255 (37)	270 (39)

b. OUTBACK model

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Outdoor temperature	-1 (30)	-12 (10)	-23 (-10)
Tire inflation pressure kPa (psi)	Front	240 (35)	255 (37)	270 (39)
	Rear	230 (33)	245 (35)	255 (37)

B: INSPECTION

Before performing diagnosis, check the following item which might affect the quality of the tire pressure monitoring system.

1. TIRE

- Inspect that the tire pressure is within the specification while the tire is cool. (Refer to Tire Caution Label.)
- Check the tires for damage or the insertion of foreign matters.

2. BATTERY

Check that amount of battery fluid, gravity and voltage are within the specifications.

Standard voltage: 12 V or more

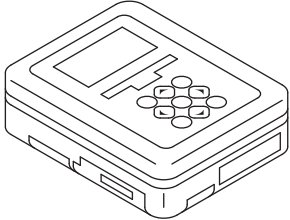
Specific gravity: 1.260 or more

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

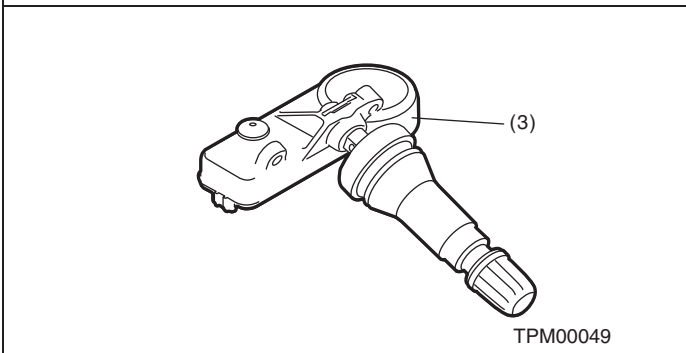
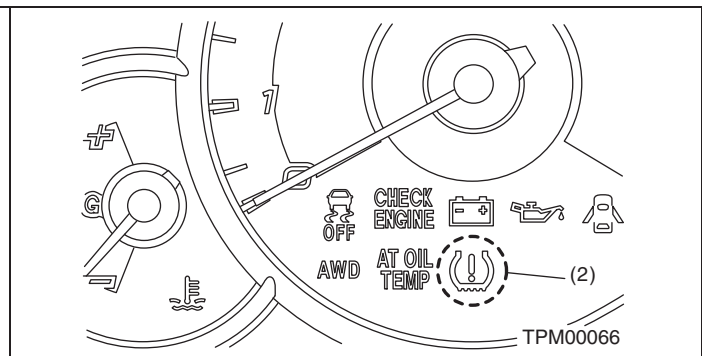
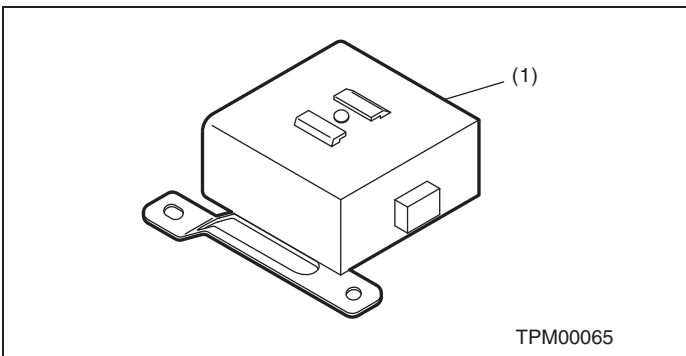
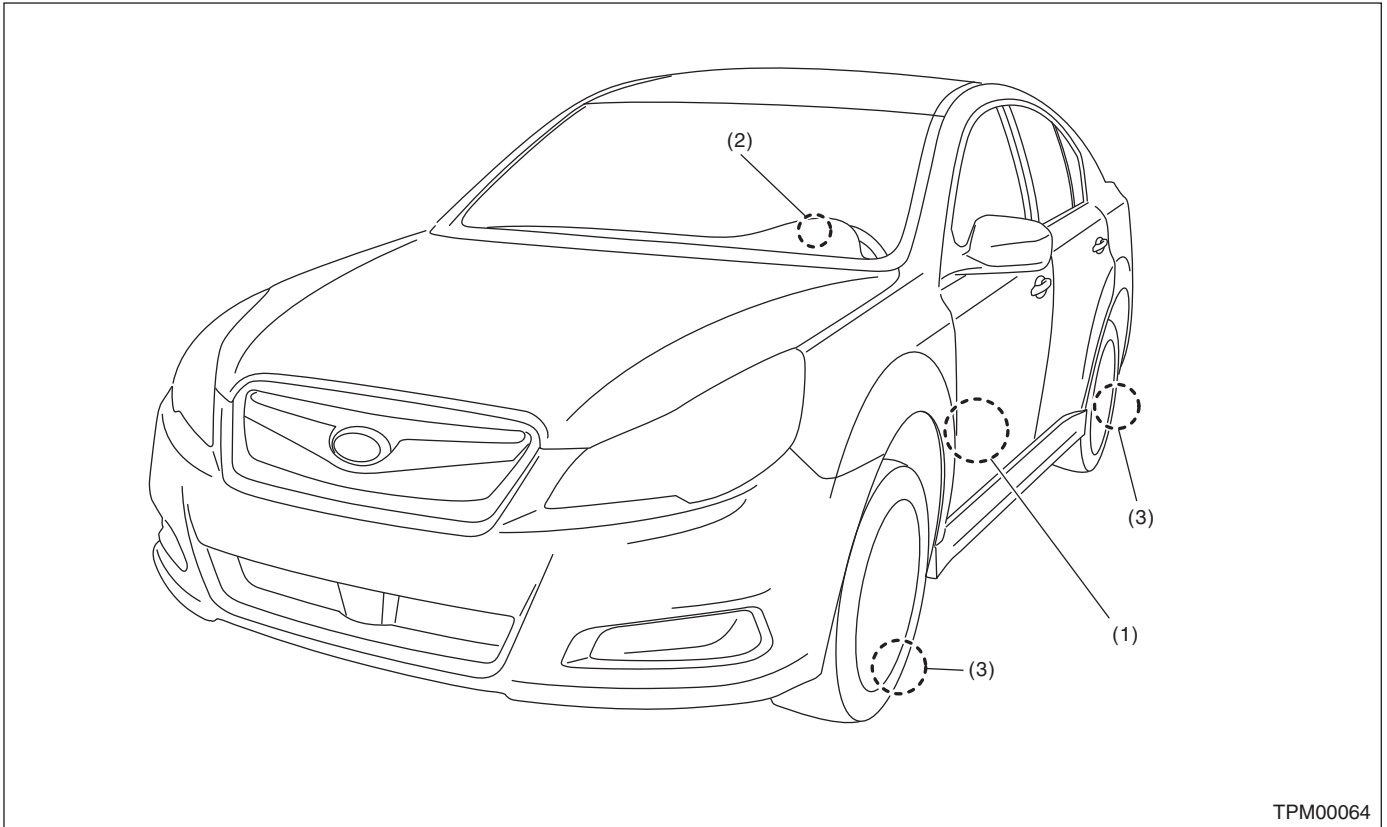
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Transmitter registration tool	Used to register the transmitter ID. Manufacturer: Kent-Moore Item number: J45295

Electrical Component Location

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

3. Electrical Component Location

A: LOCATION

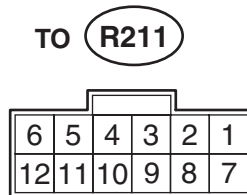


Control Module I/O Signal

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



TPM00067

Terminal No.	Measured value	Measuring condition	Remarks
1	Select monitor communication	Serial communication	—
2	Tire inflation pressure warning light output	Light up when failure occurs or tire inflation pressure decreases	System failure: Blink 25 cycles → Remain on Pressure decreases: Light up
4	Speed sensor signal	Traveling (pulse signal)	Vary with 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 warning light is lit
9	GND	0 V (constantly)	Always

B: WIRING DIAGRAM

<Ref. to WI-220, WIRING DIAGRAM, Tire Pressure Monitoring System.>

5. Subaru Select Monitor

A: OPERATION

For the operation procedure, refer to the “PC application help for Subaru Select Monitor”.

NOTE:

If the tire inflation pressure monitoring control module and Subaru Select Monitor can not communicate, check the communication circuit. <Ref. to TPM(diag)-9, INSPECTION, Subaru Select Monitor.>

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

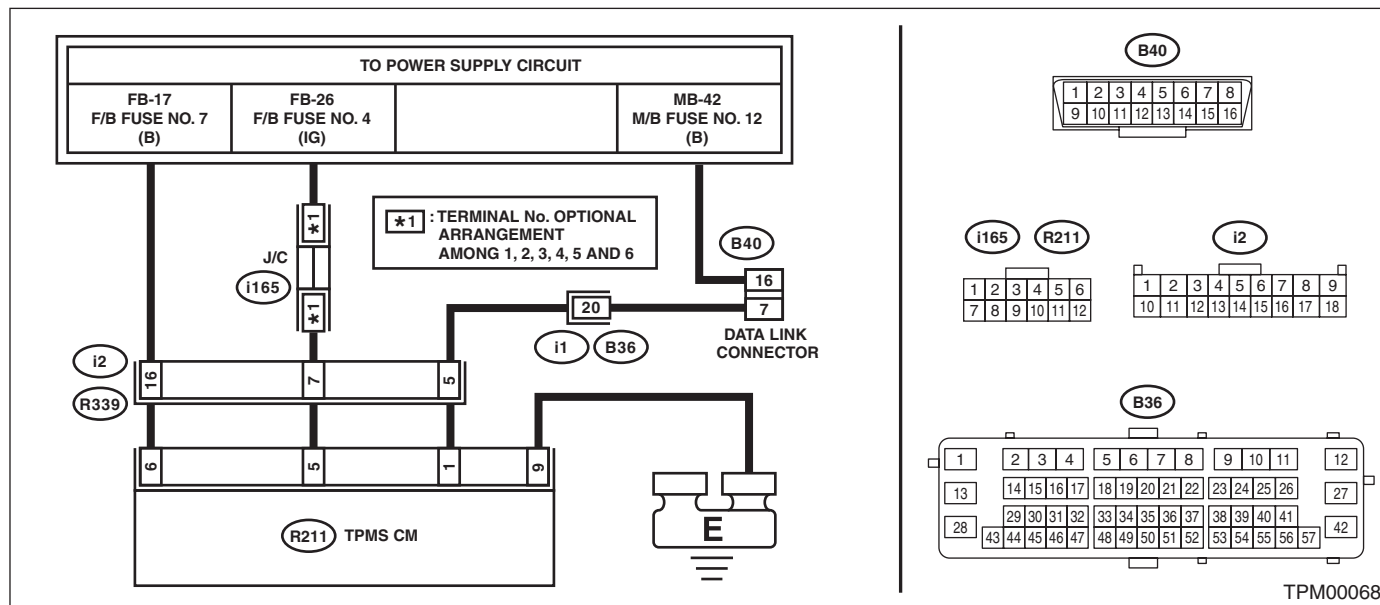
DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between the tire inflation pressure monitoring control module and the Subaru Select Monitor.

WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK IGNITION SWITCH.		
1	Is the ignition switch ON?	Go to step 2.	Turn the ignition switch to ON, and select TPM mode using Subaru Select Monitor.
2	CHECK BATTERY.		
2	Is the voltage 11 V or more?	Go to step 3.	Charge or replace the battery.
3	CHECK BATTERY TERMINAL.		
3	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.		
4	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 inflation pressure monitoring control module connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.		
5	Is the system name displayed on Subaru Select Monitor?	Replace the tire inflation pressure monitoring control module.	Go to step 6.

Subaru Select Monitor

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the tire inflation pressure monitoring control module. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7 CHECK OUTPUT VOLTAGE FOR TIRE INFLATION PRESSURE MONITORING CONTROL MODULE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the tire inflation 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 BETWEEN TIRE INFLATION PRESSURE MONITORING CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the tire inflation 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 connectors between the tire inflation pressure monitoring control module and data link connector.
9 CHECK TIRE INFLATION PRESSURE MONITORING CONTROL MODULE CONNECTOR.	Is the tire inflation pressure monitoring control module connector inserted to the module until it is locked securely?	Go to step 10.	Insert the tire inflation pressure monitoring control module connector to the tire inflation pressure monitoring control module.
10 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between the tire inflation pressure monitoring control module and chassis ground. Connector & terminal (R211) No. 5 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 11.	Repair the open circuit of harness between the tire inflation pressure monitoring control module and battery.
11 CHECK HARNESS BETWEEN TIRE INFLATION PRESSURE MONITORING CONTROL MODULE AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the tire inflation pressure monitoring control module. 3) Measure the resistance between the tire inflation 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 the open circuit of harness of the tire inflation pressure monitoring control module.
12 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of the tire inflation pressure monitoring control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the tire inflation pressure monitoring control module.

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For the operation procedure, refer to the “PC application help for Subaru Select Monitor”.

NOTE:

- For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to TPM(diag)-23, List of Diagnostic Trouble Code (DTC).>
- All detected DTCs are displayed.
- If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in tire inflation pressure monitoring control module 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.
- When DTC is not displayed, check the indicator circuit and the communication circuit. <Ref. to TPM(diag)-17, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

Clear Memory Mode

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

7. Clear Memory Mode

A: OPERATION

For the operation procedure, refer to the “PC application help for Subaru Select Monitor”.

Read Current Data

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

8. Read Current Data

A: OPERATION

For the operation procedure, refer to the “PC application help for Subaru Select Monitor”.

B: LIST

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

9. Register Transmitter (ID)

A: OPERATION

Transmitter registration is required in the following cases.

- A transmitter is replaced.
- Tire inflation pressure monitoring control module is replaced.

NOTE:

- If registration of the transmitter ID is not possible after two attempts, replace the tire inflation pressure monitoring control module.
- 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 effect on the performance or functions of the tire inflation 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 inflation pressures to the specifications.

2) Connect Subaru Select Monitor and select the {2. Each System Check} on the «Main Menu».

3) On the «System Selection Menu» display, select the {Tire pressure monitor}.

4) After the {Tire pressure monitor} is displayed, select [OK].

5) On the «Tire pressure monitor diagnosis» display, select the {Transmitter ID regist confirm}.

6) {ID registration mode When execute Registered ID is deleted. Continue?} is displayed, select [OK].

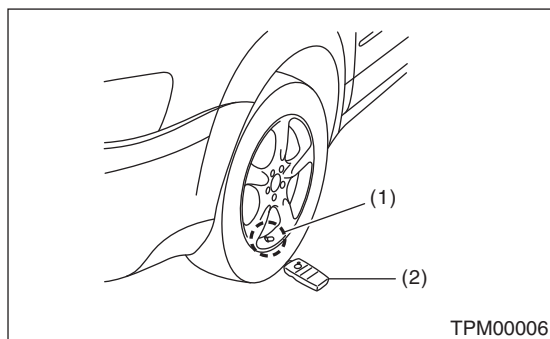
7) Touch the transmitter registration tool to the side wall area near the air valve on the front left tire, and press the switch. The transmitter ID is sent to the tire inflation pressure monitoring control module. (At that time, the tire inflation pressure warning light blinks to confirm that the registration has started.)

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 stops in the halfway (turning ignition switch to OFF, wrong registration order, etc), proceed from step 5).

8) When ID registration is completed, the tire inflation 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)-15, Display Transmitter (ID).>

9) Check the transmitter ID that was registered, then perform a driving test. <Ref. to TPM(diag)-16, Inspection Mode.>



(1) Air valve (transmitter)

(2) Transmitter registration tool

10. Display Transmitter (ID)

A: OPERATION

For the operation procedure, refer to the “PC application help for Subaru Select Monitor”.

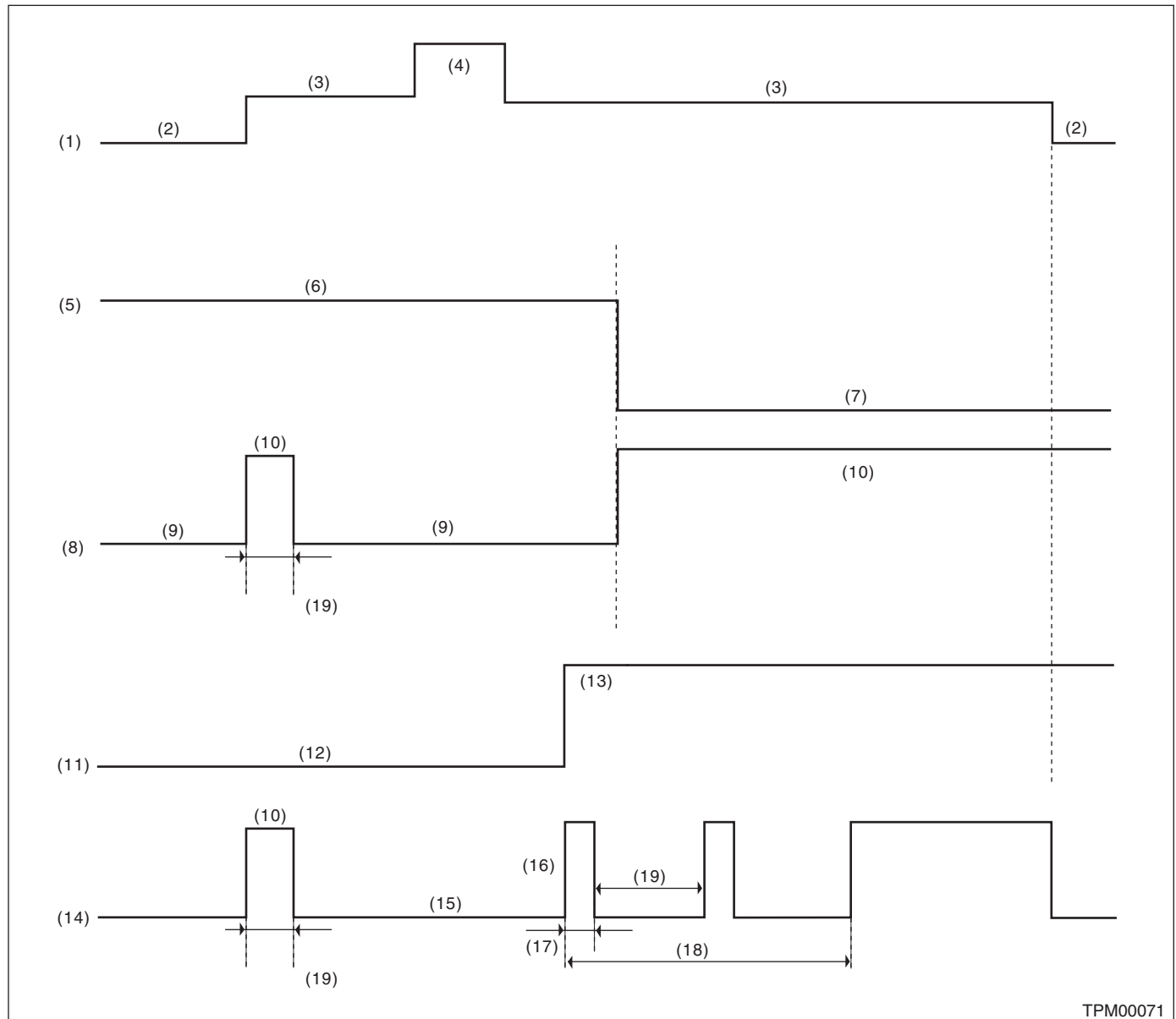
11. Inspection Mode

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.

12. Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

A: INSPECTION



TPM00071

- | | | |
|---|--|------------------|
| (1) Ignition switch | (8) Tire inflation pressure warning light (pressure condition) | (15) Light OFF |
| (2) OFF | (9) Light OFF | (16) Blink |
| (3) ON | (10) Light ON | (17) 1 second |
| (4) Start | (11) System condition | (18) 25 blinking |
| (5) Tire inflation pressure condition | (12) Normal operation | (19) 2 seconds |
| (6) Within standard value | (13) Faulty | |
| (7) Less than standard value
(For the pressure warning level, refer to "CURRENT DATA".) <Ref. to TPM(diag)-13, LIST, Read Current Data.> | (14) Tire inflation pressure warning light (system condition) | |

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

1) If the tire inflation pressure warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) If the tire inflation pressure warning light does not go off, check the tire inflation pressure monitoring control module/warning light circuits and the combination meter circuit. <Ref. to TPM(diag)-20, 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 inflation pressure warning light blinks/lights, the warning light goes out and the tire inflation pressure monitoring system operates normally. (If there is a decrease in tire inflation 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

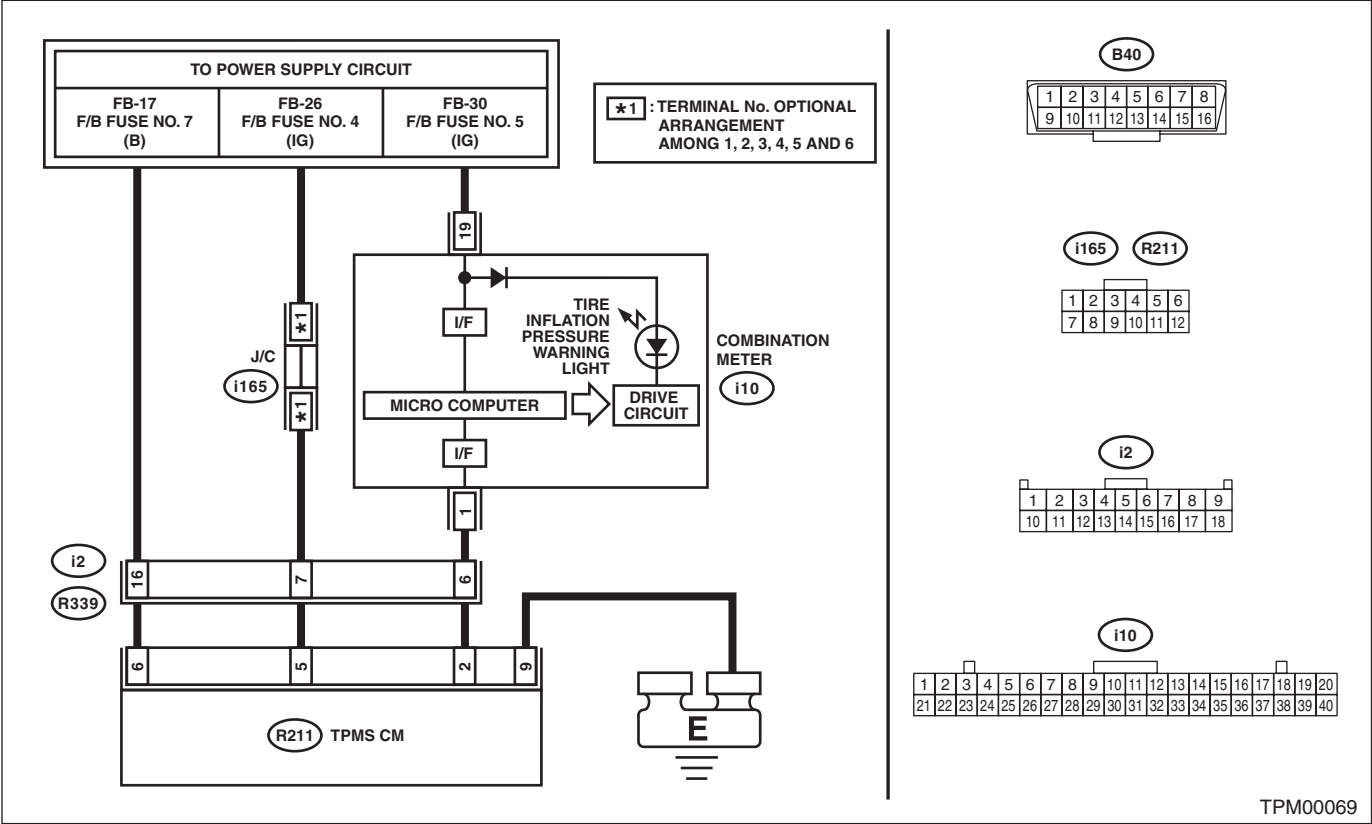
DETECTING CONDITION:

Defective combination meter

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), the tire inflation pressure warning light does not come on (for approximately 2 seconds).

WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK DIAGNOSTIC TROUBLE CODE (DTC). Read the DTC by connecting the Subaru Select Monitor. <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-23, List of Diagnostic Trouble Code (DTC).>
			Replace the combination meter. <Ref. to IDI-20, 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

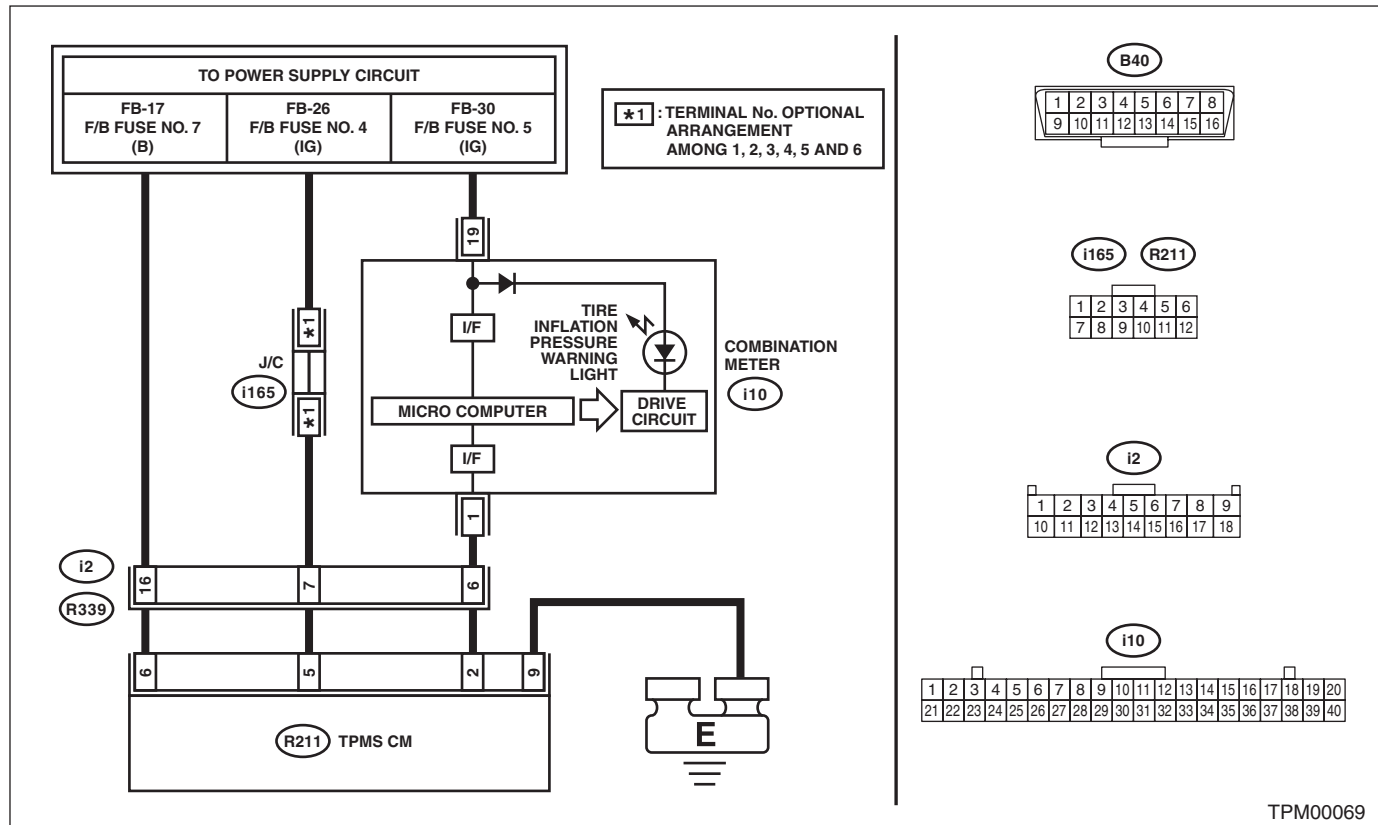
DETECTING CONDITION:

- Defective combination meter
- Tires inflation pressure drop
- Transmitter ID not registered

TROUBLE SYMPTOM:

Tire inflation pressure warning light remains illuminating after engine starts.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK DIAGNOSTIC TROUBLE CODE (DTC). Read the DTC by connecting the Subaru Select Monitor. <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-23, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TRANSMITTER (ID). Display the transmitter ID of the tire inflation pressure monitoring system.	Is the transmitter ID registered?	Go to step 3.	Register the transmitter ID. <Ref. to TPM(diag)-14, OPERATION, Register Transmitter (ID).>
3 CHECK TRANSMITTER DATA OUTPUT. 1) Select data display of the tire inflation pressure monitoring. 2) Start the engine and check the tire inflation pressure warning light output.	Is the warning light output ON?	Replace the tire inflation pressure monitoring control module.	Replace the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

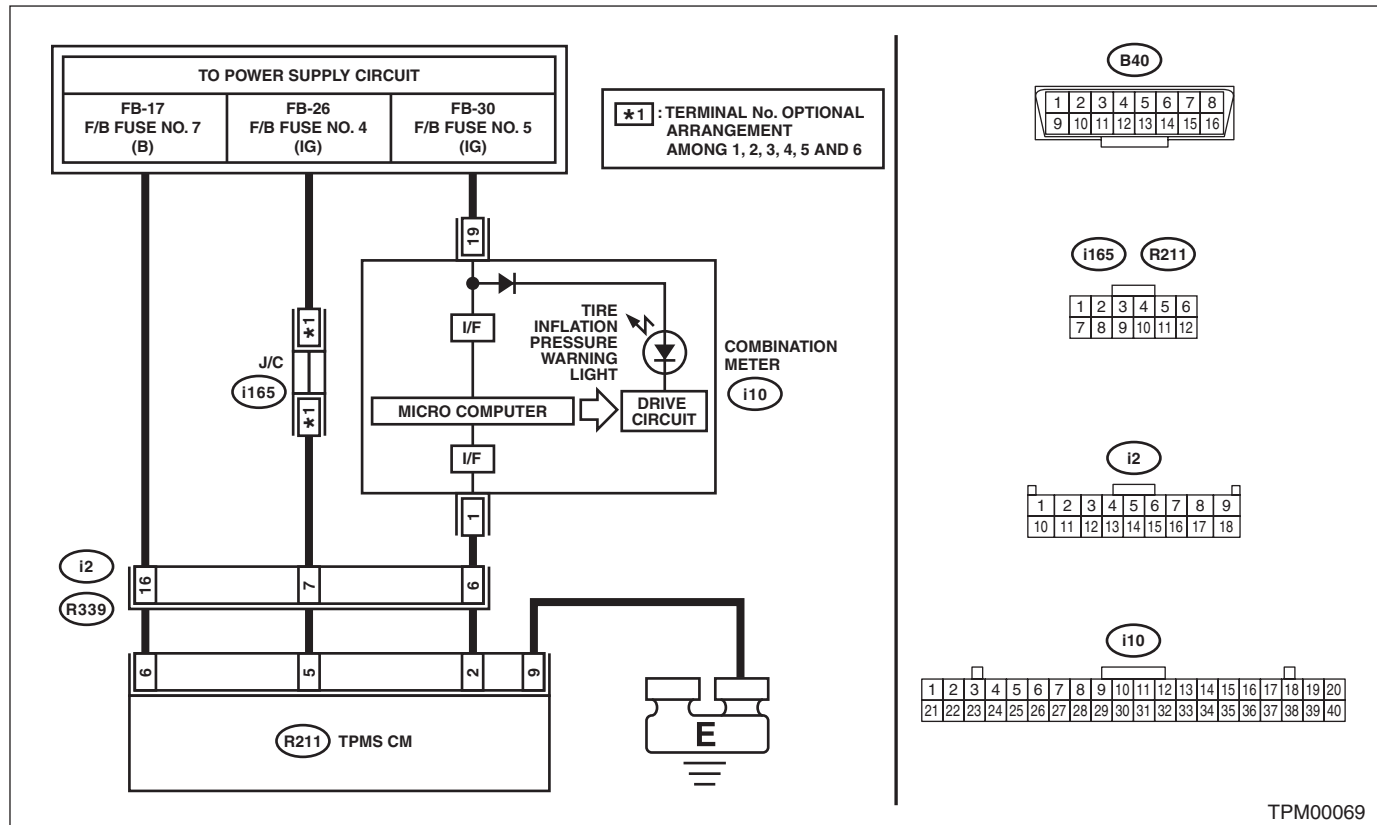
D: TIRE PRESSURE WARNING LIGHT IS 25 TIMES BLINKING AND TURN ON DETECTING CONDITION:

- Tire inflation pressure monitoring control module is faulty.
- Defective harness
- Transmitter is faulty.

TROUBLE SYMPTOM:

Every time the engine starts, tire inflation pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



Step	Check	Yes	No
1	CHECK DIAGNOSTIC TROUBLE CODE (DTC). Read the DTC by connecting the Subaru Select Monitor. <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to DTC. <Ref. to TPM(diag)-23, List of Diagnostic Trouble Code (DTC).>
2	CHECK HARNESS. 1) Connect the Subaru Select Monitor to the terminal No. 2 of the tire inflation 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 2. / Go to step 4.

Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
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.	Replace the tire inflation pressure monitoring control module.
4 CHECK HARNESS. 1) Disconnect the tire inflation pressure monitoring control module connector. 2) Connect the Subaru Select Monitor to the terminal No. 2 of the tire inflation 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 inflation pressure monitoring control module.	The harness between the combination meter connector and the tire inflation 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)

13.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)-25, 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)-25, 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)-25, 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)-26, 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)-26, 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)-26, 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)-26, 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)-27, 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)-28, 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)-28, 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)-28, 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)-29, 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)-30, 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)-30, 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)-30, 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)-31, 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)-32, 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)-32, 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)-32, 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)-32, 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)-33, DTC 61 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

14. 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)-26, 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)-26, 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)-26, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

D: DTC 14 TIRE 4 AIR PRESSURE DECREASE

DTC DETECTING CONDITION:

Inflation pressure of tires dropped below the specified value.

NOTE:

For the specifications, refer to "CURRENT DATA". <Ref. to TPM(diag)-13, LIST, Read Current Data.>

TROUBLE SYMPTOM:

Tire inflation 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.	Go to step 2.
2 CHECK TIRES. Check the tire inflation pressure.	Is the tire inflation pressure within the specified value?	Go to step 3.	Adjust the tire inflation pressure.
3 CHECK TRANSMITTER. Drive the vehicle at 40 km/h (25 MPH) or faster and compare the data from the transmitters on the four wheels.	Is there a transmitter with different data?	Replace the transmitter (tire inflation pressure sensor).	Go to step 4.
4 PERFORM DRIVING TEST. 1) Perform the Clear Memory Mode. <Ref. to TPM(diag)-12, OPERATION, Clear Memory Mode.> 2) Perform the driving test. <Ref. to TPM(diag)-16, PROCEDURE, Inspection Mode.> 3) Read diagnostic trouble code (DTC). <Ref. to TPM(diag)-11, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to TPM(diag)-25, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CAUTION:

When driving vehicle to perform driving test, there should be always 2 persons (driver and checker) to check.

E: DTC 21 TRANSMITTER 1 NO DATA

NOTE:

Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-27, 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)-27, 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)-27, 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 transmitters cannot be received for 8 minutes

TROUBLE SYMPTOM:

Tire inflation 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 "Transmitter ID display". <Ref. to TPM(diag)-15, OPERATION, Display Transmitter (ID).> 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 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 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 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 diagnostic trouble code (DTC).	Is the checked ID included 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)-29, 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)-29, 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)-29, 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 with the previous data, the change is large.
- The pressure exceeds what the transmitter can measure. (Excessive pressure)

TROUBLE SYMPTOM:

Tire inflation 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 "Transmitter ID display". <Ref. to TPM(diag)-15, OPERATION, Display Transmitter (ID).> 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 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 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 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 diagnostic trouble code (DTC).	Is the checked ID included 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)-31, 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)-31, 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)-31, 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 inflation 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 "Transmitter ID display". <Ref. to TPM(diag)-15, OPERATION, Display Transmitter (ID).> 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 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 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 RL transmitter.
8 CHECK RL TRANSMITTER ID. Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step 9.	Record the received ID update as the RL transmitter. Go to step 9.
9 CHECK MALFUNCTION TRANSMITTER.	Is ID recorded by this procedure?	Go to step 10.	Replace the transmitter indicated by diagnostics trouble code (DTC).
10 CHECK MALFUNCTION TRANSMITTER. Check the registered ID of the transmitter indicated by diagnostic trouble code (DTC).	Is the checked ID included in the record?	Replace the transmitter of the recorded position.	Replace the transmitter indicated by diagnostics trouble code (DTC).

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)-32, 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)-32, 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)-32, 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:

Received low battery signals 20 times from each transmitter.

TROUBLE SYMPTOM:

Tire inflation pressure warning light blinks 25 times and then illuminates.

Step		Check	Yes	No
1	CHECK TRANSMITTER. 1) Replace all transmitters with new parts and register their IDs. <Ref. to TPM(diag)-14, OPERATION, Register Transmitter (ID).> 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 inflation pressure monitoring control module.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

U: DTC 61 VEHICLE SPEED IS ABNORMAL

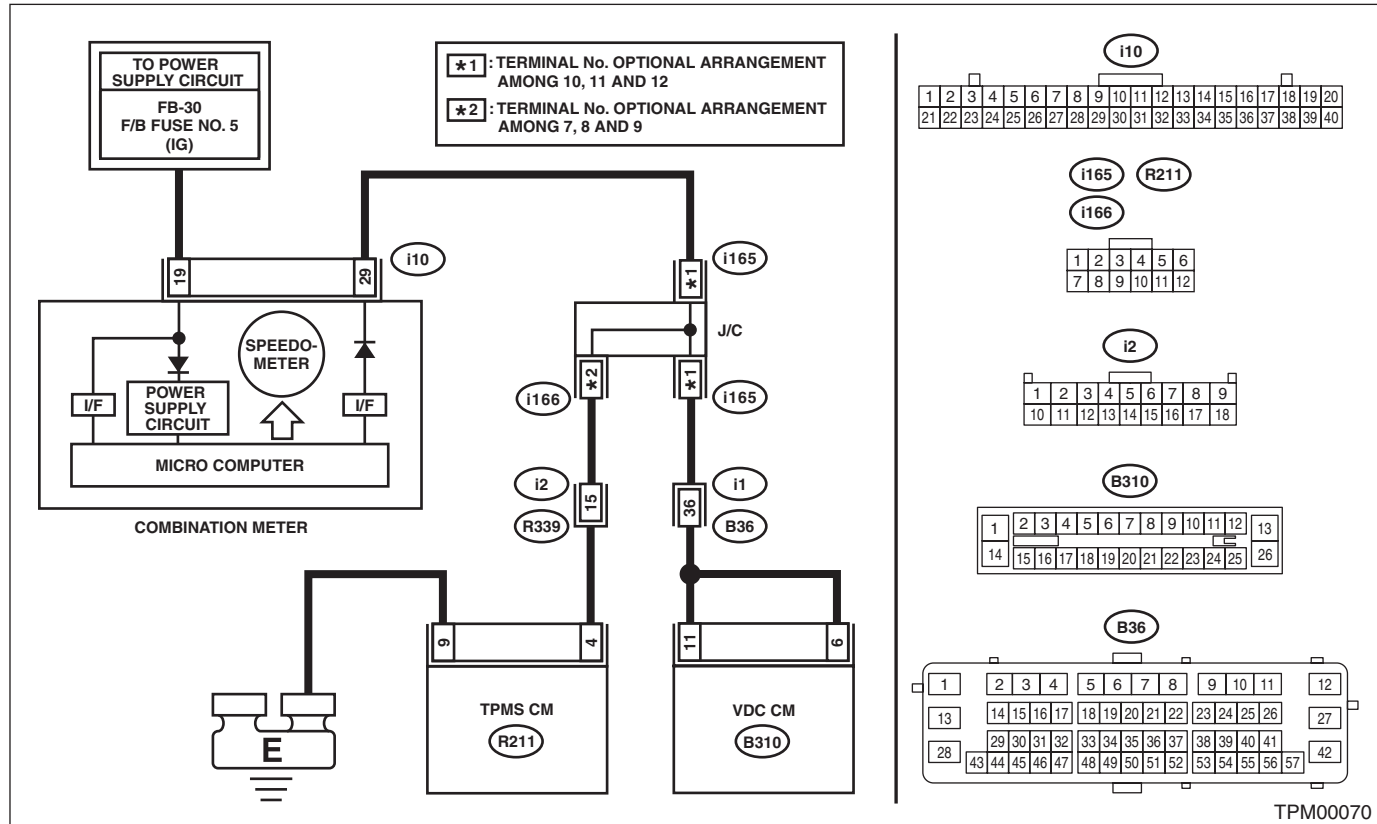
DTC DETECTING CONDITION:

Vehicle speed function codes were received from the transmitter, but the vehicle speed signal was not input to the module.

TROUBLE SYMPTOM:

Tire inflation pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK TIRE INFLATION PRESSURE MONITORING CONTROL MODULE. 1) Connect an oscilloscope to the terminal No. 4 of the tire inflation pressure monitoring control module connector (R211). 2) Lift up the vehicle and check the vehicle speed signal when the vehicle runs at 40 km/h (25 MPH).	Is the vehicle speed being input?	Replace the tire inflation pressure monitoring control module.	Go to step 2.
2 CHECK HARNESS. 1) Disconnect the combination meter connector (i10). 2) Connect a circuit tester to the tire inflation pressure monitoring control module connector (R211) and combination meter connector (i10), and measure the resistance. Connector & terminal (R211) No. 4 — (i10) No. 29:	Is the resistance less than 0.5 Ω?	Check the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>	Repair or replace the open circuit of the harness.

General Diagnostic Table

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

15.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

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:

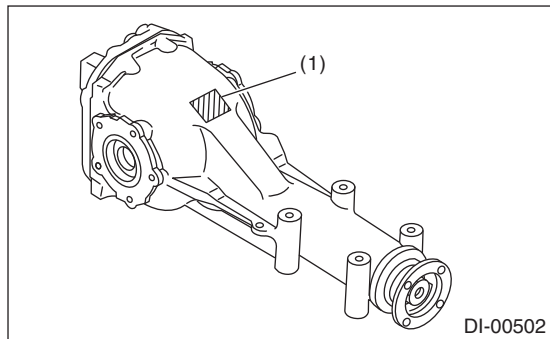
Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.

Model	Sedan				OUTBACK		
	2.5L SOHC		2.5 L DOHC turbo	3.6 L	2.5L SOHC		3.6 L
	CVT	6MT	6MT	5AT	CVT	6MT	5AT
Rear differential type	VA1-type	T-type	T-type	VA2-type	T-type	T-type	VA2-type
Identification	XD	T2	B1	XC	B2	TP	XC
LSD type	—						
Type of gear	Hypoid gear						
Gear ratio (Number of gear teeth)	3.700 (37/10)	4.111 (37/9)	4.111 (37/9)	3.083 (37/12)	3.900 (39/10)	4.444 (40/9)	3.083 (37/12)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)						
Rear differential gear oil	GL-5 (75W-90)						

2. IDENTIFICATION

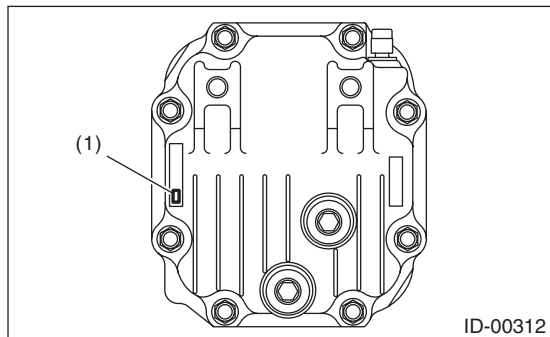
Identification positions are shown in the following figures. For details concerning identification, refer to the "ID" section.

- T-type



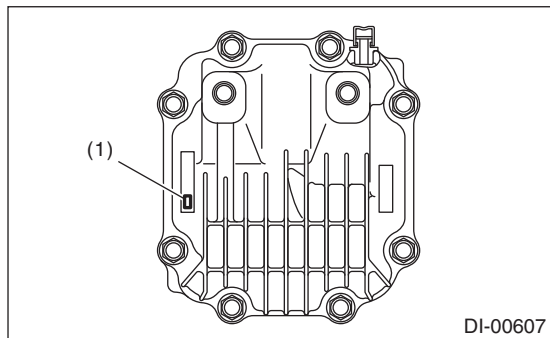
(1) Identification

- VA1-type



(1) Identification

- VA2-type



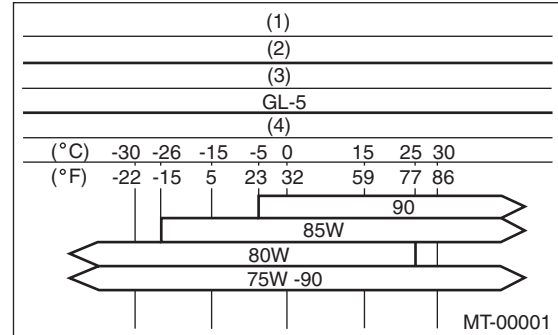
(1) Identification

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.



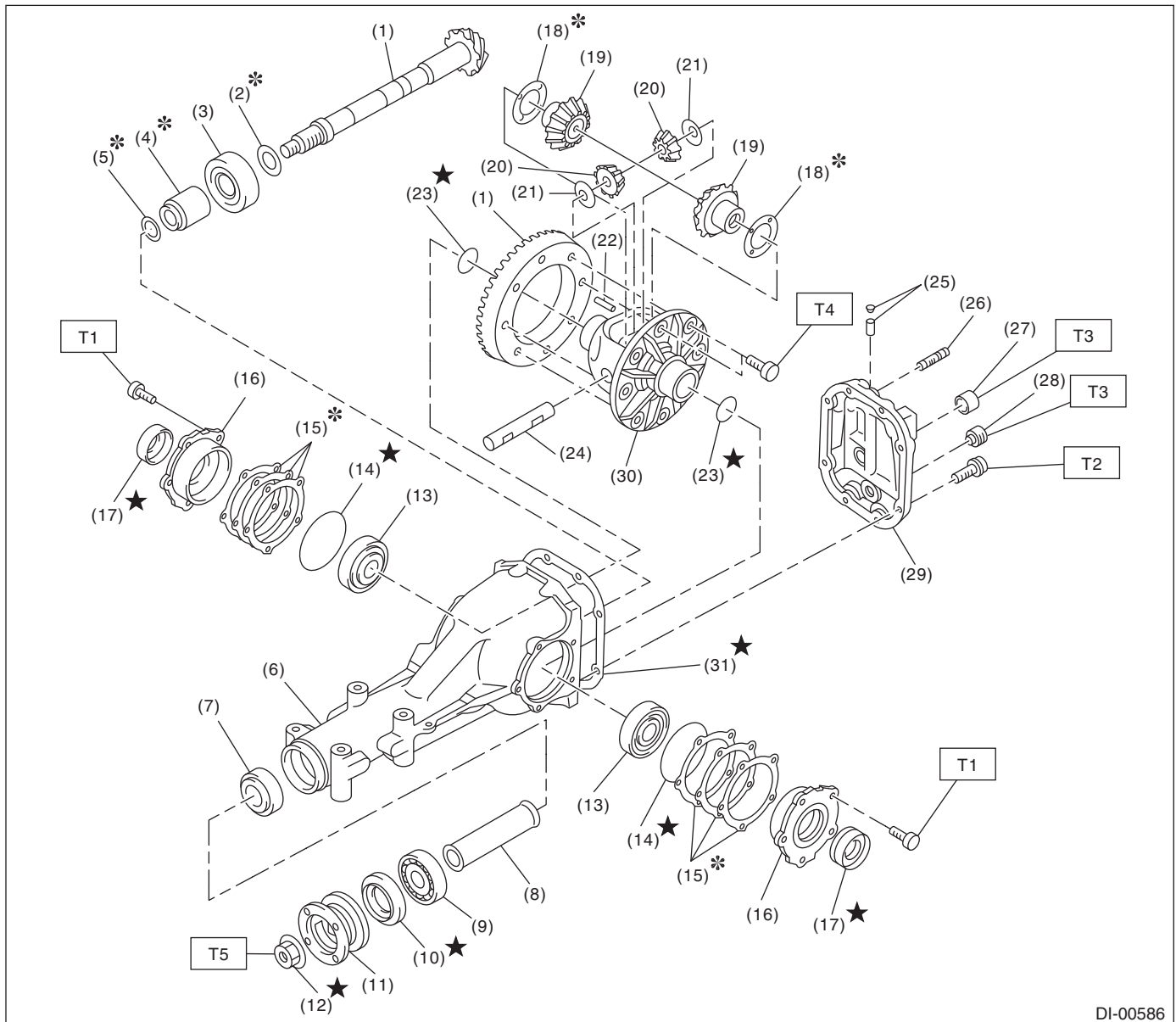
- (1) Item
- (2) Rear differential gear oil
- (3) API classification
- (4) SAE viscosity No. and applicable temperature

General Description

DIFFERENTIALS

4. SERVICE DATA

Drive pinion bearing preload (For new bearing)	Measured with spring measurement (measured at companion flange bolt hole) N (kgf, lbf)	T-type	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
		VA-type	12.7 — 32.2 (1.3 — 3.3, 2.9 — 7.2)
	Measured with torque wrench N·m (kgf-m, ft-lb)	T-type	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
		VA-type	0.48 — 1.22 (0.05 — 0.12, 0.35 — 0.90)
Side gear backlash	mm (in)	T-type	0.10 — 0.20 (0.004 — 0.008)
		VA1-type	0.05 — 0.15 (0.002 — 0.006)
		VA2-type	0.13 — 0.18 (0.005 — 0.007)
Side bearing standard width	mm (in)		20.00 (0.7874)
Hypoid driven gear to drive pinion backlash	mm (in)	T-type	0.10 — 0.20 (0.004 — 0.008)
		VA-type	0.10 — 0.15 (0.004 — 0.006)
Hypoid driven gear runout on its back surface	mm (in)		0.05 (0.002)

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

DI-00586

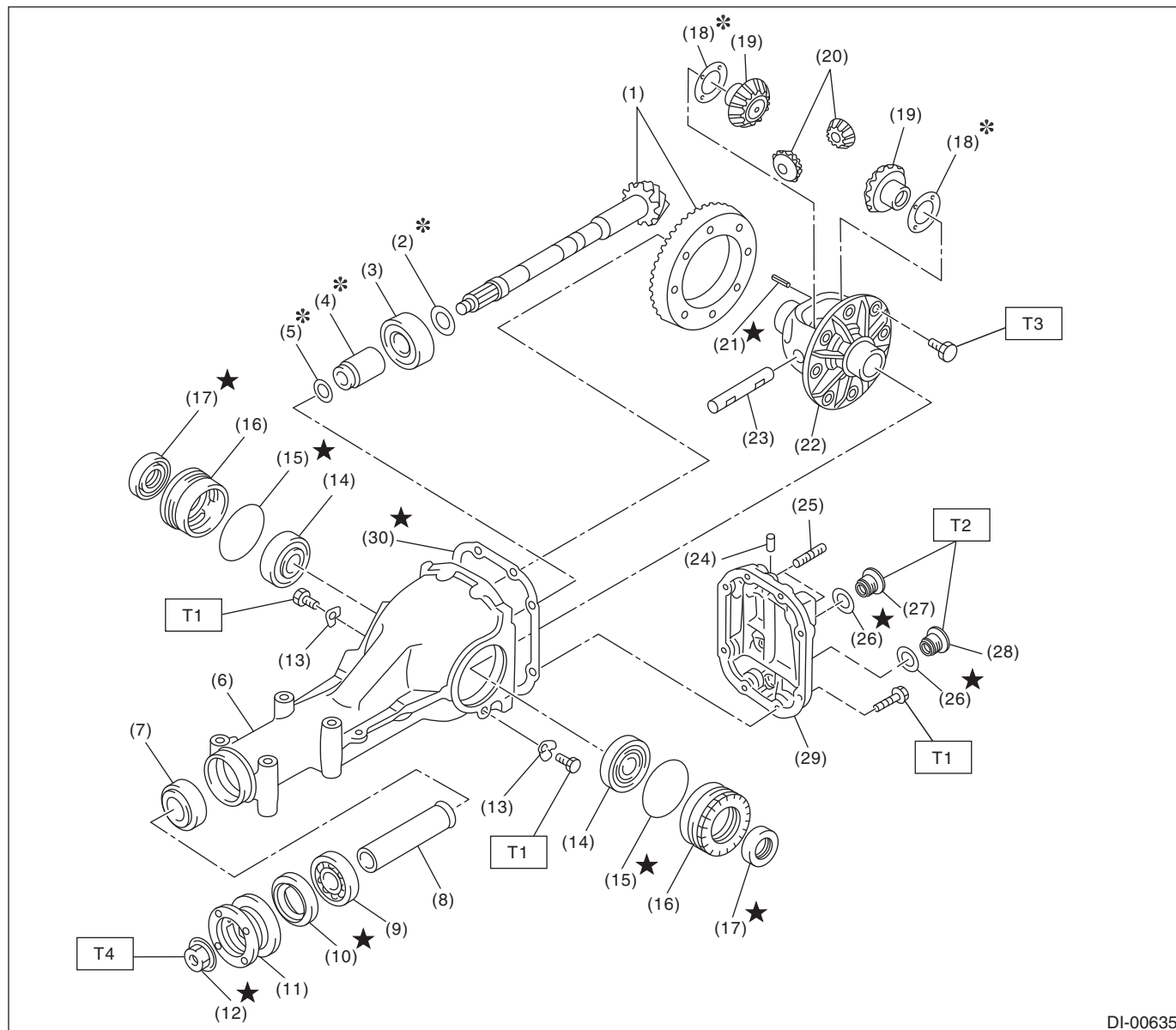
- | | | |
|---|------------------------------|------------------------|
| (1) Hypoid driven gear and drive pinion set | (14) O-ring | (27) Oil filler plug |
| (2) Pinion height adjusting washer | (15) Side retainer shim | (28) Oil drain plug |
| (3) Rear bearing | (16) Side retainer | (29) Rear cover |
| (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, 36.1)****T4: 103 (10.5, 76.0)****T5: 181.5 (18.5, 133.9)**

General Description

DIFFERENTIALS

2. REAR DIFFERENTIAL (VA1-TYPE)



DI-00635

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

Tightening torque: N·m (kgf·m, ft·lb)

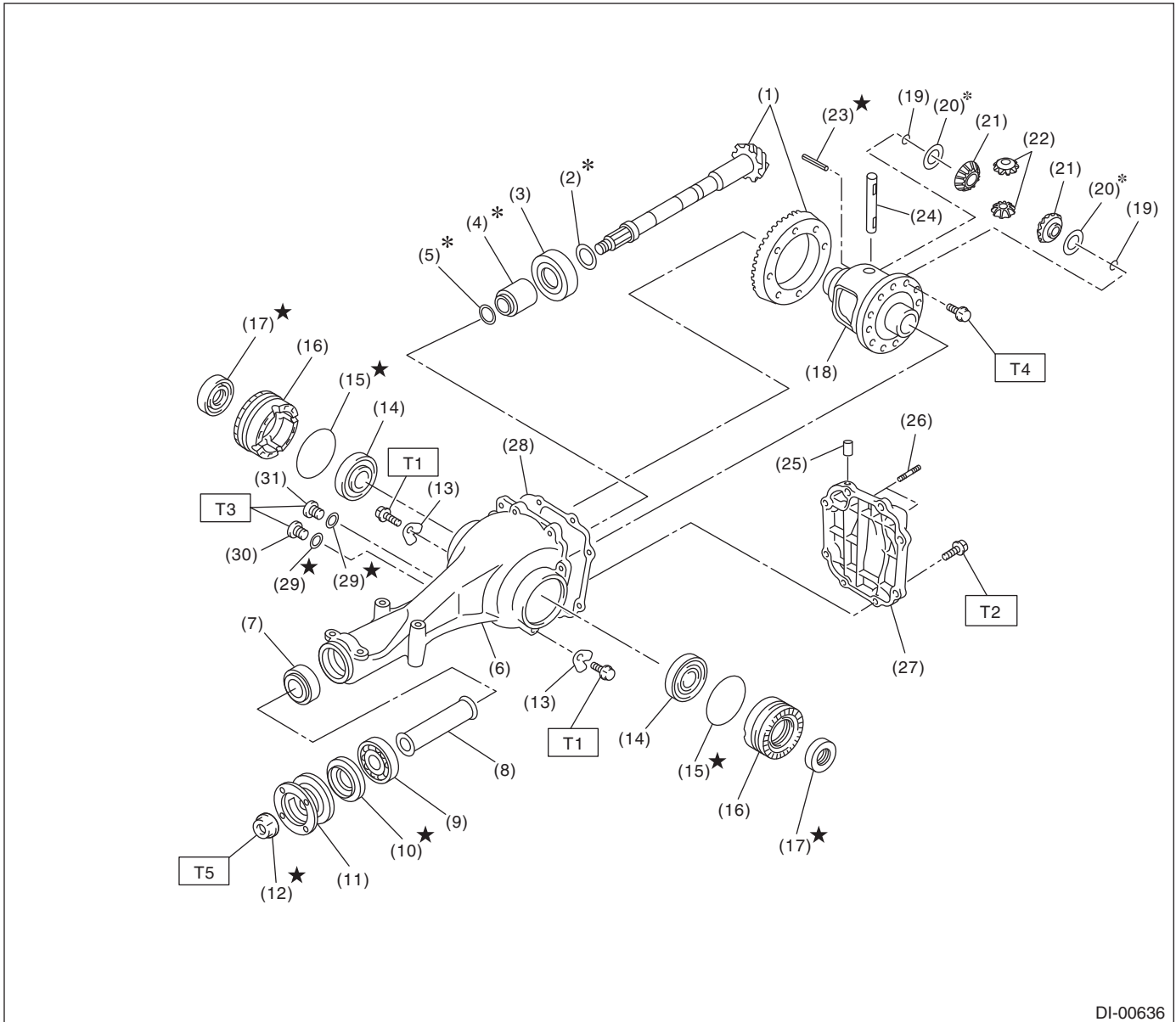
T1: 25 (2.5, 18.4)

T2: 50 (5.1, 36.9)

T3: 62 (6.3, 45.7)

T4: 191 (19.5, 140.9)

3. REAR DIFFERENTIAL (VA2-TYPE)



DI-00636

- | | |
|---|------------------------------|
| (1) Hypoid driven gear and drive pinion set | (14) Side bearing |
| (2) Pinion height adjusting washer | (15) O-ring |
| (3) Rear bearing | (16) Side retainer |
| (4) Bearing preload adjusting spacer | (17) Side oil seal |
| (5) Bearing preload adjusting washer | (18) Differential case |
| (6) Differential carrier | (19) Circlip |
| (7) Front bearing | (20) Side gear thrust washer |
| (8) SPACER | (21) Side gear |
| (9) Pilot bearing | (22) Pinion mate gear |
| (10) Front oil seal | (23) Spring pin |
| (11) Companion flange | (24) Pinion mate shaft |
| (12) Self-locking nut | (25) Air breather cap |
| (13) Lock plate | (26) Stud bolt |

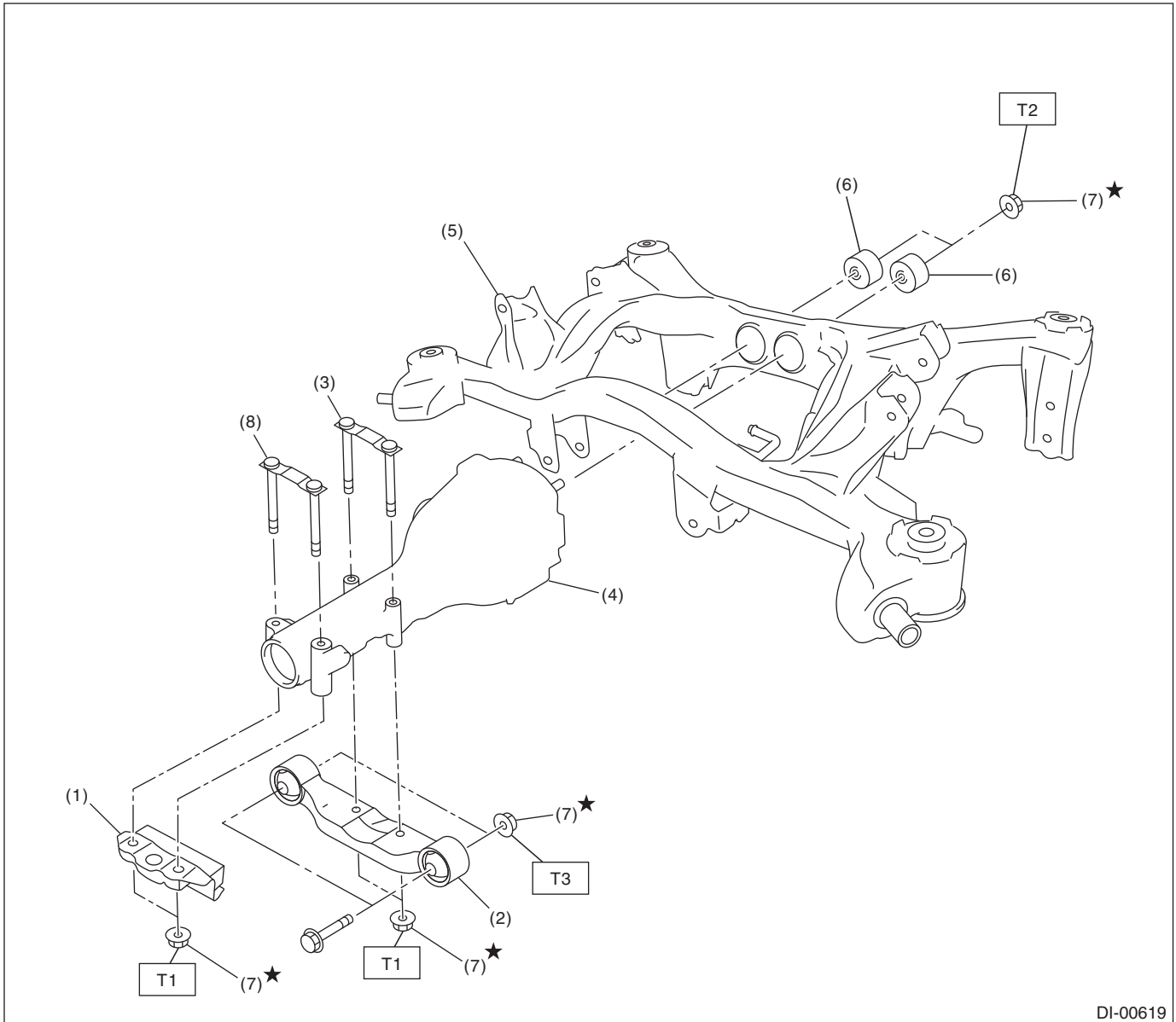
- (27) Rear cover
- (28) Gasket
- (29) Gasket
- (30) Oil filler plug
- (31) Oil drain plug

Tightening torque: N·m (kgf-m, ft-lb)**T1: 25 (2.5, 18.4)****T2: 34 (3.5, 25.1)****T3: 50 (5.1, 36.9)****T4: <Ref. to DI-51, ASSEMBLY, Rear Differential (VA-type).>****T5: 191 (19.5, 140.9)**

General Description

DIFFERENTIALS

4. REAR DIFFERENTIAL MOUNTING SYSTEM



DI-00619

- | | |
|------------------------------------|--|
| (1) Mass damper (CVT model) | (5) Sub frame |
| (2) Rear differential front member | (6) Rear differential mount bushing |
| (3) Rear differential member plate | (7) Self-locking nut |
| (4) Rear differential ASSY | (8) Rear differential member plate (CVT model) |

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

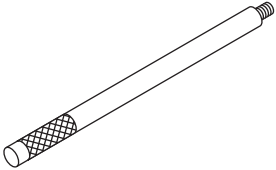
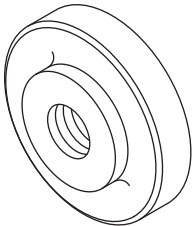
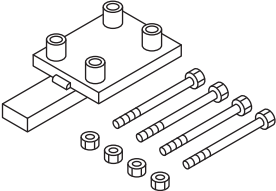
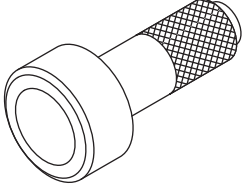
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, 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 or equivalent. 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 of differential carrier (front). (T-type) • Used for press-fitting bearing race of differential carrier (rear). (VA1-type) • Used for press-fitting side bearing race. (VA1-type)
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 ST-498447120	498447120	INSTALLER	Used for installing the front oil seal.

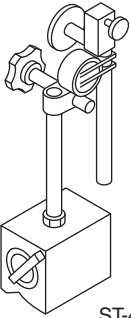
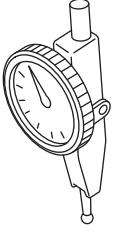
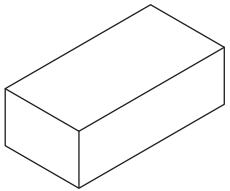
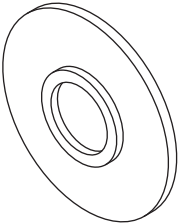
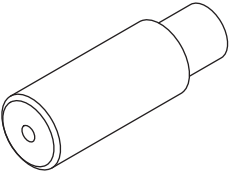
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when removing and tightening self-lock nut.
ST-398467700	398467700	DRIFT	- Used for removing pinion, pilot bearing and front bearing cone. - For T-type and VA1-type
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 removing the spring pin of the differential pinion shaft.

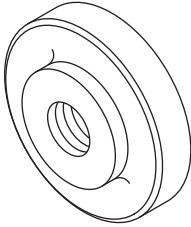
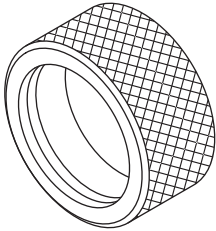
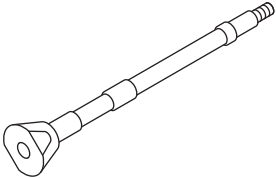
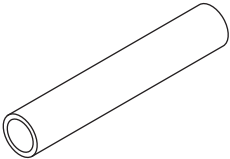
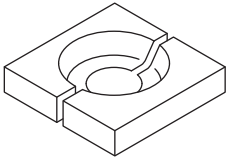
General Description

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. - For T-type and VA1-type
 ST-398177700	398177700	INSTALLER	- Used for installing the rear bearing cone. - For T-type and VA2-type
 ST-398457700	398457700	ATTACHMENT	- Used for removing the side bearing retainer. - For T-type

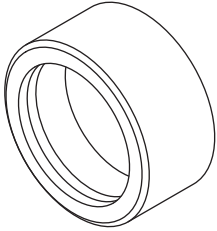
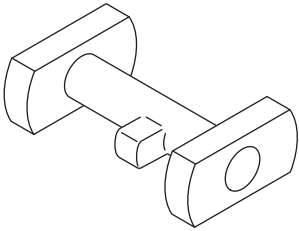
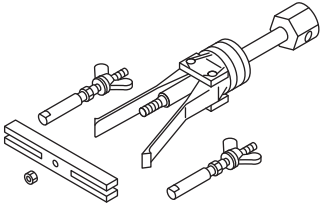
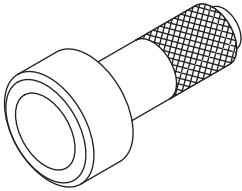
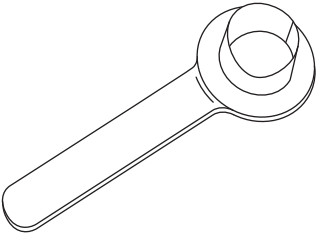
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT 2	- Used for press-fitting bearing race (rear) of differential carrier. - For T-type and VA2-type
 ST-398437700	398437700	DRIFT	- Used for installing the side oil seal. - For T-type and VA2-type
 ST-398507702	398507702	DUMMY SHAFT	- Used for adjusting pinion height and preload. - For T-type
 ST-398507703	398507703	DUMMY COLLAR	- Used for adjusting pinion height and preload. - For T-type
 ST-398517700	398517700	REPLACER	- Used for removing rear bearing cone. - For T-type and VA2-type

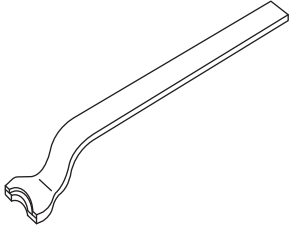
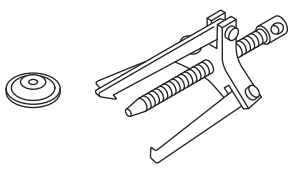
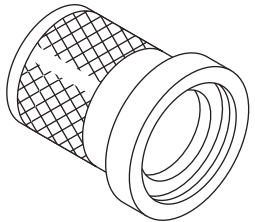
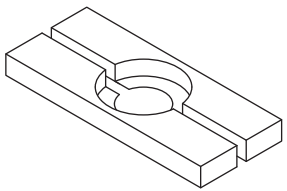
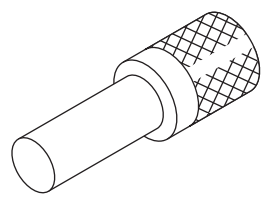
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398487700	398487700	DRIFT	- Used for press-fitting side bearing cone. - For T-type and VA2-type
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	- Used for adjusting pinion height. - For T-type
 ST-398527700	398527700	PULLER ASSY	- Used for removing front oil seal. - Used for removing side bearing cup. (T-type)
 ST-398417700	398417700	DRIFT	- Used for installing side bearing race. - For T-type and VA2-type
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	- Used for installing the rear drive shaft to the rear differential. - For oil seal protection

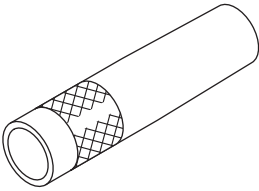
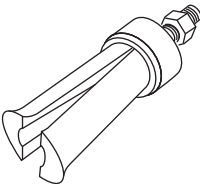
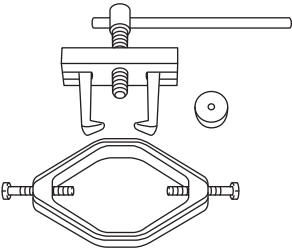
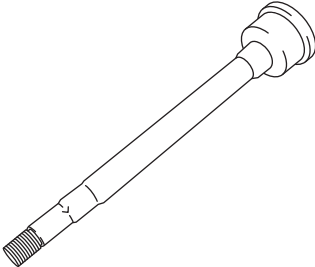
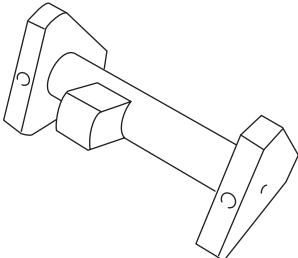
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	- Used for removing the rear drive shaft from rear differential. - For T-type
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST-498077000	498077000	REMOVER	- Used for removing the differential side bearing cone. - For VA2-type
 ST-899864100	899864100	REMOVER	Used for removing the differential side bearing.

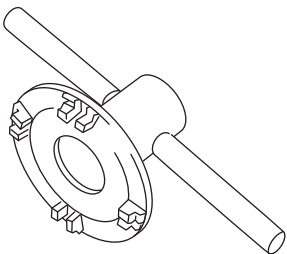
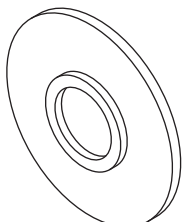
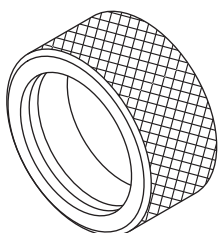
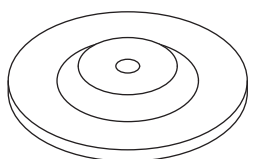
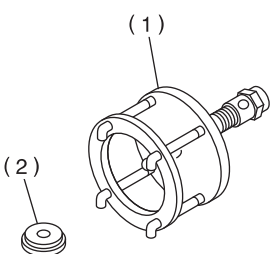
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499277200	499277200	INSTALLER	- Used for installing the front bearing cone. - For VA2-type
 ST18758AA000	18758AA000	PULLER	- Used for removing side bearing cup. - For VA2-type
 ST18759AA000	18759AA000	PULLER ASSY	- Used for removing the differential side bearing cone. - For T-type
 ST18678AA000	18678AA000	DUMMY SHAFT	- Used for adjusting pinion height and preload. - For VA2-type
 ST18831AA010	18831AA010	DIFFERENTIAL CARRIER GAUGE	- Used for adjusting pinion height. - For VA2-type

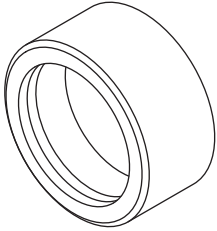
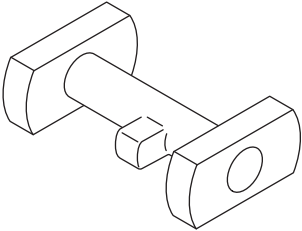
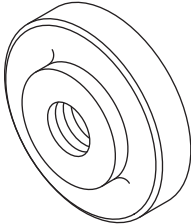
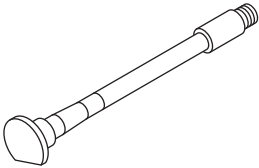
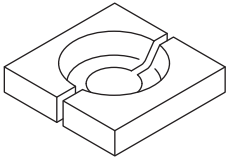
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	- Used for removing and installing the side oil seal holder. - For VA-type - WRENCH ASSY (499787000) can also be used.
 ST-498175500	498175500	INSTALLER	- Used for installing the rear bearing cone. - For VA1-type
 ST-498447100	498447100	INSTALLER	- Used for installing the oil seal. - For VA1-type
 ST-399520105	399520105	SEAT	- Used for removing the side bearing cone. - Used together with PULLER SET (899524100). - For VA-type
 ST-899524100	899524100	PULLER SET	- Used for removing the differential side bearing cone. - For VA-type (1) Puller (2) Cap

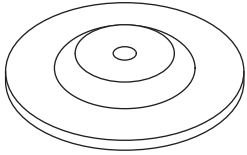
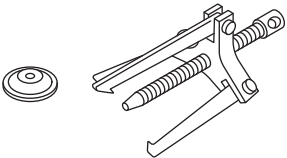
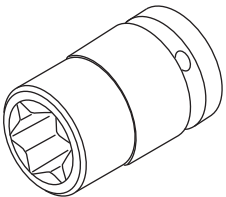
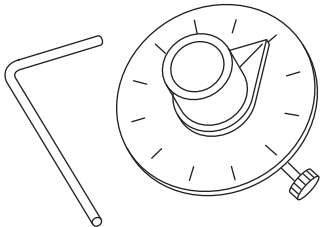
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498485400	498485400	DRIFT	- Used for installing side bearing cone. - For VA1-type
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	- Used for adjusting pinion height. - For VA1-type
 ST-498447110	498447110	DRIFT	- Used for press-fitting the bearing race (front) of the differential carrier. - For VA1-type
 ST-498447150	498447150	DUMMY SHAFT	- Used for adjusting pinion height and preload. - For VA1-type
 ST-498515500	498515500	REPLACER	- Used for removing rear bearing cone. - For VA1-type

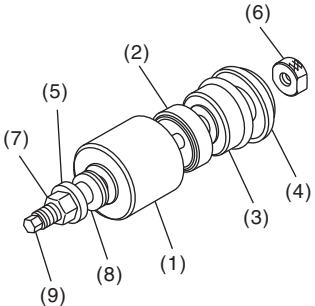
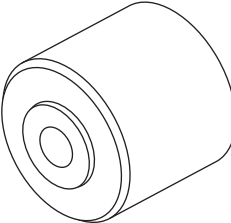
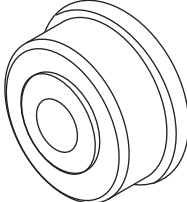
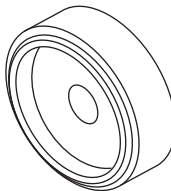
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499705404	499705404	SEAT	- Used for removing the side bearing race. - Used together with PULLER ASSY (499705401). - For VA1-type
 ST-499705401	499705401	PULLER ASSY	- Used for removing the side bearing race. - Used together with SEAT (499705404). - For VA-type
 ST18270KA020	18270KA020	SOCKET (E20)	- Used for removing and installing the hypoid driven gear. - For VA2-type
 ST18854AA000	18854AA000	ANGLE GAUGE	- Used for installing the hypoid driven gear. - For VA2-type

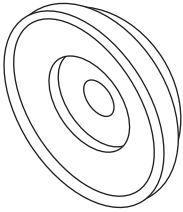
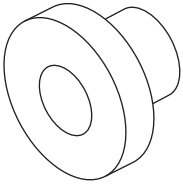
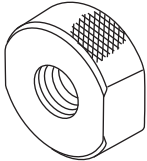
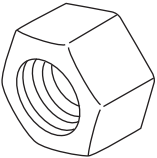
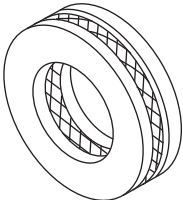
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG000	41399FG000	SPECIAL TOOL ASSY	- Used for removing and installing the rear differential mount bushing. - Use (1), (3), (5), (6), (7), (8) and (9) for removal. - Use (2), (4), (5), (6), (7), (8) and (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)
 ST41399FG010	41399FG010	SPECIAL TOOL A	- Used for removing the rear differential mount bushing. - For combination of tools for removal, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG020	41399FG020	SPECIAL TOOL B	- Used for installing the rear differential mount bushing. - For combination of tools for installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG030	41399FG030	SPECIAL TOOL C	- Used for removing the rear differential mount bushing. - For combination of tools for removal, refer to "SPECIAL TOOL ASSY (41399FG000)".

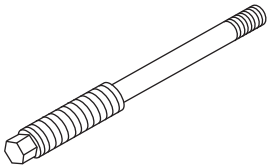
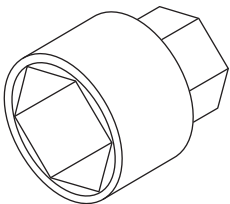
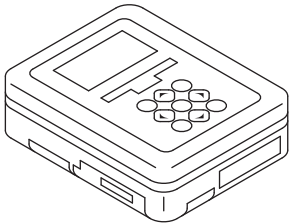
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG040	41399FG040	SPECIAL TOOL D	- Used for installing the rear differential mount bushing. - For combination of tools for installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG050	41399FG050	SPECIAL TOOL SLEEVE	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG060	41399FG060	SPECIAL TOOL RING	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG070	41399FG070	SPECIAL TOOL NUT	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399FG080	41399FG080	SPECIAL TOOL BEARING	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG000)".

General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG090	41399FG090	SPECIAL TOOL SHAFT	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG000)".
 ST41399YC000	41399YC000	SOCKET WRENCH (17)	Used for tightening the self-locking nut.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Transmission jack	Used for removing and installing the rear differential.
Puller	Used for removing the side bearing retainer.
Thickness gauge	Used for measuring clearance.
Hexagon wrench	Used for installing and removing the oil filler plug and oil drain plug.
Tire lever	Used for removing the rear drive shaft. (VA-type)

2. Differential Gear Oil

A: INSPECTION

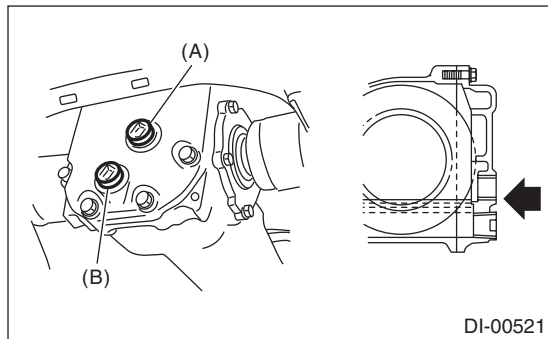
1) Remove the oil filler plug, and then check the gear oil. Replace the gear oil if it is contaminated or deteriorated. <Ref. to DI-23, REPLACEMENT, Differential Gear Oil.>

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

NOTE:

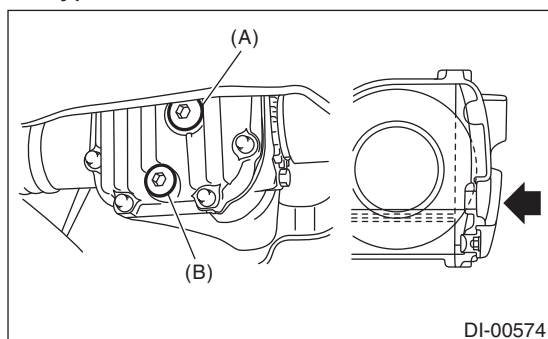
On VA1-types at factory settings, the oil level may be within -14 mm (-0.6 in) from the bottom of the oil filler plug. This is at normal level, requiring no oil refill.

• T-type



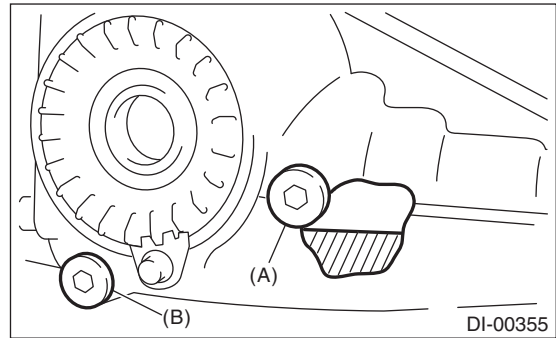
(A) Oil filler plug
(B) Oil drain plug

• VA1-type



(A) Oil filler plug
(B) Oil drain plug

• VA2-type



(A) Oil filler plug
(B) Oil drain plug

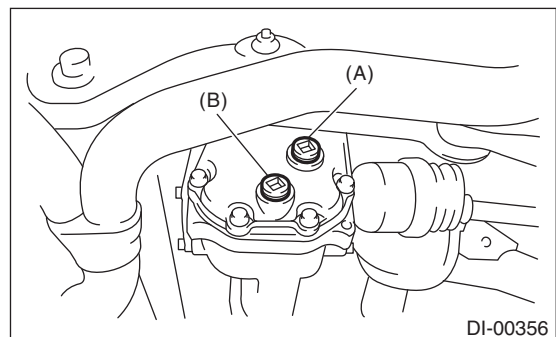
B: REPLACEMENT

CAUTION:

- Gear oil is extremely hot just after driving. Be wary of receiving burns.
- If the differential gear oil is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.

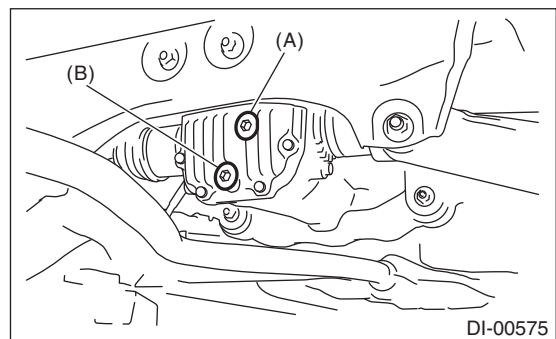
- 1) Lift up the vehicle.
- 2) Remove the oil drain plug and oil filler plug, and drain the gear oil.

• T-type



(A) Oil filler plug
(B) Oil drain plug

• VA1-type

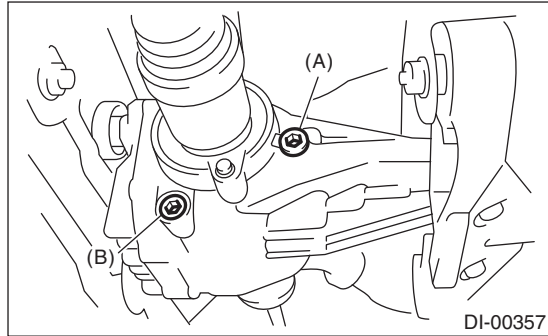


(A) Oil filler plug
(B) Oil drain plug

Differential Gear Oil

DIFFERENTIALS

• VA2-type



- (A) Oil filler plug
- (B) Oil drain plug

3) Tighten the oil drain plug.

NOTE:

- For the T-type, apply liquid gasket to the oil drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

- For VA type, use a new gasket.

Tightening torque:

T-type

49 N·m (5.0 kgf-m, 36.1 ft-lb)

VA-type:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

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

NOTE:

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

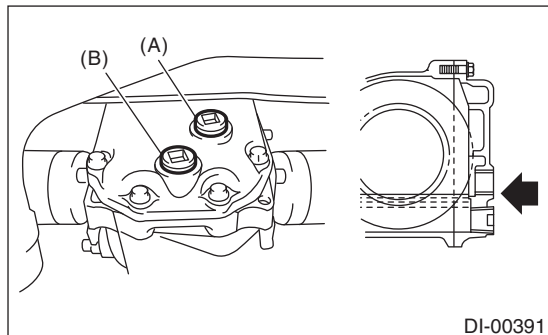
Recommended gear oil:

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

Oil capacity:

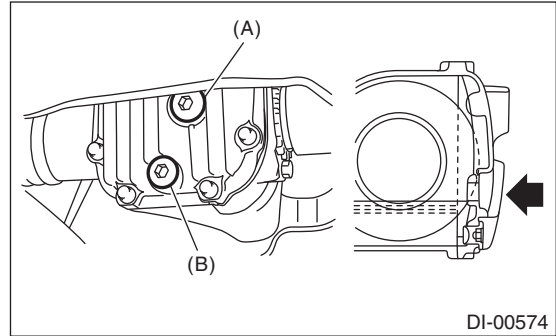
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

- T-type



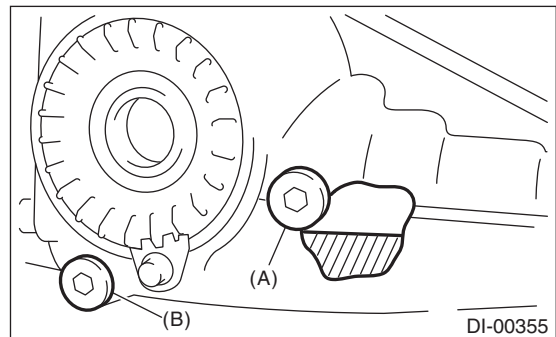
- (A) Oil filler plug
- (B) Oil drain plug

• VA1-type



- (A) Oil filler plug
- (B) Oil drain plug

• VA2-type



- (A) Oil filler plug
- (B) Oil drain plug

5) Install the oil filler plug.

NOTE:

- For the T-type, apply liquid gasket to the oil filler plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

- For VA type, use a new gasket.

Tightening torque:

T-type:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

VA-type:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

3. Front Differential Assembly

A: NOTE

1. CVT MODEL

For front differential for the CVT model, refer to the “CVT” section. <Ref. to CVT-264, Front Differential Assembly.>

2. AT MODEL

For front differential of 5AT model, refer to “5AT” section. <Ref. to 5AT-88, Front Differential Assembly.>

3. MT MODEL

For front differential for the 6MT model, refer to the “6MT” section. <Ref. to 6MT-73, Front Differential Assembly.>

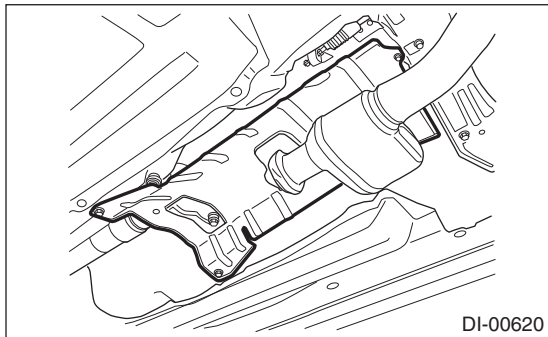
Rear Differential (T-type)

DIFFERENTIALS

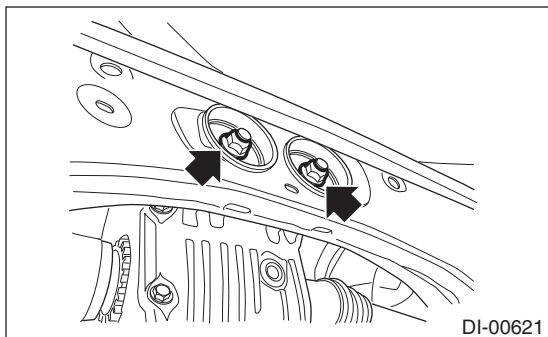
4. Rear Differential (T-type)

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Shift the select lever or gear shift lever to neutral.
- 3) Release the parking brake.
- 4) Disconnect the ground cable from battery.
- 5) Loosen the wheel nuts.
- 6) Lift up the vehicle.
- 7) Remove the rear wheels.
- 8) Drain differential gear oil. <Ref. to DI-23, REPLACEMENT, Differential Gear Oil.>
- 9) Remove the rear exhaust pipe.
 - 2.5 L SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.>
 - 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.>
 - 3.6 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>
- 10) Remove the heat shield cover.



- 11) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 12) Loosen the self-lock nuts which hold the rear differential to rear crossmember.



- 13) Remove the DOJ of rear drive shaft from rear differential using ST or tire lever.

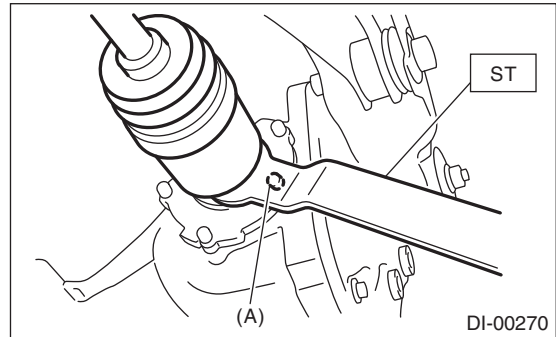
NOTE:

- For the T-type, use the ST.

- For the VA-type, use the tire lever.

T-type

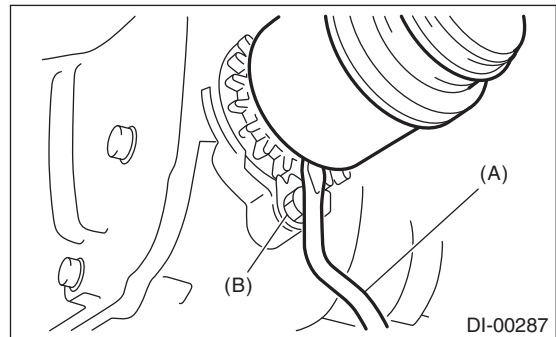
ST 28099PA100 DRIVE SHAFT REMOVER



(A) BOLT

VA-type

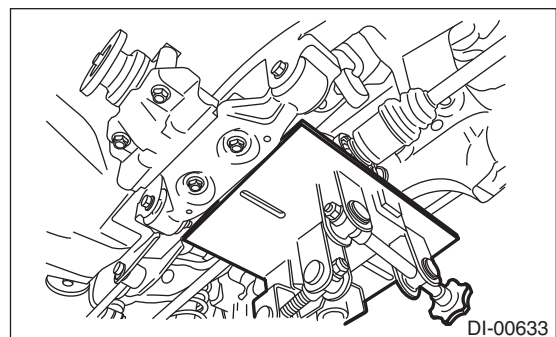
When removing the DOJ from the rear differential, place the tire lever against the bolt as shown in the figure so as not to damage the side retainer.



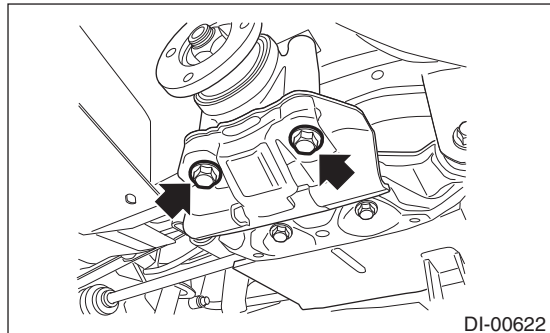
(A) Tire lever

(B) BOLT

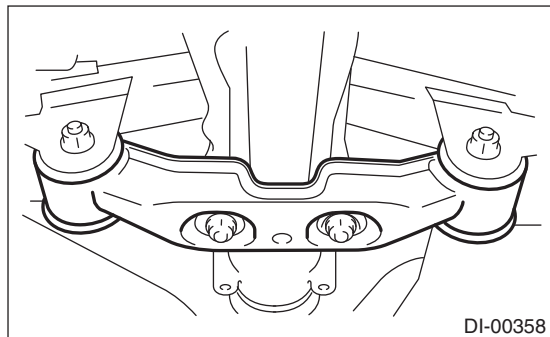
- 14) Set the rear differential to transmission jack.



15) Remove the mass damper. (CVT model)



16) Remove the rear differential front member.

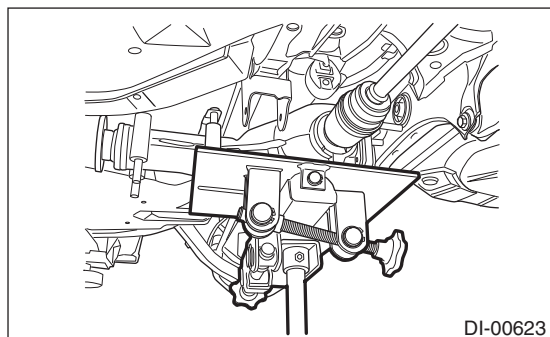


17) Remove the self-locking nuts which hold the rear differential to the crossmember.

18) Remove the rear differential stud bolt from rear crossmember bushing.

NOTE:

When removing the stud bolt from the rear crossmember bushing, carefully adjust the angle and location of transmission jack and jack stand, if necessary.



19) Lower the transmission jack.

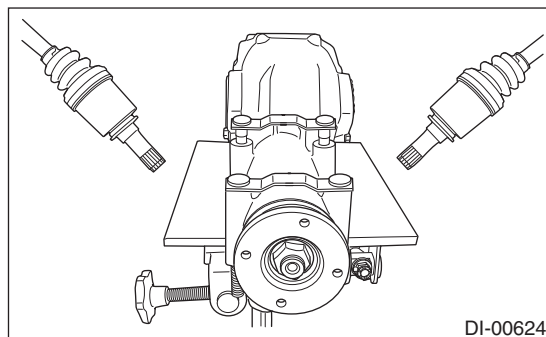
20) Pull out the axle shaft from rear differential.

NOTE:

- If it is difficult to remove the axle shaft from rear differential, use the ST for T-type and the tire lever for VA-type.

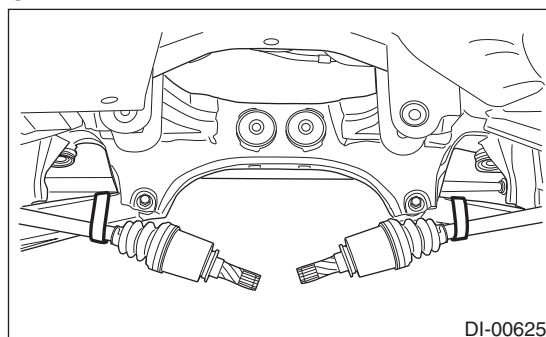
ST 28099PA100 DRIVE SHAFT REMOVER

- If a circlip is attached to the removed axle shaft for VA2 type, remove the differential case assembly and replace it with a new part.

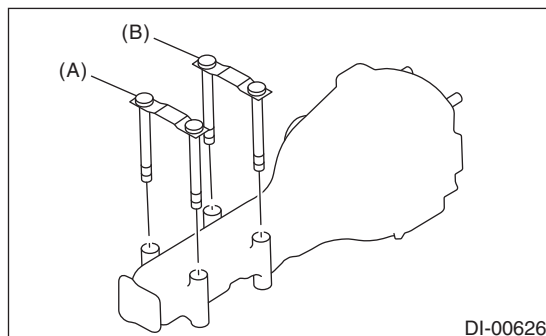


21) Lower the transmission jack.

22) Secure the rear drive shaft to rear lateral link using wire.



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



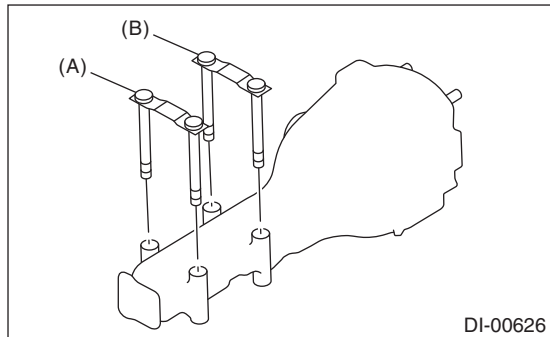
- (A) Rear differential member plate (CVT model)
(B) Rear differential member plate

Rear Differential (T-type)

DIFFERENTIALS

B: INSTALLATION

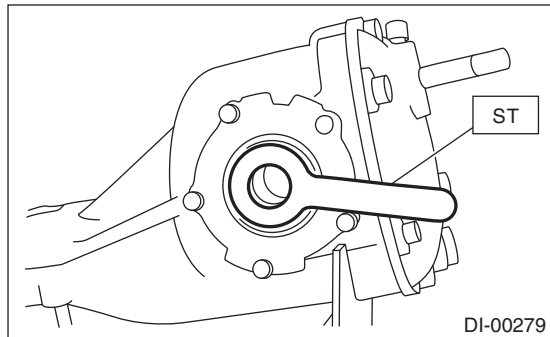
1) Install the rear differential member plate to the rear differential.



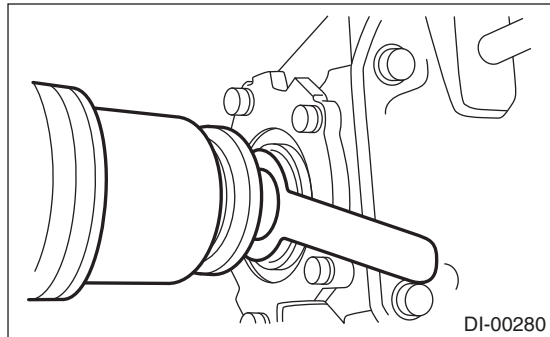
- (A) Rear differential member plate (CVT model)
- (B) Rear differential member plate

2) Set the rear differential to transmission jack.
3) Set the ST to the rear differential.

ST 28099PA090 OIL SEAL PROTECTOR

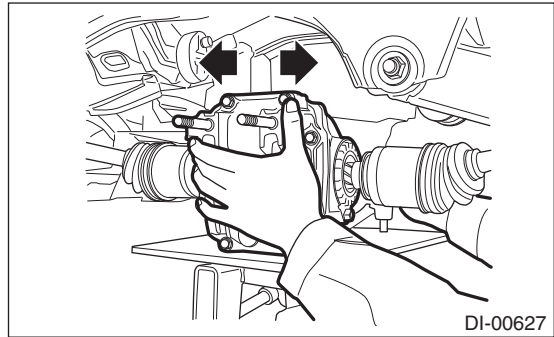


4) Insert the rear axle shaft until the spline portion of the rear drive shaft exceeds the side oil seal.

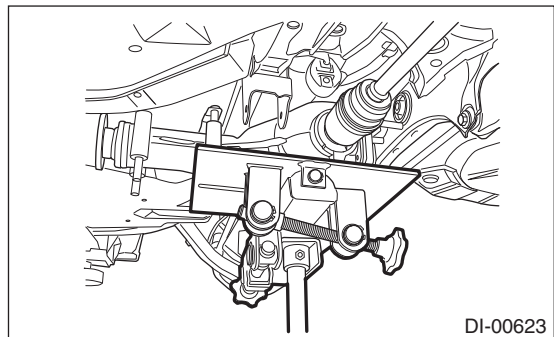


5) Remove ST from rear differential.

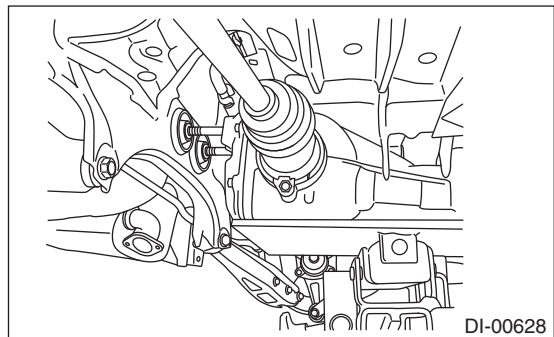
6) Push the rear differential from side to side to insert the rear axle shaft into rear differential completely.



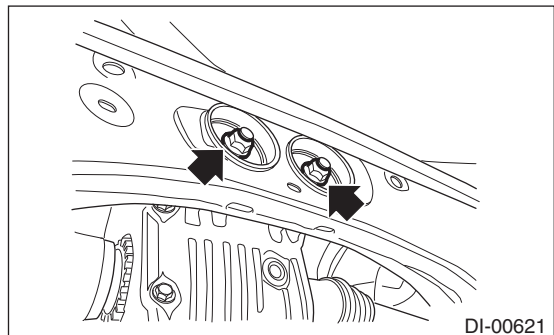
7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear crossmember bushing properly.



8) 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.



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

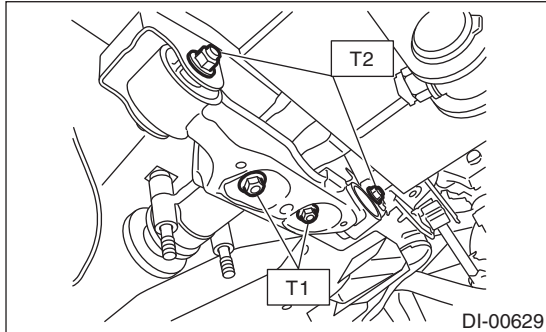


10) Install the rear differential front member with a new self-locking nut.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

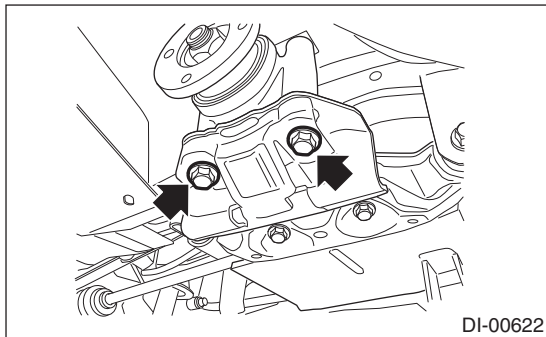
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



11) Install the mass damper with a new self-locking nut. (CVT model)

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Tighten the self-locking nut.

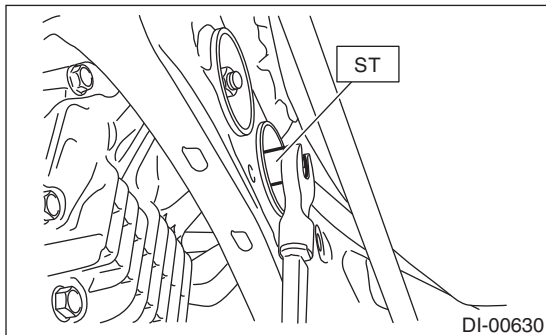
NOTE:

For models other than OUTBACK model, tighten the self-locking nut using the ST.

ST 41399YC000 SOCKET WRENCH (17)

Tightening torque:

70 N·m (7.1 kgf-m, 51.6 ft-lb)



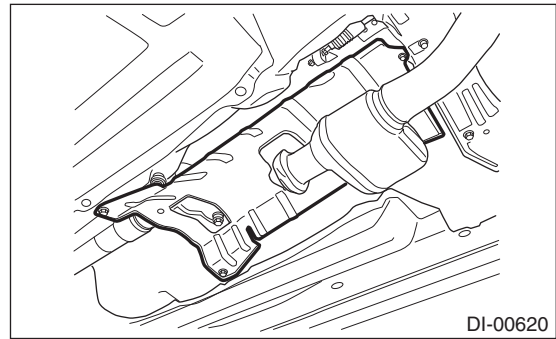
13) Remove the transmission jack.

14) Install the propeller shaft. <Ref. to DS-10, INSTALLATION, Propeller Shaft.>

15) Install the heat shield cover.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



16) Install the rear exhaust pipe.

- 2.5 L SOHC model

<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.>

- 2.5 L DOHC turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.>

- 3.6 L model

<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.>

17) Fill differential gear oil. <Ref. to DI-23, REPLACEMENT, Differential Gear Oil.>

18) Hereafter, install in the reverse order of removal.

19) Perform "Rear Differential Inspection Mode" using the Subaru Select Monitor. (CVT model)

<Ref. to DI-78, Rear Differential Inspection Mode.>

CAUTION:

Be sure to perform Rear Differential Inspection Mode when the following work has been performed.

- Replacement of rear differential
- Replacement of rear differential hypoid gear set
- Replacement of transmission assembly
- Replacement of front differential hypoid gear set

Rear Differential (T-type)

DIFFERENTIALS

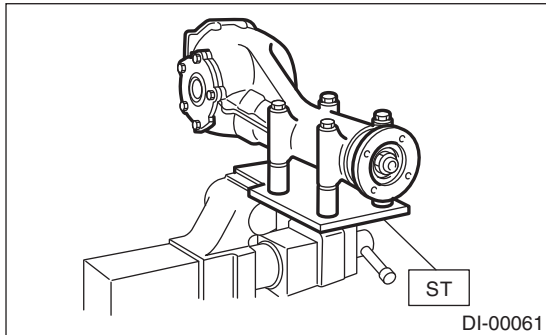
C: DISASSEMBLY

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.

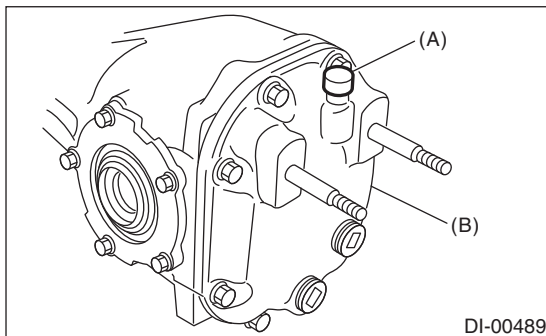
ST 398217700 ATTACHMENT SET



2) 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

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

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

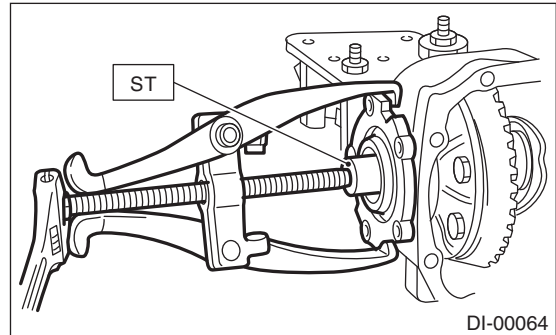
5) Remove the side retainer attachment bolts, set the ST to differential case, and extract the side retainers RH and LH with a puller.

NOTE:

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

- Keep the side retainers separate by attaching tags or in similar ways to make it possible to identify RH and LH sides.

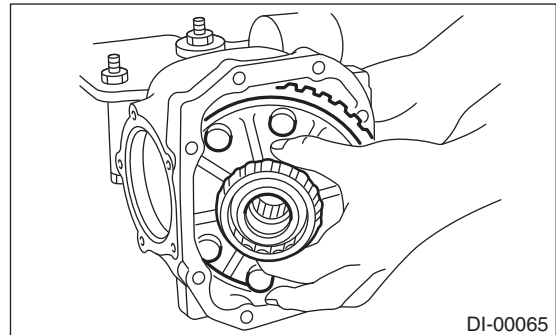
ST 398457700 ATTACHMENT



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

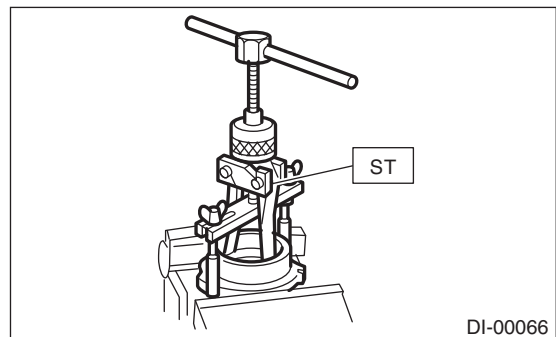
NOTE:

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



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

ST 398527700 PULLER ASSY



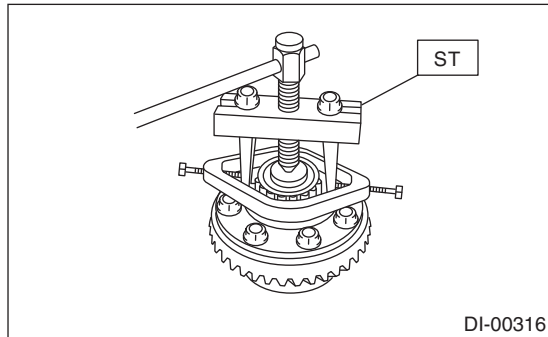
8) Using the ST, remove the bearing cone.

NOTE:

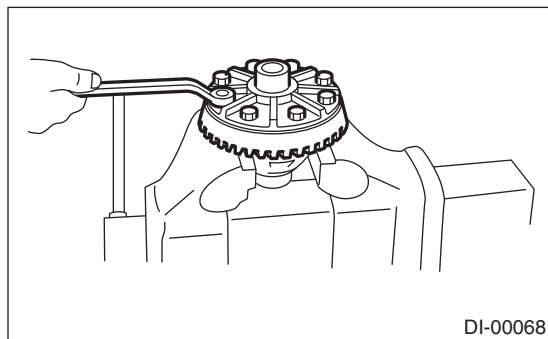
- Do not attempt to disassemble the parts unless necessary.
- Set the ST so that its claws catch the edge of the bearing cone.

- 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.

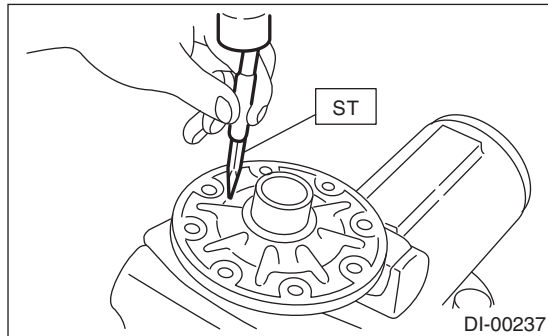


10) Remove the pinion shaft lock pin from hypoid driven gear side using ST.

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.

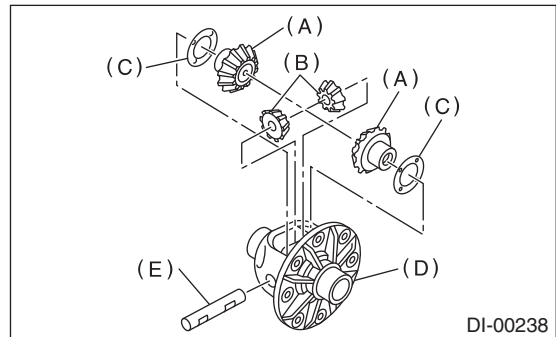
ST 899904100 STRAIGHT PIN REMOVER



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

NOTE:

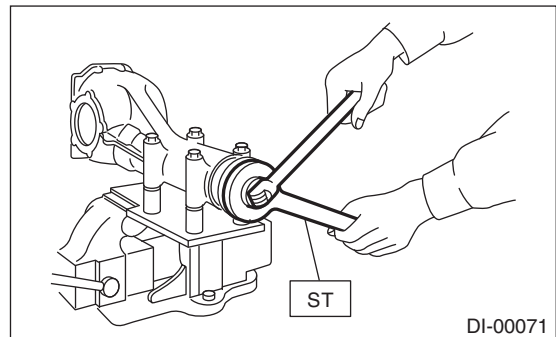
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



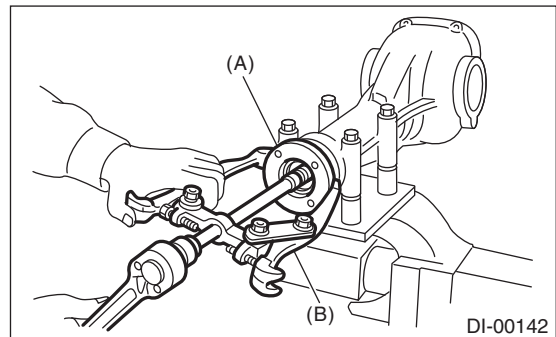
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

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 by using the ST.

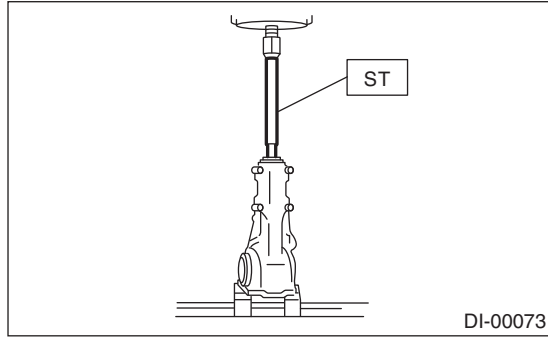
Rear Differential (T-type)

DIFFERENTIALS

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

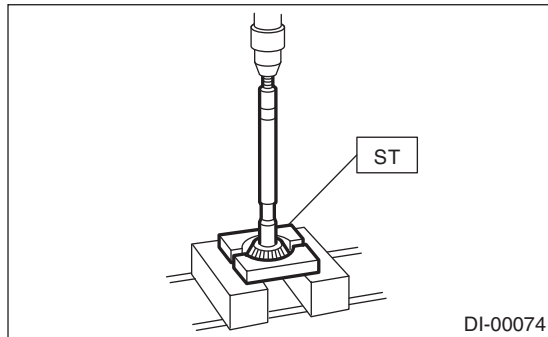


15) Remove the rear bearing cone from drive pinion while supporting the cone with ST.

NOTE:

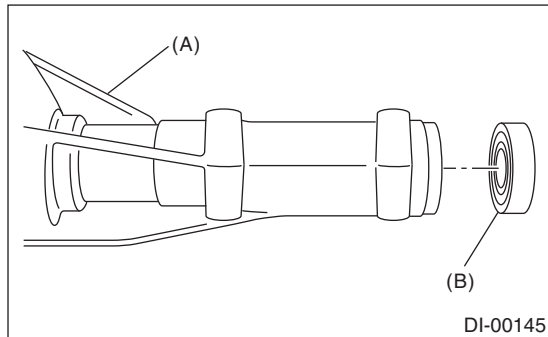
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



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

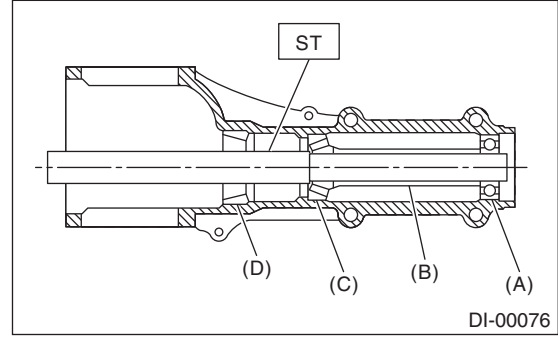
ST 398527700 PULLER ASSY



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

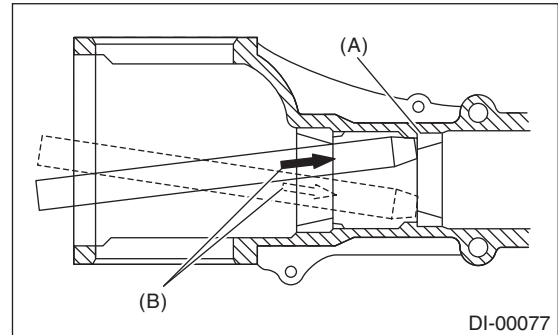
17) Remove the pilot bearing together with the front bearing cone and spacer using the ST.

ST 398467700 DRIFT



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

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

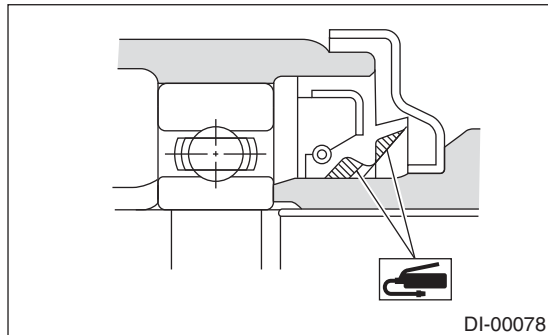


- (A) 2 cutout portions along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

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



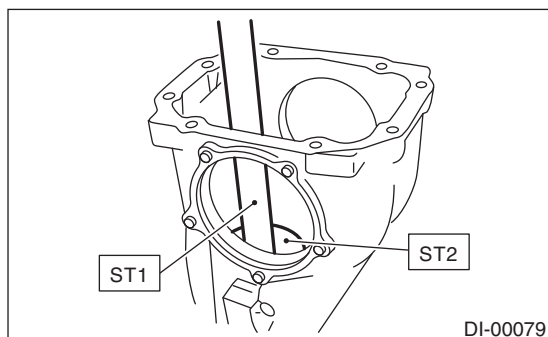
1) Adjusting preload for front and rear bearings

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.

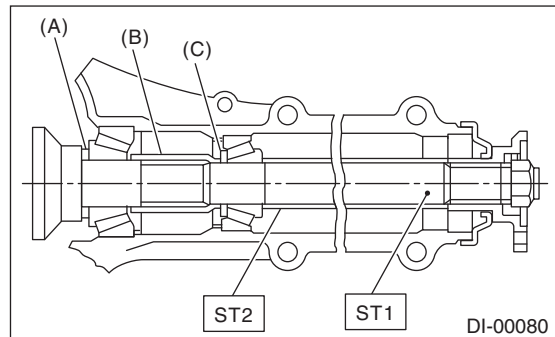
ST1 398477701 HANDLE
ST2 398477702 DRIFT

- (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 & washer, front bearing cone, ST2, companion flange, and washer & 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.

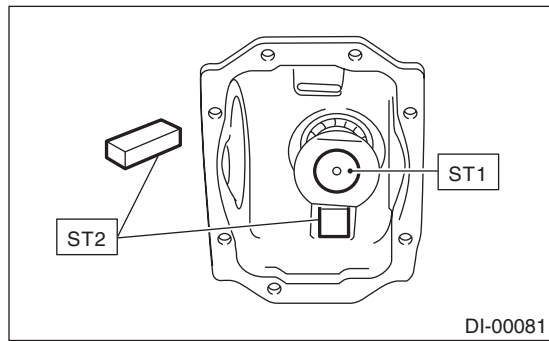
ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

Rear Differential (T-type)

DIFFERENTIALS

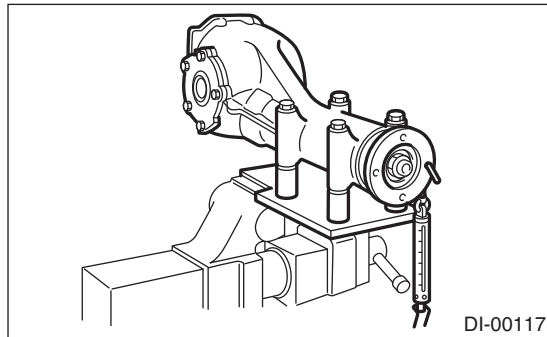
Tightening torque:

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



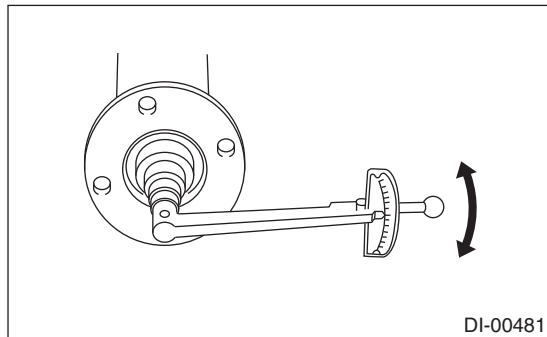
Initial load:

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 number	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 number	Length mm (in)
383695201	56.2 (2.213)
383695202	56.4 (2.220)
383695203	56.6 (2.228)
383695204	56.8 (2.236)
383695205	57.0 (2.244)
383695206	57.2 (2.252)

2) Adjusting drive pinion height:

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

(1) Attach the ST2.

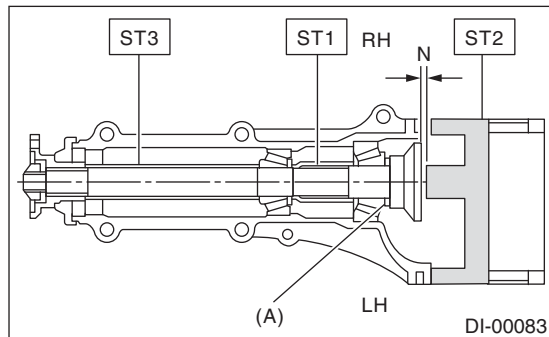
NOTE:

At this time, install a pinion height adjusting washer, temporarily selected, or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE

ST3 398507703 DUMMY COLLAR



N Measured value

(A) Pinion height adjusting washer

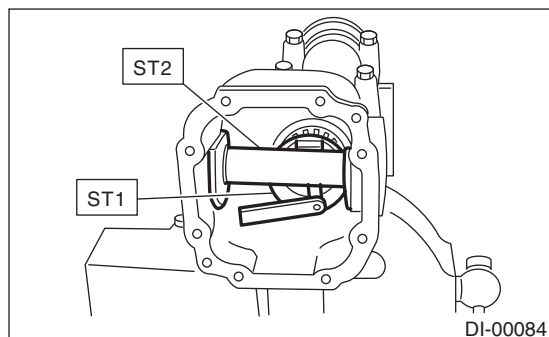
(2) Measure the clearance “N” between the end of ST2 and the end surface of ST1 by using a thickness gauge.

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 measured by thickness gauge mm (in)
H	Figure marked on drive pinion head
Memo:	

(Example of calculation)

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

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

$$H = + 1$$

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

$$\text{Thickness} = 3.42 \text{ mm (0.1346 in)}$$

Therefore use washer 383605200.

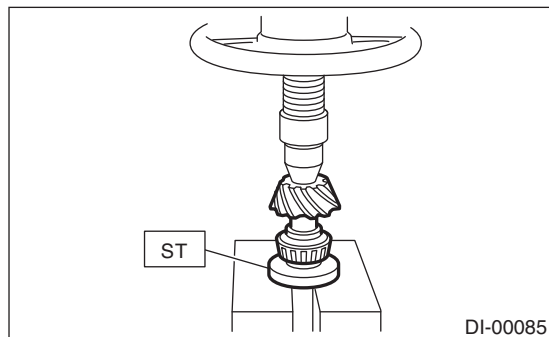
Pinion height adjusting washer	
Part number	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
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)

Rear Differential (T-type)

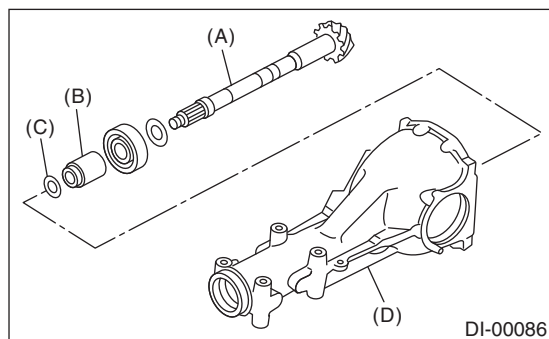
DIFFERENTIALS

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 preload adjusting spacer and washer.



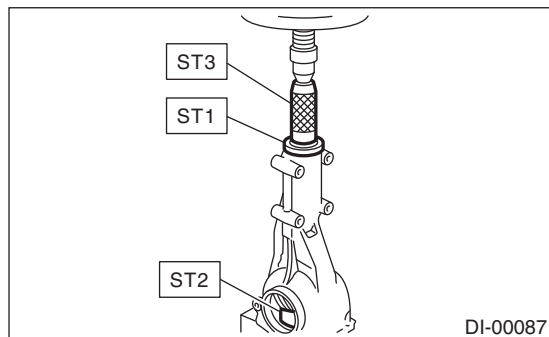
- (A) Drive pinion
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Differential carrier

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

ST1 398507703 DUMMY COLLAR

ST2 399780104 WEIGHT

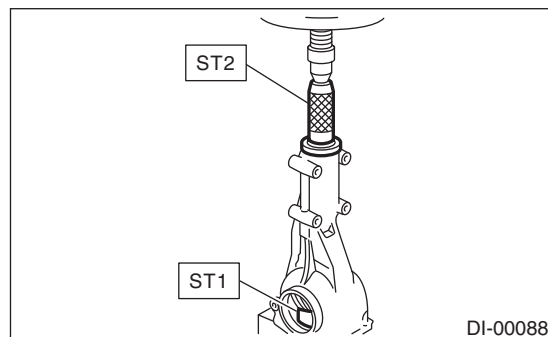
ST3 899580100 INSTALLER



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

ST1 399780104 WEIGHT

ST2 899580100 INSTALLER

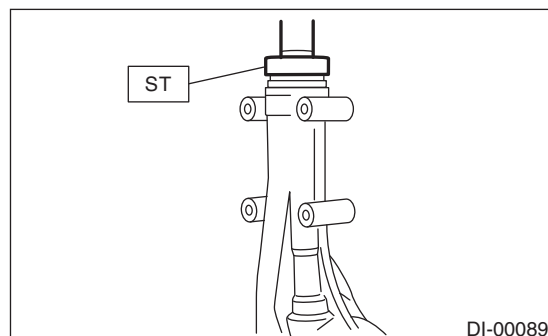


7) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.
- 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



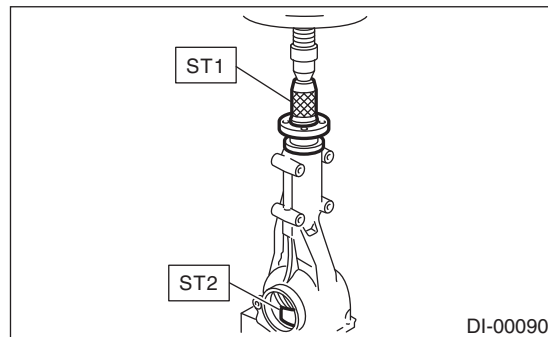
8) Press-fit the companion flange with ST1 and ST2.

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:

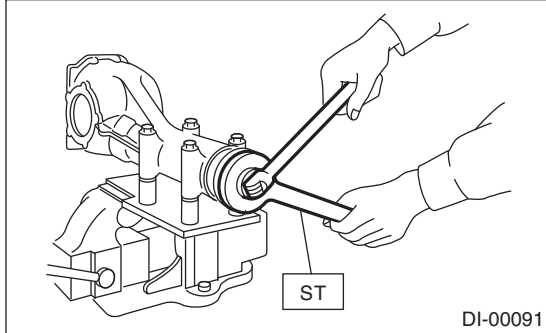
THREE BOND 1324 (Part No. 004403042) or equivalent

10) Attach the new self-locking nut and use the ST to fix the companion flange in place, then tighten the self-locking nut.

Tightening torque:

181.5 N·m (18.5 kgf·m, 133.9 ft·lb)

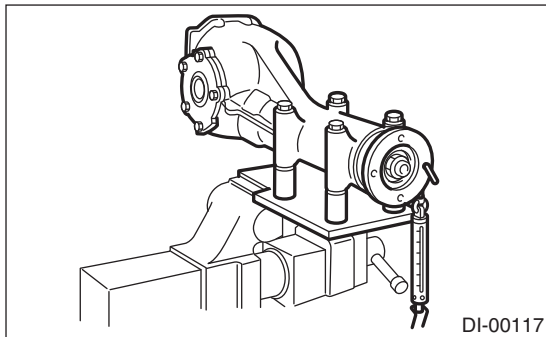
ST 498427200 FLANGE WRENCH



11) Check the initial torque or initial load.

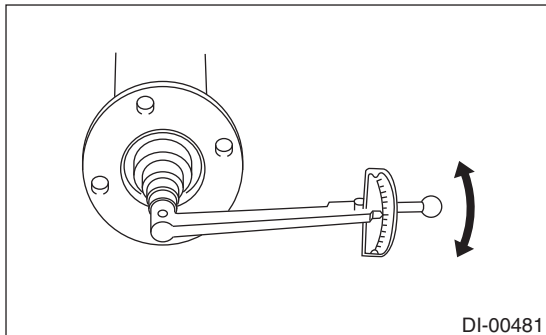
Initial load:

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)



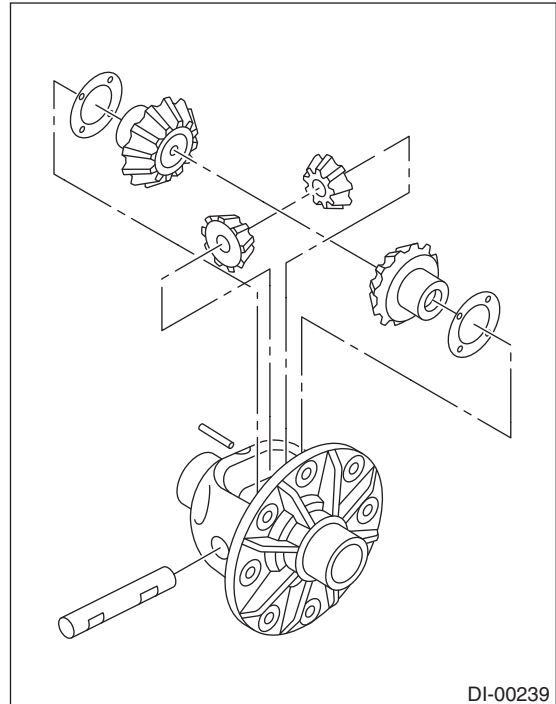
12) Assembling differential case

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.

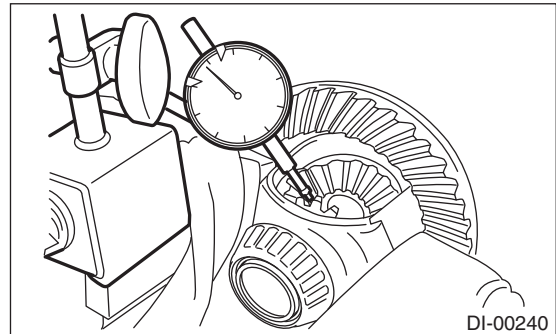
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(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 the side gear thrust washers.

Side gear thrust washer	
Part number	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 differential case.

Rear Differential (T-type)

DIFFERENTIALS

NOTE:

- Before installing bolts, apply a sealing material to bolt threads.

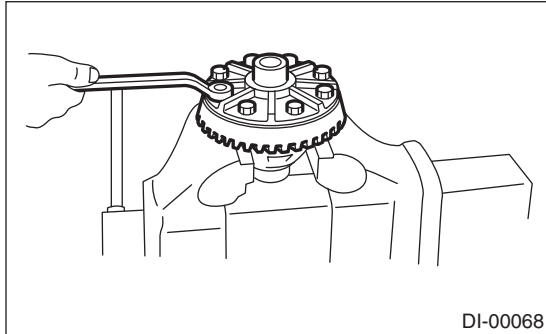
SEAL MATERIAL:

THREE BOND 1324 (Part No. 004403042) or equivalent

- Make sure there is no clearance between the differential case and driven gear.
- Tighten diagonally.

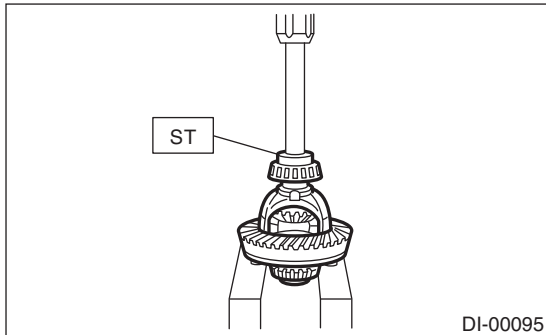
Tightening torque:

103 N·m (10.5 kgf-m, 76.0 ft-lb)



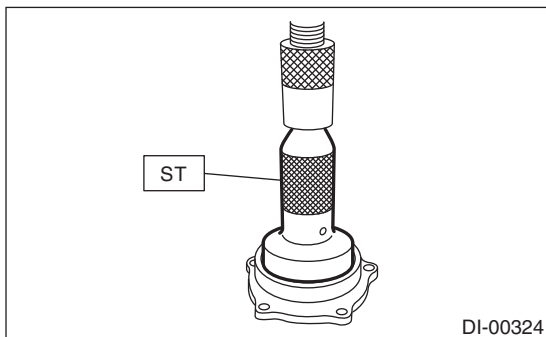
14) Using the ST, press-fit the side bearing to the differential case.

ST 398487700 DRIFT



15) Using the ST, press-fit the side bearing outer race to the side retainer.

ST 398417700 DRIFT



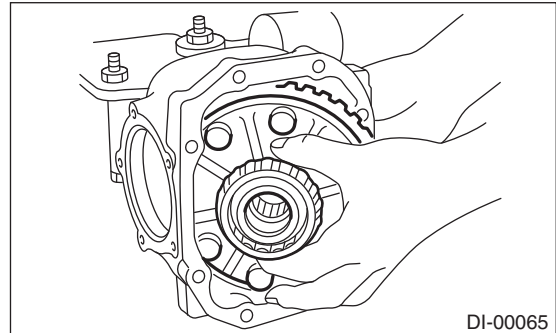
16) Side retainer shim adjustment

(1) The hypoid 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 teeth against the case.



(3) Install the side retainer shim and O-ring.

NOTE:

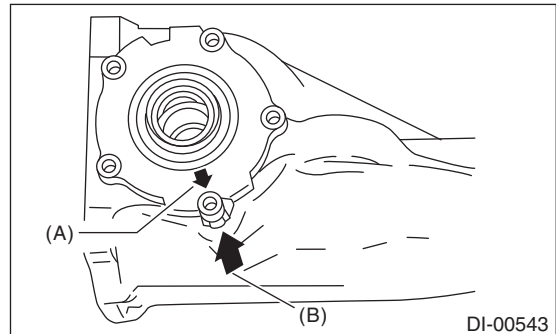
- Use new O-rings.
- Be careful not to mix up the side retainer shim RH and LH.
- Replace broken or corroded side retainer shims with a new part of the same thickness.

Side retainer shim	
Part number	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 when installing the side retainer.

NOTE:

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



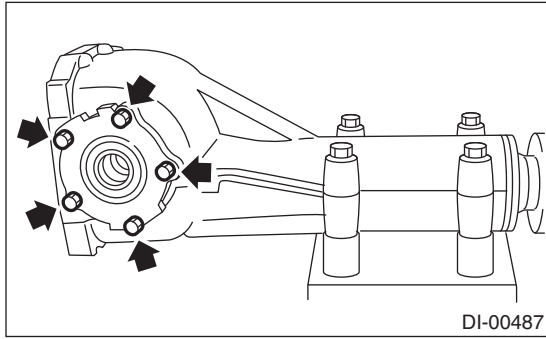
(A) Arrow mark (on the side retainer)

(B) Arrow mark (on the differential carrier)

(5) Tighten the side retainer bolt.

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):**

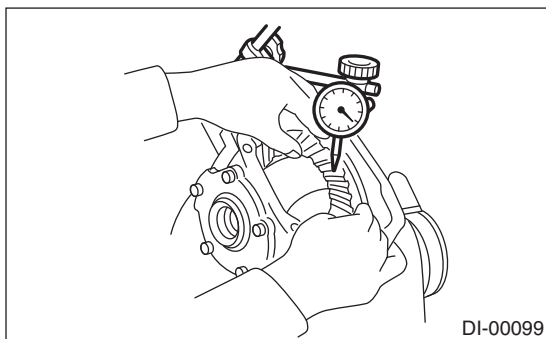
Reduce the thickness of shim on the back side of the hypoid driven gear and increase the thickness of shims on the teeth side of the hypoid driven gear.

•**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) Measure the total preload of the drive pinion. 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.

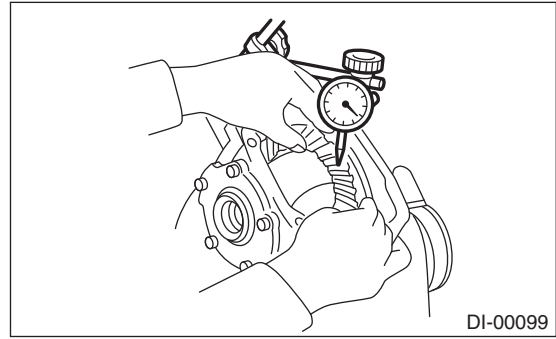
Total preload:

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

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

Backlash:

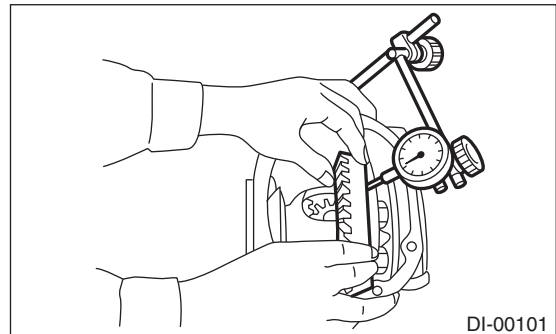
0.10 — 0.20 mm (0.004 — 0.008 in)



18) Check the hypoid driven gear runout on its back surface, and make sure that the pinion and hypoid driven gear rotate smoothly. If the hypoid driven gear runout on its back surface exceeds the specification, check for any foreign objects 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:

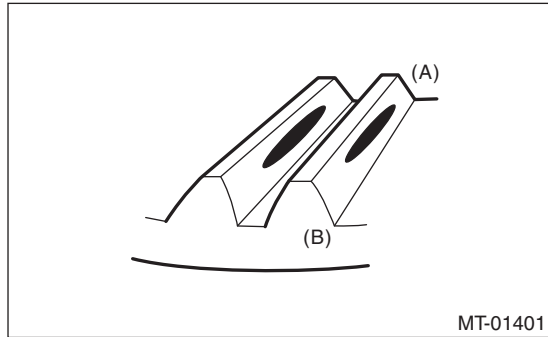
Be sure to wipe off the lead-free red dye completely after the adjustment is completed.

Rear Differential (T-type)

DIFFERENTIALS

- Correct tooth contact

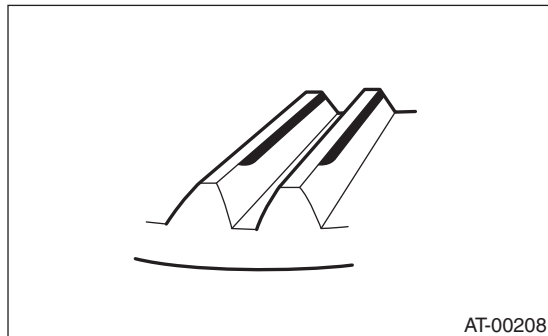
Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)



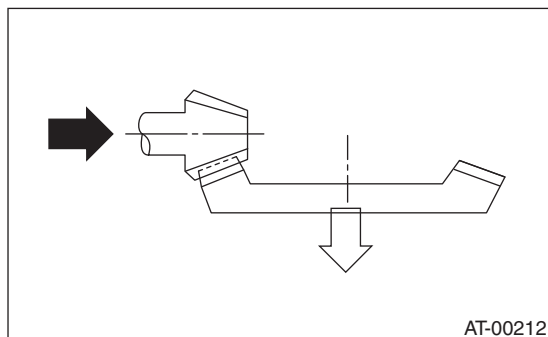
- (A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

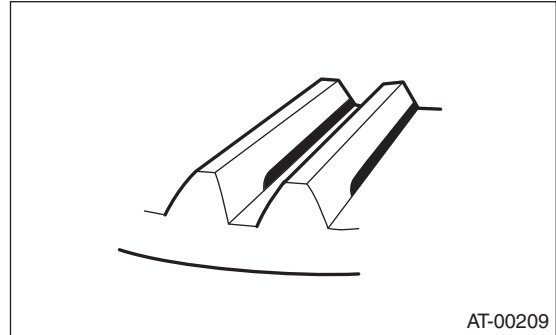


Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.

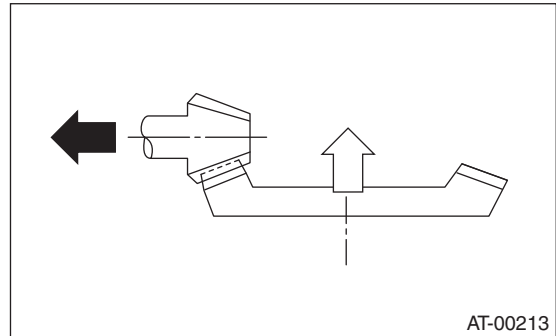


- Flank contact

Check item: Backlash is too small.
Contact pattern



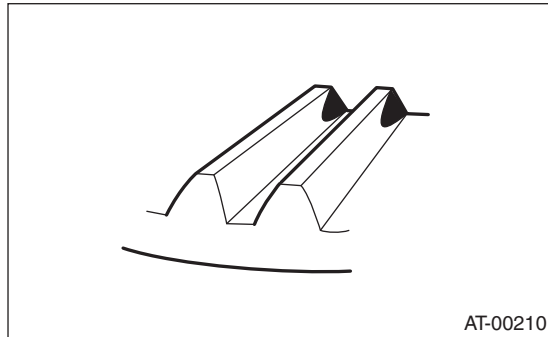
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



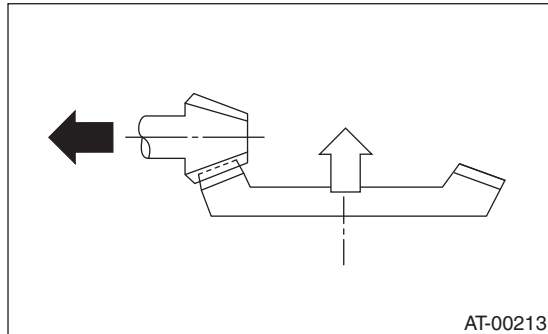
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



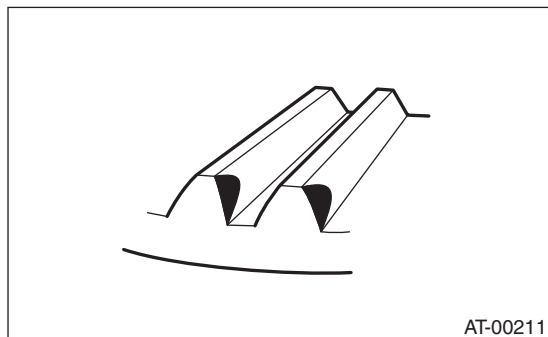
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



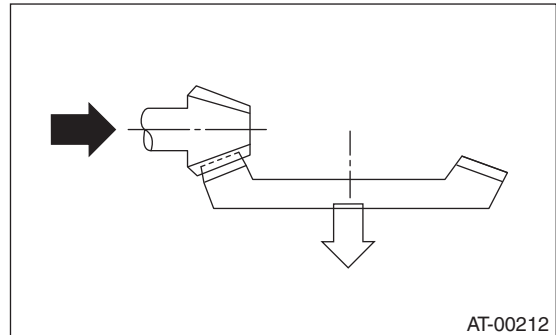
- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern



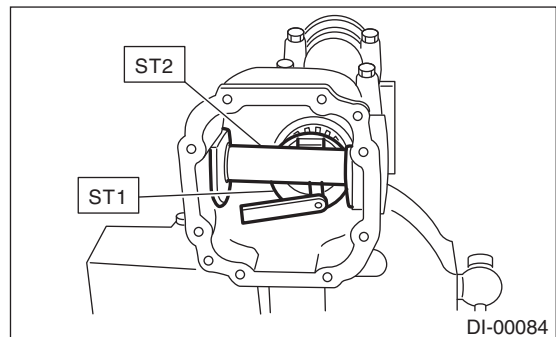
Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



20) If correct 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



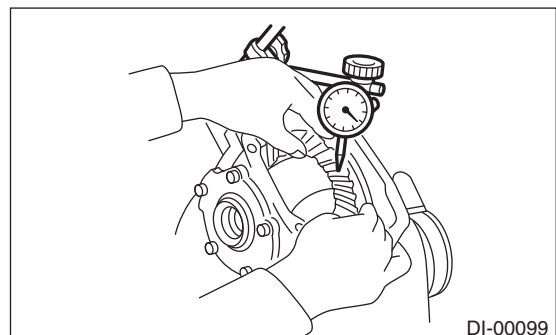
$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.008 in)}$$

T	Thickness of pinion height adjusting washer mm (in)
T _o	Thickness of washer temporarily inserted mm (in)
N	Clearance measured by 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 the O-ring to left and right side retainers.

Rear Differential (T-type)

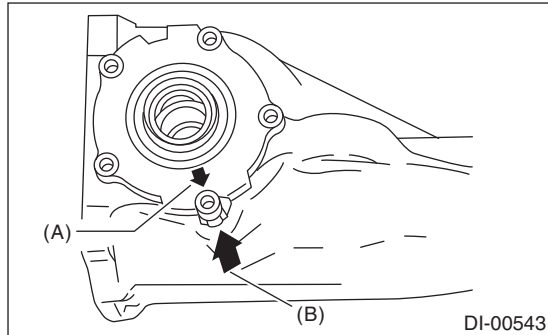
DIFFERENTIALS

NOTE:

Use new O-rings.

23) Install the oil seal to the side retainer of both sides. <Ref. to DI-74, REPLACEMENT, Rear Differential Side Oil Seal.>

24) Align the arrow mark on the differential carrier with the arrow mark on the side retainer when installing the side retainer.



(A) Arrow mark (on the side retainer)

(B) Arrow mark (on the differential carrier)

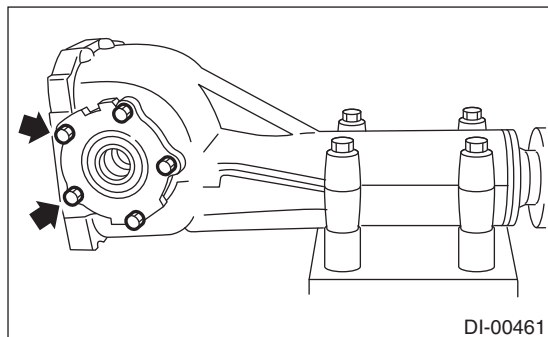
25) Apply liquid gasket to the bolts indicated by arrows, and tighten the bolts.

Liquid gasket:

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

Tightening torque:

10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



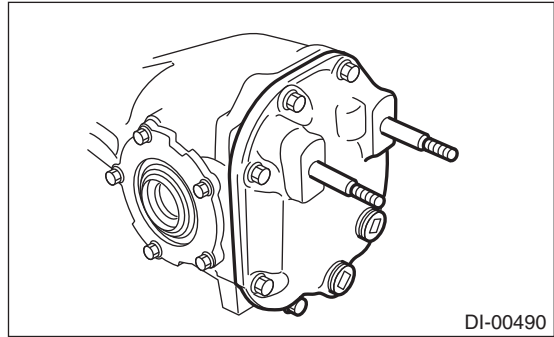
26) Install the gasket and the rear cover.

NOTE:

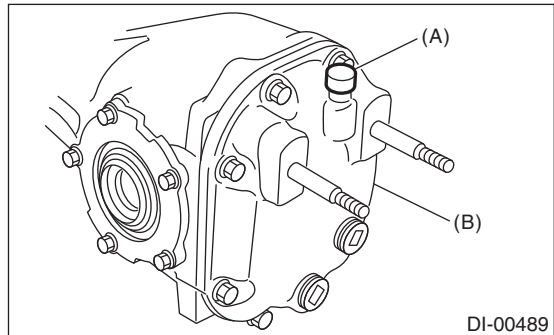
Use a new gasket.

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.

NOTE:

Apply liquid gasket to 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 filler 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.

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.

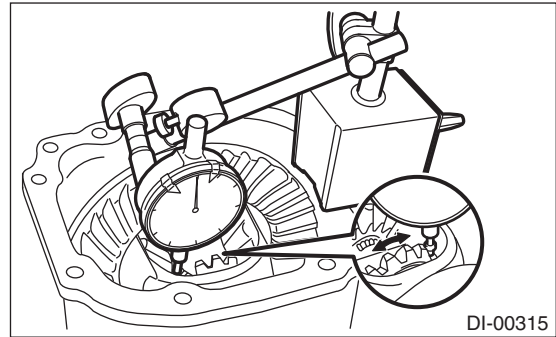
1. SIDE GEAR BACKLASH

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.



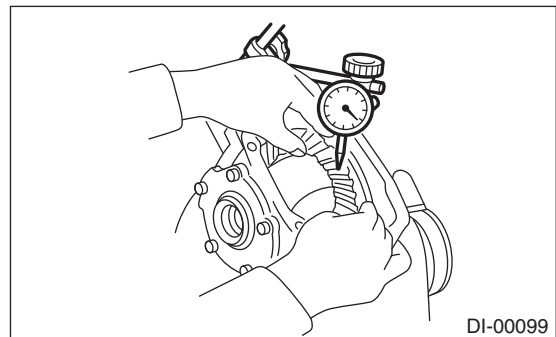
2. HYPOID DRIVEN GEAR BACKLASH

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.



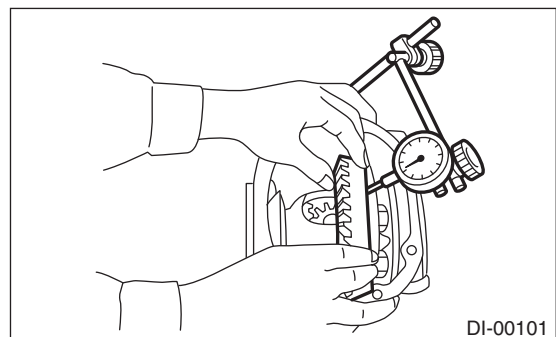
3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

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.



Rear Differential (T-type)

DIFFERENTIALS

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-33, ASSEMBLY, Rear Differential (T-type).>

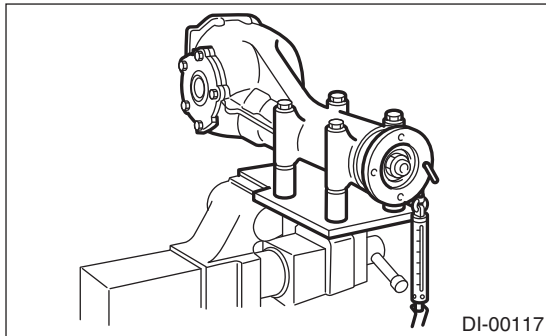
5. TOTAL PRELOAD

Using a spring scale, check the total preload.

Total preload:

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

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

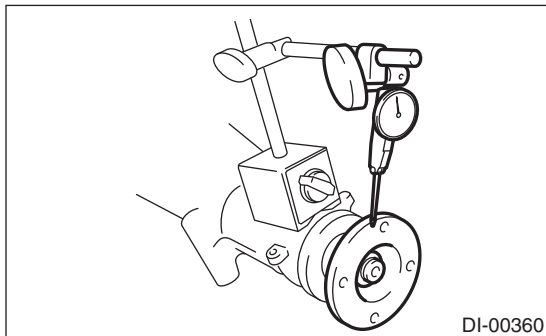


6. COMPANION FLANGE

- 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:

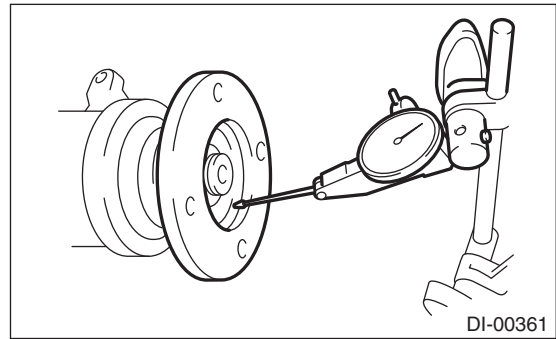
0.08 mm (0.003 in)



- 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 even 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-33, ASSEMBLY, Rear Differential (T-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-33, ASSEMBLY, Rear Differential (T-type).>

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-33, ASSEMBLY, Rear Differential (T-type).>

4. TOTAL PRELOAD

Adjust the side retainer shim. <Ref. to DI-33, ASSEMBLY, Rear Differential (T-type).>

5. Rear Differential (VA-type)

A: REMOVAL

The removal procedure for VA-type is included in "REMOVAL" for T-type. <Ref. to DI-26, REMOVAL, Rear Differential (T-type).>

B: INSTALLATION

The installation procedure for VA-type is included in "INSTALLATION" for T-type. <Ref. to DI-28, INSTALLATION, Rear Differential (T-type).>

C: DISASSEMBLY

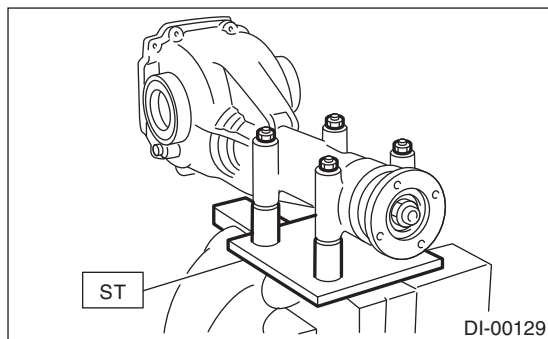
1. VA1-TYPE

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 SET

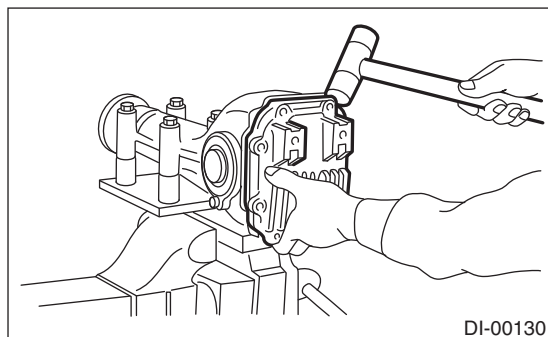


2) Remove the oil drain plug and oil filler plug.

3) Remove the rear cover by removing retaining bolts.

NOTE:

Remove it by tapping with a plastic hammer.

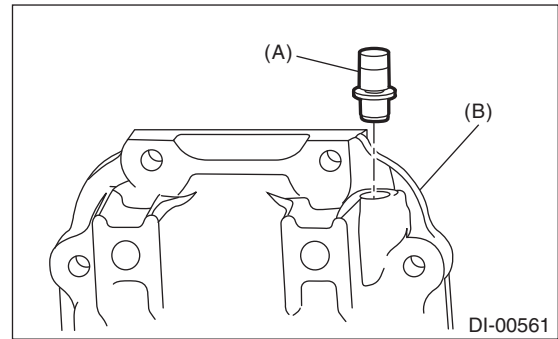


4) Remove the air breather cap.

NOTE:

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

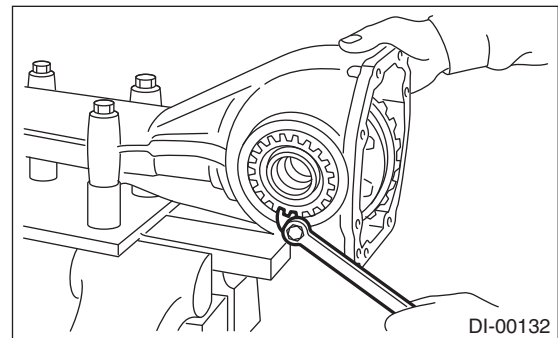
- Whenever the air breather cap is removed, replace it with a new part.



(A) Air breather cap

(B) Rear cover

5) Remove the lock plate RH and LH.

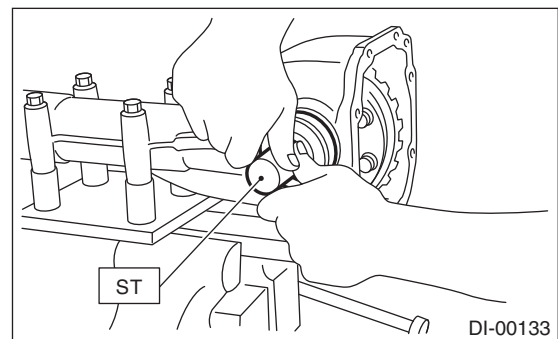


6) Remove the side retainer RH and LH with ST.

NOTE:

When keeping the retainers aside, use labels etc. to avoid confusing the left and right.

ST 18630AA010 WRENCH COMPL RETAINER



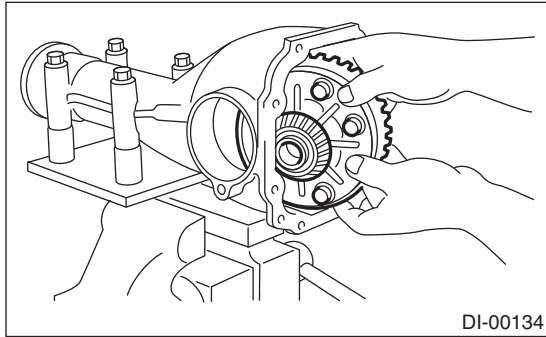
7) Pull out the differential case assembly from differential carrier.

Rear Differential (VA-type)

DIFFERENTIALS

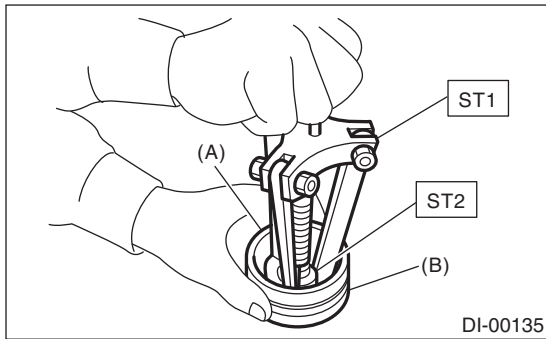
NOTE:

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



8) Remove the bearing race from side retainer RH and LH with ST1 and ST2.

ST1 499705401 PULLER ASSY
ST2 499705404 SEAT

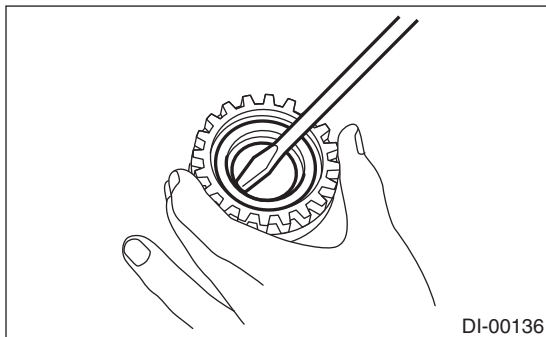


(A) Bearing race
(B) Side retainer

9) Remove the oil seal from the RH and LH side retainers using a screwdriver.

NOTE:

Perform this operation only when changing oil seal.



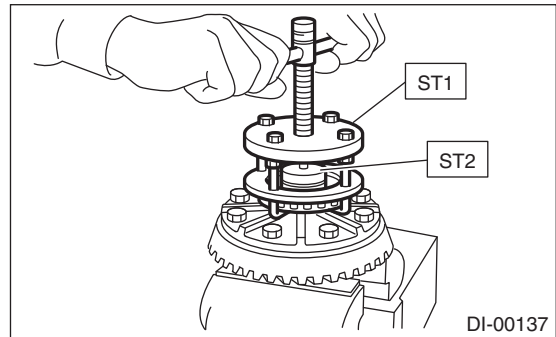
10) Extract the bearing cone with ST1 and ST2.

NOTE:

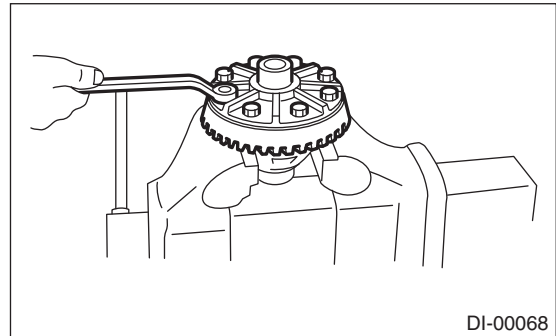
- Do not attempt to disassemble the parts unless necessary.
- Set the puller so that its claws catch the edge of the bearing cone.

- Store so that the right and left side bearing races and cones are not mixed together.

ST1 899524100 PULLER SET
ST2 399520105 SEAT

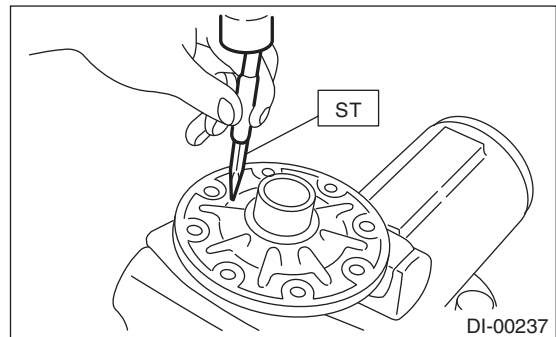


11) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



12) Remove the spring pin from hypoid driven gear side using ST.

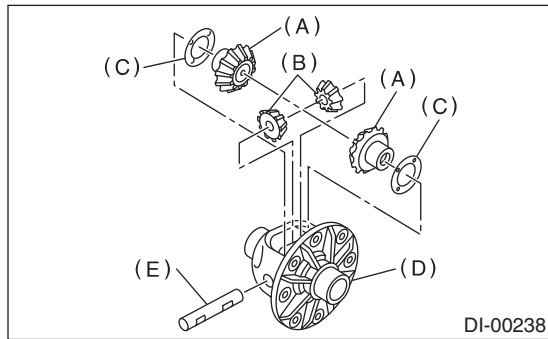
ST 899904100 STRAIGHT PIN REMOVER



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

NOTE:

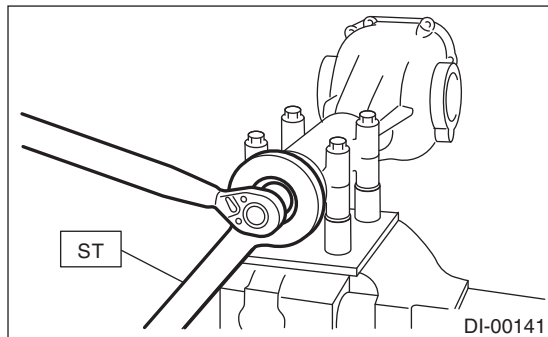
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



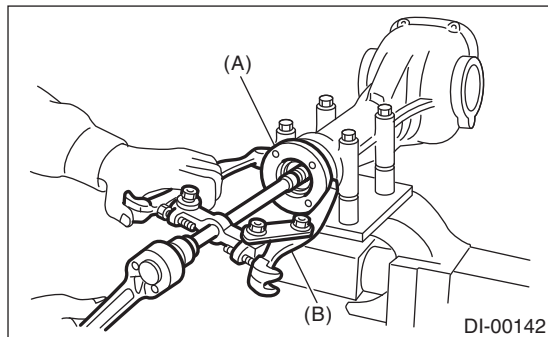
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

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

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.



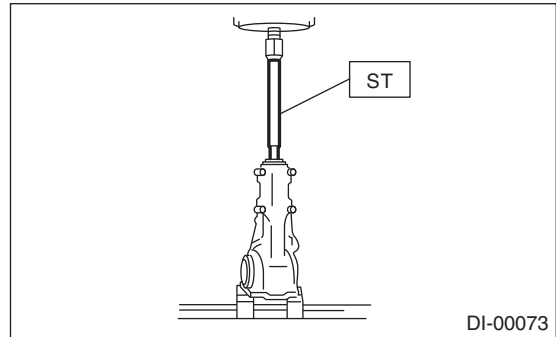
- (A) Companion flange
- (B) Puller

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

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

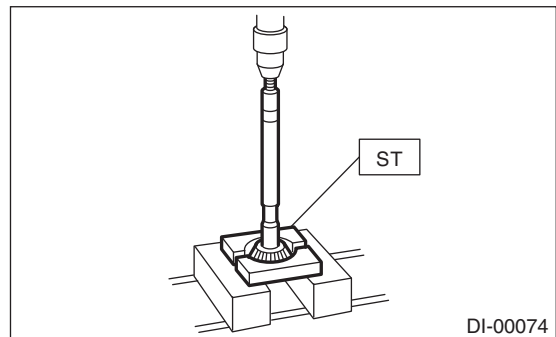


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

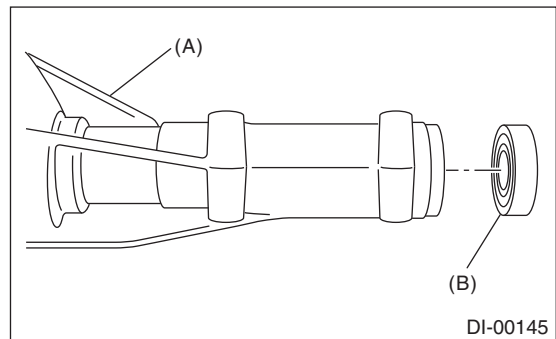
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



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

ST 398527700 PULLER ASSY



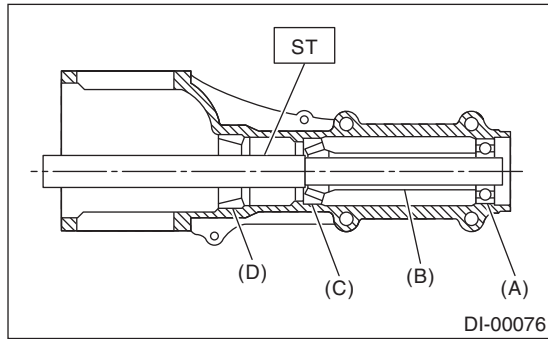
- (A) Differential carrier
- (B) Front oil seal

Rear Differential (VA-type)

DIFFERENTIALS

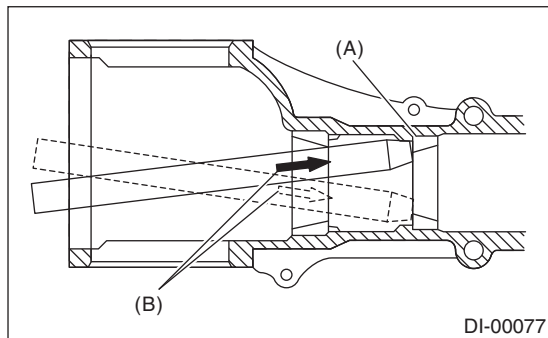
19) Remove the pilot bearing together with the front bearing cone and spacer using the ST.

ST 398467700 DRIFT



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

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



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

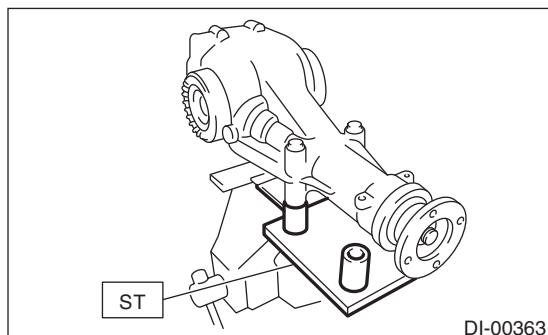
2. VA2-TYPE

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

- Tooth contact and backlash between hypoid driven gear and drive pinion
- Total preload of drive pinion

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

ST 398217700 ATTACHMENT SET

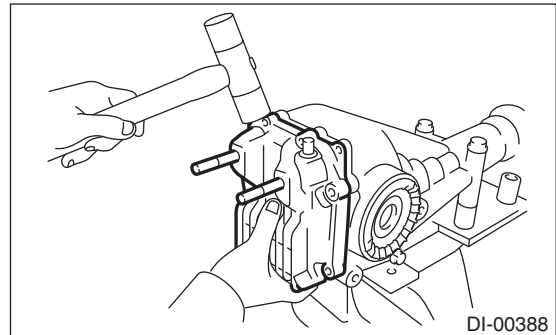


2) Remove the oil drain plug and oil filler plug.

3) Remove the rear cover by removing retaining bolts.

NOTE:

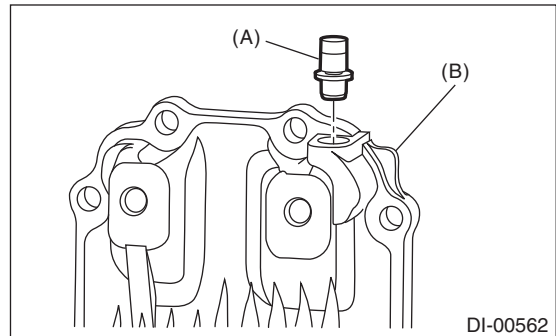
Remove it by tapping with a plastic hammer.



4) Remove the air breather cap.

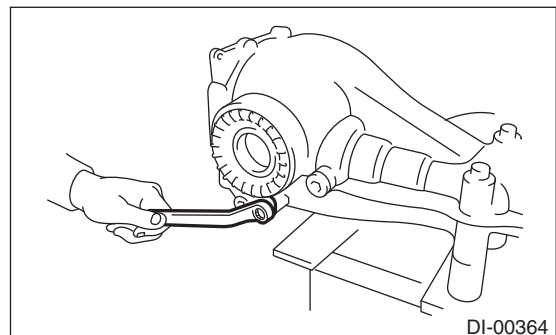
NOTE:

- 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

5) Remove the lock plate RH and LH.

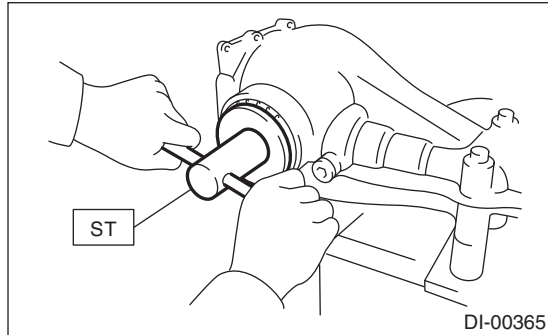


6) Remove the side retainer RH and LH with ST.

NOTE:

When keeping the retainers aside, use labels etc. to avoid confusing the left and right.

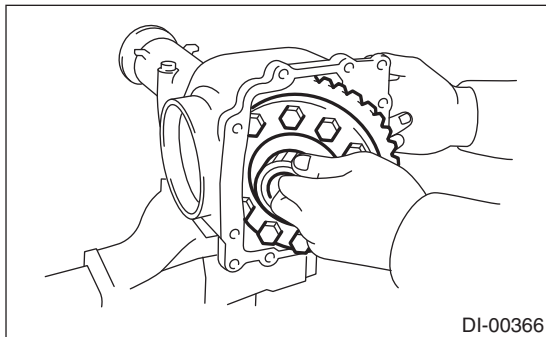
ST 18630AA010 WRENCH COMPL RETAINER



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

NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.



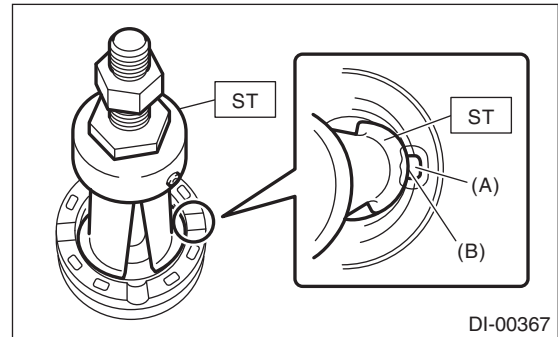
8) Remove the bearing race from side retainer RH and LH with ST and the press.

NOTE:

- Be sure to turn the bolt of the ST by hand.

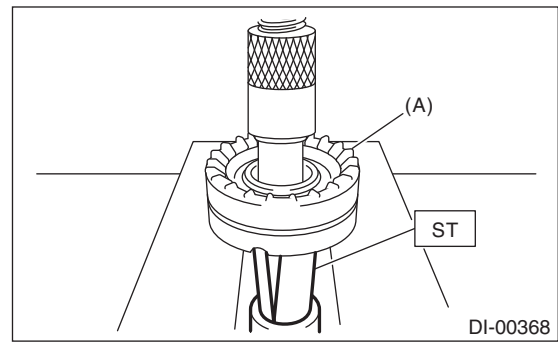
- Set the puller so that its claws catch the groove of side retainer.

ST 18758AA000 PULLER



(A) Groove

(B) Claw

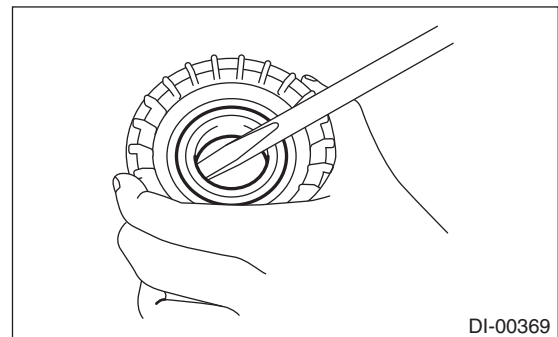


(A) Side retainer

9) Remove the oil seal from side retainer RH and LH using a screwdriver.

NOTE:

Perform this operation only when changing oil seal.



10) Extract the bearing cone with ST1, ST2 and ST3.

NOTE:

- Do not attempt to disassemble the parts unless necessary.

Rear Differential (VA-type)

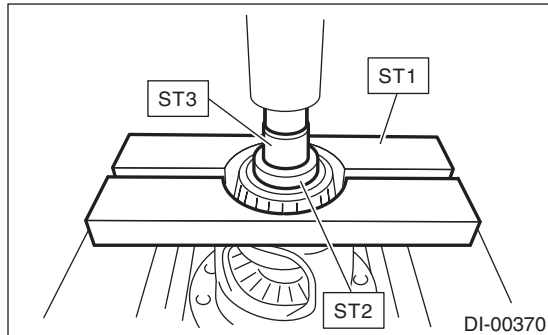
DIFFERENTIALS

- Never mix up the RH and LH bearing races and cones.

ST1 498077000 REMOVER

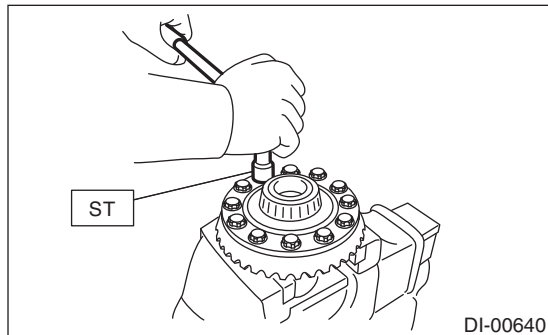
ST2 399520105 SEAT

ST3 899864100 REMOVER



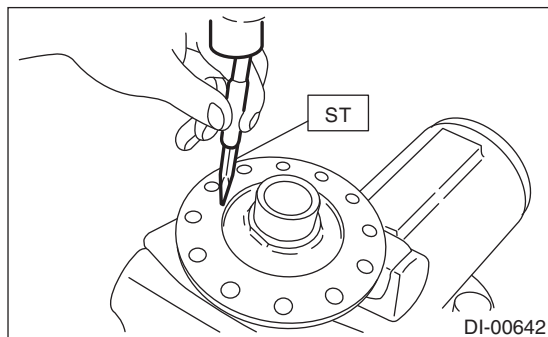
- 11) Using the ST, loosen the hypoid driven gear bolt and remove the hypoid driven gear.

ST 18270KA020 SOCKET (E20)



- 12) Remove the spring pin from hypoid driven gear side using ST.

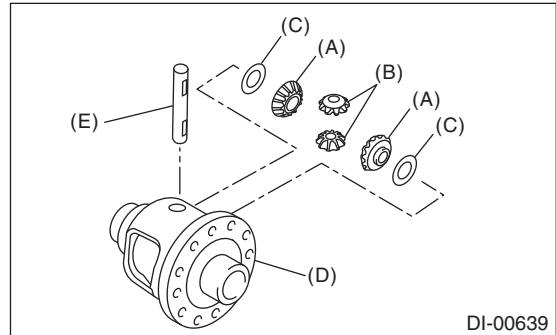
ST 899904100 STRAIGHT PIN REMOVER



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

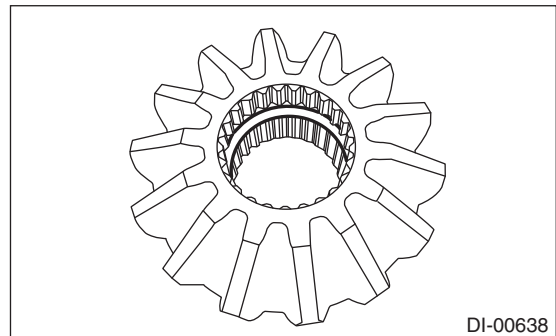
NOTE:

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



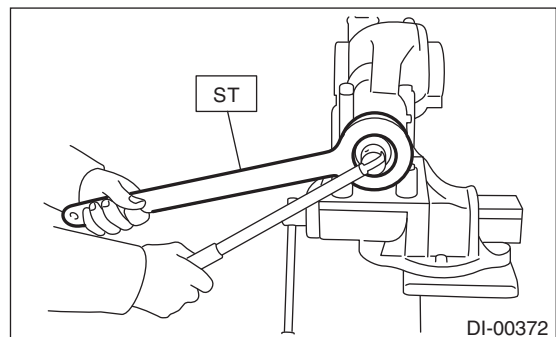
- (A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

- 14) Remove the circlip from the side gear.

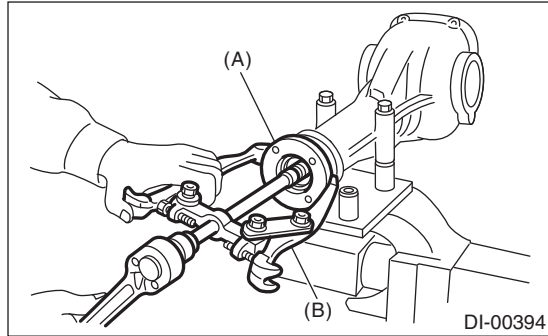


- 15) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH



16) Extract the companion flange using a puller.



- (A) Companion flange
(B) Puller

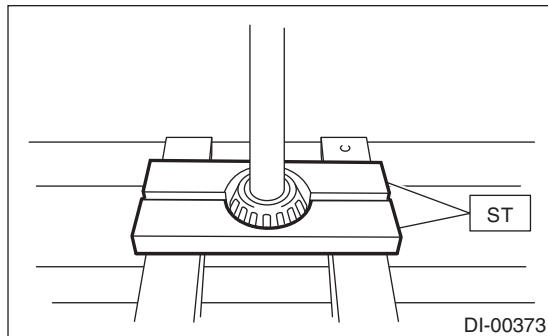
17) Removes the drive pinion shaft.

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

NOTE:

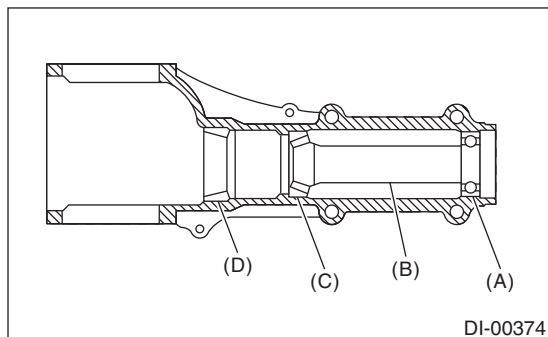
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



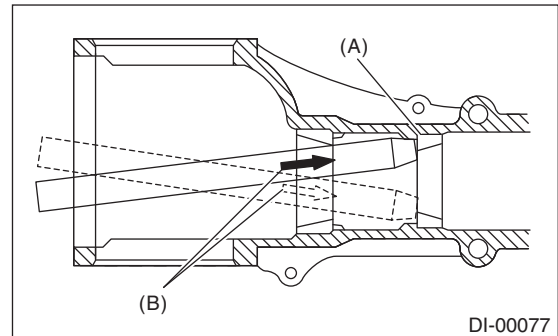
19) Remove the front oil seal from differential carrier using screwdriver.

20) Remove the pilot bearing, front bearing cone and spacer.



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

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



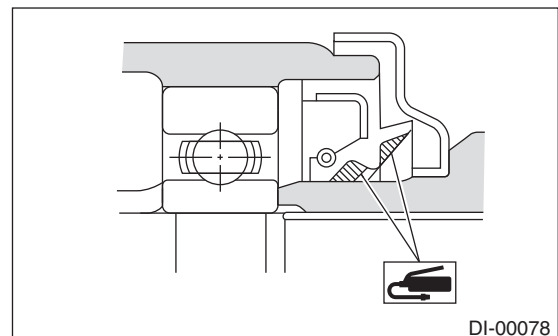
- (A) 2 cutout portions along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

1. VA1-TYPE

NOTE:

- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use new gaskets and O-rings.
- 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.
- Replace the oil seals and O-rings with new parts at every disassembly.
- Apply differential gear oil to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings

NOTE:

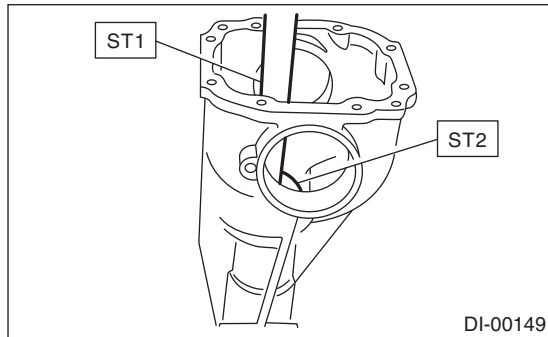
Adjust the bearing preload between front and rear bearings with spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

Rear Differential (VA-type)

DIFFERENTIALS

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

ST1 398477701 HANDLE
ST2 398477702 DRIFT



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

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Insert the front bearing cone.

NOTE:

Use new front bearing cone.

(4) Measure and record the thickness of the pinion height adjusting washer.

NOTE:

If tooth contact (drive pinion and hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then reuse the used washer.

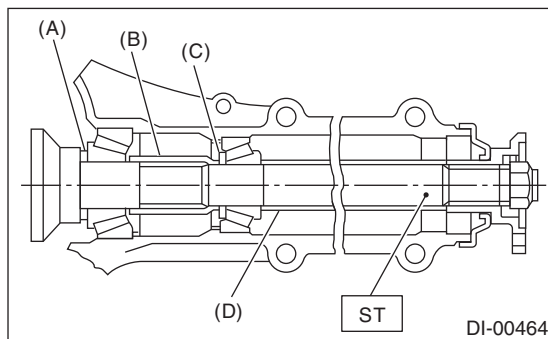
(5) Insert ST1 into the case with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

Use new rear bearing cone.

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

ST 498447150 DUMMY SHAFT
ST 32285AA000 SPACER



- (A) Pinion height adjusting washer
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Spacer (SUBARU genuine parts)

(7) Turn the ST 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.

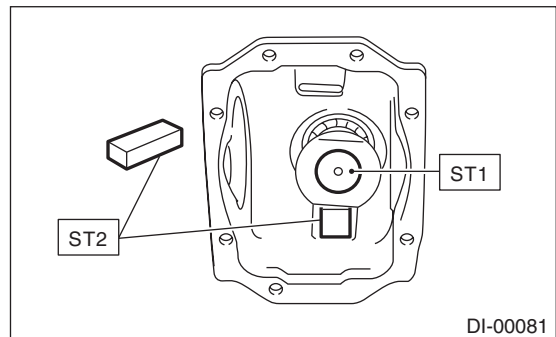
NOTE:

- 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 498447150 DUMMY SHAFT
ST2 398507704 BLOCK

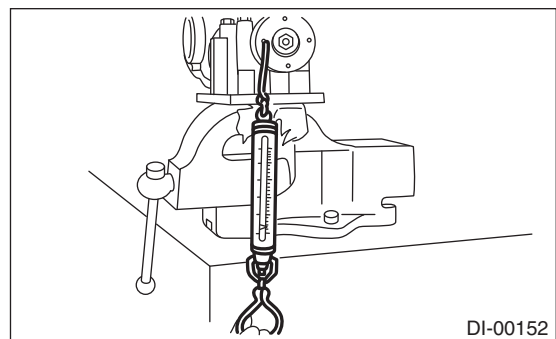
Tightening torque:

191 N·m (19.5 kgf-m, 140.9 ft-lb)



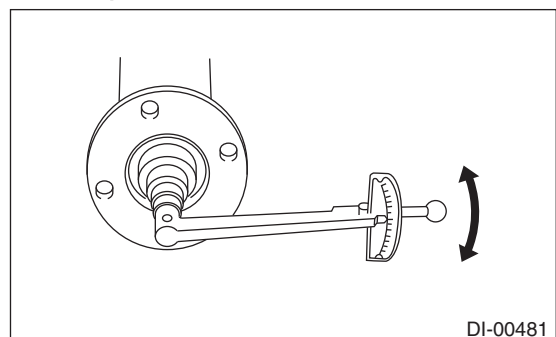
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lbf)



Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



Preload adjusting washer	
Part number	Thickness mm (in)
38336AA000	1.500 (0.0591)
38336AA120	1.513 (0.0596)
38336AA010	1.525 (0.0600)
38336AA130	1.538 (0.0606)
38336AA020	1.550 (0.0610)
38336AA140	1.563 (0.0615)
38336AA030	1.575 (0.0620)
38336AA150	1.588 (0.0625)
38336AA040	1.600 (0.0630)
38336AA160	1.613 (0.0635)
38336AA050	1.625 (0.0640)
38336AA170	1.638 (0.0645)
38336AA060	1.650 (0.0650)
38336AA180	1.663 (0.0655)
38336AA070	1.675 (0.0659)
38336AA190	1.688 (0.0665)
38336AA080	1.700 (0.0669)
38336AA200	1.713 (0.0674)
38336AA090	1.725 (0.0679)
38336AA210	1.738 (0.0684)
38336AA100	1.750 (0.0689)
38336AA220	1.763 (0.0694)
38336AA110	1.775 (0.0699)

Preload adjusting spacer	
Part number	Length mm (in)
32288AA040	52.3 (2.059)
32288AA050	52.5 (2.067)
31454AA100	52.6 (2.071)
32288AA060	52.7 (2.075)
31454AA110	52.8 (2.079)
32288AA070	52.9 (2.083)
31454AA120	53.0 (2.087)
32288AA080	53.1 (2.091)
32288AA090	53.3 (2.098)

2) Adjusting drive pinion height:

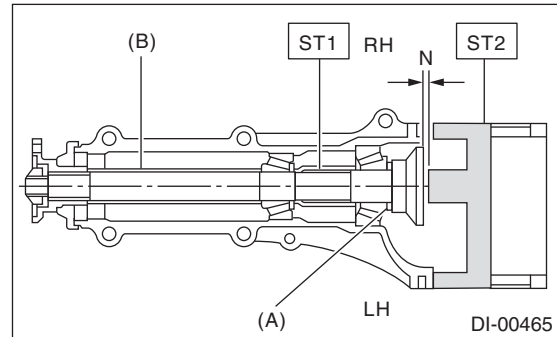
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

(1) Attach the ST2.

NOTE:

At this time, install a pinion height adjusting washer, temporarily selected, or the same as that used before.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE
ST 32285AA000 SPACER



N Measured value

(A) Pinion height adjusting washer

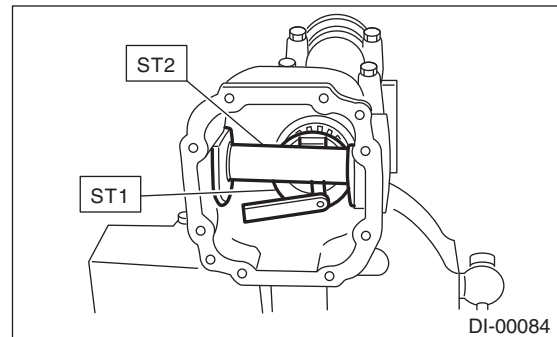
(B) Spacer (SUBARU genuine parts)

(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 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



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

Rear Differential (VA-type)

DIFFERENTIALS

NOTE:

Adjust it using the 1 — 3 washers.

$$T = T_o + N - 0.05 \text{ mm (0.0020 in)}$$

T	Thickness of pinion height adjusting washer mm (in)	
T _o	Thickness of washer temporarily inserted mm (in)	
N	Clearance measured by thickness gauge mm (in)	
Memo:		

(Example of calculation)

$$T_o = 0.15 \text{ mm (0.0059 in)}$$

$$N = 0.1 \text{ mm (0.0039 in)}$$

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm (0.0079 in)}$$

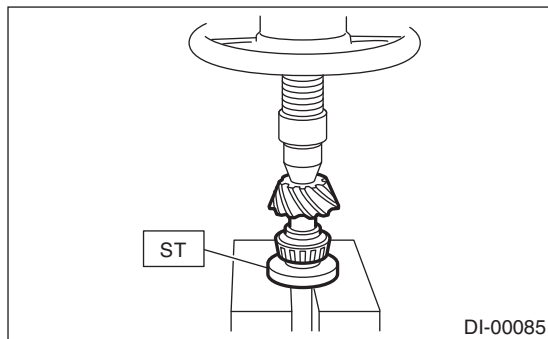
$$\text{Thickness} = 0.2 \text{ mm (0.0079 in)}$$

Therefore use part number 32295AA220.

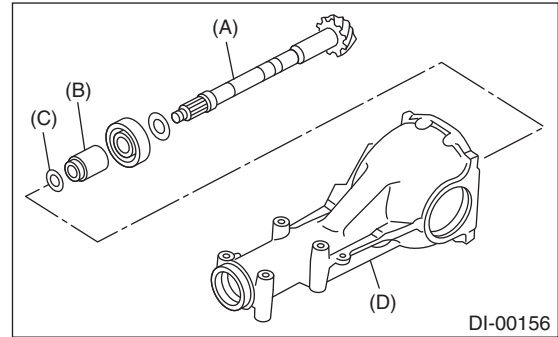
Pinion height adjusting washer	
Part number	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

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

ST 498175500 INSTALLER



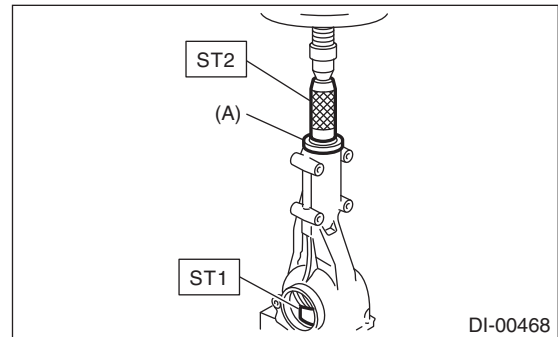
4) Insert the drive pinion into the differential carrier, and install the preselected preload adjusting spacer and washer.



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

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

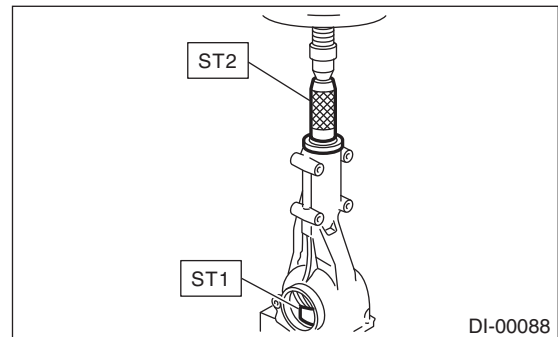
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
ST 32285AA000 SPACER



- (A) Spacer (SUBARU genuine parts)

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

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER

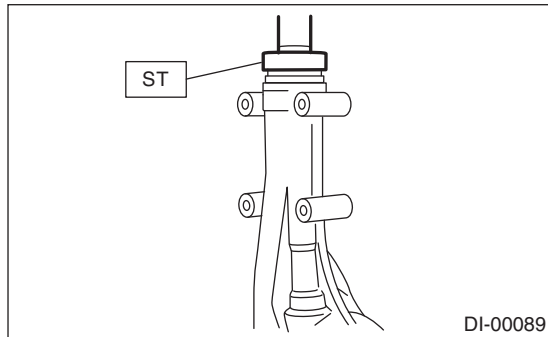


7) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.

- 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



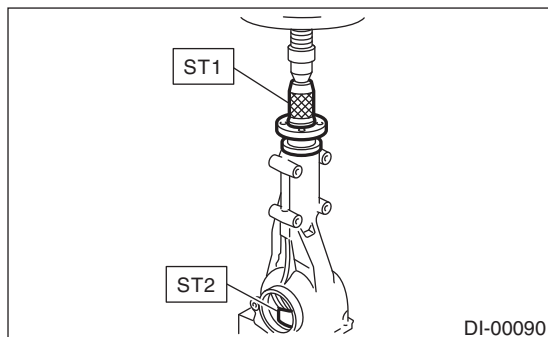
8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT



9) Attach the self-locking nut and use the ST to fix the companion flange in place, then tighten the self-locking nut.

NOTE:

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

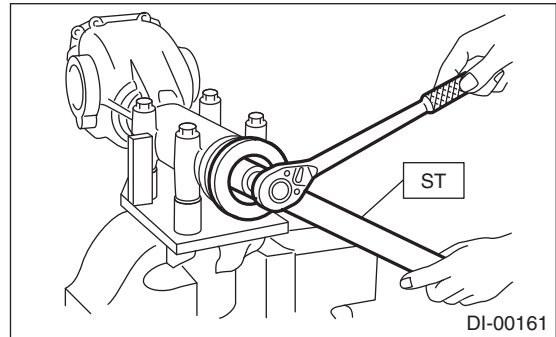
SEAL MATERIAL:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

191 N·m (19.5 kgf-m, 140.9 ft-lb)

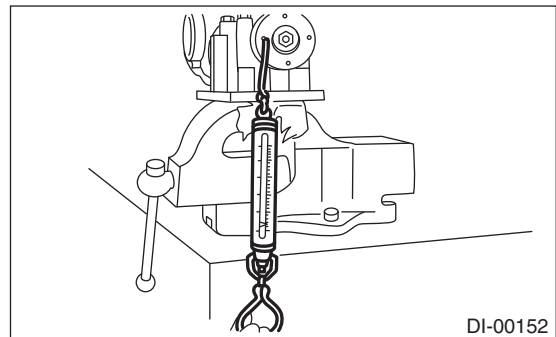
ST 498427200 FLANGE WRENCH



10) Check the initial torque or initial load.

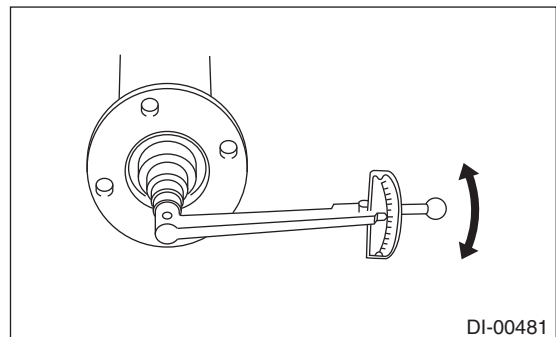
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



11) Assembling differential case

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

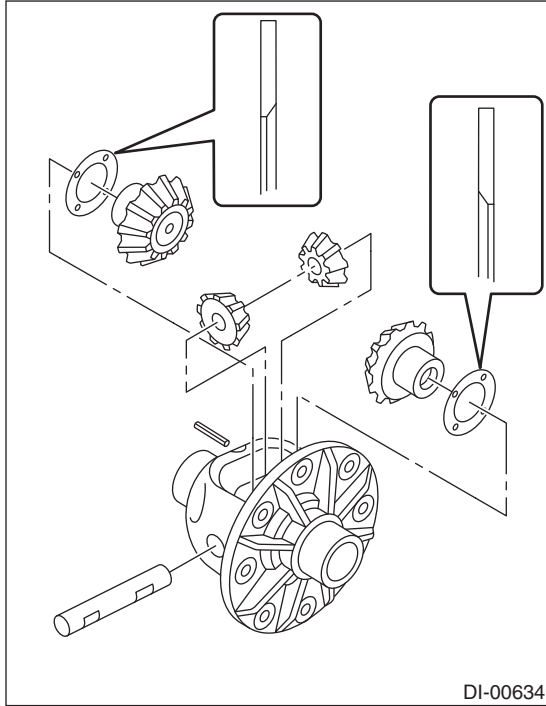
NOTE:

- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Install the pinion mate shaft to the differential case by aligning the spring pin holes.

Rear Differential (VA-type)

DIFFERENTIALS

- The thrust washer inner surface has a chamfered side. Install the washer with the chamfered side facing toward the side gear.

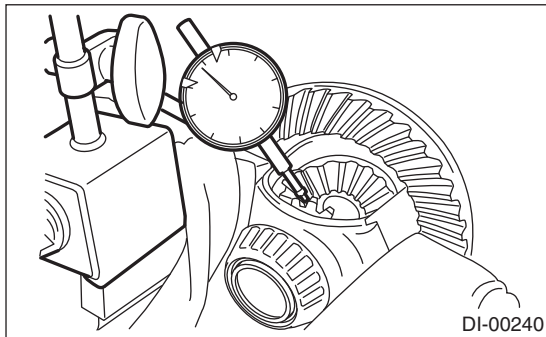


DI-00634

(2) Measure the side gear backlash.

Side gear backlash:

0.05 — 0.15 mm (0.002 — 0.006 in)



DI-00240

(3) Adjust the side gear backlash by selecting side gear thrust washer.

Side gear thrust washer	
Part number	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

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

(5) Attach the spring pin to the differential case.

NOTE:

Use new spring pin.

12) Install the hypoid driven gear to differential case.

NOTE:

- Before installing bolts, apply a sealing material to bolt threads.

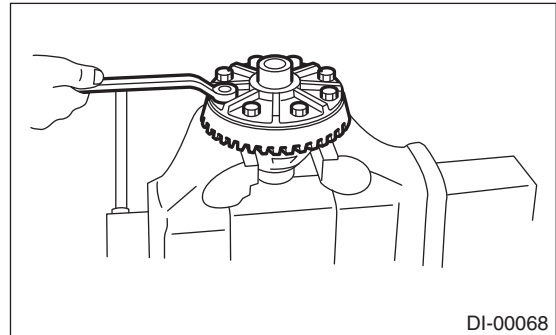
SEAL MATERIAL:

THREE BOND 1324 (Part No. 004403042) or equivalent

- Tighten diagonally.

Tightening torque:

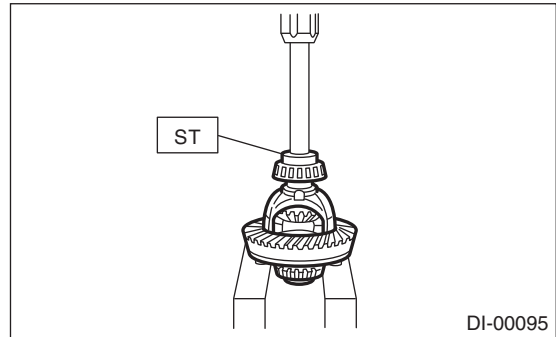
62 N·m (6.3 kgf-m, 45.7 ft-lb)



DI-00068

13) Using the ST, press-fit the side bearing to the differential case.

ST 498485400 DRIFT

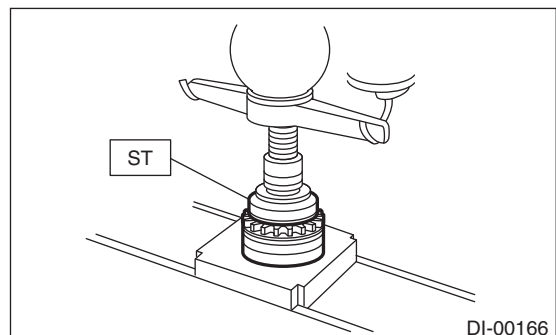


DI-00095

14) Assemble the side retainer.

(1) Install the oil seal into side retainer RH and LH.

ST 498447100 INSTALLER



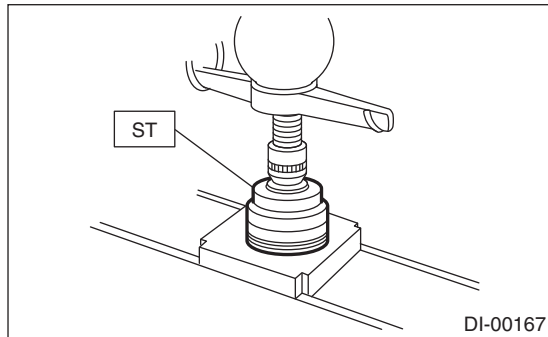
DI-00166

(2) Install the bearing race into side retainer RH and LH.

CAUTION:

Make sure that the RH and LH oil seals, bearing outer races and cones are properly assembled.

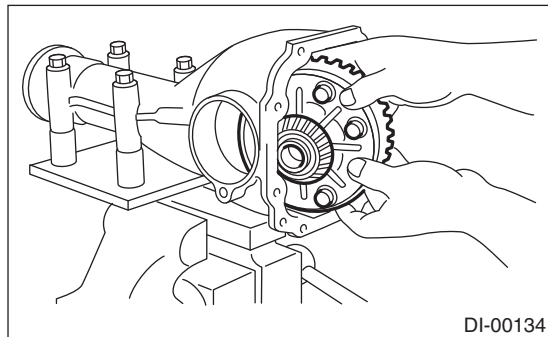
ST 398477702 DRIFT



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

NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.

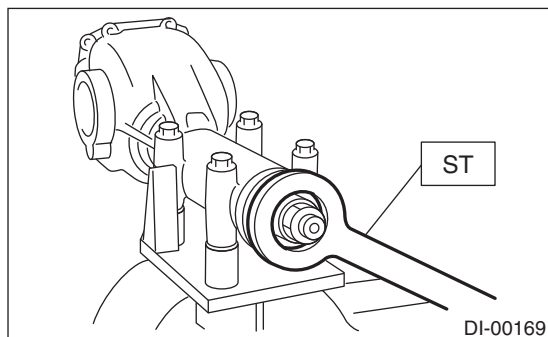


(4) Temporarily tighten the side retainers RH and LH in differential carrier to install.

15) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.

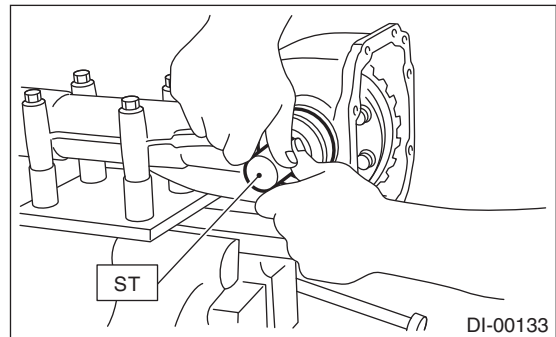
(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Using the ST, tighten side retainer RH, and then tighten side retainer LH until there is no backlash.

ST 18630AA010 WRENCH COMPL RETAINER

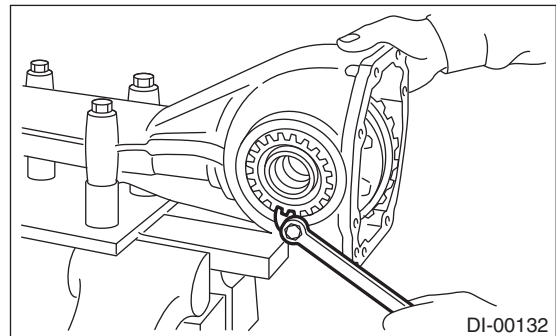


(3) Back off the side retainer LH by approx. 1.5 teeth, and tighten the side retainer RH by approx. 2 teeth (amount that the side retainer LH is turned back $(1.5) + 1/2$ teeth). Difference between [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth)] and [amount that the side retainer RH is tightened (approx. 2 teeth)] gives preload.

(4) Temporarily tighten the lock plate.

NOTE:

Turn over the lock plate to shift the holder by 1/2 tooth.



(5) 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.

NOTE:

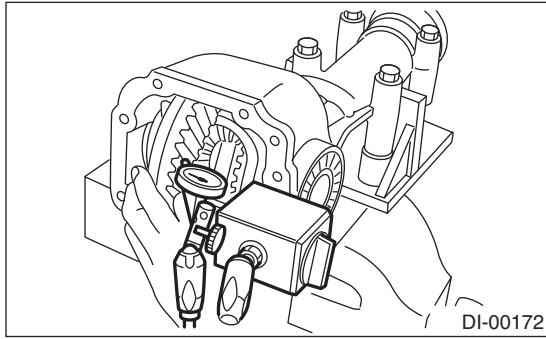
If measured value of backlash is not within the specified range, repeat the procedures for pinion driven gear set backlash adjustment and the differential side bearing preload adjustment.

Rear Differential (VA-type)

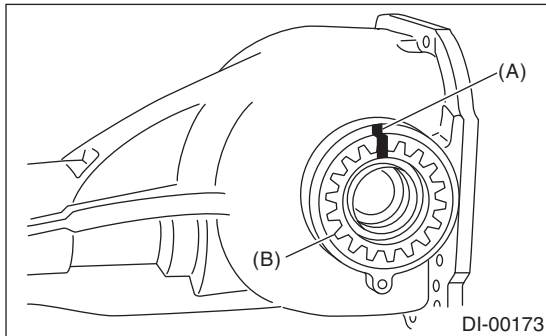
DIFFERENTIALS

Backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)



16) Put alignment marks on both the differential carrier and side retainer. Install O-rings to the side retainers one by one and restore the side retainers to the original positions.

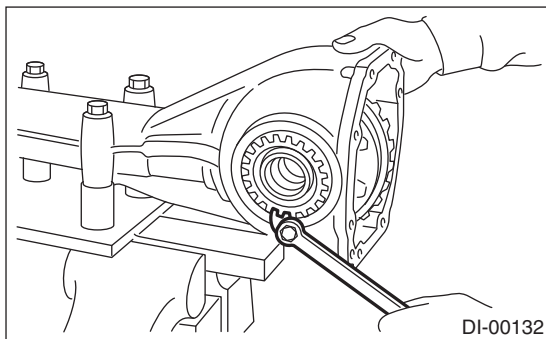


- (A) Alignment mark
(B) Side retainer

17) Install the lock plate.

Tightening torque:

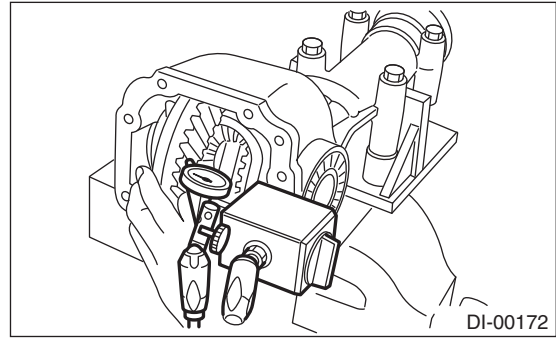
25 N·m (2.5 kgf-m, 18.4 ft-lb)



18) Recheck the hypoid driven gear to pinion backlash.

Backlash:

0.10 — 0.15 mm (0.004 — 0.006 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.

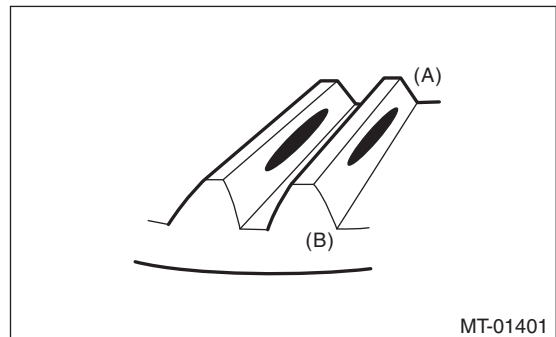
(2) When the contact pattern is not correct, re-adjust.

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.)

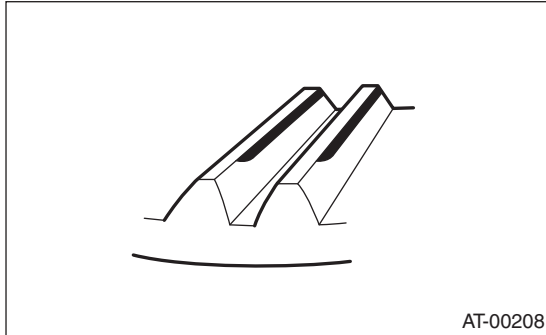


- (A) Toe side
(B) Heel side

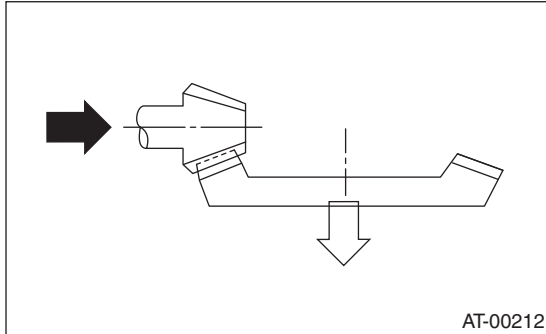
- Face contact

Check item: Backlash is too large.

Contact pattern



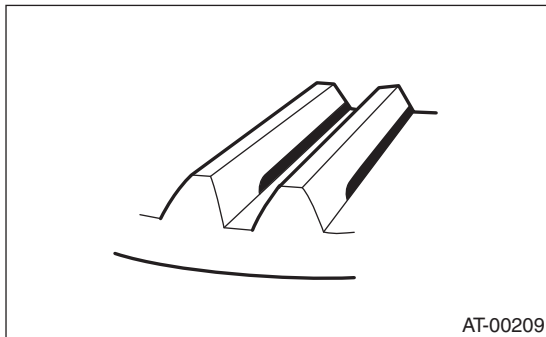
Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



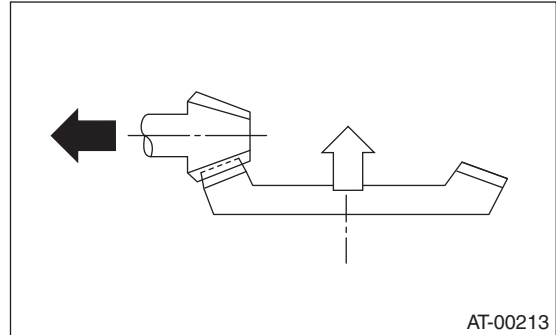
- Flank contact

Check item: Backlash is too small.

Contact pattern



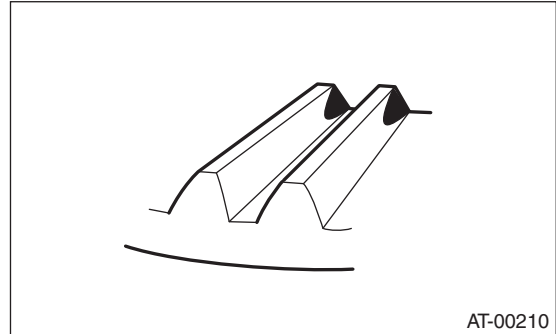
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



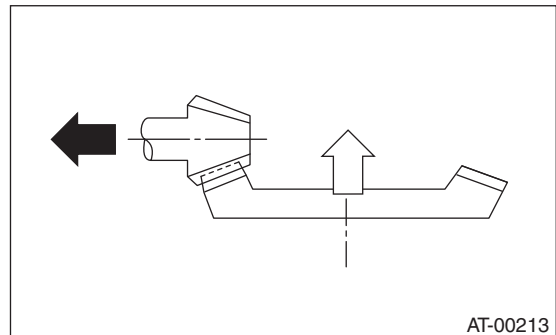
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



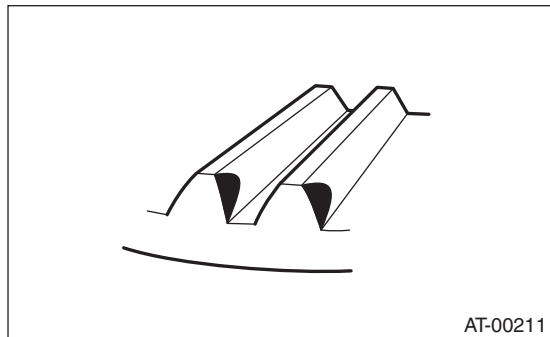
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear side.



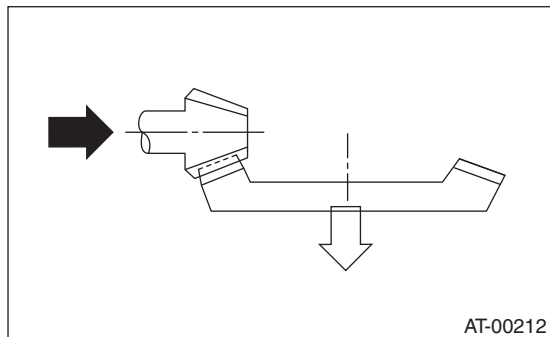
Rear Differential (VA-type)

DIFFERENTIALS

- Heel contact (outside end contact)
- Check item: Teeth contact area is too small.**
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.

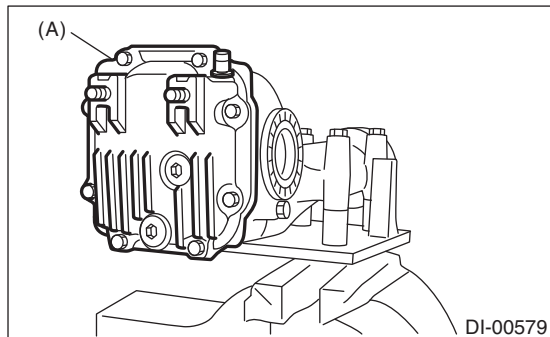


20) If correct tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

21) Install the gasket and the rear cover to the differential carrier.

NOTE:
Use a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

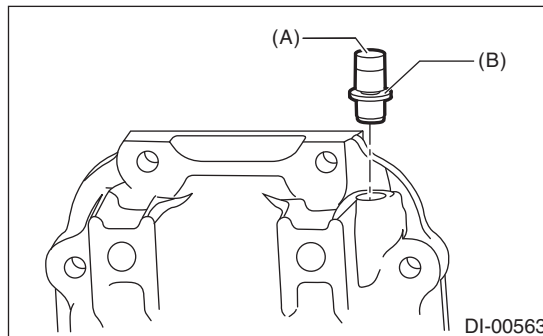


(A) Rear cover

22) Install the air breather cap.

NOTE:

Do not tap section (A) of the air breather cap. Be sure to tap section (B) to install.



23) Install the oil drain plug.

NOTE:
Use a new gasket.

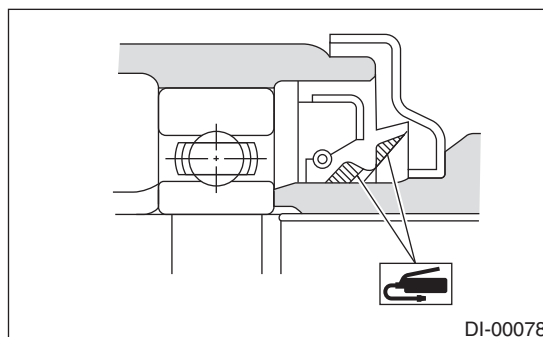
Tightening torque:
50 N·m (5.1 kg-m, 36.9 ft-lb)

24) Install the oil filler plug.

2. VA2-TYPE

NOTE:

- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use new gaskets and O-rings.
- 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.
- Attach tags not to mix up the RH and LH bearing races.
- Replace the oil seals and O-rings with new parts at every disassembly.
- Apply differential gear oil to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH to be installed.



1) Adjusting preload for front and rear bearings

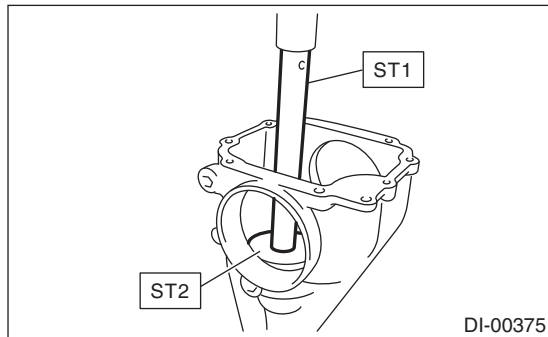
NOTE:

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.

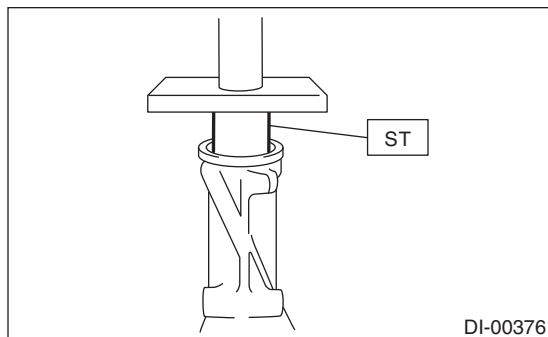
ST1 398477701 HANDLE

ST2 398477703 DRIFT 2



(2) Using the ST, press-fit the front bearing race to the differential carrier.

ST 499277200 INSTALLER



(3) Insert the front bearing cone.

NOTE:

Use new front bearing cone.

(4) Measure and record the thickness of pinion height adjusting washer.

NOTE:

If tooth contact (drive pinion and hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then reuse the used washer.

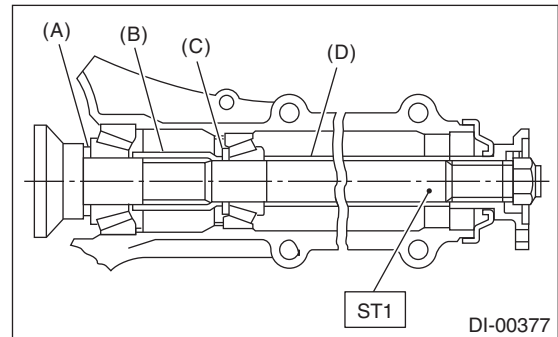
(5) Insert the ST1 into carrier with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

Use new rear bearing cone.

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

ST1 18678AA000 DUMMY SHAFT



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

(7) 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:

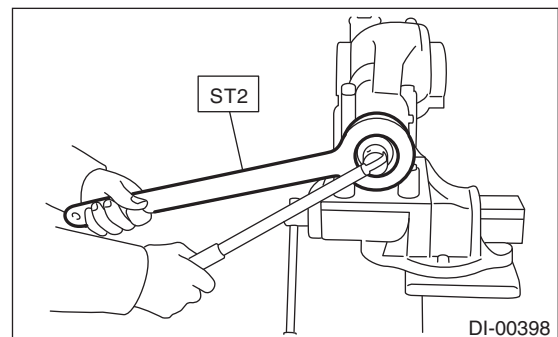
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock companion flange with ST2 as shown in the figure.
- Measure the preload in direction of tangent to the flange.

ST1 18678AA000 DUMMY SHAFT

ST2 498427200 FLANGE WRENCH

Tightening torque:

191 N·m (19.5 kgf-m, 140.9 ft-lb)

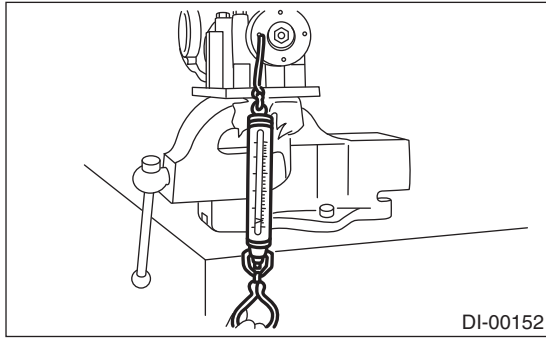


Rear Differential (VA-type)

DIFFERENTIALS

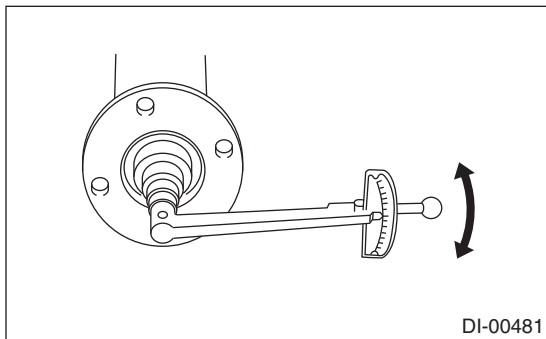
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



Preload adjusting washer

Part number	Thickness mm (in)
38336AA430	1.500 (0.0591)
38336AA440	1.513 (0.0596)
38336AA450	1.525 (0.0600)
38336AA460	1.538 (0.0606)
38336AA470	1.550 (0.0610)
38336AA480	1.563 (0.0615)
38336AA490	1.575 (0.0620)
38336AA500	1.588 (0.0625)
38336AA510	1.600 (0.0630)
38336AA520	1.613 (0.0635)
38336AA530	1.625 (0.0640)
38336AA540	1.638 (0.0645)
38336AA550	1.650 (0.0650)
38336AA560	1.663 (0.0655)
38336AA570	1.675 (0.0659)
38336AA580	1.688 (0.0665)
38336AA590	1.700 (0.0669)
38336AA600	1.713 (0.0674)
38336AA610	1.725 (0.0679)
38336AA620	1.738 (0.0684)
38336AA630	1.750 (0.0689)
38336AA640	1.763 (0.0694)
38336AA650	1.775 (0.0699)

Preload adjusting spacer

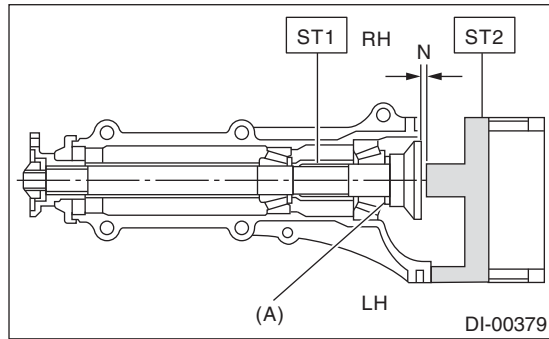
Part number	Length mm (in)
31454AA250	51.05 (2.010)
31454AA260	51.25 (2.018)
31454AA270	51.35 (2.022)
31454AA280	51.45 (2.026)
31454AA290	51.55 (2.030)
31454AA300	51.65 (2.033)
31454AA310	51.75 (2.037)
31454AA320	51.85 (2.041)
31454AA330	52.05 (2.049)

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.

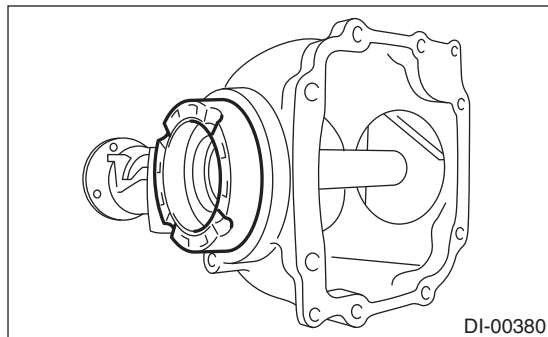
ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



N Measured value

(A) Pinion height adjusting washer

(2) Install the side retainer LH to the left side of the differential carrier in reverse direction.

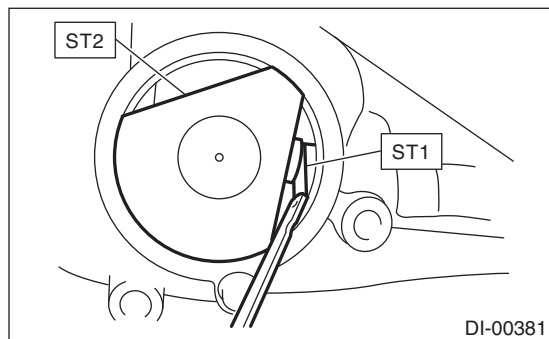


(3) Measure the clearance "N" between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

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

ST1 18678AA000 DUMMY SHAFT
ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



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

NOTE:

Adjust it using the 1 — 3 washers.

$$T = T_o + N - 0.05 \text{ mm (0.0020 in)}$$

T	Thickness of pinion height adjusting washer mm (in)	
T _o	Thickness of washer temporarily inserted mm (in)	
N	Clearance measured by thickness gauge mm (in)	
Memo:		

(Example of calculation)

$$T_o = 0.15 \text{ mm (0.0059 in)}$$

$$N = 0.1 \text{ mm (0.0039 in)}$$

$$T = 0.15 \text{ mm (0.0059 in)} + 0.1 \text{ mm (0.0039 in)} - 0.05 \text{ mm (0.0020 in)} = 0.2 \text{ mm (0.0079 in)}$$

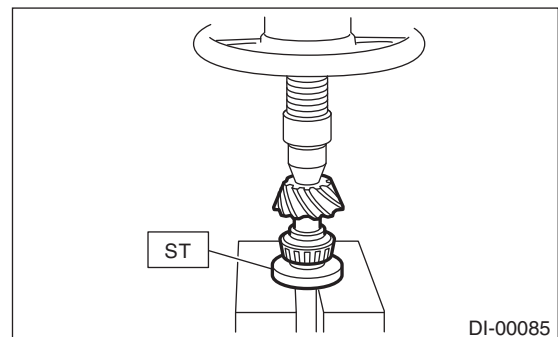
$$\text{Thickness} = 0.2 \text{ mm (0.0079 in)}$$

Therefore use part number 32295AA370.

Pinion height adjusting washer	
Part number	Thickness mm (in)
32295AA350	0.150 (0.0059)
32295AA360	0.175 (0.0069)
32295AA370	0.200 (0.0079)
32295AA380	0.225 (0.0089)
32295AA390	0.250 (0.0098)
32295AA400	0.275 (0.0108)

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

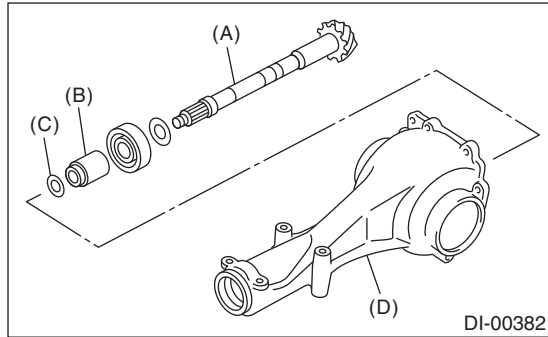
ST 398177700 INSTALLER



Rear Differential (VA-type)

DIFFERENTIALS

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

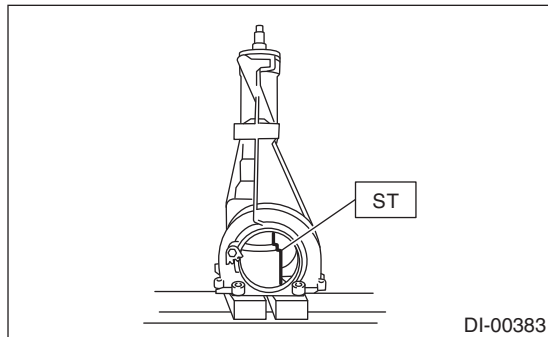


- (A) Drive pinion
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Differential carrier

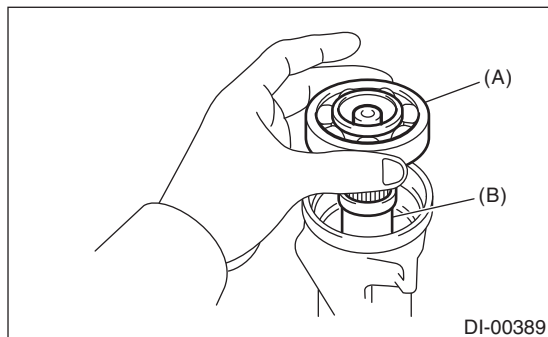
5) Set ST and differential carrier to the press and install the front bearing cone.
ST 399780104 WEIGHT

NOTE:

Set the carrier to the press until the companion flange is installed.



6) Insert the spacer, then install the pilot bearing.



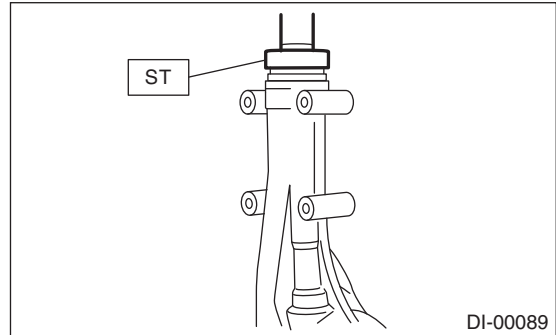
- (A) Pilot bearing
- (B) SPACER

7) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.

- 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 499277200 INSTALLER

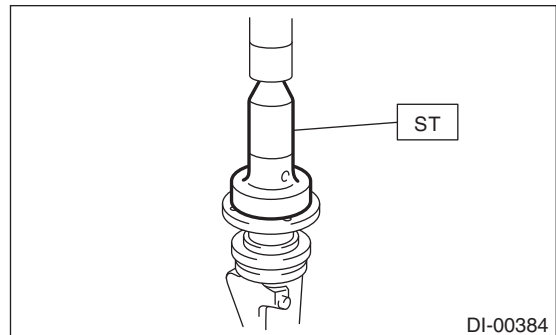


8) Press-fit the companion flange with ST.

NOTE:

Be careful not to damage the bearing.

ST 899874100 INSTALLER



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

SEAL MATERIAL:

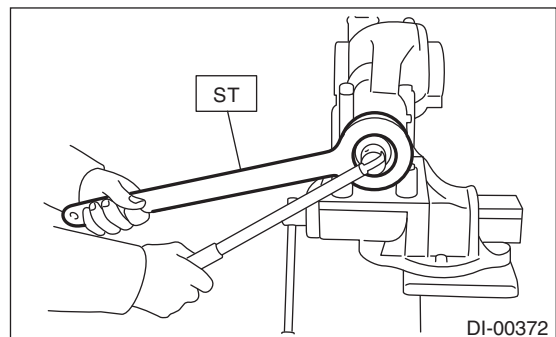
THREE BOND 1324 (Part No. 004403042) or equivalent

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

Tightening torque:

191 N·m (19.5 kgf-m, 140.9 ft-lb)

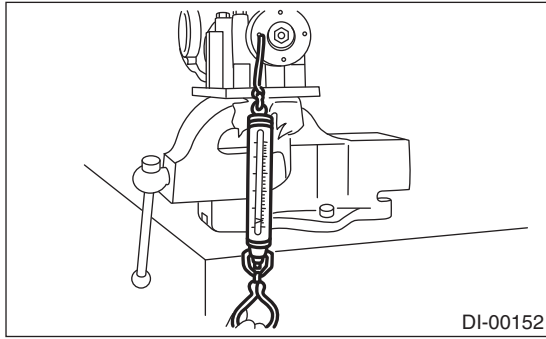
ST 498427200 FLANGE WRENCH



11) Measure the initial torque and initial load.

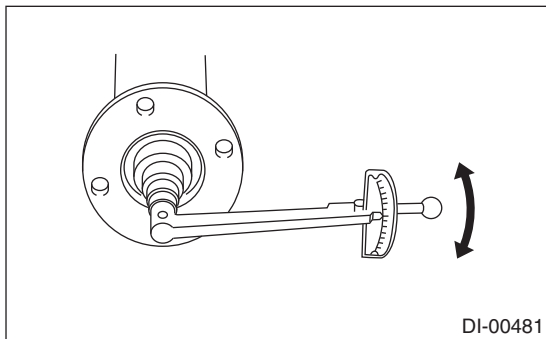
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lb)



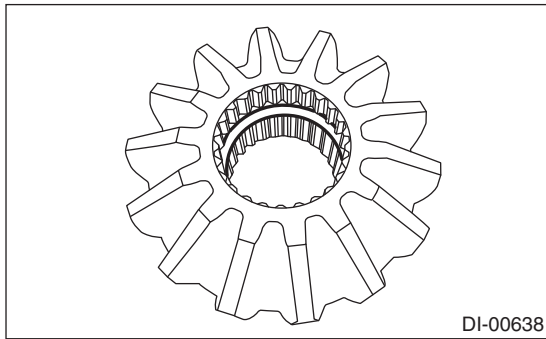
Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



12) Assembling differential case

(1) Attach the circlip to the side gear.

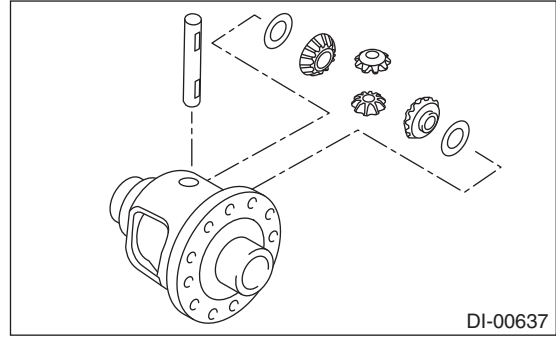


(2) Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into the differential case.

NOTE:

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

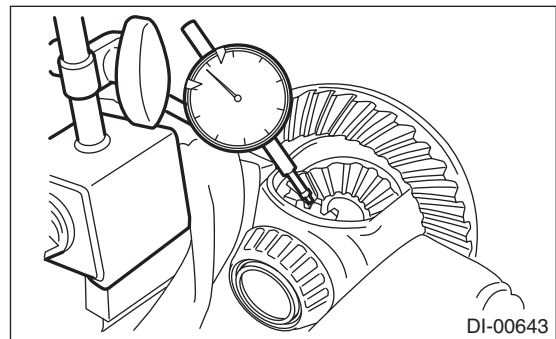
- Install the pinion mate shaft to the differential case by aligning the spring pin holes.



(3) Measure the side gear backlash.

Side gear backlash:

0.13 — 0.18 mm (0.005 — 0.007 in)



(4) Adjust the side gear backlash by selecting side gear thrust washer.

Side gear thrust washer	
Part number	Thickness mm (in)
803038021	0.950 (0.0374)
803038022	1.000 (0.0394)
803038023	1.050 (0.0413)

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

(6) Attach the spring pin to the differential case.

NOTE:

Use new spring pin.

13) Install the hypoid driven gear to differential case.

NOTE:

- Set a cushioning such as wooden block, aluminum plate or shop cloth between vise and differential case if the side gear comes into contact with vise.
- Before installing bolts, apply a sealing material to bolt threads.

SEAL MATERIAL:

THREE BOND 1324 (Part No. 004403042) or equivalent

- Tighten diagonally.

Rear Differential (VA-type)

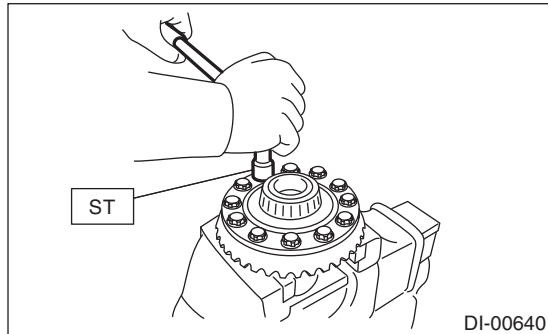
DIFFERENTIALS

- (1) Tighten the hypoid driven gear mounting bolts to the specified torque using the ST.

ST 18270KA020 SOCKET (E20)

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)

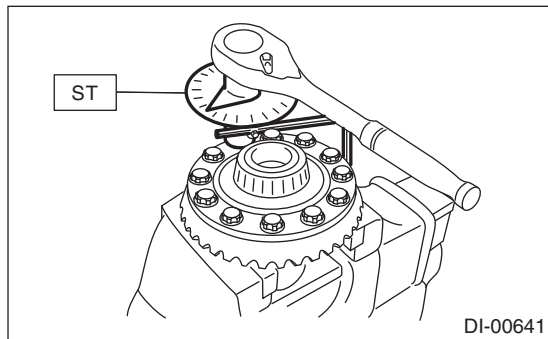


- (2) While checking the tightening angle with the ST, further tighten the hypoid driven gear mounting bolts.

Tightening angle:

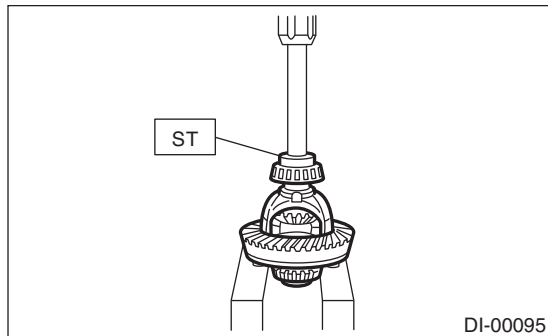
$33^{\circ} \pm 2^{\circ}$

ST 18554AA000 ANGLE GAUGE



- 14) Using the ST, press-fit the side bearing to the differential case.

ST 398487700 DRIFT



- 15) Assemble the side retainer.

- (1) Install the oil seal into side retainer RH and LH.

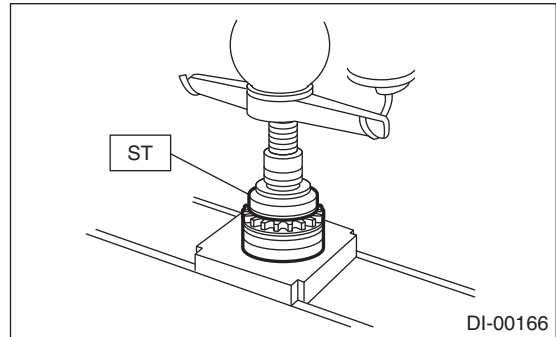
CAUTION:

Make sure that the oil seals and side retainers are properly assembled.

NOTE:

Use a new oil seal.

ST 498447100 INSTALLER

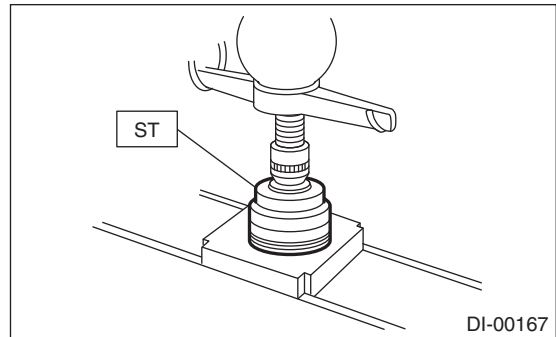


- (2) Install the bearing race into side retainer RH and LH.

CAUTION:

Make sure that the bearing outer races and cones are properly assembled.

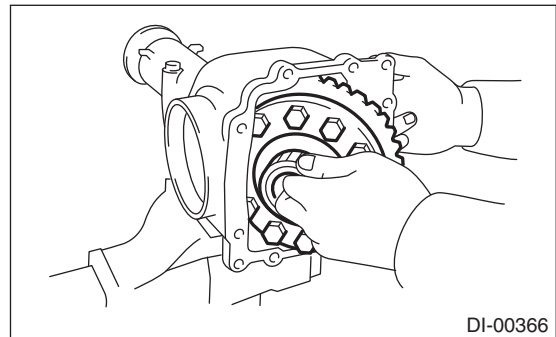
ST 398417700 DRIFT



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

NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.

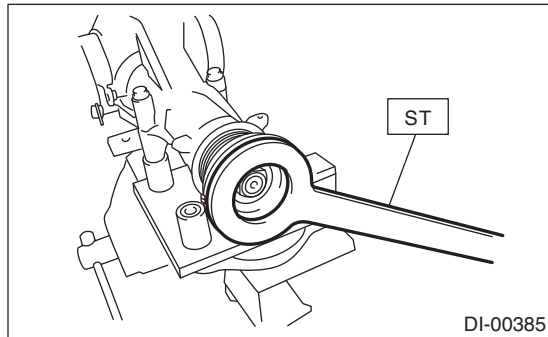


- (4) Temporally tighten the side retainers RH and LH in differential carrier to install.

- 16) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.

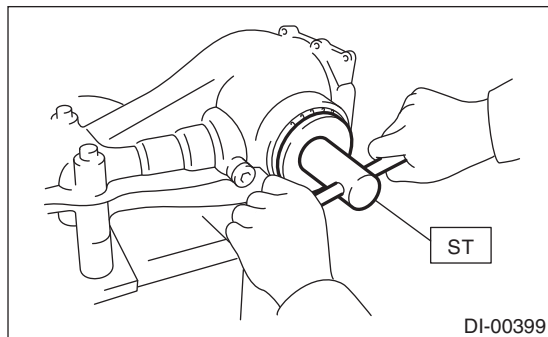
- (1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



- (2) Using the ST, tighten side retainer RH, and then tighten side retainer LH until there is no backlash.

ST 18630AA010 WRENCH COMPL RETAINER



- (3) Back off the side retainer LH by approx. 1.5 teeth, and tighten the side retainer RH by approx. 2 teeth (amount that the side retainer LH is turned back $(1.5) + 1/2$ teeth).

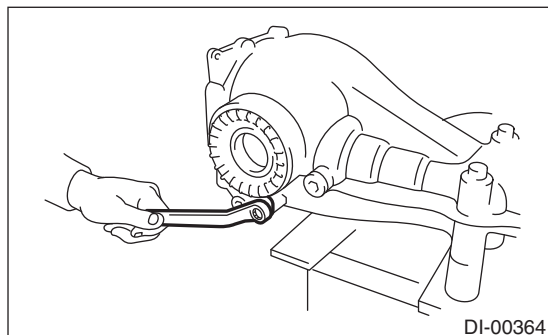
NOTE:

Difference between [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth)] and [amount that the side retainer RH is tightened (approx. 2 teeth)] gives preload.

- (4) Temporarily attach the lock plate.

NOTE:

Turn over the lock plate to shift the holder by 1/2 tooth.



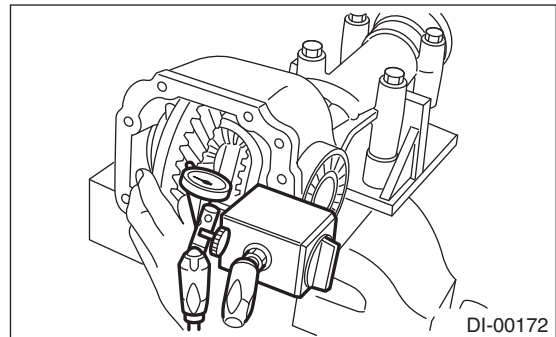
- (5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:

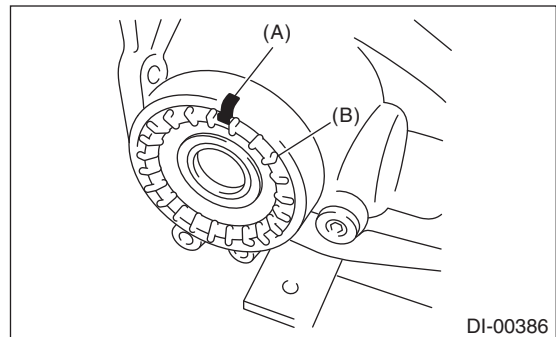
If measured value of backlash is not within the specified range, repeat the procedures for pinion driven gear set backlash adjustment and the differential side bearing preload adjustment.

Backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)



- 17) Put alignment marks on both the differential carrier and side retainer. Remove the side retainer side at a time. Replace them in the original position after inserting an O-ring and applying differential gear oil to the threaded portion.



- (A) Alignment mark
(B) Side retainer

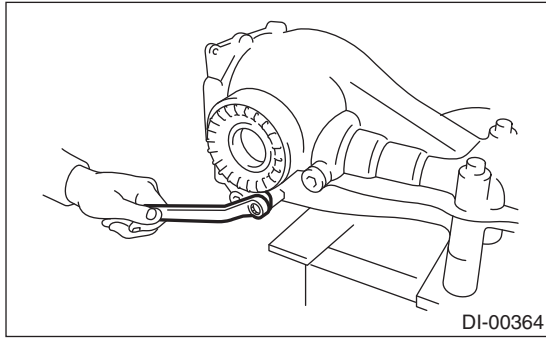
- 18) Tighten the bolt of lock plate to specified torque.

Rear Differential (VA-type)

DIFFERENTIALS

Tightening torque:

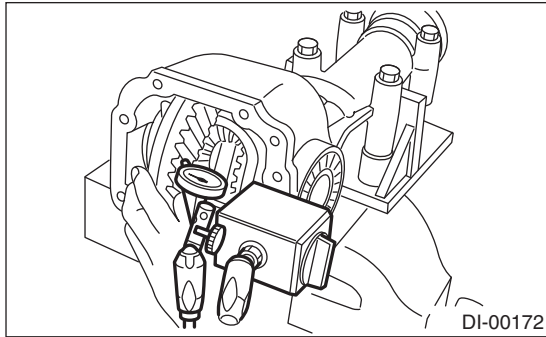
25 N·m (2.5 kgf-m, 18.4 ft-lb)



19) Recheck the hypoid driven gear to pinion backlash.

Backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)



20) 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.

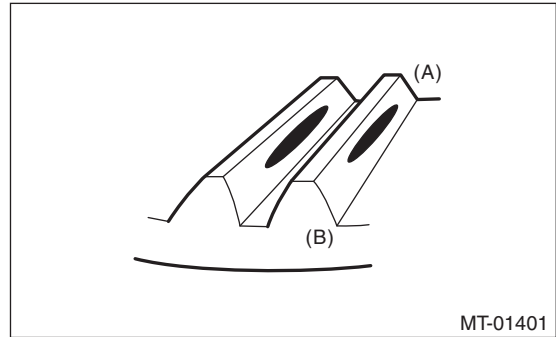
(2) When the contact pattern is not correct, re-adjust.

NOTE:

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

- Correct tooth contact

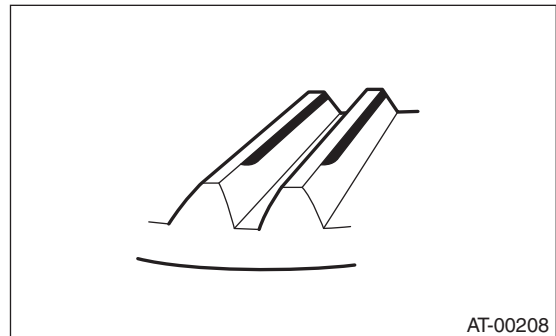
Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)



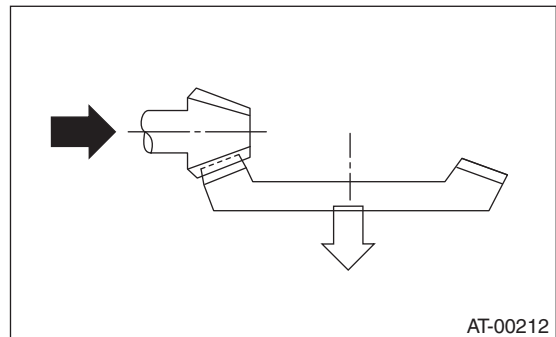
- (A) Toe side
- (B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern



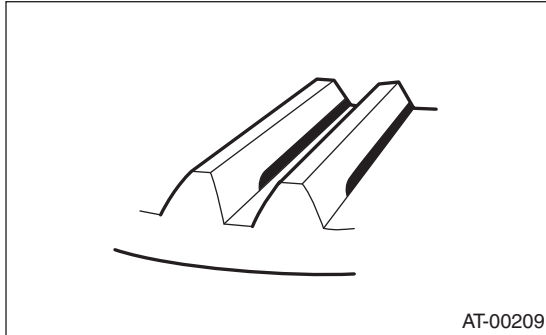
Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



- Flank contact

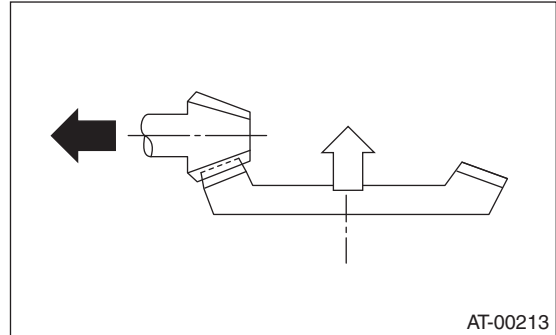
Check item: Backlash is too small.

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.

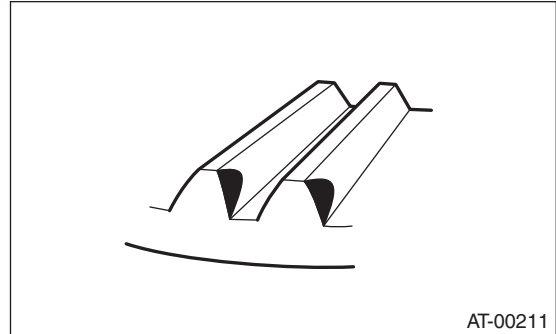
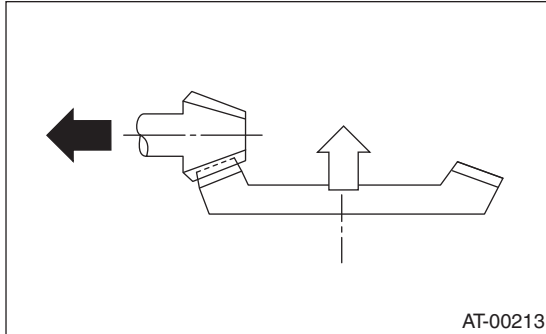
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern

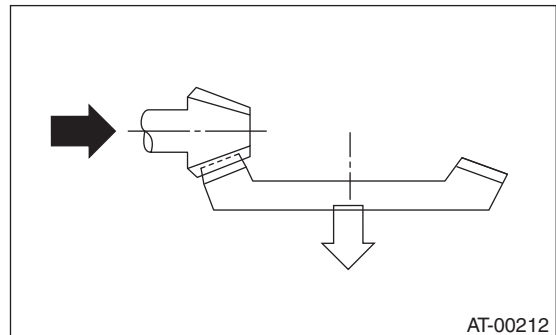
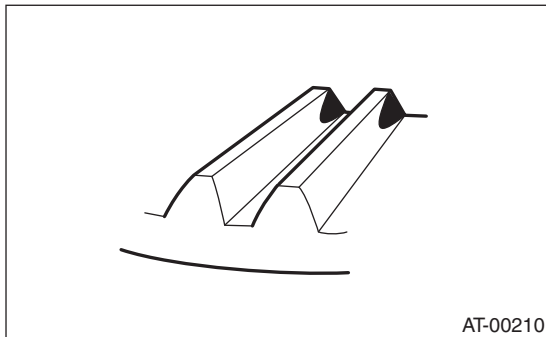


Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.

- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



21) If correct tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

22) Install the gasket and the rear cover to the differential carrier.

NOTE:

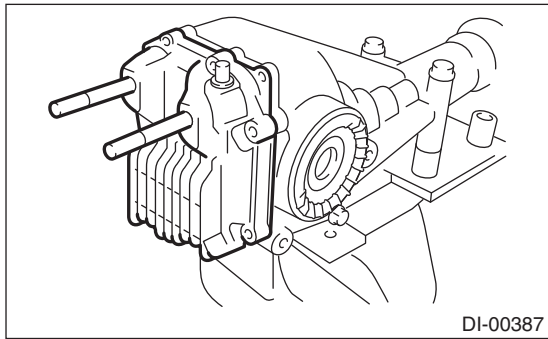
Use a new gasket.

Rear Differential (VA-type)

DIFFERENTIALS

Tightening torque:

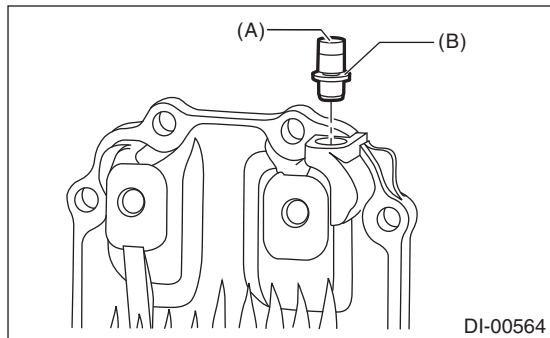
34 N·m (3.5 kgf-m, 25.1 ft-lb)



23) Install the air breather cap.

NOTE:

Do not tap section (A) of the air breather cap. Be sure to tap section (B) to install.



24) Install the oil drain plug.

NOTE:

Use a new gasket.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

25) Install the filler plug.

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage or 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, 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.

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:

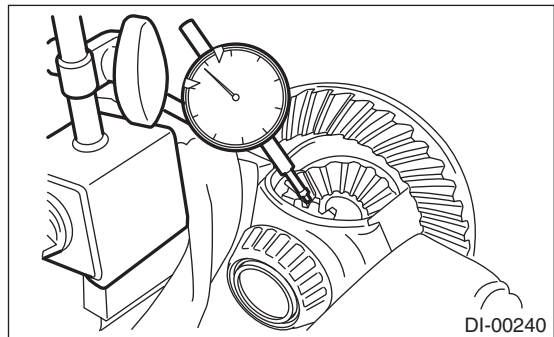
VA1-type:

0.05 — 0.15 mm (0.002 — 0.006 in)

VA2-type:

0.13 — 0.18 mm (0.005 — 0.007 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.



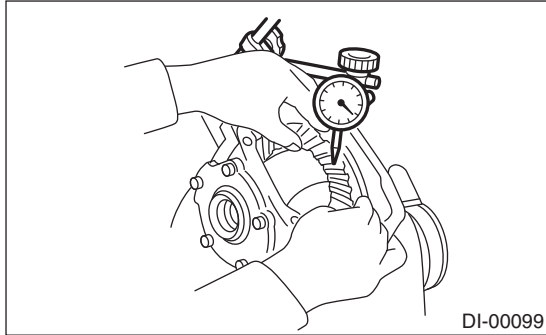
2. HYPOID DRIVEN GEAR BACKLASH

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

Hypoid driven gear backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)

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



3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

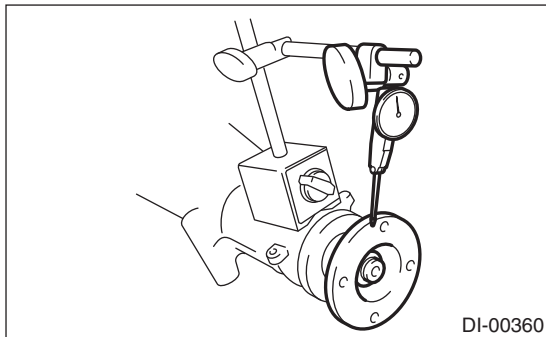
Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-51, ASSEMBLY, Rear Differential (VA-type).>

4. 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:

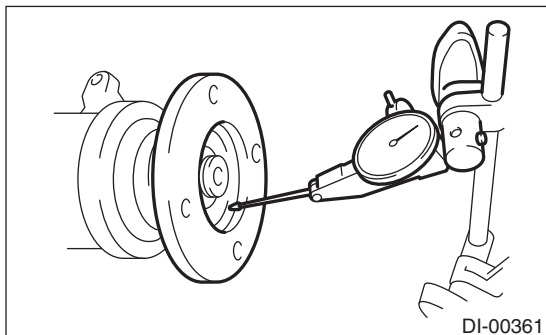
0.08 mm (0.003 in)



- 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 even 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-51, ASSEMBLY, Rear Differential (VA-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-51, ASSEMBLY, Rear Differential (VA-type).>

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-51, ASSEMBLY, Rear Differential (VA-type).>

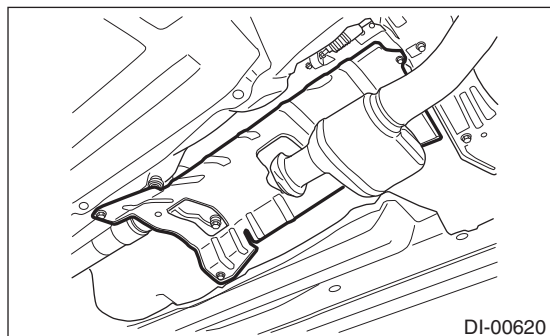
6. Rear Differential Front Oil Seal

A: INSPECTION

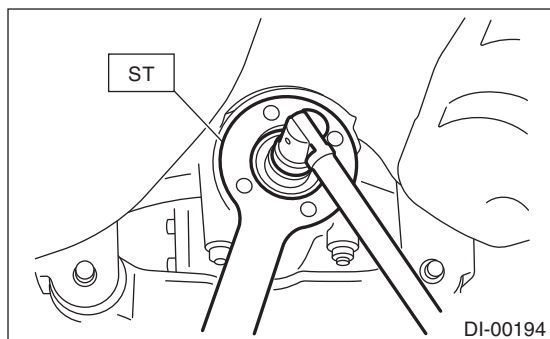
Make sure that there is no leakage from front oil seal portion. If there is any leakage, replace the oil seal and inspect the propeller shaft.

B: REPLACEMENT

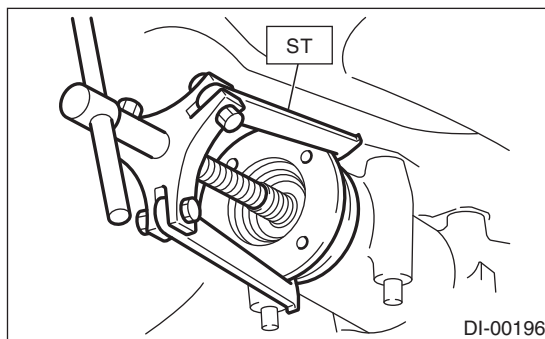
- 1) Disconnect the ground cable from battery.
- 2) Shift the select lever or gear shift lever to neutral.
- 3) Release the parking brake.
- 4) Lift up the vehicle.
- 5) Drain differential gear oil.
- 6) Remove the rear exhaust pipe.
 - 2.5 L SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.>
 - 2.5 L DOHC turbo model
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.>
 - 3.6 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>
- 7) Remove the heat shield cover.



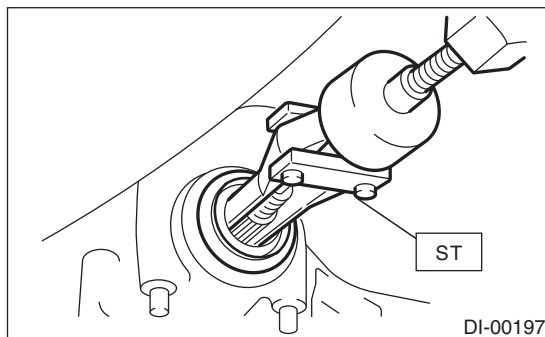
- 8) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
 - 9) Remove the self-locking nut while holding the companion flange with ST.
- ST 498427200 FLANGE WRENCH



- 10) Extract the companion flange using the ST.
- ST 399703600 PULLER ASSY



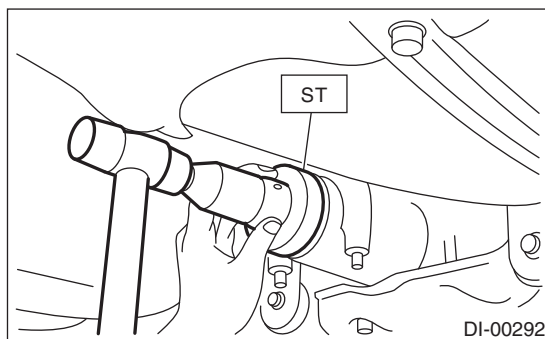
- 11) Remove the oil seal using ST or screwdriver.
- ST 398527700 PULLER ASSY



- 12) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.
 - Apply differential gear oil to the oil seal lips.
- ST 498447120 INSTALLER



- 13) Use a plastic hammer to install companion flange.
 - 14) Tighten the self-locking nut within the specified torque range so that the rotating resistance of companion flange becomes the same as that of before oil seal replacement.
- ST 498427200 FLANGE WRENCH

NOTE:

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

SEAL MATERIAL:

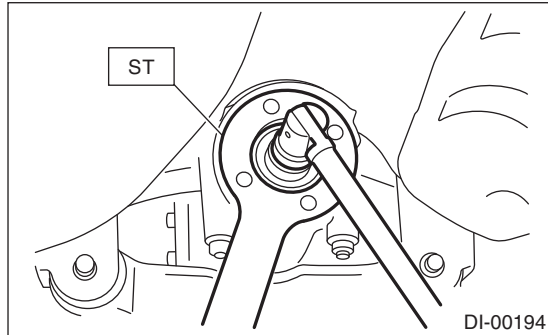
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:**T-type**

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)

VA-type

191 N·m (19.5 kgf-m, 140.9 ft-lb)



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

16) Fill differential gear oil. <Ref. to DI-23, Differential Gear Oil.>

7. Rear Differential Side Oil Seal

A: INSPECTION

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

B: REPLACEMENT

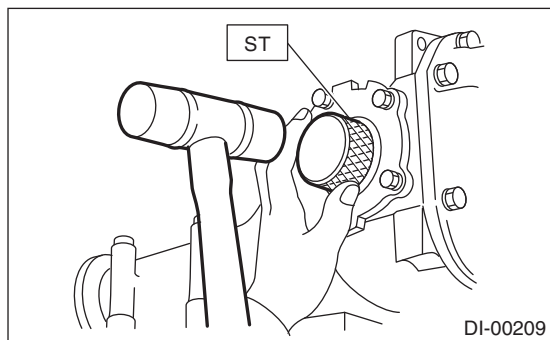
1) Remove the rear differential. <Ref. to DI-26, REMOVAL, Rear Differential (T-type).> <Ref. to DI-45, REMOVAL, Rear Differential (VA-type).>

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

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

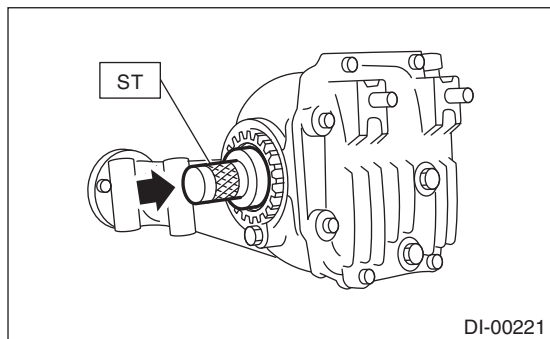
- T-type and VA2-type

ST 398437700 DRIFT



- VA1-type

ST 498447100 INSTALLER

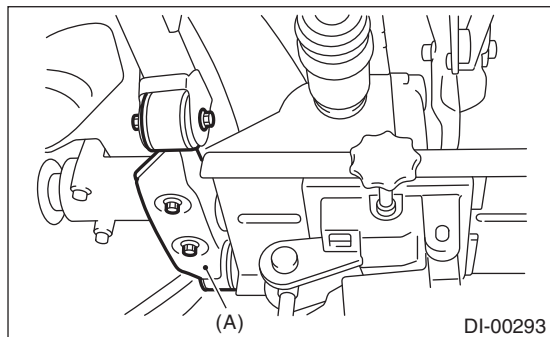


4) Install the rear differential. <Ref. to DI-28, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-45, INSTALLATION, Rear Differential (VA-type).>

8. 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

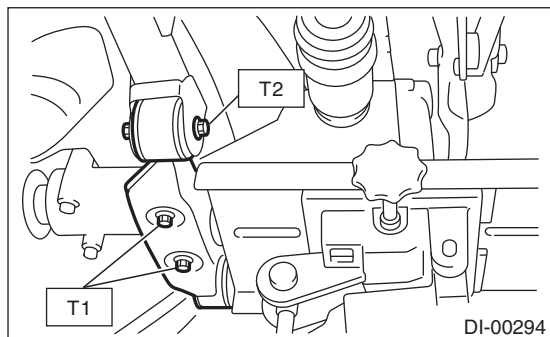
B: INSTALLATION

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)



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 member for cracking, hardening and damage. If cracking, hardening or damage is excessive, replace rear differential front member.

9. Rear Differential Mount Bushing

A: INSPECTION

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

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-26, REMOVAL, Rear Differential (T-type).> <Ref. to DI-45, REMOVAL, Rear Differential (VA-type).>

2) Remove the rear differential mount bushing using ST1 — 7.

(1) From the SPECIAL TOOL ASSY (41399FG000), select the tool to be used for removal.

(2) Apply grease to the threaded portion on the shaft of ST1 and the bearing of ST4.

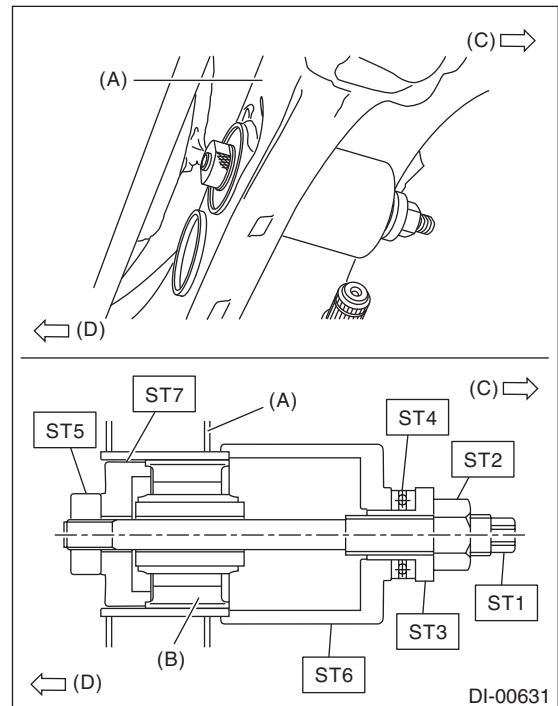
(3) Set the STs as shown in the illustration and tighten the ring of ST5 by hand until it stops.

(4) Secure the edge of the shaft of ST1 with a spanner, and tighten the nut of ST2 until the rear differential mount bushing comes out of the sub frame.

CAUTION:

Turning the shaft of ST1 may loosen the ST5 and damage a ST. Be sure to secure 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 mount bushing
- (C) Front
- (D) REAR

3) Install the rear differential mount bushing using ST1 — 7.

(1) From the SPECIAL TOOL ASSY (41399FG000), select the tool to be used for installation.

(2) Set the STs as shown in the illustration and tighten the ring of ST5 by hand until it stops.

CAUTION:

Be careful not to install the ST7 in a wrong direction.

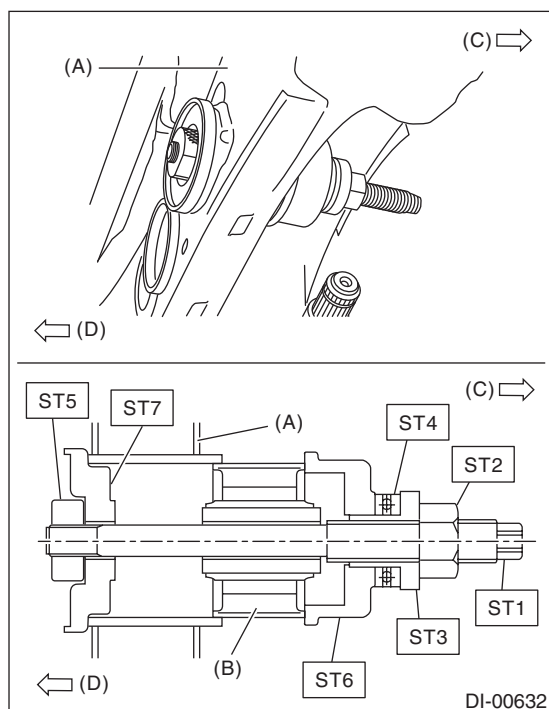
(3) Secure the edge of the shaft of ST1 with a spanner, tighten the nut of ST2, and press-fit the ST6 until it contacts the end face of sub frame.

CAUTION:

• **Turning the shaft of ST1 may loosen the ST5 and damage a ST. Be sure to secure the ST1.**

- Be careful not to damage a ST by tightening the nut of ST2 further after the ST6 contacts the end face of sub frame.

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 mount bushing
 (C) Front
 (D) REAR

4) Install the rear differential. <Ref. to DI-28, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-45, INSTALLATION, Rear Differential (VA-type).>

10. Rear Differential Inspection Mode

A: GENERAL DESCRIPTION

CAUTION:

Be sure to perform Rear Differential Inspection Mode.

- Follow the messages displayed on the Subaru Select Monitor when working.
- “Rear Differential Inspection Mode” using the Subaru Select Monitor is available only for the CVT model.
- Perform Rear Differential Inspection Mode when the following work has been performed.
Transmission assembly replacement/Replacement of rear differential/Replacement of front differential hypoid gear set/Replacement of rear differential hypoid gear set

B: PROCEDURE

CAUTION:

Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.

- 1) Shift the select lever to “P” range.
- 2) Apply the electronic parking brake.
- 3) Lift up the vehicle.

WARNING:

Lift up the vehicle until the tire bottom is 30 cm or more above the ground.

- 4) Connect the Subaru Select Monitor to data link connector.
- 5) Turn the ignition switch to ON. (In the case of a push button start, press the push button ignition switch twice without stepping on the brake.)
- 6) Select {AT related learning & inspecting mode} in the «Transmission Diagnosis» screen of the Subaru Select Monitor.
- 7) Select {Rear differential inspection mode} in the «Learning and inspection mode related to AT» display screen of the Subaru Select Monitor.
- 8) Follow the messages displayed on the Subaru Select Monitor screen when working.
- 9) The results of the rear differential inspection mode are displayed on the Subaru Select Monitor screen.
 - When ended normally: «Rear differential has been replaced successfully.»
 - When ended abnormally: «Rear differential error is detected. Check the items for rear differential installation again.»
 - When interrupted: «Inspection interrupted. Start this inspection mode over again from the beginning.»

10) After the message «Inspection completed. Turn off the IG SW.» appears, the rear differential inspection mode completes.

NOTE:

- For details concerning the operation procedure, refer to “PC application help for Subaru Select Monitor”.
- If the rear differential inspection mode does not end normally, repeat the mode until it ends normally.
- When the inspection mode does not end normally, the AWD warning light will start blinking at 2 Hz.
- When the inspection mode ends abnormally, the front differential and rear differential may be different from the specifications for the vehicle.
- When the inspection mode is interrupted, the following reasons are possible.

Message	Main reasons for abnormal termination
• “Inspection interrupted.” • «Inspection interrupted. Start this inspection mode over again from the beginning.»	• TCM has detected a failure. • VDC has a failure. • Brake is applied after start during automatic running. • Too delayed operation to the instructions displayed on the Subaru Select Monitor.
“TCM incompatible. Rear differential inspection mode canceled.”	The model does not support the rear differential inspection mode.
TCM has detected a failure. Inspect according to the manual.	TCM has detected a failure.

11) Perform “Function Check Sequence” for VDC. <Ref. to VDC(diag)-17, FUNCTION CHECK, OPERATION, Subaru Select Monitor.> <Ref. to VDC-10, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

General Diagnostic Table

DIFFERENTIALS

11.General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attachment bolts or damaged gasket.	Tighten the bolts to specified torque. Replace gasket and apply liquid gasket.
	(5) Loose oil filler or oil drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrect fitting of spindle, 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 recommended differential gear 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) Excessive backlash for hypoid gear.	Readjust.
	(2) Improper tooth contact of hypoid gear.	Readjust. (Drive pinion adjustment and backlash adjustment)
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(4) Insufficient preload for front or rear bearing.	Readjust.
	(5) Loose drive pinion nut.	Tighten to the specified torque.
	(6) Loose bolts and nuts such as side retainer attachment bolt.	Tighten to the specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

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 jacking-up all four wheels. Perform these inspections according to the condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace 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

1. General Description

A: NOTE

For general description, refer to “5AT”, “CVT” or “6MT” section.

5AT model:

<Ref. to 5AT-2, General Description.>

CVT model:

<Ref. to CVT-3, General Description.>

6MT model:

<Ref. to 6MT-2, General Description.>

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to “6MT” section. <Ref. to 6MT-39, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to
“5AT” or “CVT” section.

5AT model:

<Ref. to 5AT-68, Transfer Clutch.>

CVT model:

<Ref. to CVT-148, Transfer Clutch.>

4. Extension Case

A: NOTE

For removal, installation and inspection, refer to
“5AT” or “CVT” section.

5AT model:

<Ref. to 5AT-66, Extension Case.>

CVT model:

<Ref. to CVT-140, Extension Case.>

5. Oil Seal

A: NOTE

For replacement and inspection, refer to “5AT”, “CVT” or “6MT” section.

5AT model:

<Ref. to 5AT-48, Extension Case Oil Seal.>

CVT model:

<Ref. to CVT-88, Extension Case Oil Seal.>

6MT model:

<Ref. to 6MT-33, Oil Seal.>

6. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to "6MT" section. <Ref. to 6MT-45, Transfer Drive Gear.>

7. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to "6MT" section. <Ref. to 6MT-47, Transfer Driven Gear.>

8. Center Differential Carrier

A: NOTE

For removal, installation and inspection, refer to "5AT" section. <Ref. to 5AT-74, Center Differential Carrier.>

9. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to "5AT" or "CVT" section.

5AT model:

<Ref. to 5AT-71, Reduction Driven Gear.>

CVT model:

<Ref. to CVT-160, Transfer Reduction Driven Gear.>

10.Center Differential

A: NOTE

For removal, installation and inspection, refer to "6MT" section. <Ref. to 6MT-49, Center Differential.>

11. Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to “5AT” or “CVT” section.

5AT model:

<Ref. to 5AT-36, Transfer Clutch Pressure Test.>

CVT model:

<Ref. to CVT-52, Transfer Clutch Pressure Test.>

General Description

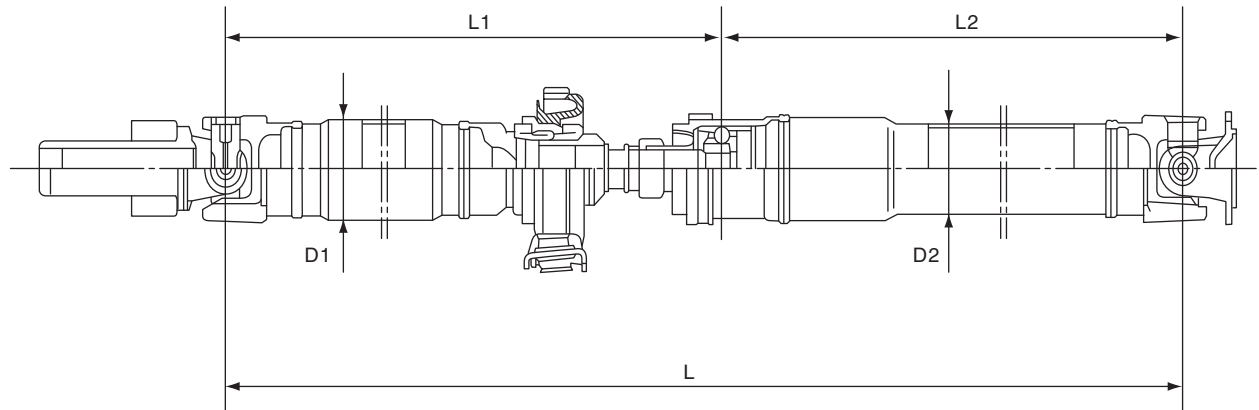
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

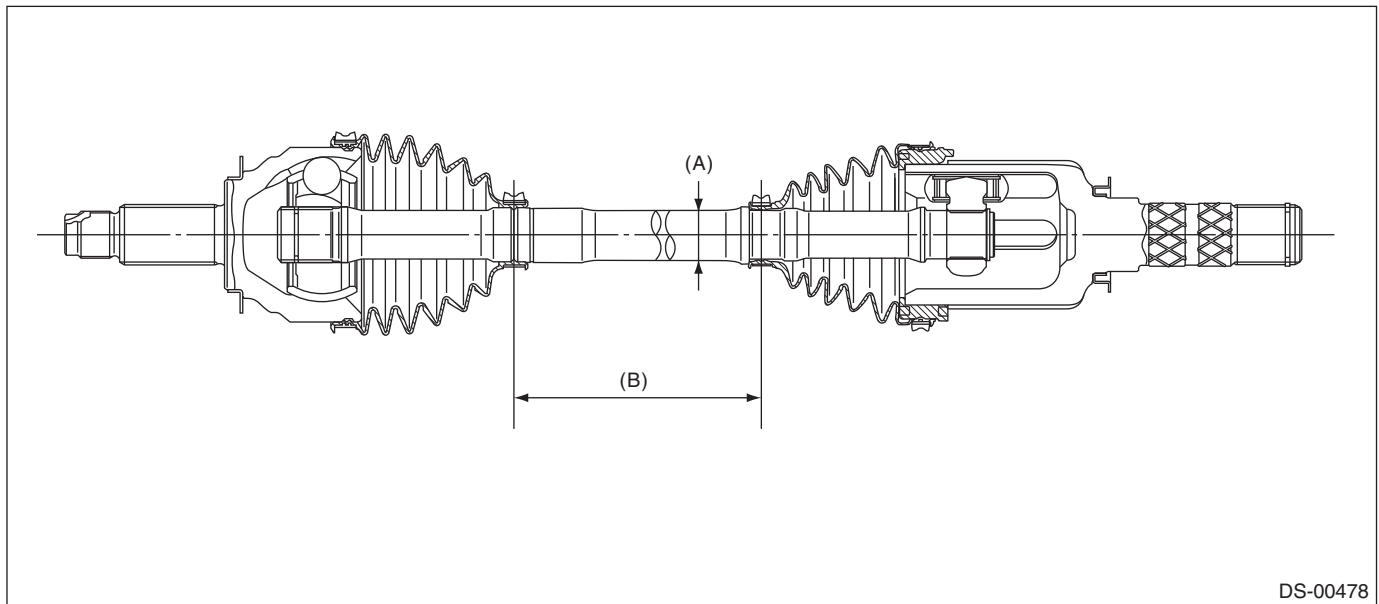
Car line		All models
Propeller shaft type		EDJ
Front propeller shaft Joint-to-joint length: L_1	mm (in)	
	CVT	578 (22.76)
	6MT	735.5 (28.96)
	5AT	562 (22.13)
Rear propeller shaft Joint-to-Joint length: L_2		mm (in)
		828 (32.6)
Outer diameter of tube:	mm (in)	
	D_1	63.5 (2.500)
	D_2	57.5 (2.264)



DS-00430

2. FRONT DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft	Axle diameter ϕ mm (in)	Axle length mm (in)
All models	AC + AAR	22.67 (0.89)	352.4 (13.87)

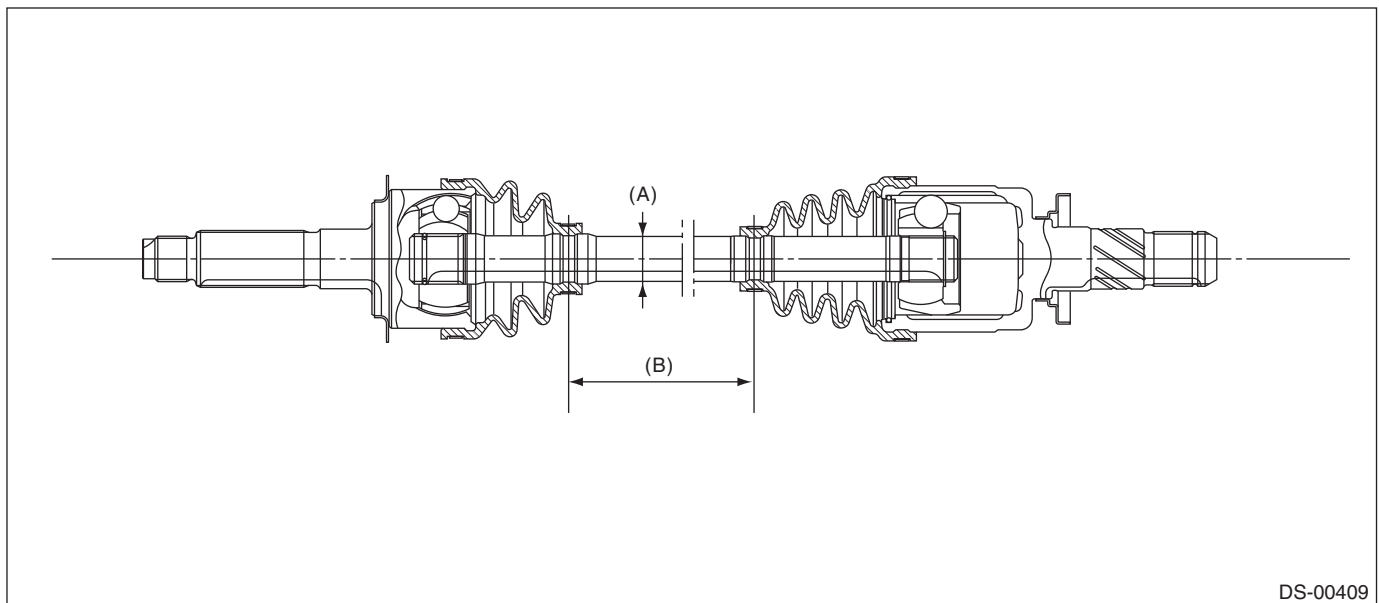


(A) Axle diameter

(B) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

Model	Type of drive shaft	Axle diameter ϕ mm (in)	Axle length mm (in)
Sedan CVT	BJ + DOJ	22 (0.87)	400.6 (15.77)
Other than the above	EBJ + DOJ	22 (0.87)	394.3 (15.52)



(A) Axle diameter

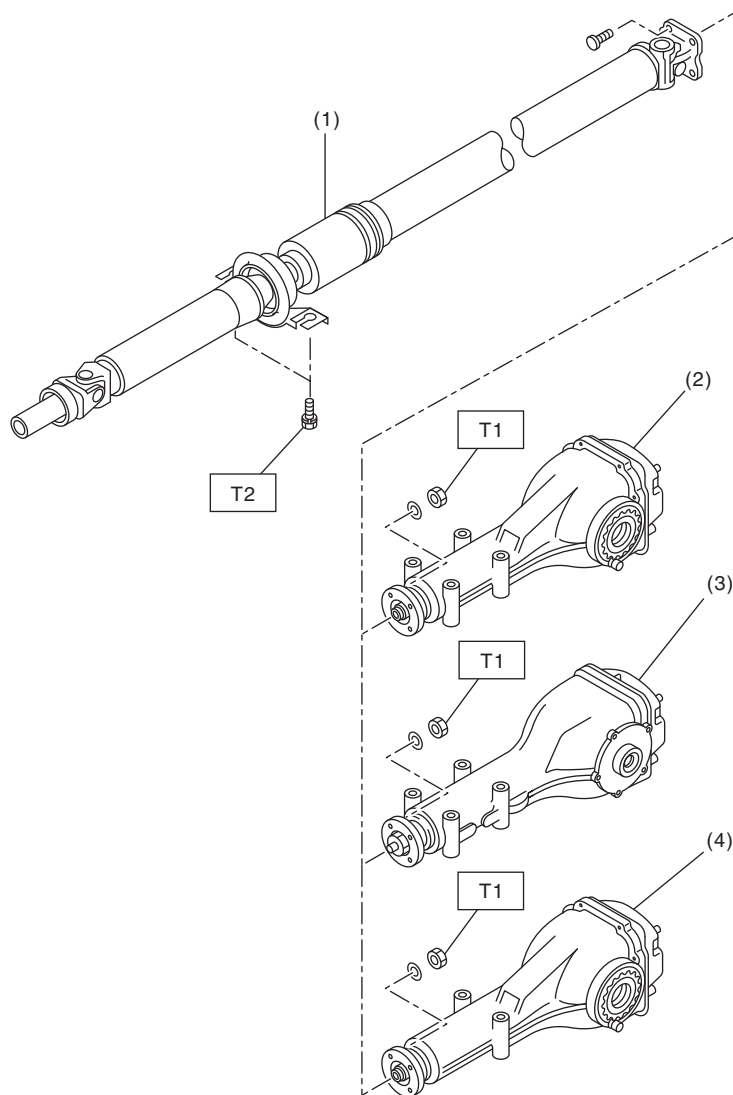
(B) Axle length

General Description

DRIVE SHAFT SYSTEM

B: COMPONENT

1. PROPELLER SHAFT



DS-00471

- (1) Propeller shaft
- (2) Rear differential (VA1-type)

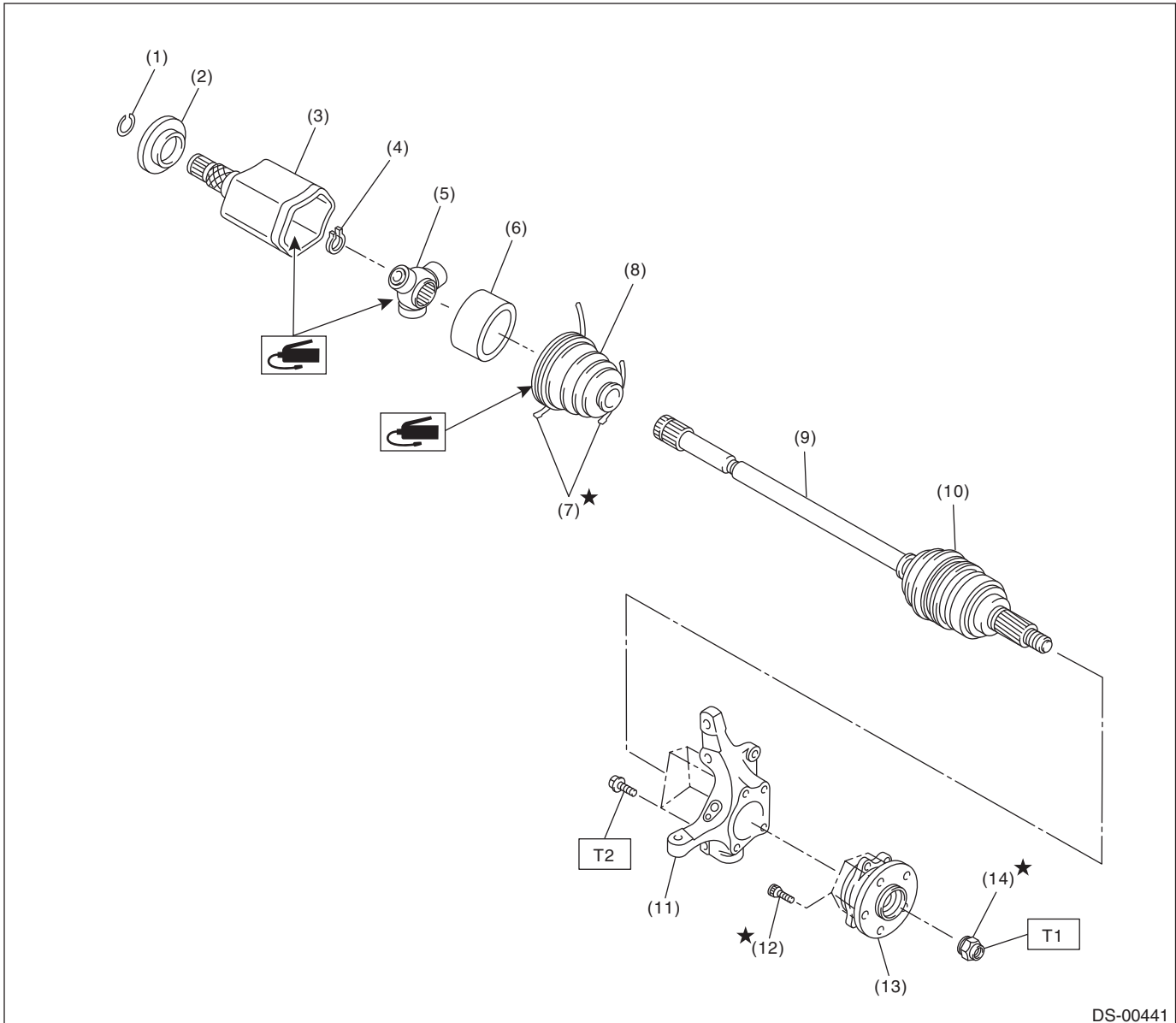
- (3) Rear differential (T-type)
- (4) Rear differential (VA2-type)

Tightening torque: N·m (kgf-m, ft-lb)

T1: 31 (3.2, 22.9)

T2: 52 (5.3, 38.4)

2. FRONT AXLE



DS-00441

- (1) Circlip
- (2) Baffle plate
- (3) Outer race (AAR)
- (4) Snap ring
- (5) Trunnion
- (6) Grommet

- (7) Boot band
- (8) Boot (AAR)
- (9) AC shaft ASSY
- (10) Boot (AC)
- (11) Housing
- (12) Hub bolt

- (13) Front hub unit bearing
- (14) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)

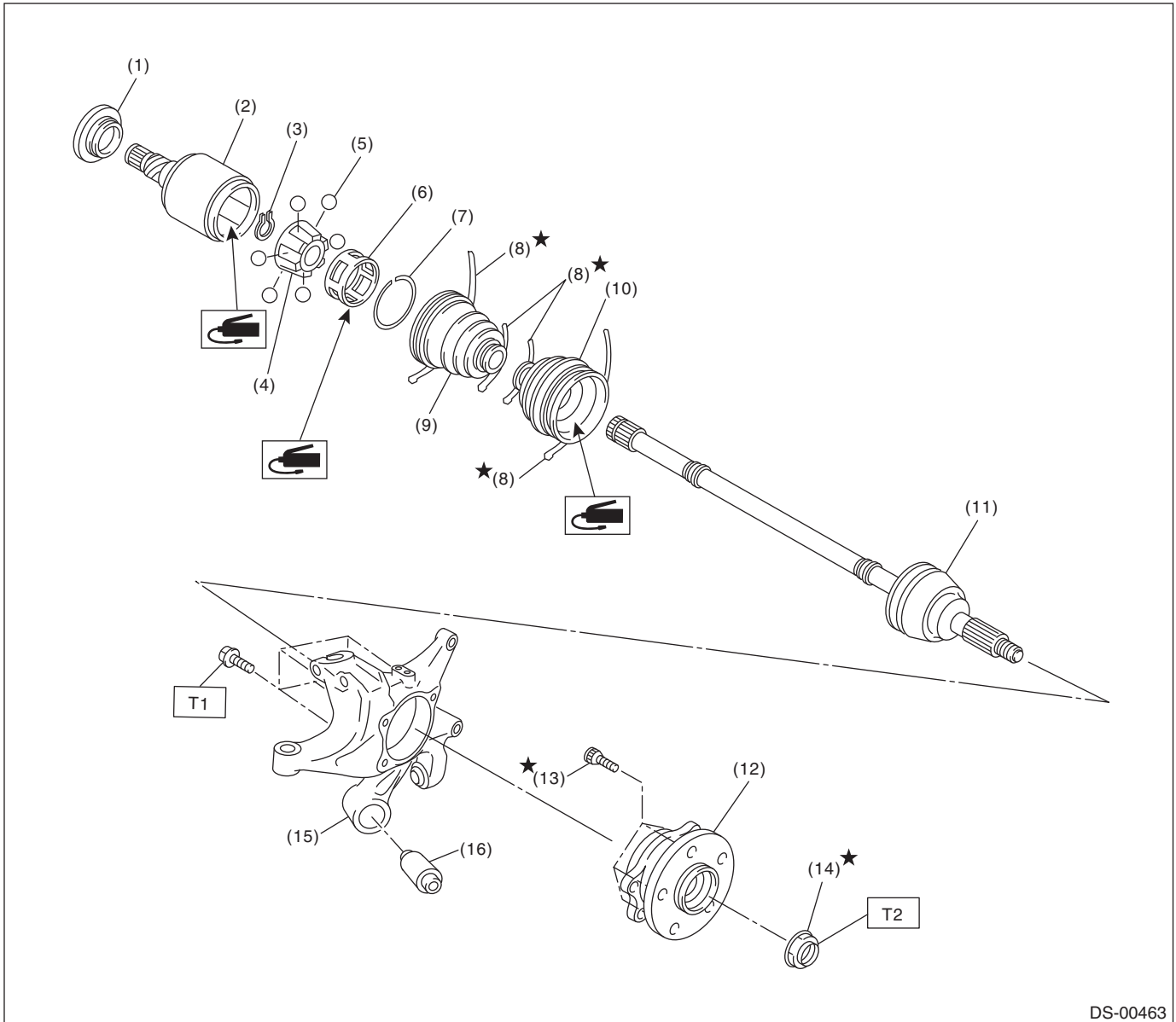
T1: 220 (22.4, 162.3)

T2: 65 (6.6, 47.9)

General Description

DRIVE SHAFT SYSTEM

3. REAR AXLE



DS-00463

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

Tightening torque: N·m (kgf-m, ft-lb)

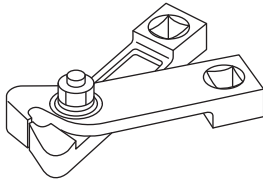
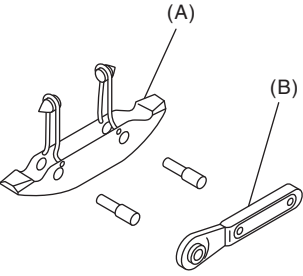
T1: 65 (6.6, 47.9)

T2: 240 (24.5, 177)

C: CAUTION

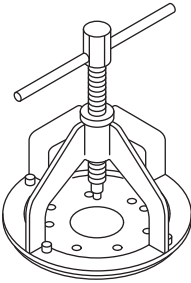
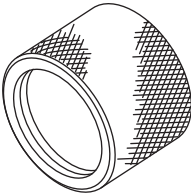
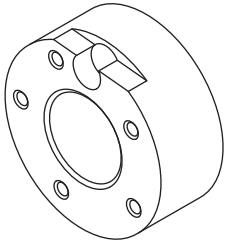
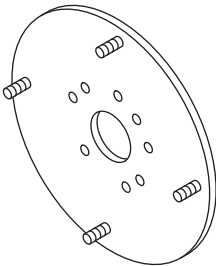
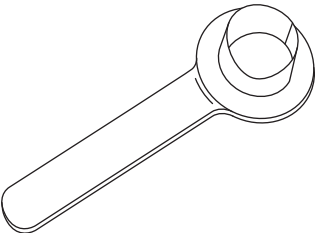
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, 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	Part number	DESCRIPTION	REMARKS
 ST28099AC000	28099AC000	BOOT BAND PLIER	Used for tightening the boot band. (Front boot band)
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench

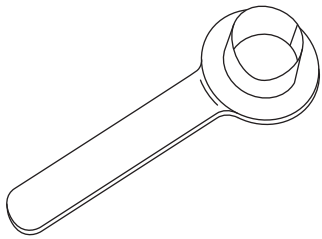
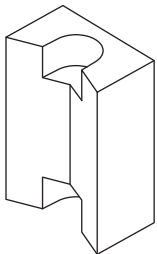
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	Part number	DESCRIPTION	REMARKS
 ST-926470000	926470000	AXLE SHAFT PULLER	- Used for removing the axle shaft. - Used together with AXLE SHAFT PULLER PLATE (28099PA110).
 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 PROTECTOR	- Used for installing the rear drive shaft to the rear differential. - For protecting the oil seal.

General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	Part number	DESCRIPTION	REMARKS
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	- Used for installing front drive shaft into front differential. - For protecting the oil seal.
 ST28399AG000	28399AG000	HUB STAND	Used for extracting hub bolt.

2. GENERAL TOOL

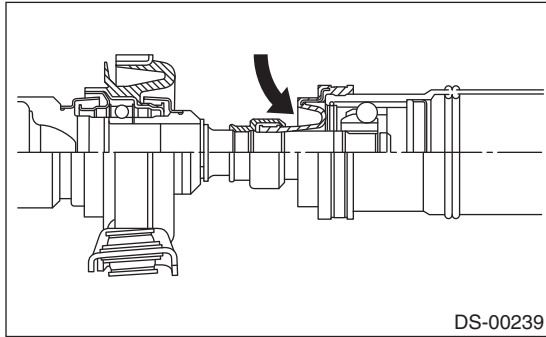
TOOL NAME	REMARKS
Puller	Used for removing the ball joint from knuckle arm.
Dial gauge	Used for inspecting the propeller shaft run-out.
Extension cap	Used for preventing leakage of gear oil or ATF.
Crowbar	Used for extracting drive shaft.

2. Propeller Shaft

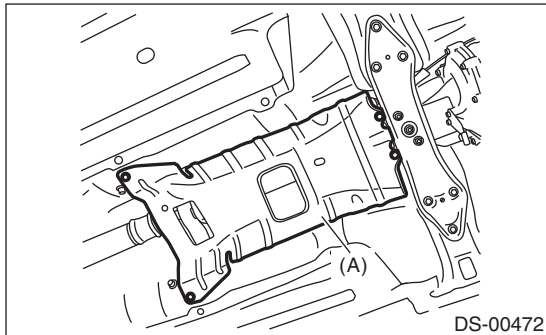
A: REMOVAL

NOTE:

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

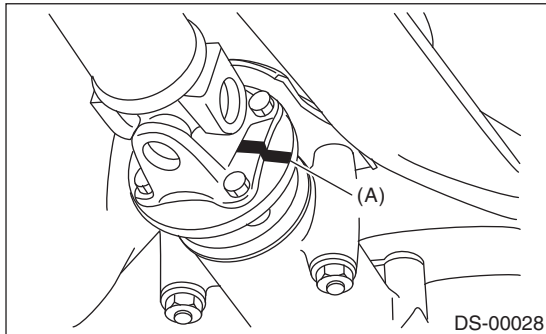


- 1) Shift the select lever or gear shift lever to neutral.
- 2) Release the parking brake.
- 3) Lift up the vehicle.
- 4) Remove the center exhaust pipe.
- 5) Remove the rear exhaust pipe and muffler.
- 6) Remove the heat shield cover.



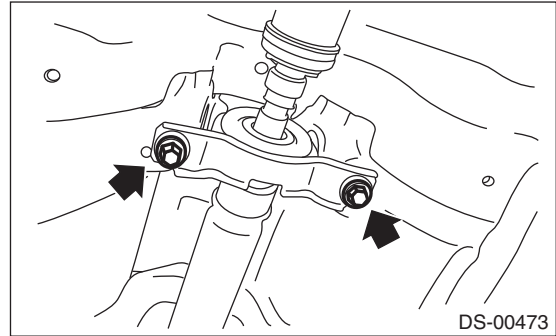
(A) Heat shield cover

- 7) Place alignment marks on the flange yoke and rear differential.
- 8) Remove four bolts holding the propeller shaft to the rear differential.



(A) Alignment mark

- 9) Remove the center bearing.



- 10) Remove the propeller shaft from transmission.

NOTE:

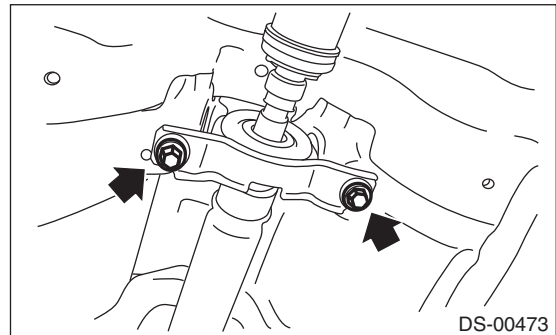
- Use a container to catch ATF or oil flowing from propeller shaft.
- To prevent ATF from leaking, install extension cap etc. to the transmission.

B: INSTALLATION

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

Tightening torque:

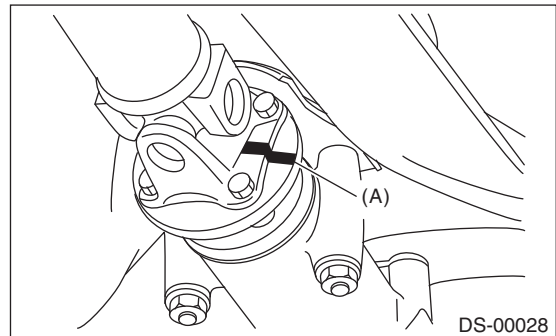
52 N·m (5.3 kgf-m, 38.4 ft-lb)



- 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.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

- 4) Install the center exhaust pipe.
- 5) Install the rear exhaust pipe and muffler.
- 6) Lower the vehicle.

C: INSPECTION

NOTE:

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

- Tube surface for dents or cracks
- 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

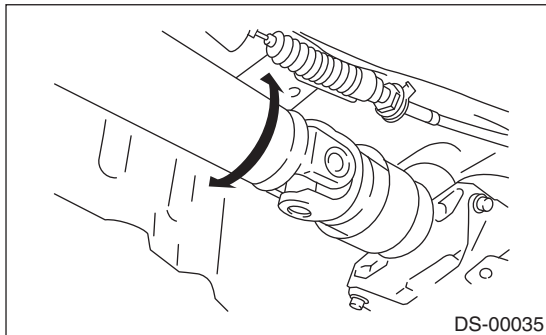
Check the following points with propeller shaft installed in vehicle.

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.

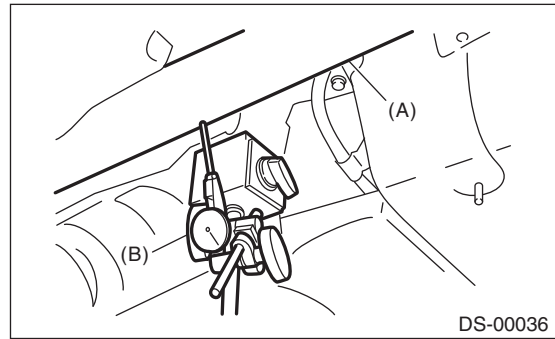


3. RUNOUT OF PROPELLER SHAFT

- 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.

Runout:

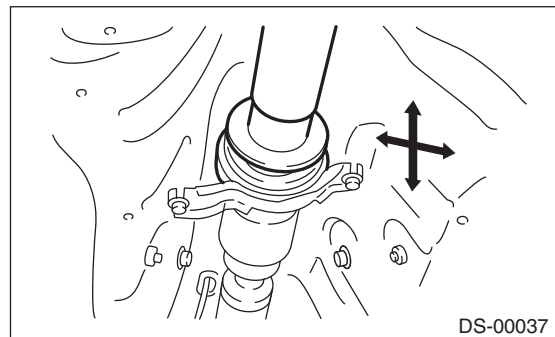
Service limit 0.6 mm (0.024 in)



- (A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

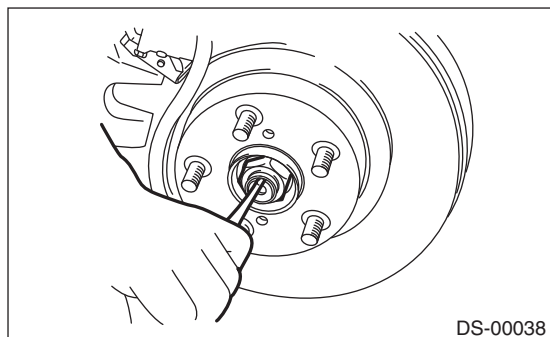
- 1) Remove the front and center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



3. Front Axle

A: REMOVAL

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Lift the crimped section of axle nut.

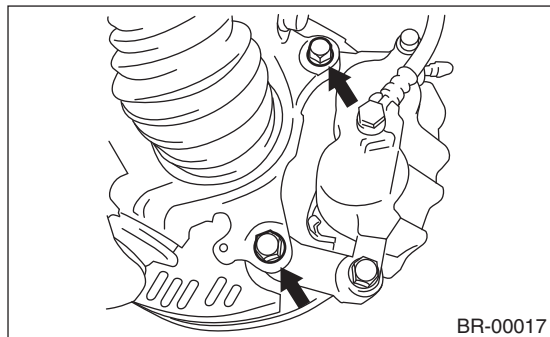


- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

Do not loosen the axle nut while the front axle is loaded. Doing so may damage the hub bearing.

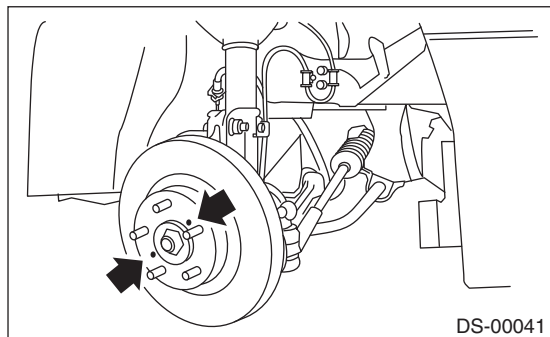
- 4) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.



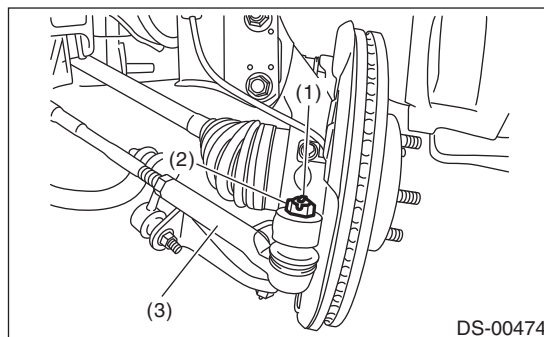
- 5) Remove the disc rotor.

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.

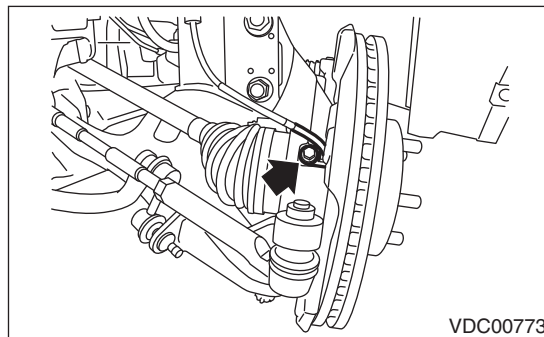


- 6) After removing the cotter pin and castle nut, use a puller to remove the tie-rod end from the front housing.

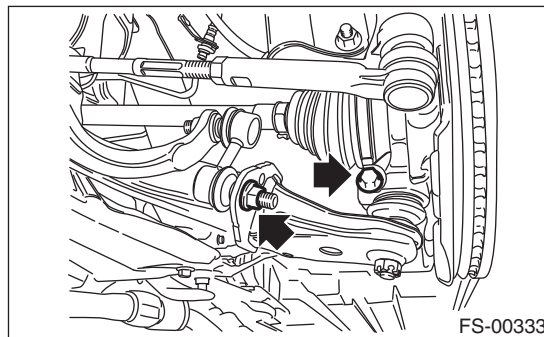


- (1) Cotter pin
- (2) Castle nut
- (3) Tie-rod end

- 7) Remove the front ABS wheel speed sensor.



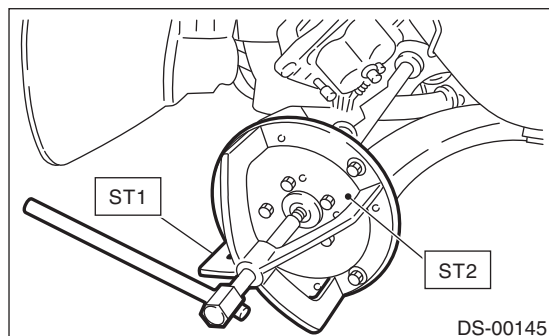
- 8) Remove the stabilizer link and ball joint.



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

10) 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



11) Place an alignment mark on the camber adjusting bolt and front housing.

12) Remove two bolts to remove the front housing from the strut.

B: INSTALLATION

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

Tightening torque:

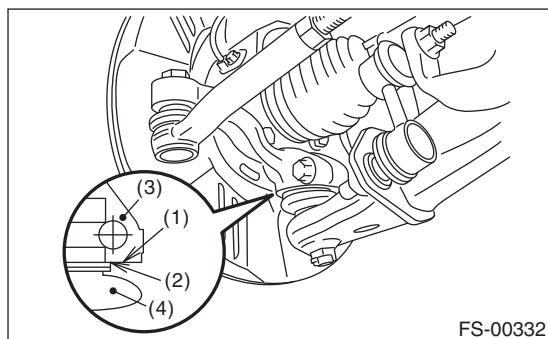
155 N·m (15.8 kgf-m, 114.3 ft-lb)

2) Install the front drive shaft. <Ref. to DS-25, INSTALLATION, Front Drive Shaft.>

3) Install the ball joint into housing.

CAUTION:

Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.



- (1) Housing bottom
- (2) Raised section of ball joint
- (3) Housing
- (4) Ball joint

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

4) Install the front ABS wheel speed sensor.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

5) Install the disc rotor.

6) Install the disc brake.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

7) Install the stabilizer link.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

8) Install the tie-rod end ball joint to the front housing using a castle nut.

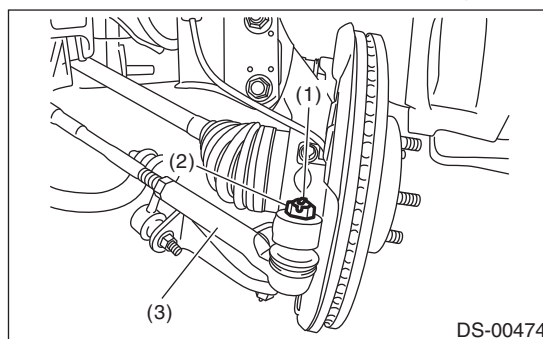
Tightening torque:

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.

9) 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.



- (1) Cotter pin
- (2) Castle nut
- (3) Tie-rod end

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

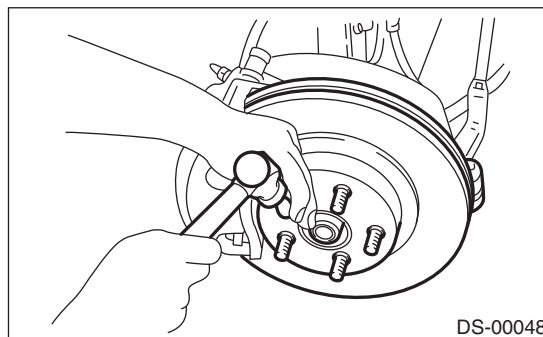
Tightening torque:

220 N·m (22.4 kgf-m, 162.3 ft-lb)

CAUTION:

Do not load the front axle before tightening the axle nut. Doing so may damage the hub bearing.

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



12) Install the wheel.

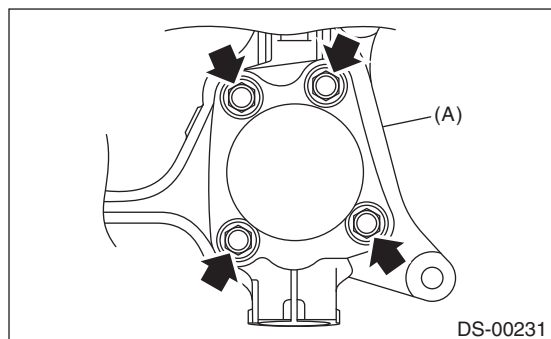
Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

13) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

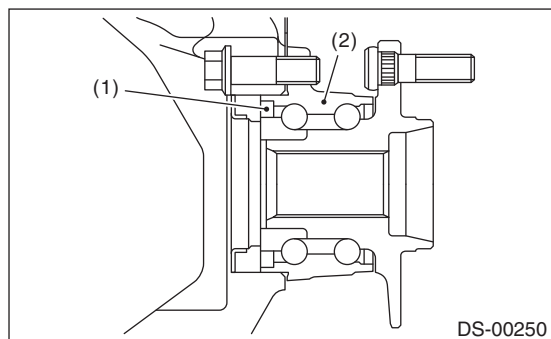
1) Remove four bolts from the housing, and remove the front hub unit bearing and disc brake cover.



(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-17, DISASSEMBLY, Front Hub Unit Bearing.>

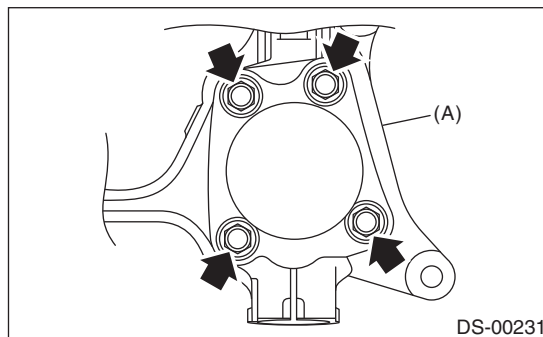
D: ASSEMBLY

1) Assemble the front hub unit bearing. <Ref. to DS-17, ASSEMBLY, Front Hub Unit Bearing.>

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

Tightening torque:

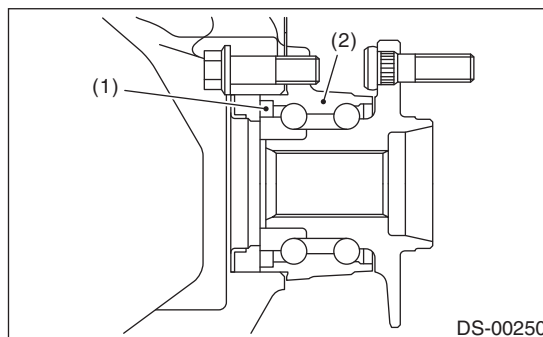
65 N·m (6.6 kgf-m, 47.9 ft-lb)



(A) Housing

CAUTION:

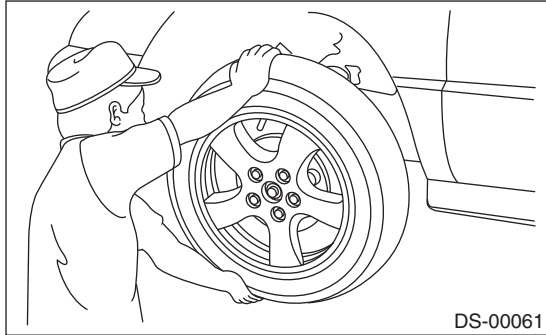
- Do not get closer the tool which charged magnetism to magnetic encoder.
- Be careful not to damage the magnetic encoder.



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

E: INSPECTION

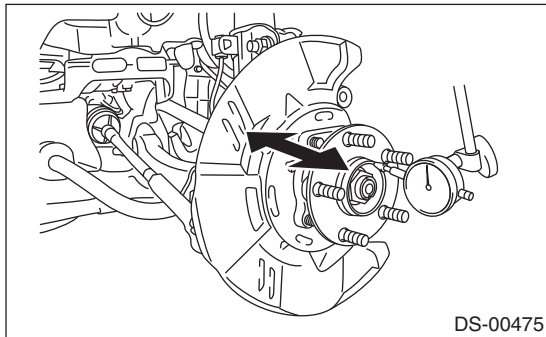
1) While moving the front tire up and down by hand, check if there is no free play in the bearing, and make sure the wheel rotates smoothly.



2) Inspect the play in axial direction using a dial gauge. Replace the bearing if the load range exceeds the limitation.

Service limit:

Maximum: 0.05 mm (0.0020 in)



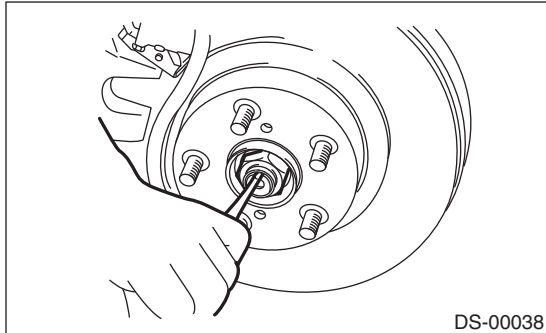
Front Hub Unit Bearing

DRIVE SHAFT SYSTEM

4. Front Hub Unit Bearing

A: REMOVAL

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Lift the crimped section of axle nut.

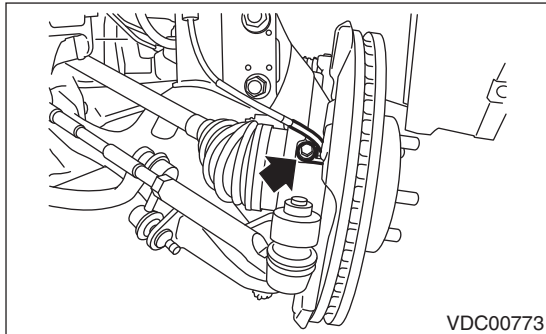


- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

Do not loosen the axle nut while the front axle is loaded. Doing so may damage the hub bearing.

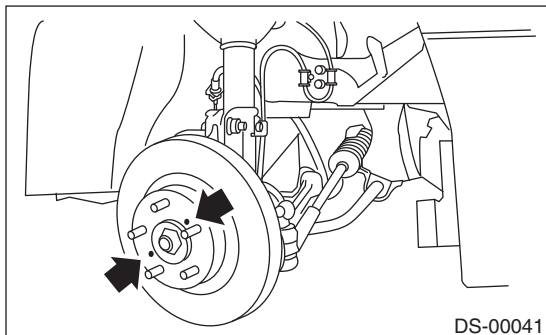
- 4) Remove the front ABS wheel speed sensor.



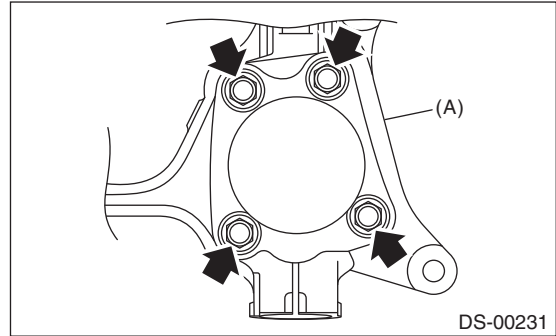
- 5) Remove the front disc brake and hang it to the front strut.
- 6) Remove the disc rotor.

NOTE:

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



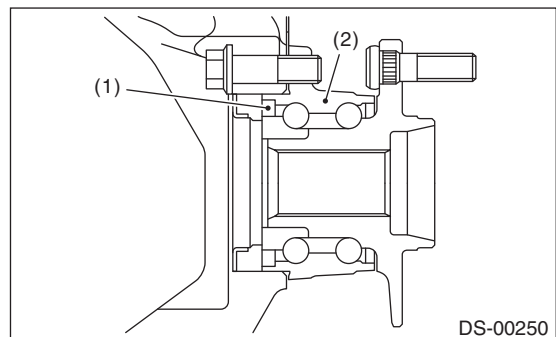
- 7) Remove the four bolts from the housing.



(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.

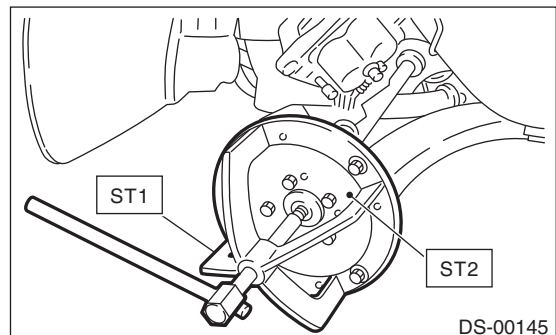
ST1 926470000

AXLE SHAFT PULLER

ST2 28099PA110

AXLE SHAFT PULLER

PLATE

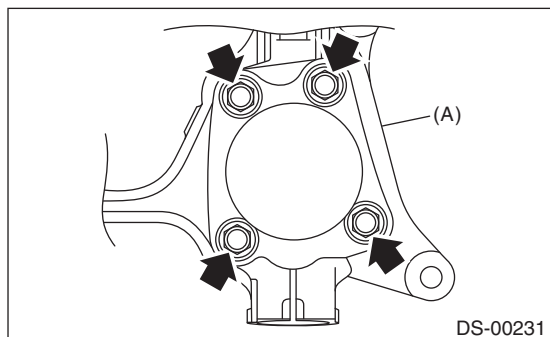


B: INSTALLATION

1) Place the disc brake 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-25, INSTALLATION, Front Drive Shaft.>

3) Tighten the axle nut temporarily.

4) Install the disc rotor to hub.

5) Install the disc brake caliper on the housing.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

6) Install the front ABS wheel speed sensor.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

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

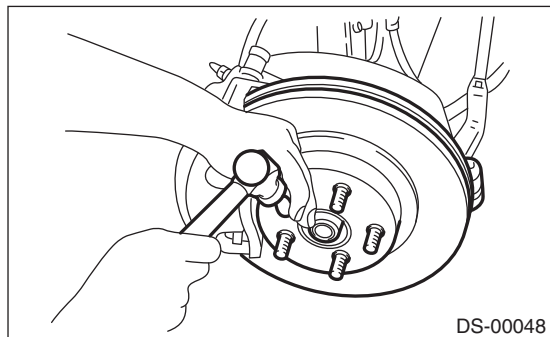
Tightening torque:

220 N·m (22.4 kgf-m, 162.3 ft-lb)

CAUTION:

Do not load the front axle before tightening the axle nut. Doing so may damage the hub bearing.

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



9) Install the wheel.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

C: DISASSEMBLY

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

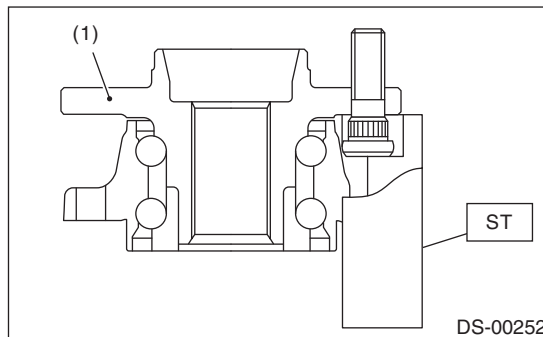
ST 28399AG000 HUB STAND

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.

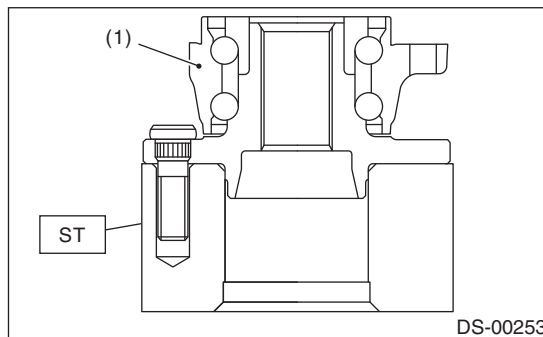


(1) Front hub unit bearing

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-15, INSPECTION, Front Axle.>

CAUTION:

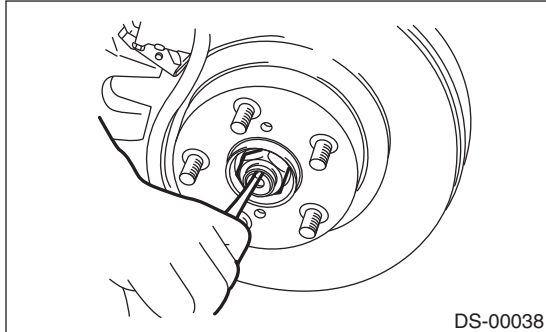
If there is any fault in the bearing, replace hub unit bearing.

5. Rear Axle

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.

2) Lift the crimped section of axle nut.

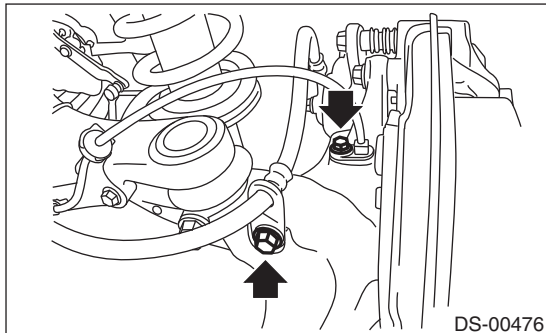


3) Remove the axle nut using a socket wrench while depressing the brake pedal.

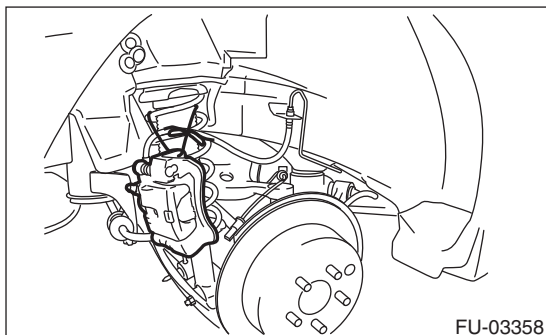
CAUTION:

Do not loosen the axle nut while the rear axle is loaded. Doing so may damage the hub bearing.

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

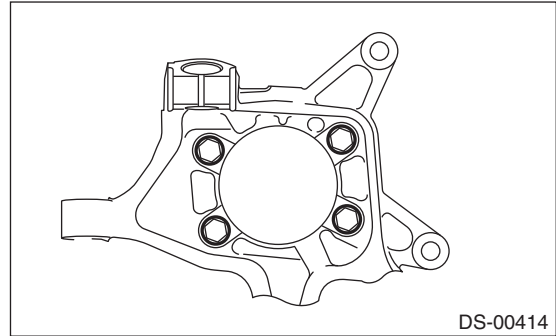


5) Remove the disc brake caliper from the rear housing, and suspend it from the vehicle using ropes.



6) Remove the rear disc rotor.

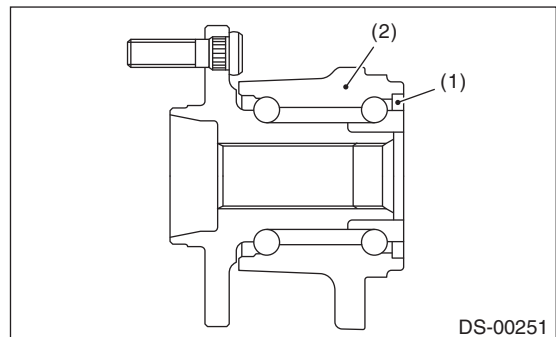
7) Remove four bolts from the rear housing.



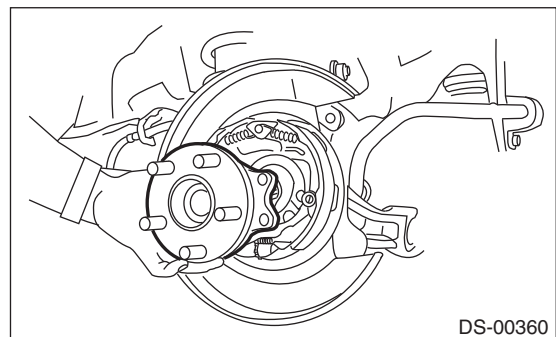
8) Remove the rear hub unit bearing.

CAUTION:

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



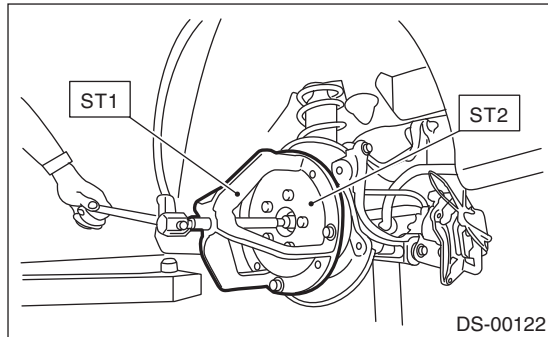
- (1) Magnetic encoder
(2) Rear hub unit bearing



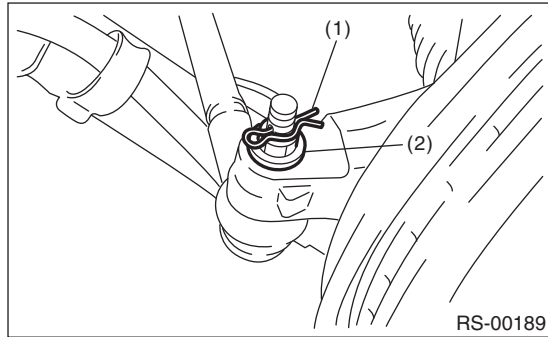
NOTE:

If it is hard to remove, use the ST.

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

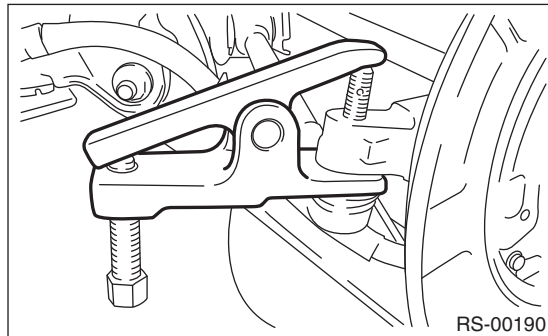


9) Remove the snap pin and nut from the front lateral link.

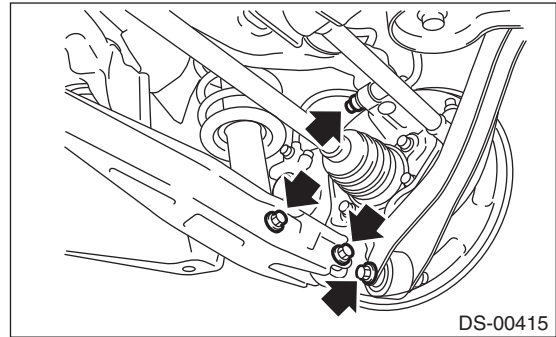


- (1) Snap pin
- (2) Nut

10) Separate the rear housing and ball joint using a puller.



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



12) Remove the rear axle.

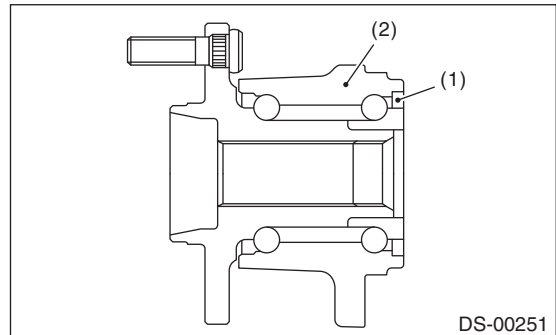
B: INSTALLATION

1) Temporarily tighten the rear housing to the upper arm.

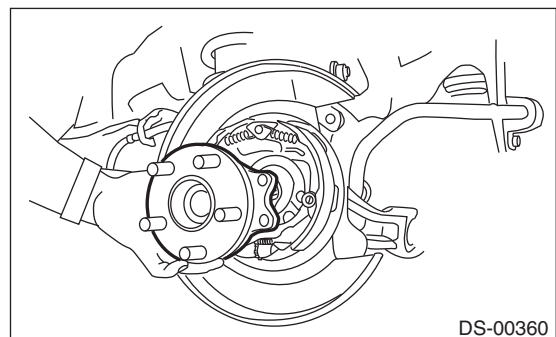
2) Align the hole of rear brake back plate, and temporarily tighten the rear hub unit bearing to the rear housing.

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) Install the rear drive shaft to the rear hub unit bearing.

4) Tighten the new axle nut temporarily.

CAUTION:

Use a new axle nut.

Rear Axle

DRIVE SHAFT SYSTEM

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

80 N·m (8.2 kgf-m, 59 ft-lb)

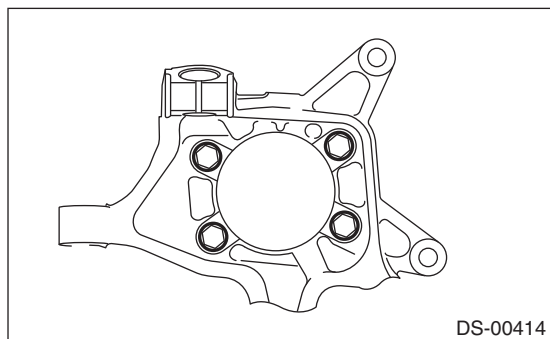
Trailing link

80 N·m (8.2 kgf-m, 59 ft-lb)

6) Tighten the rear hub unit bearing.

Tightening torque:

65 N·m (6.6 kgf-m, 47.9 ft-lb)



7) Install the rear disc rotor.

8) Install the rear disc brake.

Tightening torque:

66 N·m (6.7 kgf-m, 48.7 ft-lb)

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

Tightening torque:

Frame 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)

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

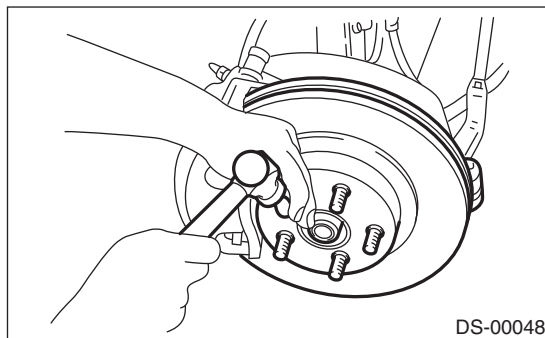
Tightening torque:

240 N·m (24.5 kgf-m, 177 ft-lb)

CAUTION:

Do not load the rear axle before tightening the axle nut. Doing so may damage the hub bearing.

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



12) Install the rear wheels.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

13) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Refer to "Rear Trailing Link" of "REAR SUSPENSION" for removal procedures of bushing.

<Ref. to RS-10, REAR HOUSING BUSHING, DISASSEMBLY, Rear Trailing Link.>

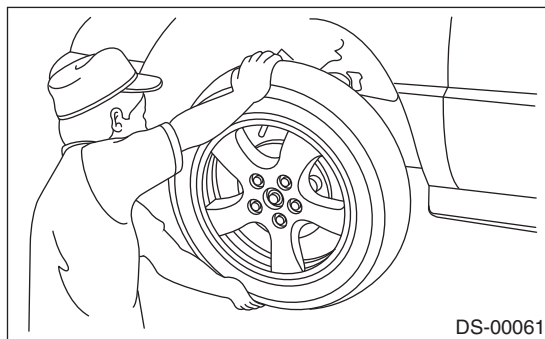
D: ASSEMBLY

Refer to "Rear Trailing Link" of "REAR SUSPENSION" for installation procedures of bushing.

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

E: INSPECTION

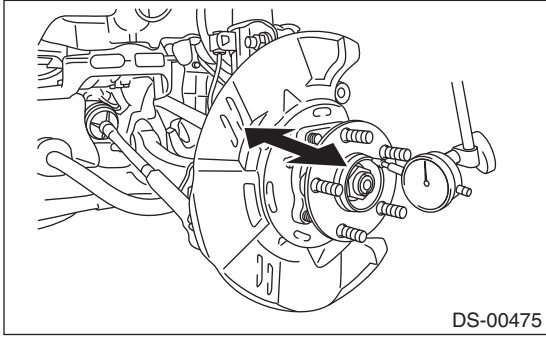
1) While moving the rear tire up and down by hand, check if there is no backlash in the bearing, and make sure the wheel rotates smoothly.



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

Service limit:

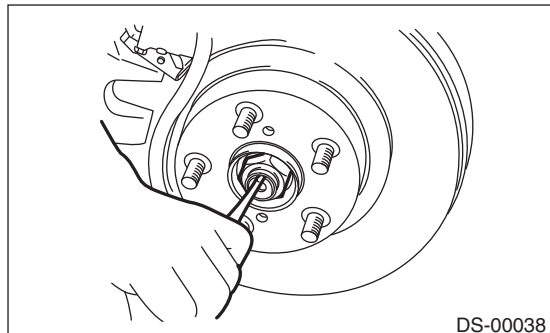
Maximum: 0.05 mm (0.0020 in)



6. Rear Hub Unit Bearing

A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Lift the crimped section of axle nut.

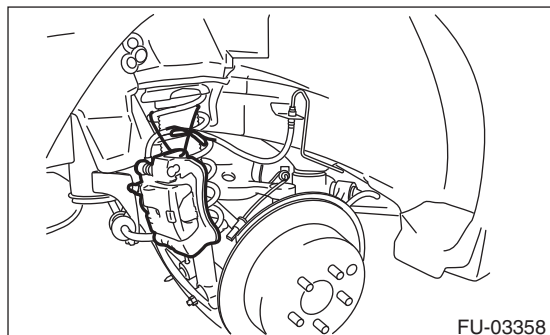


- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

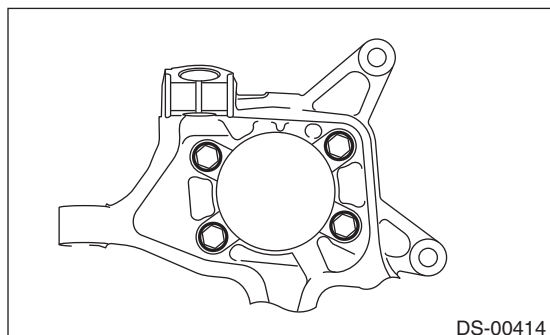
CAUTION:

Do not loosen the axle nut while the rear axle is loaded. Doing so may damage the hub bearing.

- 4) Remove the disc brake caliper from the rear housing, and suspend it from the vehicle using ropes.



- 5) Remove the rear disc rotor.
- 6) Remove four bolts from the rear housing.

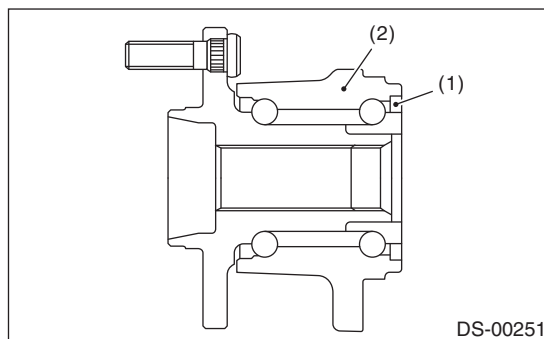


- 7) Remove the rear hub unit bearing.

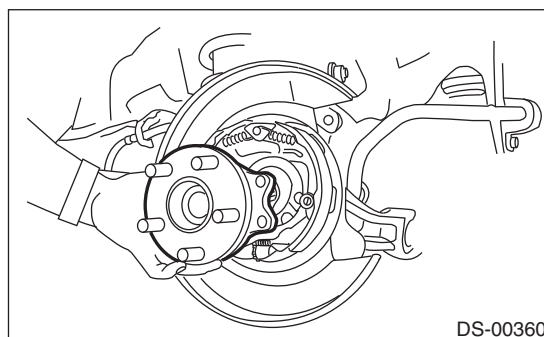
CAUTION:

- Be careful not to damage the magnetic encoder.

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



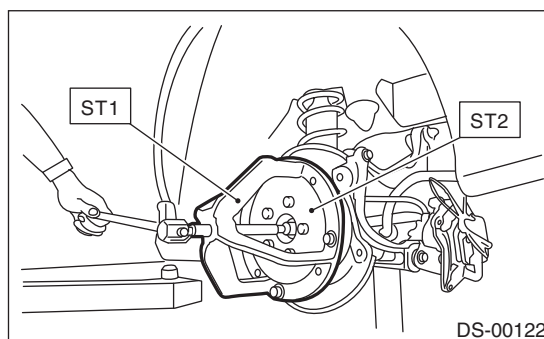
- (1) Magnetic encoder
- (2) Rear hub unit bearing



NOTE:

If it is hard to remove, use the ST.

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

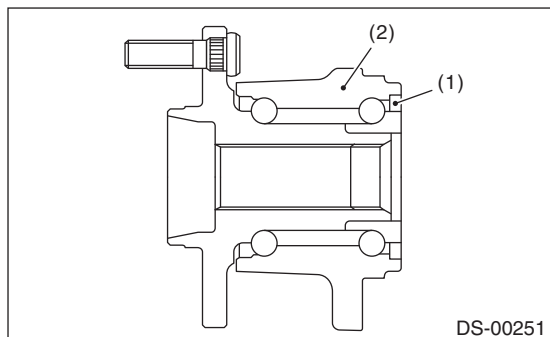


B: INSTALLATION

1) Align the hole of rear brake back plate, and 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.

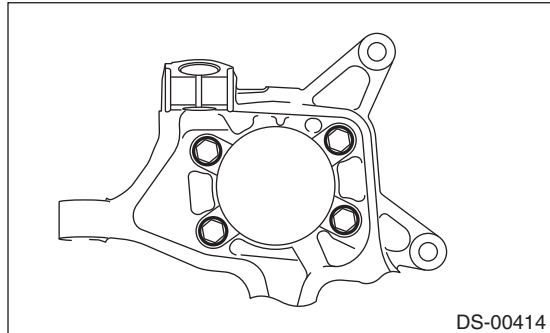


- (1) Magnetic encoder
(2) Rear hub unit bearing

2) Tighten the rear hub unit bearing.

Tightening torque:

65 N·m (6.6 kgf·m, 47.9 ft·lb)



3) Tighten the new axle nut temporarily.

CAUTION:

Use a new axle nut.

- 4) Install the rear disc rotor.
5) Install the disc brake.

Tightening torque:

66 N·m (6.7 kgf·m, 48.7 ft·lb)

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

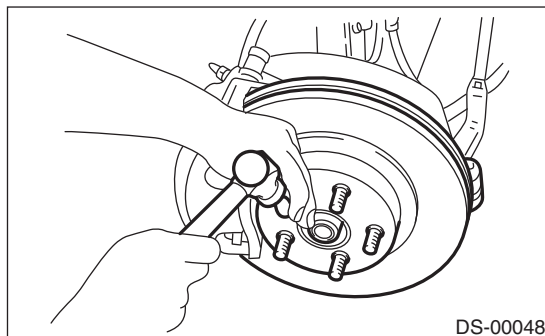
Tightening torque:

240 N·m (24.5 kgf·m, 177 ft·lb)

CAUTION:

Do not load the rear axle before tightening the axle nut. Doing so may damage the hub bearing.

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



8) Install the rear wheels.

Tightening torque:

120 N·m (12.2 kgf·m, 88.5 ft·lb)

C: DISASSEMBLY

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

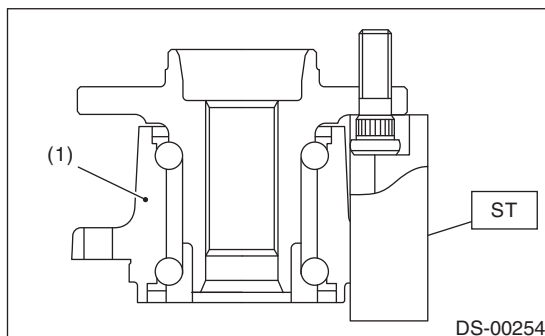
ST 28399AG000 HUB STAND

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.

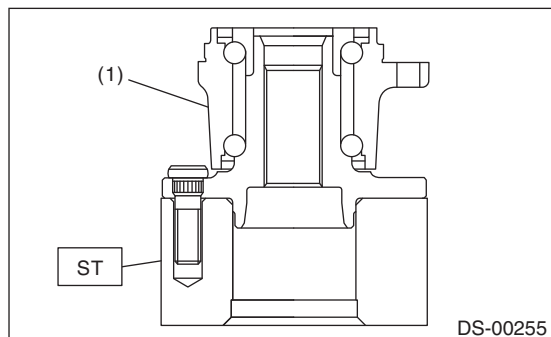


- (1) Rear hub unit bearing

D: ASSEMBLY

1) Attach the hub to the ST securely.

ST 927080000 HUB STAND



(1) Rear hub unit bearing

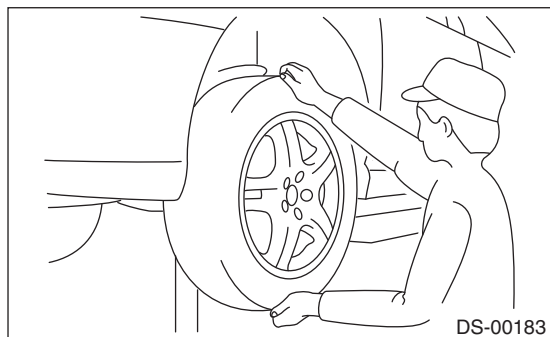
2) Using a press, press the new hub bolts until their seating surfaces contact the hub.

NOTE:

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

E: INSPECTION

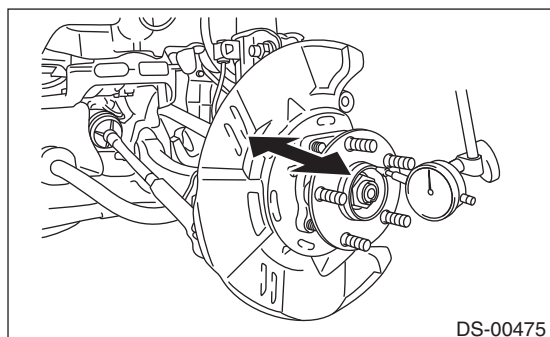
1) While moving the rear tire up and down by hand, check if there is no free play in the bearing, and make sure the wheel rotates smoothly.



2) Inspect the play in axial direction using a dial gauge. Replace the hub bearing if the play exceeds the limit.

Service limit:

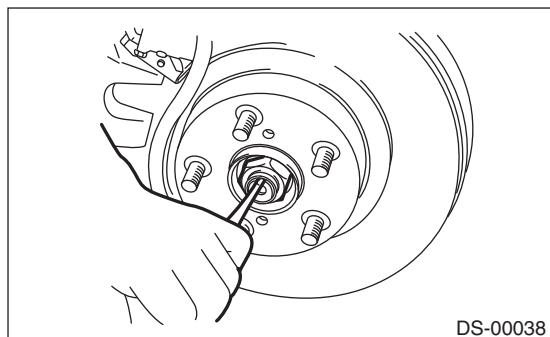
Maximum: 0.05 mm (0.0020 in)



7. Front Drive Shaft

A: REMOVAL

- 1) Lift up the vehicle, and remove the front wheels.
- 2) Lift the crimped section of axle nut.

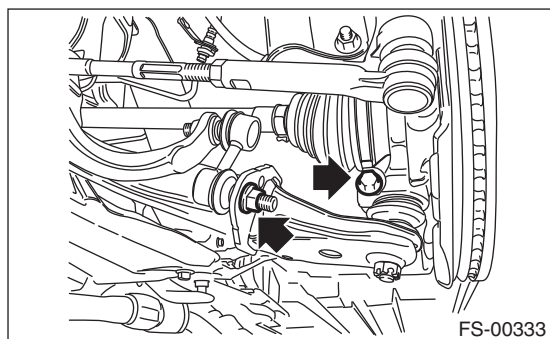


- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

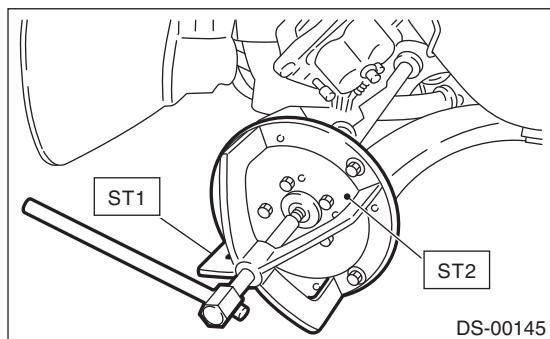
Do not loosen the axle nut while the front axle is loaded. Doing so may damage the hub bearing.

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



- 8) 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



- 9) 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.

6MT MODEL <Ref. to 6MT-35, REPLACEMENT, Differential Side Retainer Oil Seal.>

5AT model <Ref. to 5AT-49, REPLACEMENT, Differential Side Retainer Oil Seal.>

CVT model <Ref. to CVT-90, REPLACEMENT, Differential Side Retainer Oil Seal.>

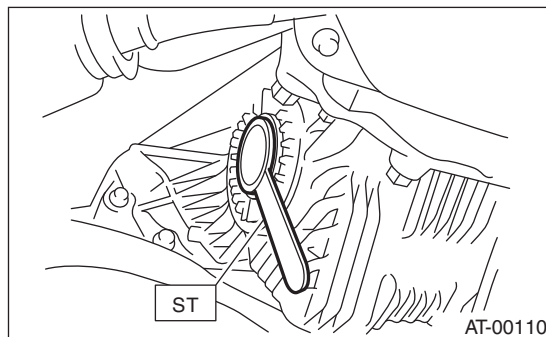
- 2) Insert the drive shaft into the hub spline, and pull in the drive shaft into specified position.

CAUTION:

Do not hammer drive shaft when installing it.

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

ST 28399SA010 OIL SEAL PROTECTOR



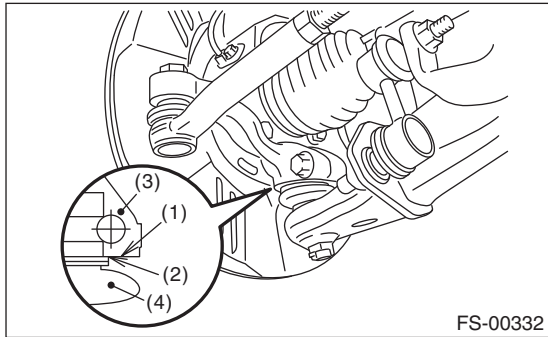
- 5) Connect the front arm ball joint to the housing.

Front Drive Shaft

DRIVE SHAFT SYSTEM

CAUTION:

Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.



- (1) Housing bottom
- (2) Raised section of ball joint
- (3) Housing
- (4) Ball joint

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

6) Install the stabilizer link.

CAUTION:

Use a new flange nut.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)

7) 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 load the front axle before tightening the axle nut. Doing so may damage the hub bearing.

8) After tightening axle nut, lock it securely.

9) Fill transmission gear oil. (MT model)

10) Fill differential gear oil. (AT and CVT models)

11) Install the front wheels.

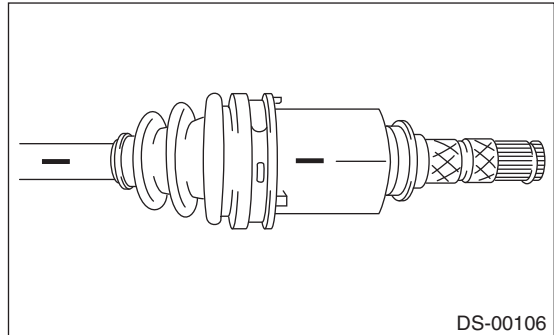
Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

12) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

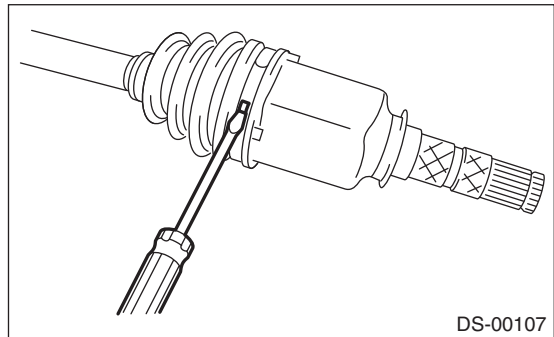
1) Place alignment marks on the shaft and outer race.



2) Remove the AAR boot band and boot.

CAUTION:

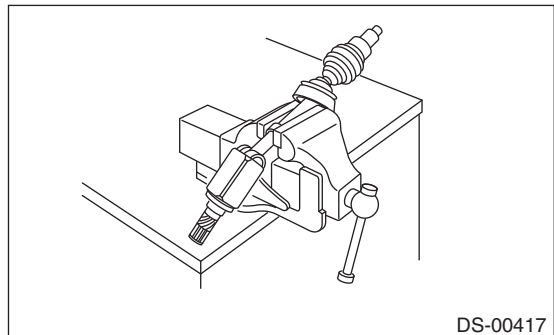
Be careful not to damage the boot.



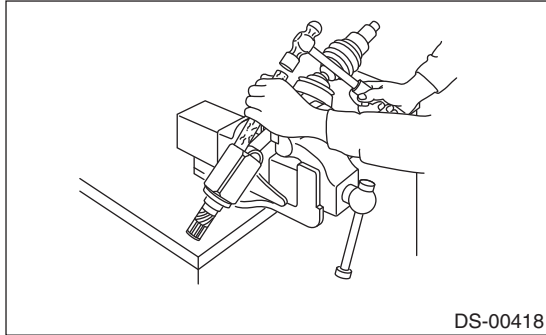
3) Place the drive shaft between wooden blocks etc, and secure it with a vise.

CAUTION:

Do not clamp the drive shaft directly with vise.

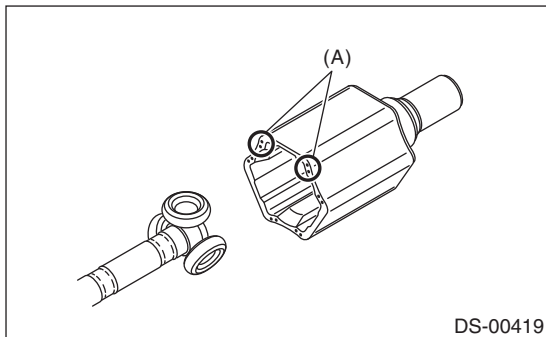


4) Tap the staked part of outer race one after the other using the plastic or wooden bar to remove the roller one by one.



CAUTION:

- Tap the staked part (A) of outer race.
- Do not use the metal rod because it may deform the outer race.
- Be careful not to damage the roller parts.



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

CAUTION:

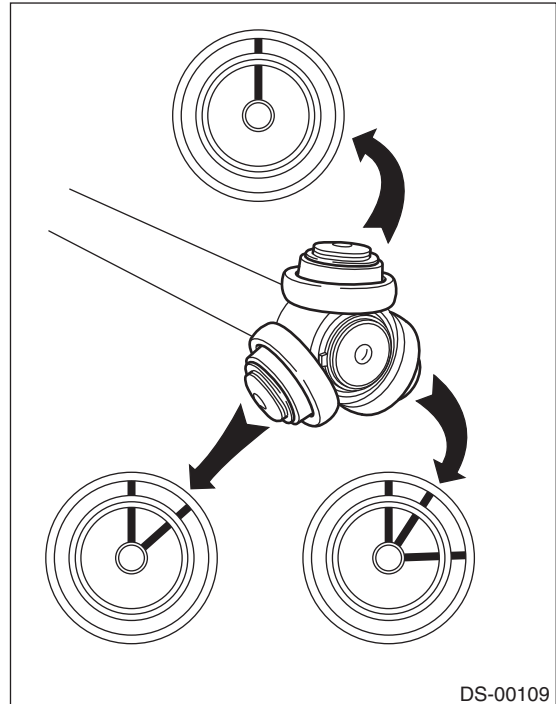
To prevent the outer race from dropping, have the work assistant to support the outer race when removing the 3rd roller.

6) Wipe off grease.

CAUTION:

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

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

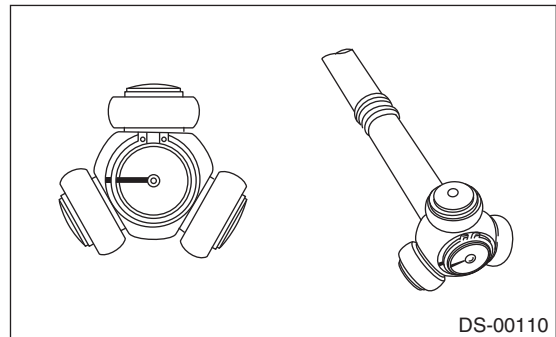


8) Remove the roller kit from trunnion.

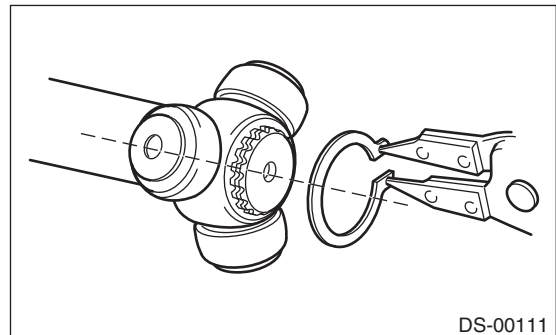
CAUTION:

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.

Front Drive Shaft

DRIVE SHAFT SYSTEM

NOTE:

Further disassembly of the drive shaft is impossible because the AC cannot be disassembled.

D: ASSEMBLY

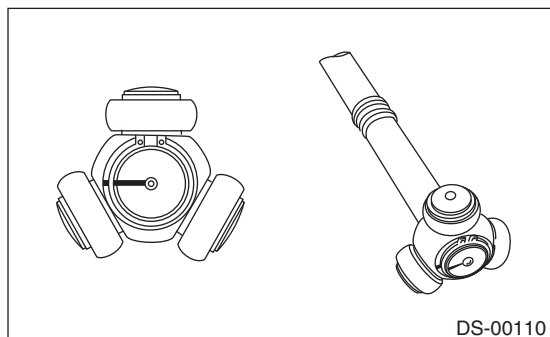
NOTE:

Use specified grease.

AAR side:

ONE LUBER (C)

- 1) Pass the AAR boot through the shaft.
- 2) Match alignment marks and install the trunnion onto the shaft, and securely install the snap ring to the shaft groove.



- 3) Fill 50 to 60 g (1.76 to 2.12 oz) of specified grease into the inner side of the AAR outer race.
- 4) Apply a thin coat of specified grease to the roller and trunnion.
- 5) Place the drive shaft between wooden blocks etc, and secure it with a vise.

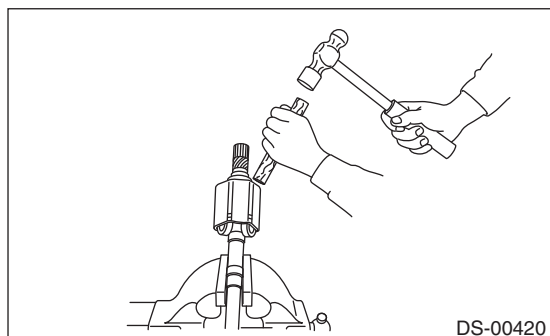
CAUTION:

Do not clamp the drive shaft directly with vise.

- 6) Match alignment marks of the shaft and outer race.
- 7) Tap the upper part of roller insertion on the outer race one after the other, using the plastic or wooden bar, to insert the roller one by one.

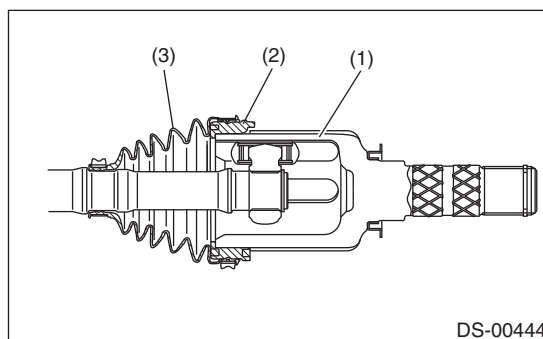
CAUTION:

- Do not use the metal rod because it may deform the outer race.
- Do not tap the outer race tip (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 and grommet taking care not to twist them.



- (1) Outer race
- (2) Grommet
- (3) Boot

CAUTION:

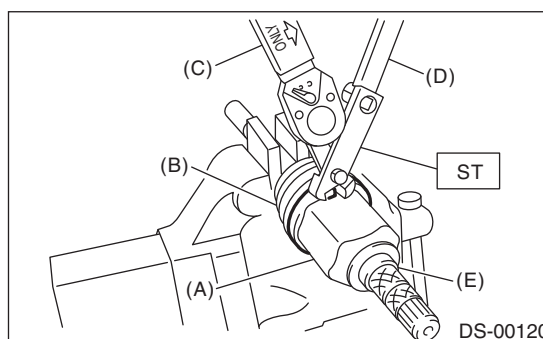
- Replace the boot and grommet as a set.
- Make sure the groove on the outer race side is free from grease.

- 10) Insert a flat tip screwdriver between the outer race and grommet so that the air pressure inside the boot is equal to the atmospheric pressure.

- 11) Install new large boot band and small boot band to the specified locations.

- 12) Tighten the boot band 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) Outer race

Clearance on the crimped section of boot band:

Large boot band

1 mm (0.04 in) or less

Small boot band

1 mm (0.04 in) or less

13) 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, correct 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.

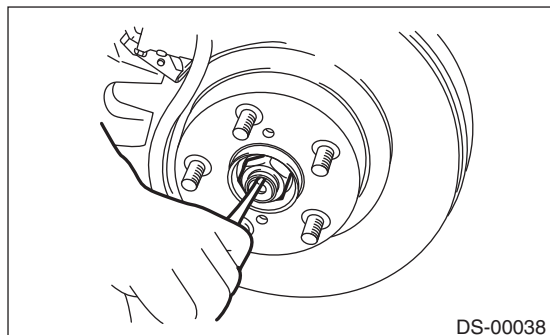
- Grease

Check for discoloration and fluidity.

8. Rear Drive Shaft

A: REMOVAL

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Lift the crimped section of axle nut.



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

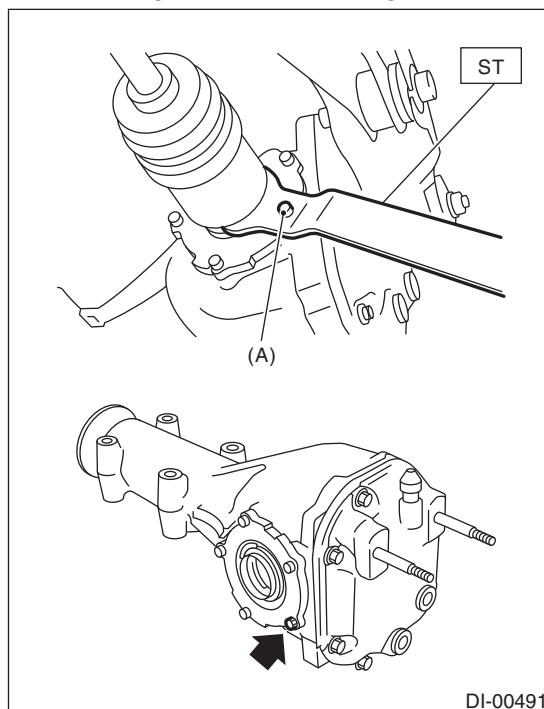
CAUTION:

Do not loosen the axle nut while the rear axle is loaded. Doing so may damage the hub bearing.

- 4) Drain differential gear oil.
 - 5) Remove the rear trailing link. <Ref. to RS-10, REMOVAL, Rear Trailing Link.>
 - 6) Remove the rear lateral link. <Ref. to RS-16, REMOVAL, Rear Lateral Link.>
 - 7) Remove the rear drive shaft from the rear differential using ST. (T-type)
- ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:

Attach the ST to the bolt as shown in the figure so as not to damage the side bearing retainer.

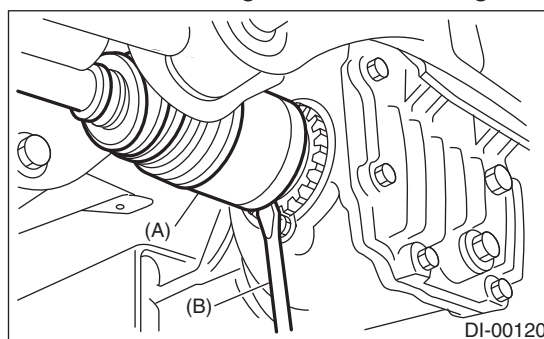


(A) BOLT

- 8) Remove the rear drive shaft from the rear differential. (VA-type)

NOTE:

Attach the tire lever to the bolt as shown in the figure so as not to damage the side bearing retainer.

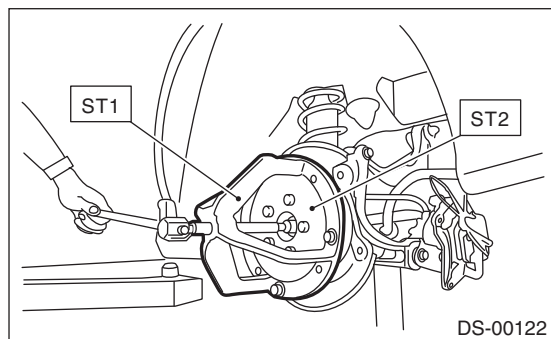


(A) Drive shaft

(B) Tire lever

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-74, REPLACEMENT, Rear Differential Side Oil Seal.>

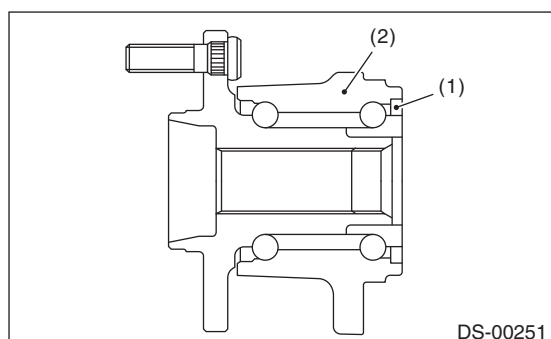
NOTE:

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

2) Insert the drive shaft into the rear hub spline, and pull the drive shaft into specified position.

CAUTION:

- Be careful not to damage the magnetic encoder.
- Do not get closer the tool which charged magnetism to magnetic encoder.
- Do not hammer drive shaft when installing it.

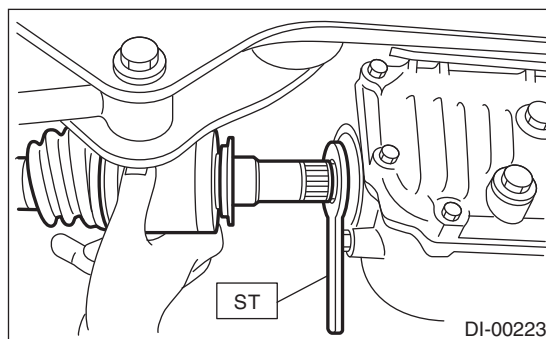


- (1) Magnetic encoder
(2) Rear hub unit bearing

3) Tighten the axle nut temporarily.

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

ST 28099PA090 OIL SEAL PROTECTOR



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

Tightening torque:

Stabilizer link

33 N·m (3.4 kgf-m, 24.3 ft-lb)

Shock absorber

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Rear lateral link

80 N·m (8.2 kgf-m, 59 ft-lb)

Trailing link to Rear sub frame

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Trailing link to Rear housing

80 N·m (8.2 kgf-m, 59 ft-lb)

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

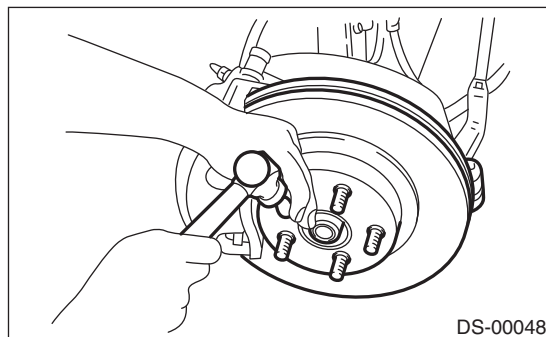
Tightening torque:

240 N·m (24.5 kgf-m, 177 ft-lb)

CAUTION:

Do not load the rear axle before tightening the axle nut. Doing so may damage the hub bearing.

7) Lock the axle nut securely.



8) Fill differential gear oil.

9) Install the rear wheels.

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

10) Inspect the wheel alignment and adjust if necessary.

Rear Drive Shaft

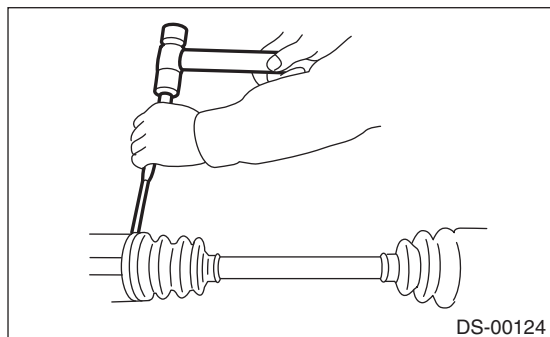
DRIVE SHAFT SYSTEM

C: DISASSEMBLY

1) Loosen the boot band at the large end of DOJ boot using the flat tip screwdriver or pliers.

CAUTION:

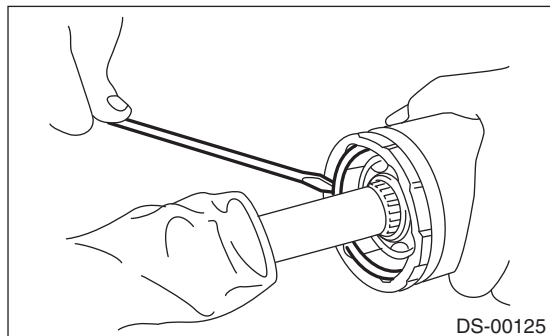
Be careful not to damage the boot.



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 screwdriver.



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

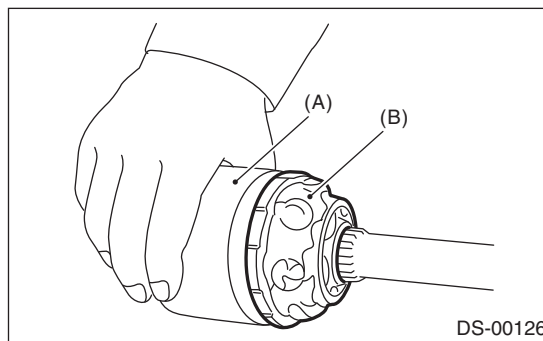
6) Wipe off the grease and take out the ball bearings.

CAUTION:

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

NOTE:

Disassemble while taking care not to lose balls.



(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 BJ boot or EBJ boot in the same procedure as the DOJ boot.

NOTE:

Further disassembly of the drive shaft is impossible because the BJ and EBJ cannot be disassembled.

D: ASSEMBLY

CAUTION:

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

NOTE:

Use specified grease.

BJ, EBJ side:

NKG106

DOJ side:

NKG205

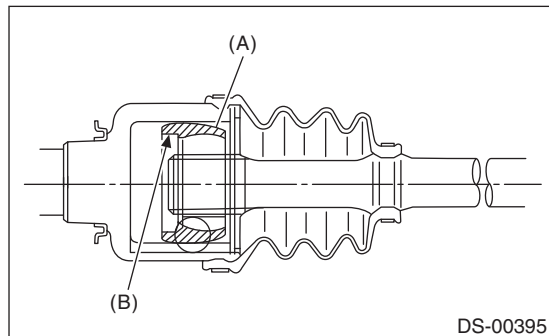
1) Install the BJ or EBJ boot in specified position, and fill it with 50 to 60 g (1.76 to 2.12 oz.) of specified grease.

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.

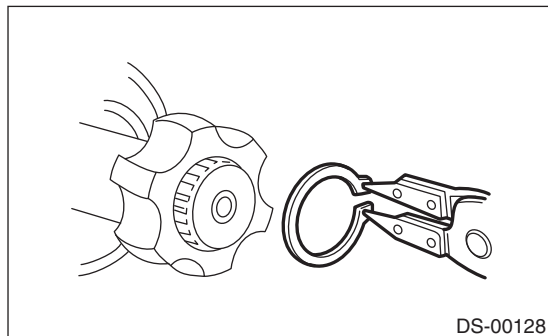


(A) Cage
(B) Cutout portion

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

NOTE:

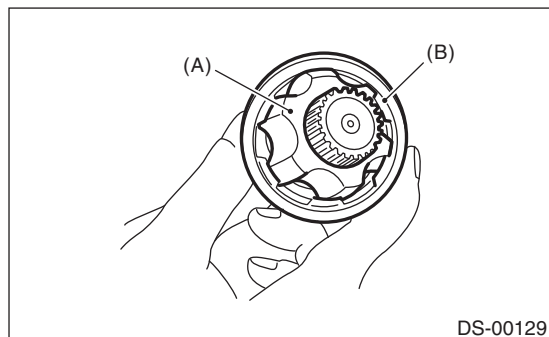
Confirm that the snap ring is completely fitted in the shaft groove.



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.



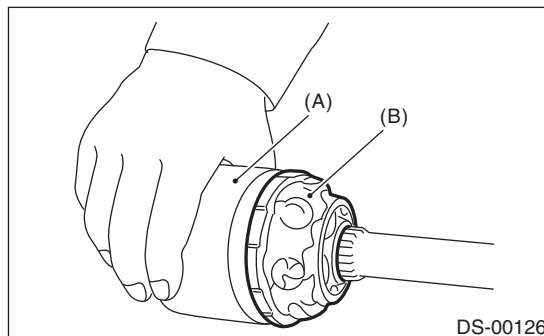
(A) Inner race
(B) Cage

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 balls.

8) Insert balls 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.

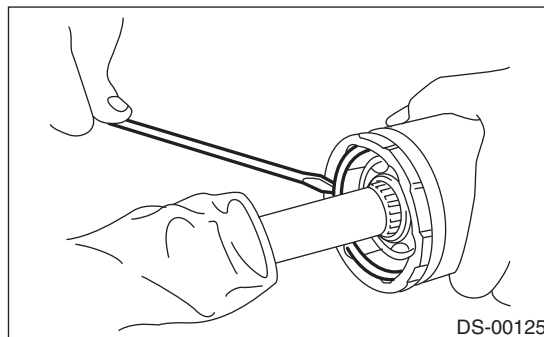


(A) Outer race
(B) Grease

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.

NOTE:

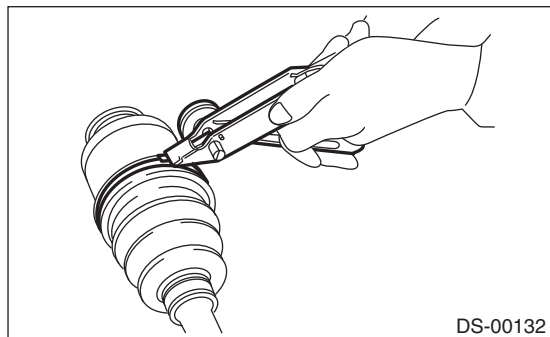
When tightening boot, use care so that the air within the boot is appropriate.

15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

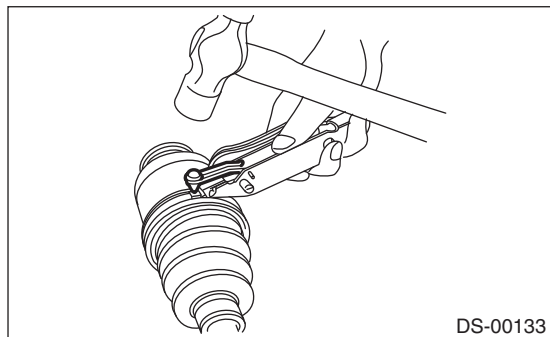


16) Tap the clip with the punch provided at the end of the ST.

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 BJ boot or EBJ boot in the same procedure as a 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.

- BJ (Bell Joint)

Check for seizure, corrosion, damage and excessive play.

- 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-11, 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 balancing. <Ref. to WT-4, WHEEL BALANCING, INSPECTION, Tire and Wheel.>
	Front wheel alignment	Check the front wheels alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheels alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front struts. <Ref. to FS-27, 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 bearings. <Ref. to DS-17, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearings. <Ref. to DS-24, INSPECTION, Rear Hub Unit Bearing.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balancing. <Ref. to WT-4, WHEEL BALANCING, INSPECTION, Tire and Wheel.>
	Front wheel alignment	Check the front wheels alignment. <Ref. to FS-8, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheels alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front struts. <Ref. to FS-27, 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

General Description

VEHICLE DYNAMICS CONTROL (VDC)

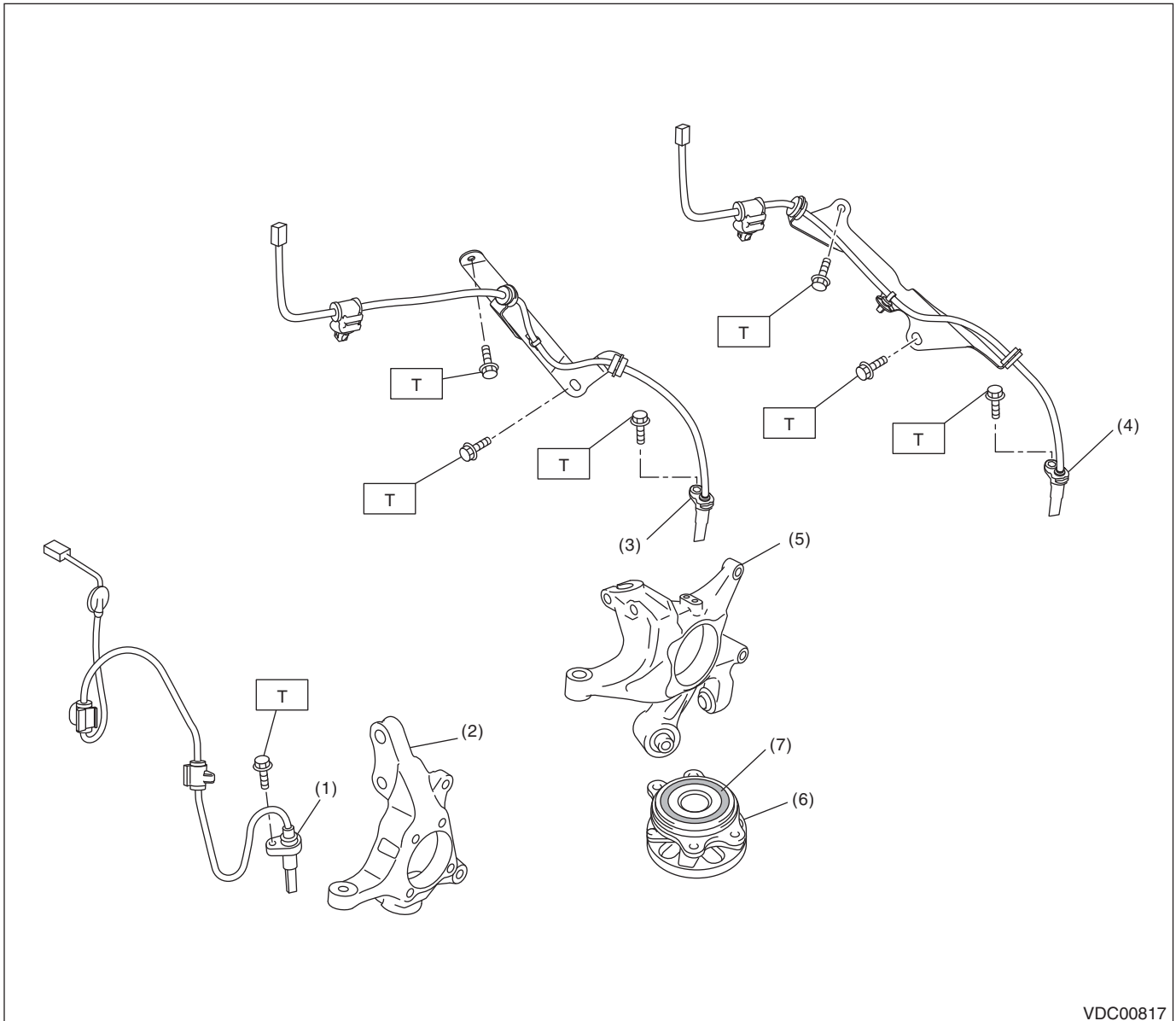
1. General Description

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		0.64 — 1.56 mm (0.025 — 0.061 in)	
	Front	(Except for OBK model)	S1 (Pink)		
		OBK model	S2 (Blue)		
	Rear	RH (Except for OBK model)	S3 (Yellow)		
		LH (Except for OBK model)	S4 (White)		
		RH (OBK model)	S5 (Red)		
		RH (OBK model)	S6 (Light green)		
VDCCM&H/U Identification				V1	

B: COMPONENT

1. ABS WHEEL SPEED SENSOR



VDC00817

- | | |
|---|----------------------|
| (1) Front ABS wheel speed sensor | (5) Rear housing |
| (2) Front housing | (6) Hub unit bearing |
| (3) Rear ABS wheel speed sensor
(except for OBK model) | (7) Magnetic encoder |
| (4) Rear ABS wheel speed sensor
(OBK model) | |

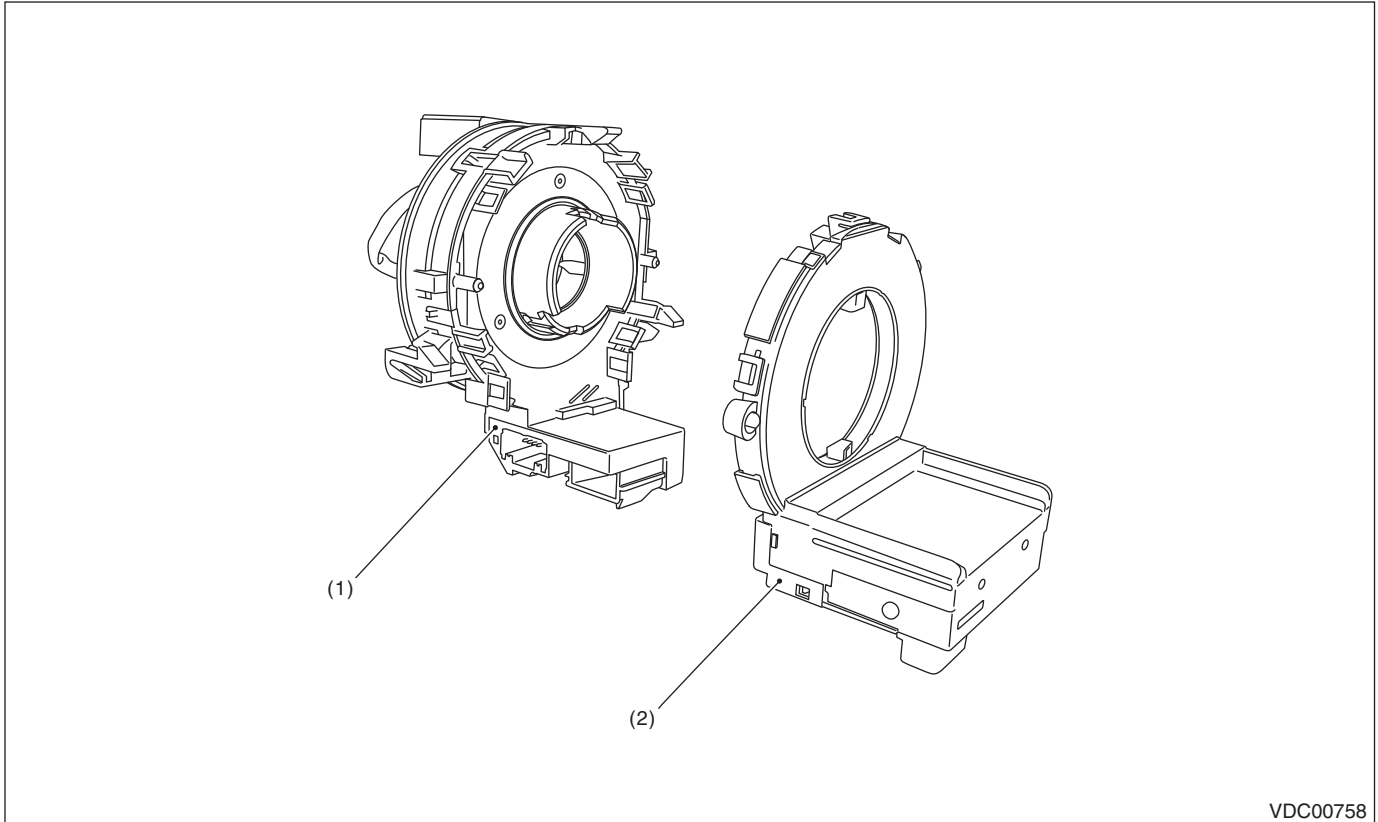
Tightening torque: N·m (kgf-m, ft-lb)

T: 7.5 (0.76, 5.5)

General Description

VEHICLE DYNAMICS CONTROL (VDC)

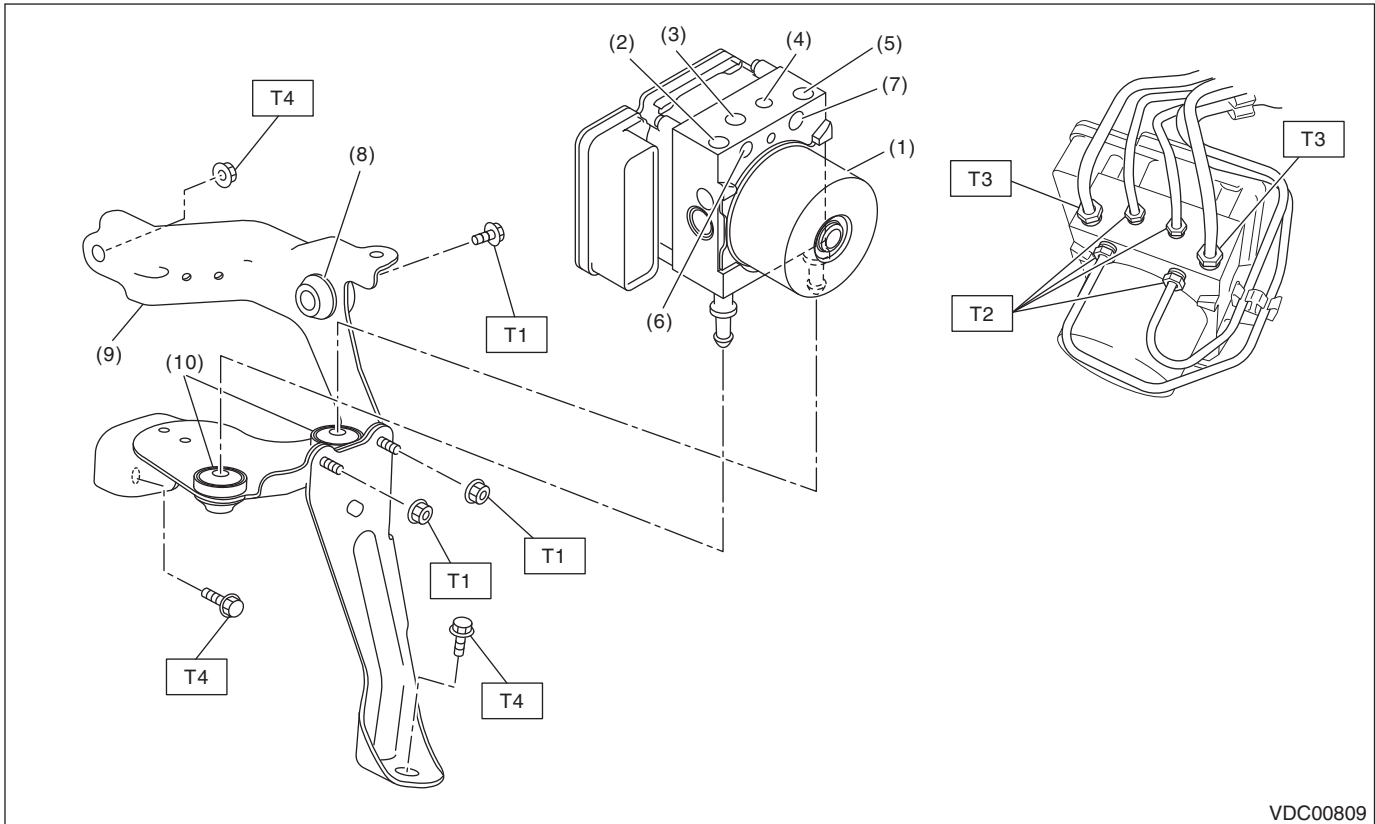
2. STEERING ANGLE SENSOR



- (1) Steering roll connector
- (2) Steering angle sensor

VDC00758

3. VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U)



VDC00809

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

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 15 (1.5, 11.1)

T3: 19 (1.9, 14)

T4: 33 (3.4, 24.3)

General Description

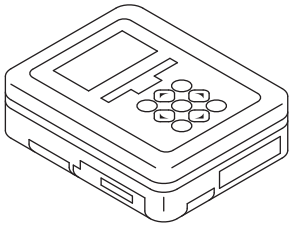
VEHICLE DYNAMICS CONTROL (VDC)

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 the battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for setting of each function and troubleshooting for 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.

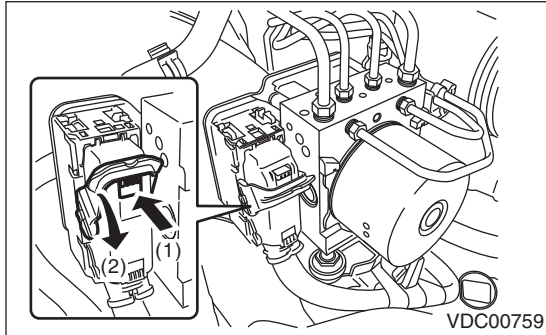
2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove any dirt from around the VDCCM&H/U.
- 3) Release the lock (1), pull down the lock lever (2) and disconnect the VDCCM&H/U connector.

CAUTION:

Do not pull on the harness when disconnecting the connector.

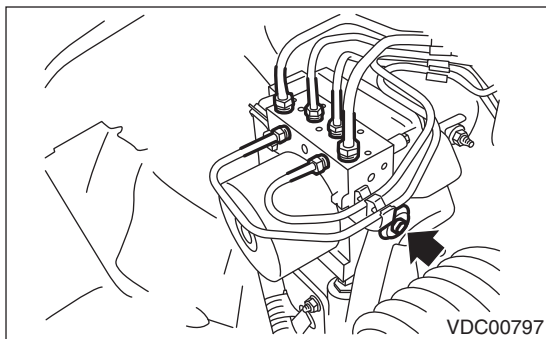


- 4) Disconnect the brake pipes from the VDCCM&H/U.
- 5) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

CAUTION:

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

- 6) Remove the bolt, and then 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.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

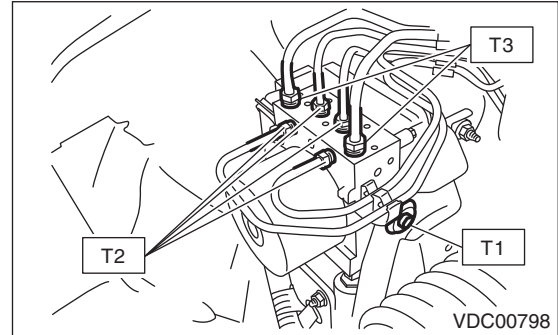
When installing the VDCCM&H/U to the bracket, make sure that there is no oil adhered to the threads of VDCCM&H/U. If the oil is adhered, degrease it carefully before tightening.

Tightening torque:

T1: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

T2: 15 N·m (1.5 kgf-m, 11.1 ft-lb)

T3: 19 N·m (1.9 kgf-m, 14 ft-lb)



- 2) Connect the VDCCM&H/U connector.
- 3) Lift the lock lever to securely lock the connector.
- 4) Bleed air from the brake system.
- 5) Check the parameter to confirm that the applied model and grade of the target vehicle are included. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>
- 6) 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 has been replaced with a new part, be sure to perform parameter selection and registration.
 - Parameter selection and registration operation requires the Subaru Select Monitor.
 - When no data is registered, ABS/EBD/VDC warning light illuminates and the DTC "Parameter selection error" is detected.
- 7) Perform "Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point". <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

VEHICLE DYNAMICS CONTROL (VDC)

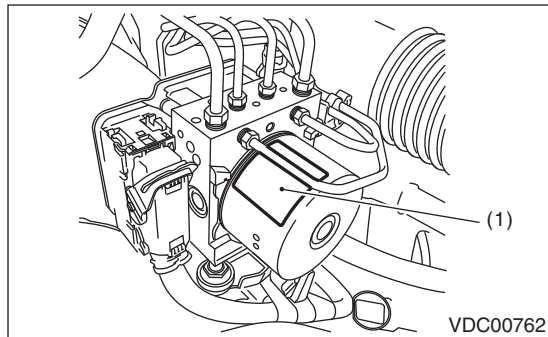
8) Perform "Longitudinal G sensor & lateral G sensor 0 point setting mode". <Ref. to VDC-11, LONGITUDINAL G SENSOR & LATERAL G SENSOR 0 POINT SETTING MODE, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

C: INSPECTION

1) Check the condition of connection and settlement of connector.

2) Check the identification label of the VDCCM&H/U.

Refer to "SPECIFICATION" for identification label. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Identification label

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.

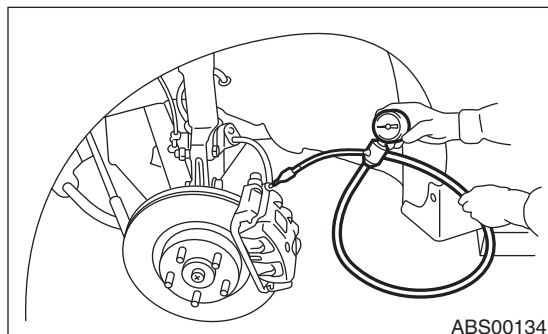
3) Connect two pressure gauges to FL and FR caliper bodies.

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-12, 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-12, 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.

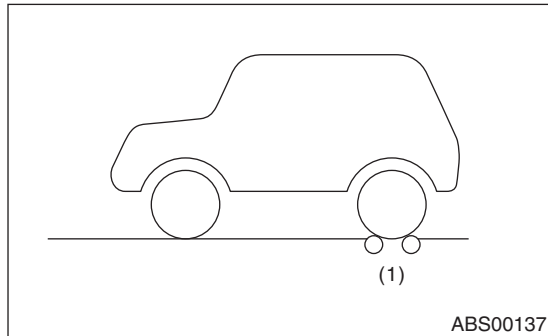
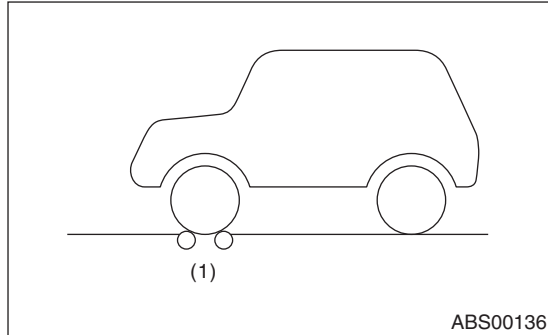
17) Disconnect the pressure gauge from the RL and RR caliper bodies.

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 for ABS sequence control operation. <Ref. to VDC-12, 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-12, 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

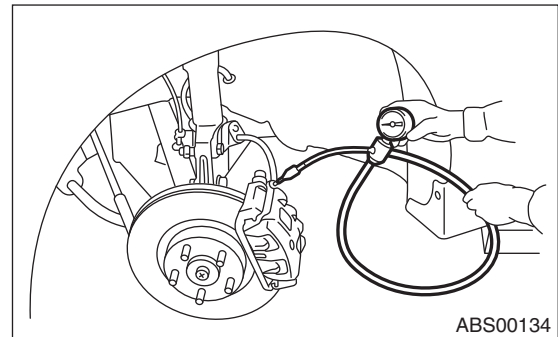
- 1) Lift up the vehicle, and remove the wheels.
- 2) Remove the air bleeder screws from FL and FR caliper bodies.
- 3) Connect two pressure gauges to FL and FR caliper bodies.

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-15, 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.
- 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.

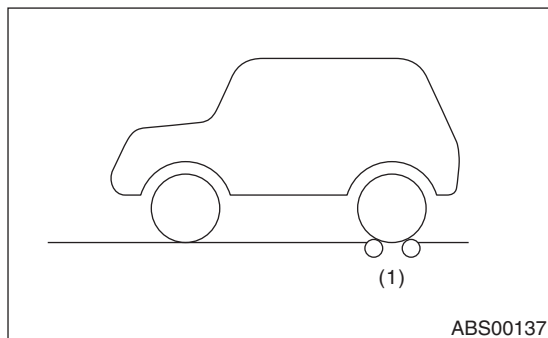
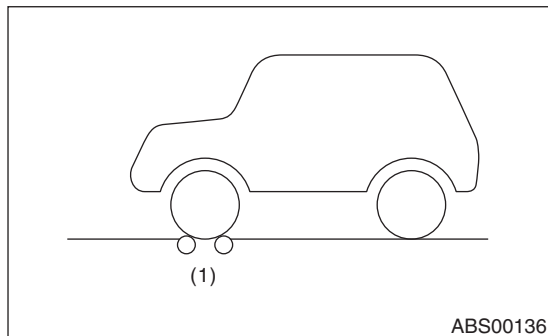
VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

VEHICLE DYNAMICS CONTROL (VDC)

- 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-15, 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 be measured on free rollers.
- 2) Prepare to operate the VDC sequence control. <Ref. to VDC-15, VDC 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 VDC sequence control. <Ref. to VDC-15, 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: ADJUSTMENT

1. SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT

Perform this mode after installing, replacing or adjusting the following parts.

- Steering angle sensor
- Steering wheel
- Suspension parts
- Wheel alignment
- VDCCM&H/U
- VDCCM&H/U bracket

- 1) Set the steering wheel to the neutral position.
- 2) Connect the Subaru Select Monitor.
- 3) On the «Main Menu» display, select {Each System Check}.
- 4) On the «System Selection Menu» display, select {Brake Control System}.
- 5) When {VDC} is displayed, select the [OK] button.
- 6) On the «Brake Control Diagnosis» display, select {Current Data Display & Save}.
- 7) Read {Steering angle sensor value}.
- 8) Check that the displayed value is between - 10 and 10 deg.
- 9) On the «Function Check Sequence» display, select {Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point}.
- 10) Drive the vehicle for 10 minutes, and check that there is no system malfunction or the warning light illumination while driving.
- 11) Make sure that the DTC is not stored.

2. LONGITUDINAL G SENSOR & LATERAL G SENSOR 0 POINT SETTING MODE

Perform this mode after installing or replacing the following parts.

- Suspension parts
- VDCCM&H/U
- VDCCM&H/U bracket

- 1) Park the vehicle on a level surface with all wheels aligned straight.
- 2) Connect the Subaru Select Monitor.
- 3) On the «Main Menu» display, select {Each System Check}.
- 4) On the «System Selection Menu» display, select {Brake Control System}.
- 5) When {VDC} is displayed, select the [OK] button.
- 6) On the «Brake Control Diagnosis» display, select {Current Data Display & Save}.
- 7) Read {Longitudinal G sensor output} and {Lateral G sensor Output}.
- 8) Check that the displayed value is between -2 and 2 m/s^2 .
- 9) On the «Function Check Sequence» display, select {Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point}.
- 10) Drive the vehicle for 10 minutes, and check that there is no system malfunction or the warning light illumination while driving.
- 11) Make sure that the DTC is not stored.

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.

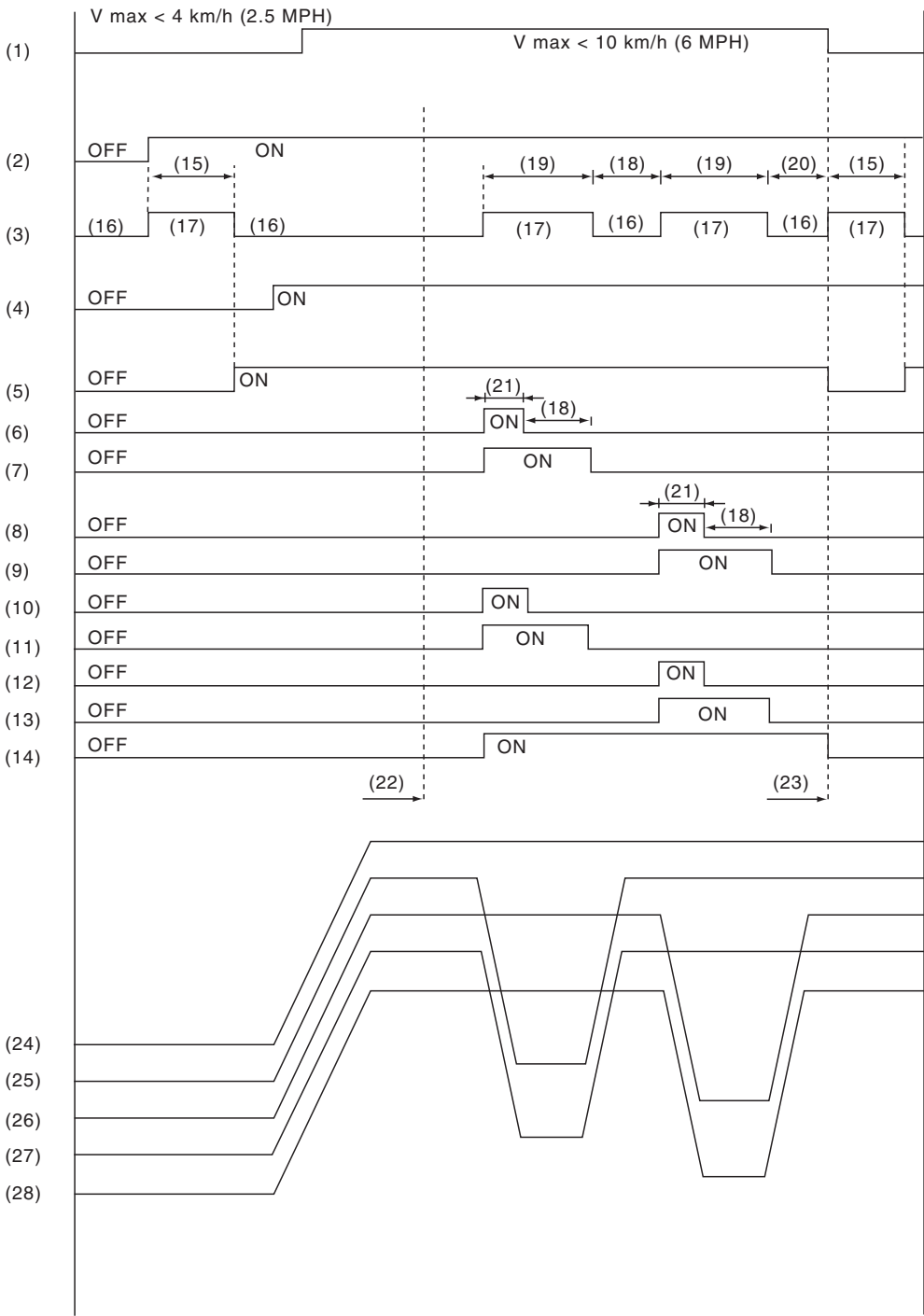
1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

In the event of any trouble, the ABS sequence control will not operate.

- 1) Connect the Subaru Select Monitor.
- 2) Follow the procedures displayed in the Subaru Select Monitor to execute the following.
 - (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).
- 3) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



VDC00799

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) 2 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 from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

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

- When the speed of at least one wheel reaches 10 km/h (6 MPH).
- When the brake pedal is released during ABS sequence control and the stop light switch becomes OFF.
- After completion of ABS sequence control.
- 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:

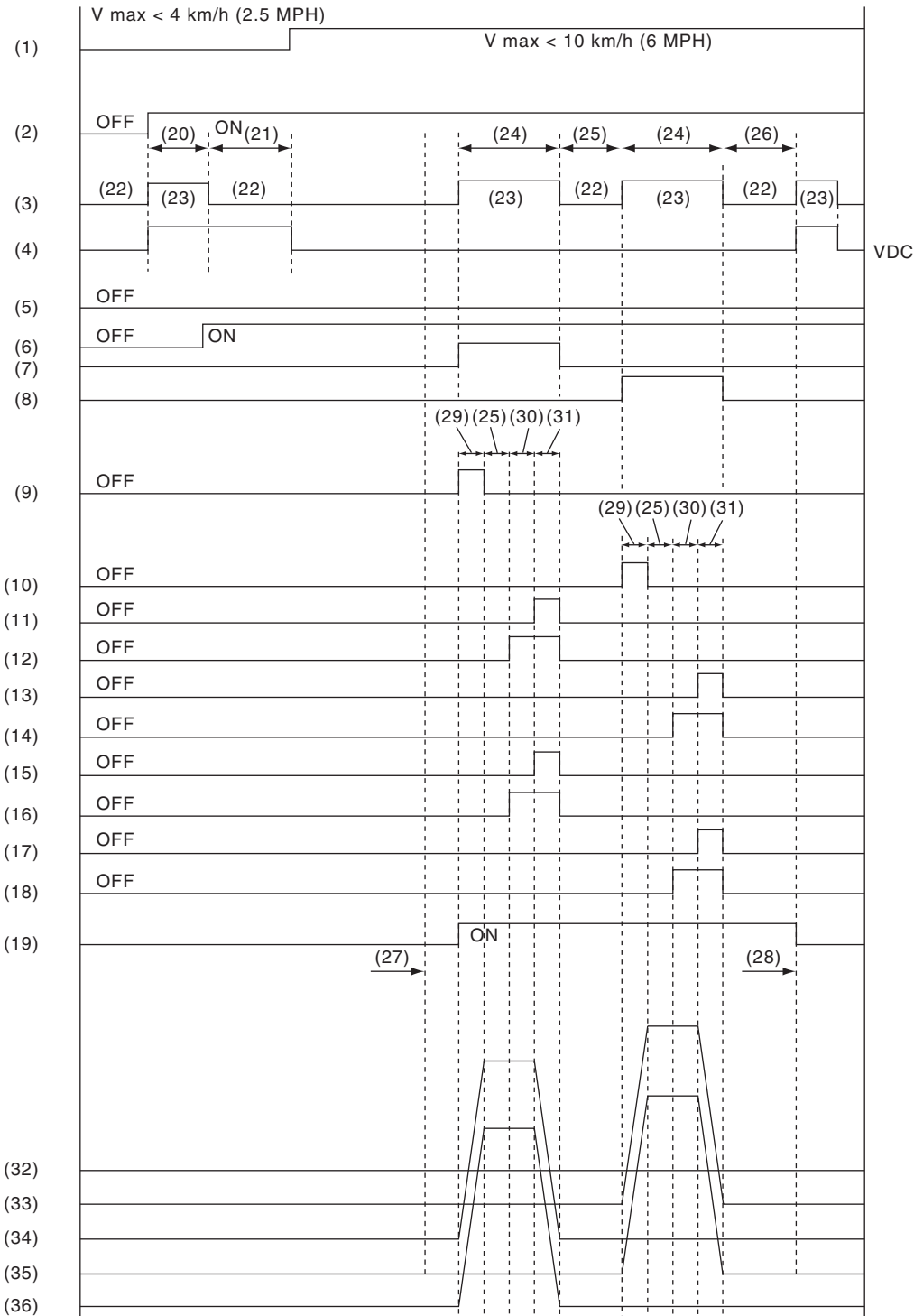
In the event of any trouble, sequence control will not operate.

- 1) Connect the Subaru Select Monitor.
- 2) Operate according to the procedures displayed in the Subaru Select Monitor.
- 3) Operation points will be displayed on Subaru Select Monitor.

VDC Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00800

(1) All wheel speed	(13) FR decompression valve	(25) 1 second
(2) Ignition key	(14) FR compression valve	(26) 1.6 seconds
(3) ABS warning light	(15) RR decompression valve	(27) Point A
(4) VDC warning light	(16) RR compression valve	(28) Reset
(5) Stop light switch	(17) RL decompression valve	(29) 0.8 seconds
(6) Valve relay	(18) RL compression valve	(30) 1.2 seconds
(7) VDC switching valve 1 FL	(19) Pump motor	(31) 0.4 seconds
(8) VDC switching valve 1 FR	(20) 2 seconds	(32) Master cylinder pressure
(9) VDC switching valve 2 FL	(21) Approx. 1 second	(33) FR wheel cylinder pressure
(10) VDC switching valve 2 FR	(22) Light OFF	(34) FL wheel cylinder pressure
(11) FL decompression valve	(23) Light ON	(35) RL wheel cylinder pressure
(12) FL compression valve	(24) 3.4 seconds	(36) RR wheel cylinder pressure

NOTE:

The control operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

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

- When the speed of at least one wheel reaches 10 km/h (6 MPH).
- After completion of VDC sequence control.
- When a malfunction is detected.

Yaw Rate and G Sensor

VEHICLE DYNAMICS CONTROL (VDC)

5. Yaw Rate and G Sensor

A: NOTE

Yaw rate & longitudinal G and lateral G sensor are integrated with the VDC control module.

B: INSPECTION

1. YAW RATE & LONGITUDINAL G AND LATERAL G SENSOR SIGNAL

Step	Check	Yes	No
1 CHECK YAW RATE & G SENSOR. 1) Select "Current Data Display & Save" on the Subaru Select Monitor. 2) Read the output of yaw rate & G sensor.	When the vehicle is placed horizontally, are the displayed values $-1.5 \text{ — } 1.5 \text{ m/s}^2$ for longitudinal G and lateral G sensor, and $-4 \text{ — } 4 \text{ deg/s}$ for yaw rate sensor?	Go to step 2.	Replace the VDCCM.
2 DRIVING INSPECTION. Drive for approximately 10 minutes, and check that there is no system malfunction or the warning light illumination while driving.	Is there any abnormal movement or the warning light illumination while driving?	Perform the diagnosis according to DTCs for the VDC system. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	G sensor is normal.

6. Steering Angle Sensor

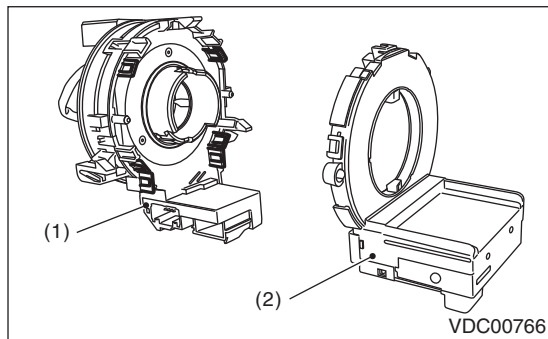
A: REPLACEMENT

- 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-31, REMOVAL, Driver's Airbag Module.>

CAUTION:

Always refer to "Airbag System" before performing the service operation. <Ref. to AB-9, CAUTION, General Description.>

- 4) Remove the roll connector. <Ref. to AB-89, REMOVAL, Roll Connector.>
- 5) Disengage tabs, and remove the steering angle sensor from the roll connector.

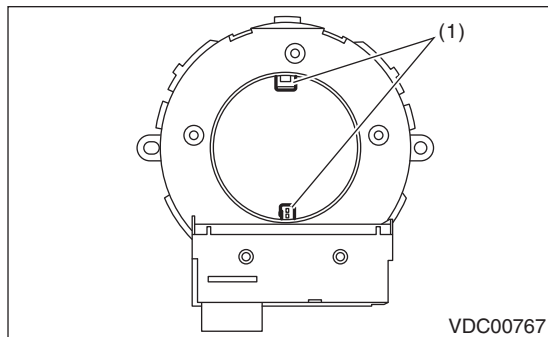


- (1) Steering roll connector
- (2) Steering angle sensor

- 6) Remove the clip attached to the protrusion of new steering angle sensor.

CAUTION:

Do not rotate the steering angle sensor protrusion.



- (1) Protrusion portion

- 7) Align the center of roll connector. <Ref. to AB-91, INSTALLATION, Roll Connector.>
- 8) Align the position of the protrusion and install roll connector to steering angle sensor.
- 9) Install the roll connector. <Ref. to AB-91, INSTALLATION, Roll Connector.>

- 10) After installation, perform the neutral position setting of the steering angle sensor. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

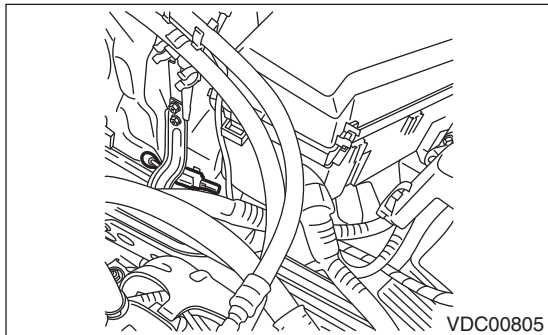
Front ABS Wheel Speed Sensor

VEHICLE DYNAMICS CONTROL (VDC)

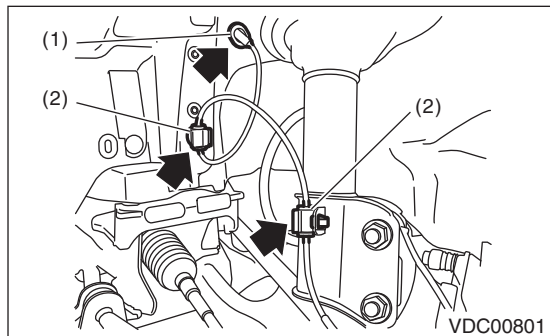
7. Front ABS Wheel Speed Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the ABS wheel speed sensor connector in the engine compartment.



- 3) Remove the sensor harness clip and the grommet.

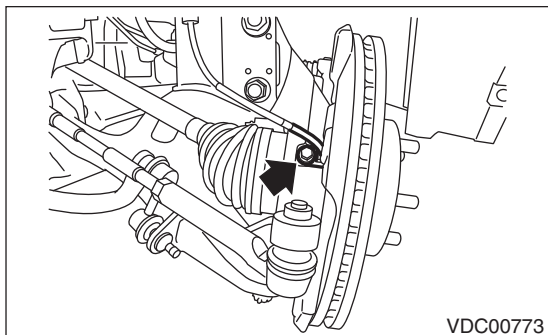


- (1) Grommet
(2) Sensor harness clip

- 4) 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)

CAUTION:

Be careful not to damage the sensor.

NOTE:

- Check the identification (mark) on the harness to make sure there is no warpage. <Ref. to VDC-2, SPECIFICATION, General Description.>
- Check if the harness is not pulled and does not come in contact with the suspension or body while operating the steering.

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-20, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

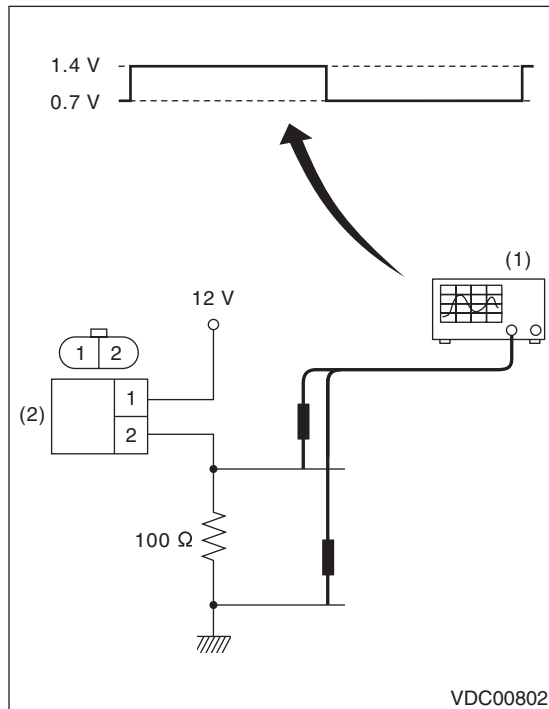
2. ABS WHEEL SPEED SENSOR

- 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.

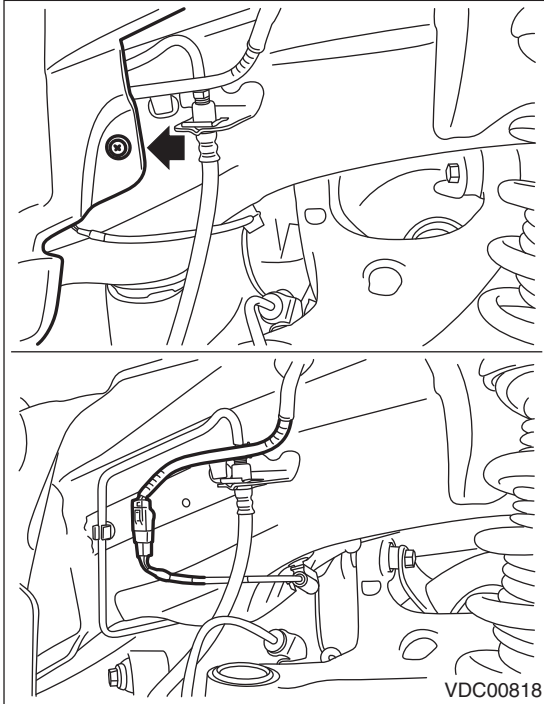
Rear ABS Wheel Speed Sensor

VEHICLE DYNAMICS CONTROL (VDC)

8. Rear ABS Wheel Speed Sensor

A: REMOVAL

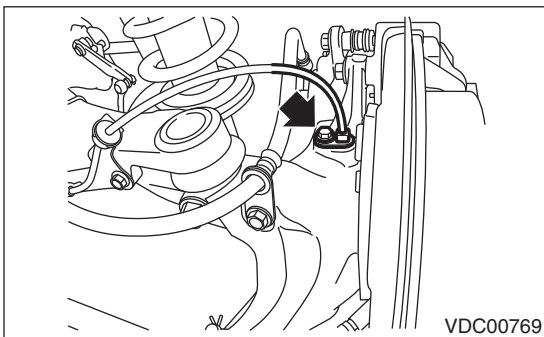
- 1) Disconnect the ground cable from battery.
- 2) Remove the clips, turn over the mud guard, and disconnect the rear ABS wheel speed sensor connector.



- 3) Remove the rear ABS wheel speed sensor from the rear housing.

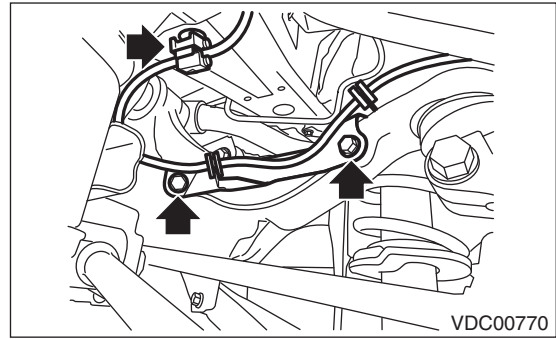
CAUTION:

- Be careful not to damage the sensor.
- Do not apply excessive force to the sensor harness.



- 4) Remove the sensor harness clip.

- 5) Remove the sensor harness bracket from the upper arm.



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

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

<Ref. to VDC-20, 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-16, 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-22, 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-23, 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.

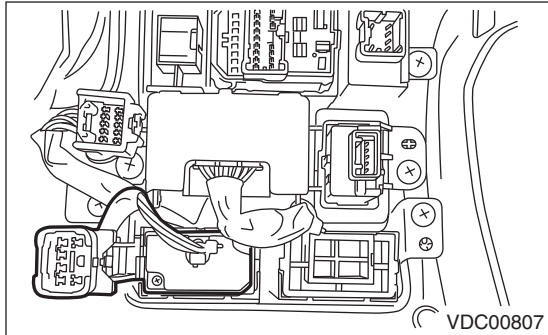
NOTE:

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 VDC OFF switch.



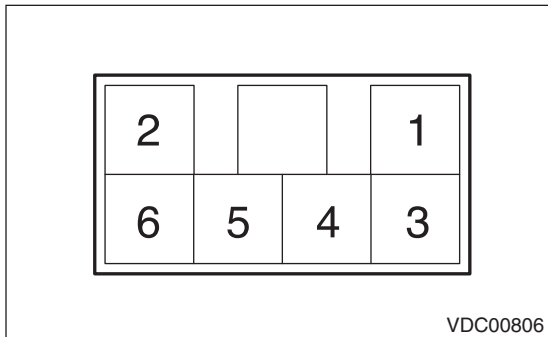
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between the VDC OFF switch terminals.

Switch position	Terminal No.	Specification
OFF	1 — 3	1 M Ω or more
ON	1 — 3	Less than 1 Ω



If it exceeds the standard, replace the VDC OFF switch.

VDC OFF Switch

VEHICLE DYNAMICS CONTROL (VDC)

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)-89, 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 & VDC indicator light, VDC OFF indicator light and ABS warning light go off after starting the engine?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-30, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC OFF INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

Basic Diagnostic Procedure

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
4 CHECK INFORMATION STORED IN FREEZE FRAME DATA. Using the Subaru Select Monitor, check the freeze frame data of VDC control module.	Are freeze frame data recorded?	Record the freeze frame data. Go to step 5.	Go to step 5.
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)-35, 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 comes on.	☐ 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 operating other electrical parts		
	• Part name: • Operating condition:		

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. STATE OF VDC WARNING LIGHT & VDC INDICATOR LIGHT

VDC warning light & VDC indicator 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 operating other electrical parts			
• Part name: • Operating condition:			

3. STATE OF VDC OFF INDICATOR LIGHT

VDC OFF indicator light comes on.	☐ 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 operating other electrical parts			
• 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. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

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

CAUTION:

- Do not use electrical test devices on airbag system wiring harnesses or connector circuits.
- 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 (GV) bolt for 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.

- With brake tester <Ref. to VDC-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&H/U).>
- Without brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&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-21, INSPECTION, Rear Brake Pad.> <Ref. to BR-22, INSPECTION, Rear Disc Rotor.>

7. TIRE

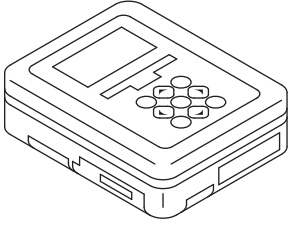
Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

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

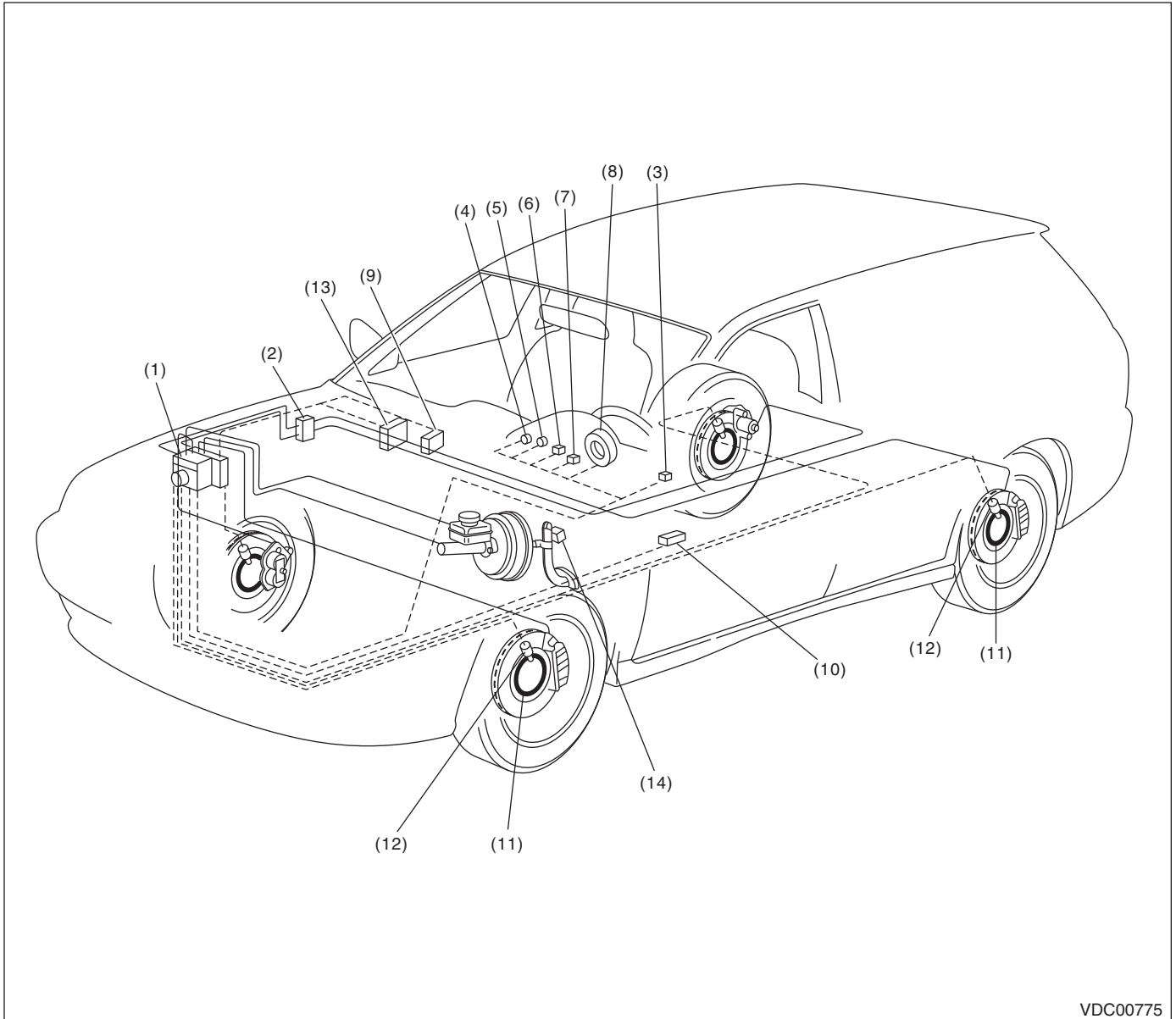
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

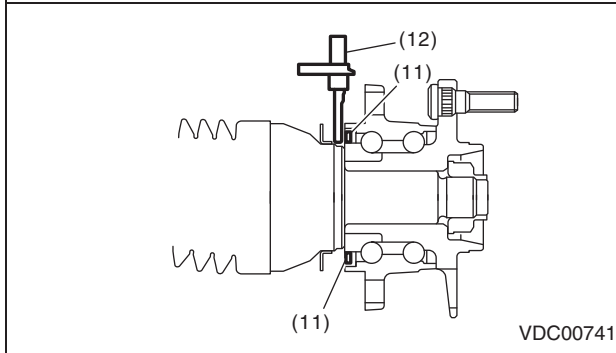
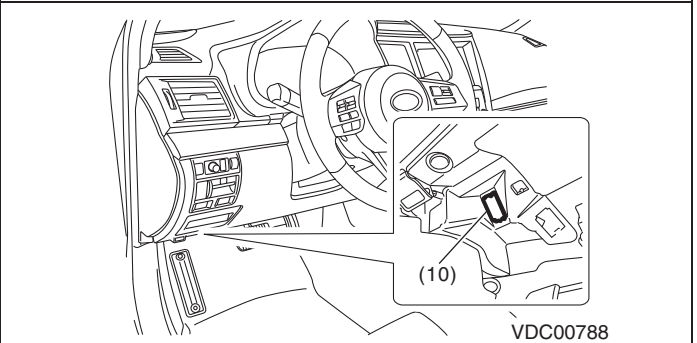
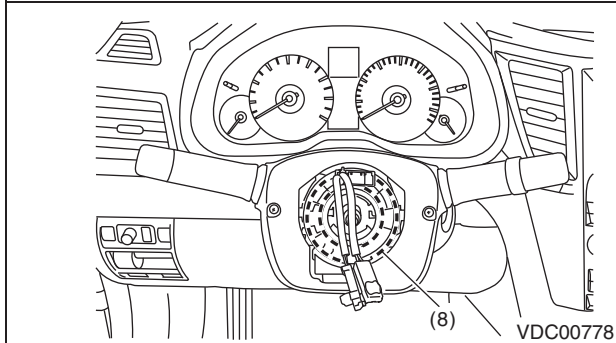
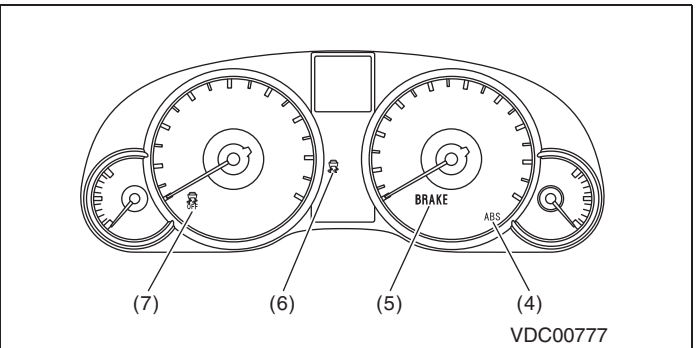
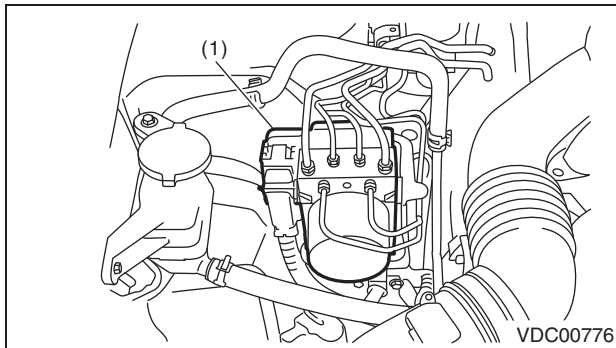


VDC00775

- | | | |
|---|---|----------------------------------|
| (1) VDC control module & hydraulic control unit (VDCCM&H/U) | (6) VDC warning light & VDC indicator light | (11) Magnetic encoder |
| (2) Connector | (7) VDC OFF indicator light | (12) ABS wheel speed sensor |
| (3) VDC OFF switch | (8) Steering angle sensor | (13) Engine control module (ECM) |
| (4) ABS warning light | (9) Transmission control module (TCM) | (14) Stop light & brake switch |
| (5) Brake warning light (EBD warning light) | (10) Data link connector | |

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

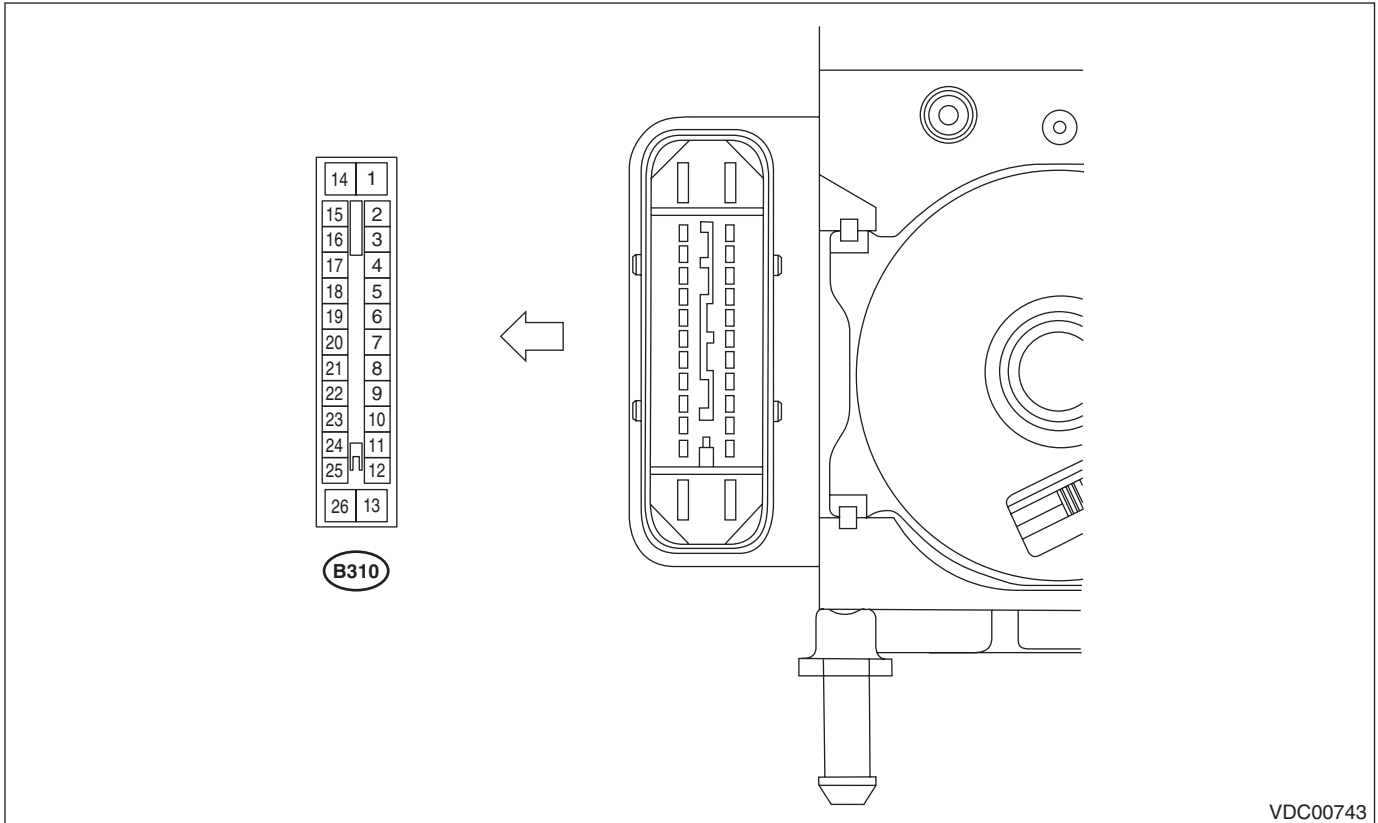


Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:

- Terminal numbers in VDCCM&H/U connector are shown in the figure.
- When the connector is removed from VDCCM&H/U, the brake warning light (EBD warning light), ABS warning light, and VDC warning light & VDC indicator light illuminate.

Control Module I/O Signal

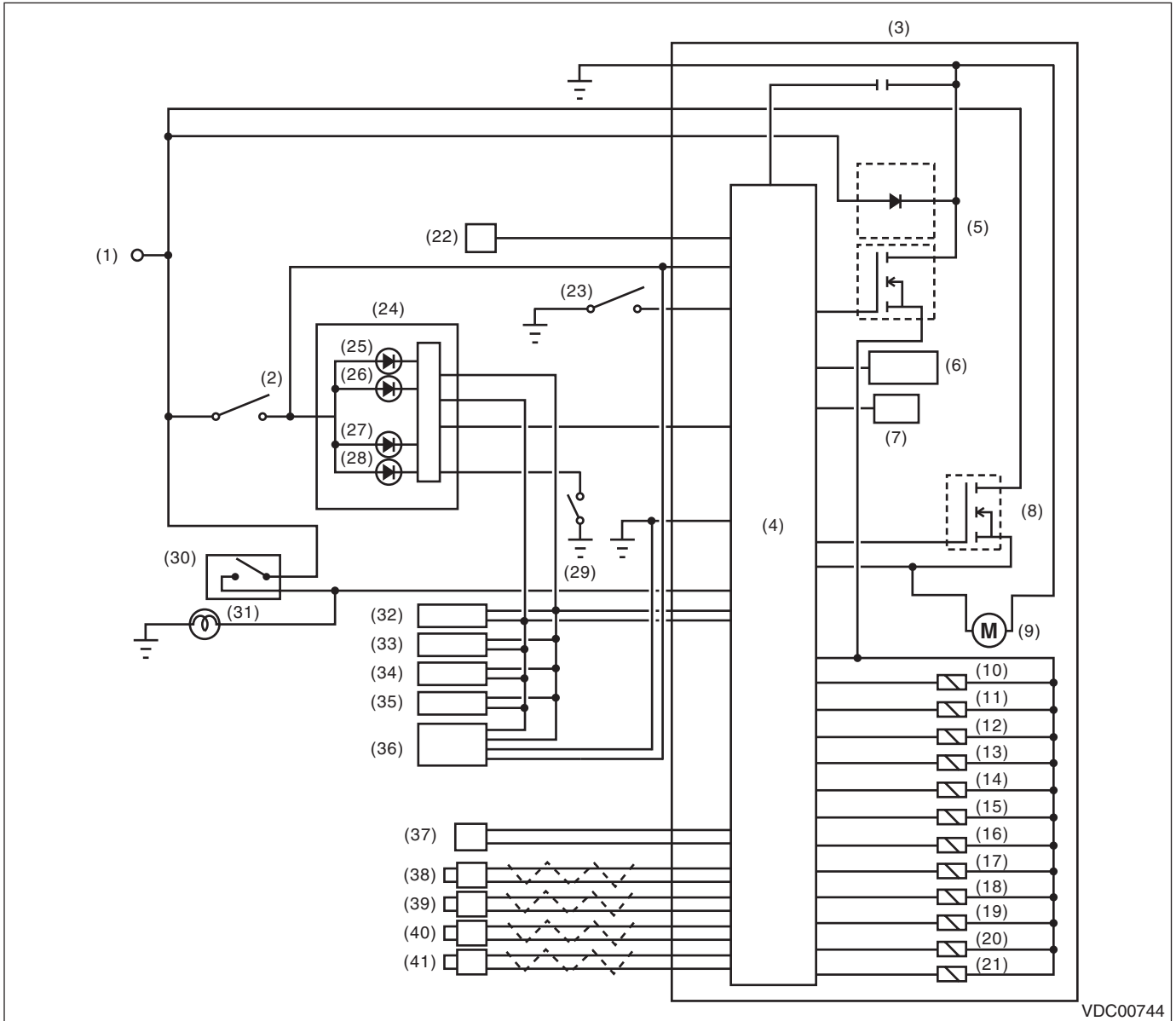
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Content			Terminal No. (+) — (–)	Input/Output signal
				Measured value and measuring conditions
Power supply			7 — 13	10 — 15 V when the ignition switch is ON.
ABS wheel speed sensor	Front LH wheel	Power supply	22 — 13	0 — 18 V
		Signal	21	7 — 14 mA: Rectangle waveform
	Front RH wheel	Power supply	18 — 13	0 — 18 V
		Signal	19	7 — 14 mA: Rectangle waveform
	Rear LH wheel	Power supply	16 — 13	0 — 18 V
		Signal	15	7 — 14 mA: Rectangle waveform
	Rear RH wheel	Power supply	24 — 13	0 — 18 V
		Signal	25	7 — 14 mA: Rectangle waveform
CAN communication line (L)			8	0.5 — 2.25 V pulse signal
CAN communication line (H)			10	2.75 — 4.5 V pulse signal
Valve relay power supply			14 — 13	10 — 15 V when the ignition switch is ON.
Motor relay power supply			1 — 13	10 — 15 V when the ignition switch is ON.
Stop light switch			3 — 13	1.5 V or less when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
Subaru Select Monitor			5 — 13	0 ↔ 12 V pulse (in communication)
Vehicle speed output signal			11	0 ↔ 12 V pulse
VDC OFF switch			9 — 13	0.5 Ω or less when the OFF switch is ON; 1 MΩ or more when the switch is OFF.
Clutch stroke sensor power supply			2 — 13	4.8 — 5.2 V
Clutch stroke sensor ground			23	—
Ground			13	—

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	(15) Rear outlet solenoid valve LH	(29) Brake fluid level switch
(2) Ignition switch	(16) Rear inlet solenoid valve RH	(30) Stop light switch
(3) VDC control module & hydraulic control unit (VDCCM&H/U)	(17) Rear outlet solenoid valve RH	(31) Stop light
(4) VDC control module	(18) Primary cut solenoid valve	(32) Body integrated unit
(5) Valve relay	(19) Primary suction solenoid valve	(33) Engine control module (ECM)
(6) Pressure sensor	(20) Secondary cut solenoid valve	(34) Transmission control module (TCM)
(7) Yaw rate & G sensor	(21) Secondary suction solenoid valve	(35) Parking brake control module
(8) Motor relay	(22) Data link connector	(36) Steering angle sensor
(9) Motor	(23) VDC OFF switch	(37) Clutch stroke sensor (MT model only)
(10) Front inlet solenoid valve LH	(24) Combination meter	(38) Front ABS wheel speed sensor LH
(11) Front outlet solenoid valve LH	(25) VDC OFF indicator light	(39) Front ABS wheel speed sensor RH
(12) Front inlet solenoid valve RH	(26) VDC warning light & VDC indicator light	(40) Rear ABS wheel speed sensor LH
(13) Front outlet solenoid valve RH	(27) ABS warning light	(41) Rear ABS wheel speed sensor RH
(14) Rear inlet solenoid valve LH	(28) Brake warning light (EBD warning light)	

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- 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

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- 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
Longitudinal G sensor output	Vehicle longitudinal acceleration detected by longitudinal G sensor is displayed.	m/s ²
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
M. Relay monitor Voltage	Voltage applied to the motor relay is displayed.	V
Motor Relay Signal	Motor relay operation signal is displayed.	ON or OFF
Valve Relay Signal	Valve relay operation signal 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
EBD Control Flag	EBD operation condition is displayed.	ON or OFF
ABS Control Flag	ABS 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
E/G Control Stop Flag	Engine control command signal is displayed.	1 or 0
OFF Lamp	ON/OFF condition of VDC OFF indicator light is displayed.	ON or OFF
OFF SW Signal	Operation condition of VDC OFF switch is displayed.	ON or OFF
Brake Switch	Brake ON/OFF is displayed.	ON or OFF
Master Cylinder Pressure Sensor	Master cylinder brake fluid pressure detected by pressure sensor is displayed.	bar
FL Wheel Cylinder Pressure Sensor	0 bar is always displayed.	bar
FR Wheel Cylinder Pressure Sensor	0 bar is always displayed.	bar

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-12, ABS Sequence Control.>
VDC Check Mode	Operate the valve and pump motor continuously to perform the VDC sequence control.	<Ref. to VDC-15, 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-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
Longitudinal G sensor & lateral G sensor 0 point setting mode	Set “0” point of the longitudinal G sensor and the lateral G sensor.	<Ref. to VDC-11, LONGITUDINAL G SENSOR & LATERAL G SENSOR 0 POINT SETTING MODE, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

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
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.
Vehicle Speed	Vehicle speed calculated by VDC control module is 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.
Longitudinal G sensor output	Vehicle longitudinal acceleration detected by longitudinal G sensor is displayed.
Lateral G sensor Output	Vehicle lateral acceleration detected by lateral G sensor is displayed.
IG power supply voltage	Voltage supplied to VDC control module is displayed.
Accel. Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed on malfunction occurrence is displayed.
Steering angle flag	Whether the absolute angle of the steering angle sensor was determined is displayed.
EBD Control Flag	EBD control condition is displayed.
ABS Control Flag	ABS control condition is displayed.
TCS Control Flag	TCS control condition is displayed.
VDC Control Flag	VDC control condition is displayed.
E/G Control Stop Flag	Engine control command signal is displayed.
OFF Switch Detection	ON/OFF condition of the VDC operated by the driver is displayed.

Display	Contents to be displayed
Brake Switch	Brake ON/OFF is displayed.
Master Cylinder Pressure Sensor	Master cylinder brake fluid pressure detected by pressure sensor is displayed.
FL Wheel Cylinder Pressure Sensor	0 bar is always displayed.
FR Wheel Cylinder Pressure Sensor	0 bar is always displayed.

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.**

NOTE:

- When the VDCCM&H/U is replaced with a replacement part, be sure to perform the parameter selection/registration to the VDCCM&H/U 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 the {VDC} is displayed.
 - 5) On «Brake Control Diagnosis» display, select {Selection of Parameter}.
 - 6) Check the applied model and option code 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) When the option code screen is displayed after entering the applied model, enter the option code of 4-digit alphanumeric characters and press the [Enter] key. When the option code is 3 digits, add “0” in front and enter the code 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 the «Main Menu» display, select the {Each System Check}.

3) On the «System Selection Menu» display, select the {Brake Control System}.

4) Click the [OK] button after the {VDC} is displayed.

5) On the «Brake Control Diagnosis» display, select the {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.>

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

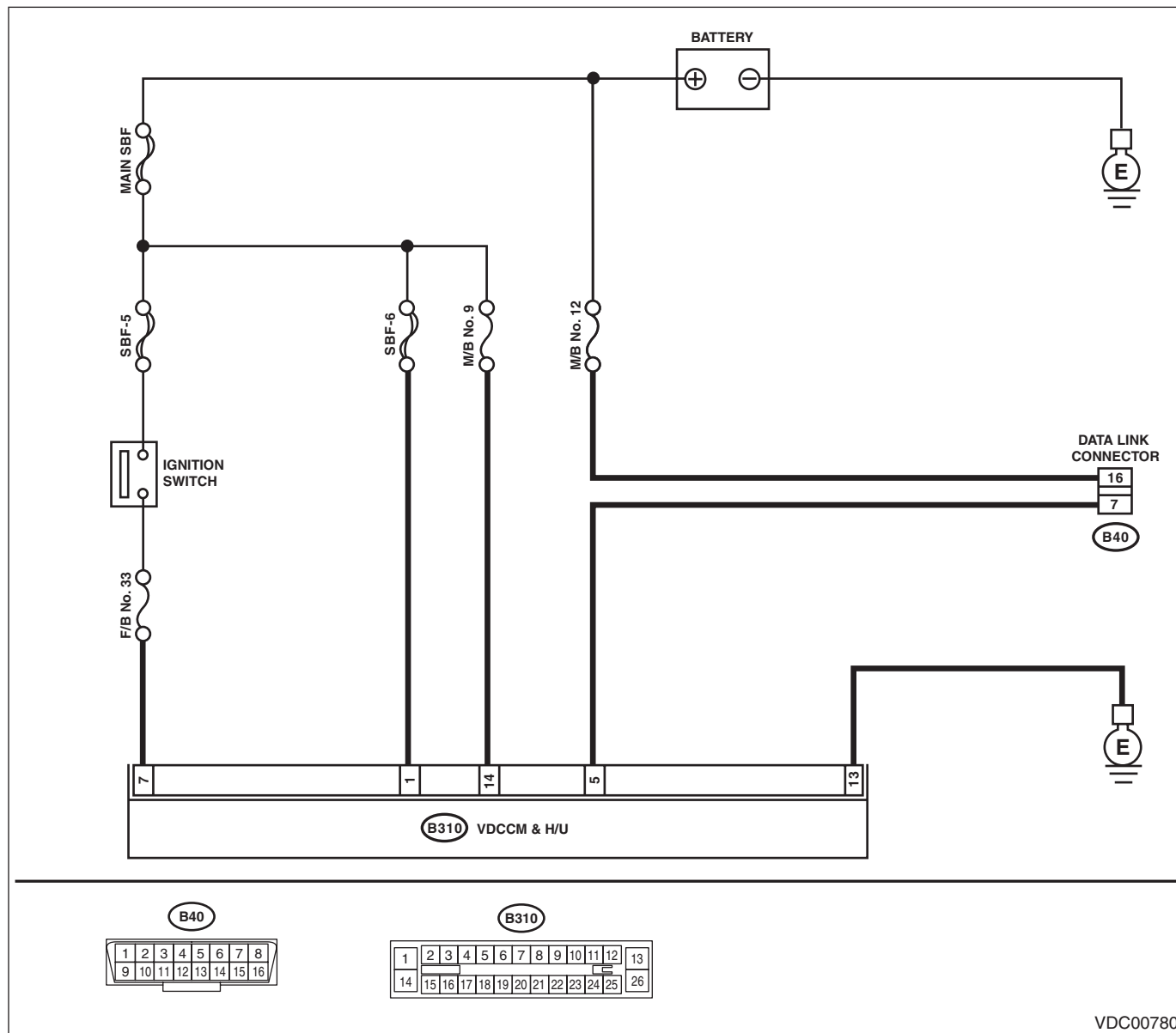
DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between VDC and Subaru Select Monitor.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2.	Turn the ignition switch to ON, and select 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&H/U. <Ref. to VDC-7, 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 connectors from ECM, TCM, airbag CM and impact sensor. CAUTION: When disconnecting the connector from airbag CM, always follow the precautions on AB section. <Ref. to AB-9, CAUTION, General Description.> 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. 5 — (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. 7 (+) — Chassis ground (-): (B310) No. 14 (+) — Chassis ground (-): (B310) No. 1 (+) — 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. 13 — 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&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

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)-35, List of Diagnostic Trouble Code (DTC).>
- Up to 3 DTCs are displayed in the order of detection.
- If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in 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.
(Old)	The latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.
(Older)	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
(Before 3)	The third latest DTC from the history of 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

NOTE:

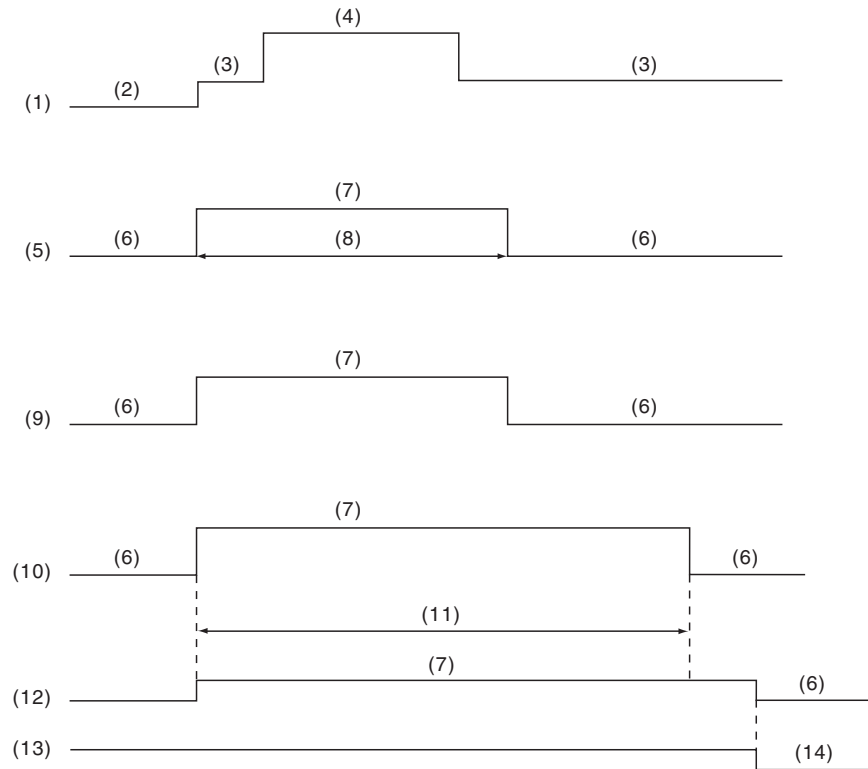
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

10.Warning Light Illumination Pattern

A: INSPECTION



VDC00214

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, ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.>

3) When the ABS warning light, VDC OFF indicator light, and VDC warning light & VDC indicator light do not go off, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC OFF INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-30, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>

4) When the brake warning light blinks and the hill hold indicator light illumination is faulty, check the parking brake system. <Ref. to PB(diag)-2, Basic Diagnostic Procedure.>

NOTE:

- Even though the ABS warning light, and the VDC warning light & VDC indicator light do not go off in 2 seconds after illuminating, the ABS and VDC functions are normal if the warning lights go off while the vehicle is driven at approximately 12 km/h (7 MPH). However, while these lights are on, the functions with their warning lights illuminated do not operate.
- It may take several minutes before the VDC warning light & VDC 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. If DTC is recorded at this time, perform the Clear Memory Mode.
- 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, and VDC warning light & VDC indicator light may illuminate because VDC-CM&H/U detects the abnormal conditions from ABS wheel speed sensors. In this case, this is not a malfunction. Perform the Clear Memory Mode.

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING 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), ABS warning light, VDC OFF indicator light, and VDC warning light & VDC 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. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK VDCCM. When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is "EBD Warning Light" output set to ON?	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 VDCCM. When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is "ABS Warning Light" output set to ON?	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 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 6.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

C: 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 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)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

D: VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective engine
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the VDC warning light & VDC indicator light remains lit.

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)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ENGINE.	Does the malfunction indicator light illuminate?	Repair the engine. <Ref. to EN(H4SO)(diag)-40, Read Diagnostic Trouble Code (DTC).> <Ref. to EN(H4DOTC)(diag)-43, Read Diagnostic Trouble Code (DTC).> <Ref. to EN(H6DO)(diag)-44, Read Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ENGINE COOLANT TEMPERATURE. Warm up the engine, and check if the VDC warning light & VDC indicator light illumination condition changes.	When the engine coolant temperature is too low, the VDC warning light & VDC indicator light illuminates. Do the lights go off when the engine is warmed up?	Normal operation. If DTC is recorded, clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Go to step 4.
4 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 5.
5 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

E: VDC OFF INDICATOR LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication
- 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)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK VDC OFF SWITCH. Remove and check VDC OFF switch. <Ref. to VDC-25, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step 3.	Replace the VDC OFF switch.
3 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 4.
4 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

F: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

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

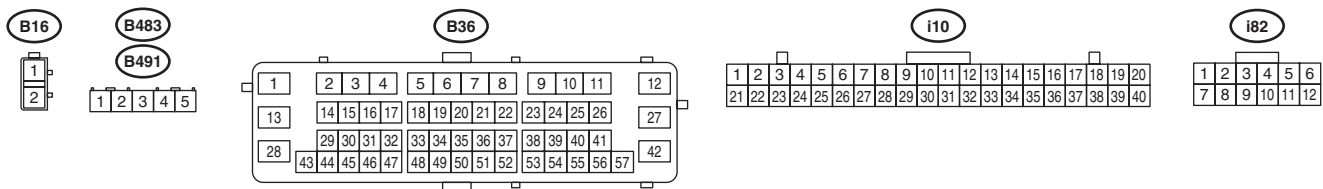
TROUBLE SYMPTOM:

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

NOTE:

When brake warning light blinks, check the parking brake system. <Ref. to PB(diag)-2, Basic Diagnostic Procedure.>

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

[illegible]

VDC00781

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.

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
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)-35, 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. <Ref. to BR-27, Master Cylinder.>
5 CHECK GROUND SHORT OF HARNESS. 1) Disconnect the connector from the combination meter. 2) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i10) No. 24 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the harness connector between combination meter and brake fluid level switch.
6 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 7.
7 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Perform the diagnosis for the parking brake system. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Replace the combination meter. <Ref. to IDI-20, REMOVAL, 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	5045	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	5049 5053 5057 5061 5065	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	5044	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	5048 5052 5056 5060 5064	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	5047	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	5051 5055 5059 5063 5067	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	5046	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	5050 5054 5058 5062 5066	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).>
C0031	5019	FR Hold Valve malfunction	Front inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-45, DTC C0031 FR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0032	5023	FR Pressure Reducing Valve malfunction	Front outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-45, DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0033	5018	FL Hold Valve malfunction	Front inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-45, DTC C0033 FL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0034	5022	FL Pressure Reducing Valve malfunction	Front outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-45, DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0035	5021	RR Hold Valve malfunction	Rear inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0035 RR 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
C0036	5025	RR Pressure Reducing Valve malfunction	Rear outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0036 RR PRES-SURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0037	5020	RL Hold Valve malfunction	Rear inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0037 RL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0038	5024	RL Pressure Reducing Valve malfunction	Rear outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0038 RL PRES-SURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0041	5002 5003 5004 5005 5006 5007 5008 5009 5010 5011 5012 5013 5014 5015 5037 5038 5040 5041 5068 5069 5134	Electrical Control Module	VDC control module malfunction	<Ref. to VDC(diag)-49, DTC C0041 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5148 5149	Parameter selection error	VDC control module parameter selection failure	<Ref. to VDC(diag)-51, DTC C0041 PARAMETER SELECTION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0042	5000 5001	Power Supply Voltage Failure	Power voltage malfunction	<Ref. to VDC(diag)-52, DTC C0042 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0044	5137 5140 5142	TCM Communication Circuit	CAN communication failure of transmission control module	<Ref. to VDC(diag)-54, DTC C0044 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0045	5144	TCM malfunction	Malfunction of transmission control module	<Ref. to VDC(diag)-55, DTC C0045 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5146	Incorrect VDC Control Module specifications	Different VDC control module specification	<Ref. to VDC(diag)-56, DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0046	5155	Body Integrated Module Communication Circuit	Body integrated module communication circuit	<Ref. to VDC(diag)-58, DTC C0046 BODY INTEGRATED MODULE COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0047	5135	Improper CAN Communication	Improper CAN communication	<Ref. to VDC(diag)-59, DTC C0047 CAN COMMUNICATION, 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
C0048	5156	Parking Brake System Communication Circuit	Parking brake system communication circuit	<Ref. to VDC(diag)-61, DTC C0048 PARKING BRAKE SYSTEM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0051	5016 5017 5034 5036	Valve Relay	Valve Relay	<Ref. to VDC(diag)-62, DTC C0051 VALVE RELAY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0052	5039 5042 5043 5154	Motor malfunction	Motor	<Ref. to VDC(diag)-64, DTC C0052 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0054	5133	BLS OFF Malfunction	BLS OFF Malfunction	<Ref. to VDC(diag)-67, DTC C0054 BLS OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5153	BLS ON malfunction	BLS ON malfunction	<Ref. to VDC(diag)-69, DTC C0054 BLS ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0056	5102 5108	G Sensor Failure	G sensor failure	<Ref. to VDC(diag)-70, DTC C0056 G SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5103 5104 5105 5106 5107 5109	G Sensor Signal	G sensor signal	<Ref. to VDC(diag)-71, DTC C0056 G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0057	5136 5139 5141	ECM Communication Circuit	CAN communication failure of engine control module	<Ref. to VDC(diag)-73, DTC C0057 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5143	ECM Control System	Coordinate control prohibition of engine control module	<Ref. to VDC(diag)-74, DTC C0057 ECM CONTROL SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5145	VDC interrupted due to EGI reason	VDC interrupted due to EGI reason	<Ref. to VDC(diag)-75, DTC C0057 VDC INTERRUPTED DUE TO EGI REASON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0061	5027	Normal Opening Valve 1 malfunction	Secondary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0062	5026	Normal Opening Valve 2 malfunction	Primary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0063	5029	Normal Closing Valve 1 malfunction	Secondary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-46, DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0064	5028	Normal Closing Valve 2 malfunction	Primary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 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
C0071	5121 5122 5123 5138	No signal from Steering Angle Sensor	Steering angle sensor communication	<Ref. to VDC(diag)-76, DTC C0071 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5124 5125 5126 5127 5128 5129 5132	Steering Angle Sensor Op	Steering angle sensor output	<Ref. to VDC(diag)-78, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0072	5116 5117 5118 5119 5120 5131	Yaw Rate Sensor Output	Yaw rate sensor output	<Ref. to VDC(diag)-81, DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0073	5110 5114	Voltage inputted to Lateral G Sensor exceeds specification	Lateral G sensor power supply/output	<Ref. to VDC(diag)-82, DTC C0073 LATERAL G SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5111 5112 5113 5115 5130	Lateral G sensor Output	Lateral G sensor output	<Ref. to VDC(diag)-83, DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0074	5070 5071 5072 5073 5074 5075 5076 5077 5078 5079	Master Cylinder Pressure Sensor Output	Master cylinder pressure sensor output	<Ref. to VDC(diag)-86, DTC C0074 MASTER CYLINDER PRESSURE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0075	5080 5081 5082 5083 5084 5086 5087 5088 5089 5090 5091 5092 5093 5094 5095 5097 5098 5099 5100 5101	Wheel Cylinder Pressure Sensor Output	Wheel cylinder pressure sensor output	<Ref. to VDC(diag)-86, DTC C0075 WHEEL CYLINDER PRESSURE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0081	5147	System Failure	System malfunction	<Ref. to VDC(diag)-87, 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

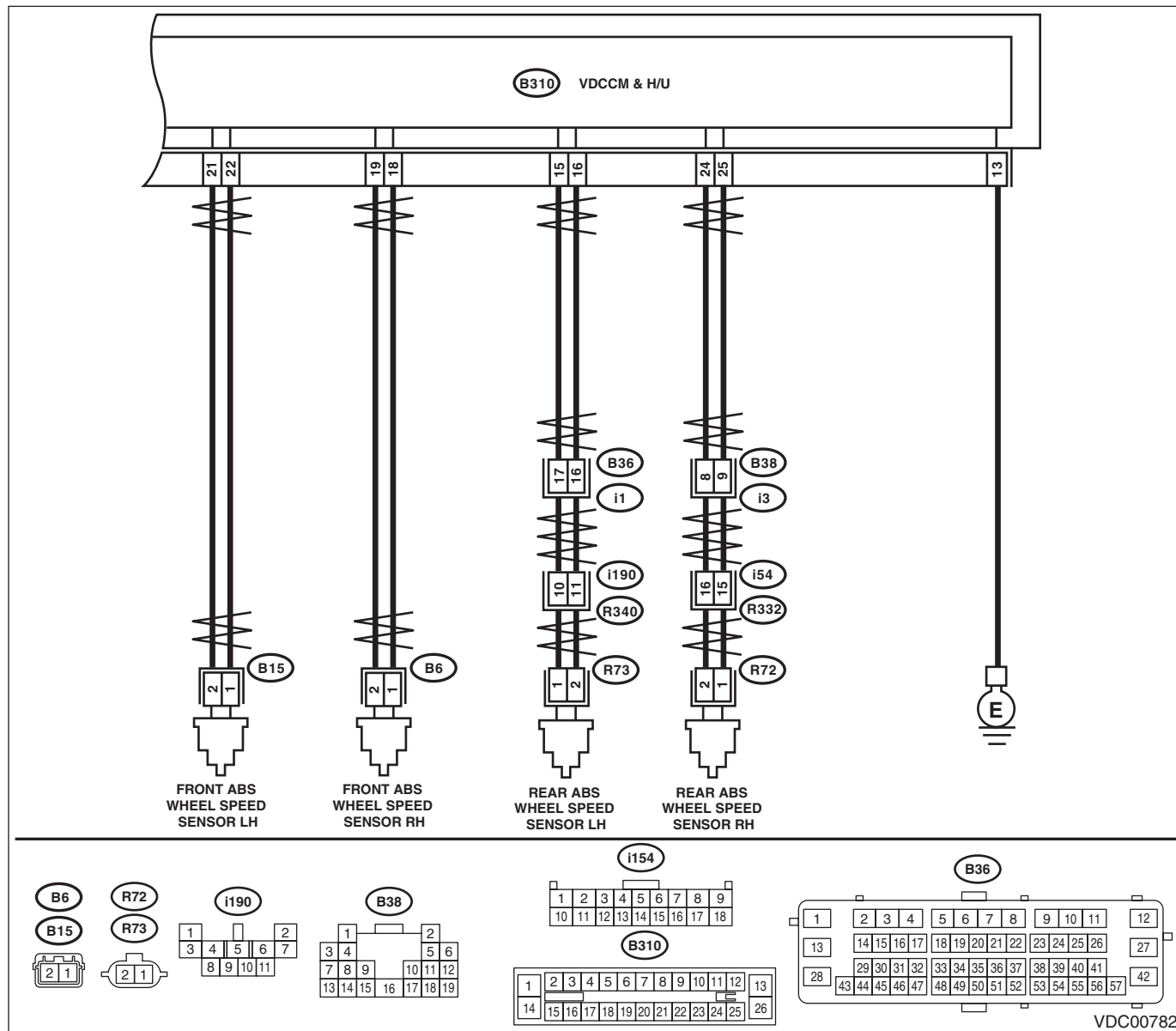
DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



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. 18 — (B6) No. 1: (B310) No. 19 — (B6) No. 2: DTC C0023 (B310) No. 22 — (B15) No. 1: (B310) No. 21 — (B15) No. 2: DTC C0025 (B310) No. 25 — (R72) No. 1: (B310) No. 24 — (R72) No. 2: DTC C0027 (B310) No. 15 — (R73) No. 1: (B310) No. 16 — (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. 19 — Chassis ground: DTC C0023 (B310) No. 21 — Chassis ground: DTC C0025 (B310) No. 25 — Chassis ground: DTC C0027 (B310) No. 15 — 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. 1 (+) — Chassis ground (–): DTC C0023 (B15) No. 1 (+) — 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.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
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. 7 (+) — (B310) No. 13 (-): (B310) No. 14 (+) — (B310) No. 13 (-): (B310) No. 1 (+) — (B310) No. 13 (-):	Is the voltage 10 — 15 V?	Go to step 6.	Check the generator, battery and VDCCM&H/U power supply circuit.
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-20, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern as shown in the figure?	Go to step 7.	Replace the ABS wheel speed sensor. <Ref. to VDC-20, Front 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&H/U. <Ref. to VDC-7, 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)-35, 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).>

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the defective ABS wheel speed sensor output.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/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&H/U. <Ref. to VDC-7, 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)-35, 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-20, 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.
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&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 13.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. NOTE: Though the ABS warning light, and the VDC warning light & VDC indicator light remain lit at this point, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn off the ABS warning light, and the VDC warning light & VDC indicator light. Be sure to drive the vehicle and check that the warning light goes off.

I: DTC C0031 FR HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: 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)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0033 FL HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, 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)

M: DTC C0035 RR HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0037 RL HOLD VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

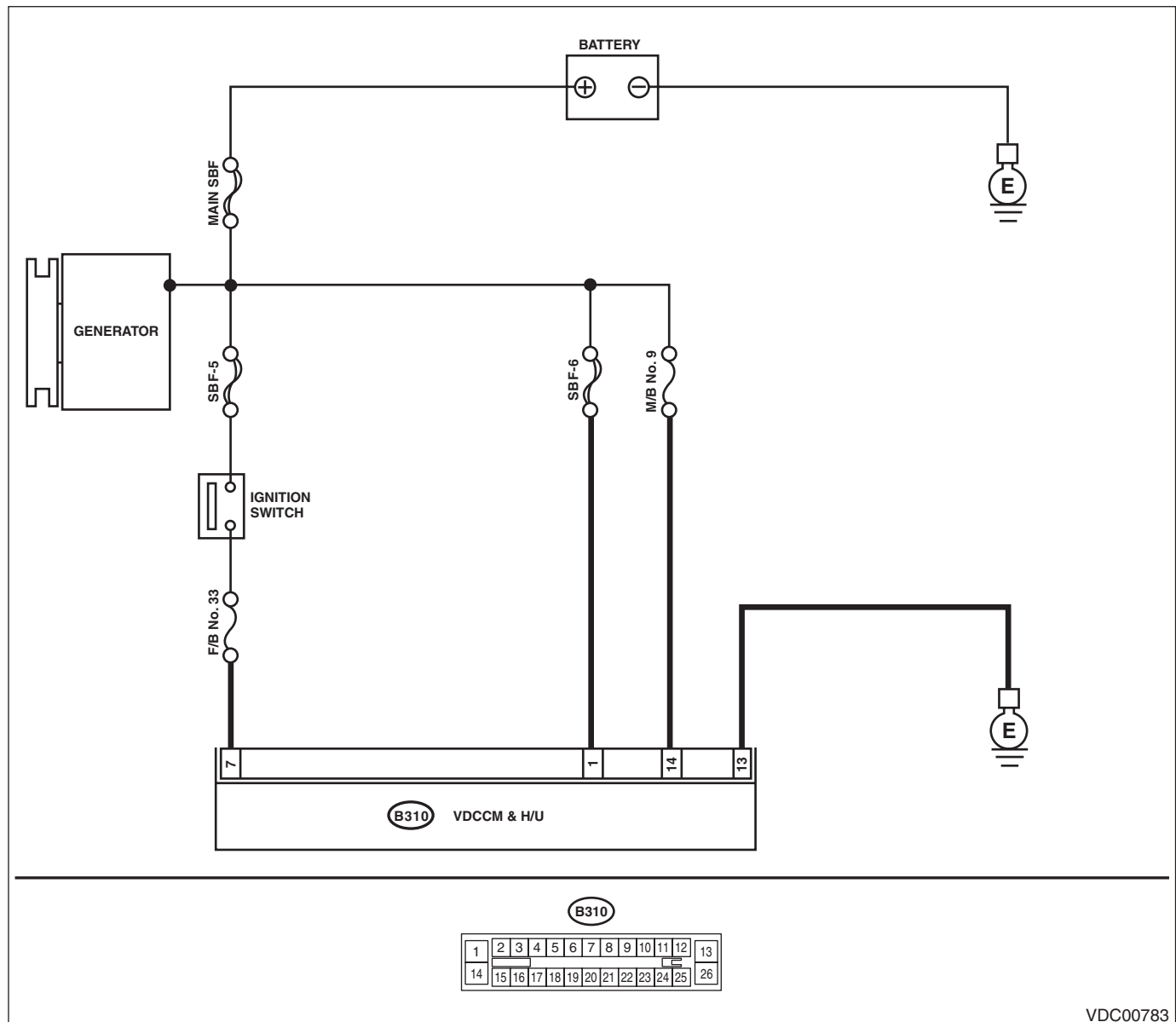
S: DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION

NOTE:

For the diagnostic procedure, refer to C0064 "NORMAL CLOSING VALVE 2 MALFUNCTION". <Ref. to VDC(diag)-47, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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. 7 (+) — Chassis ground (-): (B310) No. 14 (+) — Chassis ground (-): (B310) No. 1 (+) — 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. 13 — 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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

U: DTC C0041 ECM

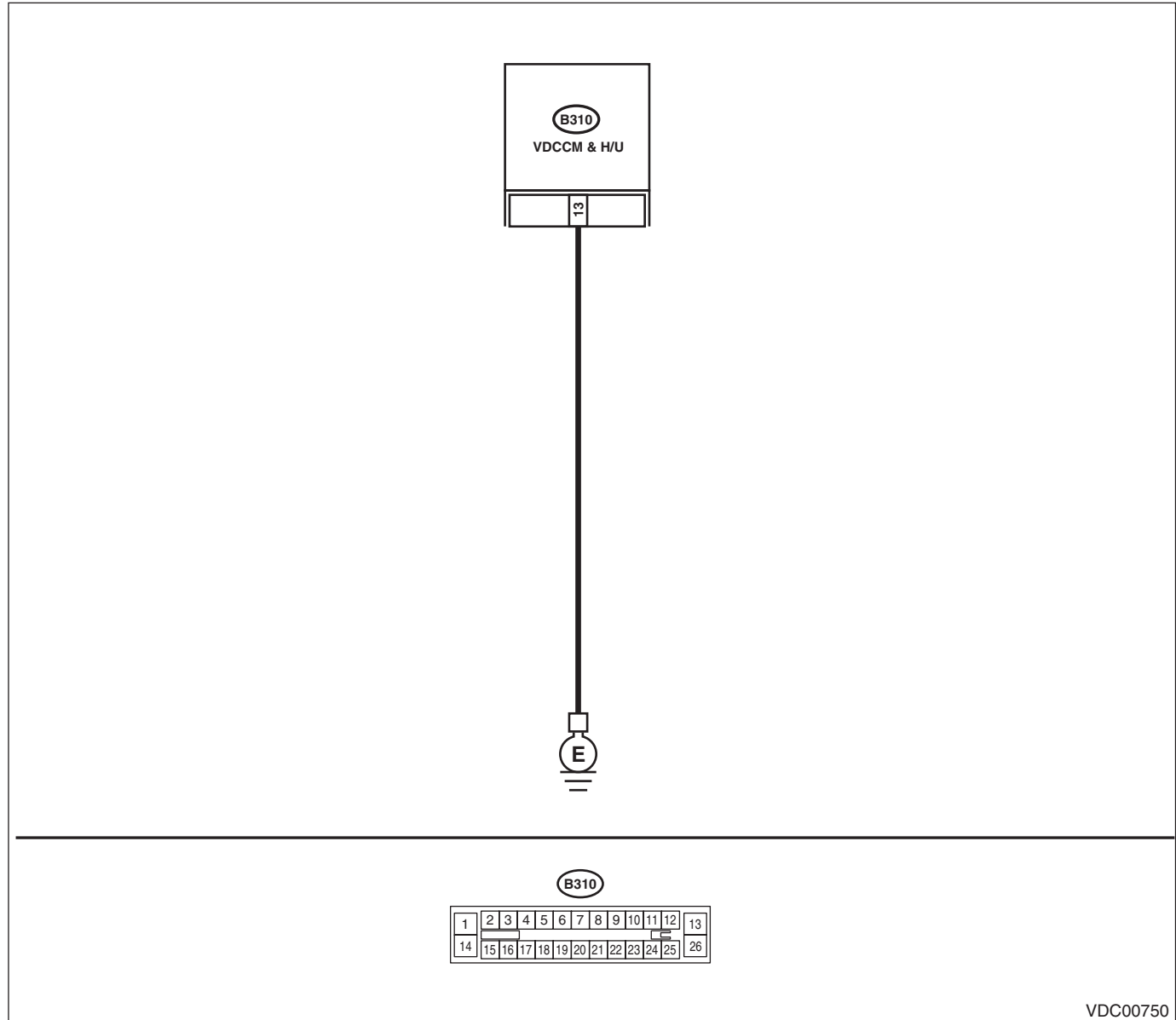
DTC DETECTING CONDITION:

Defective VDCCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00750

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. 13 — 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 and VDCCM?	Install the noise source apart from the sensor harness and VDCCM. 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&H/U. <Ref. to VDC-7, 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)-35, List of Diagnostic Trouble Code (DTC).> Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

V: 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.
- Hill start assist does not operate.

NOTE:

When the VDCCM&H/U is replaced, this DTC may be stored.

Step	Check	Yes	No
1 CHECK VDCCM&H/U IDENTIFICATION SYMBOL. Check the identification symbol attached on the H/U. Identification symbol: V1	Is the identification symbol correct?	Go to step 2.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2 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&H/U. <Ref. to VDC-7, 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.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

W: DTC C0042 POWER SUPPLY VOLTAGE FAILURE

DTC DETECTING CONDITION:

Improper VDCCM&H/U power supply voltage

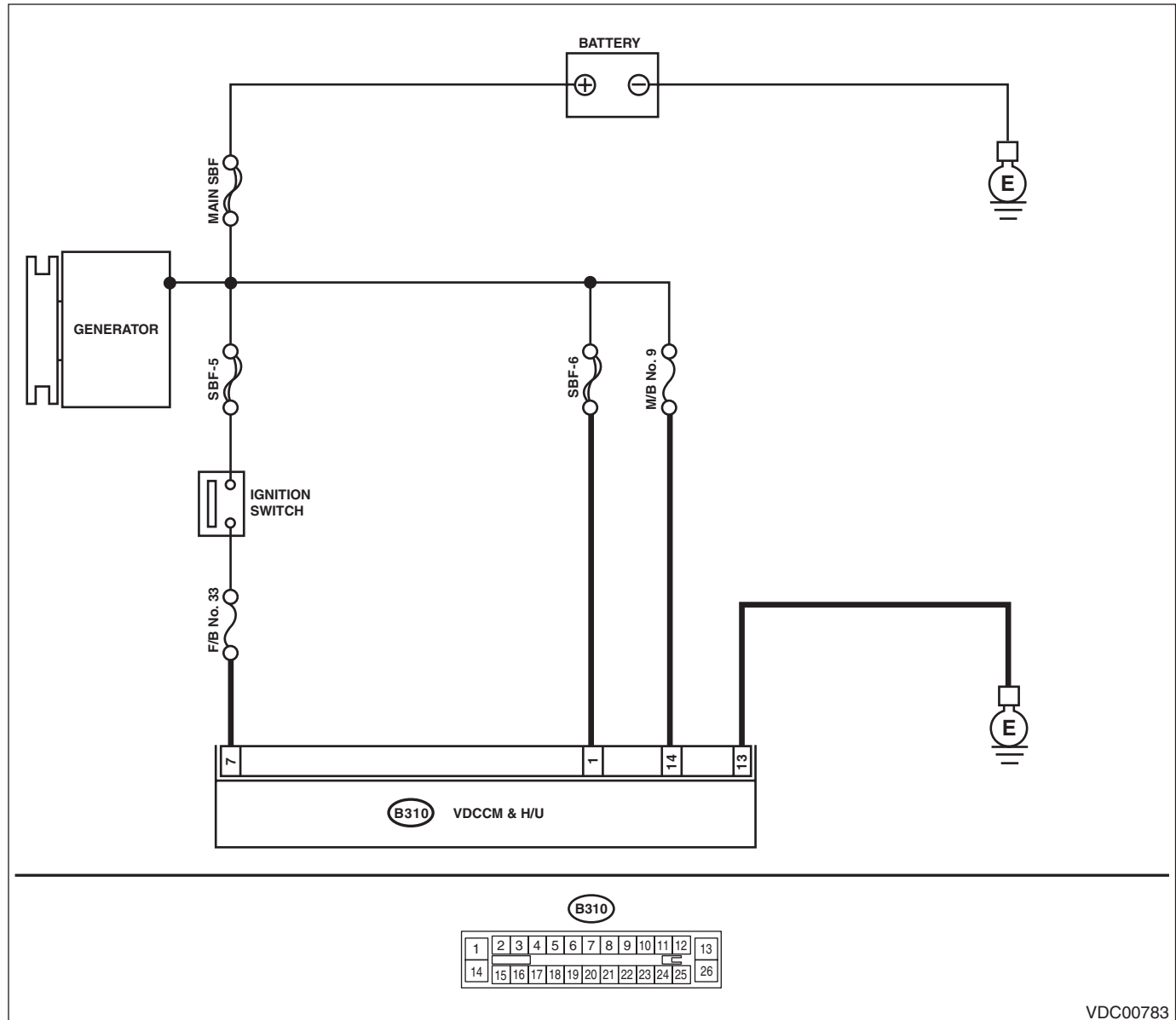
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.
- VDC does not operate.
- Hill start assist does not operate.

NOTE:

Warning lights go off if voltage returns.

WIRING DIAGRAM:



VDC00783

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. <Ref. to SC(H4SO)-18, 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. 7 (+) — Chassis ground (–): (B310) No. 14 (+) — Chassis ground (–): (B310) No. 1 (+) — 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. 13 — 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&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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

X: DTC C0044 TCM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from TCM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	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 5AT-58, Transmission Control Module (TCM).> <Ref. to CVT-122, 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&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)-35, 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)

Y: DTC C0045 TCM MALFUNCTION

DTC DETECTING CONDITION:

Defective TCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK AT SYSTEM OR CVT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system or CVT system.	Is DTC of AT system or CVT system displayed?	Repair the AT system or CVT system. <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).> <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).>	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&H/U. <Ref. to VDC-7, 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)-35, 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)

Z: DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:

Different control module specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

NOTE:

When parameter selection for VDCCM is improper, this DTC may be memorized.

Step	Check	Yes	No
1 CHECK VDCCM&H/U IDENTIFICATION SYMBOL. Check the identification symbol attached on the H/U. Identification symbol: V1	Is the identification symbol correct?	Go to step 2.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2 CHECK PARAMETER SELECTED IN VDCCM. <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 3.	Select and register the correct parameter. <Ref. to VDC(diag)-18, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
3 CHECK TCM SPECIFICATION. Check the TCM specification.	Is the specification of TCM same as vehicle specification?	Go to step 4.	Replace the TCM. <Ref. to 5AT-58, Transmission Control Module (TCM).> <Ref. to CVT-122, Transmission Control Module (TCM).>
4 CHECK AT SYSTEM OR CVT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system or CVT system.	Is DTC of AT system or CVT system displayed?	Repair the AT system or CVT system. <Ref. to 5AT(diag)-33, List of Diagnostic Trouble Code (DTC).> <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).>	Go to step 5.
5 CHECK ECM SPECIFICATION. Check the ECM specification.	Is the specification of ECM same as vehicle specification?	Go to step 6.	Replace the ECM. <Ref. to FU(H4SO)-39, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> <Ref. to FU(H6DO)-50, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step		Check	Yes	No
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.
	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, 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 C0046 BODY INTEGRATED MODULE COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal received from body integrated unit.

TROUBLE SYMPTOM:

- VDC may not operate.
- Hill start assist does not operate. (MT model only)

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of body integrated unit connector?	Repair the connector.	Go to step 3.
3 CHECK BODY INTEGRATED UNIT. Perform the diagnosis for body integrated unit. <Ref. to BC(diag)-13, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the body integrated unit normal?	Go to step 4.	Perform the diagnosis according to DTC for the body integrated unit. <Ref. to BC(diag)-25, List of Diagnostic Trouble Code (DTC).>
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)-35, 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)

AB:DTC C0047 CAN COMMUNICATION

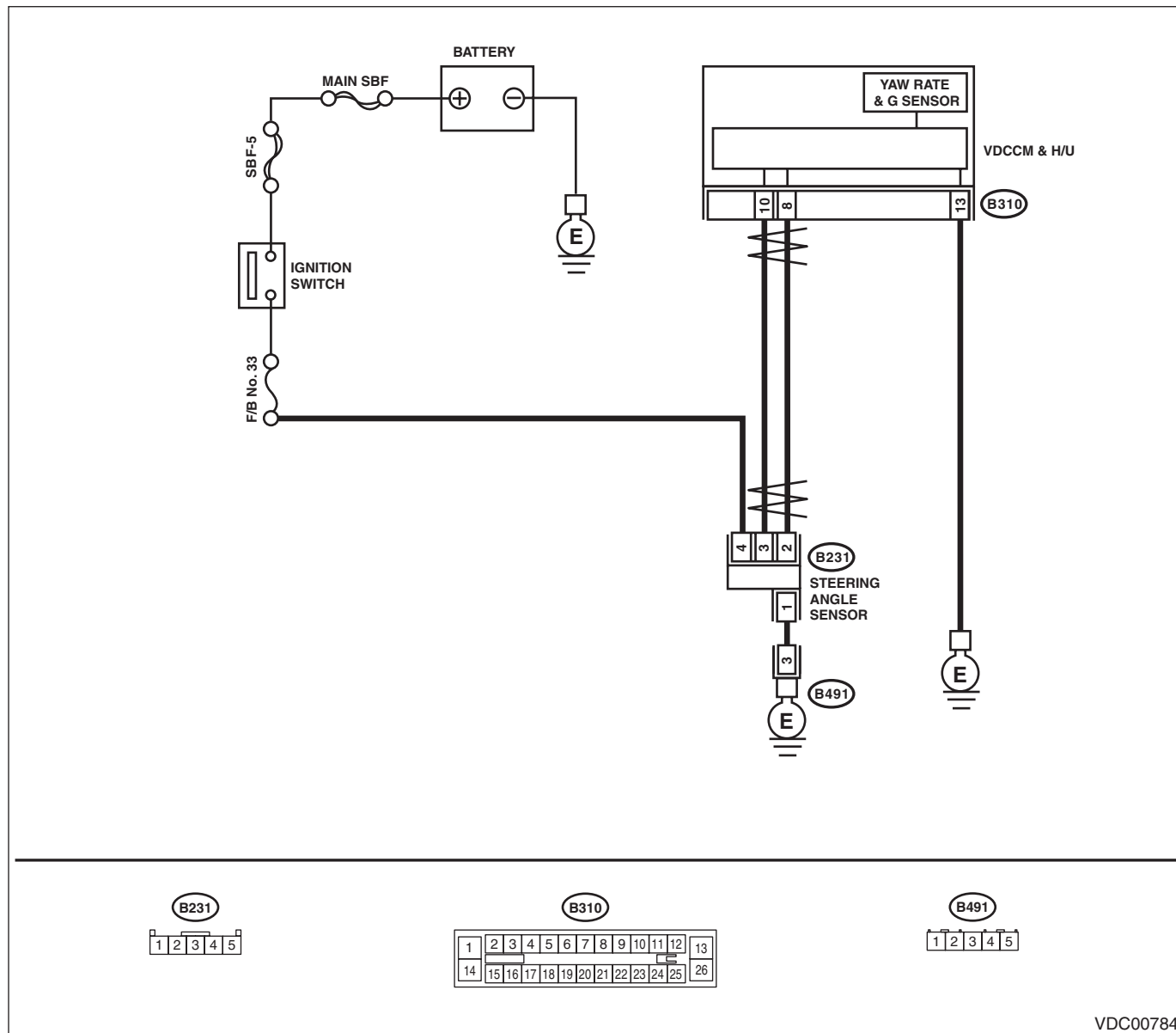
DTC DETECTING CONDITION:

CAN communication line circuit is open or shorted.

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00784

Step	Check	Yes	No
1	CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK POOR CONTACT OF CONNECTORS.	Repair the connector.	Go to step 3.

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. 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)-78, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
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).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AC:DTC C0048 PARKING BRAKE SYSTEM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from parking brake control module.

TROUBLE SYMPTOM:

- VDC may not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of the parking brake control module connector?	Repair the connector.	Go to step 3.
3 CHECK PARKING BRAKE SYSTEM. Perform the diagnosis for the parking brake system. <Ref. to PB(diag)-22, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the parking brake system normal?	Go to step 4.	Perform the diagnosis according to DTC for the parking brake system. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>
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)-35, 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)

AD:DTC C0051 VALVE RELAY

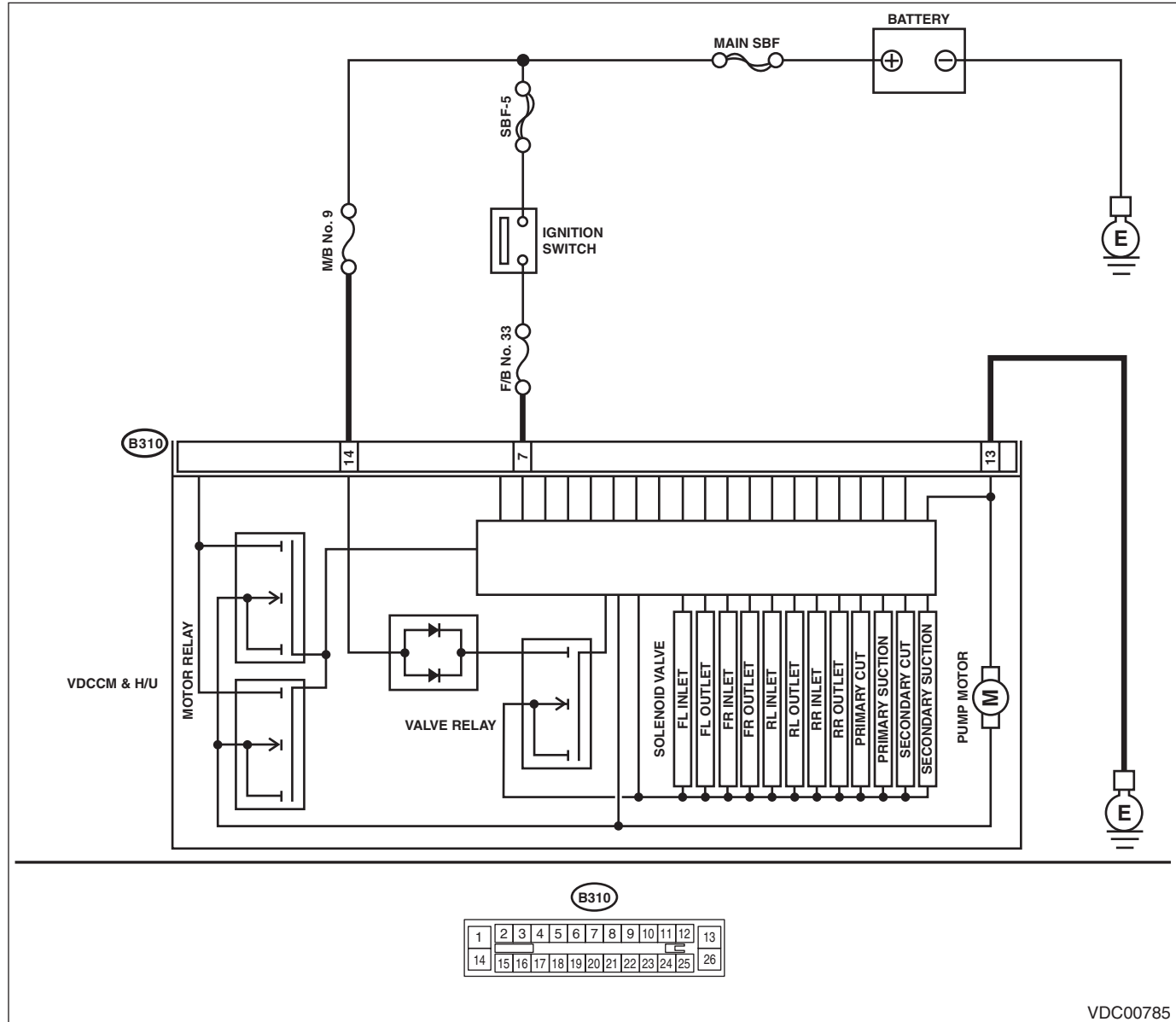
DTC DETECTING CONDITION:

Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00785

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. 7 (+) — Chassis ground (-): (B310) No. 14 (+) — 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. 7 (+) — Chassis ground (-): B: (B310) No. 14 (+) — 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 INSTALLATION OF VDCCM&H/U GROUND.	Is the VDCCM&H/U ground terminal installation bolt tightened to 13 N·m (1.3 kgf-m, 9.6 ft-lb)?	Go to step 4.	Tighten the VDCCM&H/U ground terminal installation bolt.
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. 13 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 5.	Repair the VDCCM&H/U ground harness.
5 CHECK VDCCM&H/U VALVE RELAY. Measure the resistance between VDCCM&H/U connector terminals. Connector & terminal (B310) No. 14 — (B310) No. 13:	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of connector between generator, battery 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&H/U. <Ref. to VDC-7, 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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

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. 1 (+) — Chassis ground (-): (B310) No. 7 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the VDCCM&H/U power supply circuit.
2	CHECK VDCCM&H/U INPUT VOLTAGE. Calculate the voltage difference measured in step 1. A: (B310) No. 1 (+) — Chassis ground (-): B: (B310) No. 7 (+) — 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 INSTALLATION OF VDCCM&H/U GROUND.	Is the VDCCM&H/U ground terminal installation bolt tightened to 13 N·m (1.3 kgf-m, 9.6 ft-lb)?	Go to step 4.	Tighten the VDCCM&H/U ground terminal installation bolt.
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. 13 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the VDCCM&H/U ground harness.
5	CHECK VDCCM&H/U MOTOR RELAY. Measure the resistance between VDCCM&H/U connector terminals. Terminals No. 1 — No. 13:	Is the resistance 1 M Ω or more?	Go to step 6.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6	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 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&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light, and the VDC warning light & VDC indicator light remain lit at this point, this is normal. Drive the vehicle at 12 km/h (7 MPH) or more in order to turn off the ABS warning light, and the VDC warning light & VDC indicator light. 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)

AF:DTC C0054 BLS OFF MALFUNCTION

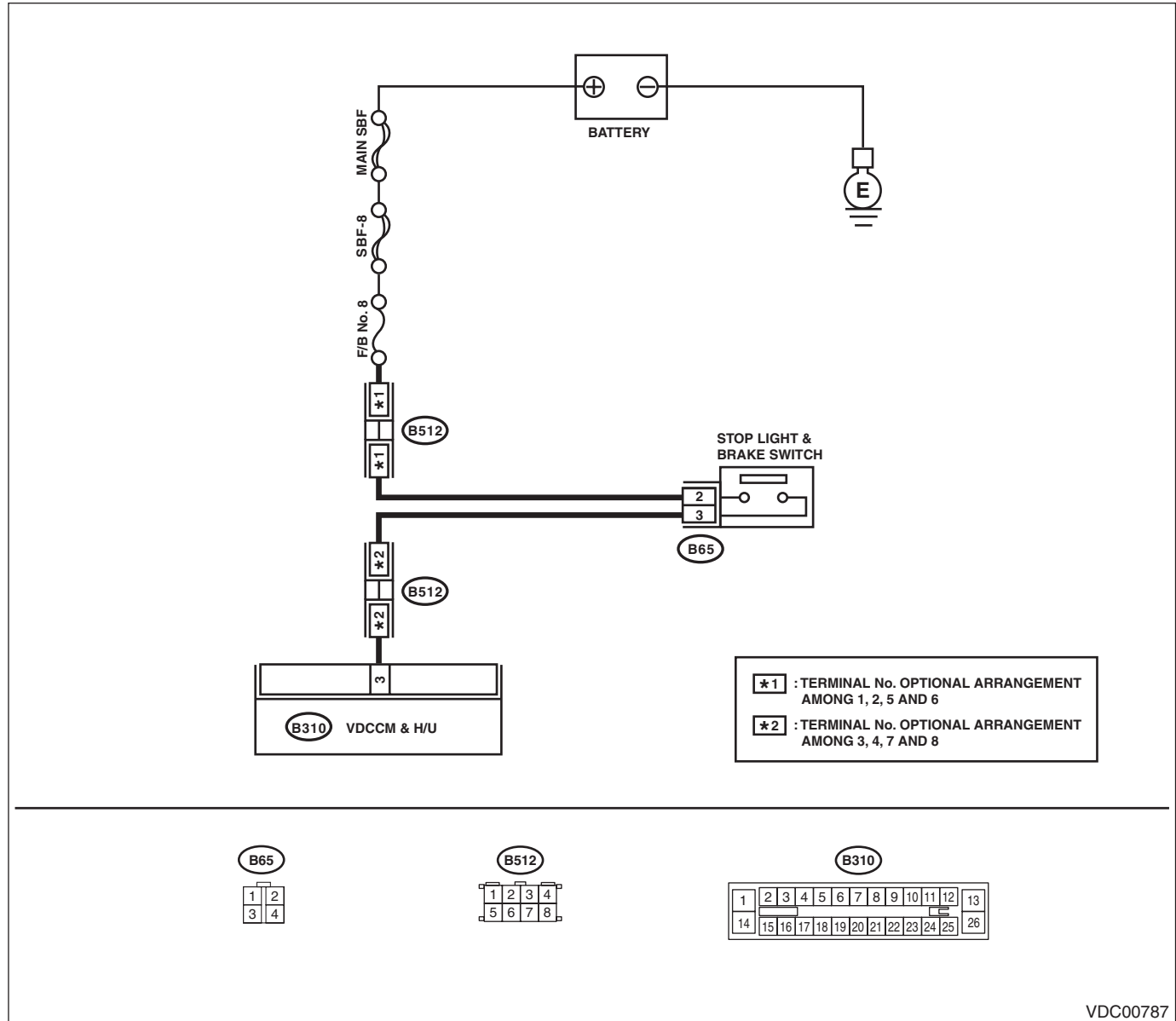
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00787

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. Terminals No. 2 — No. 3:	Is the resistance 1 Ω or less when the switch is ON (when pedal is depressed)?	Go to step 2.	Replace the stop light switch. <Ref. to BR-41, Stop Light Switch.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK STOP LIGHT POWER SUPPLY. Measure the voltage between stop light switch terminal and chassis ground. Connector & terminal (B65) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 3.	Repair the stop light power supply circuit.
3 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 (B65) No. 3 — (B310) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the stop light switch circuit.
4 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 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&H/U. <Ref. to VDC-7, 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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AG:DTC C0054 BLS ON MALFUNCTION

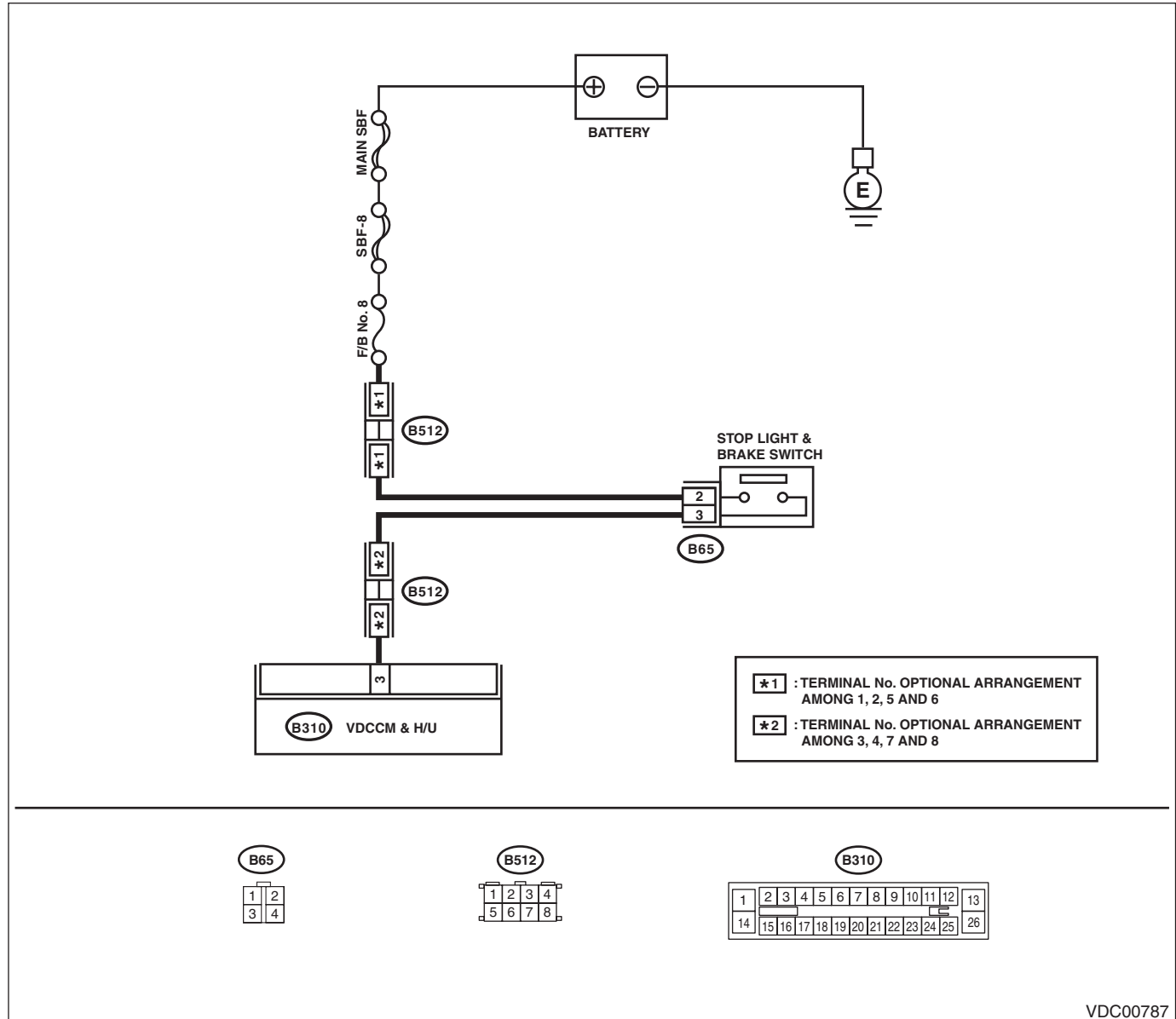
DTC DETECTING CONDITION:

Defective stop light switch

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00787

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. Terminals No. 2 — No. 3:	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. <Ref. to BR-41, Stop Light Switch.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK STOP LIGHT SWITCH HARNESS. 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. Connector & terminal (B310) No. 3 — Chassis ground:	Is the resistance less than 1 MΩ?	Go to step 3.	Repair the stop light switch circuit.
3 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 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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AH:DTC C0056 G SENSOR FAILURE

DTC DETECTING CONDITION:

Longitudinal G sensor signal failure

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

NOTE:

For the diagnostic procedure, refer to DTC C0056 “G SENSOR SIGNAL”. <Ref. to VDC(diag)-71, DTC C0056 G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AI: DTC C0056 G SENSOR SIGNAL

DTC DETECTING CONDITION:

Longitudinal G sensor signal failure

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM&H/U.	Is VDCCM&H/U installed properly without being tilted? Is the bracket deformation-free? Are the VDCCM&H/U installation bolts installed without missing or getting loose?	Go to step 2.	Repair the fault location. Go to step 2. • Install VDCCM&H/U properly. • Replace the bracket if faulty. • Tighten the VDCCM&H/U installation bolt. <Ref. to VDC-5, VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U), COMPONENT, General Description.>
2 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the longitudinal G sensor output displayed on the screen.	Is the indicated reading of the longitudinal G sensor on the monitor display $-2 \sim 2 \text{ m/s}^2$?	Go to step 3.	Recheck from step 1, and if the problem is not solved, go to next. Go to step 6.
3 SET 0 POINT FOR LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Function Check Sequence" on Subaru Select Monitor. 2) Perform the "Longitudinal G sensor & lateral G sensor 0 point setting mode". <Ref. to VDC-11, LONGITUDINAL G SENSOR & LATERAL G SENSOR 0 POINT SETTING MODE, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Is the 0 point setting successful?	Go to step 4.	Recheck from step 1, and when the 0 point setting is not possible, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4 PERFORM DRIVING TEST. Drive approximately 10 minutes, and check if the warning lights illuminate or improperly operate during driving. In a safe place, drive the vehicle while alternating acceleration and deceleration as much as possible.	Did the ABS warning light or VDC warning light remain off? Does ABS or VDC operate without malfunction?	Go to step 5.	Recheck from step 1, and when the warning lights illuminate or improperly operate, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the longitudinal G sensor output displayed on the screen.	Is the indicated reading of the longitudinal G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	End. It results from a temporary noise interference.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6 CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Remove the VDCCM&H/U installation bolt and bracket. 2) Keep VDCCM&H/U in a horizontal position. 3) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 4) Read the longitudinal G sensor output displayed on the screen.	When the VDCCM&H/U is in a horizontal position, is the indicated reading of the longitudinal G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	Check the bracket and brake pipe, and install VDCCM&H/U in a horizontal position to the vehicle.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AJ:DTC C0057 ECM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from ECM.

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	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. <Ref. to FU(H4SO)-39, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> <Ref. to FU(H6DO)-50, Engine Control Module (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&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)-35, 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)

AK:DTC C0057 ECM CONTROL SYSTEM

DTC DETECTING CONDITION:

ECM malfunctioning

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK COOPERATION CONTROL FEASIBILITY OF ECM USING SUBARU SELECT MONITOR. 1) Start the engine, and run the engine at idle approximately 5 minutes. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Check the E/G Control Stop Flag displayed on screen.	Is the E/G Control Stop Flag "1"?	Go to step 4.	Go to step 2.
2 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 3.	VDC is normal. Perform the Clear Memory Mode. NOTE: DTC may be recorded if cranking is performed during driving.
3 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of ECM connector?	Repair the connector.	Go to step 4.
4 CHECK ECM.	Is ECM normal?	Go to step 5.	Replace the ECM. <Ref. to FU(H4SO)-39, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> <Ref. to FU(H6DO)-50, Engine Control Module (ECM).>
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&H/U. <Ref. to VDC-7, 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)-35, 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)

AL:DTC C0057 VDC INTERRUPTED DUE TO EGI REASON

DTC DETECTING CONDITION:

Cooperation control prohibition of ECM

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

NOTE:

- For the diagnostic procedure, refer to DTC C0057 "ECM CONTROL SYSTEM". <Ref. to VDC(diag)-73, DTC C0057 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
- Warning lights go off if the cooperation control of ECM returns.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



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. 1 — 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-19, 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&H/U. <Ref. to VDC-7, 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)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. Though VDC warning light may remain lit, this is normal. Warning light goes off when the vehicle is driven at 12 km/h (7 MPH) or more.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



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. 1 — 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. 2 — (B310) No. 8: (B231) No. 3 — (B310) No. 10:	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. 2 — Chassis ground: (B231) No. 3 — 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 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 6.	Perform the centering adjustment of steering wheel, and perform Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6 CHECK STEERING ANGLE SENSOR OUTPUT. 1) Adjust steering wheel to the center position. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the steering angle sensor output displayed on display.	Is the indicated reading of the steering angle sensor output on the monitor display -10° — 10°?	Perform Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point. Go to step 7. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Check the installation of the steering wheel and steering angle sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR. 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 8.	Go to step 9.
8 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. <Ref. to VDC-19, 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&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step 10.
9 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. Though VDC warning light may remain lit, this is normal. Warning light goes off when the vehicle is driven at 12 km/h (7 MPH) or more.
10 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AO:DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT

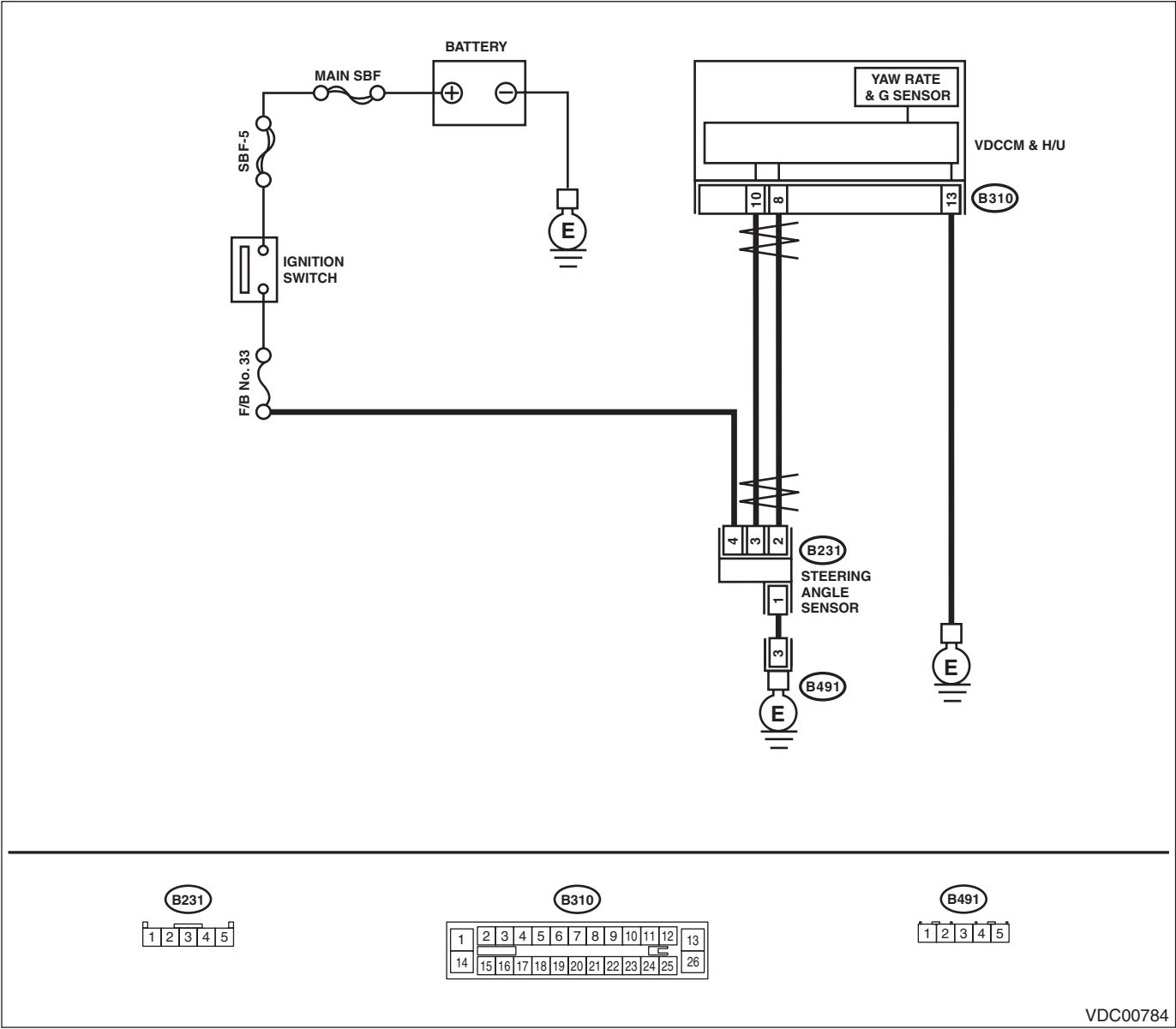
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



VDC00784

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).

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INSTALLATION OF VDCCM&H/U.	Is VDCCM&H/U installed properly without being tilted? Is the bracket deformation-free? Are the VDCCM&H/U installation bolts installed without missing or getting loose?	Go to step 3.	Repair the fault location. Go to step 3. • Install VDCCM&H/U properly. • Replace the bracket if faulty. • Tighten the VDCCM&H/U installation bolt. <Ref. to VDC-5, VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U), COMPONENT, General Description.>
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. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display $-4 \sim 4$ deg/s?	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 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. 4) Read the steering angle sensor output displayed on display.	Is the reading indicated on monitor display $-5 \sim 5^\circ$?	Go to step 5.	Perform the centering adjustment of steering wheel.
5 CHECK VDCCM&H/U. 1) Turn the ignition switch to OFF. 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 6.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference. Though VDC warning light may remain lit, this is normal. Warning light goes off when the vehicle is driven at 12 km/h (7 MPH) or more.

AP:DTC C0073 LATERAL G SENSOR POWER/OUTPUT

NOTE:

For the diagnostic procedure, refer to DTC C0073 "ABNORMAL LATERAL G SENSOR OUTPUT". <Ref. to VDC(diag)-83, DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AQ:DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT

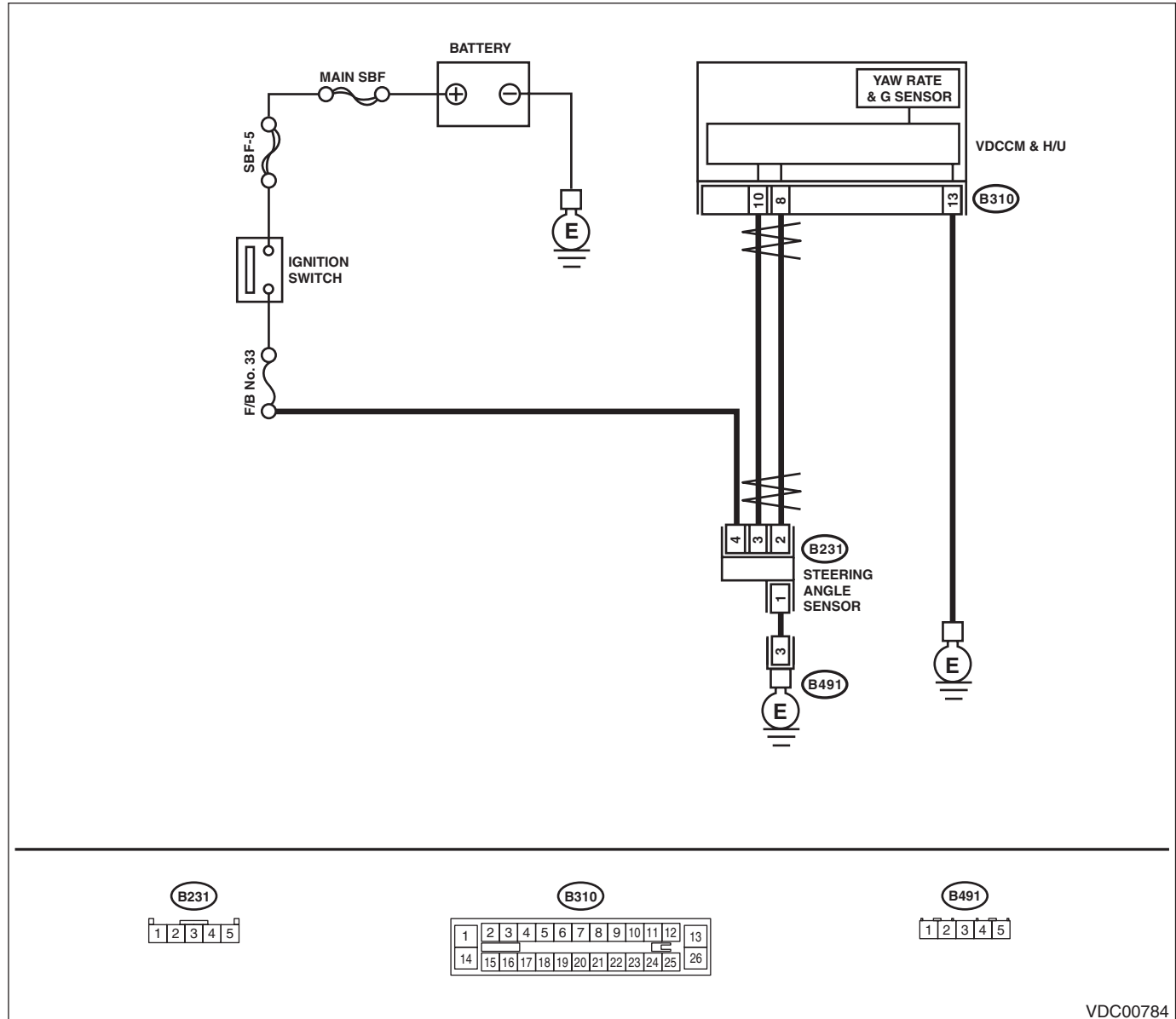
DTC DETECTING CONDITION:

Defective lateral G sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM&H/U.	Is VDCCM&H/U installed properly without being tilted? Is the bracket deformation-free? Are the VDCCM&H/U installation bolts installed without missing or getting loose?	Go to step 2.	Repair the fault location. Go to step 2. • Install VDCCM&H/U properly. • Replace the bracket if faulty. • Tighten the VDCCM&H/U installation bolt. <Ref. to VDC-5, VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U), COMPONENT, General Description.>
2 CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR. 1) Park the vehicle straight on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the steering angle sensor output displayed on display.	Is the indicated reading of the steering angle sensor on the monitor display -10° — 10° ?	Go to step 3.	Check the installation of steering angle sensor.
3 CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR. 1) Park the vehicle straight on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the lateral G sensor output displayed on display.	Is the indicated reading of the lateral G sensor on the monitor display -2 — 2 m/s^2 ?	Go to step 4.	Recheck from step 1, and if the problem is not solved, go to next. Go to step 7.
4 SET 0 POINT FOR LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Function Check Sequence" on Subaru Select Monitor. 2) Perform Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Is the 0 point setting successful?	Go to step 5.	Recheck from step 1, and when the 0 point setting is not possible, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
5 PERFORM DRIVING TEST. Drive approximately 10 minutes, and check if the warning lights illuminate or improperly operate during driving. In a safe place, drive the vehicle while alternating acceleration and deceleration as much as possible.	Did the ABS warning light or VDC warning light remain off? Does ABS or VDC operate without malfunction?	Go to step 6.	Recheck from step 1, and when the warning lights illuminate or improperly operate, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the longitudinal G sensor output displayed on the screen.	Is the indicated reading of the lateral G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	End. It results from a temporary noise interference. Though VDC warning light may remain lit, this is normal. Warning light goes off when the vehicle is driven at 12 km/h (7 MPH) or more.	Recheck from step 1, and if the problem is not solved, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
7 CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR. 1) Remove the VDCCM&H/U installation bolt and bracket. 2) Keep VDCCM&H/U in a horizontal position. 3) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 4) Read the lateral G sensor output displayed on display.	When the VDCCM&H/U is in a horizontal position, is the indicated reading of the lateral G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	Check the bracket and brake pipe, and install VDCCM&H/U in a horizontal position to the vehicle.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AR:DTC C0074 MASTER CYLINDER PRESSURE SENSOR OUTPUT

DTC DETECTING CONDITION:

Defective pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- Hill start assist 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. 2) Read the master cylinder output displayed on display.	With the brake pedal released, is the displayed value 0 — 11 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. 2) Read the master cylinder output displayed on display.	When the brake pedal is operated, does the master cylinder output value displayed on the display 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)-35, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AS:DTC C0075 WHEEL CYLINDER PRESSURE SENSOR OUTPUT

DTC DETECTING CONDITION:

Different VDCCM&H/U specification

NOTE:

When this DTC is displayed, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AT:DTC C0081 SYSTEM FAILURE

DTC DETECTING CONDITION:

VDC long time sequential control

TROUBLE SYMPTOM:

- VDC does not operate.
- Hill start assist does not operate.

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM&H/U.	Is VDCCM&H/U installed properly without being tilted? Is the bracket deformation-free? Are the VDCCM&H/U installation bolts installed without missing or getting loose?	Go to step 2.	Repair the fault location. Go to step 2. • Install VDCCM&H/U properly. • Replace the bracket if faulty. • Tighten the VDCCM&H/U installation bolt. <Ref. to VDC-5, VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U), COMPONENT, General Description.>
2 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 3.	Perform the centering adjustment of steering wheel, and perform Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point. Go to step 3. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3 CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR. 1) Adjust steering wheel to the center position. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read the steering angle sensor output displayed on display.	Is the indicated reading of the steering angle sensor output on the monitor display -10° — 10°?	Go to step 4.	Check the installation of the steering wheel and steering angle sensor, and replace the parts if necessary.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
4 CHECK OUTPUT OF SENSORS USING SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 4) Read output of sensors displayed on display.	Are the indicated reading of sensor outputs following values? Lateral G sensor output: $-2 \sim 2 \text{ m/s}^2$ Longitudinal G sensor output: $-2 \sim 2 \text{ m/s}^2$ Yaw rate sensor output: $-4 \sim 4 \text{ deg/s}$	Go to step 5.	Recheck from step 1, and if the problem is not solved, go to next. Go to step 8.
5 SET 0 POINT FOR LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR. 1) Select "Function Check Sequence" on Subaru Select Monitor. 2) Perform Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point. <Ref. to VDC-10, SET UP MODE FOR NEUTRAL OF STEERING ANGLE SENSOR & LATERAL G SENSOR 0 POINT, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Is the 0 point setting successful?	Go to step 6.	Recheck from step 1, and when the 0 point setting is not possible, replace the VDCCM&H/U and steering angle sensor. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).> <Ref. to VDC-19, Steering Angle Sensor.>
6 PERFORM DRIVING TEST. Drive approximately 10 minutes, and check if the warning lights illuminate or improperly operate during driving.	Did the ABS warning light or VDC warning light remain off? Does ABS or VDC operate without malfunction?	Go to step 7.	Recheck from step 1, and when the warning lights illuminate or improperly operate, replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
7 CHECK OUTPUT OF SENSORS USING SUBARU SELECT MONITOR. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 3) Read output of sensors displayed on display.	Are the indicated reading of sensor outputs following values? Lateral G sensor output: $-1.5 \sim 1.5 \text{ m/s}^2$ Longitudinal G sensor output: $-1.5 \sim 1.5 \text{ m/s}^2$ Yaw rate sensor output: $-4 \sim 4 \text{ deg/s}$	It results from a temporary noise interference.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
8 CHECK OUTPUT OF SENSORS USING SUBARU SELECT MONITOR. 1) Remove the VDCCM&H/U installation bolt and bracket. 2) Keep VDCCM&H/U in a horizontal position. 3) Connect Subaru Select Monitor, and select {Current Data Display & Save}. 4) Read output of sensors displayed on display.	When VDCCM&H/U is in a horizontal position, are the indicated reading of sensor outputs following values? Lateral G sensor output: $-1.5 \sim 1.5 \text{ m/s}^2$ Longitudinal G sensor output: $-1.5 \sim 1.5 \text{ m/s}^2$ Yaw rate sensor output: $-4 \sim 4 \text{ deg/s}$	Check the bracket and brake pipe, and install VDCCM&H/U in a horizontal position to the vehicle.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

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 of VDCCM&H/U. • 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 of VDCCM&H/U. • 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 of VDCCM&H/U. • 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 of VDCCM&H/U.
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 of VDCCM&H/U. • 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 of VDCCM&H/U.
	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 of VDCCM&H/U. - 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 of VDCCM&H/U. • 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 of VDCCM&H/U. • 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 of VDCCM&H/U. • 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 of VDCCM&H/U. • 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 Description

BRAKE

1. General Description

A: SPECIFICATION

Size		16-inch type	17-inch type
Front disc brake	Type	Disc (Floating type, ventilated)	
	Effective disc diameter mm (in)	244 (4.61)	261 (10.28)
	Disc thickness x Diameter mm (in)	24 x 294 (0.94 x 11.57)	30 x 316 (1.18 x 12.44)
	Effective cylinder diameter	42.8 (1.685) x 2	
	Pad dimensions (Length x Width x Thickness) mm (in)	117.8 x 50.5 x 11.0 (4.638 x 1.988 x 0.433)	130.0 x 53.5 x 11.0 (5.118 x 2.106 x 0.433)
	Clearance adjustment	Automatic adjustment	
Rear disc brake	Size	16-inch type	
	Type	Disc (Floating type, solid)	Disc (Floating type, ventilated)
	Effective disc diameter mm (in)	250 (9.84)	255 (10.0)
	Disc thickness x Diameter mm (in)	10 x 286 (0.39 x 11.26)	18 x 290 (0.71 x 11.42)
	Effective cylinder diameter mm (in)	38.1 (1.500)	40.4 (1.591)
	Pad dimensions (Length x Width x Thickness) mm (in)	92.0 x 33.0 x 9.0 (3.622 x 1.299 x 0.354)	95.5 x 34.8 x 11.0 (3.759 x 1.370 x 0.433)
	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	

General Description

BRAKE

NOTE:

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

Contents			Specification	Service limit
Front brake	Pad thickness mm (in)	16-inch type	11 (0.43)	1.5 (0.059)
		17-inch type	11 (0.43)	1.5 (0.059)
	Disc thickness mm (in)	16-inch type	24 (0.94)	22 (0.87)
		17-inch type	30 (1.18)	28 (1.10)
	Disc runout mm (in)		—	0.05 (0.0020)
Rear brake (disc type)	Pad thickness mm (in)	Solid disc	9.0 (0.354)	1.5 (0.059)
		Ventilated disc	11 (0.43)	1.5 (0.059)
	Disc thickness mm (in)	Solid disc	10 (0.39)	8.5 (0.335)
		Ventilated disc	18 (0.71)	16 (0.63)
	Disc runout mm (in)		—	0.05 (0.0020)
Parking brake	Inside diameter mm (in)		190 (7.48)	191 (7.52)
	Lining thickness mm (in)		2.8 (0.11)	1.5 (0.059)

		Brake pedal force N (kgf, lbf)	Fluid pressure kPa (kgf/cm ² , psi)
Brake booster	Brake fluid pressure with engine stopped	147 (15, 33)	533 (5, 77)
		294 (30, 66)	1,551 (16, 225)
	Brake fluid pressure with engine running and vacuum pressure at 66.7 kPa (500 mmHg, 19.69 inHg)	147 (15, 33)	6,177 (63, 896)
		294 (30, 66)	11,273 (115, 1,635)

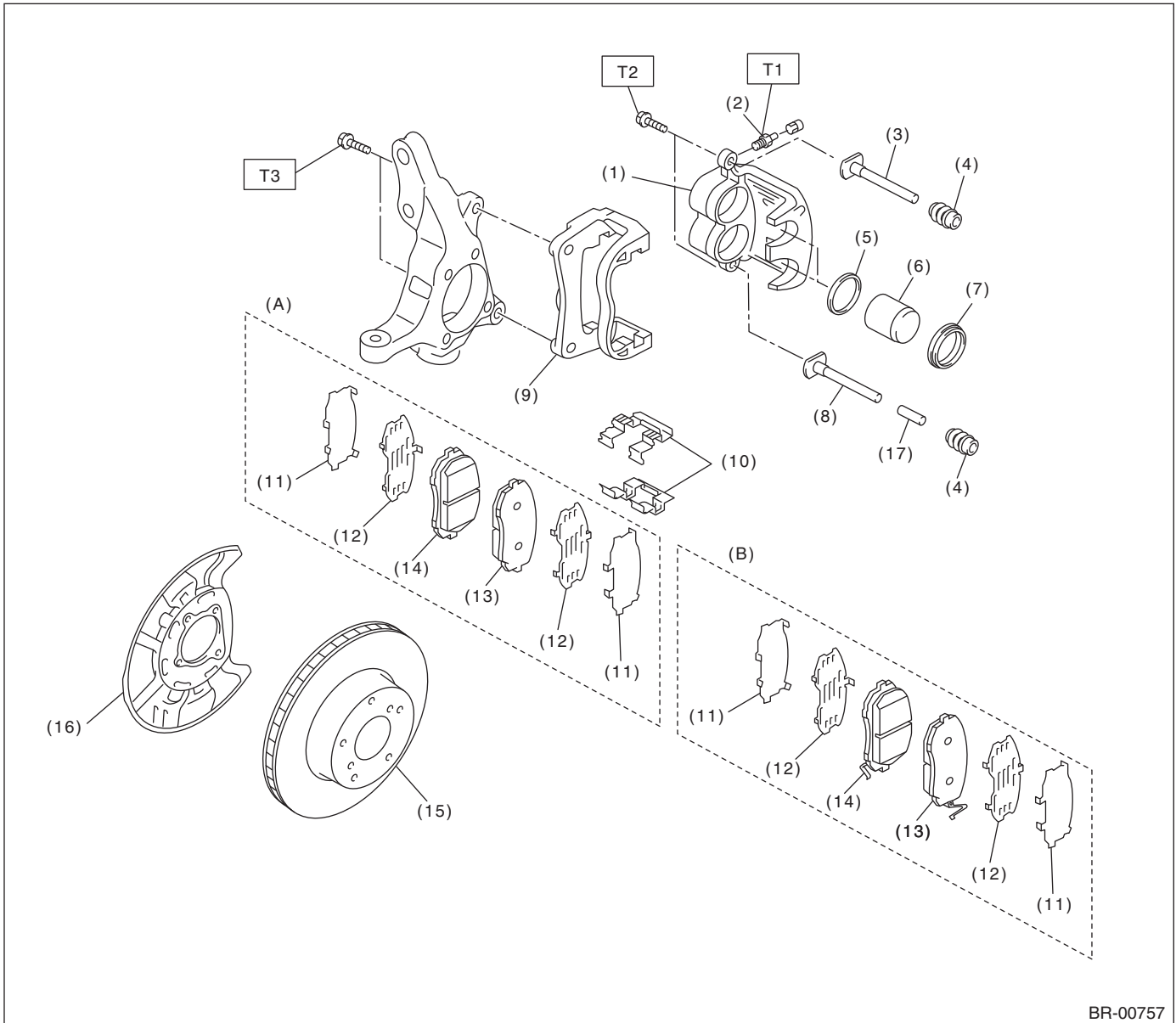
Brake pedal	Free play mm (in)	2 — 5 (0.079 — 0.197) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf)]
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General Description

BRAKE

B: COMPONENT

1. FRONT DISC BRAKE



BR-00757

(A) 16-inch type

(B) 17-inch type

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

- (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

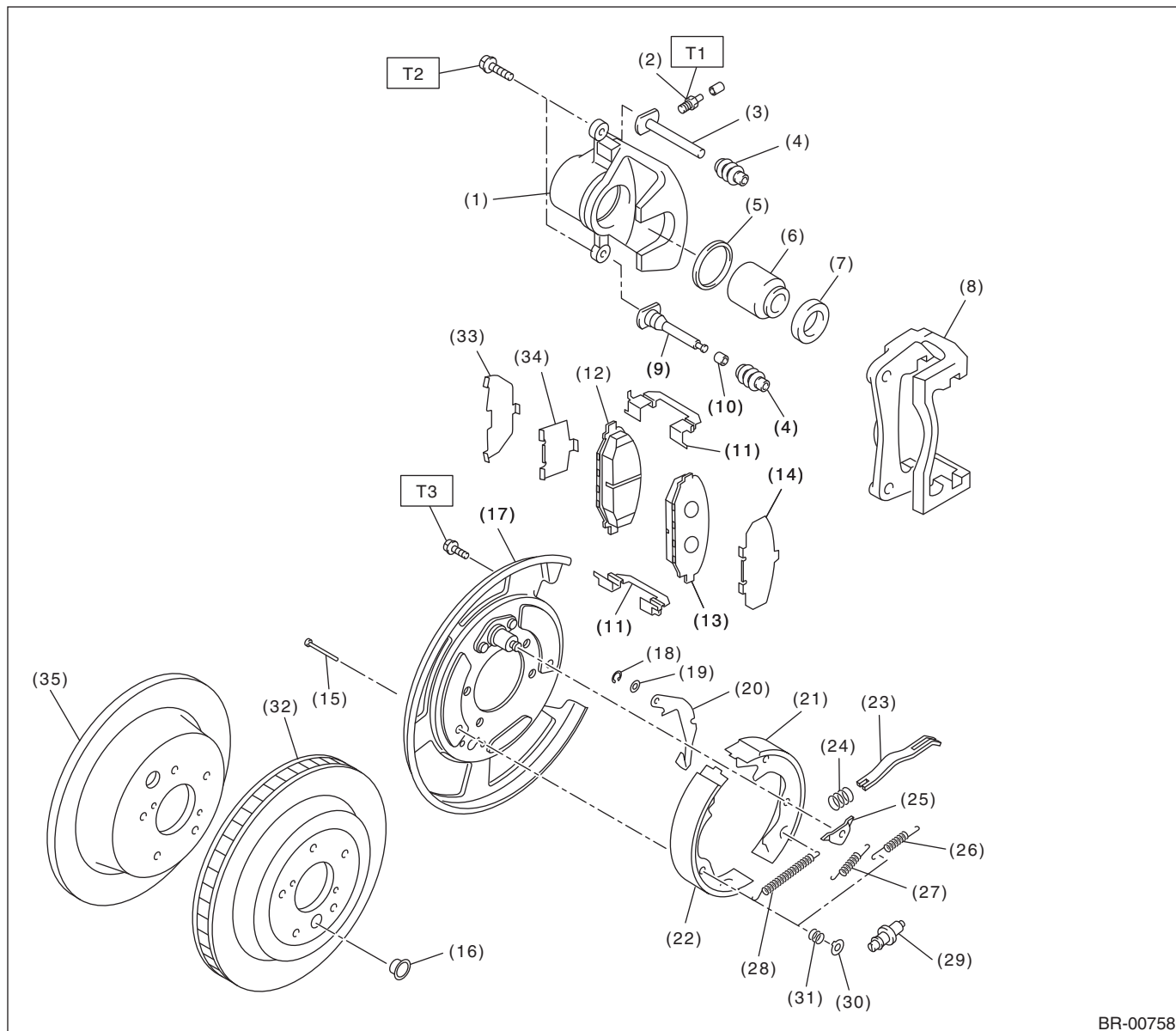
Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 27 (2.8, 19.9)

T3: 120 (12.2, 88.5)

2. REAR DISC BRAKE



BR-00758

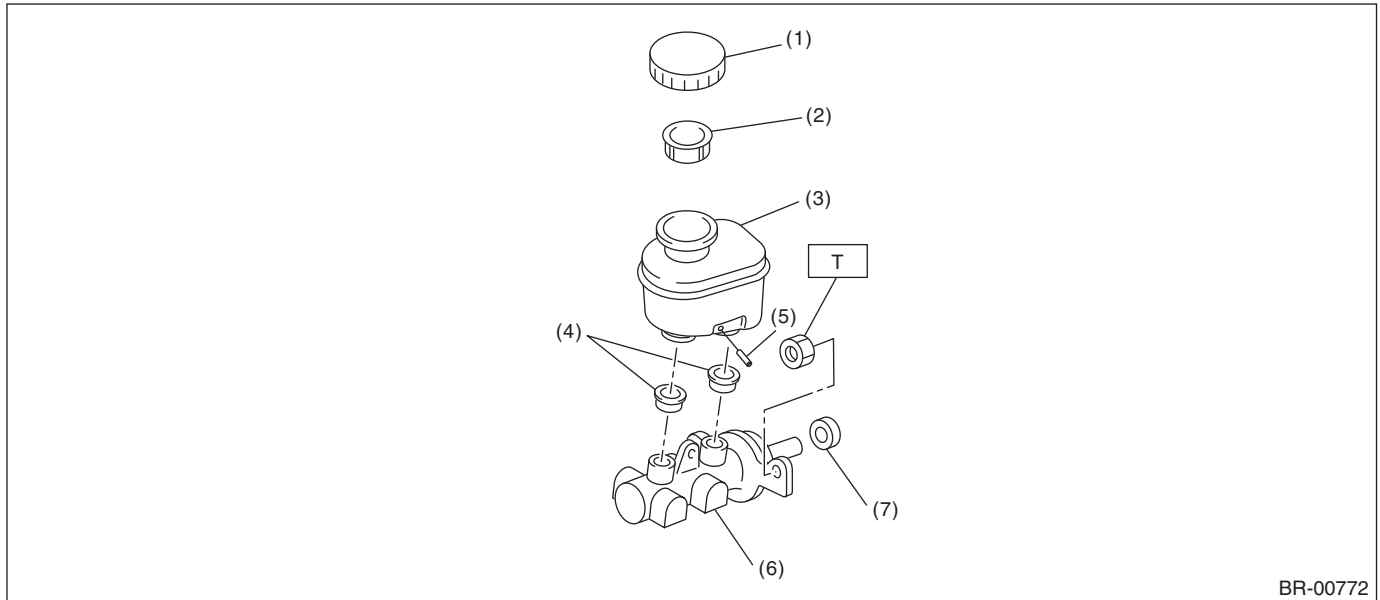
- | | | |
|-----------------------|-------------------------------------|-----------------------------------|
| (1) Caliper body | (15) Shoe hold-down pin | (29) Adjuster |
| (2) Air bleeder screw | (16) Adjusting hole cover | (30) Shoe hold-down cup |
| (3) Guide pin (Black) | (17) Back plate | (31) Shoe hold-down spring |
| (4) Pin boot | (18) Retainer | (32) Disc rotor (Ventilated type) |
| (5) Piston seal | (19) Wave washer | (33) Outer shim |
| (6) Piston | (20) Lever | (34) Inner shim |
| (7) Piston boot | (21) Parking brake shoe (Secondary) | (35) Disc rotor (Solid type) |
| (8) Support | (22) Parking brake shoe (Primary) | |
| (9) Lock pin (Silver) | (23) Strut | |
| (10) Bushing | (24) Strut spring | |
| (11) Pad clip | (25) Shoe guide plate | |
| (12) Inner pad | (26) Secondary shoe return spring | |
| (13) Outer pad | (27) Primary shoe return spring | |
| (14) Shim | (28) Adjusting 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

BRAKE

3. MASTER CYLINDER



BR-00772

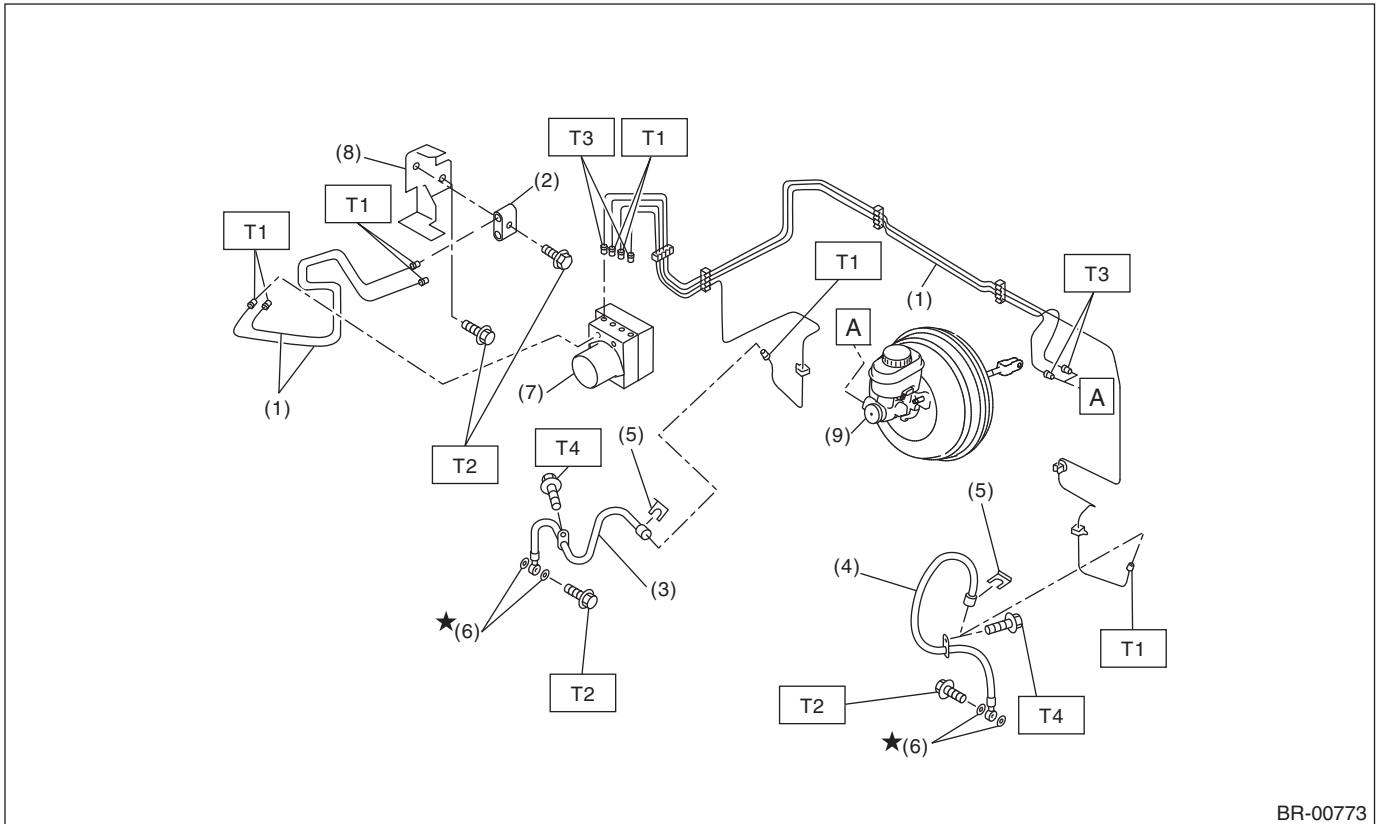
- (1) Cap
- (2) Filter
- (3) Reservoir tank
- (4) Seal

- (5) Pin
- (6) Cylinder body ASSY
- (7) Seal sub ASSY

Tightening torque: N·m (kgf-m, ft-lb)

T: 13 (1.3, 9.6)

4. FRONT BRAKE PIPES AND HOSES



BR-00773

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

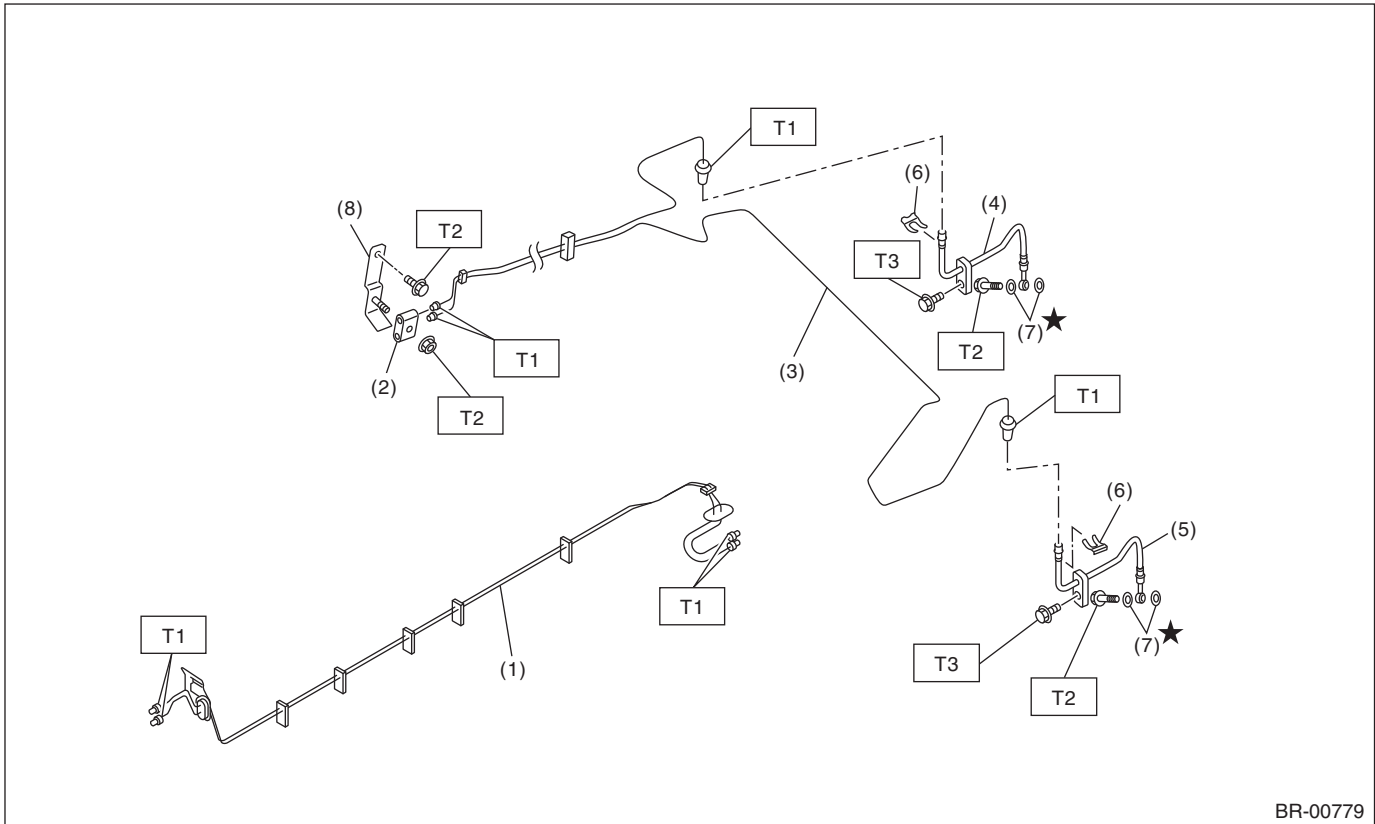
- (6) Gasket
- (7) VDC control module and hydraulic control unit (VDCCM&H/U)
- (8) Bracket
- (9) Master cylinder

<i>Tightening torque:N·m (kgf-m, ft-lb)</i>	
T1:	15 (1.5, 11.1)
T2:	18 (1.8, 13.3)
T3:	19 (1.9, 14)
T4:	33 (3.4, 24.3)

General Description

BRAKE

5. CENTER AND REAR BRAKE PIPES AND HOSES



BR-00779

- | | |
|----------------------------|------------------------|
| (1) Center brake pipe ASSY | (5) Rear brake hose LH |
| (2) Connector | (6) Clamp |
| (3) Rear brake pipe ASSY | (7) Gasket |
| (4) Rear brake hose RH | (8) Bracket |

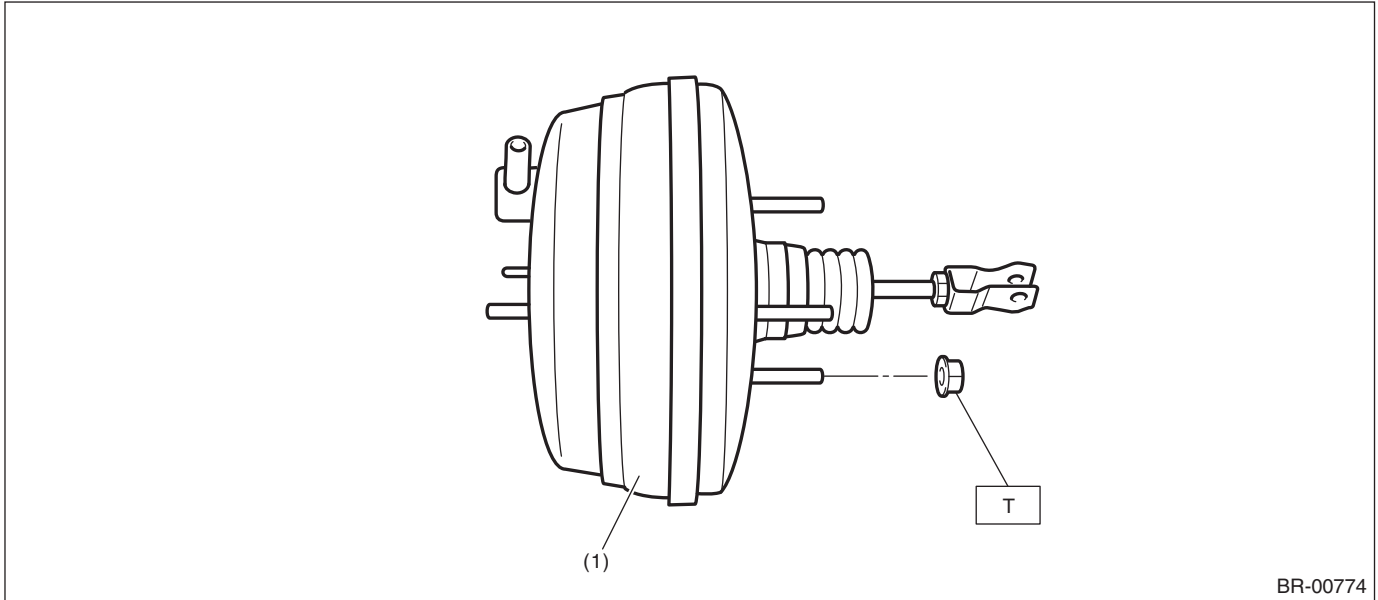
Tightening torque: N·m (kgf-m, ft-lb)

T1: 15 (1.5, 11.1)

T2: 18 (1.8, 13.3)

T3: 33 (3.4, 24.3)

6. BRAKE BOOSTER



(1) Brake booster

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

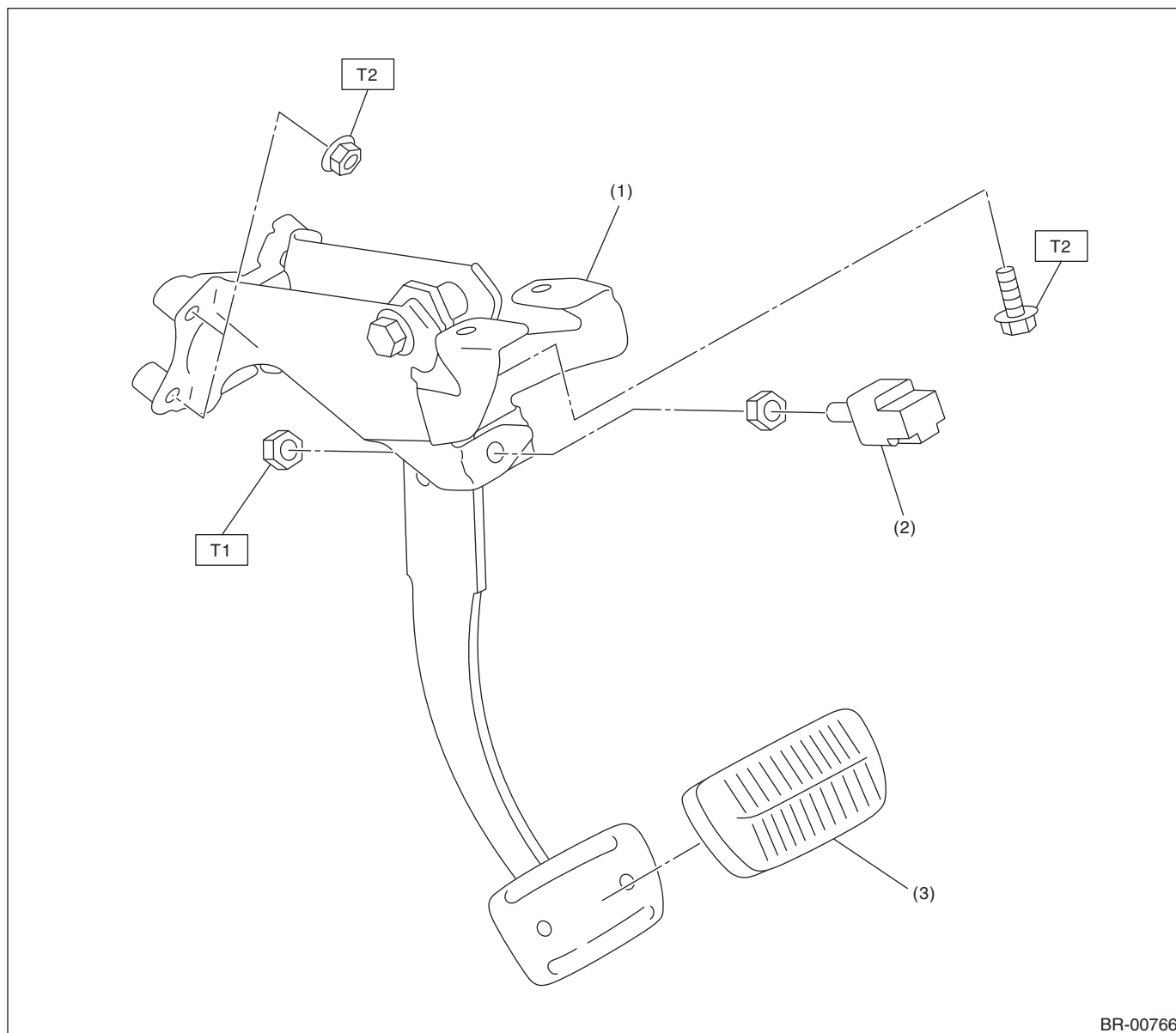
T: 18 (1.8, 13.3)

General Description

BRAKE

7. BRAKE PEDAL

- AT model



BR-00766

(1) Brake pedal ASSY

(2) Stop light switch

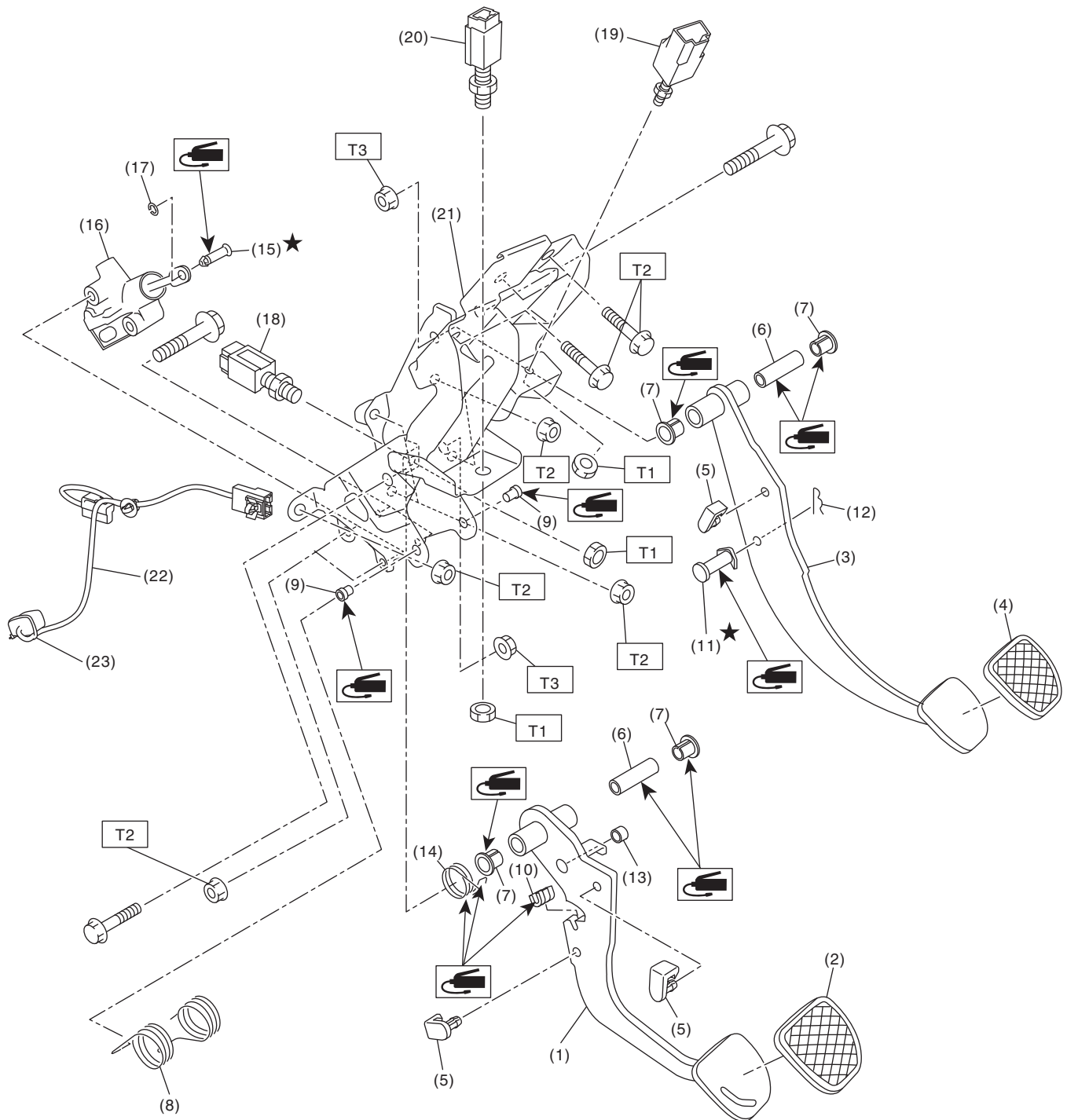
(3) Brake pedal pad

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 18 (1.8, 13.3)

- MT model



CL-00760

General Description

BRAKE

(1) Clutch pedal	(11) Clevis pin	(21) Pedal bracket
(2) Clutch pedal pad	(12) Snap pin	(22) Sensor harness
(3) Brake pedal	(13) Bush A	(23) Band
(4) Brake pedal pad	(14) Assist spring	
(5) Stopper	(15) Clevis pin	
(6) Spacer	(16) Master cylinder ASSY	
(7) Bushing	(17) Clip	
(8) Torsion spring	(18) Clutch switch (clutch start)	
(9) Assist bushing	(19) Stop and brake switch	
(10) Torsion spring bush	(20) Clutch switch (cruise control)	

Tightening torque:N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.9)

T2: 18 (1.8, 13.3)

T3: 30 (3.1, 22.1)

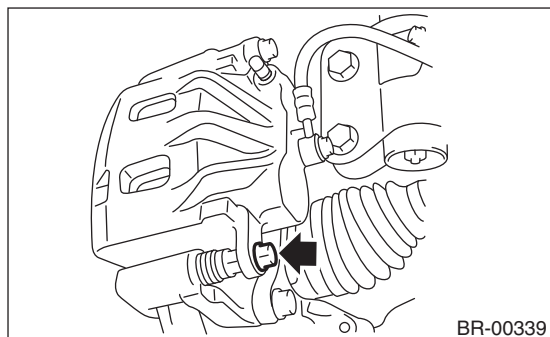
C: CAUTION

- 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.

2. Front Brake Pad

A: REMOVAL

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

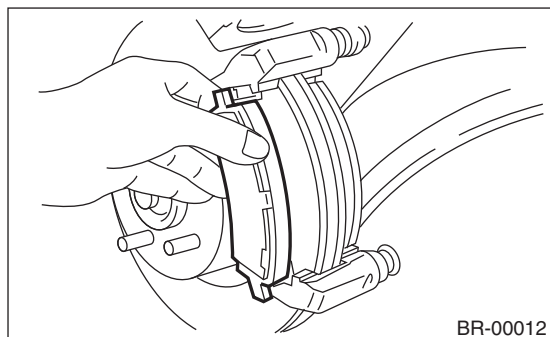


- 3) Raise the caliper body and support it.

NOTE:

Do not disconnect the brake hose from the caliper body.

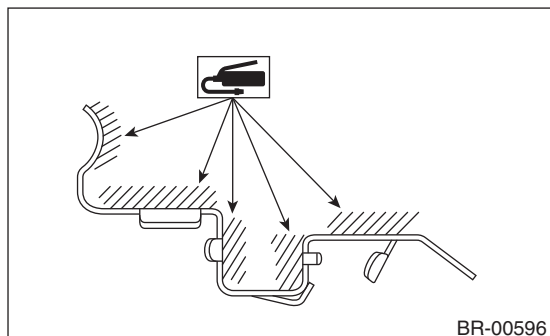
- 4) Remove the pad.



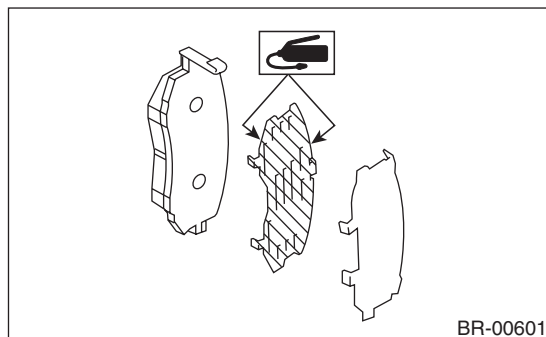
B: INSTALLATION

1. 16-INCH TYPE

- 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 and inner shim.



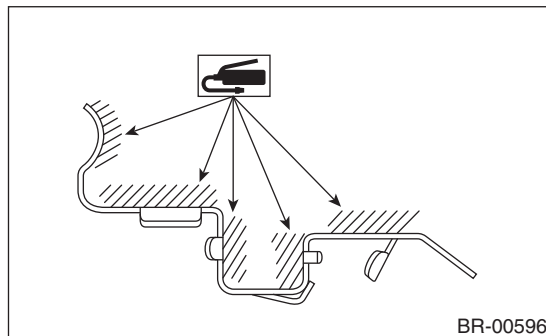
- 3) Install the pad to support.
- 4) Install the caliper body to the support.

Tightening torque:

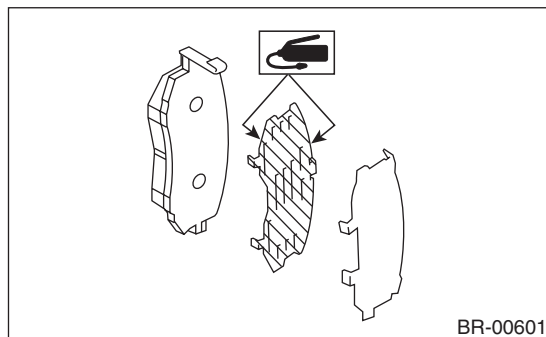
27 N·m (2.8 kgf-m, 19.9 ft-lb)

2. 17-INCH TYPE

- 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 and inner shim.



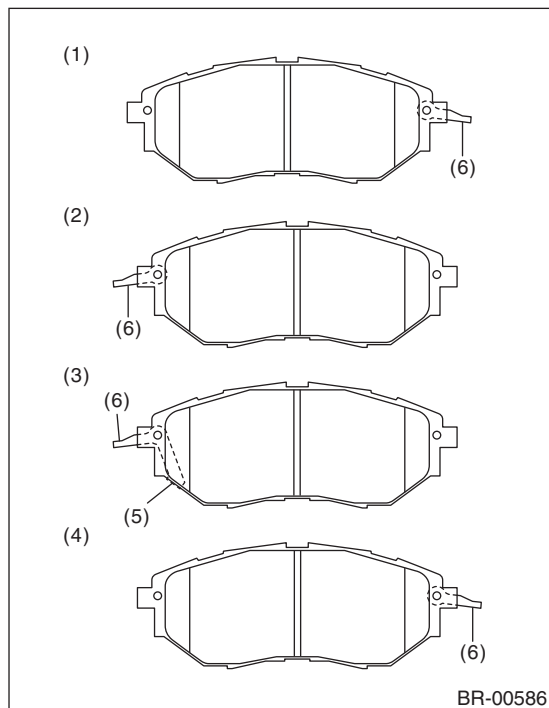
- 3) Install the pad to support.

Front Brake Pad

BRAKE

NOTE:

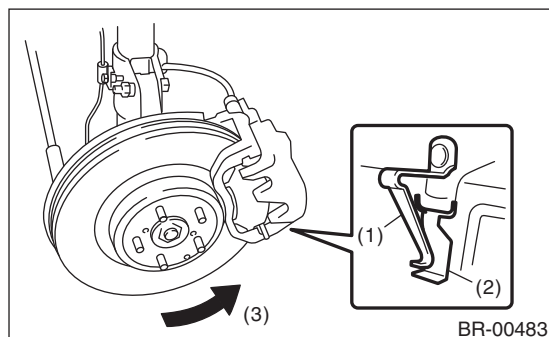
Install the pad indicator in proper direction.



- (1) LH – IN
- (2) LH – OUT
- (3) RH – IN
- (4) RH – OUT
- (5) Pad indicator
- (6) Pad return spring

CAUTION:

- Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
- Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
- If the pad return spring is deformed or damaged, replace the brake pad.



- (1) Pad return spring
- (2) Supporting surface of pad clip
- (3) Direction of brake rotor rotation

4) Install the caliper body to the support.

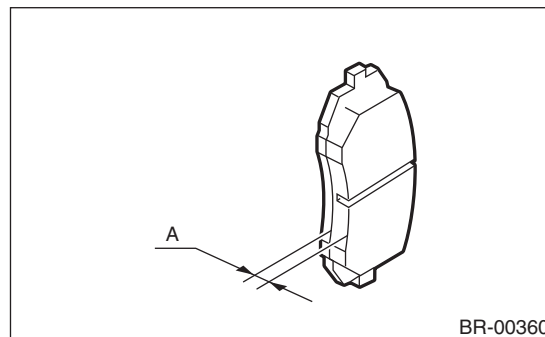
Tightening torque:

27 N·m (2.8 kgf-m, 19.9 ft-lb)

C: INSPECTION

1. 16-INCH TYPE

Check the pad thickness A.



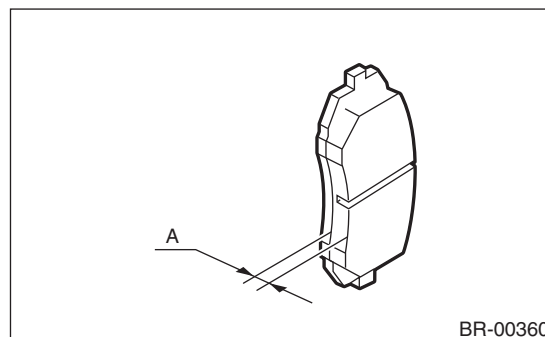
Pad thickness mm (in)	Standard	11 (0.43)
	Wear limit	1.5 (0.059)

NOTE:

- Always replace the pads of both wheels and both sides as a set.
- Replace pad clips if they are twisted or worn.
- Replace the pad if there is oil or grease on it.

2. 17-INCH TYPE

Check the pad thickness A.



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

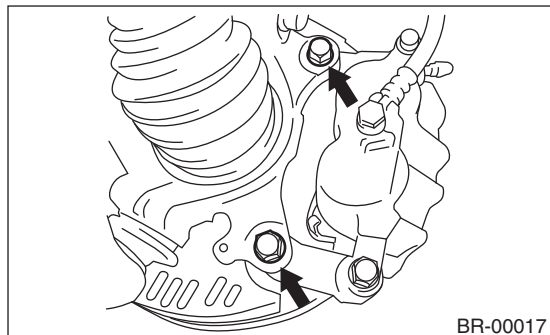
NOTE:

- Always replace the pads of both wheels and both sides as a set.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

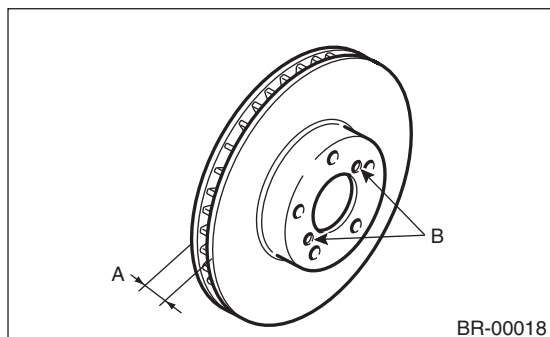
- 1) Lift up the vehicle, and remove the front wheels.
- 2) Remove the caliper body and the support from housing, and suspend them from the strut using a wire.



- 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.

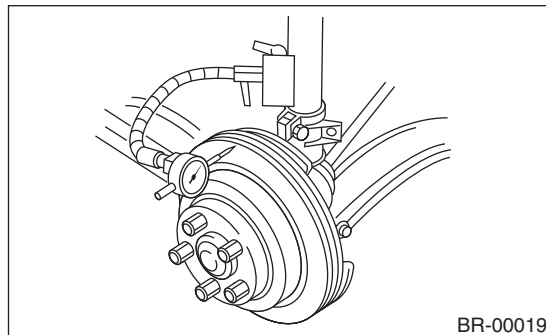
Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

- 3) Install the front wheels.

C: INSPECTION

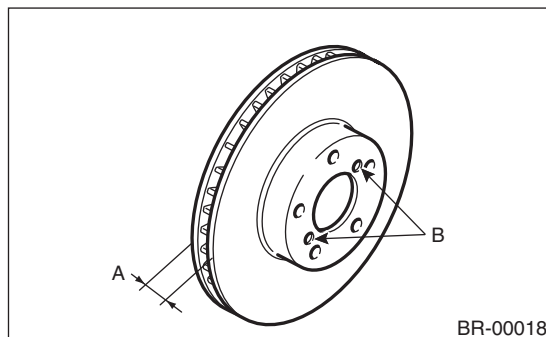
- 1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-15, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening the five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the service limit, grind the disc rotor. After grinding, check the thickness of the disc rotor by following 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 disc rotor exceeds the service limit, replace with a new disc rotor.



		Standard	Limit	Disc rotor outer diameter
Disc rotor thickness A mm (in)	16"	24 (0.94)	22 (0.87)	294 (11.57)
	17"	30 (1.18)	28 (1.10)	316 (12.44)

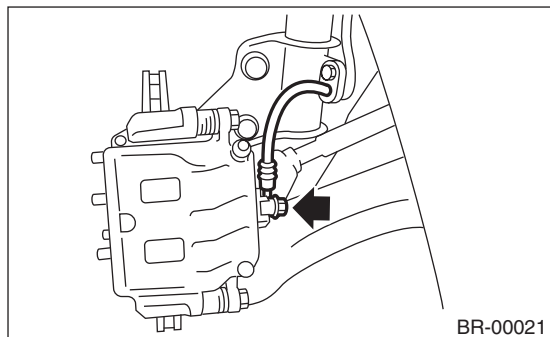
4. Front Disc Brake Assembly

A: REMOVAL

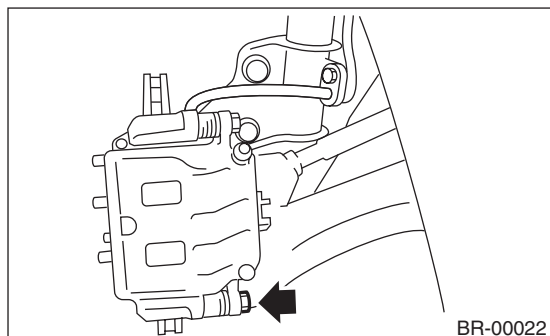
CAUTION:

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.



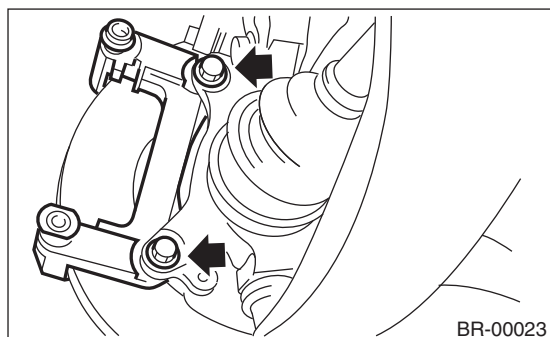
- 3) Remove the bolts which secure the caliper body.



- 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.

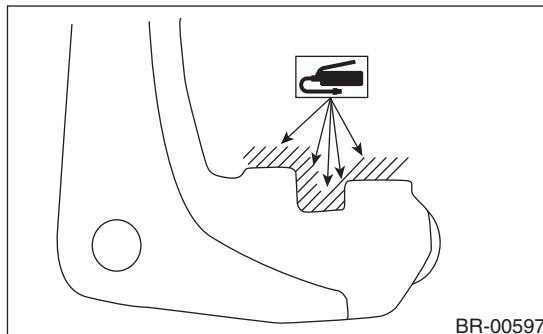


- 6) Remove mud and foreign matter from the caliper body assembly and the support.

B: INSTALLATION

1. 16-INCH TYPE

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

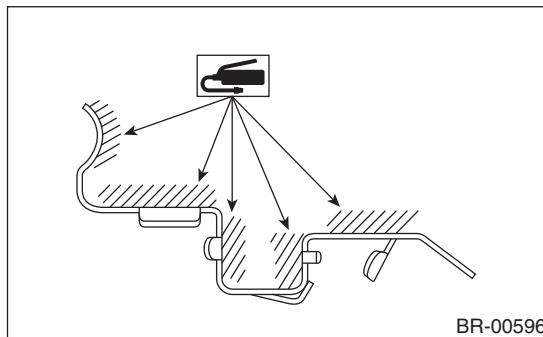


- 2) Install the support to the housing.

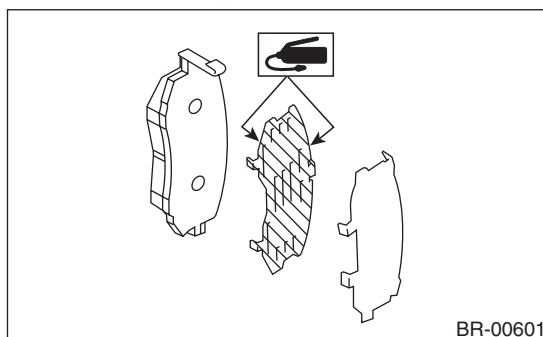
Tightening torque:

120 N·m (12.2 kgf-m, 88.5 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 and 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.

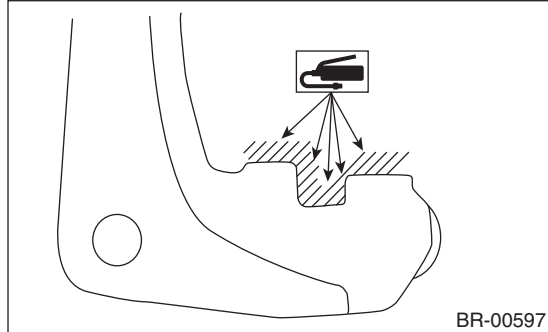
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

8) Bleed air from the brake system.

2. 17-INCH TYPE

1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) to the support.

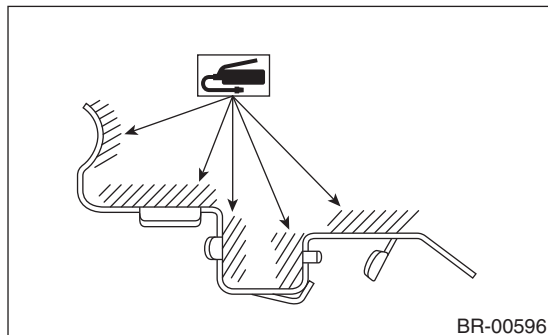


2) Install the support to the housing.

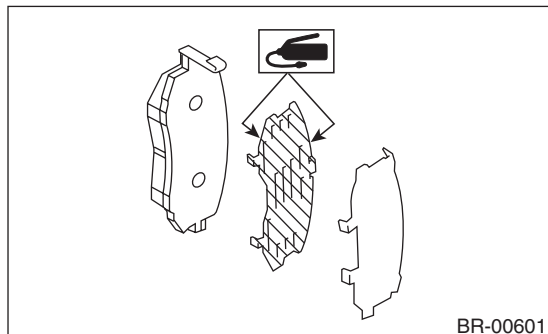
Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

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



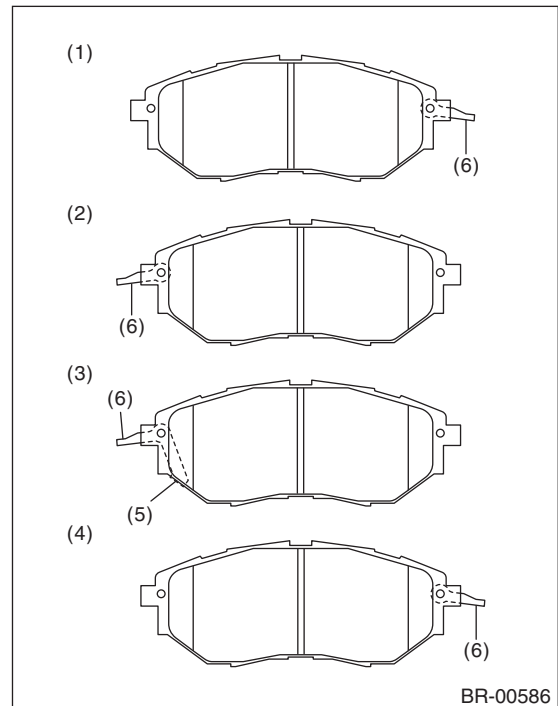
4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad and inner shim.



5) Install the pad to support.

NOTE:

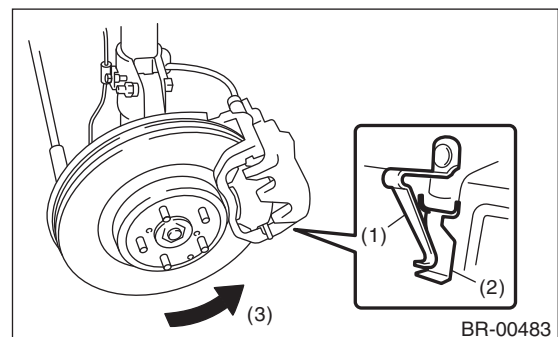
Install the pad indicator in proper direction.



- (1) LH – IN
- (2) LH – OUT
- (3) RH – IN
- (4) RH – OUT
- (5) Pad indicator
- (6) Pad return spring

CAUTION:

- Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
- Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
- If the pad return spring is deformed or damaged, replace the brake pad.



- (1) Pad return spring
- (2) Supporting surface of pad clip
- (3) Direction of brake rotor rotation

Front Disc Brake Assembly

BRAKE

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

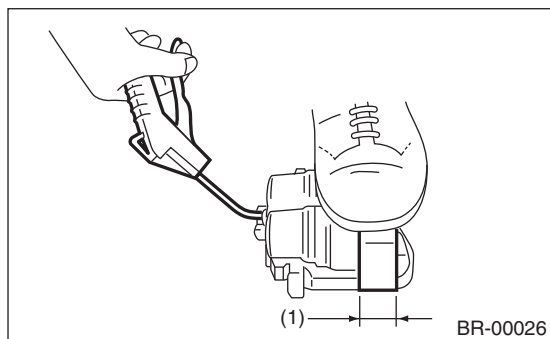
C: DISASSEMBLY

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

CAUTION:

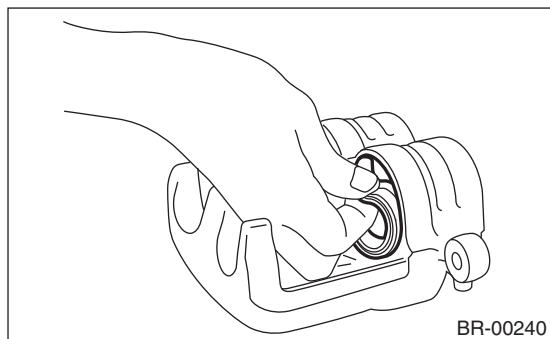
Be careful not to allow foreign matter to enter the brake hose connector.

- 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.

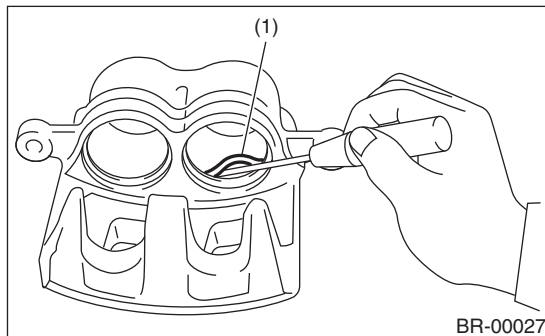
- 4) Remove the piston boot.



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

CAUTION:

Do not damage the cylinder and piston seal groove.



(1) Piston seal

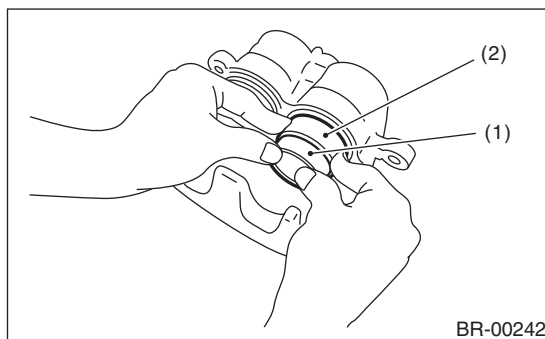
- 6) Remove the guide pin and boot from caliper body.

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 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.

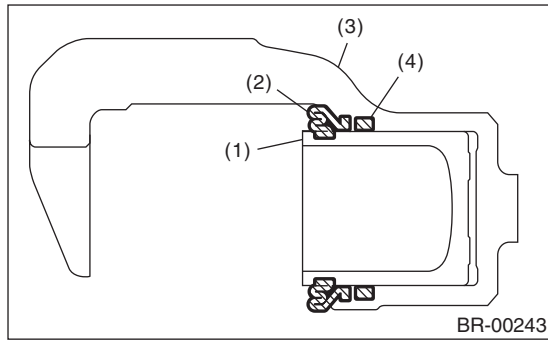
CAUTION:

Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

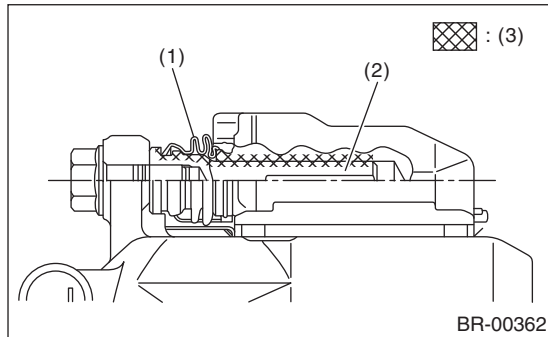
6) Position the boot in the grooves on cylinder and piston.



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

7) Apply grease contained in the piston seal kit to the lock pin, guide pin outer surface, cylinder inner surface, and boot grooves.

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.

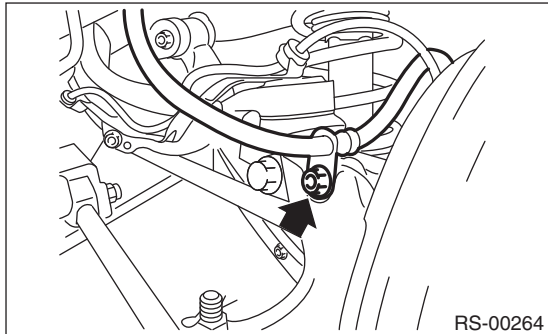
E: INSPECTION

- 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.

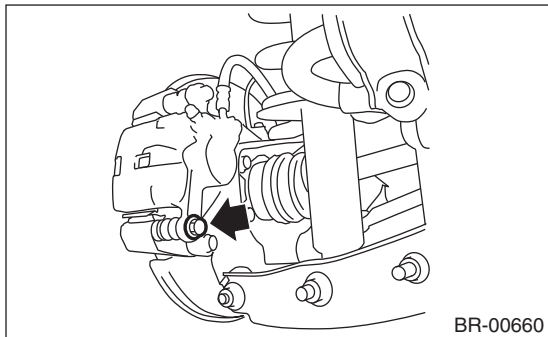
5. Rear Brake Pad

A: REMOVAL

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



- 3) Remove the caliper bolt.

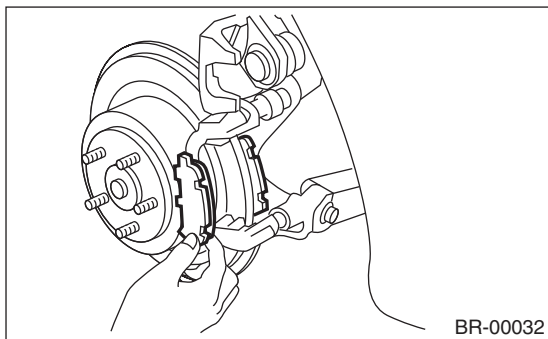


- 4) Raise the caliper body and support it.

NOTE:

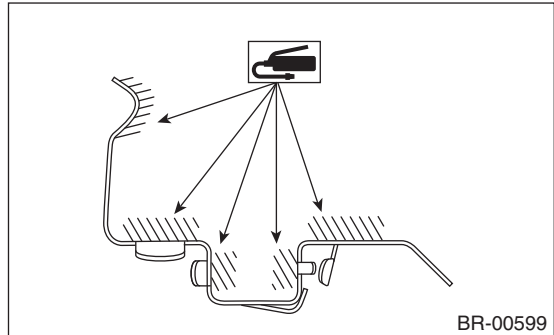
Do not disconnect the brake hose from the caliper body.

- 5) Remove the pad.

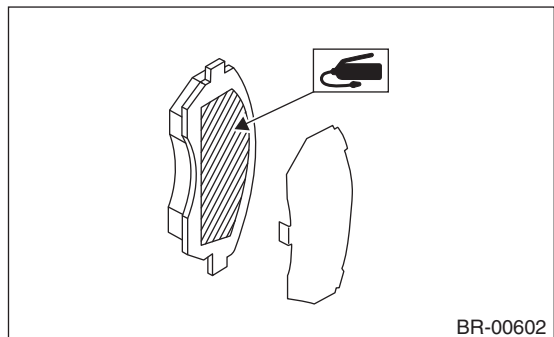


B: INSTALLATION

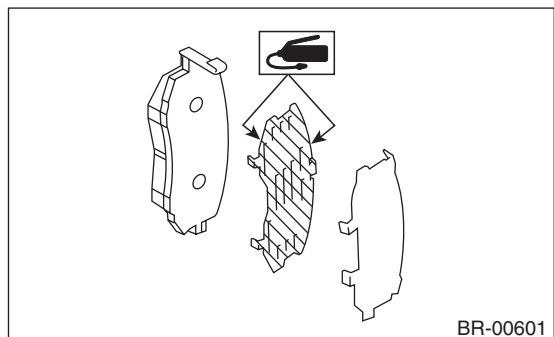
- 1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



- 2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit between the outer 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 inner 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)

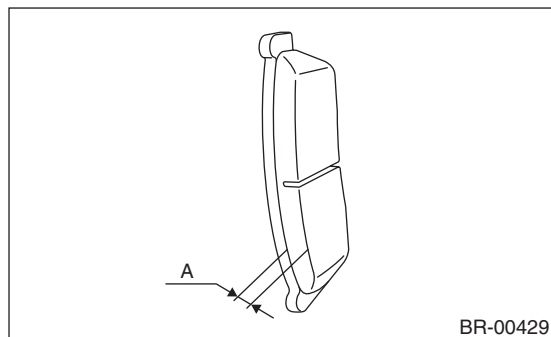
- 6) Install the brake hose bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

C: INSPECTION

Check the pad thickness A.



Type of disc rotor		Solid	Ventilated
Pad thickness mm (in)	Standard	9.0 (0.35)	11 (0.43)
	Wear limit	1.5 (0.059)	1.5 (0.059)

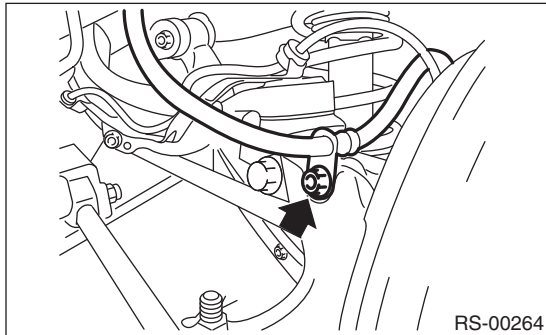
NOTE:

- 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.

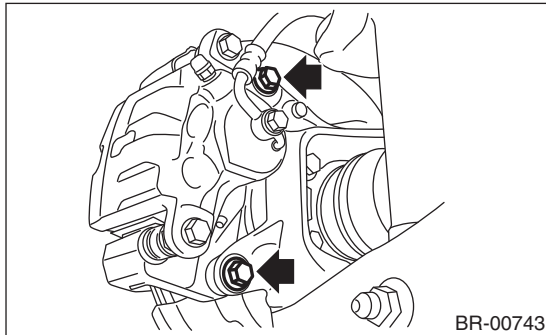
6. Rear Disc Rotor

A: REMOVAL

- 1) Lift up the vehicle, and then 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.

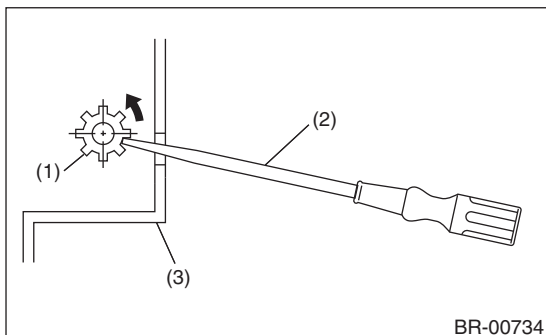


- 5) Suspend the disc brake assembly so that the hose is not stretched.
- 6) Remove the disc rotor.

NOTE:

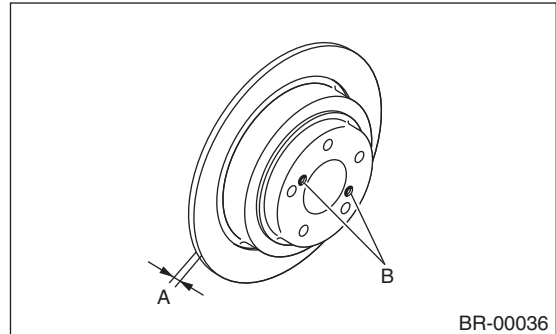
If it is difficult to remove the disc rotor, perform the following two methods in order.

- (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 hub, drive an 8 mm bolt into the threads B of the rotor, and remove the rotor.



B: INSTALLATION

- 1) Install in the reverse order of removal.

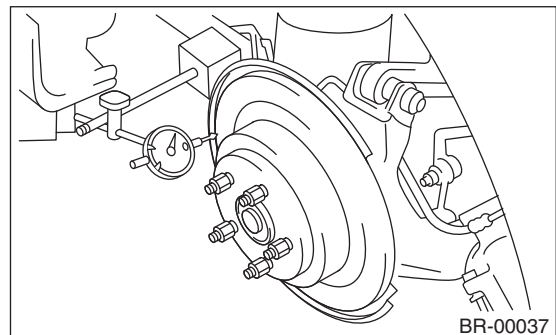
Tightening torque:

<Ref. to BR-4, COMPONENT, General Description.>

- 2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

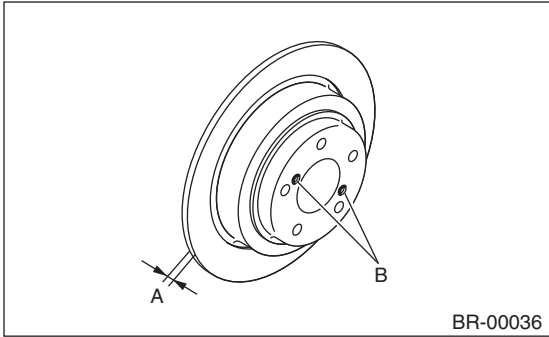
C: INSPECTION

- 1) Check the rear wheel bearing play and axle hub runout before inspecting the disc rotor runout limit. <Ref. to DS-24, 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 service limit, grind the disc rotor. After grinding, check the thickness of the disc rotor by following 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 disc rotor exceeds the service limit, replace with a new disc rotor.



		Standard	Limit	Disc outer dia.
Disc rotor thickness A mm (in)	Solid disc	10 (0.39)	8.5 (0.335)	286 (11.26)
	Ventilated disc	18 (0.71)	16 (0.63)	290 (11.42)

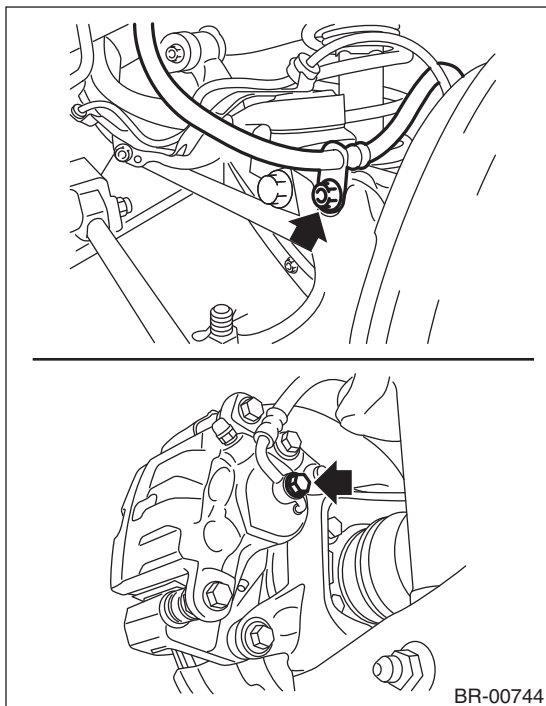
7. Rear Disc Brake Assembly

A: REMOVAL

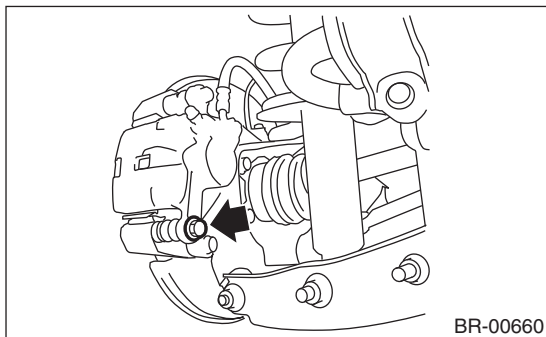
CAUTION:

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 then remove the rear wheels.
- 2) Disconnect the brake hoses.



- 3) Remove the caliper mounting bolt.



- 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.

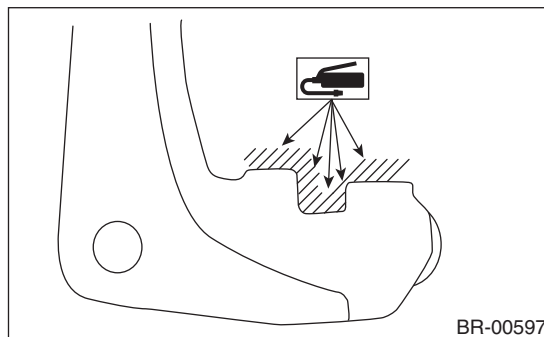
- 6) Remove mud and foreign matter from the caliper body assembly and the support.

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.

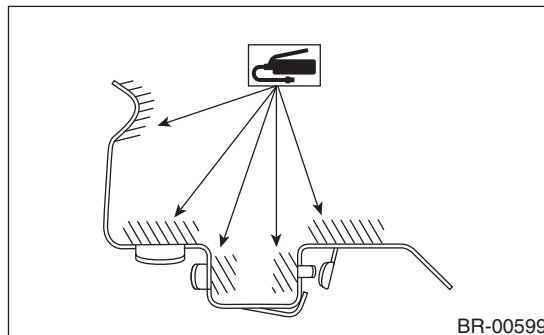


- 2) Install the support to the housing.

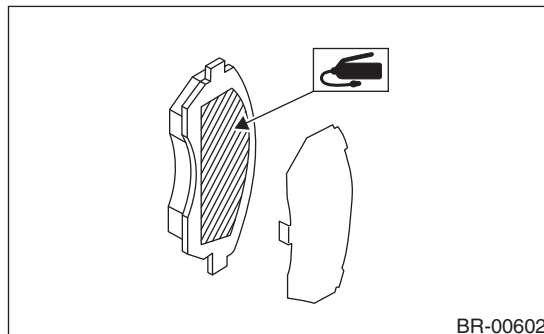
Tightening torque:

66 N·m (6.7 kgf-m, 48.7 ft-lb)

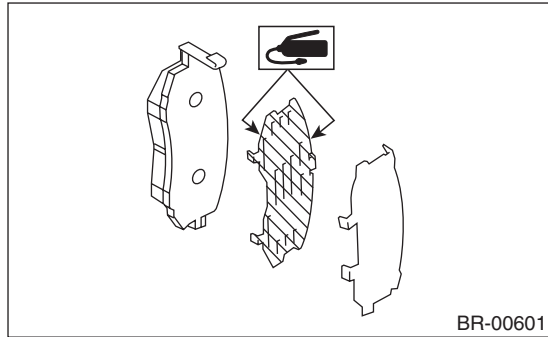
- 3) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



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



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

Tightening torque:

33 N·m (3.4 kgf-m, 14.3 ft-lb)

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

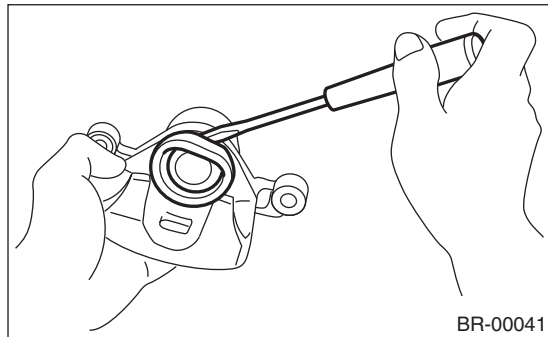
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

10) Bleed air from the brake system.

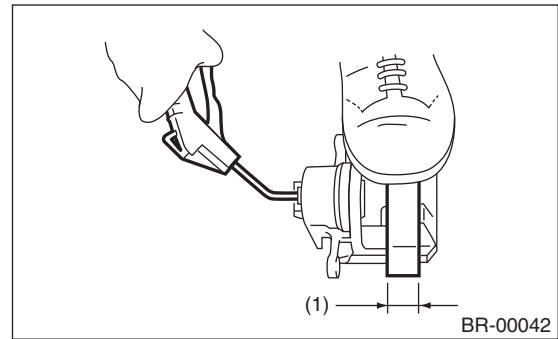
C: DISASSEMBLY

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.

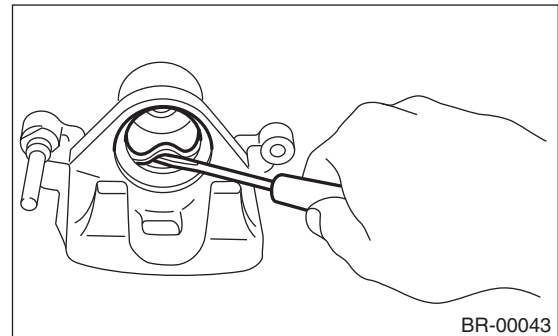


(1) Place a wooden block of 30 mm (1.18 in) width.

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 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.

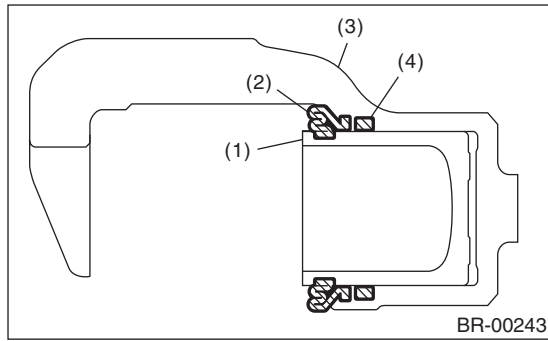
CAUTION:

Do not force the piston into cylinder.

Rear Disc Brake Assembly

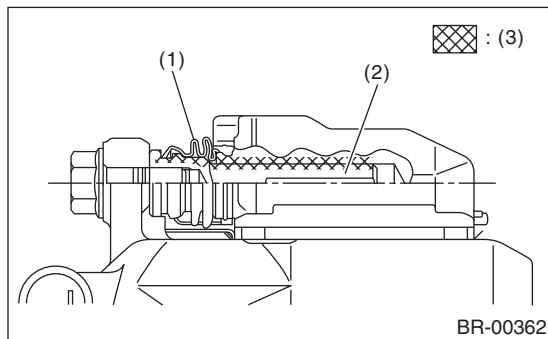
BRAKE

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



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

7) Apply grease contained in the piston seal kit to the 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 to the support.

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

CAUTION:

Insert the 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.

8. Master Cylinder

A: REMOVAL

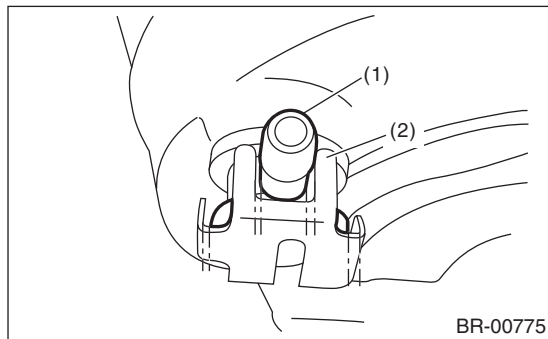
CAUTION:

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 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 remove the master cylinder slowly from the brake booster.

CAUTION:

In order to prevent the contact of the bracket and check valve, be sure to loosen the master cylinder mounting nut while holding the bracket with hand. Otherwise it may deform the bracket.



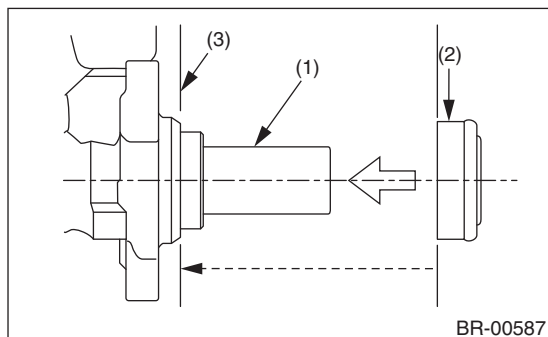
- (1) Check valve
- (2) Bracket

B: INSTALLATION

- 1) Replace the seal sub assembly for the master cylinder with a new part.

CAUTION:

Be careful not to install the seal sub assembly in the wrong location.

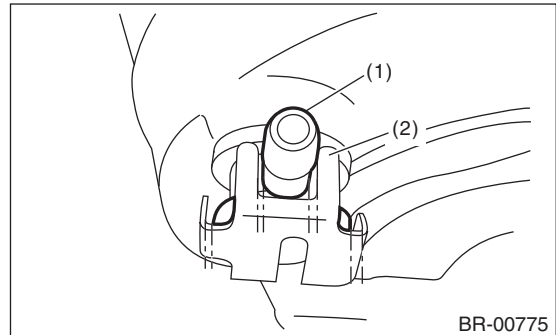


- (1) Primary piston
- (2) Seal sub ASSY
- (3) Install the seal sub assembly to this surface.

- 2) Install in the reverse order of removal.

CAUTION:

- Install the bracket at the position with sufficient clearance that it does not contact with the check valve.
- Be sure to loosen the master cylinder mounting nut while holding the bracket with hand. Otherwise the bracket may deform.



- (1) Check valve
- (2) Bracket

Tightening torque:

Master cylinder mounting nut

13 N·m (1.3 kgf-m, 9.6 ft-lb)

Piping flare nut

19 N·m (1.9 kgf-m, 14 ft-lb)

- 3) Bleed air from brake system. <Ref. to BR-34, PROCEDURE, Air Bleeding.>

CAUTION:

Be sure to use recommended brake fluid.

C: REPLACEMENT

CAUTION:

Since the master cylinder assembly cannot be disassembled, disassembly and cleaning are prohibited. When replacing, replace the master cylinder assembly.

9. Brake Booster

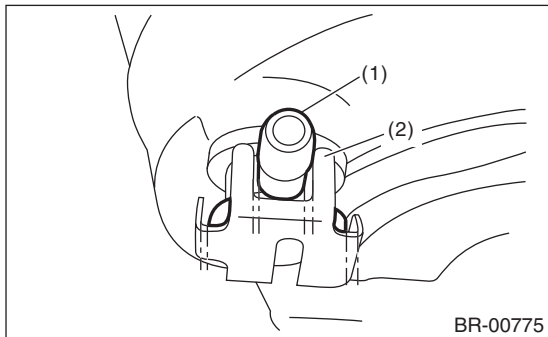
A: REMOVAL

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.

CAUTION:

In order to prevent the contact of the bracket and check valve, be sure to loosen the master cylinder mounting nut while holding the bracket with hand. Otherwise it may deform the bracket.



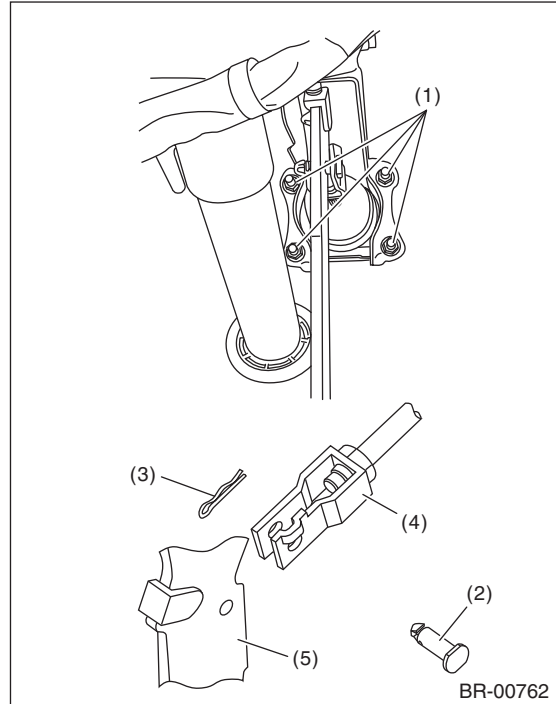
- (1) Check valve
- (2) Bracket

(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.

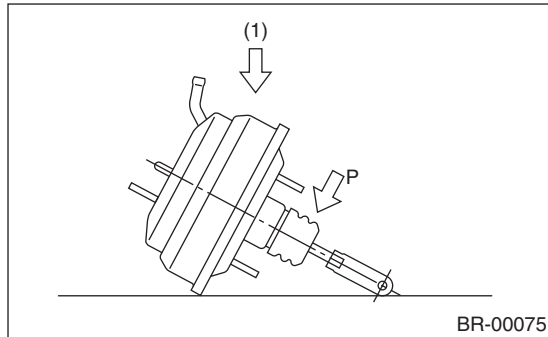
NOTE:

- 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

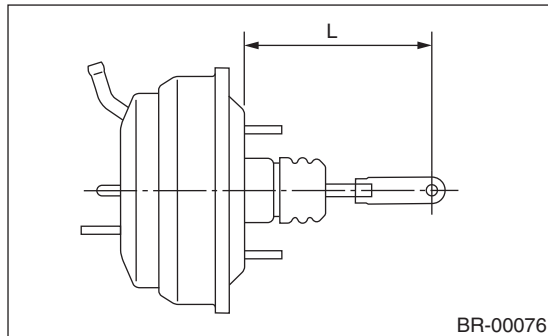
B: INSTALLATION

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

Specification L:

136.5 mm (5.37 in)

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

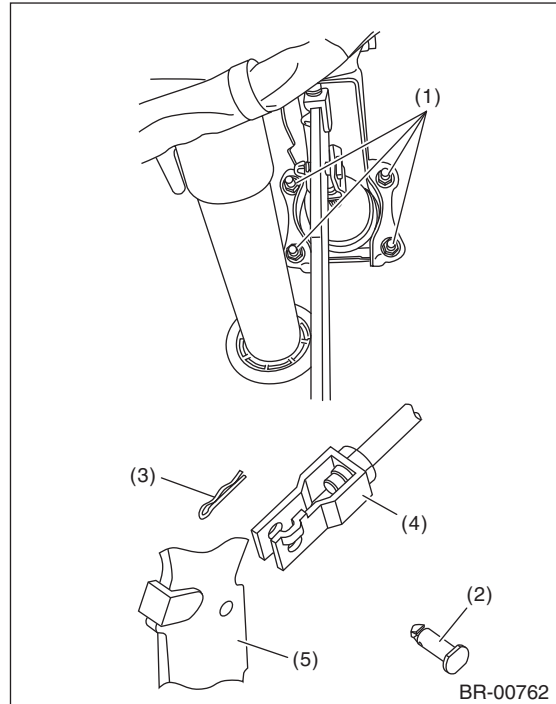


- 2) Mount the brake booster in position.
- 3) Tighten the brake booster mounting nuts.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

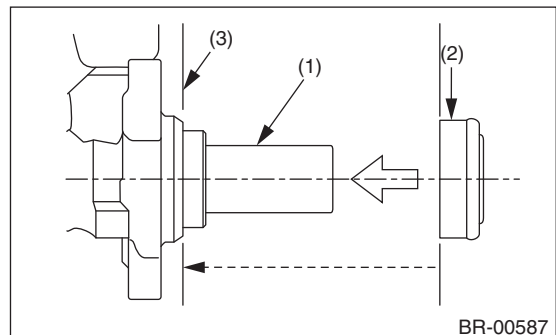
- 4) Install the clevis pin and snap pin which secure the operating rod and brake pedal.



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

NOTE:

- Replace the clevis pin with a new part.
 - Apply NIGTIGHT LYW NO. 2 grease to the clevis pin.
- 5) Connect the vacuum hose to the brake booster.
 - 6) After replacing the seal sub assembly with a new part, install the master cylinder to brake booster.



- (1) Primary piston
- (2) Seal sub ASSY
- (3) Install the seal sub assembly to this surface.

Tightening torque:

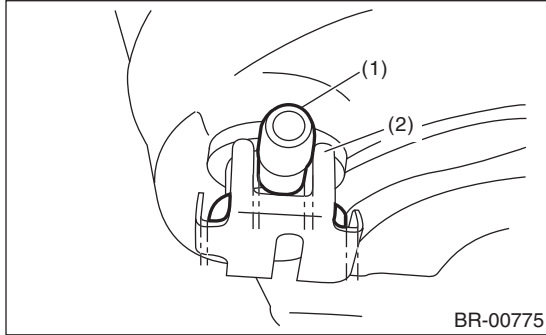
13 N·m (1.3 kgf-m, 9.6 ft-lb)

Brake Booster

BRAKE

CAUTION:

- Install the bracket at the position with sufficient clearance that it does not contact with the check valve.
- Be sure to loosen the master cylinder mounting nut while holding the bracket with hand. Otherwise the bracket may deform.



- (1) Check valve
(2) Bracket

7) Connect the brake pipes to the master cylinder.

Tightening torque:

19 N·m (1.9 kgf-m, 14 ft-lb)

8) Connect the connector of the brake fluid level gauge.

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

10) Bleed air from brake system.

Tightening torque (air bleeder screw):

8 N·m (0.8 kgf-m, 5.9 ft-lb)

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

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

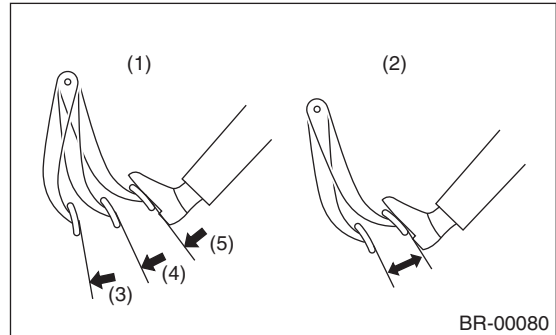
When checking operation, be sure to apply the parking brake securely.

- Check without gauges

This method can not determine 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.



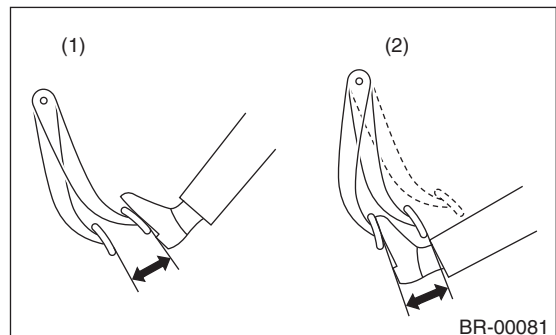
- (1) Normal
(2) Not OK
(3) 1st
(4) Second
(5) 3rd

NOTE:

- In case of defective operation, inspect the condition of the check valve and vacuum hose as well.
- Replace them if faulty, and perform the test again.
- If 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.

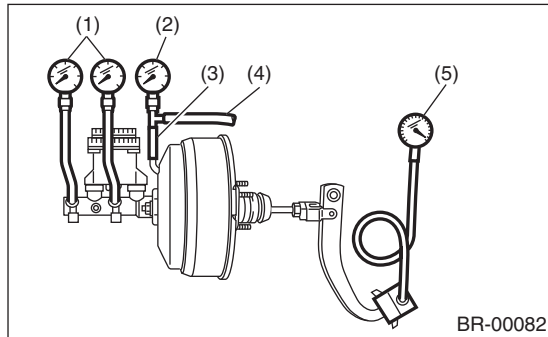
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

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

• CHECK WITH GAUGE

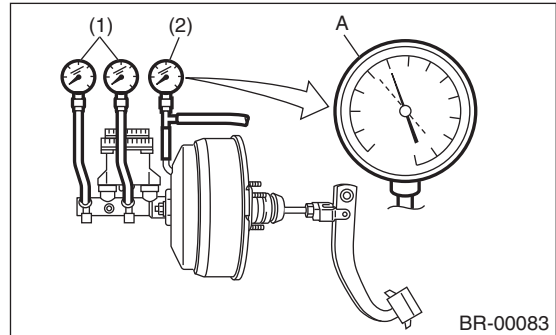
Connect the gauge as shown in the figure. After bleeding air from pressure gauge, perform each check.



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

• AIR TIGHTNESS CHECK

1) Start the engine and keep it running until vacuum pressure indicates 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

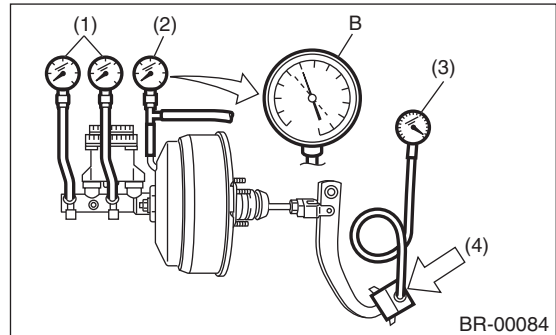
2) Stop the engine and check the gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is 3.3 kPa (25 mmHg, 0.98 inHg) or less, the function of brake booster is normal.

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-30, 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)	All models	533 (5, 77)	1,551 (16, 225)

• 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)	All models	6,177 (63, 896)	11,273 (115, 1,635)

10.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level is between “MIN” and “MAX”. If out of the specified range, refill or drain 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 color has changed excessively, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:

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

NOTE:

- During the operation, keep the reservoir tank filled with brake fluid to eliminate entry of air.
 - Operate the brake pedal slowly.
 - For convenience and safety, two people should do the work.
 - 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 the recommended brake fluid.

Recommended brake fluid:

Refer to the specification of “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-34, PROCEDURE, Air Bleeding.>

11. 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:

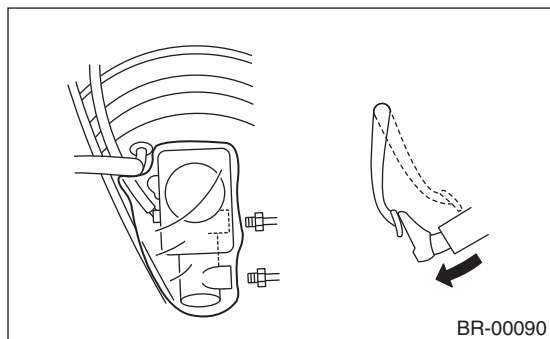
- When the master cylinder is replaced or the reservoir tank is empty, bleed the master cylinder.
- If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-34, BRAKE LINE, PROCEDURE, Air Bleeding.>

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

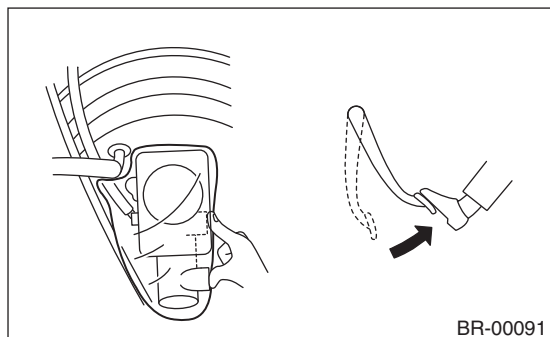
NOTE:

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.



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:

19 N·m (1.9 kgf-m, 14 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-34, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

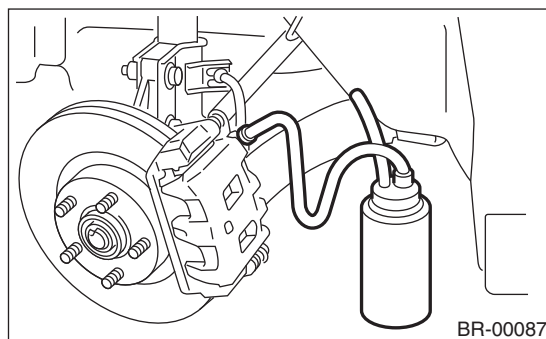
1) When the master cylinder is replaced or the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-34, MASTER CYLINDER, PROCEDURE, Air Bleeding.>

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 keep it pressed.

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

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

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

NOTE:

Perform the operation in the order starting from the farthest wheel cylinder from the master cylinder.

8) Securely tighten the air bleeder screws.

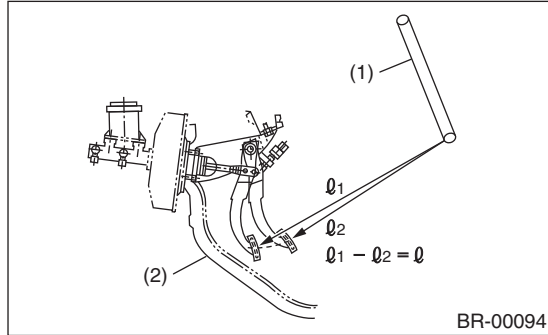
Tightening torque:

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).

100 mm (3.94 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-12, 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.

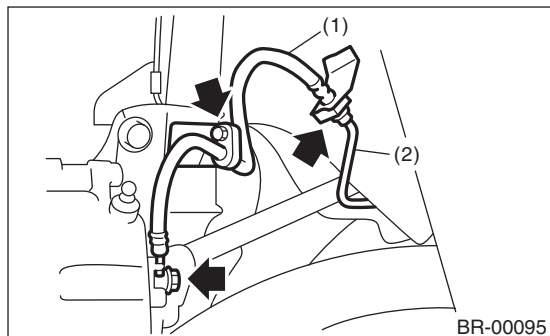
16) Test run the vehicle and ensure that the brakes operate normally.

12.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

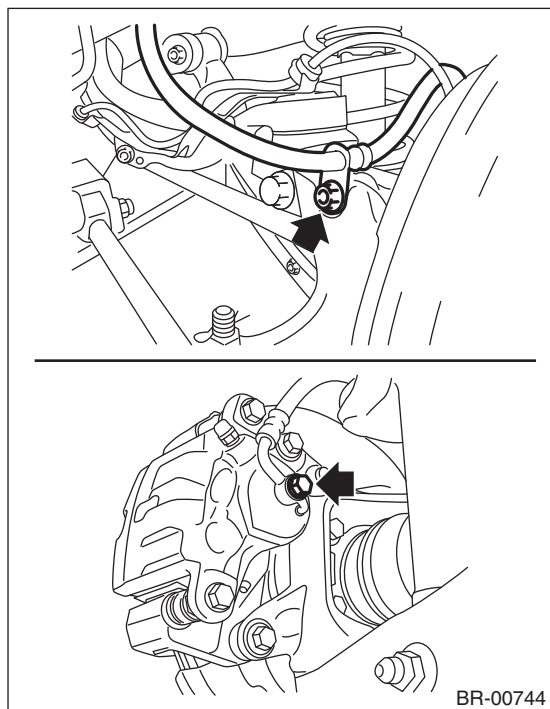
- 1) Separate the brake pipe from brake hose using a flare nut wrench.
- 2) Remove the clamp, the strut mount bolts, and union bolt.



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

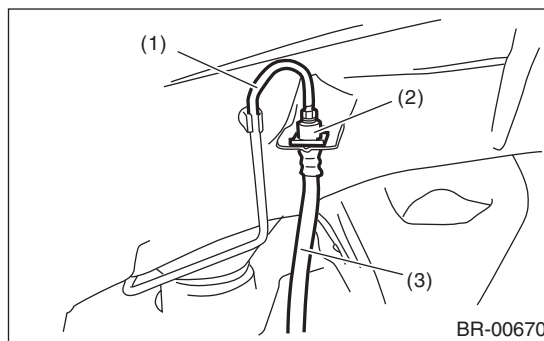
2. REAR BRAKE HOSE

- 1) Remove the union bolt and brake hose bracket.



- 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:

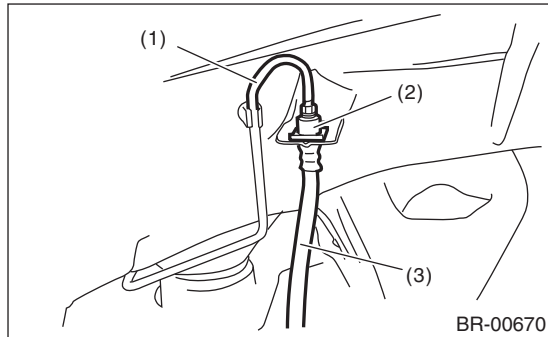
Brake pipe flare nut

15 N·m (1.5 kgf-m, 11.1 ft-lb)

- 7) Bleed air from the 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 to rear brake caliper using a new gasket.

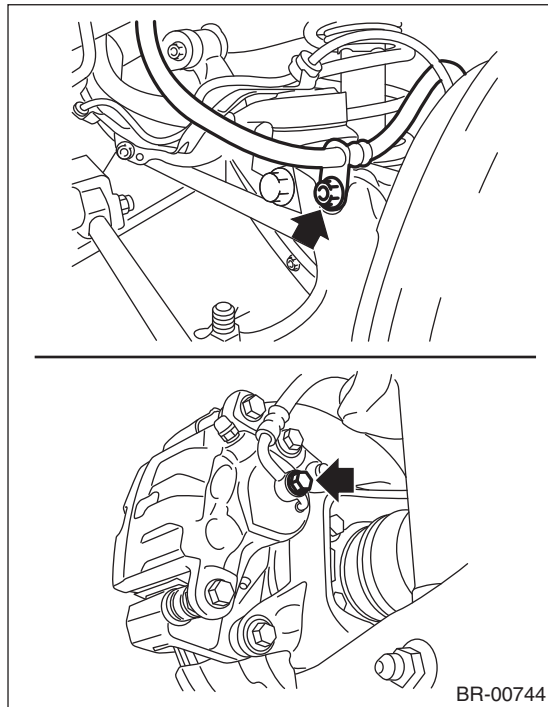
Tightening torque:

Union bolt

18 N·m (1.8 kgf-m, 13.3 ft-lb)

Frame hose bracket

33 N·m (3.4 kgf-m, 24.3 ft-lb)



- 4) 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)

- 5) 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.

13.Brake Pipe

A: REMOVAL

NOTE:

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

CAUTION:

- The 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:

- The 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-7, FRONT BRAKE PIPES AND HOSES, COMPONENT, General Description.> <Ref. to BR-8, 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:

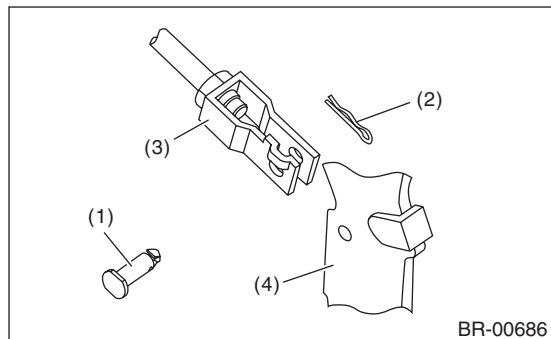
Use a mirror when inspecting back sides and other locations which are hard to see.

14.Brake Pedal

A: REMOVAL

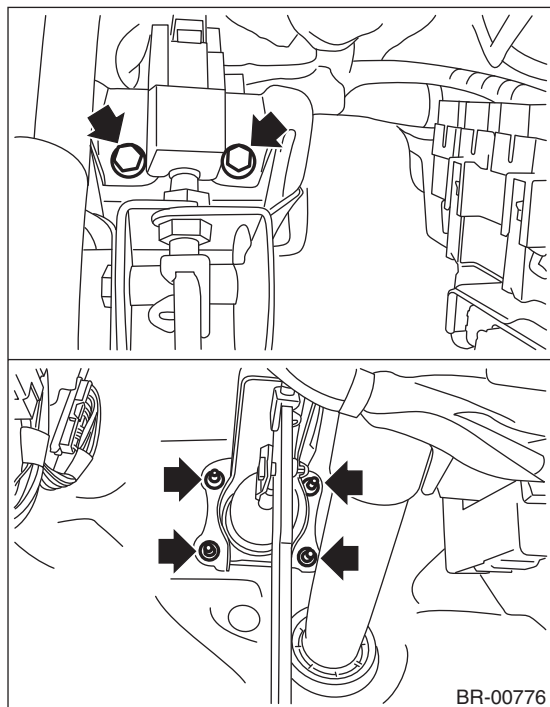
1. AT MODEL

- 1) Disconnect the connector from stop light switch.
- 2) Remove the clevis pin which secures the brake pedal and the operating rod.



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

- 3) Remove the bolt and nut which secures the brake pedal bracket.



2. MT MODEL

Refer to "CLUTCH PEDAL". <Ref. to CL-26, REMOVAL, Clutch Pedal.>

B: INSTALLATION

1. AT MODEL

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

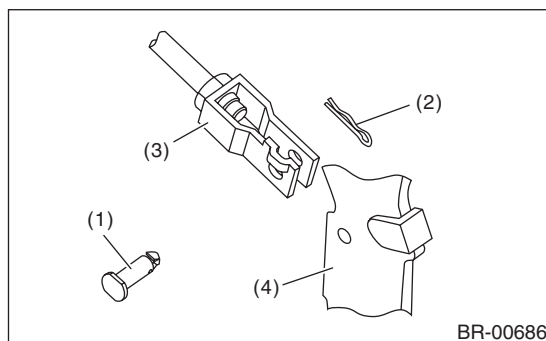
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

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

NOTE:

- Replace the clevis pin with a new part.
- Apply NIGTIGHT LYW NO. 2 grease to the clevis pin.



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

- 3) Connect the stop light switch connector.
- 4) Check the brake light illumination condition.
- 5) Check the brake pedal after installation. <Ref. to BR-40, INSPECTION, Brake Pedal.>

2. MT MODEL

Refer to "CLUTCH PEDAL". <Ref. to CL-26, INSTALLATION, Clutch 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.

Tightening torque:

22 N·m (2.2 kgf-m, 16.2 ft-lb)

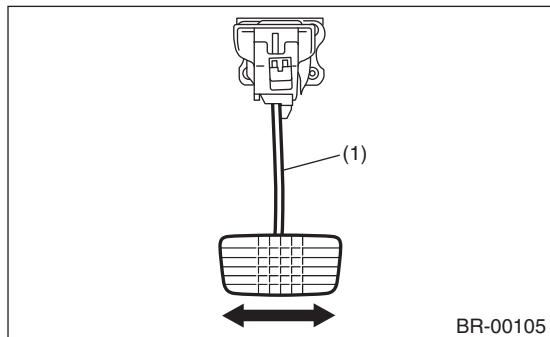
CAUTION:

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

Deflection of brake pedal:

Limit

5.0 mm (0.197 in) or less



(1) Brake pedal

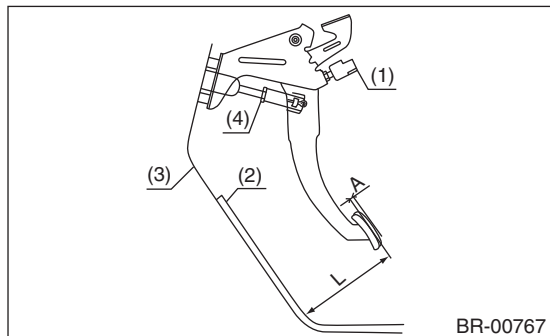
2) Check the position of the pedal pad.

Pedal height L:

140 — 150 mm (5.51 — 5.91 in)

Brake pedal free play A:

2 — 5 mm (0.079 — 0.197 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

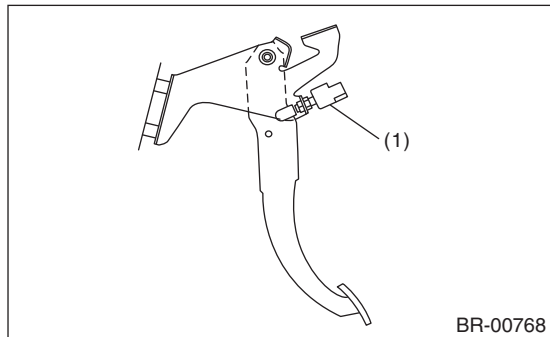
3) If it is not within the specification, loosen the lock nuts of brake booster operating rod, and rotate the rod to adjust the pedal height L within the specification.

4) Tighten the lock nut.

15. Stop Light Switch

A: REMOVAL

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



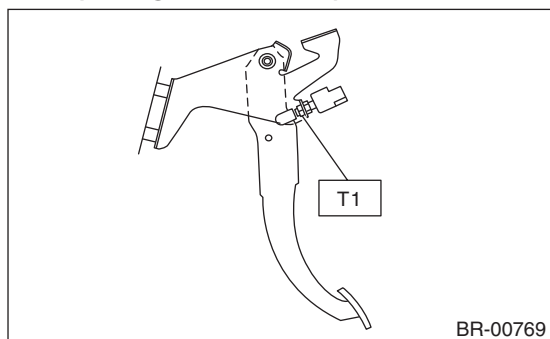
(1) Stop light switch

B: INSTALLATION

- 1) Install the stop light switch onto the bracket with screws and position it with the nut.
- 2) Adjust the stop light switch position, and then tighten the nut. <Ref. to BR-42, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



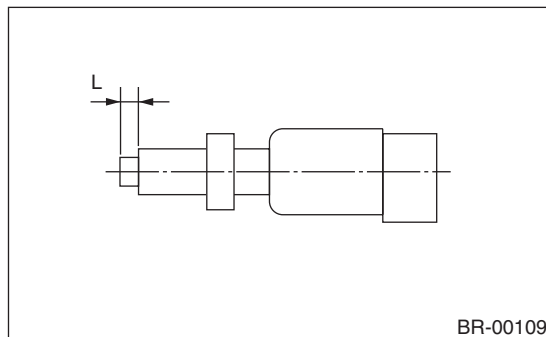
C: INSPECTION

1. CHECK SPECIFIED POSITION

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

Specified position L:

$2.8 \text{ mm}^{+1.5 \text{ mm}}_{-0 \text{ mm}}$ ($0.11 \text{ in}^{+0.06 \text{ in}}_{-0 \text{ in}}$)



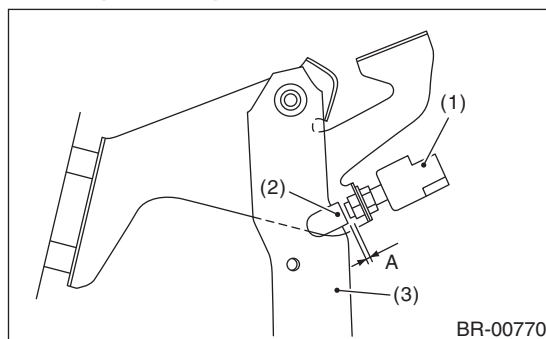
- 2) Measure the clearance between the threaded end of the stop light switch and the stopper.

CAUTION:

Be careful not to rotate the stop light switch.

Stop light switch clearance A:

0.8 mm (0.031 in)



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

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

CAUTION:

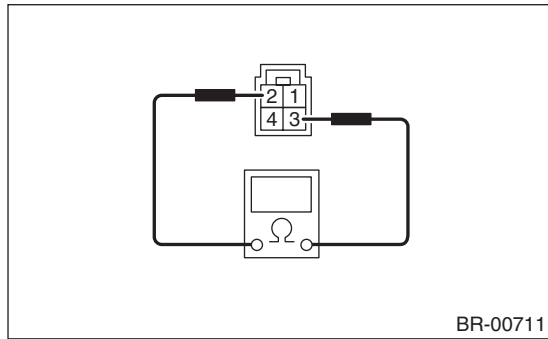
Be careful not to rotate the stop light switch.

Stop Light Switch

BRAKE

2. CHECK RESISTANCE

1) Measure the resistance of stop light switch.



Switch	Pedal	Terminal No.	Standard
Stop light	Released	2 and 3	1 MΩ or more
	Depressed		Less than 1 Ω

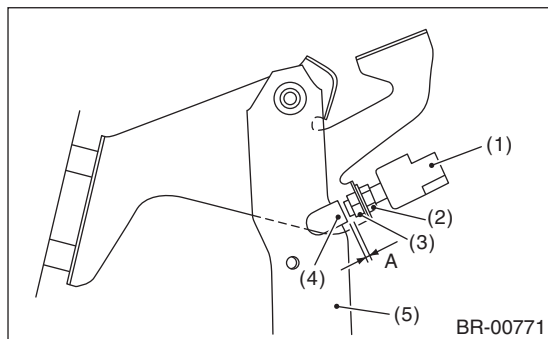
2) If the stop light switch does not operate properly, replace with a new part.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between the threaded end of the stop light switch and stopper (A) becomes 0.8 mm (0.031 in). Then, tighten the lock nut.

Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



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

16. General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(2) Entry of air into the hydraulic mechanism	Bleed air.
	(3) 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	Correct 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	Correct 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	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(4) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Repair or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Improper disc caliper operation	Correct 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.

General Diagnostic Table

BRAKE

General Description

PARKING BRAKE

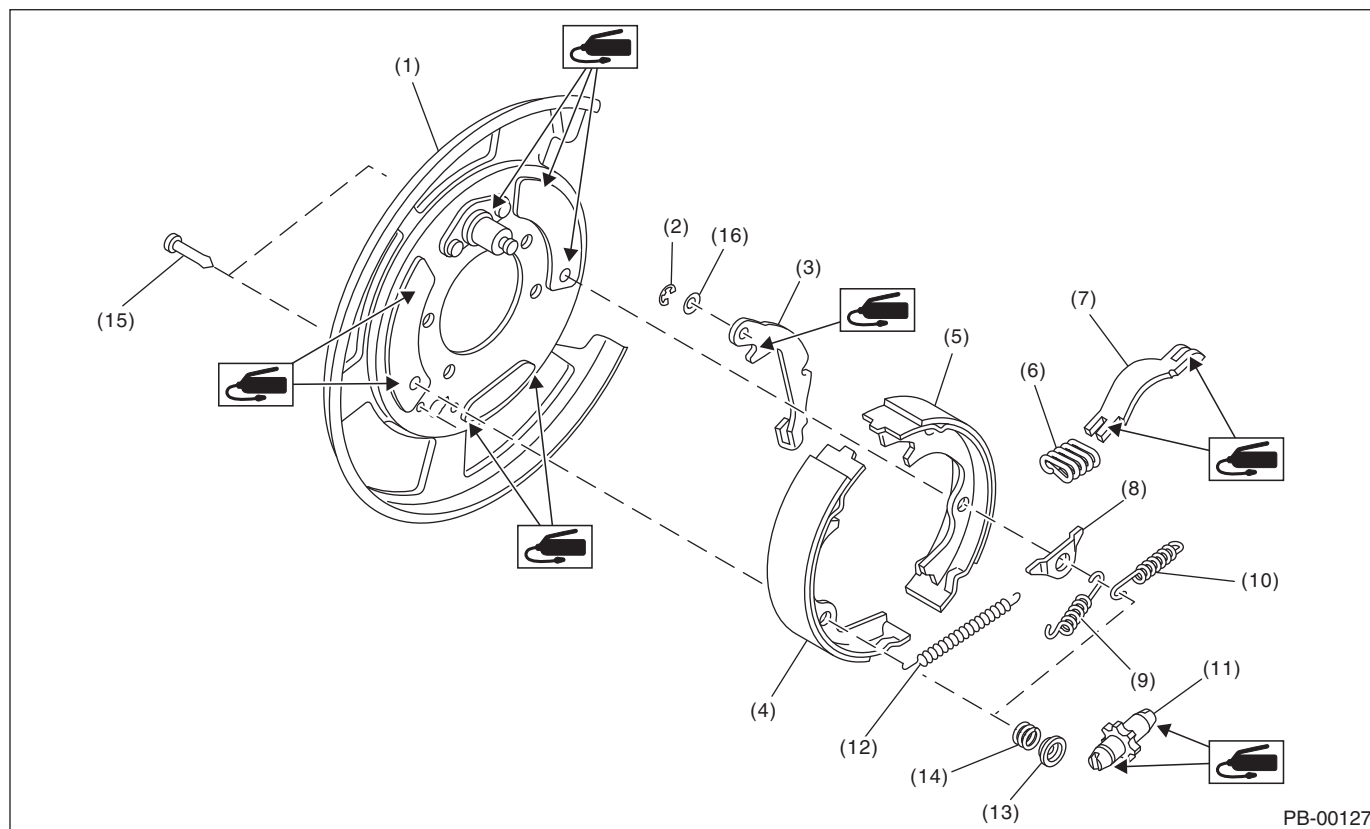
1. General Description

A: SPECIFICATION

Model		Rear disc brake
Type		Electronic type, drum in disc brakes
Effective drum diameter	mm (in)	190 (7.48)
Lining dimensions (Length × Width × Thickness)	mm (in)	165.8 × 30.0 × 2.8 (6.53 × 1.181 × 0.11)
Clearance adjustment		Manual adjustment

B: COMPONENT

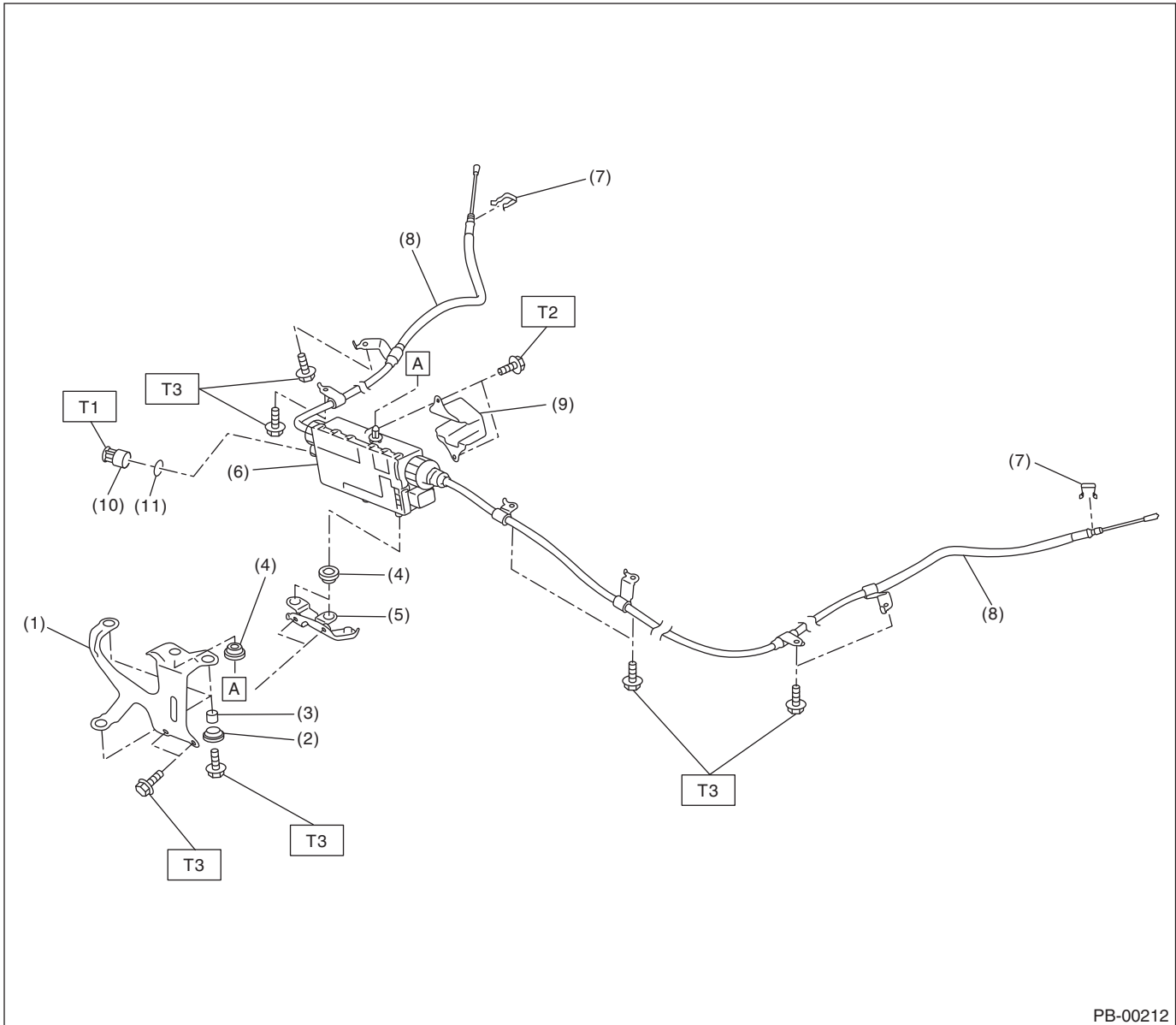
1. PARKING BRAKE (REAR DISC BRAKE)



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 ACTUATOR



- | | |
|--------------------|-------------------------|
| (1) Upper bracket | (7) Clamp |
| (2) Bushing | (8) Parking Brake Cable |
| (3) Spacer | (9) Tank bracket |
| (4) Bushing | (10) Cap |
| (5) Bracket | (11) O-ring |
| (6) Brake actuator | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3 (0.3, 2.2)

T2: 7.5 (0.76, 5.5)

T3: 18 (1.8, 13.3)

General Description

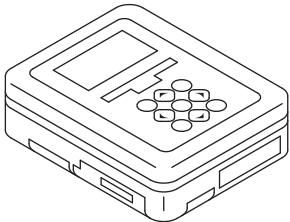
PARKING BRAKE

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.

D: PREPARATION TOOL

1. ST

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for setting of each function and troubleshooting for electrical system.

2. GENERAL TOOL

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

2. Parking Brake Actuator

A: REMOVAL

CAUTION:

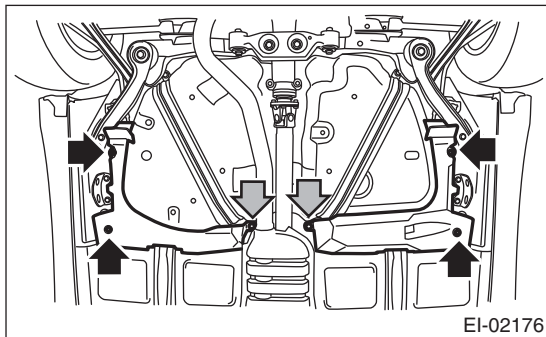
Since the parking brake actuator and parking brake cable are integrated as a unit, do not disassemble them.

- 1) Lift up the vehicle, and then remove the rear wheels.
- 2) Perform "Parking Brake Removal Mode" after connecting the Subaru Select Monitor. <Ref. to PB(diag)-17, PARKING BRAKE REMOVAL MODE, OPERATION, Subaru Select Monitor.>

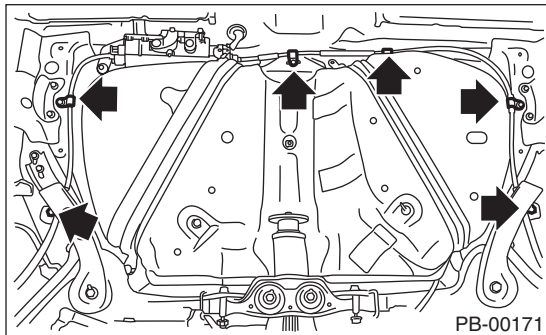
CAUTION:

Be sure to lift up the vehicle, before performing the "Parking Brake Removal Mode".

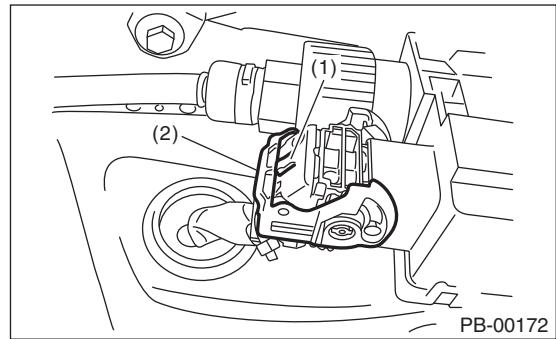
- 3) Disconnect the ground cable from battery.
- 4) Remove the fuel tank protector.



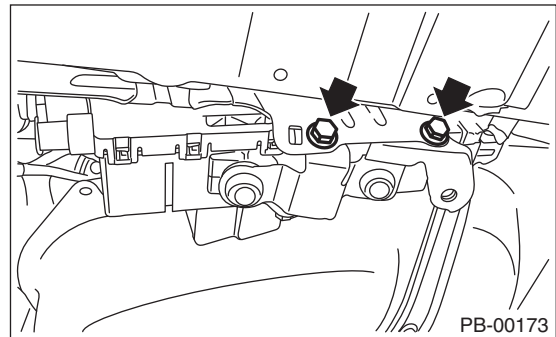
- 5) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
- 6) Remove the cable clamp.



- 7) Press the lock (1), and move the lever (2) to disconnect the parking brake actuator connector.



- 8) Remove the bolts and remove the parking brake actuator.



B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

<Ref. to PB-3, PARKING BRAKE ACTUATOR, COMPONENT, General Description.>

- 2) Park the vehicle at a level ground with the four wheels on the ground.
- 3) Connect the Subaru Select Monitor to perform the following operations.
 - "Force Sensor Calibration Mode" <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>
 - "Clutch Sensor Calibration Mode" (only MT model) <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>

Parking Brake Assembly (Rear Disc Brake)

PARKING BRAKE

3. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.

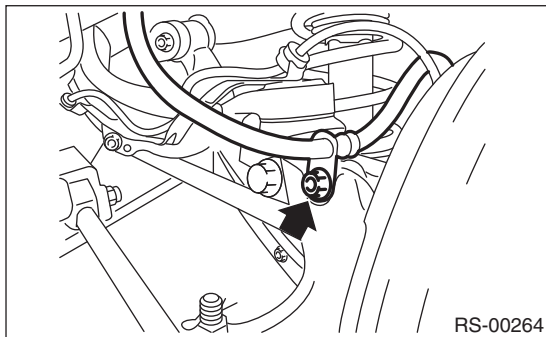
2) Perform "Parking Brake Removal Mode" after connecting the Subaru Select Monitor. <Ref. to PB(diag)-17, PARKING BRAKE REMOVAL MODE, OPERATION, Subaru Select Monitor.>

CAUTION:

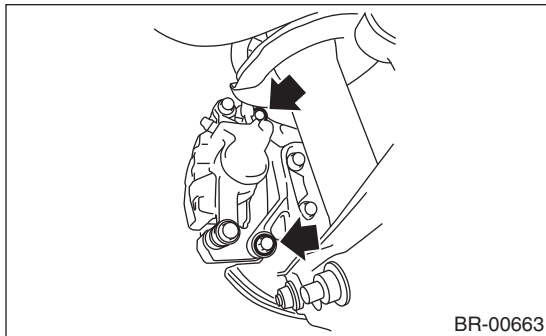
Be sure to lift up the vehicle, before performing the "Parking Brake Removal Mode".

3) Disconnect the ground cable from battery.

4) Remove the brake hose bracket.



5) Remove the two mounting bolts and remove the rear disc brake caliper.



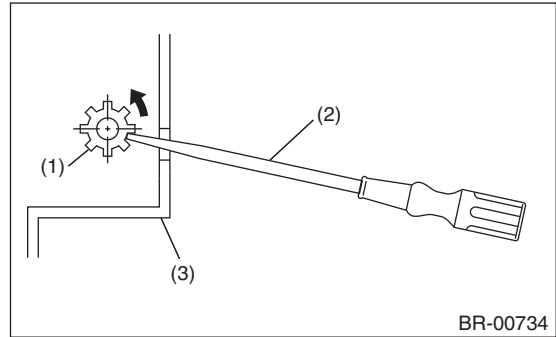
6) Suspend the rear disc brake caliper so that the brake hose is not stretched.

7) 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.

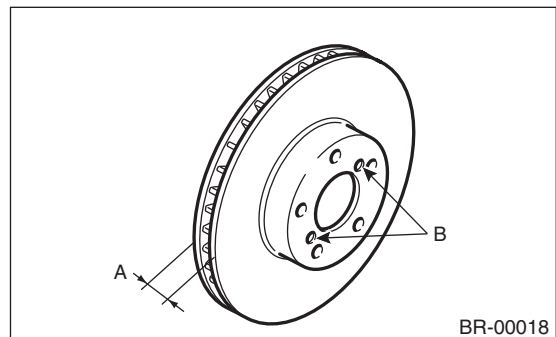


(1) Adjuster

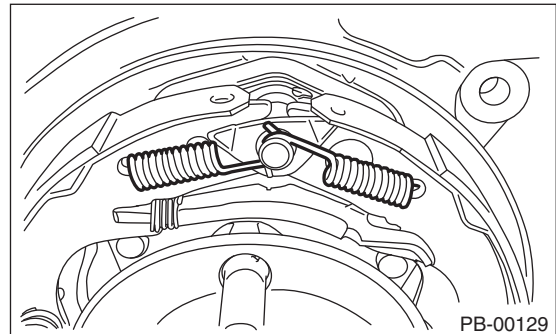
(2) Flat tip screwdriver

(3) Disc rotor

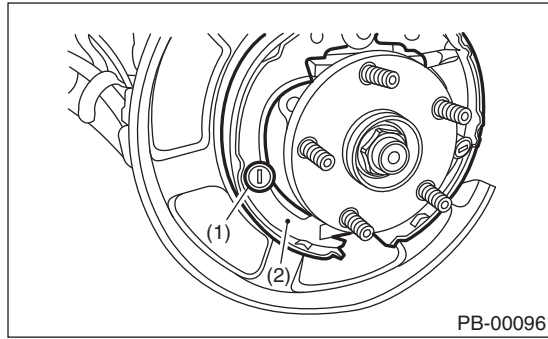
(2) If disc rotor is seized on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



8) Remove the shoe return spring.



9) Detach the brake shoe cup and brake shoe spring, and remove the primary brake shoe.



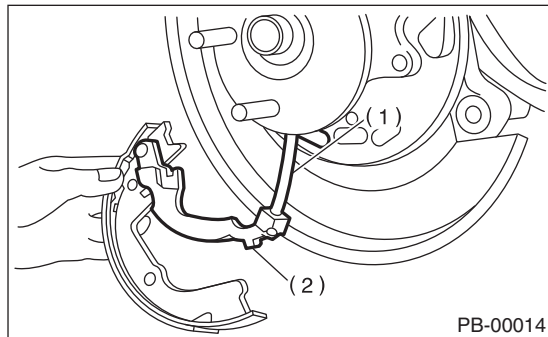
- (1) Brake shoe cup
- (2) Primary brake shoe

10) Remove the strut and strut spring.

11) Remove the adjuster.

12) Detach the brake shoe cup and brake shoe spring, and remove the secondary brake shoe.

13) Remove the parking brake cable from lever.



- (1) Parking Brake Cable
- (2) Lever

14) Remove the retainer from the secondary side brake shoe. Remove the brake shoe from the lever.

15) Remove the clamp and, remove the parking brake cable from the back plate.

B: INSTALLATION

1) Install the parking brake cable to the back plate, and secure it by the clamp.

CAUTION:

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

2) 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 the adjuster

• Contact surface of the brake shoe and strut

• Contact surface of lever and brake shoe

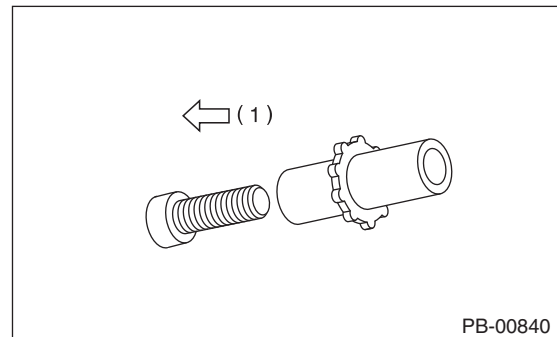
3) Install the wave washer and lever to the secondary side brake shoe pin, and lock the retainer securely.

4) Install the parking brake cable to the lever.

5) Install the adjuster and adjusting spring to the brake shoe.

NOTE:

Install the adjuster with screw section in the direction shown below.



- (1) For left wheels, facing the front side of vehicle, for right wheels, facing the rear side of vehicle

6) Check that the parking brake cable does not fall from the cable guide.

7) Install the brake shoes to the back plate with shoe hold pins, brake shoe springs, and brake shoe cups.

8) Install the strut and strut spring to the brake shoes.

NOTE:

Install the strut spring to face the upper side of the vehicle.

9) Install the return springs; first the primary side then the secondary side.

10) Install the brake disc rotor and the brake caliper.

11) Install the brake hose bracket.

Tightening torque:

<Ref. to BR-4, COMPONENT, General Description.>

12) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

13) When replacing with the new brake shoe, connect the Subaru Select Monitor and perform the "Break-in Parking Brake Drive Mode". <Ref. to PB(diag)-18, BREAK-IN PARKING BRAKE DRIVE MODE, OPERATION, Subaru Select Monitor.>

Parking Brake Assembly (Rear Disc Brake)

PARKING BRAKE

14) After breaking-in, re-adjust the parking brakes. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:

Standard:

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.

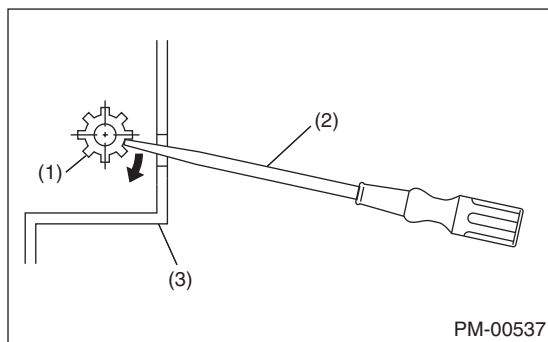
D: ADJUSTMENT

1. SHOE CLEARANCE

1) Lift up the vehicle, and then remove the rear wheels.

2) Remove the adjusting hole cover from the disc rotor.

3) Using a flat tip screwdriver, turn the adjusting screw in the direction of arrow as shown in the figure below until the brake shoe is in close contact with the disc rotor.



- (1) Adjusting screw
- (2) Flat tip screwdriver
- (3) Disc rotor

4) Turn back the adjusting screw 5 notches to opposite direction of arrow.

CAUTION:

- Operate the parking brake several times to check there is no brake drag.

- If the amount that the adjusting screw is turned back is little, securely turn back 5 notches to avoid dragging.

5) Install the adjusting hole cover to the disc rotor.

6) Install the rear wheels and lower the vehicle.

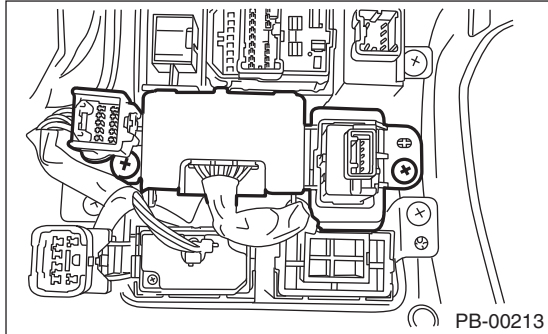
7) Park the vehicle at a level ground with the four wheels on the ground.

8) Connect the Subaru Select Monitor to perform the "Force Sensor Calibration Mode". <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>

4. Parking Brake Switch

A: REMOVAL

- 1) Remove the instrument panel lower cover.
- 2) Remove the screws and remove the parking brake switch.



B: INSTALLATION

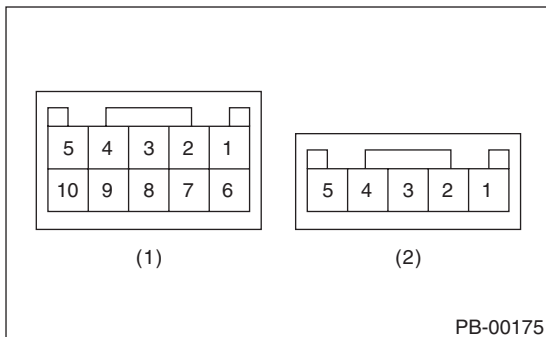
Install in the reverse order of removal.

C: INSPECTION

1. PARKING BRAKE CONTROL SWITCH

Measure the resistance between parking brake control switch terminals.

Switch position	Terminal No.	Specification
Press	2, 3 and 9	Less than 1 Ω
Neutral	2 and 9 1 and 3	Less than 1 Ω
Pull	1, 2 and 3	Less than 1 Ω



- (1) Parking brake control switch
- (2) Hill hold switch

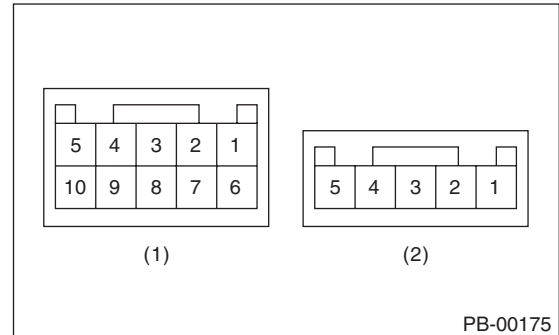
NOTE:

If it is not within the specification, replace the switch.

2. HILL HOLD SWITCH

Measure the resistance between hill hold switch terminals.

Switch position	Terminal No.	Specification
ON	1 and 4	Less than 1 Ω
OFF	—	1 M Ω or more



- (1) Parking brake control switch
- (2) Hill hold switch

NOTE:

If it is not within the specification, replace the switch.

Emergency Release of Electronic Parking Brake

PARKING BRAKE

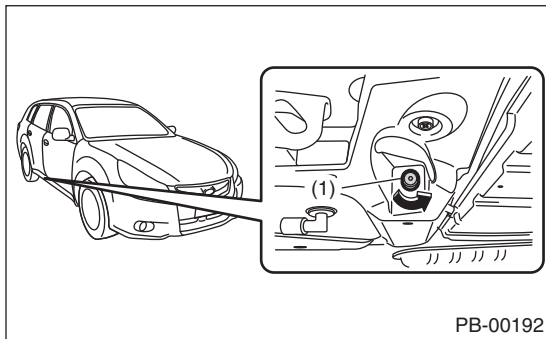
5. Emergency Release of Electronic Parking Brake

A: OPERATION

CAUTION:

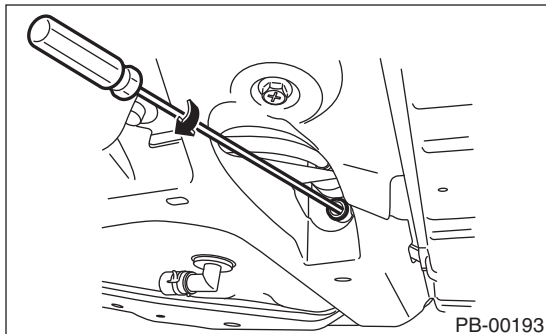
- Perform this operation only when the parking brake must be released in emergency situation such as a system malfunction.
- When doing this operation at the slope, the vehicle may move and the unintentional accident may happen. Before operation, be sure to confirm the safety condition of vehicle surrounding.

- 1) Shift the select lever to "P" range (AT or CVT model), or "1st" or "R" (MT model).
- 2) Stop the engine.
- 3) Set the wheel stoppers to tires.
- 4) Take out the electronic parking brake release tool from the vehicle service tools.
- 5) Insert the release tool to the parking brake actuator cap, and remove the cap by turning the counterclockwise.



(1) Cap

- 6) Insert the release tool into the parking brake actuator by breaking through the film, and turn clockwise 200 to 250 times.



- 7) Install the cap which was removed in step 5).

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)

8) When the emergency release of electronic parking brake was performed, be sure to perform the inspection of the Emergency Release of Electronic Parking Brake, regardless of the vehicle drive/no-drive. <Ref. to PB-10, INSPECTION, Emergency Release of Electronic Parking Brake.>

B: INSPECTION

When the emergency release of electronic parking brake was performed, check the following items, regardless of the vehicle drive/no-drive.

- Parking brake actuator operates or not, when parking brake switch is operated.

NOTE:

When returning from the emergency release condition, operation time takes for 10-odd seconds because the actuator strokes fully.

- Brake warning light illuminates or not, when parking brake is operated. <Ref. to PB(diag)-25, Warning Light Illumination Pattern.>
- Noise occurs or not, when parking brake is operated.
- Visual inspection of parking brake shoe. <Ref. to PB-6, Parking Brake Assembly (Rear Disc Brake).>
- Drag occurs or not, when parking brake is released. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

6. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Brake drag	Parking brake actuator is faulty.	Replace.
	Parking brake cable does not move.	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

Basic Diagnostic Procedure

PARKING BRAKE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

When removing or installing, remove all foreign matter (dust, water, and oil) from the parking brake control module connectors.

NOTE:

- To check the harness for open or short circuits, shake problem spot or connector.
- Refer to "Check List for Interview". <Ref. to PB(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 PB(diag)-4, Check List for Interview.> 2) Before performing diagnosis, check the component which might affect parking brake system problems. <Ref. to PB(diag)-8, INSPECTION, General Description.>	Is the component that might influence the parking brake system 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 PB(diag)-22, 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 PB(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 PB(diag)-65, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to PB(diag)-24, OPERATION, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, PROCEDURE, Inspection Mode.> 4) Read the DTC. <Ref. to PB(diag)-22, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	After starting the engine, do the electronic parking brake warning light (C6 model only), hill hold indicator light and brake warning light go off with the parking brake released?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to PB(diag)-29, PARKING BRAKE WARNING LIGHT AND HILL HOLD ON INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to PB(diag)-30, BRAKE WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>
4 CHECK INFORMATION STORED IN FREEZE FRAME DATA. Using the Subaru Select Monitor, check the freeze frame data for the parking brake control module.	Are freeze frame data recorded?	Record the freeze frame data. Go to step 5.	Go to step 5.

Basic Diagnostic Procedure

PARKING BRAKE (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 PB(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to PB(diag)-24, OPERATION, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to PB(diag)-23, PROCEDURE, Inspection Mode.> 5) Read the DTC. <Ref. to PB(diag)-22, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 5 until DTC is not shown.	Finish the diagnosis.

Check List for Interview

PARKING BRAKE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following item about the vehicle's state.

1. STATE OF BRAKE WARNING LIGHT

Brake warning light illuminates/goes off/blinks.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not illuminate ☐ Does not go off ☐ Blinks ☐ When/How long does illuminate/go off/blink?		
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 the parking brake switch is pressed ☐ When the parking brake switch is pulled ☐ When the parking brake switch is pressed continually (times) ☐ When the parking brake switch is pulled continually (times)		
	☐ 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 operating other electrical parts		
	☐ Part name: ☐ Operating condition:		

Check List for Interview

PARKING BRAKE (DIAGNOSTICS)

2. STATE OF ELECTRONIC PARKING BRAKE WARNING LIGHT (C6 MODEL ONLY)

Electronic parking brake 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 the parking brake switch is pressed ☐ When the parking brake switch is pulled ☐ When the parking brake switch is pressed continually (times) ☐ When the parking brake switch is pulled continually (times)		
	☐ 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 operating other electrical parts • Part name: • Operating condition:		

Check List for Interview

PARKING BRAKE (DIAGNOSTICS)

3. HILL HOLD INDICATOR LIGHT CONDITION

Hill hold indicator 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 the hill hold switch is pressed (seconds) ☐ When the parking brake switch is pressed ☐ When the parking brake switch is pulled ☐ When the parking brake switch is pressed continually (times) ☐ When the parking brake switch is pulled continually (times)		
	☐ 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 operating other electrical parts		
	• Part name: • Operating condition:		

Check List for Interview

PARKING BRAKE (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:
Condition	a) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	b) Degree of wear	Front RH tire: mm (in)
		Front LH tire: mm (in)
		Rear RH tire: mm (in)
		Rear LH tire: mm (in)
	c) Tire/Wheel size	☐ Specified size ☐ Except specification ()
	d) Tire variation	☐ Summer tire ☐ Studless tire (Brand:)
	e) Tire chain is attached: ☐ Yes / ☐ No	
	f) Using T-type tires: ☐ Yes / ☐ No	
	g) Condition of suspension alignment:	
h) Loaded condition:		
i) Repaired parts are used: ☐ Yes / ☐ No		
• Content:		
j) Others:		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the parking brake switch, hill hold switch and parking brake control module.

CAUTION:

- Do not use electrical test equipment on the airbag system circuits.
- Be careful not to damage the airbag system wiring harness, when servicing the parking brake switch, hill hold switch and parking brake control module.

B: INSPECTION

Before performing diagnosis, inspect the following items which may influence parking brake system problems.

1. BATTERY

Measure the battery voltage and specific gravity of the electrolyte.

Standard voltage:

12 V or more

Specific gravity:

1.260 or more

2. GROUND

Check the tightening torque of ground (GB-9 and 10) bolts of the parking brake system.

Tightening torque:

13 N·m (1.3 kgf-m, 9.6 ft-lb)

3. BRAKE DRAG

Check for brake drag.

4. PARKING BRAKE ASSEMBLY

Check and adjust the parking brake assembly.

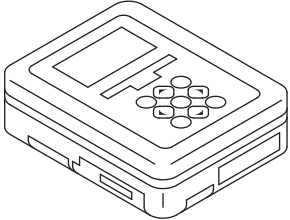
- Check the disc rotor inner diameter and lining thickness. <Ref. to PB-8, INSPECTION, Parking Brake Assembly (Rear Disc Brake).>
- Adjust the shoe clearance. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

5. TIRE

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

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

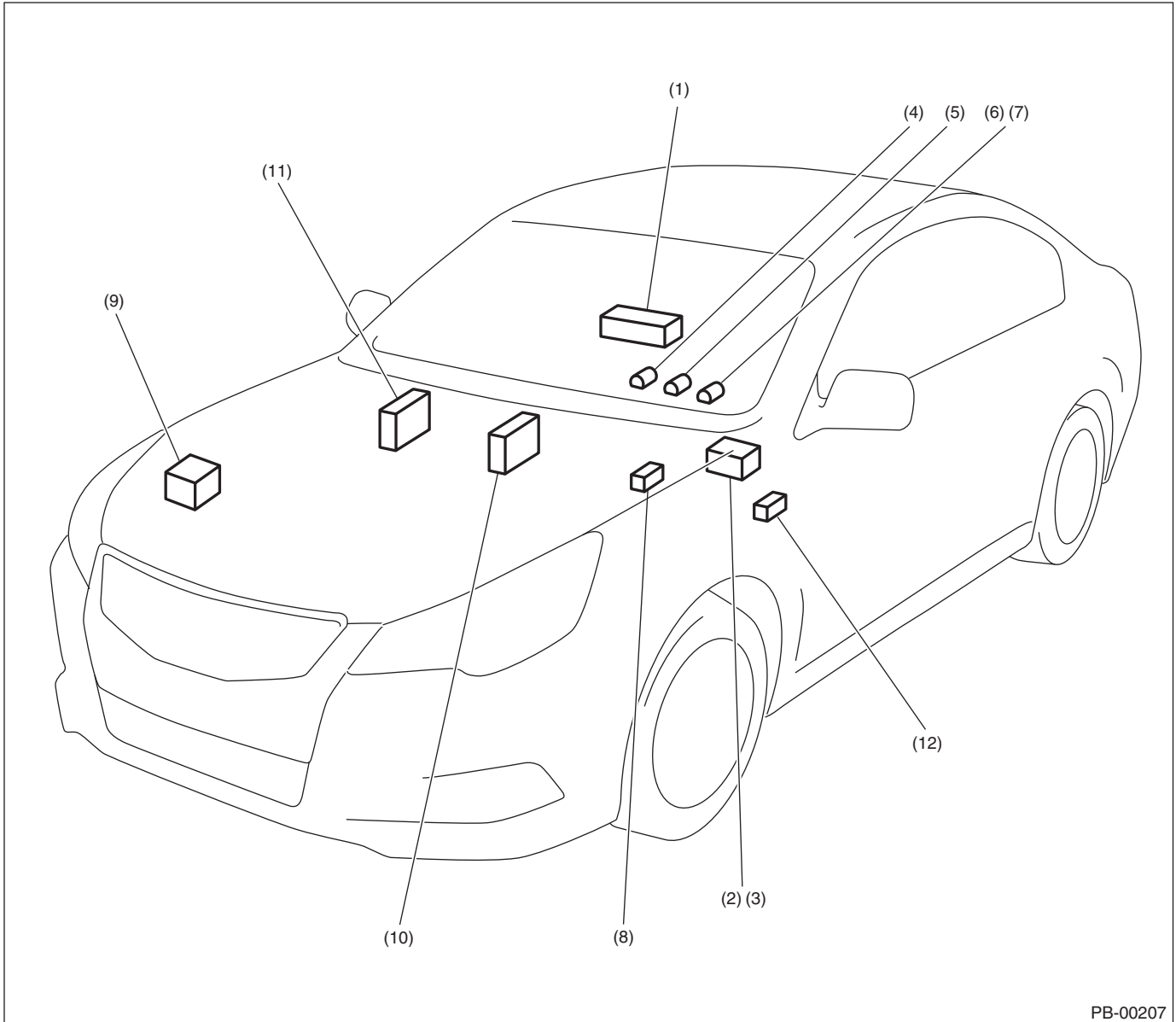
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

Electrical Component Location

PARKING BRAKE (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

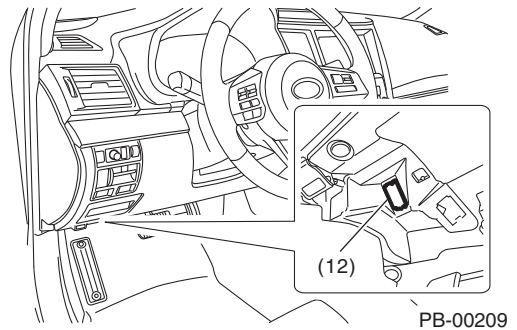
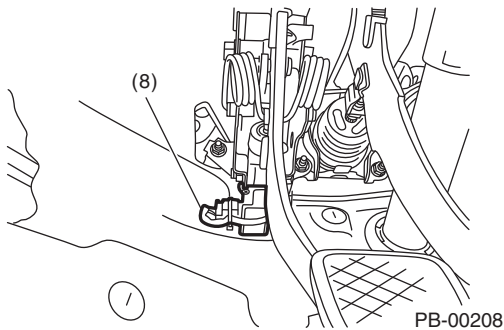
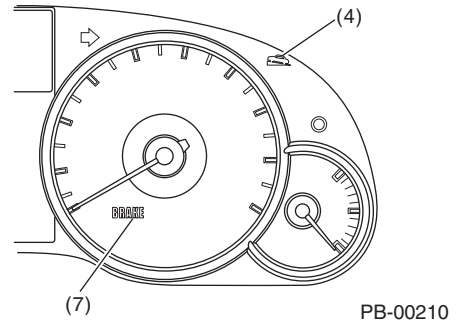
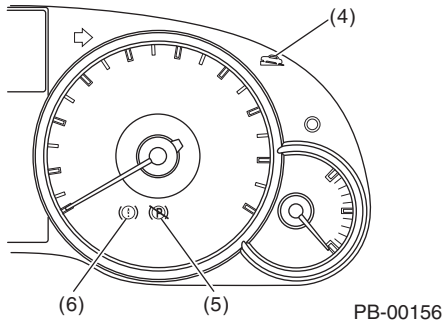
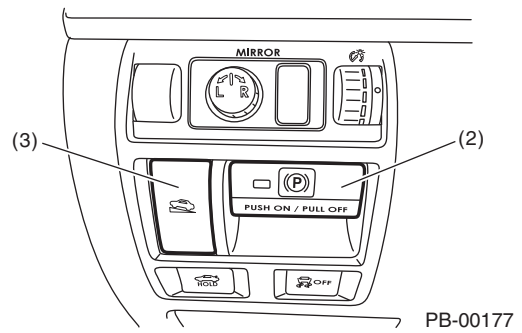
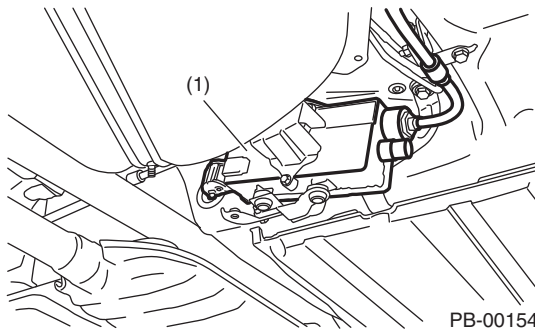


PB-00207

- | | | |
|----------------------------------|--|---|
| (1) Parking brake control module | (5) Electronic parking brake warning light (C6 model only) | (9) VDC control module & hydraulic control unit (VDCCM&H/U) |
| (2) Parking brake switch | (6) Brake warning light (C0, C5 and C6 models) | (10) Body integrated unit |
| (3) Hill hold switch | (7) Brake warning light (U4, U5 and U6 models) | (11) Engine control module (ECM) |
| (4) Hill hold indicator light | (8) Clutch stroke sensor (MT model only) | (12) Data link connector |

Electrical Component Location

PARKING BRAKE (DIAGNOSTICS)

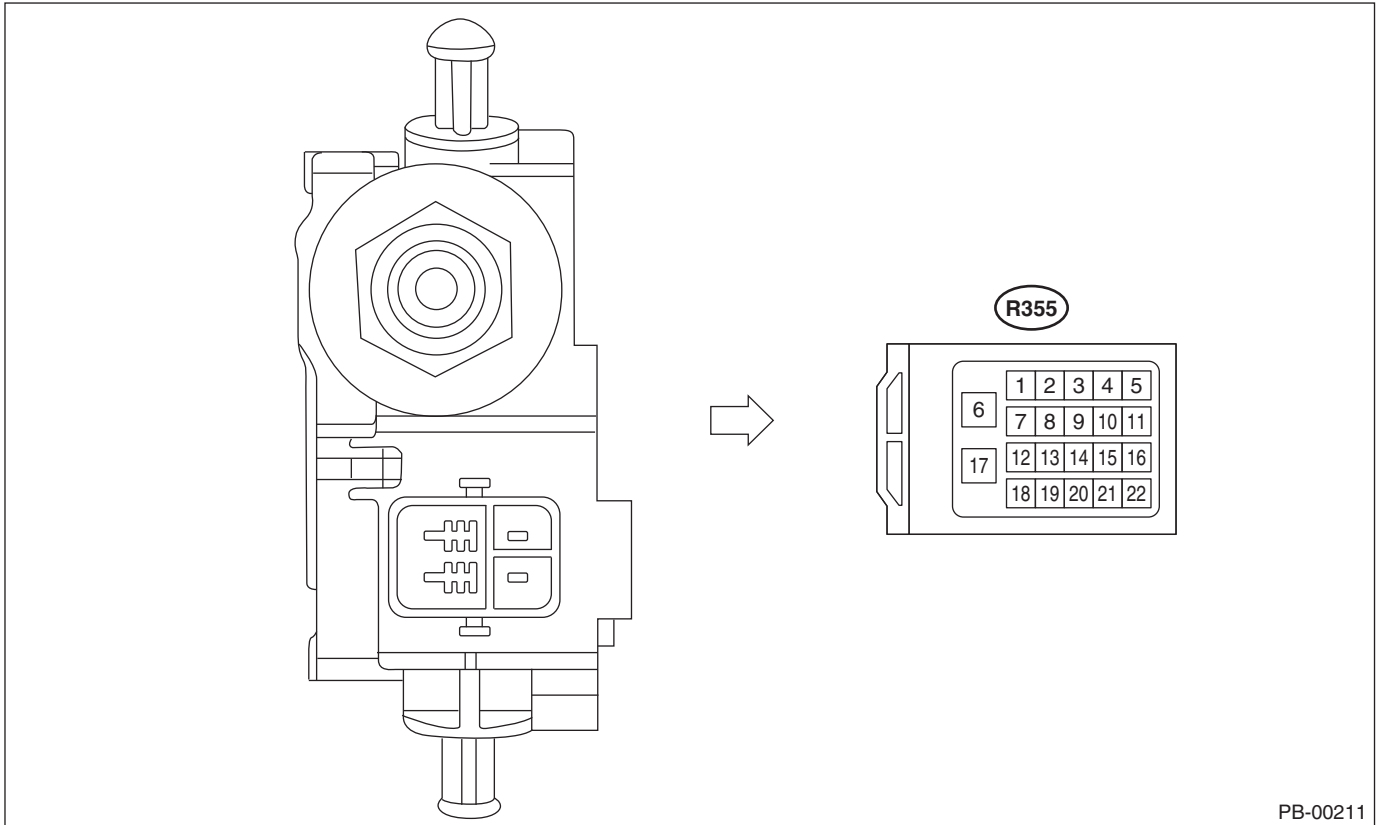


Control Module I/O Signal

PARKING BRAKE (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



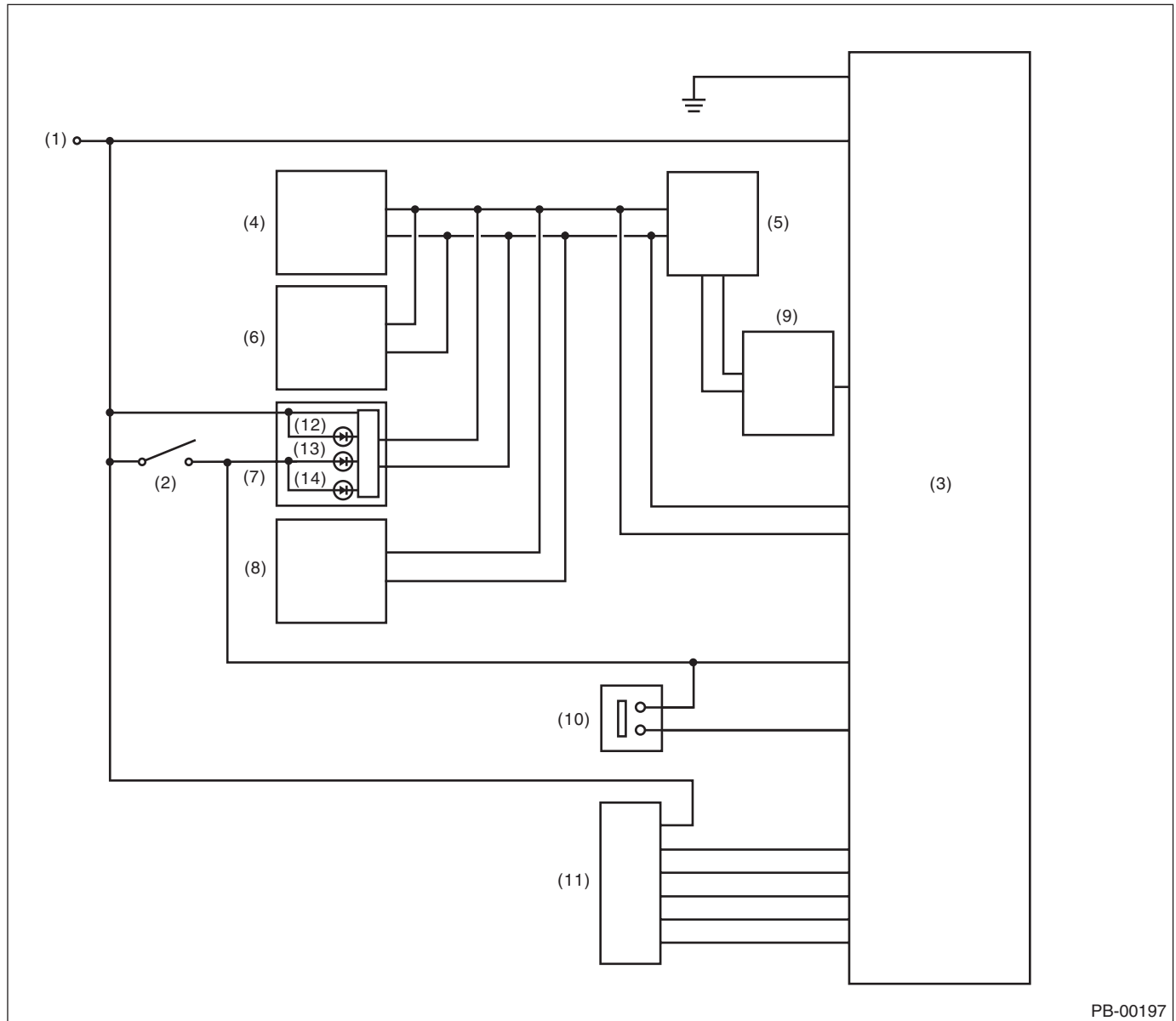
PB-00211

NOTE:

The terminal numbers of the parking brake control module connectors are as indicated in the figure.

Content	Terminal No. (+) — (—)	Input/Output signal
		Measured value and measuring conditions
Battery power supply	17 — 6	Always 10 — 15 V
IGN power supply	18 — 6	10 — 15 V when the ignition switch is ON.
Parking brake switch	13	Pulse signal
Parking brake switch	14	Pulse signal
Parking brake switch	20	Pulse signal
Parking brake switch	19	Pulse signal
Hill hold switch	2 — 6	When hill hold switch is operated, 10 — 15 V
Parking brake switch indicator light	7 — 6	When the light is on: 0 V, when the light is off: 10 — 15 V
Clutch stroke sensor (MT model only)	12	Pulse signal
CAN-H	9	Serial communication
CAN-L	3	Serial communication
Ground	6	—

B: WIRING DIAGRAM



PB-00197

- | | | |
|---------------------------------|--|---|
| (1) Battery | (6) Transmission control module | (11) Parking brake switch |
| (2) Ignition switch | (7) Combination meter | (12) Hill hold indicator light |
| (3) Electronic parking brake CM | (8) Body integrated unit | (13) Electronic parking brake warning light (C6 model only) |
| (4) Engine control module (ECM) | (9) Clutch stroke sensor (MT model only) | (14) Brake warning light |
| (5) VDC control module | (10) Hill hold switch | |

6. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- If communication is not possible between the parking brake control module and the Subaru Select Monitor, check the communication circuit.
<Ref. to PB(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

2. READ CURRENT DATA

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- A list of the support data is shown in the following table.

Display	Contents to be displayed	Unit
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
Power Supply Voltage	The voltage supplied to the parking brake control module is displayed.	V
Engine Speed	Engine speed is displayed.	rpm
Accel. Opening Angle	Acceleration opening is displayed.	%
Reverse Signal	Input condition of reverse signal is displayed. (When reverse: ON)	ON or OFF
Force Sensor	The tension detected by the force sensor in the actuator is displayed.	N
Stroke Sensor	The parking brake cable stroke amount detected by the stroke sensor in the actuator is displayed.	mm
Clutch stroke sensor	The pedal stroke amount detected by the clutch stroke sensor is displayed.	%
Clutch engagement point	Clutch engagement position is displayed.	%
Actuator Inner Temperature(Primary)	Actuator inner temperature (PRY) is displayed.	°C
Actuator Inner Temperature(Secondary)	Actuator inner temperature (SEC) is displayed.	°C
Incline	Incline of the vehicle is displayed.	%
Total Operation Number	Total number of parking brake operation is displayed.	time
Hill Hold Operation Number	Operation number of hill hold function at uphill parking is displayed.	time
Auto Operation Number	“0” is always displayed.	time
Auto Cancel Number	Operation number of automatic accelerator interlock cancel function at starting is displayed.	time
Parking Operation Number when driving	Total number of parking brake operation while driving is displayed.	time
Engine Torque	Engine torque is displayed. (According to ECM specification, engine torque value may be displayed while engine stops.)	N·m
Manual Parking Operation	Parking brake operation condition is displayed. (At manual parking operation: 1)	1 or 0
Auto Parking Operation	Parking brake operation condition is displayed. (At automatic parking operation: 1)	1 or 0
Parking Operation when driving	Parking brake operation condition is displayed. (At parking operation when driving: 1)	1 or 0
Parking Cancel	Parking brake operation condition is displayed. (At parking cancel: 1)	1 or 0
Hill hold lamp	Hill hold indicator control condition is displayed. (When illuminating: ON)	ON or OFF
Ignition Signal	Input condition of ignition signal is displayed.	ON or OFF
Brake Warning Light	Brake warning light control condition is displayed. (When illuminating: ON)	ON or OFF

Subaru Select Monitor

PARKING BRAKE (DIAGNOSTICS)

Display	Contents to be displayed	Unit
Parking System Warning Light	For C6 model, electronic parking brake warning light control condition is displayed. (When illuminating: ON) For other than C6 model, brake warning light control condition is displayed. (When blinking: ON)	ON or OFF
Neutral Signal	Input condition of neutral signal is displayed. (When neutral: ON)	ON or OFF
Brake Switch	Input condition of brake pedal signal is displayed. (When depressed: ON)	ON or OFF
Engine idle flag	Engine speed condition is displayed. (When idling: ON)	ON or OFF
Door Signal	Input condition of door (four locations) open/close signal is displayed. (When at least one door is open: OPEN)	OPEN or CLOSE
Driver Seat Belt Signal	Input condition of driver's seatbelt signal is displayed.	Not in use/In use

3. MAINTENANCE OPERATION MODE

Display	Contents of display	Index No.
Force Sensor Calibration Mode	Perform the force sensor calibration.	<Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>
Break-in Parking Brake Drive Mode	Perform the break-in parking brake drive mode after replacing the parking brake assembly.	<Ref. to PB(diag)-18, BREAK-IN PARKING BRAKE DRIVE MODE, OPERATION, Subaru Select Monitor.>
Parking Brake Removal Mode	Release the cable tension before removing the parking brake cable.	<Ref. to PB(diag)-17, PARKING BRAKE REMOVAL MODE, OPERATION, Subaru Select Monitor.>
Parameter Initialization Mode	Perform the parameter initialization.	<Ref. to PB(diag)-18, PARAMETER INITIALIZATION MODE, OPERATION, Subaru Select Monitor.>
Clutch Sensor Calibration Mode	Perform the clutch sensor calibration.	<Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>
Clutch Engagement Position Setting	Perform the clutch sensor engagement position setting.	<Ref. to PB(diag)-19, CLUTCH ENGAGEMENT POSITION SETTING, OPERATION, Subaru Select Monitor.>

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.

Display	Contents to be displayed
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.
Power Supply Voltage	The voltage supplied to the parking brake control module is displayed.
Engine Speed	Engine speed is displayed.
Accel. Opening Angle	Acceleration opening is displayed.
Reverse Signal	Input condition of reverse signal is displayed. (When reverse: ON)
Brake Switch	Input condition of brake pedal signal is displayed. (When depressed: ON)
Force Sensor	The tension detected by the force sensor in the actuator is displayed.
Stroke Sensor	The parking brake cable stroke amount detected by the stroke sensor in the actuator is displayed.
Clutch stroke sensor	The pedal stroke amount detected by the clutch stroke sensor is displayed.
Clutch engagement point	Clutch engagement position is displayed.
Actuator Inner Temperature (Primary)	Actuator inner temperature (PRY) is displayed.
Actuator Inner Temperature (Secondary)	Actuator inner temperature (SEC) is displayed.
Incline	Incline of the vehicle is displayed.
Engine Torque	Engine torque is displayed.
Manual Parking Operation	Parking brake operation condition is displayed. (At manual parking operation: 1)
Auto Parking Operation	Parking brake operation condition is displayed. (At automatic parking operation: 1)
Parking Operation when driving	Parking brake operation condition is displayed. (At parking operation when driving: 1)
Parking Cancel	Parking brake operation condition is displayed. (At parking cancel: 1)
Hill hold lamp	Hill hold indicator control condition is displayed. (When illuminating: ON)
Ignition Signal	Input condition of ignition signal is displayed.

Display	Contents to be displayed
Neutral Signal	Input condition of neutral signal is displayed. (When neutral: ON)
Engine idle flag	Engine speed condition is displayed. (When idling: ON)
Door Signal	Input condition of door open/close signal is displayed. (When at least one door is open: OPEN)
Driver Seat Belt Signal	Input condition of driver's seatbelt signal is displayed.

5. PARKING BRAKE REMOVAL MODE

CAUTION:

- **Subaru Select Monitor is required for the parking brake removal mode.**
- **Make sure to perform this procedure with the vehicle lifted.**
- **When this mode is performed by mistake, operate and then release the parking brake.**

NOTE:

When disassembling the parking brake, use this function to set the parking brake cable at the release position.

- 1) Lift up the vehicle.
- 2) Connect the Subaru Select Monitor.
- 3) On «Main Menu» display, select {Each System Check}.
- 4) On «System Selection Menu» display, select {Brake Control System}.
- 5) Click the [OK] button after {Parking Brake System} is displayed.
- 6) On «Maintenance Operation Mode» display, select {Parking Brake Removal Mode}.
- 7) The confirmation screen, "Perform parking brake removal?", is displayed. Click the [YES] button.
- 8) The message, "Releasing parking cable until removal position.", is displayed on the screen, and the removal mode begins.
- 9) The message, "Parking cable released until removal position.", is displayed on the screen. Turn the ignition switch to OFF to end the removal mode.

6. FORCE SENSOR CALIBRATION MODE

CAUTION:

- **Subaru Select Monitor is required for the Force Sensor Calibration Mode.**
- **Make sure to perform this procedure with the vehicle parked in a horizontal place and to use wheel chocks.**

NOTE:

- When the following work is performed, use this function to perform calibration of force sensor in the parking brake actuator.
 - Removing the parking brake assembly

Subaru Select Monitor

PARKING BRAKE (DIAGNOSTICS)

- Replacing the electronic parking brake control module
 - Adjusting the shoe clearance
 - After replacing the electronic parking brake control module, if the calibration of the force sensor has not yet been performed, the brake warning light will blink and “Force Sensor Line (abnormal)” DTC will be detected.
- 1) Park the vehicle in a horizontal place using wheel chocks.
 - 2) Connect the Subaru Select Monitor.
 - 3) On «Main Menu» display, select {Each System Check}.
 - 4) On «System Selection Menu» display, select {Brake Control System}.
 - 5) Click the [OK] button after {Parking Brake System} is displayed.
 - 6) On «Maintenance Operation Mode» display, select {Force Sensor Calibration Mode}.
 - 7) The confirmation screen of vehicle parking condition and wheel chocks usage is displayed. Confirm the parking condition and wheel chocks, and click the [YES] button.
 - 8) A message indicating the calibration mode in progress is displayed on the screen, and the Force Sensor Calibration Mode begins.
 - 9) The message, “Force sensor calibration done. Turn Ignition Switch OFF.”, is displayed on the screen. Turn the ignition switch to OFF to end the calibration mode.

7. BREAK-IN PARKING BRAKE DRIVE MODE

CAUTION:

Subaru Select Monitor is required for the “Break-in Parking Brake Drive Mode”.

NOTE:

- When the parking brake shoe is replaced, use this function to perform parking brake lining break-in drive after adjusting the shoe clearance of the parking brake. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
 - After performing the “Break-in Parking Brake Drive Mode”, adjust the shoe clearance of the parking brake again, and perform the “Force Sensor Calibration Mode”. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>
- 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 {Parking Brake System} is displayed.

- 5) On «Maintenance Operation Mode» display, select {Break-in Parking Brake Drive Mode}.
- 6) The confirmation message, “Perform break-in parking brake drive?”, is displayed on the screen. With the vehicle parked, release the parking brake, and click the [YES] button.
- 7) Confirm the message indicating the break-in drive mode start on the screen and the blink of the brake warning light, and begin the break-in drive.
- 8) Drive the vehicle at approximately 35 km/h (22 MPH) or more.
- 9) C6 model
Drive the vehicle approximately 200 m (0.12 miles) with the parking brake switch pressed, until the brake warning light goes off.
- 10) Models other than C6 model
Drive the vehicle approximately 200 m (0.12 miles) with the parking brake switch pressed. Release a hand from the parking brake switch once to cancel. Drive the vehicle again with the parking brake switch pressed, and if brake drag is not felt, go to step 11). If brake drag is felt, repeat steps 8) and 10) again.
- 11) Turn the ignition switch to OFF, and wait for 5 to 10 minutes until the parking brake temperature drops.
- 12) Repeat steps 2) to 10) again.
- 13) Turn the ignition switch to OFF to end the break-in drive mode.
- 14) Adjust the shoe clearance of the parking brake again. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
- 15) Perform the Force Sensor Calibration Mode. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>

8. PARAMETER INITIALIZATION MODE

CAUTION:

- **Subaru Select Monitor is required for the Parameter Initialization Mode.**
- **This function can be used for replacement parts of the parking brake control module.**

NOTE:

- When DTC “Parameter selection error” is detected after replacing the parking brake control module, use this function to perform parameter initialization of the parking brake control module.
- After performing Parameter Initialization Mode, perform the Force Sensor Calibration Mode and Clutch Sensor Calibration Mode. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>

- 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 {Parking Brake System} is displayed.
- 5) On «Maintenance Operation Mode» display, select {Parameter Initialization Mode}.
- 6) The confirmation message, “Perform parameter initialization?”, is displayed on the screen. Following the instructions on the screen, confirm the connections of all control modules, and click the [YES] button.
- 7) The message, “Parameter initialization in progress---”, is displayed on the screen, and initialization begins.
- 8) The message, “Parameter initialization done. Turn Ignition Switch OFF.”, is displayed on the screen. Turn the ignition switch to OFF to end the Parameter Initialization Mode.

9. CLUTCH SENSOR CALIBRATION MODE

CAUTION:

Subaru Select Monitor is required for Clutch Sensor Calibration Mode.

NOTE:

- When the following parts are replaced, use this function to perform clutch sensor calibration.
 - Clutch master cylinder assembly
 - Electronic parking brake control module
 - Clutch pedal
 - After replacing the parts above, if the calibration of the clutch sensor has not yet been performed, “Clutch Sensor” DTC will be detected. At this time, the electronic parking brake warning light illuminates on C6 model, or the brake warning light blinks on models other than C6 model.
- 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 {Parking Brake System} is displayed.
 - 5) On «Maintenance Operation Mode» display, select {Clutch Sensor Calibration Mode}.
 - 6) The confirmation message, “Perform clutch sensor calibration?”, is displayed on the screen. Following the instructions on the screen, click the [YES] button with the clutch pedal not depressed.
 - 7) The message, “Clutch sensor calibration done. Turn Ignition switch OFF.”, is displayed on the screen. Turn the ignition switch to OFF to end the calibration mode.

10. CLUTCH ENGAGEMENT POSITION SETTING

CAUTION:

Subaru Select Monitor is required for Clutch Engagement Position Setting.

NOTE:

- When the clutch master cylinder assembly is replaced, use this function to set the engagement position for the clutch stroke sensor.
 - When the customer requested a change of the accelerator interlocking release timing, use this function to change the engagement position of the clutch stroke sensor in order to change the accelerator interlocking release timing.
 - The clutch engagement position can be set between 50 — 80%.
- 1) Park the vehicle on a safe level surface without obstacles.
 - 2) Start the engine to warm up.
 - 3) Connect the Subaru Select Monitor.
 - 4) On «Main Menu» display, select {Each System Check}.
 - 5) On «System Selection Menu» display, select {Brake Control System}.
 - 6) Click the [OK] button after {Parking Brake System} is displayed.
 - 7) On «Maintenance Operation Mode» display, select {Clutch Engagement Position Setting}.
 - 8) Release the parking brake. Shift the gear to 1st, then slowly release the clutch pedal, and read “Clutch position current value” on the screen when the vehicle starts to move.
 - 9) Enter the reading to “Engagement position input value”, and press the [Execution] button.
 - 10) Drive the vehicle, and check the accelerator interlocking release timing.
 - 11) Turn the ignition switch to OFF to end the clutch engagement position setting.

CAUTION:

If the clutch engagement position is not set correctly, early release or release delay of the parking brake may occur at the accelerator interlocking release. After completing the setting, check the accelerator interlocking timing in a safe place, and confirm that neither early release nor release delay occurs.

NOTE:

- When a smaller value than “Engagement position learning value” is entered in “Engagement position input value”, the parking brake release timing delays.
- When a larger value than “Engagement position learning value” is entered in “Engagement position input value”, the parking brake release timing becomes early.

PARKING BRAKE (DIAGNOSTICS)

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

Defective harness connector

Communication is impossible between the parking brake control module and Subaru Select Monitor.

[illegible]

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 {Parking Brake System} using the 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

PARKING BRAKE (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 LAN SYSTEM. Perform the diagnosis for LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 5.
5	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Press the parking brake switch once. 2) Check whether communication with the parking brake system can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Check DTC of the parking brake system. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Go to step 6.
6	CHECK INSTALLATION OF ELECTRONIC PARKING BRAKE CM CONNECTOR. Turn the ignition switch to OFF.	Is the electronic parking brake CM connector inserted into the electronic parking brake CM until the clamp locks onto it?	Go to step 7.	Insert the electronic parking brake CM connector into the electronic parking brake CM.
7	CHECK HARNESS CONNECTOR BETWEEN ELECTRONIC PARKING BRAKE CM AND CHASSIS GROUND. Measure the resistance of harness between electronic parking brake CM connector and chassis ground. Connector & terminal (B355) No. 6 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 8.	Repair the open circuit of the electronic parking brake CM ground circuit and poor contact of connector.
8	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 electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>

Read Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

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 PB(diag)-34, List of Diagnostic Trouble Code (DTC).>
- Up to 3 DTCs are displayed in the order of detection.

Display	Contents to be displayed
(Current)	The current DTC is displayed on Subaru Select Monitor display screen.
(Old)	The latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.
(Older)	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
(Before 3)	The third latest DTC from the history of 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 10 minutes, and operate and release the parking brake a few times.

9. Clear Memory Mode

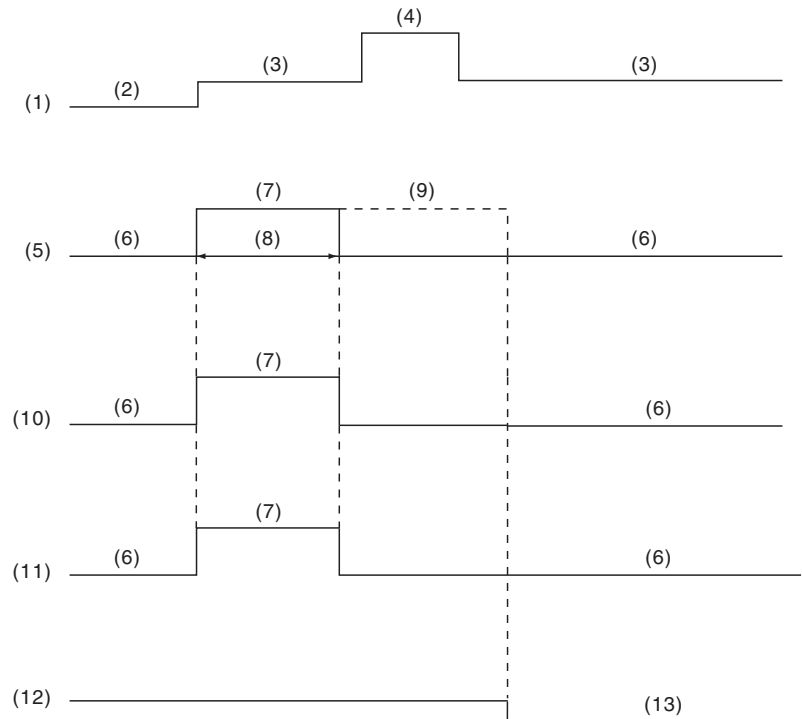
A: OPERATION

NOTE:

For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

10.Warning Light Illumination Pattern

A: INSPECTION



PB-00163

- | | | |
|---|---|---|
| (1) Ignition switch | (6) Light OFF | (10) Electronic parking brake warning light (C6 model only) |
| (2) OFF | (7) Light ON | (11) Hill hold indicator light |
| (3) ON | (8) Approx. 2 sec. | (12) Parking brake |
| (4) Engine start | (9) If the parking brake is being operated, illumination continues until the brake is released. | (13) Released |
| (5) Brake warning light (EBD warning light) | | |

Warning Light Illumination Pattern

PARKING BRAKE (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 PB(diag)-27, PARKING BRAKE WARNING LIGHT AND HILL HOLD ON INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.>
- 3) When the electronic parking brake warning light (C6 model only) and hill hold indicator light do not go off, check the combination meter circuit, CAN communication circuit and electronic parking brake CM. <Ref. to PB(diag)-29, PARKING BRAKE WARNING LIGHT AND HILL HOLD ON INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to PB(diag)-28, HILL HOLD INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.>
- 4) When the brake warning light does not go off, check the combination meter circuit, CAN communication circuit, electronic parking brake CM, and VDCCM&H/U. <Ref. to PB(diag)-30, BRAKE WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to PB(diag)-32, BRAKE WARNING LIGHT REMAINS BLINKING, Warning Light Illumination Pattern.>
- 5) After replacing the electronic parking brake CM, the brake warning light blinks. Make sure to perform the Force Sensor Calibration Mode and Clutch Sensor Calibration Mode. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>
- 6) When operation and release of the parking brake is repeated excessively, the brake warning light blinks and the parking brake switch operation may not be accepted for several tens of seconds; this is not malfunction, however.

Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

B: PARKING BRAKE WARNING LIGHT AND HILL HOLD ON 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), brake warning light, electronic parking brake warning light (C6 model only) and hill hold indicator light do not come on.

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 diagnosis for combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>
2	CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Replace the combination meter case assembly. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

C: HILL HOLD INDICATOR LIGHT DO NOT GO OFF

NOTE:

This diagnosis is applied to models other than C6 model.

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the hill hold indicator light remains lit.

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. With the engine started, display the current data of the electronic parking brake CM using Subaru Select Monitor.	When the hill hold switch is not operated after starting the engine, is the "Hill hold lamp" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Replace the combination meter case assembly. <Ref. to IDI-20, REMOVAL, Combination Meter.>

**D: PARKING BRAKE WARNING LIGHT AND HILL HOLD ON INDICATOR LIGHT
DO NOT GO OFF****NOTE:**

This diagnosis is applied to C6 model.

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the electronic parking brake warning light and hill hold indicator light remain lit.

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. With the engine started, display the current data of the electronic parking brake CM using Subaru Select Monitor.	Is "Parking System Warning Light" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK ELECTRONIC PARKING BRAKE CM. With the engine started, display the current data of the electronic parking brake CM using Subaru Select Monitor.	When the hill hold switch is not operated after starting the engine, is the "Hill hold lamp" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 5.
5 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Replace the combination meter case assembly. <Ref. to IDI-20, REMOVAL, Combination Meter.>

Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

E: BRAKE WARNING LIGHT DOES NOT GO OFF

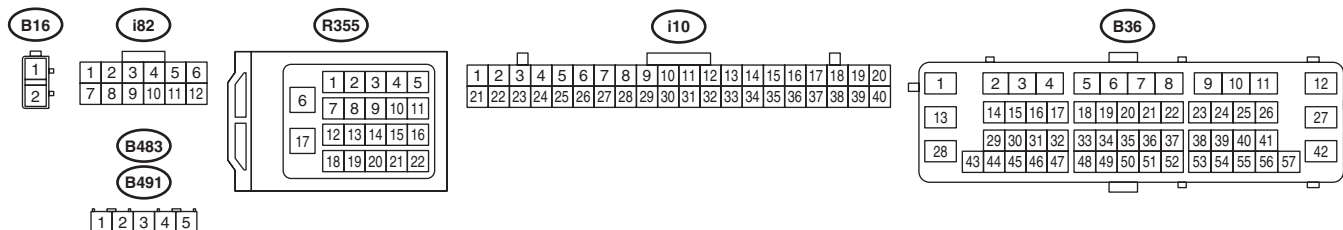
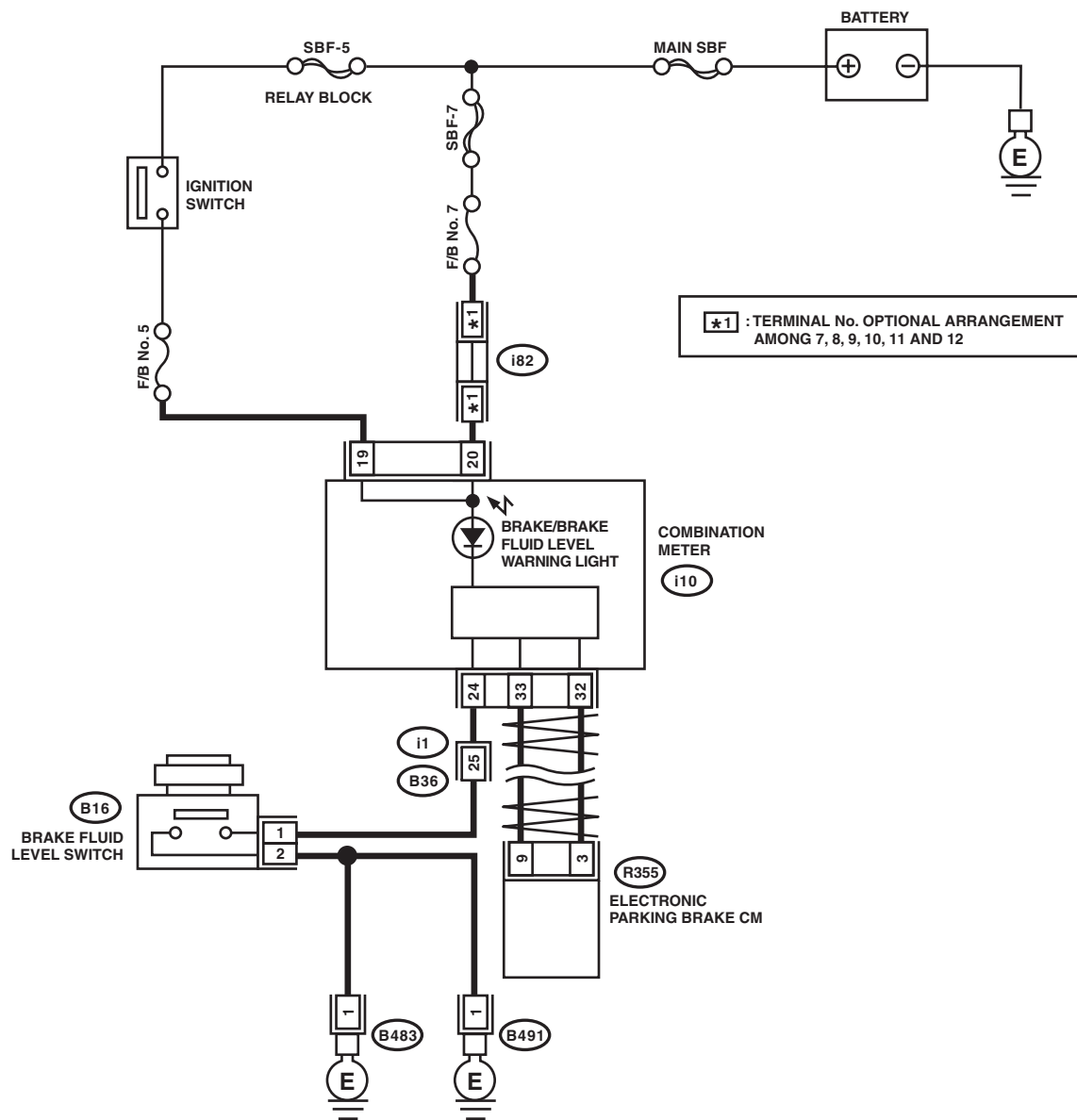
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



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Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 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 3.	Replenish brake fluid to the specified value.
3 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 4.	Replace the master cylinder. <Ref. to BR-27, Master Cylinder.>
4 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. 24 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the harness connector between combination meter and brake fluid level switch.
5 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 6.
6 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Go to step 7.	Replace the combination meter case assembly. <Ref. to IDI-20, REMOVAL, Combination Meter.>
7 CHECK VDC SYSTEM. Check the DTC in VDC system. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of VDC system displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 8.
8 CHECK ELECTRONIC PARKING BRAKE CM. With the parking brake released, display the current data of the electronic parking brake CM using Subaru Select Monitor.	Is "Brake Warning Light" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 9.
9 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

F: BRAKE WARNING LIGHT REMAINS BLINKING

NOTE:

This diagnosis is applied to models other than C6 model.

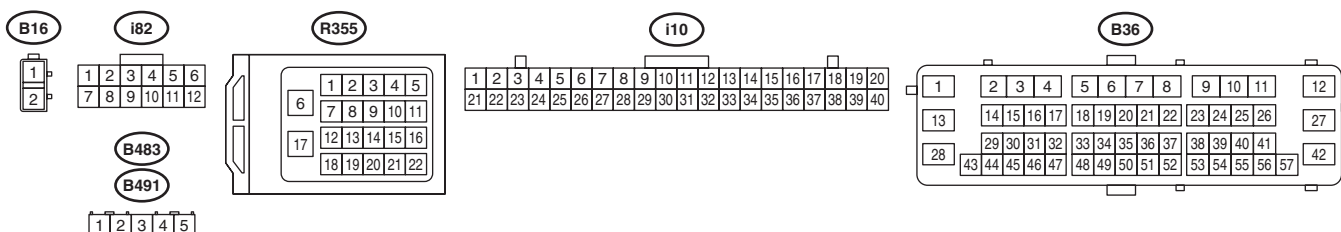
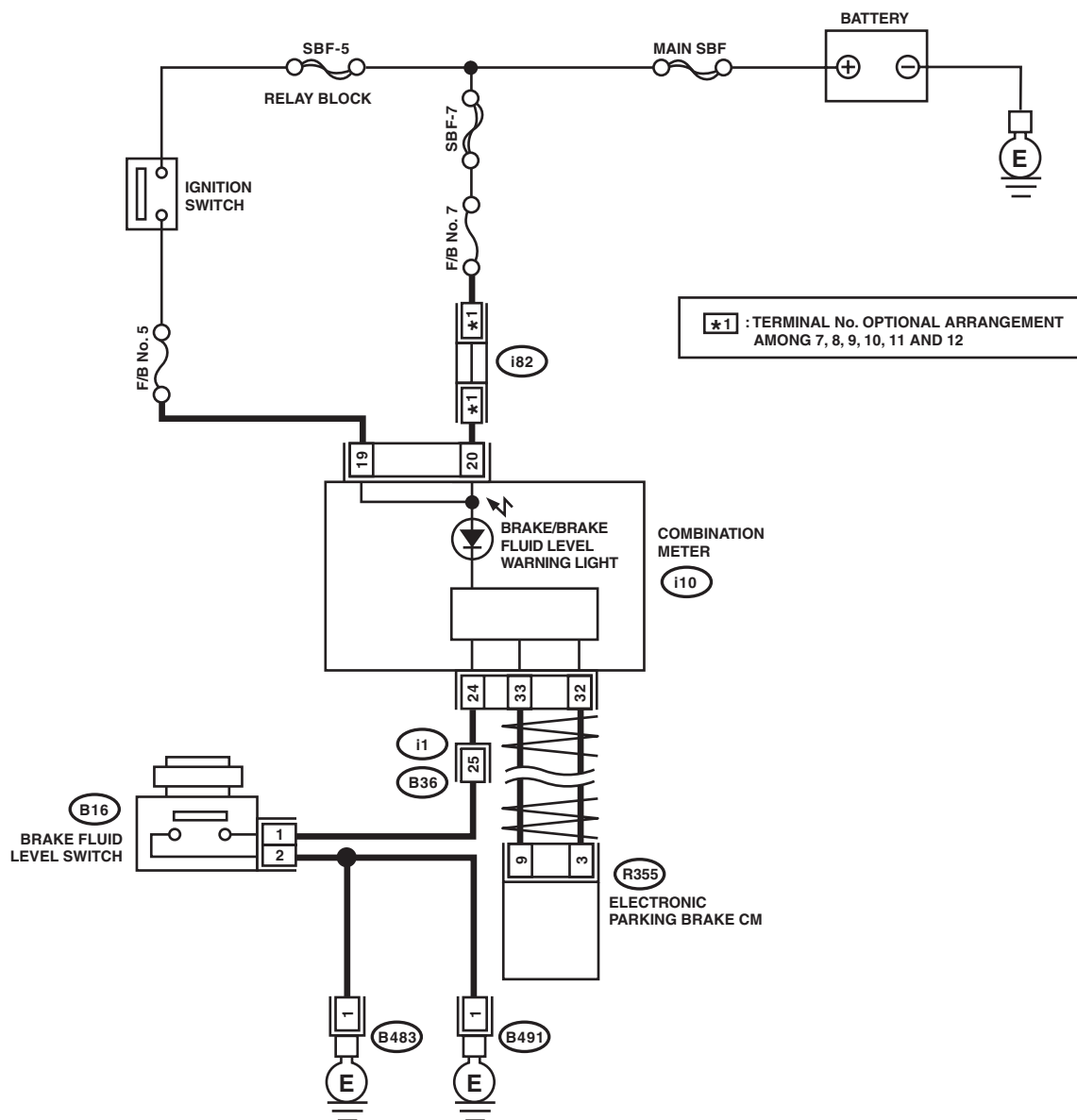
DETECTING CONDITION:

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

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



PB-00181

Warning Light Illumination Pattern

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to PB(diag)-22, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 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 3.	Replenish brake fluid to the specified value.
3 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 4.	Replace the master cylinder. <Ref. to BR-27, Master Cylinder.>
4 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. 24 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the harness connector between combination meter and brake fluid level switch.
5 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 6.
6 CHECK COMBINATION METER. Check the combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is combination meter OK?	Go to step 7.	Replace the combination meter case assembly. <Ref. to IDI-20, REMOVAL, Combination Meter.>
7 CHECK VDC SYSTEM. Check the DTC in VDC system. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of VDC system displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 8.
8 CHECK ELECTRONIC PARKING BRAKE CM. With the parking brake released, display the current data of the electronic parking brake CM using Subaru Select Monitor.	Is "Brake Warning Light" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 9.
9 CHECK ELECTRONIC PARKING BRAKE CM. With the parking brake released, display the current data of the electronic parking brake CM using Subaru Select Monitor.	Is "Parking System Warning Light" ON?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 10.
10 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

List of Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detailed code	Display	Content of diagnosis	Reference
C0221	504A 504B 504C	Parking Switch Line (abnormal)	Parking switch malfunction	<Ref. to PB(diag)-36, DTC C0221 PARKING POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0222	504E	Hill hold switch circuit	Hill hold switch malfunction	<Ref. to PB(diag)-38, DTC C0222 HILL HOLD SWITCH CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0231	C110	ECM Failure	Malfunction signal reception from ECM	<Ref. to PB(diag)-40, DTC C0231 ECM FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0232	C114	AT abnormal	Malfunction signal reception from TCM	<Ref. to PB(diag)-40, DTC C0232 AT ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0233	509E 509F	MT shift switch circuit	Malfunction of neutral position switch, back-up light switch	<Ref. to PB(diag)-41, DTC C0233 MT SHIFT SWITCH CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0234	C111	VDC Failure	Malfunction signal reception from VDC CM	<Ref. to PB(diag)-42, DTC C0234 VDC FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0235	5046	Ignition switch circuit	No match of IGN input	<Ref. to PB(diag)-43, DTC C0235 IGNITION SWITCH CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0241	5000 502A 5026 C100	Electrical Control Module	Parking brake control module is faulty.	<Ref. to PB(diag)-45, DTC C0241 ELECTRICAL CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0242	5040 5041	Power Supply Voltage Failure	Parking brake control module power supply voltage is faulty.	<Ref. to PB(diag)-47, DTC C0242 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	5042	Internal Power Supply Voltage abnormal	Parking brake control module inner power supply voltage is faulty.	<Ref. to PB(diag)-48, DTC C0242 INTERNAL POWER SUPPLY VOLTAGE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0243	50D1 50D3 50D4 50D5 50D6	Parameter selection error	Parking brake control module parameter selection failure	<Ref. to PB(diag)-49, DTC C0243 PARAMETER SELECTION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0251	5020 5022 5028 50CE 50CF	Actuator Line (abnormal)	Actuator line of parking brake control module is faulty.	<Ref. to PB(diag)-50, DTC C0251 ACTUATOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0252	5018 5019 501A 50A0	Motor Malfunction	Motor malfunction of parking brake control module	<Ref. to PB(diag)-51, DTC C0252 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0253	501F 50C6	Actuator Stroke Excess	Actuator stroke excess	<Ref. to PB(diag)-52, DTC C0253 ACTUATOR STROKE EXCESS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0261	C101 C13F	Improper CAN Communication	Defective CAN communication	<Ref. to PB(diag)-52, DTC C0261 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

DTC	Detailed code	Display	Content of diagnosis	Reference
C0262	C10B	TCM Communication Circuit	CAN signal not received from TCM	<Ref. to PB(diag)-53, DTC C0262 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0263	C107	ECM Communication Circuit	CAN signal not received from ECM	<Ref. to PB(diag)-54, DTC C0263 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0264	C108 C141	VDC communication system	CAN signal not received from VDC CM	<Ref. to PB(diag)-55, DTC C0264 VDC COMMUNICATION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0265	C109	Body Integrated Module Communication Circuit	CAN signal not received from body integrated unit	<Ref. to PB(diag)-56, DTC C0265 BODY INTEGRATED MODULE COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0267	C13E	Meter communication system	CAN signal not received from combination meter	<Ref. to PB(diag)-57, DTC C0267 METER COMMUNICATION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0271	5030 5031 503C 50BE 50C5 50CB 50CC	Force Sensor Line (abnormal)	Defective force sensor	<Ref. to PB(diag)-57, DTC C0271 FORCE SENSOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0272	501B 503D 503E	Temperature Sensor Line (abnormal)	Defective temperature sensor	<Ref. to PB(diag)-57, DTC C0272 TEMPERATURE SENSOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0273	50B9 50BA	Stroke Sensor Line (abnormal)	Defective stroke sensor	<Ref. to PB(diag)-57, DTC C0273 STROKE SENSOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0274	5033 503A	Clutch sensor circuit	Defective clutch sensor	<Ref. to PB(diag)-58, DTC C0274 CLUTCH SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0275	5037	Longitudinal G sensor circuit	Defective longitudinal G sensor	<Ref. to PB(diag)-61, DTC C0275 LONGITUDINAL G SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0281	50CA	Mid stop condition	Stop in the middle of stroke while actuator operation	<Ref. to PB(diag)-63, DTC C0281 MID STOP CONDITION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0282	50C9	Emergency cancel status	Perform the emergency cancel.	<Ref. to PB(diag)-64, DTC C0282 EMERGENCY CANCEL STATUS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0221 PARKING POSITION SWITCH

DTC DETECTING CONDITION:

- Defective parking brake switch
- Defective harness connector

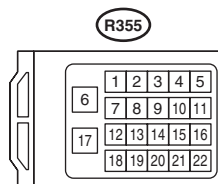
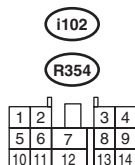
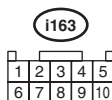
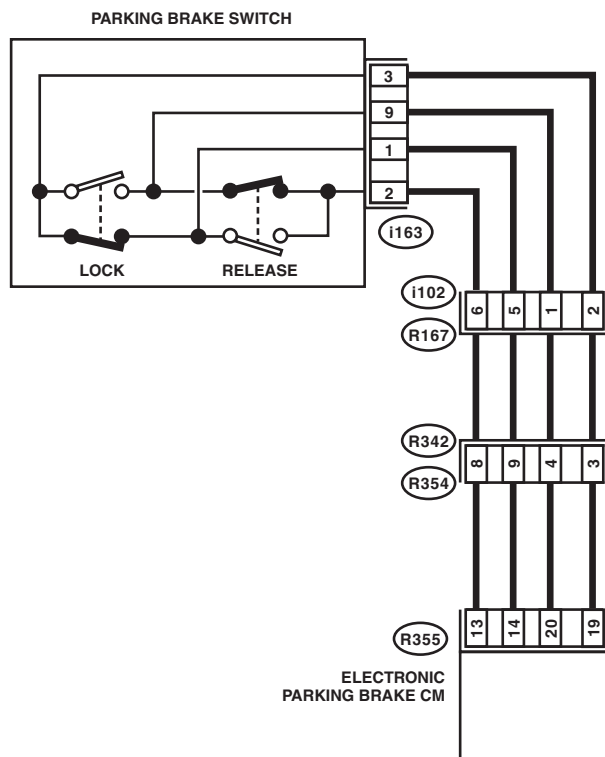
TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

NOTE:

- When the parking brake switch is stopped at the mid-operation, or operated too slowly, this DTC may be stored; this is not malfunction, however.
- When the parking brake switch is pressed or pulled for 90 seconds or more, subsequent switch operations are not accepted. At this time, the electronic parking brake warning light illuminates on C6 model, or the brake warning light blinks on models other than C6 model. When turning the ignition switch from OFF to ON, the operation enabled status is restored.

WIRING DIAGRAM:



PB-00165

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the electronic parking brake CM, and parking brake switch. 3) Measure the resistance of harness between electronic parking brake CM and parking brake switch connector. Connector & terminal <i>(R355) No. 13 — (i163) No. 2:</i> <i>(R355) No. 14 — (i163) No. 1:</i> <i>(R355) No. 20 — (i163) No. 9:</i> <i>(R355) No. 19 — (i163) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the harness and connector between electronic parking brake CM and parking brake switch connector.
2 CHECK HARNESS. Measure the resistance of harness between parking brake switch connector and chassis ground. Connector & terminal <i>(i163) No. 2 — Chassis ground:</i> <i>(i163) No. 1 — Chassis ground:</i> <i>(i163) No. 9 — Chassis ground:</i> <i>(i163) No. 3 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair ground short of harness between electronic parking brake CM and parking brake switch connector.
3 CHECK HARNESS. Measure the voltage between parking brake switch connector and chassis ground. Connector & terminal <i>(i163) No. 2 (+) — Chassis ground (-):</i> <i>(i163) No. 1 (+) — Chassis ground (-):</i> <i>(i163) No. 9 (+) — Chassis ground (-):</i> <i>(i163) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Repair short to power supply of harness between electronic parking brake CM and parking brake switch connector.
4 CHECK PARKING BRAKE SWITCH. Check the parking brake switch. <Ref. to PB-9, INSPECTION, Parking Brake Switch.>	Is the parking brake switch normal?	Go to step 5.	Replace the parking brake switch. <Ref. to PB-9, Parking Brake Switch.>
5 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 6.
6 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

B: DTC C0222 HILL HOLD SWITCH CIRCUIT

DTC DETECTING CONDITION:

- Defective hill hold switch
- Defective harness connector

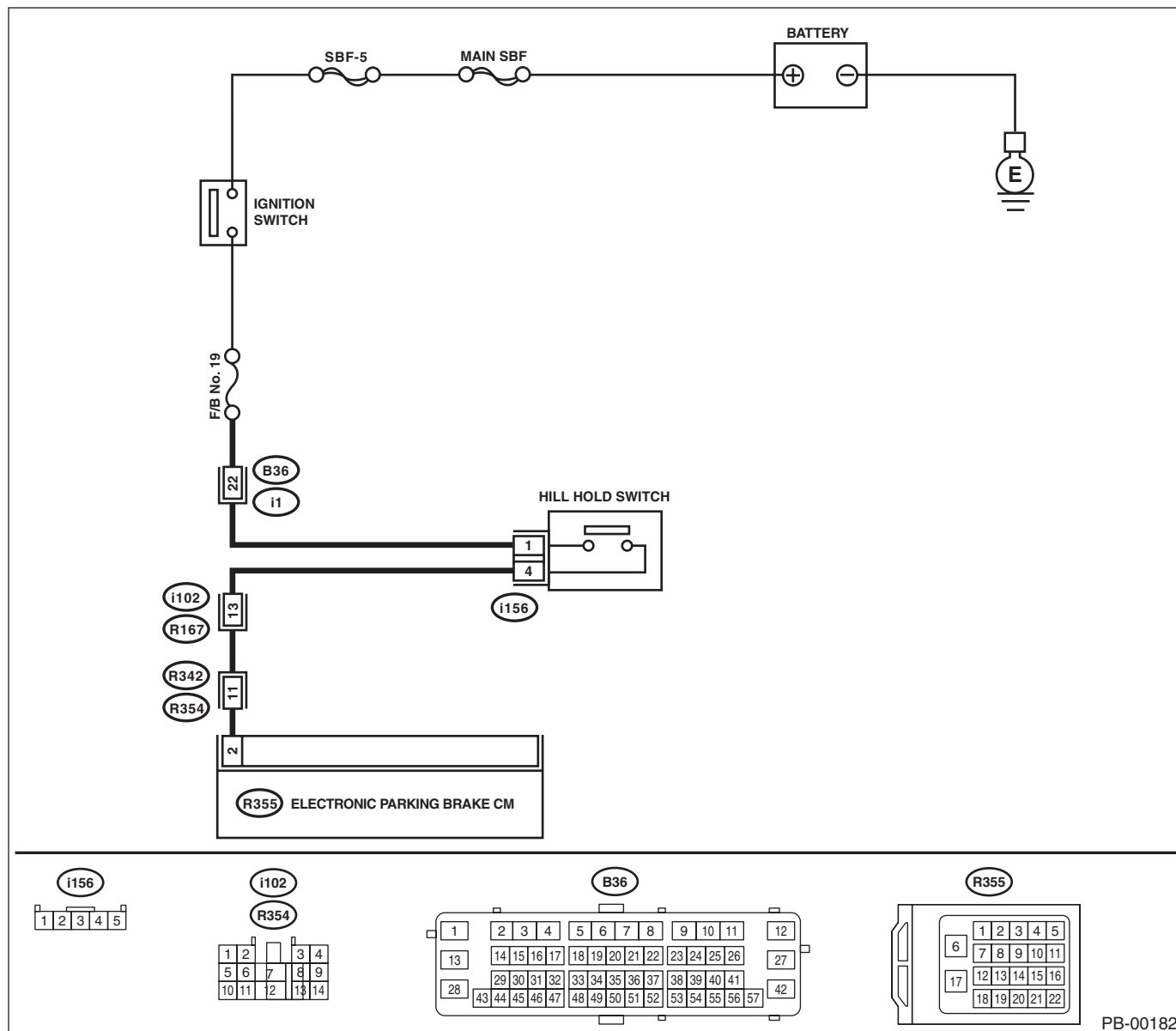
TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function cannot be set.

NOTE:

When hill hold switch is pressed for 30 seconds or more, hill hold indicator goes off, and subsequent switch operations are not accepted. At this time, the electronic parking brake warning light illuminates on C6 model, or the brake warning light blinks on models other than C6 model. When turning the ignition switch from OFF to ON, the operation enabled status is restored.

WIRING DIAGRAM:



PB-00182

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HILL HOLD SWITCH POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from hill hold switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between hill hold switch connector and chassis ground. Connector & terminal (i156) No. 1 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit of hill hold switch.
2 CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the electronic parking brake CM. 3) Measure the resistance of harness between hill hold switch and electronic parking brake CM connector. Connector & terminal (i156) No. 4 — (R355) No. 2:	Is the resistance less than 1 Ω?	Go to step 3.	Repair the harness and connector between hill hold switch and electronic parking brake CM connector.
3 CHECK HARNESS. Measure the resistance of harness between hill hold switch connector and chassis ground. Connector & terminal (i156) No. 4 — Chassis ground:	Is the resistance less than 1 MΩ?	Go to step 4.	Repair ground short of harness between hill hold switch and electronic parking brake CM connector.
4 CHECK HARNESS. Measure the voltage between hill hold switch connector and chassis ground. Connector & terminal (i156) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Repair short to power supply of harness between hill hold switch and electronic parking brake CM connector.
5 CHECK HILL HOLD SWITCH. Check the hill hold switch. <Ref. to PB-9, HILL HOLD SWITCH, INSPECTION, Parking Brake Switch.>	Is the hill hold switch normal?	Go to step 6.	Replace the hill hold switch. <Ref. to PB-9, REMOVAL, Parking Brake Switch.>
6 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

C: DTC C0231 ECM FAILURE

DTC DETECTING CONDITION:

Faulty signal received from engine control module (ECM)

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

NOTE:

Refer to EN section for diagnostic procedure. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>
<Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

D: DTC C0232 AT ABNORMAL

DTC DETECTING CONDITION:

Faulty signal received from transmission control module (TCM)

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

NOTE:

Refer to CVT or 5AT section for diagnostic procedure. <Ref. to CVT(diag)-2, Basic Diagnostic Procedure.>
<Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>

E: DTC C0233 MT SHIFT SWITCH CIRCUIT

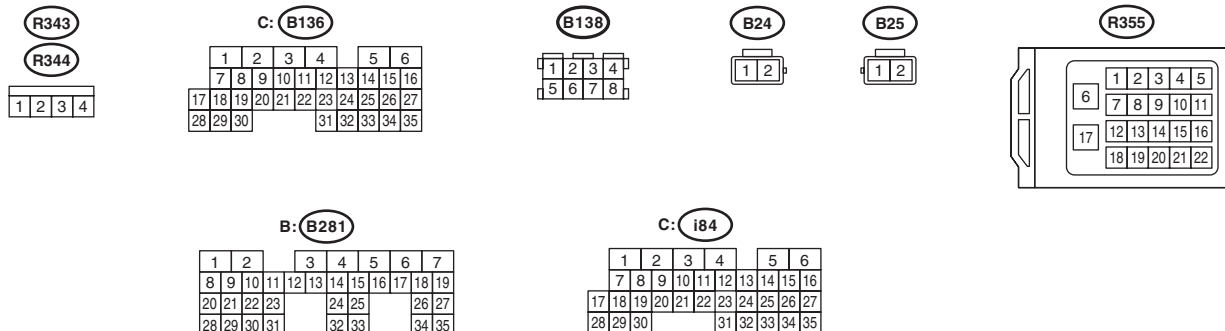
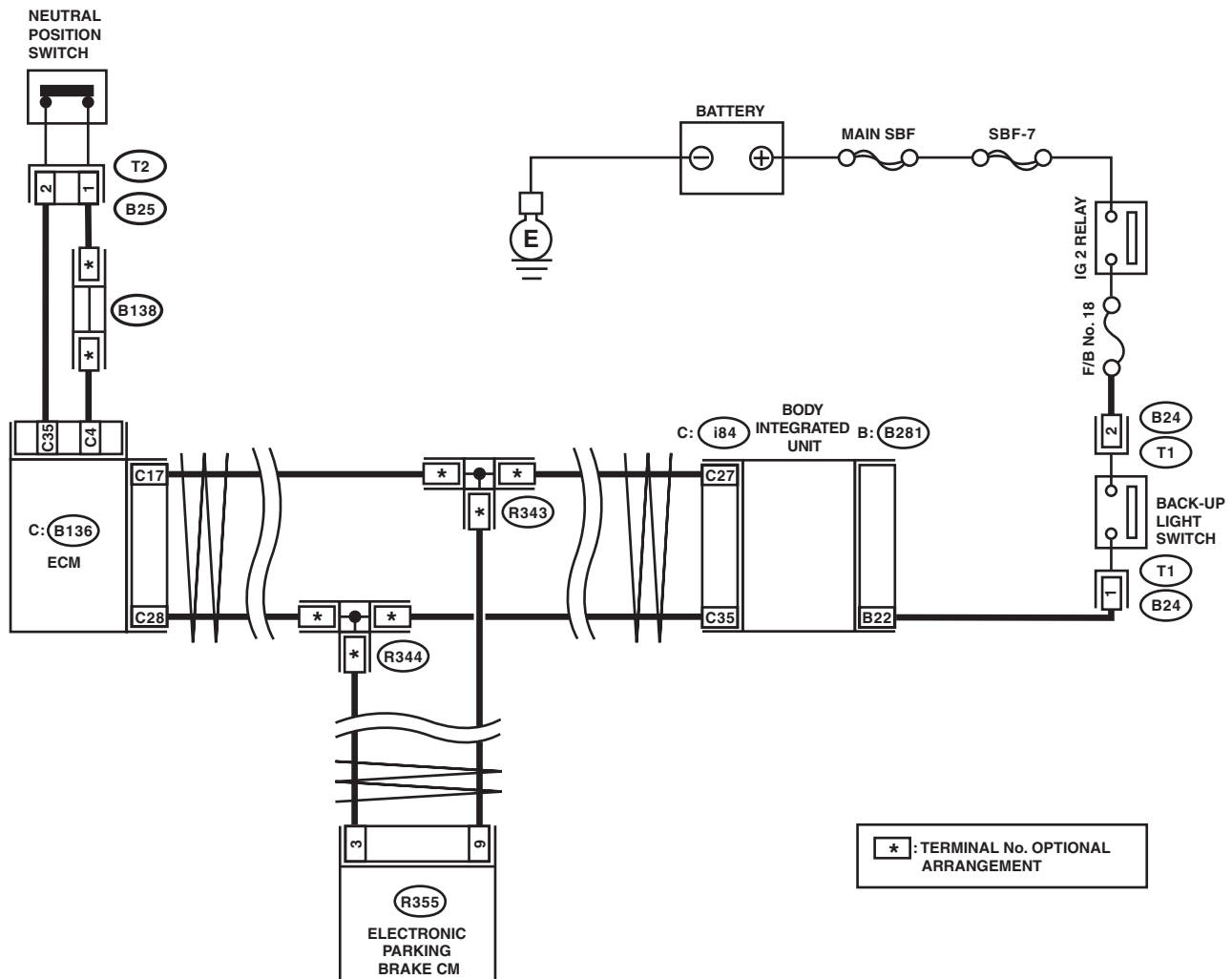
DTC DETECTING CONDITION:

- Defective neutral position switch
- Defective back-up light switch
- Defective harness connector

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF NEUTRAL POSITION SWITCH USING SUBARU SELECT MONITOR. 1) Select "Current Data Display & Save" for "Engine Control System" on Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-37, Subaru Select Monitor.> 2) Read the neutral position switch output displayed on the screen.	Is "ON" displayed on the screen at neutral state?	Go to step 2.	Perform the diagnosis for the engine. <Ref. to EN(H4DOTC)(diag)-43, Read Diagnostic Trouble Code (DTC).>
2 CHECK OUTPUT OF BACK-UP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1) Select "Current Data Display & Save" for "Integ. unit mode" on Subaru Select Monitor. <Ref. to BC(diag)-15, Read Current Data.> 2) Read the MT reverse SW output displayed on the screen.	Is "ON" displayed on the screen at reverse state?	Go to step 3.	Check DTC of integrated unit. <Ref. to BC(diag)-13, Read Diagnostic Trouble Code (DTC).>
3 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 4.
4 CHECK ELECTRONIC PARKING BRAKE CM. 1) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 3) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

F: DTC C0234 VDC FAILURE

DTC DETECTING CONDITION:

Faulty signal received from VDC control module

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.
- Parking brake system occasionally may not operate.

NOTE:

Refer to VDC section for diagnostic procedure. <Ref. to VDC(diag)-2, Basic Diagnostic Procedure.>

G: DTC C0235 IGNITION SWITCH CIRCUIT

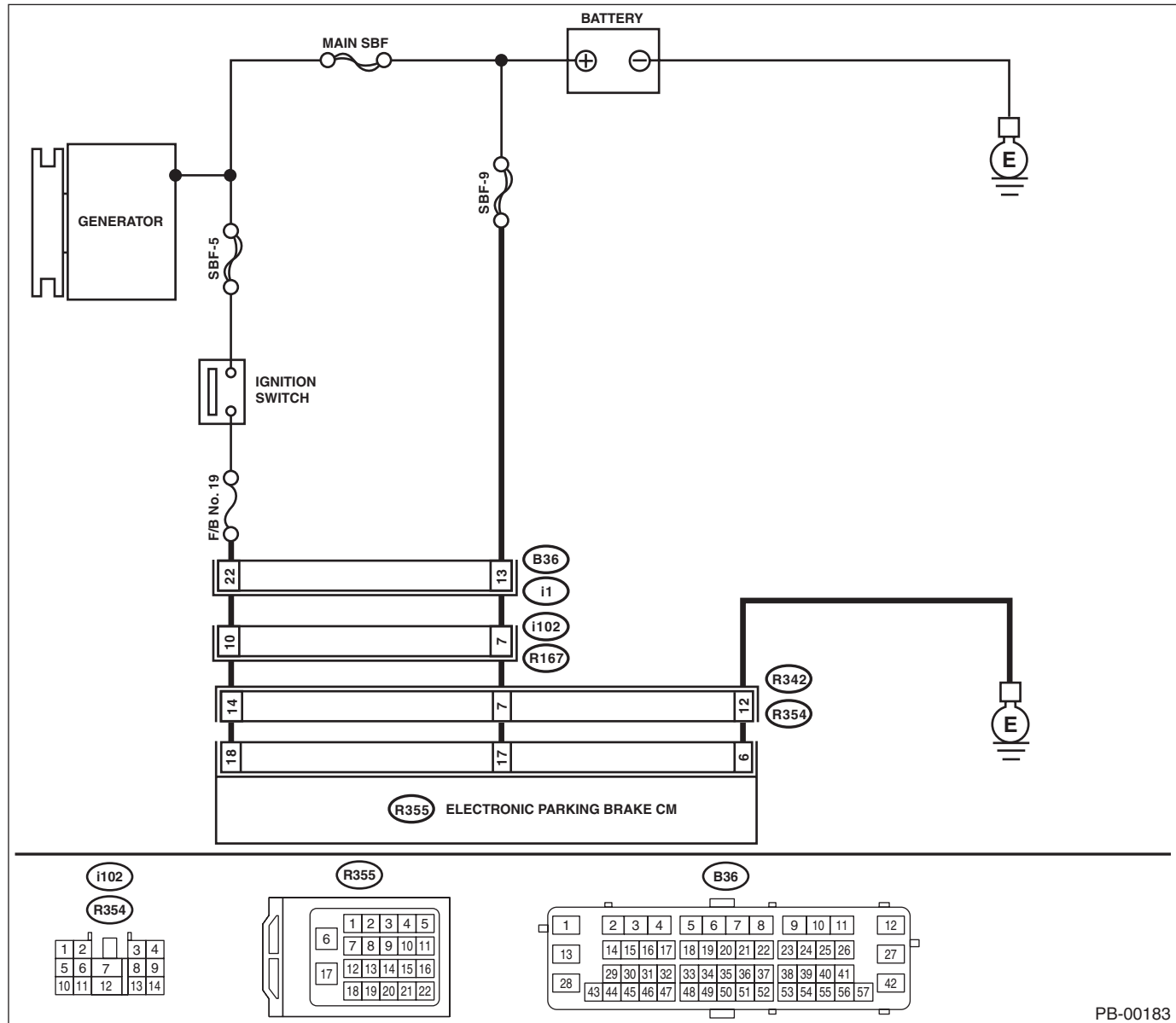
DTC DETECTING CONDITION:

IGN input of the parking brake control module and IGN input of VDC control module do not match.

TROUBLE SYMPTOM:

- Parking brake cannot be released.
- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold does not function.

WIRING DIAGRAM:



PB-00183

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT VOLTAGE FOR ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the electronic parking brake CM. 3) Turn the ignition switch to ON. 4) Measure the resistance between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit.
2	CHECK GROUND CIRCUIT OF ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 6 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the defective ground circuit of the electronic parking brake CM.
3	CHECK VDC. 1) Turn the ignition switch to ON. 2) Check DTC of VDC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of VDC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 4.
4	CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of LAN system displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 5.
5	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of power supply circuit, ground circuit and electronic parking brake CM connector?	Repair the connector.	Go to step 6.
6	CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 7.
7	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

H: DTC C0241 ELECTRICAL CONTROL MODULE

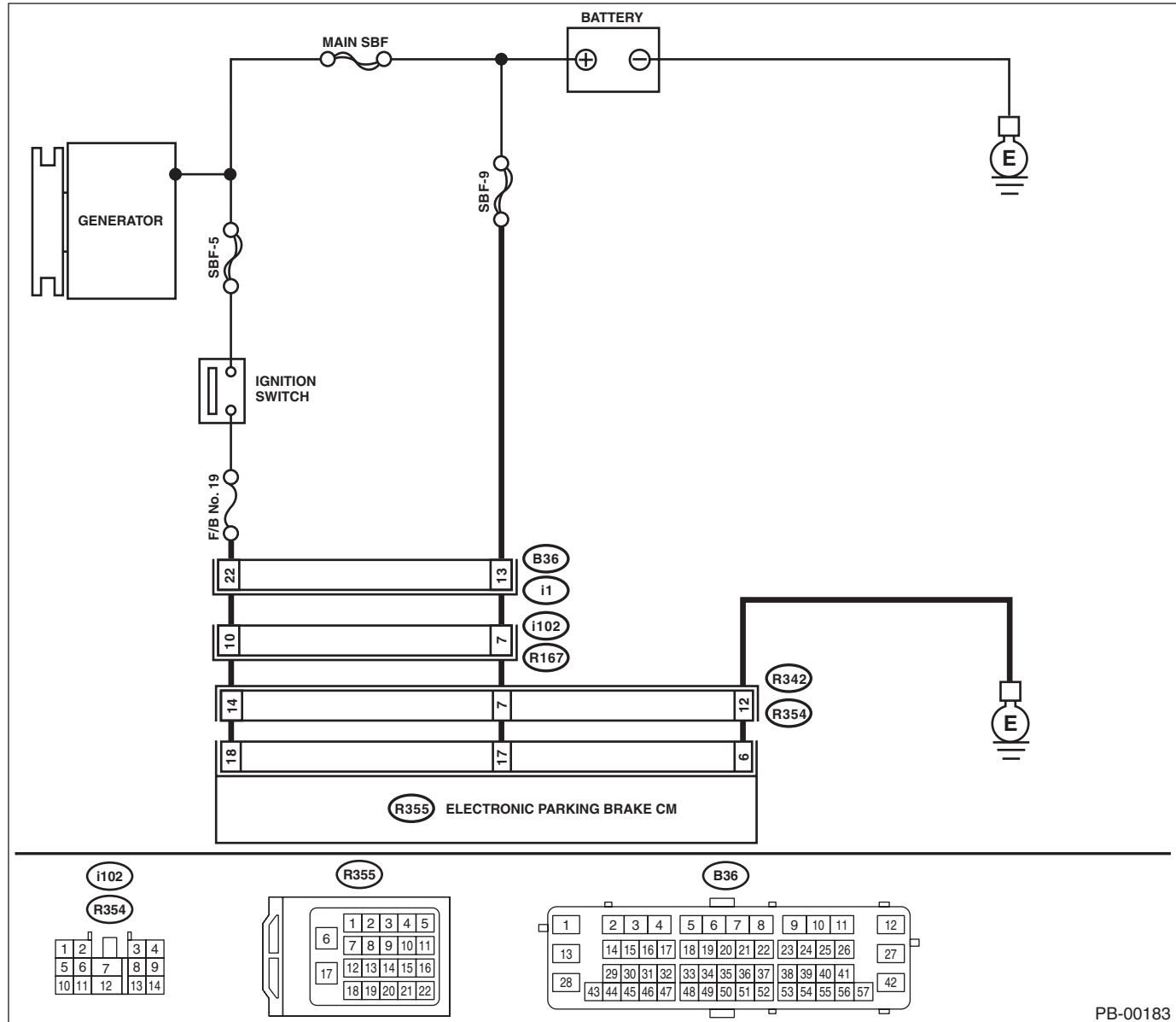
DTC DETECTING CONDITION:

Defective parking brake control module

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

WIRING DIAGRAM:



PB-00183

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INPUT VOLTAGE FOR ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the electronic parking brake CM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 18 (+) — Chassis ground (-): (R355) No. 17 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit.
2	CHECK GROUND CIRCUIT OF ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 6 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the defective ground circuit of the electronic parking brake CM.
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 electronic parking brake CM harness.	Are noise sources installed?	Install the noise sources apart from the electronic parking brake CM harness.	Go to step 5.
5	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of power supply circuit, ground circuit and electronic parking brake CM connector?	Repair the connector.	Go to step 6.
6	CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 7.
7	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

I: DTC C0242 POWER SUPPLY VOLTAGE FAILURE

DTC DETECTING CONDITION:

Defective power supply voltage for the electronic parking brake CM

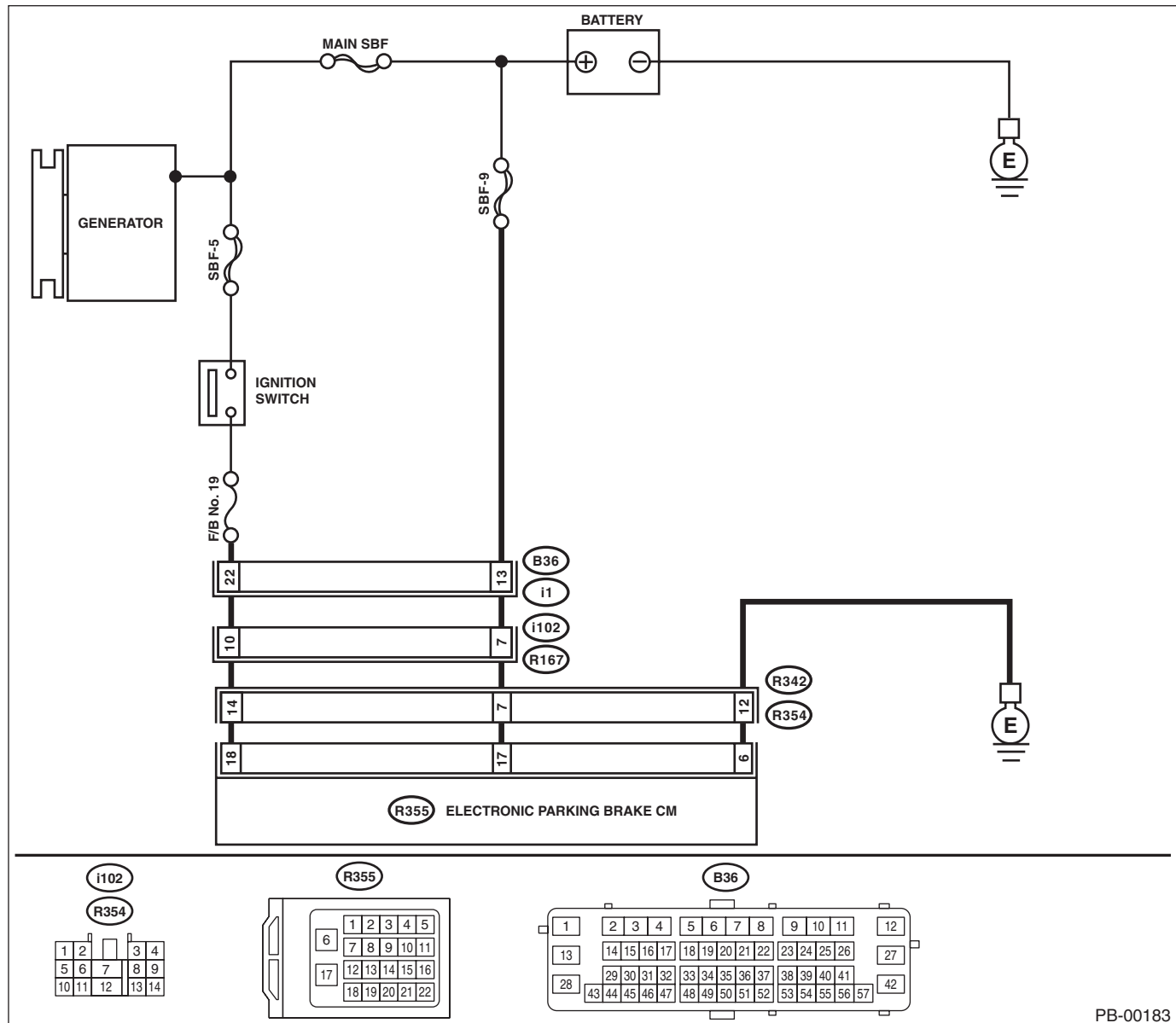
TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

NOTE:

Warning lights go off if voltage returns.

WIRING DIAGRAM:



PB-00183

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (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. <Ref. to SC(H4SO)-18, 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 INPUT VOLTAGE FOR ELECTRONIC PARKING BRAKE CM. 1) Disconnect the connectors from the electronic parking brake CM. 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 electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the power supply circuit.
4	CHECK GROUND CIRCUIT OF ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 6 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the defective ground circuit of the electronic parking brake CM.
5	CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of power supply circuit, ground circuit and electronic parking brake CM connector?	Repair the connector.	Go to step 6.
6	CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 7.
7	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

J: DTC C0242 INTERNAL POWER SUPPLY VOLTAGE ABNORMAL

NOTE:

For the diagnostic procedure, refer to DTC C0242 "Power Supply Voltage Failure". <Ref. to PB(diag)-47, DTC C0242 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0243 PARAMETER SELECTION ERROR**DTC DETECTING CONDITION:**

Parameter selection error for the electronic parking brake CM

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

NOTE:

After performing Parameter Initialization Mode, make sure to perform the Force Sensor Calibration Mode and Clutch Sensor Calibration Mode. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.>

	Step	Check	Yes	No
1	CHECK ECM, TCM AND COMBINATION METER. Check that ECM, TCM and combination meter with correct specifications are installed.	Are correct ECM, TCM and combination meter installed?	Go to step 2.	Replace with parts with correct specifications.
2	INITIALIZE PARAMETER USING SUBARU SELECT MONITOR. 1) Using the Subaru Select Monitor, initialize the parameter for the electronic parking brake CM. <Ref. to PB(diag)-18, PARAMETER INITIALIZATION MODE, OPERATION, Subaru Select Monitor.> 2) Perform calibration of the force sensor. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> 3) Perform calibration of the clutch sensor. <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> 4) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

L: DTC C0251 ACTUATOR LINE (ABNORMAL)

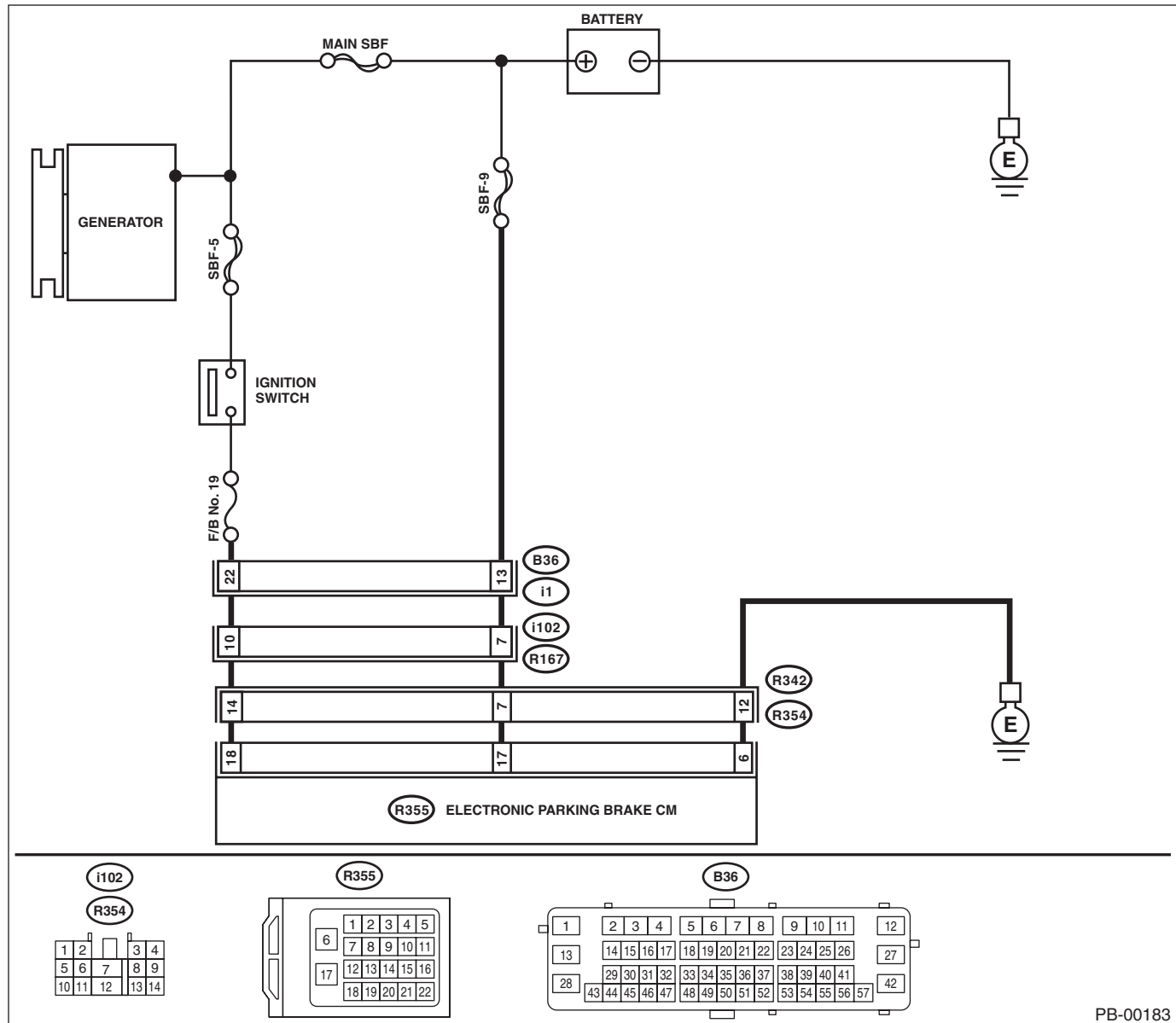
DTC DETECTING CONDITION:

Defective parking brake control module

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

WIRING DIAGRAM:



PB-00183

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE FOR ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the electronic parking brake CM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 18 (+) — Chassis ground (-): (R355) No. 17 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the power supply circuit.
2 CHECK GROUND CIRCUIT OF ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic parking brake CM connector and chassis ground. Connector & terminal (R355) No. 6 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the defective ground circuit of the electronic parking brake CM.
3 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact of power supply circuit, ground circuit and electronic parking brake CM connector?	Repair the connector.	Go to step 4.
4 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Release the parking brake, and then operate again. 5) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 5.
5 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

M: DTC C0252 MOTOR MALFUNCTION

NOTE:

- For the diagnostic procedure, refer to DTC C0251 “Actuator Line (abnormal)”. <Ref. to PB(diag)-50, DTC C0251 ACTUATOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
- When the operation and release of the parking brake is repeated excessively, this DTC may be stored.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

N: DTC C0253 ACTUATOR STROKE EXCESS

DTC DETECTING CONDITION:

Actuator stroke too long

TROUBLE SYMPTOM:

- Brake warning light blinks.
- Electronic parking brake warning light illuminates. (C6 model)
- Parking brake system does not operate.

Step	Check	Yes	No
1 CHECK PARKING BRAKE ASSEMBLY. Check the parking brake cable connection of parking brake assembly.	Is there any trouble with the parking brake shoe lever or the parking brake cable connection?	Repair the parking brake cable connection. Go to step 2.	Go to step 2.
2 CHECK PARKING BRAKE ASSEMBLY. Check the parking brake assembly disc rotor and shoe assembly. <Ref. to PB-8, INSPECTION, Parking Brake Assembly (Rear Disc Brake).>	Are the disc rotor and shoe assembly normal?	Adjust the shoe clearance of the parking brake assembly. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).> Go to step 3.	Replace the defective parts, and adjust the shoe clearance of the parking brake assembly. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).> Go to step 3.
3 PERFORM CALIBRATION OF FORCE SENSOR USING SUBARU SELECT MONITOR. 1) Perform calibration of force sensor using the Subaru Select Monitor. <Ref. to PB(diag)-17, FORCE SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	It results from poor adjustment of the shoe clearance.

O: DTC C0261 IMPROPER CAN COMMUNICATION

DTC DETECTING CONDITION:

Defective CAN communication

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

NOTE:

Refer to LAN section for diagnostic procedure. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

P: DTC C0262 TCM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal received from transmission control module (TCM).

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

Step	Check	Yes	No
1 CHECK AT SYSTEM OR CVT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system or CVT system.	Is DTC of AT system or CVT system displayed?	Perform the diagnosis according to DTC of AT system or CVT system. <Ref. to 5AT(diag)-33, List of Diagnostic Trouble Code (DTC).> <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Q: DTC C0263 ECM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal received from engine control module (ECM).

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

Step	Check	Yes	No
1 CHECK ECM. 1) Start the engine. 2) Check DTC of ECM.	Is DTC of ECM displayed?	Perform the diagnosis according to DTC of ECM.	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

R: DTC C0264 VDC COMMUNICATION SYSTEM

DTC DETECTING CONDITION:

No CAN signal received from VDC control module.

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Parking brake system does not operate.

Step	Check	Yes	No
1 CHECK VDC SYSTEM. 1) Start the engine. 2) Check the DTC in VDC system. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of VDC system displayed?	Perform the diagnosis according to DTC of VDC system. <Ref. to VDC(diag)-35, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

S: DTC C0265 BODY INTEGRATED MODULE COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal received from body integrated unit.

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

Step	Check	Yes	No
1 CHECK BODY INTEGRATED UNIT. 1) Start the engine. 2) Check DTC of body integrated unit. <Ref. to BC(diag)-13, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC of the body integrated unit displayed?	Perform the diagnosis according to DTC for the body integrated unit. <Ref. to BC(diag)-25, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 3.
3 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

T: DTC C0267 METER COMMUNICATION SYSTEM

DTC DETECTING CONDITION:

No CAN signal received from combination meter.

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

Step	Check	Yes	No
1 CHECK COMBINATION METER. Check the DTC of combination meter. <Ref. to IDI-8, DTC DISPLAY MODE, OPERATION, Combination Meter System.>	Is DTC of combination meter displayed?	Perform the diagnosis according to DTC of the combination meter. <Ref. to IDI-8, DTC DISPLAY MODE, OPERATION, Combination Meter System.>	Go to step 2.
2 CHECK LAN SYSTEM. Check the DTC in LAN system. <Ref. to LAN(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 4.
4 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary noise interference.

U: DTC C0271 FORCE SENSOR LINE (ABNORMAL)

NOTE:

For the diagnostic procedure, refer to DTC C0251 "Actuator Line (abnormal)". <Ref. to PB(diag)-50, DTC C0251 ACTUATOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC C0272 TEMPERATURE SENSOR LINE (ABNORMAL)

NOTE:

- For the diagnostic procedure, refer to DTC C0251 "Actuator Line (abnormal)". <Ref. to PB(diag)-50, DTC C0251 ACTUATOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
- When the operation and release of the parking brake is repeated excessively, this DTC may be stored.

W: DTC C0273 STROKE SENSOR LINE (ABNORMAL)

NOTE:

For the diagnostic procedure, refer to DTC C0251 "Actuator Line (abnormal)". <Ref. to PB(diag)-50, DTC C0251 ACTUATOR LINE (ABNORMAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

X: DTC C0274 CLUTCH SENSOR CIRCUIT

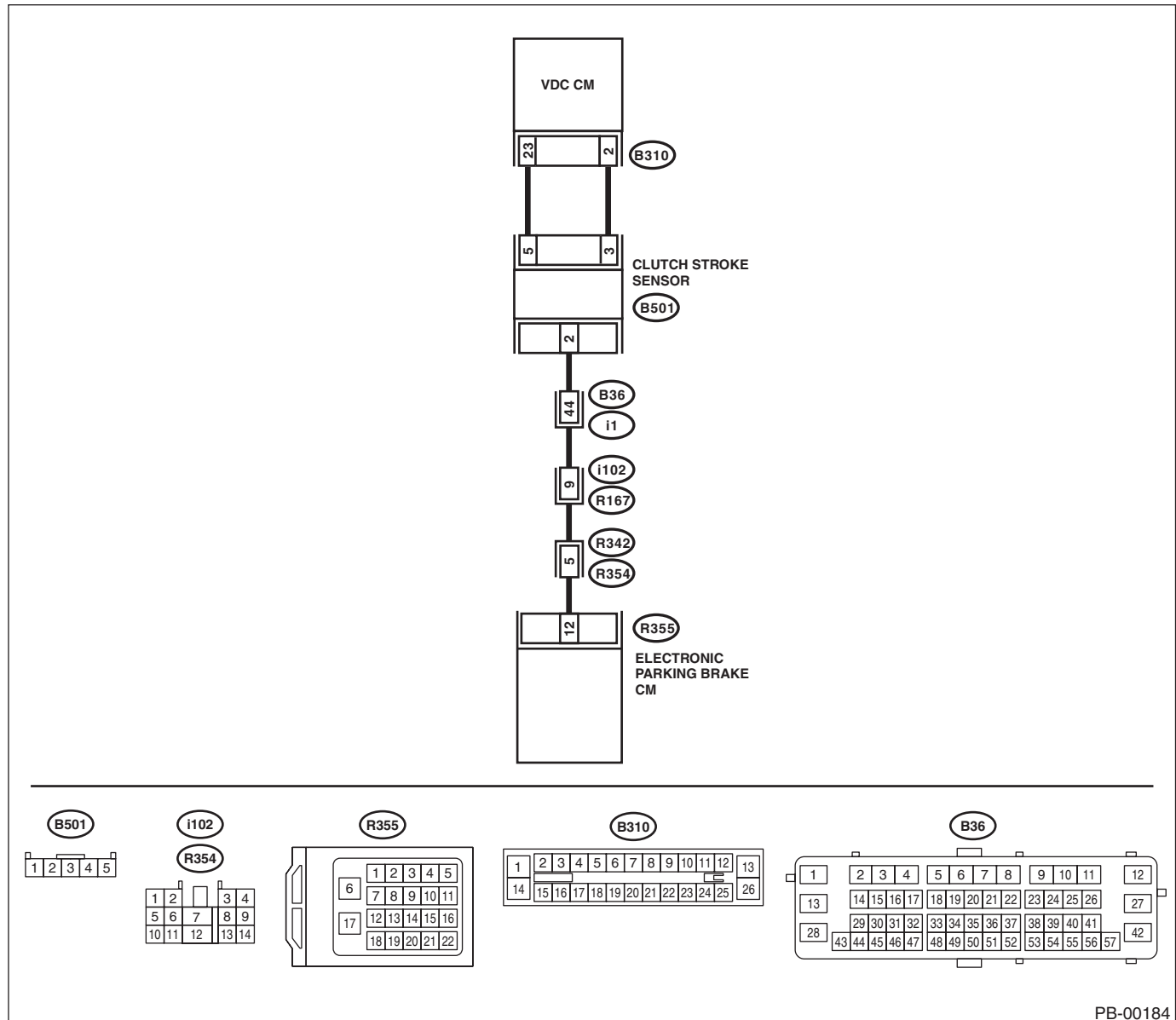
DTC DETECTING CONDITION:

- Defective clutch stroke sensor
- Defective harness connector

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.
- Parking brake is not released even after depressing the clutch pedal to release the parking brake switch.

WIRING DIAGRAM:



PB-00184

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
1 PERFORM CALIBRATION OF CLUTCH SENSOR USING SUBARU SELECT MONITOR. 1) Select "Maintenance Operation Mode" on Subaru Select Monitor. 2) Perform the Clutch Sensor Calibration Mode. <Ref. to PB(diag)-19, CLUTCH SENSOR CALIBRATION MODE, OPERATION, Subaru Select Monitor.> 3) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step 2.	It results from poor calibration of the clutch stroke sensor.
2 CHECK OUTPUT OF CLUTCH STROKE SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. <Ref. to PB(diag)-14, Subaru Select Monitor.> 2) Read the clutch stroke sensor output displayed on the screen.	When the clutch pedal is operated, does the stroke sensor output value displayed on the screen change in accordance with the clutch pedal?	Go to step 11.	Go to step 3.
3 CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from clutch stroke sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between clutch stroke sensor connector terminals. Connector & terminal (B501) No. 3 (+) — (B501) No. 5 (-):	Is the voltage 5 V or more?	Go to step 7.	Go to step 4.
4 CHECK HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance of harness between clutch stroke sensor and VDCCM connector. Connector & terminal (B501) No. 3 — (B310) No. 2: (B501) No. 5 — (B310) No. 23:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector between clutch stroke sensor and VDCCM connector.
5 CHECK HARNESS. Measure the resistance of harness between clutch stroke sensor and chassis ground. Connector & terminal (B501) No. 3 — Chassis ground: (B501) No. 5 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the ground short of harness between clutch stroke sensor and VDCCM connector.
6 CHECK HARNESS. Measure the voltage between clutch stroke sensor and chassis ground. Connector & terminal (B501) No. 3 (+) — Chassis ground (-): (B501) No. 5 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Check DTC of VDC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Repair short to power supply of harness between clutch stroke sensor and VDCCM connector.
7 CHECK HARNESS. 1) Disconnect the connectors from the electronic parking brake CM. 2) Measure the resistance of harness between clutch stroke sensor and electronic parking brake CM connector. Connector & terminal (B501) No. 4 — (B355) No. 12:	Is the resistance less than 1 Ω?	Go to step 8.	Repair the harness and connector between clutch stroke sensor and electronic parking brake CM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS. Measure the resistance of harness between clutch stroke sensor and chassis ground. Connector & terminal (B501) No. 4 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 9.	Repair ground short of harness between clutch stroke sensor and electronic parking brake CM connector.
9 CHECK HARNESS. Measure the voltage between clutch stroke sensor and chassis ground. Connector & terminal (B501) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 10.	Repair short to power supply of harness between clutch stroke sensor and electronic parking brake CM connector.
10 CHECK CLUTCH STROKE SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Using an oscilloscope, check clutch stroke sensor output. Connector & terminal (B501) No. 4 (+) — Chassis ground (-):	Is there any output?	Go to step 11.	Replace the clutch master cylinder. <Ref. to CL-20, Master Cylinder.>
11 CHECK ELECTRONIC PARKING BRAKE CM. 1) Connect all connectors. 2) Clear the memory. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Go to step 12.
12 CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	It results from a temporary poor contact interference.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Y: DTC C0275 LONGITUDINAL G SENSOR CIRCUIT

DTC DETECTING CONDITION:

- Defective longitudinal G sensor
- Defective harness connector

TROUBLE SYMPTOM:

- Electronic parking brake warning light illuminates. (C6 model)
- Brake warning light blinks. (Models other than C6 model)
- Hill hold function and accelerator interlocking release function do not operate.

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM&H/U.	Is VDCCM&H/U installed properly without being tilted? Is the bracket deformation-free? Are the VDCCM&H/U installation bolts installed without missing or getting loose?	Go to step 2.	Repair the fault location. Go to step 2. • Install VDCCM&H/U properly. • Replace the bracket if faulty. • Tighten the VDCCM&H/U installation bolt. <Ref. to VDC-5, VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U), COMPONENT, General Description.>
2 CHECK LONGITUDINAL G SENSOR OUTPUT. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select "VDC" and then "Current Data Display & Save". 3) Read the longitudinal G sensor output displayed on the screen.	Is the indicated reading of the longitudinal G sensor on the monitor display $-2 \sim 2 \text{ m/s}^2$?	Go to step 3.	Go to step 6.
3 SET 0 POINT FOR LONGITUDINAL G SENSOR. 1) Select "VDC", and then "Function Check Sequence". 2) Perform the "Longitudinal G sensor & lateral G sensor 0 point setting mode". <Ref. to VDC-11, LONGITUDINAL G SENSOR & LATERAL G SENSOR 0 POINT SETTING MODE, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Is the 0 point setting successful?	Go to step 4.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4 PERFORM DRIVING TEST. Drive the vehicle approximately 10 minutes, and check if the warning lights illuminate/blink or improperly operate during driving. In a safe place, drive the vehicle while alternating acceleration and deceleration as much as possible.	Does the electronic parking brake warning light remain off without blinking? (C6 model) Does the brake warning light remain off? (Models other than C6 model) Does the parking brake operate without malfunction?	Go to step 5.	When the warning lights illuminate/blink or improperly operate, replace the electronic parking CM. <Ref. to PB-5, Parking Brake Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK LONGITUDINAL G SENSOR OUTPUT. 1) Park the vehicle on a level surface. 2) Connect Subaru Select Monitor, and select "VDC" and then "Current Data Display & Save". 3) Read the longitudinal G sensor output displayed on the screen.	Is the indicated reading of the longitudinal G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	It results from a temporary noise interference.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
6 CHECK LONGITUDINAL G SENSOR OUTPUT. 1) Remove the VDCCM&H/U installation bolt and bracket. 2) Keep VDCCM&H/U in a horizontal position. 3) Connect Subaru Select Monitor, and select "VDC" and then "Current Data Display & Save". 4) Read the longitudinal G sensor output displayed on the screen.	When the VDCCM&H/U is in a horizontal position, is the indicated reading of the longitudinal G sensor on the monitor display $-1.5 \text{ — } 1.5 \text{ m/s}^2$?	Check the bracket and brake pipe, and install VDCCM&H/U in a horizontal position to the vehicle.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

Z: DTC C0281 MID STOP CONDITION**DTC DETECTING CONDITION:**

Actuator stops in the mid-stroke

TROUBLE SYMPTOM:

Brake warning light blinks.

NOTE:

- When the actuator stops in the mid-stroke due to power supply error (ex. voltage drop during cranking) during the operation, this DTC is stored. If the actuator operates normally after operating and then releasing the parking brake again, this is not malfunction.
- When being restored from the mid-stroke stop state, the actuator will have full-stroke once, and therefore, operation time may take approximately 10 seconds.

Step	Check	Yes	No
1 CHECK ELECTRONIC PARKING BRAKE CM USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to ON. 2) Release the parking brake. 3) Approximately 10 seconds after releasing the parking brake, clear the memory using the Subaru Select Monitor. <Ref. to PB(diag)-24, Clear Memory Mode.> 4) Read the DTC.	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary voltage drop.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

PARKING BRAKE (DIAGNOSTICS)

AA:DTC C0282 EMERGENCY CANCEL STATUS

DTC DETECTING CONDITION:

Emergency release (manual release) of the parking brake was performed.

TROUBLE SYMPTOM:

Brake warning light blinks.

NOTE:

- When emergency release of the parking brake is performed, this DTC is stored. If the actuator operates normally after operating and then releasing the parking brake following the emergency release, this is not malfunction. When the actuator operates normally, the brake warning light goes off.
- When being restored from emergency release state, the actuator will have full-stroke once, and therefore, operation time may take approximately 10 seconds.
- When emergency release is performed, check the electronic parking brake control module and brake shoe. For details, refer to the restoring procedures after emergency release. <Ref. to PB-10, INSPECTION, Emergency Release of Electronic Parking Brake.>

Step	Check	Yes	No
1 INTERVIEW CUSTOMERS. Ask the user if emergency release was performed.	Was the emergency release performed?	Go to step 2.	Go to step 3.
2 CHECK ELECTRONIC PARKING BRAKE CM. 1) Turn the ignition switch to ON, and then release the parking brake. 2) After approximately 10 seconds, clear the memory using the Subaru Select Monitor. <Ref. to PB(diag)-24, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to PB(diag)-23, Inspection Mode.> 4) Read the DTC.	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to PB(diag)-34, List of Diagnostic Trouble Code (DTC).>	End.
3 CHECK PARKING BRAKE ASSEMBLY. Check that the parking brake assembly does not have malfunction. <Ref. to PB-10, INSPECTION, Emergency Release of Electronic Parking Brake.>	Is the parking brake assembly free of malfunction?	Replace the electronic parking brake CM. <Ref. to PB-5, Parking Brake Actuator.>	Repair the parking brake assembly.

13.General Diagnostic Table

A: INSPECTION

Symptoms		Malfunction parts/Condition
- Electronic parking brake warning light illuminates. (C6 model) - Brake warning light blinks. (Models other than C6 model)	Parking brake system does not operate.	- Defective parking brake switch - Defective electronic parking brake CM - Defective power supply/ground for electronic parking brake CM - No CAN signal received from VDC control module - Defective actuator in the electronic parking brake CM - Defective force sensor in the electronic parking brake CM - Defective temperature sensor in the electronic parking brake CM - Defective stroke sensor in the electronic parking brake CM - Defective CAN communication
- Electronic parking brake warning light illuminates. (C6 model) - Brake warning light blinks. (Models other than C6 model)	Hill hold function and accelerator interlocking release function do not operate.	- Defective hill hold switch - Faulty signal received from engine control module - Faulty signal received from transmission control module - Faulty signal received from VDC control module - Defective neutral position switch (MT model only) - Defective back-up light switch (MT model only) - Defective parameter selection for the parking brake control module - No CAN signal received from engine control module - No CAN signal received from transmission control module - No CAN signal received from body integrated unit - Defective clutch stroke sensor (MT model only) - Defective longitudinal G sensor
The brake warning light blinks, and the electronic parking brake warning light (C6 model only) and hill hold indicator light illuminate.	—	No CAN signal from the electronic parking brake CM to combination meter
Only the brake warning light blinks.	—	- Mid-course stop state - Emergency release state - The operation and release of the parking brake was repeated excessively
The brake warning light blinks, and the electronic parking brake warning light (C6 model only) illuminates.	Parking brake system does not operate.	Parking brake shoe clearance too large
When the hill hold function is set to ON, drugging of brake may occur when the vehicle starts to move.	—	Driver's seat belt is not fastened.

General Diagnostic Table

PARKING BRAKE (DIAGNOSTICS)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATION

Model			H4 non-turbo model	H6, turbo model
Whole system	Minimum turning radius m (ft)		5.6 (18.4)	
	Steering angle	Inner wheel	225/50R17 tire: 37.4°±1.5° 225/45R18 tire: 37.4°±1.5° 215/50R17 tire: 37.6°±1.5° 205/60R16 tire: 37.6°±1.5° 225/60R17 tire: 38.4°±1.5° 215/70R16 tire: 38.4°±1.5°	
		Outer wheel	225/50R17 tire: 33.0°±1.5° 225/45R18 tire: 33.0°±1.5° 215/50R17 tire: 33.3°±1.5° 205/60R16 tire: 33.3°±1.5° 225/60R17 tire: 34.1°±1.5° 215/70R16 tire: 34.1°±1.5°	
	Steering wheel diameter mm (in)		375 (14.76)	
	Lock-to-lock revolution number		OUTBACK: 3.2 Except for OUTBACK: 2.8	
Gearbox	Type		Rack and Pinion, Integral	
	Backlash		0 (Automatic adjusting)	
	Valve (Power steering system)		Rotary valve	
Pump (Power steering system)	Type		Vane pump	
	Oil tank		Installed on body	
	Specific output cm ³ (cu in)/rev.		8.5 (0.519)	8.5 (0.519)
	Relief pressure kPa (kgf/cm ² , psi)		8,300 — 9,000 (85 — 92, 1,203 — 1,305)	8,900 — 9,600 (91 — 98, 1,290 — 1,392)
	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: 5.4 (5.7, 4.8)	1,000 rpm: 6.8 (7.2, 6) 3,000 rpm: 6.1 (6.4, 5.4)
	RPM range rpm		500 — 9,600	650 — 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)	

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

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)	Sliding resistance		N (kgf, lbf)	314 (32, 71) or less Difference between right and left sliding resistance: 20%
	Rack shaft play in the radial direction	Right-turn steering	mm (in)	Horizontal play: 0.6 (0.024) or less Vertical play: 0.4 (0.016) or less
		Left-turn steering	mm (in)	0.4 (0.016) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.27 (0.0106) or less
	Rotation resistance		N (kgf, lbf)	Maximum allowable value: 13 (1.3, 2.9) or less Difference between right and left sliding resistance: 20%
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		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

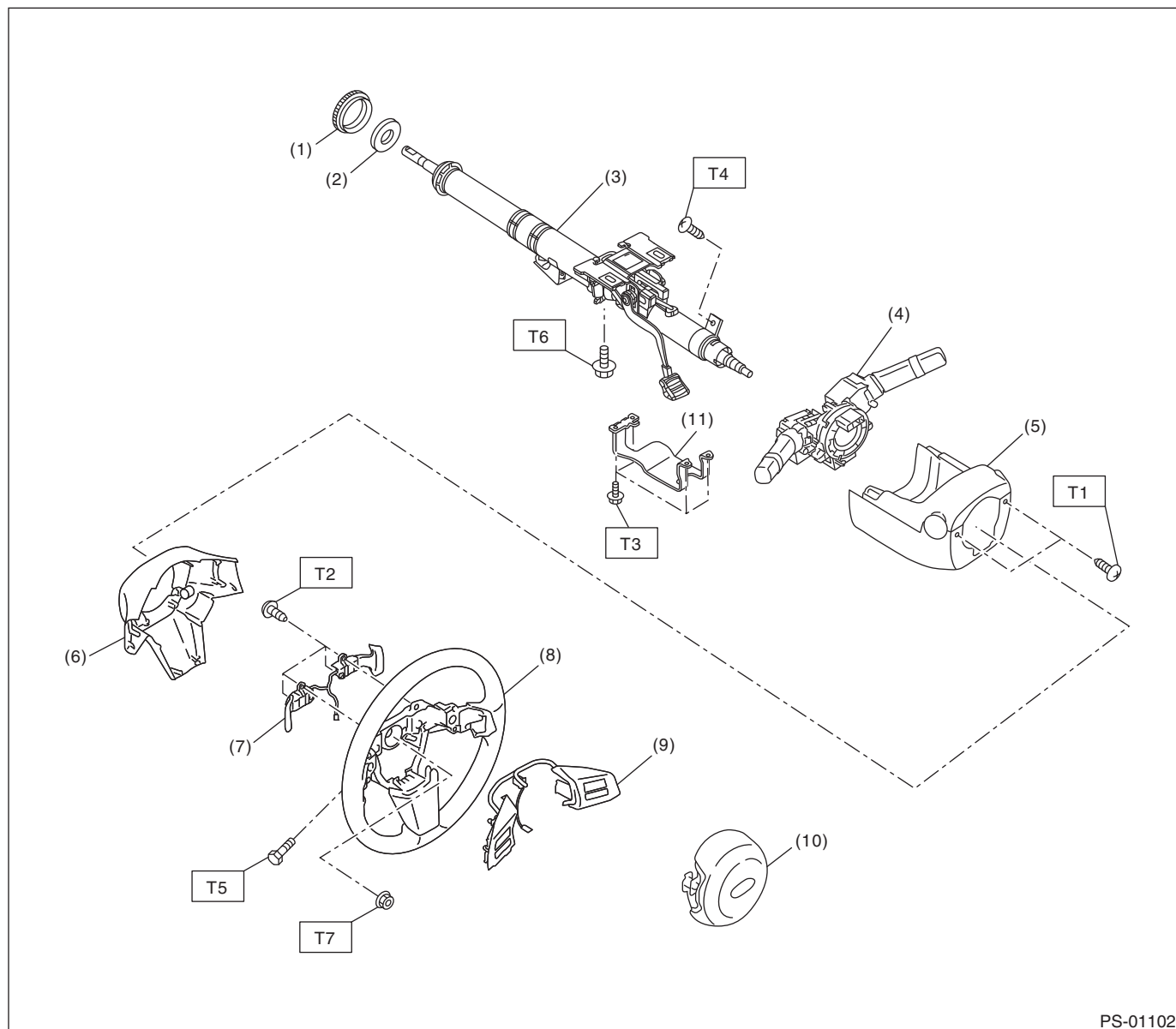
Recommended power steering fluid
SUBARU ATF or DEXRON III

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



- | | |
|--------------------------------|---------------------|
| (1) Bushing | (7) Paddle shift |
| (2) Insulator (CVT model) | (8) Steering wheel |
| (3) Steering shaft | (9) Switch |
| (4) Steering roll connector | (10) AIRBAG MODULE |
| (5) Column cover | (11) Knee protector |
| (6) Steering wheel lower cover | |

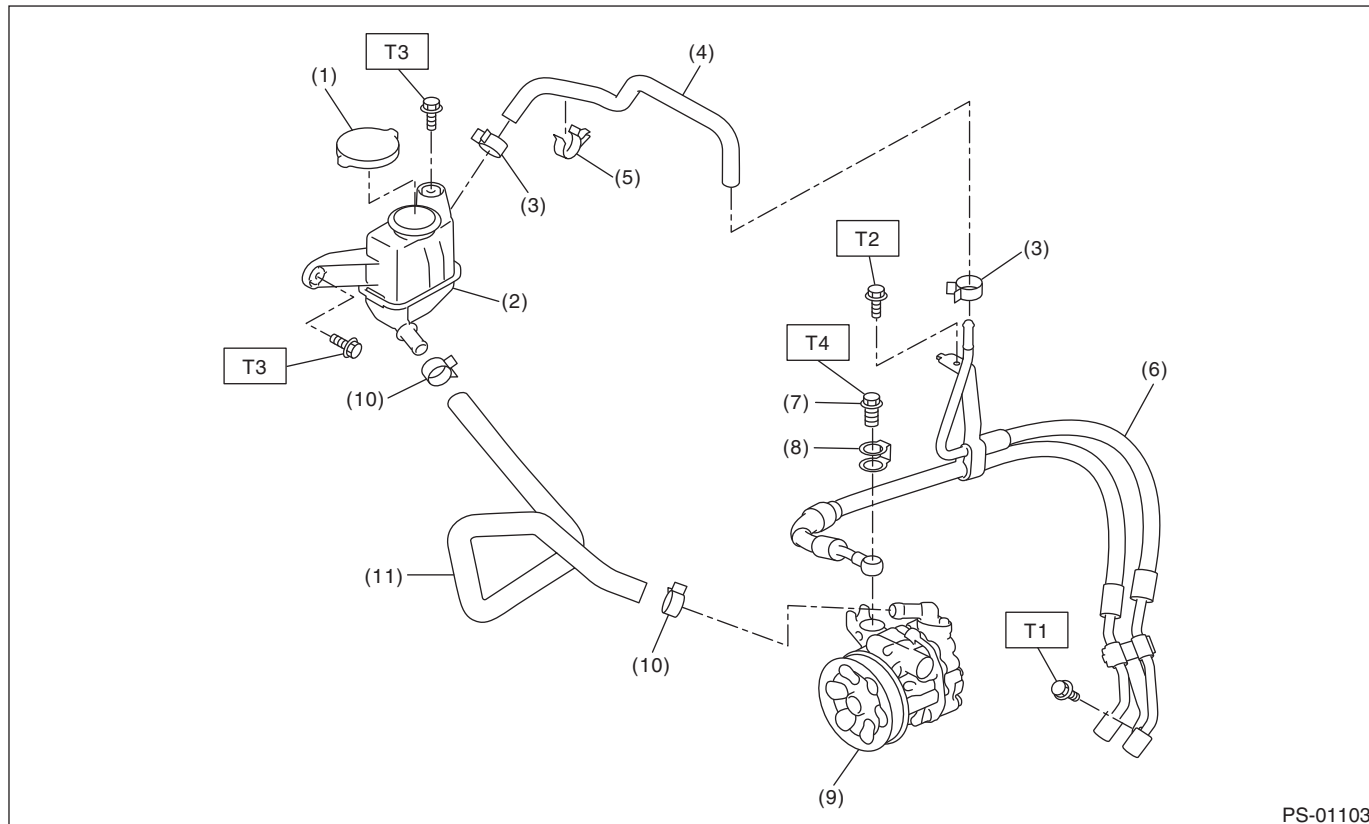
Tightening torque:N·m (kgf-m, ft-lb)

- | | |
|------------|------------------------|
| T1: | 1.2 (0.12, 0.9) |
| T2: | 1.7 (0.2, 1.3) |
| T3: | 3.4 (0.3, 2.5) |
| T4: | 3.5 (0.4, 2.6) |
| T5: | 10 (1.0, 7.4) |
| T6: | 20 (2.0, 14.8) |
| T7: | 39 (4.0, 28.8) |

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. HOSE AND TANK



- (1) Cap
- (2) Reservoir tank
- (3) Clip
- (4) Return hose
- (5) Clip
- (6) Hose ASSY

- (7) Eye bolt
- (8) Eye bolt gasket
- (9) Oil pump
- (10) Clip
- (11) Suction hose

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 10 (1.0, 7.4)

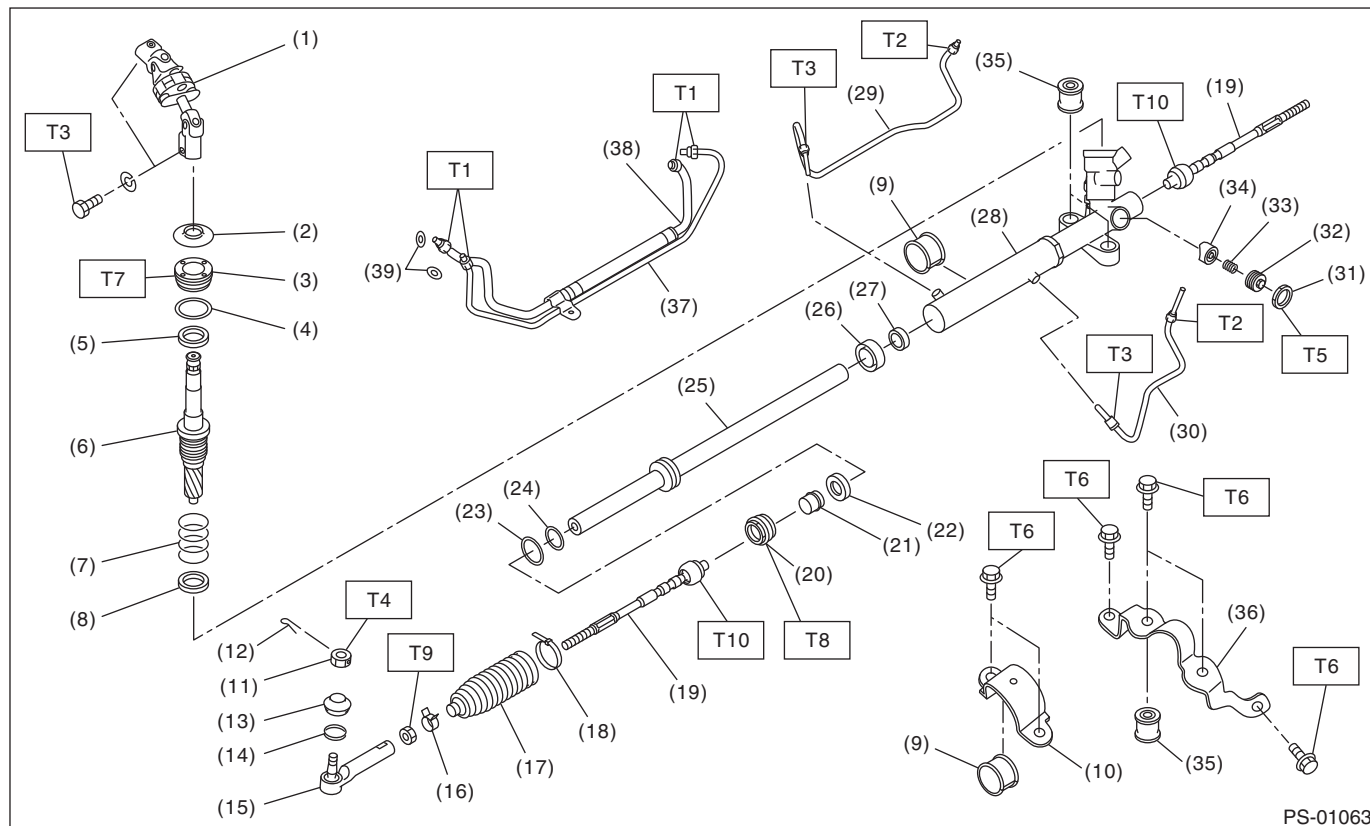
T3: 13 (1.3, 9.6)

T4: 40 (4.1, 29.5)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

3. STEERING GEARBOX



- (1) Universal joint
- (2) Dust cover
- (3) PLUG
- (4) O-ring
- (5) Oil seal
- (6) Control valve
- (7) Seal ring
- (8) Oil seal
- (9) Adapter
- (10) Clamp
- (11) Castle nut
- (12) Cotter pin
- (13) Dust seal
- (14) Clip
- (15) Tie-rod end
- (16) Clip
- (17) Boot
- (18) Band

- (19) Tie-rod
- (20) HOLDER
- (21) Bushing
- (22) Oil seal
- (23) Seal ring
- (24) O-ring
- (25) Rack
- (26) Oil seal
- (27) Back-up washer
- (28) Steering body
- (29) Pipe A
- (30) Pipe B
- (31) Lock nut
- (32) Adjusting screw
- (33) Spring
- (34) Sleeve
- (35) Bushing
- (36) Stiffener

- (37) Feed pipe
- (38) Return pipe
- (39) O-ring

Tightening torque:N·m (kgf·m, ft·lb)

T1: 15 (1.5, 11.1)

T2: 20 (2.0, 14.8)

T3: 24 (2.4, 17.7)

T4: 27 (2.8, 19.9)

T5: 39 (4.0, 28.8)

T6: 60 (6.1, 44.3)

T7: 64 (6.5, 47.2)

T8: 75 (7.6, 55.3)

T9: 85 (8.7, 62.7)

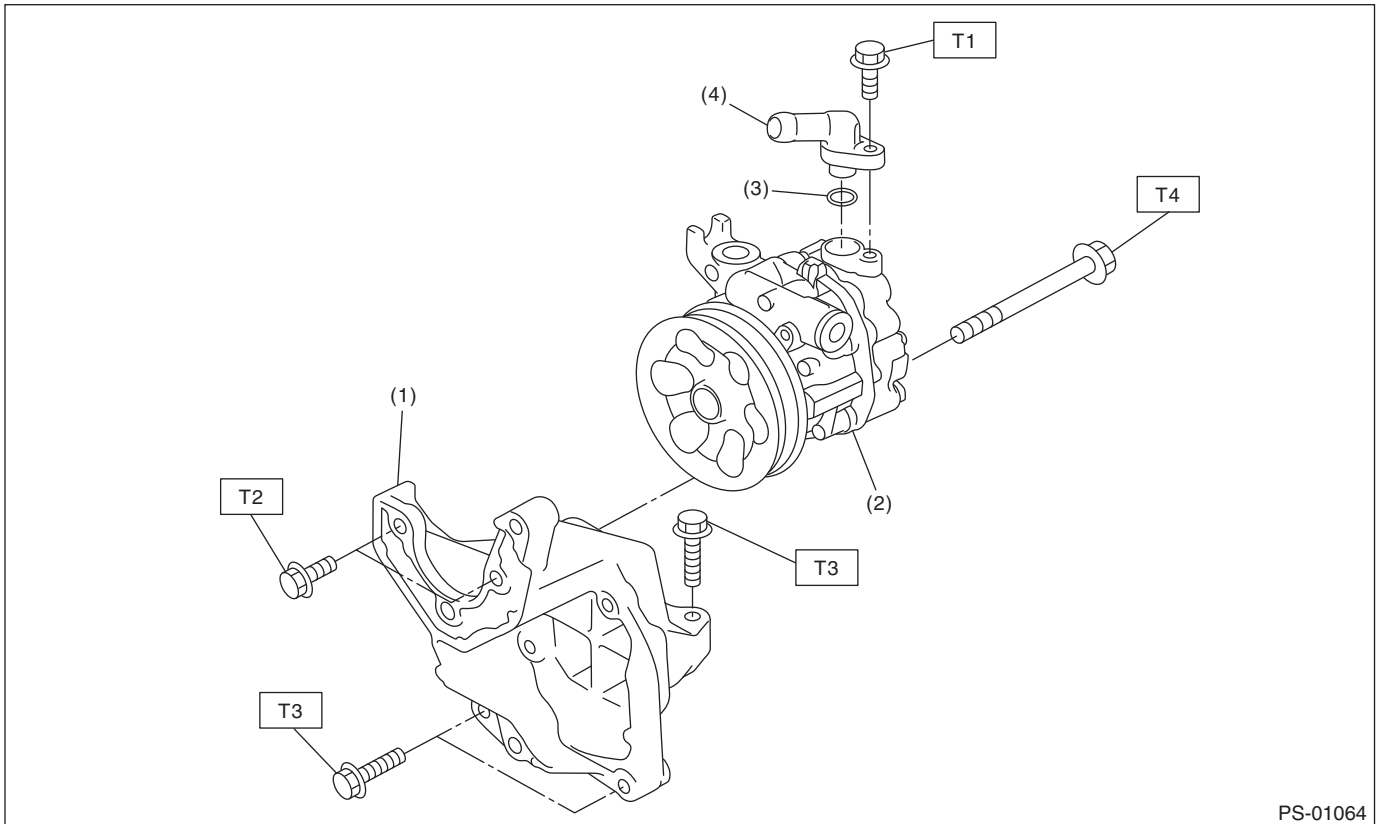
T10: 90 (9.2, 66.4)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

4. OIL PUMP

- H4 non-turbo model



PS-01064

- (1) Bracket
- (2) Oil pump
- (3) O-ring
- (4) Joint

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10 (1.0, 7.4)

T2: 16 (1.6, 11.8)

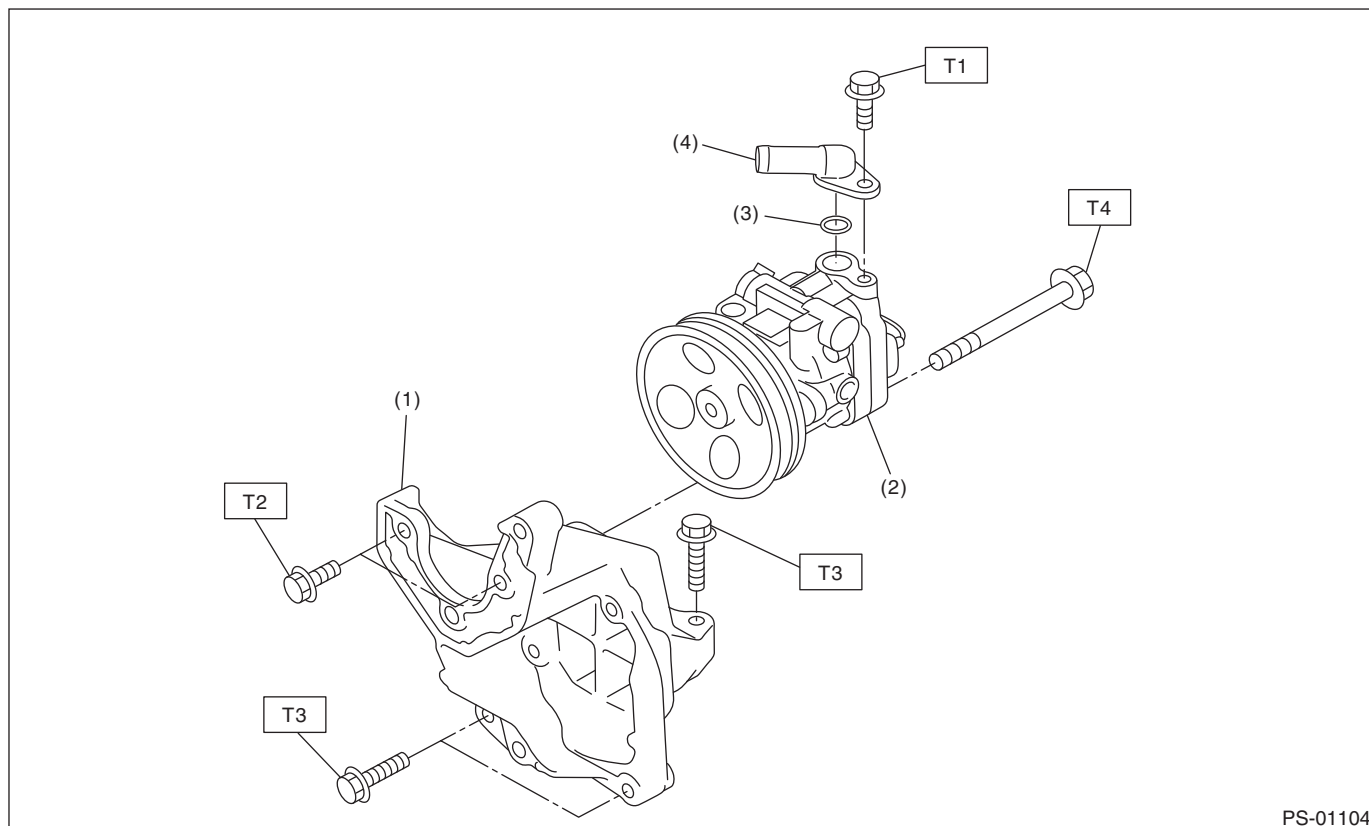
T3: 22 (2.2, 16.2)

T4: 36 (3.7, 26.6)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

- H4 turbo model



- (1) Bracket
- (2) Oil pump
- (3) O-ring
- (4) Joint

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10 (1.0, 7.4)

T2: 16 (1.6, 11.8)

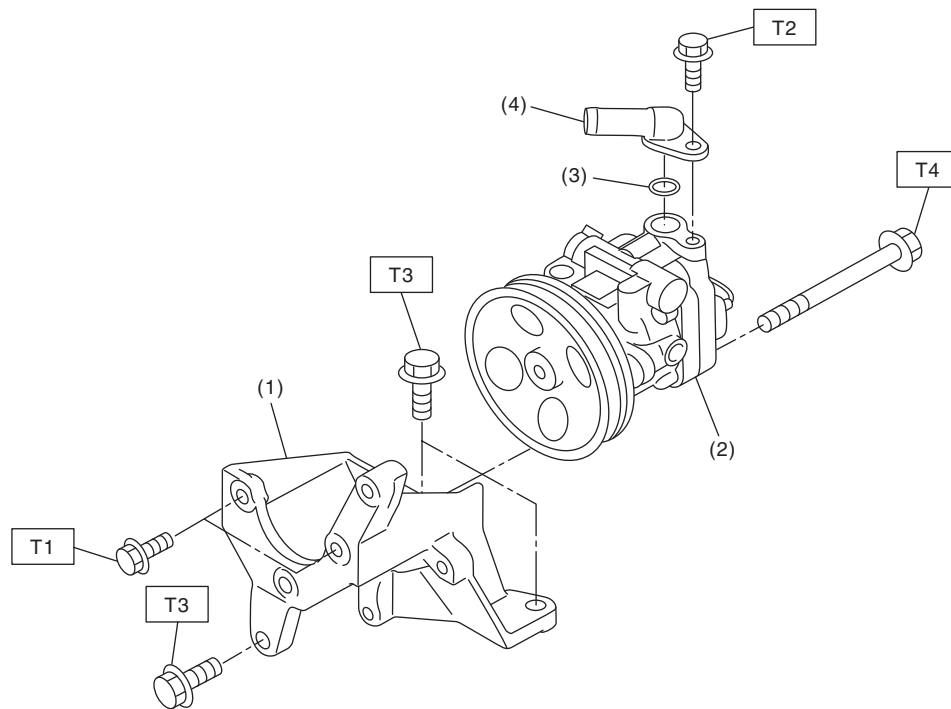
T3: 22 (2.2, 15.9)

T4: 36 (3.7, 26.6)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

- H6 model



- (1) Bracket
- (2) Oil pump
- (3) O-ring
- (4) Joint

Tightening torque: N·m (kgf-m, ft-lb)

T1: 16 (1.6, 11.8)

T2: 20 (2.0, 14.8)

T3: 33 (3.4, 24.3)

T4: 36 (3.7, 26.6)

C: CAUTION

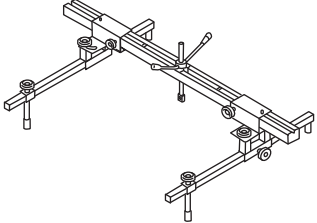
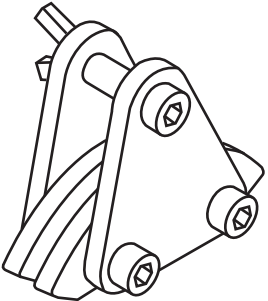
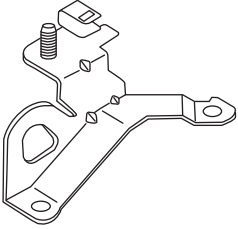
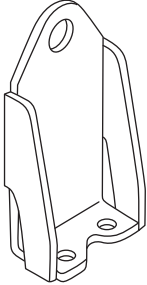
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use grease and oil of Subaru genuine or the equivalent products. Do not mix them 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.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

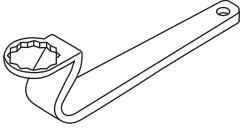
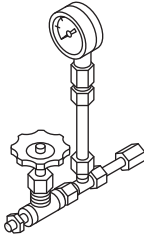
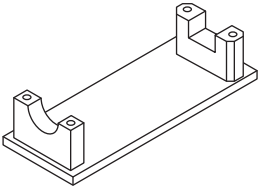
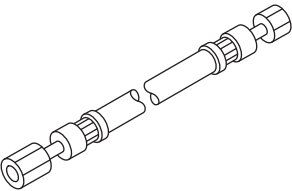
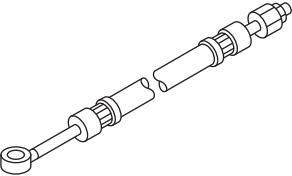
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST99099AJ000	99099AJ000 (Newly adopted tool)	ENGINE HANGER	- Used for hanging power unit. - Used together with CHAIN BALANCER (99099AJ010).
 ST99099AJ010	99099AJ010 (Newly adopted tool)	CHAIN BALANCER	- Used for hanging power unit. - Used together with ENGINE HANGER (99099AJ000).
 ST10004AA180	10004AA180 (SUBARU genuine part)	HANGER CP ENGINE RR	- Used for hanging power unit. - For H4 non-turbo model. - SUBARU genuine part
 ST18360AA020	18360AA020 (Newly adopted tool)	HANGER	- Used for hanging power unit. - For H6 model.

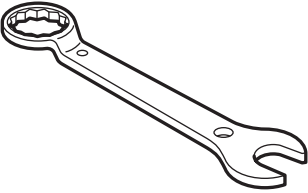
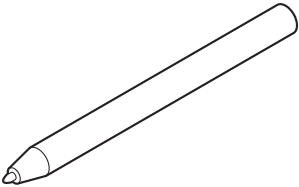
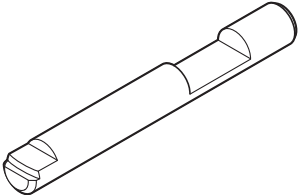
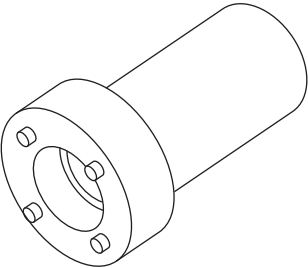
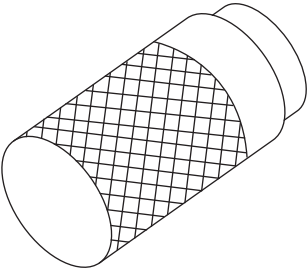
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AJ000	34199AJ000 (Newly adopted tool)	Special tool CPS LHD	Used for adjusting the backlash of gearbox. (lock nut side)
 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).
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).

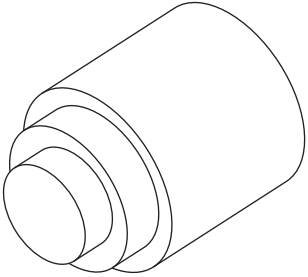
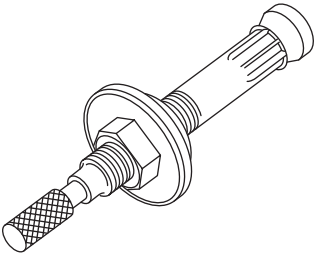
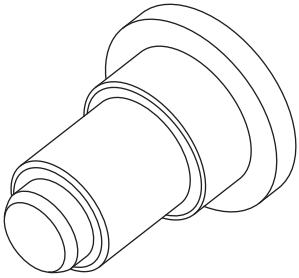
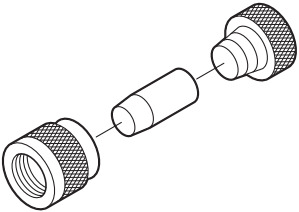
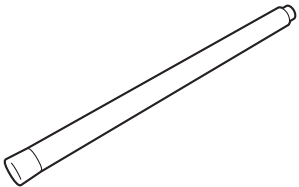
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for crimping.
 ST34099FA080	34099FA080	PUNCH	Used for removing crimps.
 ST34199AE090	34199AE090	PLUG WRENCH	Used for removing the plug.
 ST34199AE100	34199AE100	OIL SEAL PLUG REMOVER	Used for removing the oil seal plug.

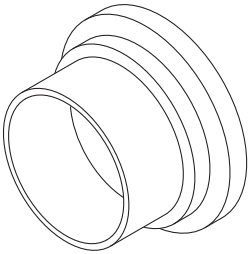
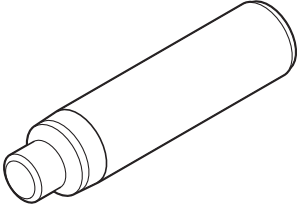
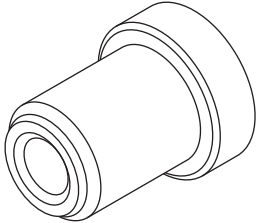
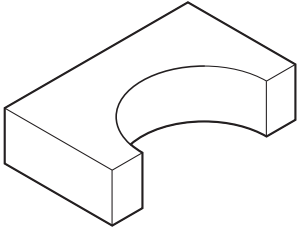
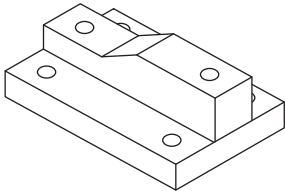
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	Used for installing the oil seal plug.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing the gearbox oil seal.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing the gearbox oil seal.
 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
 ST34199FE010	34199FE010	REMOVER	Used for removing the back-up ring and oil seal.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE050	34199FE050	GUIDE	Used for installing the rack and seal into housing assembly.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer and inner).
 ST34199FE060	34199FE060	INSTALLER	Used for installing the rack oil seal (outer).
 ST34199FE020	34199FE020	BASE	Used for crimping.
 ST34199AG000	34199AG000	BOSS D	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with STAND (926200000).

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. GENERAL TOOL

TOOL NAME	REMARKS
Chain sling	• Used for hanging power unit. • Diameter: 6 mm (0.24 in) or 6.3 mm (0.25 in) • Length: 0.8 — 1 m (2.6 — 3.3 ft) • Chain inner width: 8.5 mm (0.33 in) or more • Chain external width: 23.5 mm (0.93 in) or less • Load capacity: 1.2 t (2646 lb) or more
Shackle	• Two units used for hanging power unit. • Attached to both end of chain sling and connected to engine hook. • Load capacity: 250 kg (551 lb) or more
Sling belt	• Used to remove and install the cradle. • Width: 35 — 40 mm (1.38 — 1.57 in) • Length: 2 m (6.6 ft) • Load capacity: 1 t (2205 lb) or more
Shackle	• Used to remove and install the cradle. • Load capacity: 500 kg (1103 lb) or more
Steering wheel puller	Used for removing the steering wheel.

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

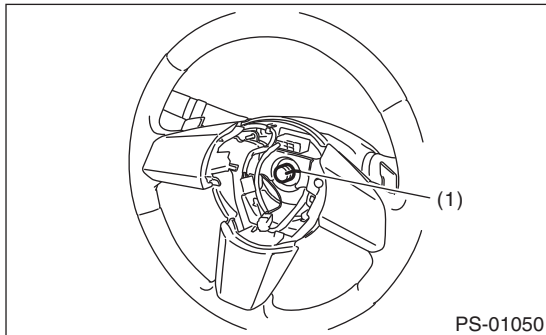
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tire to the straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-31, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-9, CAUTION, General Description.>

- 4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

- 5) Remove the steering wheel nut and pull out the steering wheel from the shaft using the steering wheel puller.

CAUTION:

When removing, always use the steering wheel puller to avoid deforming the steering wheel.

B: INSTALLATION

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-9, CAUTION, General Description.>

- 1) Align the center position of the roll connector. <Ref. to AB-93, 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:

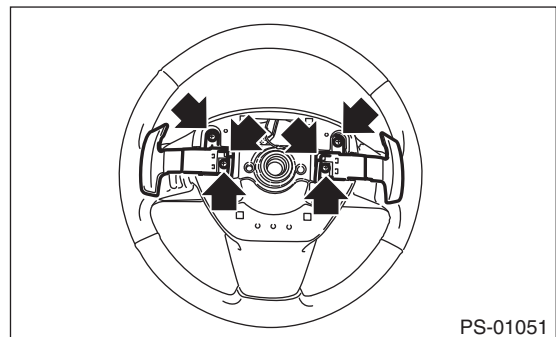
39 N·m (4.0 kgf-m, 28.8 ft-lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

C: DISASSEMBLY

- 1) Remove the connector and screws and remove the paddle shift.



- 2) Remove the hook, and then remove the switch panel and lower cover.

D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

Paddle shift

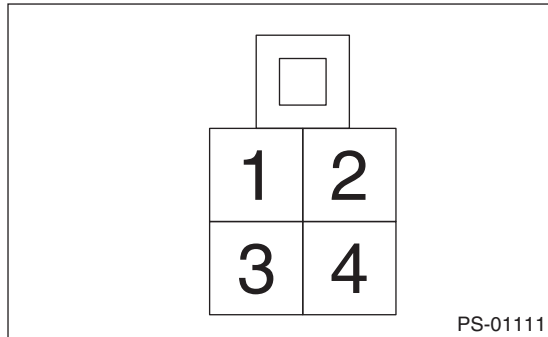
1.7 N·m (0.2 kgf-m, 1.3 ft-lb)

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

Measure the paddle switch resistance.



Step	Check	Yes	No
1 SHIFT-UP SWITCH CONTINUITY CHECK. 1) Operate the + side of paddle shift assembly and hold it. 2) Measure the resistance between the paddle shift assembly connector terminals. Terminals No. 2 — No. 4:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the paddle shift assembly.
2 SHIFT-DOWN SWITCH CONTINUITY CHECK. 1) Operate the – side of paddle shift assembly and hold it. 2) Measure the resistance between the paddle shift assembly connector terminals. Terminals No. 2 — No. 3:	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the paddle shift assembly.
3 CHECK SHIFT SWITCH INSULATION. 1) Do not operate the paddle shift assembly. 2) Measure the resistance between the paddle shift assembly connector terminals. Terminals No. 2 — No. 4: No. 2 — No. 3:	Is the resistance 1 M Ω or more?	Paddle shift assembly is normal.	Replace the paddle shift assembly.

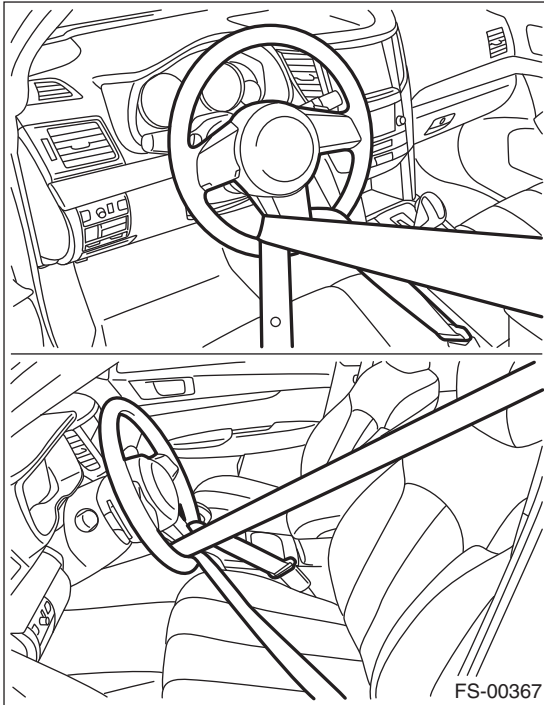
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

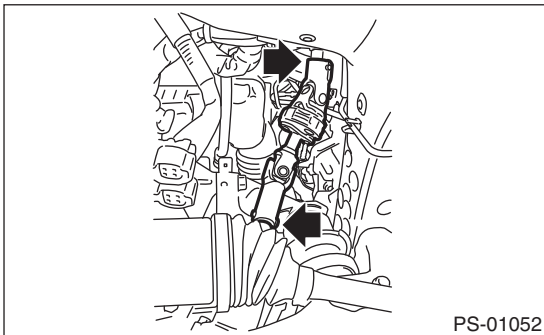
3. Universal Joint

A: REMOVAL

- 1) Adjust the tilt position of the steering column to the lowest position and lock the tilt lever.
- 2) Prevent the steering wheel from turning using the seat belt.

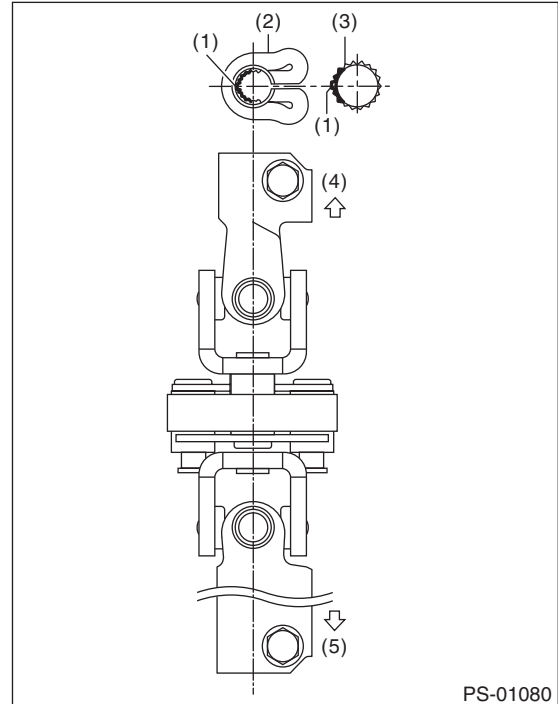


- 3) Place alignment marks on universal joint.
- 4) Remove the universal joint bolt and remove the universal joint.



B: INSTALLATION

- 1) Adjust the tilt position of the steering column to the lowest position and lock the tilt lever.
- 2) 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

- 3) Install the universal joint to the serrations of gearbox assembly by matching alignment marks.
- 4) Tighten the bolts in the order from gearbox side to column shaft side.

CAUTION:

Always follow the tightening order for universal joint and tightening torque. Otherwise this may cause heavy steering effort.

Tightening torque:

24 N·m (2.4 kgf-m, 17.7 ft-lb)

Clearance between universal joint coupling and adjacent parts:

15 mm (0.59 in) or more

Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

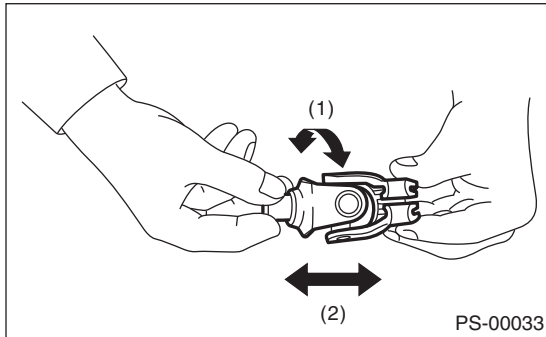
C: INSPECTION

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)



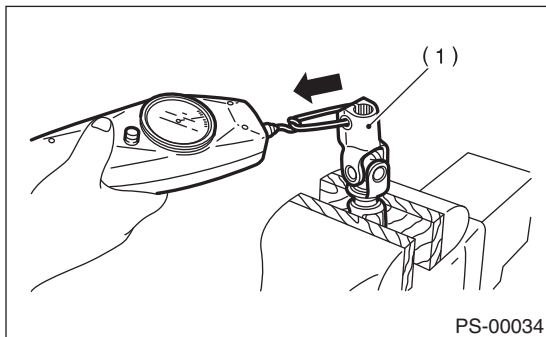
(1) Swing torque

(2) Play

2) Measure the swing torque of universal joint.

Service limit:

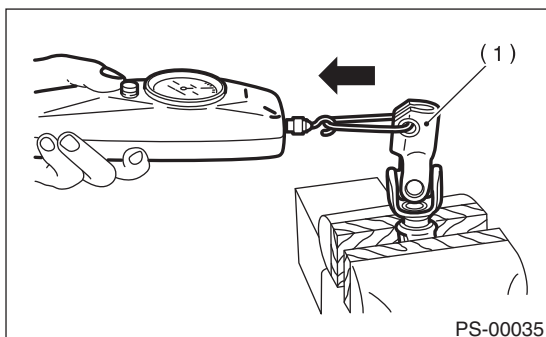
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



(1) Yoke (Gearbox side)

Service limit:

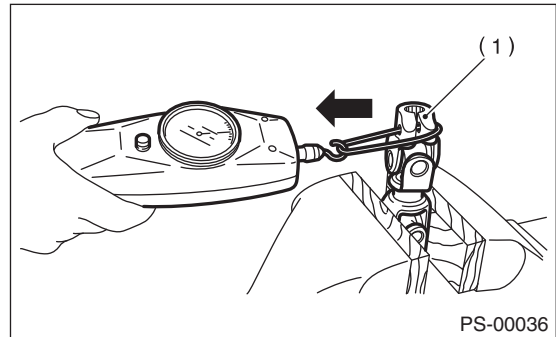
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



(1) Yoke (Gearbox side)

Service limit:

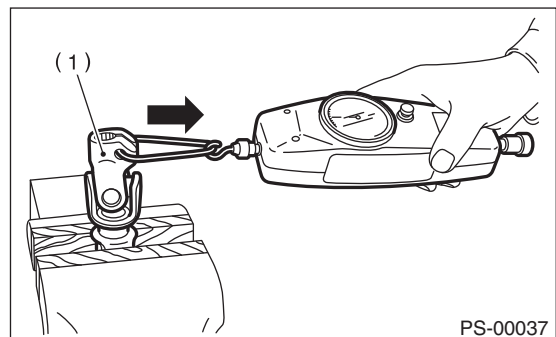
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(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)

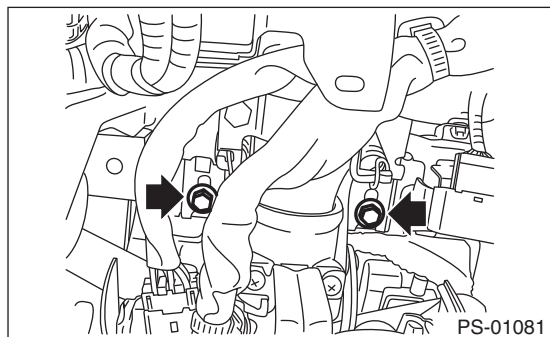
Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

4. Steering Column

A: REMOVAL

- 1) Adjust the tilt position to the lowest position and lock the tilt lever.
- 2) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
- 3) Remove the universal joint. <Ref. to PS-18, REMOVAL, Universal Joint.>
- 4) Remove the instrument panel lower cover.
- 5) Remove all connectors from the steering column.
- 6) Remove the two bolts under instrument panel securing the steering column.



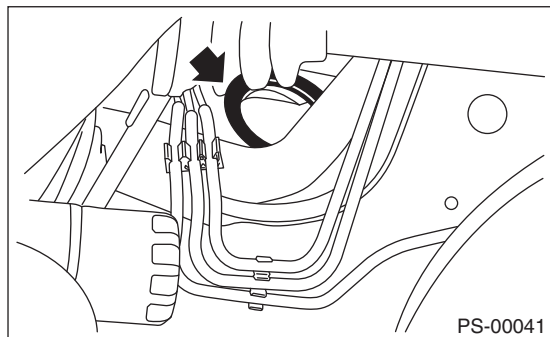
- 7) Pull out the steering shaft assembly from the hole on toe board.

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.

B: INSTALLATION

- 1) Install the grommet to the toe board.



- 2) Insert the end of the steering shaft into the toe board grommet.
- 3) Tighten the steering column installation bolt located under the instrument panel with the tilt lever fixed.

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.

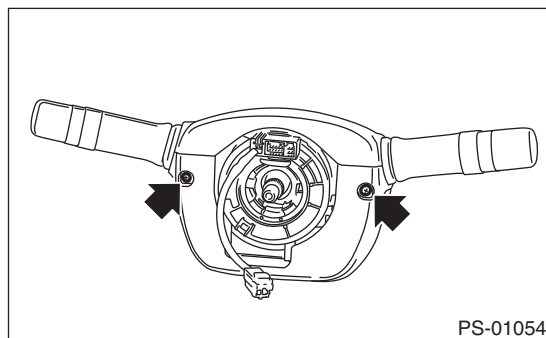
- 6) Install the instrument panel lower cover.
- 7) Install the universal joint. <Ref. to PS-18, INSTALLATION, Universal Joint.>

CAUTION:

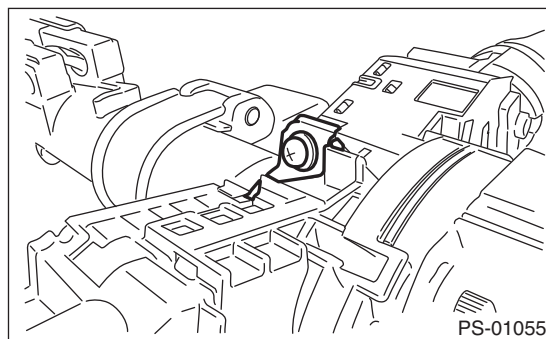
- Always install the universal joint after installing the steering column to avoid damage to the universal joint.
 - Always follow the tightening order for universal joint and tightening torque. Otherwise this may cause heavy steering effort.
- 8) Align the center position of the roll connector. <Ref. to AB-93, ADJUSTMENT, Roll Connector.>
 - 9) Install the steering wheel. <Ref. to PS-16, INSTALLATION, Steering Wheel.>

C: DISASSEMBLY

- 1) Remove the screws and remove the column cover.



- 2) Remove the screw and remove the combination switch.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

Combination switch

3.5 N·m (0.4 kgf-m, 2.6 ft-lb)

Column cover

1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

E: INSPECTION

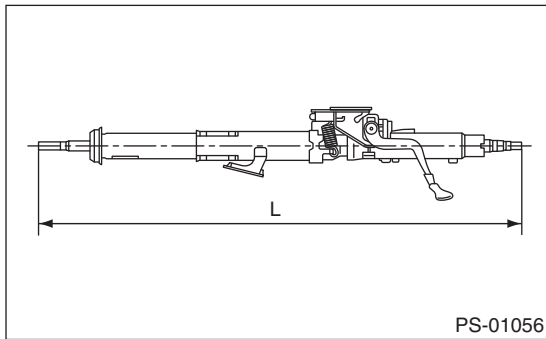
1. BASIC INSPECTION

Measure the overall length of steering column. If not within specification, replace it.

Standard: Overall length L

Tilt and telescopic column (measure while minimized)

$816.9^{+1.5}_{-1.5}$ mm ($32.2^{+0.059}_{-0.059}$ in)



PS-01056

2. INSPECTION OF AIRBAG SYSTEM

Refer to “Airbag System” for airbag inspection procedure. <Ref. to AB-32, INSTALLATION, Driver’s Airbag Module.>

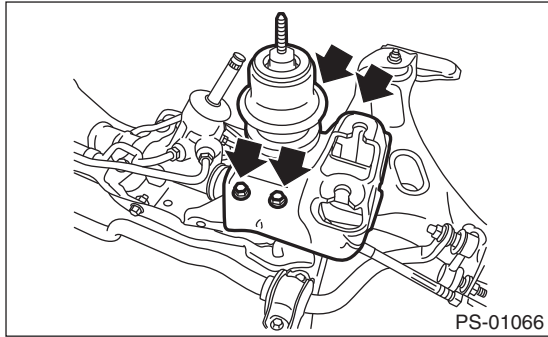
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox

A: REMOVAL

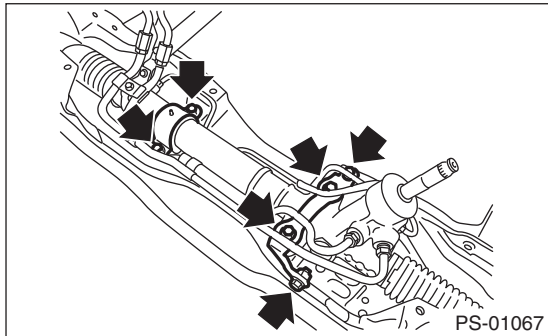
- 1) Remove the cradle. <Ref. to FS-15, REMOVAL, Cradle.>
- 2) Remove the bolt, and then remove the left and right main mounting bracket.



- 3) Remove the bolts and remove the steering gearbox.

CAUTION:

Be careful not to damage the steering boot.



B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

<Ref. to PS-4, COMPONENT, General Description.>

<Ref. to FS-3, COMPONENT, General Description.>

- 2) Inspect the wheel alignment and adjust if necessary.

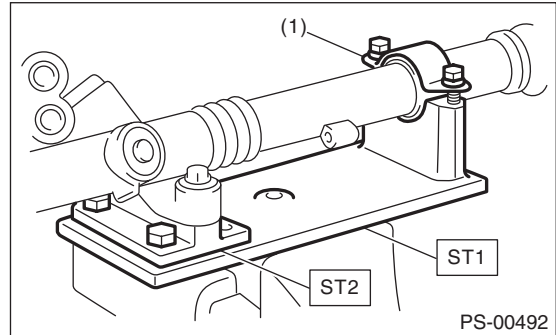
C: DISASSEMBLY

- 1) Disconnect the four pipes from steering body and control valve housing.
- 2) Secure the gearbox removed from vehicle in a vise using ST.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

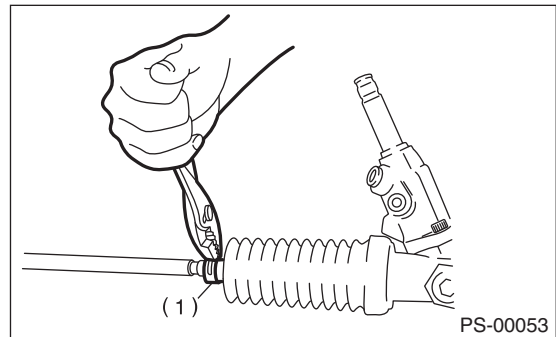
CAUTION:

Secure the gearbox assembly in a vise using ST as shown. Do not affix the gearbox to the vice without this ST.



(1) Clamp

- 3) Remove the tie-rod end and lock nut from gearbox.
- 4) Remove the clip of boot outside using the plier, and then slide the boot to the tie-rod end side.



(1) Clip

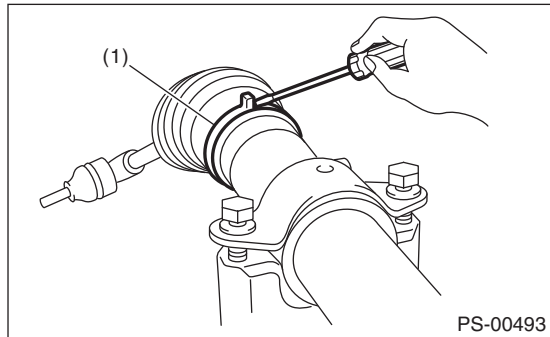
- 5) Using a flat tip screwdriver, remove the band from boot.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

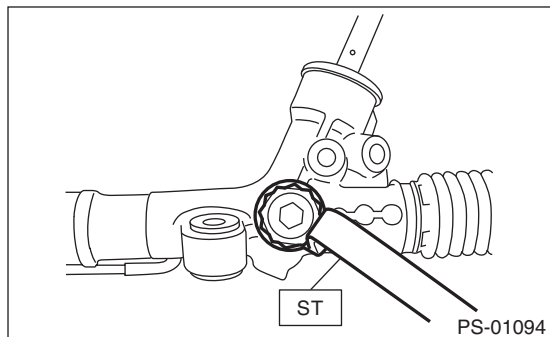
NOTE:

Replace the boot if there is damage, cracks or deterioration.

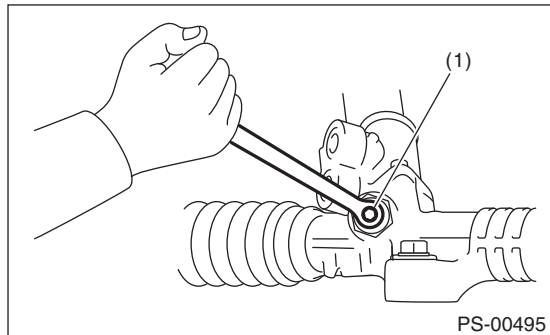


(1) Band

6) Using the ST, loosen the lock nut.
ST 34199AJ000 SPECIAL TOOL CPS LHD



7) Tighten the adjusting screw until it can no longer be tightened.



(1) Adjusting screw

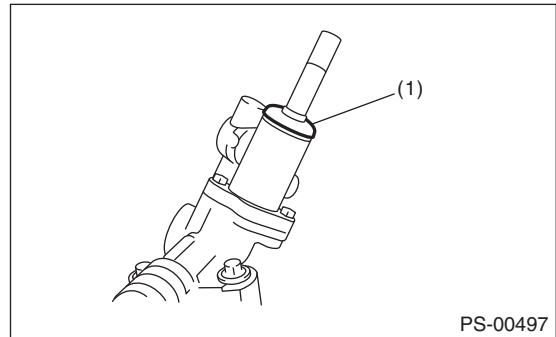
8) Remove the tie-rod.

9) Loosen the adjusting screw, and remove the spring and sleeve.

10) Clean any dirt adhered to the input shaft. Remove the dust cover, paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter gearbox interior.

CAUTION:

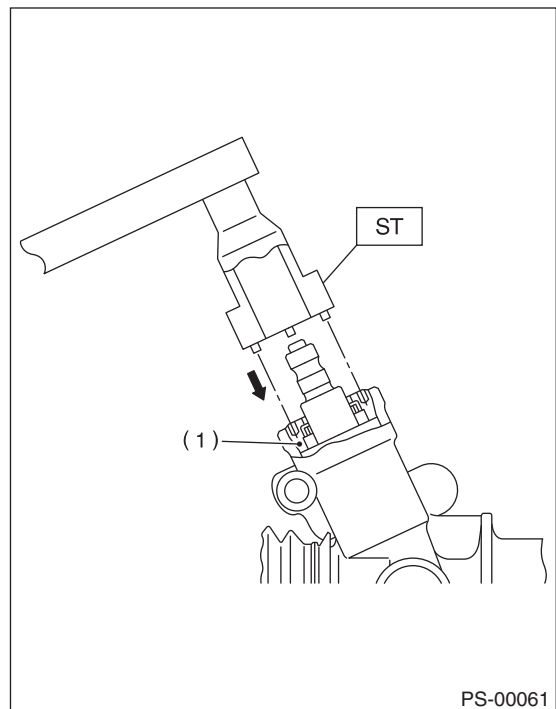
Roll a vinyl tape around the input shaft spline to avoid scratching the dust cover.



(1) Dust cover

11) Align the ST pin with plug hole to install. Rotate the ST counterclockwise to remove plug.

ST 34199AE090 PLUG WRENCH

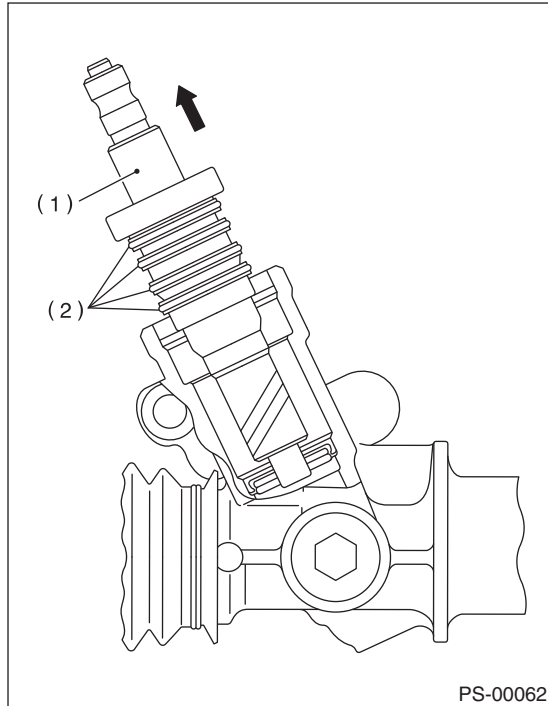


(1) PLUG

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

12) Remove the valve assembly paying attention not to scratch the seal ring or valve housing inner surfaces.



(1) Valve ASSY

(2) Seal ring

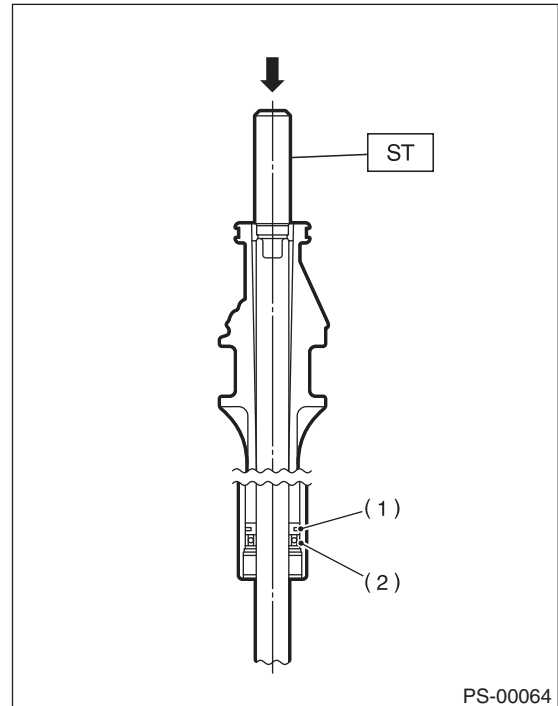
13) Remove the holder.

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.

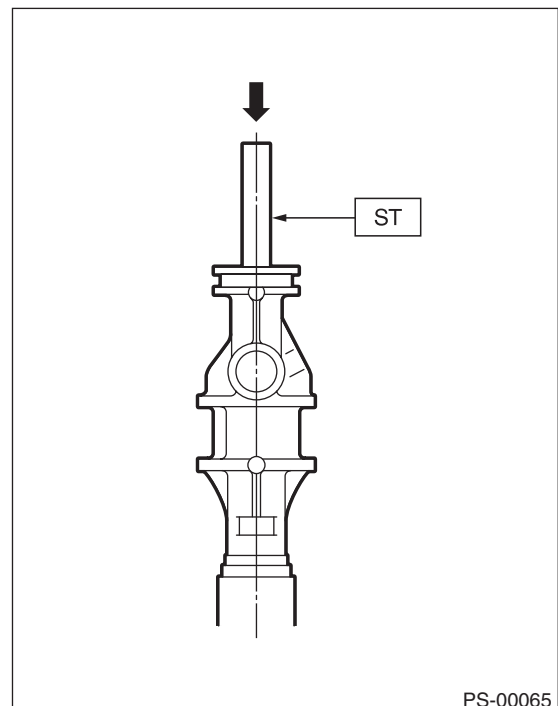


(1) Rack piston

(2) Outer side oil seal

15) Insert the ST from the valve side and press the back-up ring and oil seal out.

ST 34199FE010 REMOVER

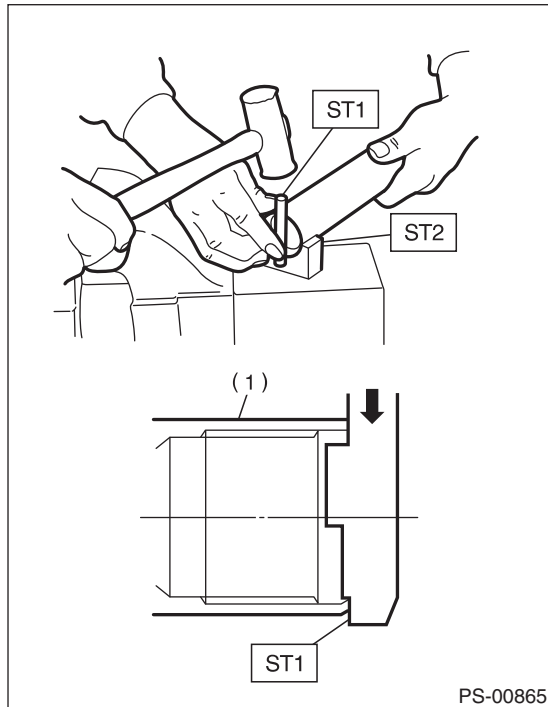


Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

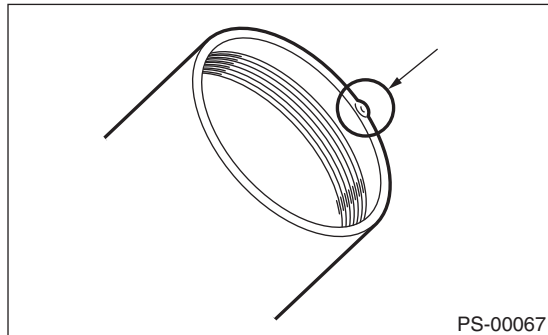
16) Using ST1 and ST2, repair the crimped portion of cylinder.

ST1 34099FA080 PUNCH
ST2 34199FE020 BASE



(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.

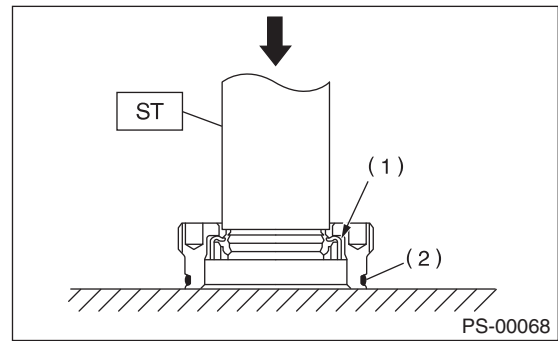


18) Using the ST, remove the oil seal and push out from the plug.

ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:

Do not apply force on the plug edge surface.

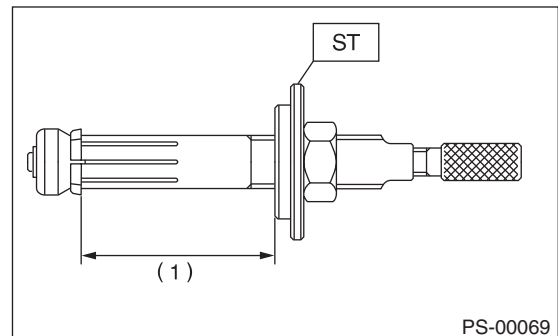


(1) Oil seal

(2) O-ring

19) Set the ST at a size shown in the figure.

ST 34199AE120 GEARBOX OIL SEAL RE-MOVER

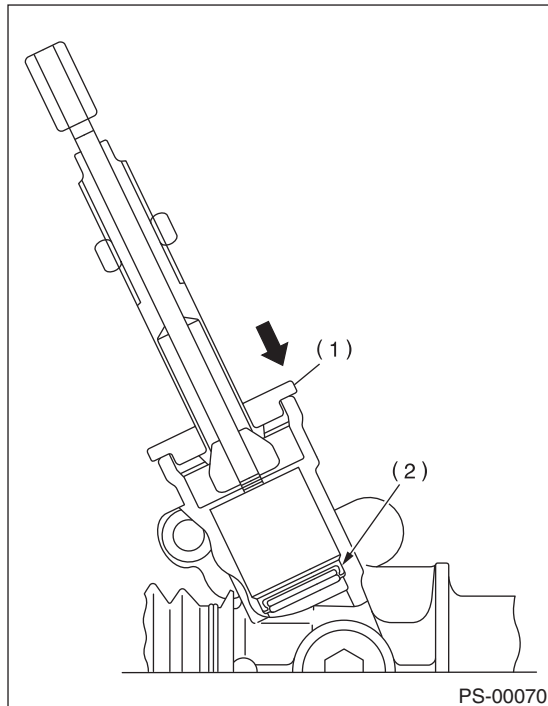


(1) 70 mm (2.76 in)

Steering Gearbox

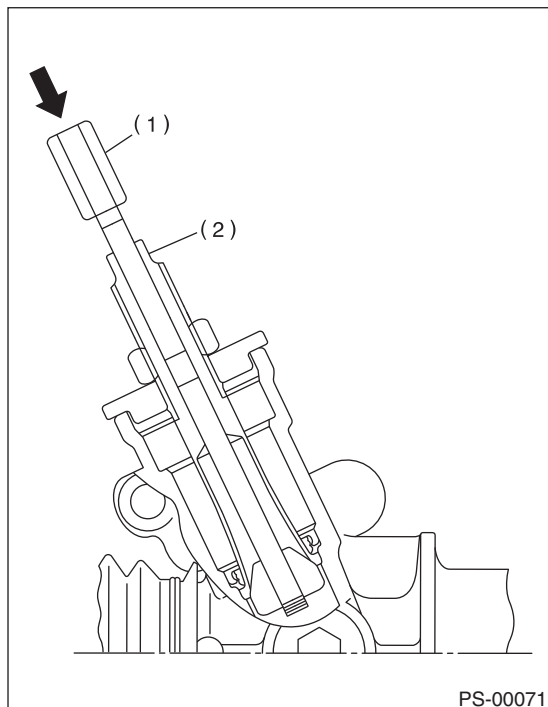
POWER ASSISTED SYSTEM (POWER STEERING)

20) Set the stopper to gearbox, then insert the tip of the ST to the gearbox.



- (1) STOPPER
- (2) Oil seal

21) By fixing the 2-surface widths, press-in the rod while rotating it and catch the oil seal.

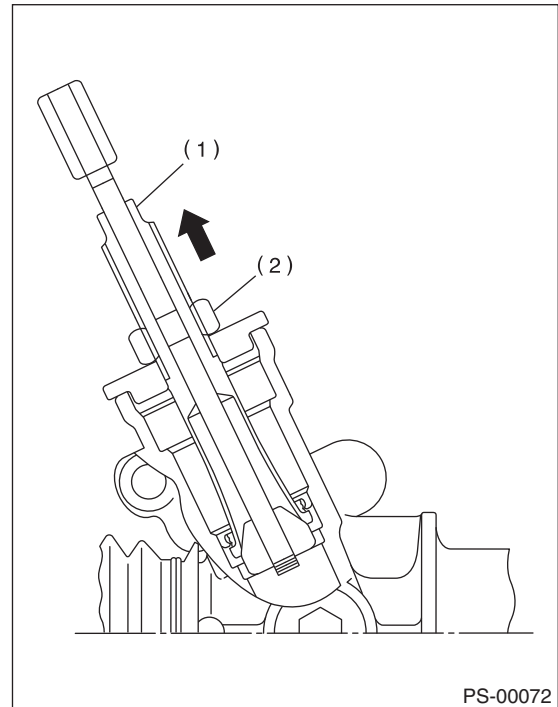


- (1) Rod
- (2) 2-surface widths

22) While fixing the 2-surface widths, pull out the oil seal by rotating nut.

CAUTION:

Take care not to scratch the gearbox inner surface.



- (1) 2-surface widths
- (2) Nut

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1) Apply a coat of grease to the inside and outside of the new oil seal.

Steering grease:

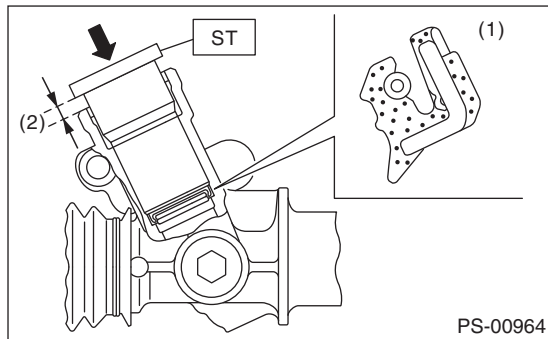
VALIANT GREASE M2

2) Verify the direction of the oil seal and installation position. Using the ST and a press, press-fit the oil seal into the gearbox.

CAUTION:

- Make sure to press fit the oil seal in all the way.
- The gap between the gearbox end face and the ST is to be approximately 4 mm (0.157 in) after press fitting.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER



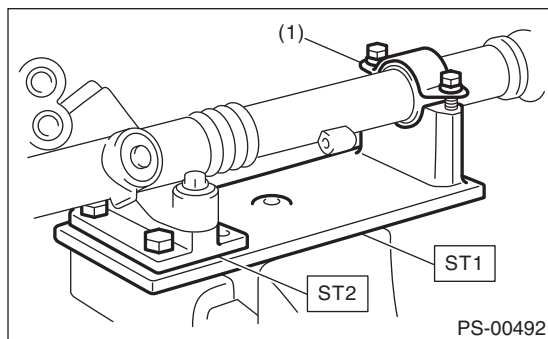
- (1) Oil seal
(2) 4 mm (0.157 in)

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.

ST1 926200000 STAND
ST2 34199AG000 BOSS D

CAUTION:

Make sure the needle bearing is free from defects. If it is faulty, replace the steering body with a new part.



- (1) Clamp

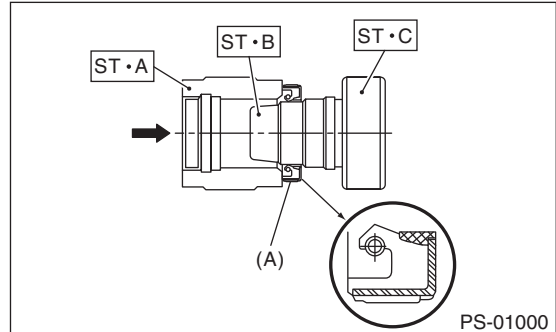
4) Using the ST A and ST B, attach the oil seal to ST C.

ST 34199FE040 INSTALLER A, B, C

- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

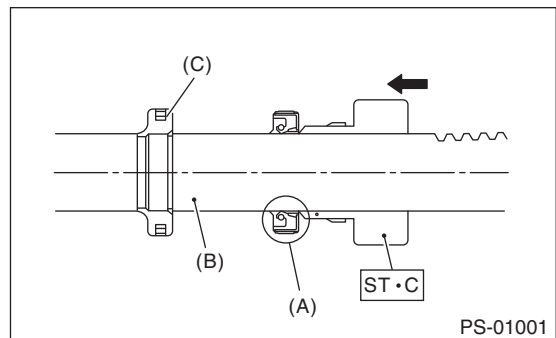
NOTE:

Face the oil seal in the direction as shown in the figure.



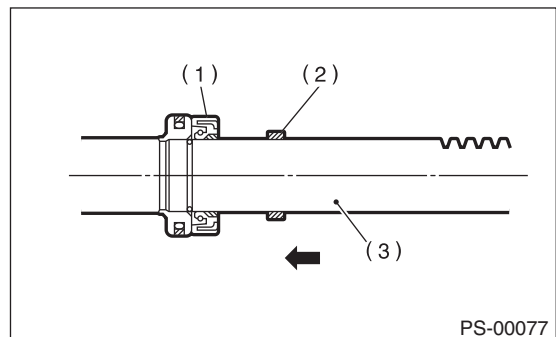
- (A) Oil seal

5) 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

6) Install the back-up washer from the gear side of rack.



- (1) Oil seal
(2) Back-up washer
(3) Rack

Steering Gearbox

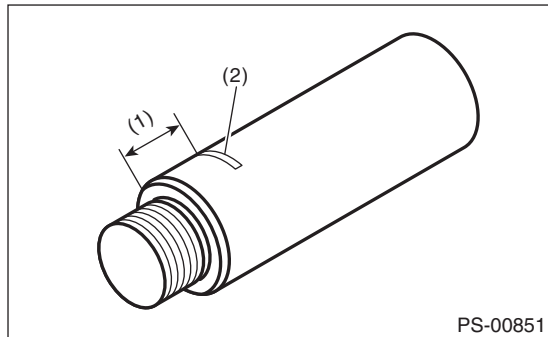
POWER ASSISTED SYSTEM (POWER STEERING)

7) 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.

8) Temporarily tighten the holder to gearbox cylinder.

9) Put a mark on a location of 9 mm (0.35 in) from the ST end surface as shown in the figure.

ST 34199FE000 INSTALLER & REMOVER

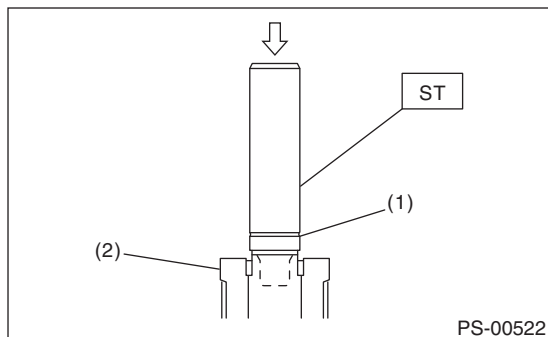


- (1) 9 mm (0.35 in)
- (2) Place a mark

10) Set the ST to the end of rack.

ST 34199FE000 INSTALLER & REMOVER

11) Using a press, press-fit until the mark on ST is aligned to the end surface of holder.



- (1) Mark
- (2) HOLDER

12) Remove the ST and holder.

13) Insert the outer side oil seal to the rack in the same procedure as step 4) to 5).

ST 34199FE040 INSTALLER A, B, C

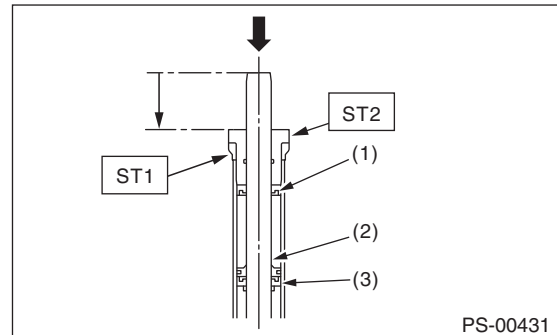
- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

14) Make the ST2 pass through the rack, and then press in the rack and ST2 using a press.

Press in the outer side oil seal until the ST1 and ST2 comes into contact with each other and the rack end surface is aligned to the end surface of the ST2.

ST1 34199FE050 GUIDE

ST2 34199FE060 INSTALLER



- (1) Outer side oil seal
- (2) Rack piston
- (3) Inner side oil seal

15) Attach a new holder on the cylinder side of the steering body.

Tightening torque:

75 N·m (7.6 kgf-m, 55.3 ft-lb)

16) Using the ST, crimp one location less than 3 mm (0.12 in) from the holder.

Steering Gearbox

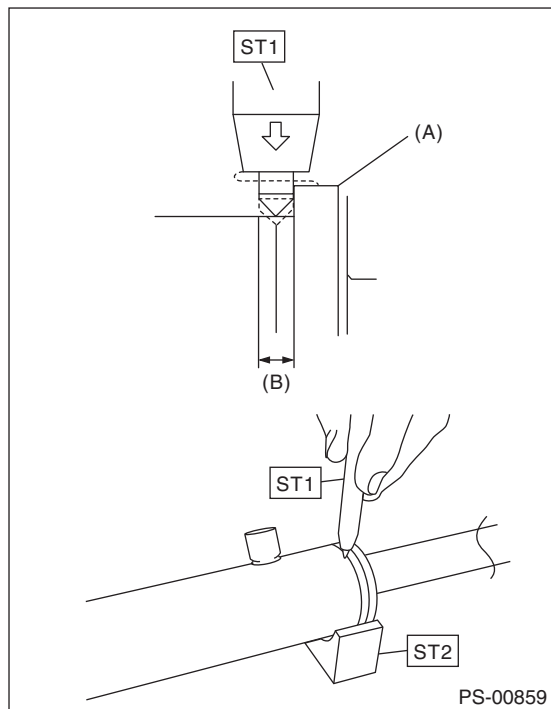
POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

Be careful not to deform the holder.

ST1 34099FA060 PUNCH HOLDER

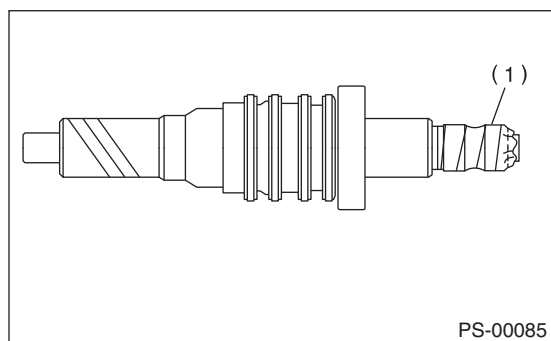
ST2 34199FE020 BASE



(A) HOLDER

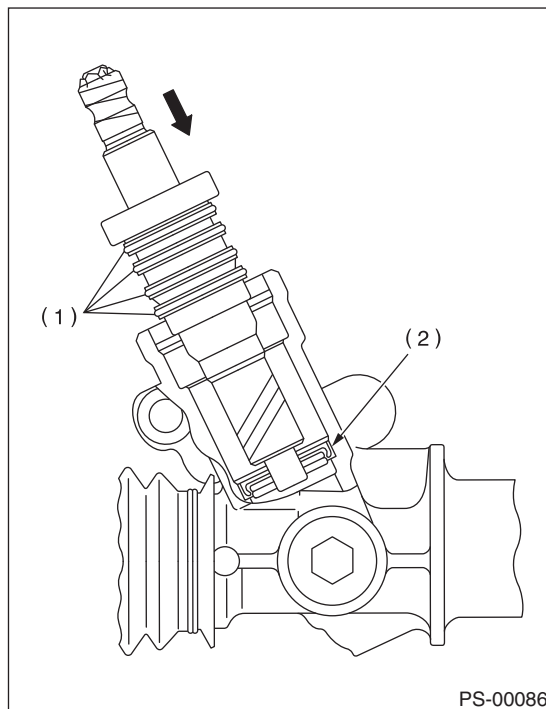
(B) 3 mm (0.12 in)

17) Roll a vinyl tape on the serration portion of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

18) Apply a coat of grease on the gear teeth of the valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring

(2) Oil seal

19) Replace the O-rings of plug circumference with new O-rings.

20) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press.

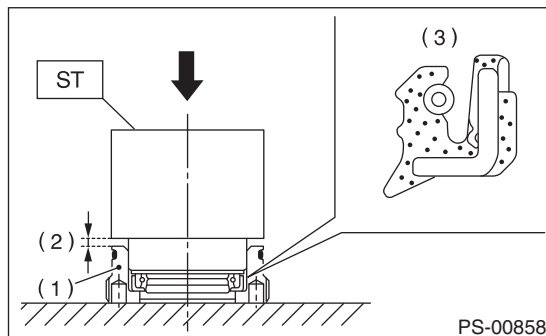
ST 34199AE110 OIL SEAL PLUG INSTALLER

CAUTION:

- Install the oil seal paying attention to correct direction.

- Make sure to press fit the oil seal in all the way.

- The gap between the plug and the ST is to be approximately 1 mm (0.039 in) after press fitting.



(1) PLUG

(2) 1 mm (0.039 in)

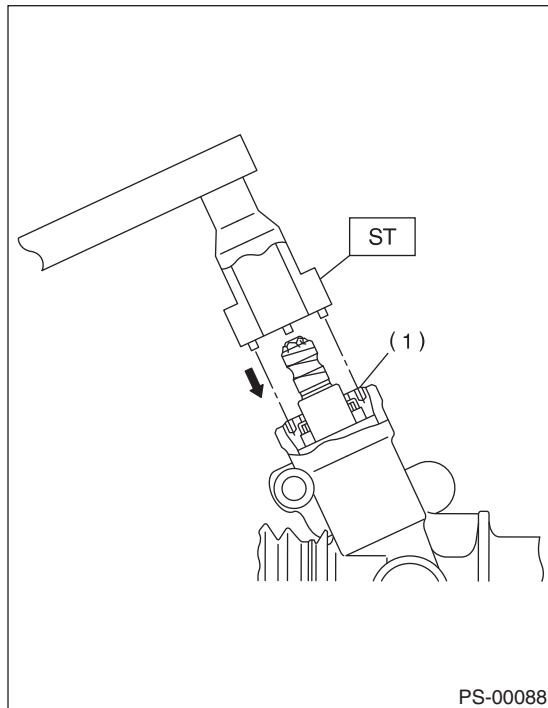
(3) Oil seal

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

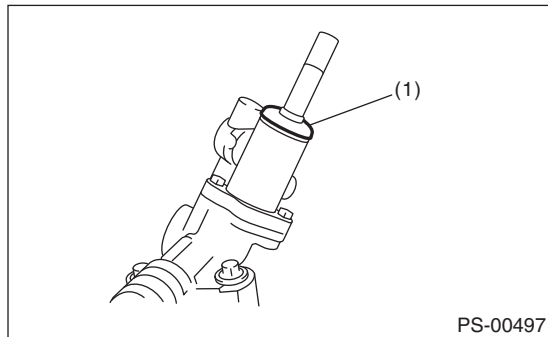
21) Attach the plug using ST.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



(1) PLUG

22) Install the dust cover, and remove the vinyl tape.



(1) Dust cover

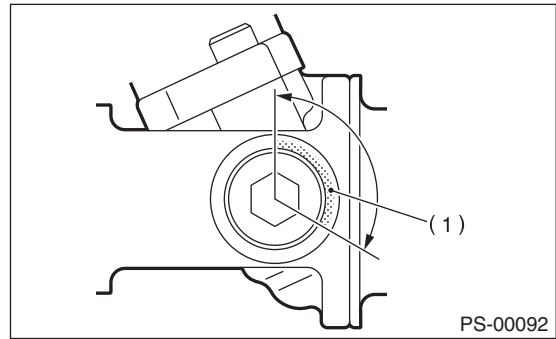
23) Temporarily tighten the tie-rod to the rack end, and then operate the rack from lock to lock for two or three times to make it fit in.

CAUTION:

If operating the rack from lock to lock without installing tie-rods, it may damage the oil seal. Always install the tie-rods LH and RH.

24) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

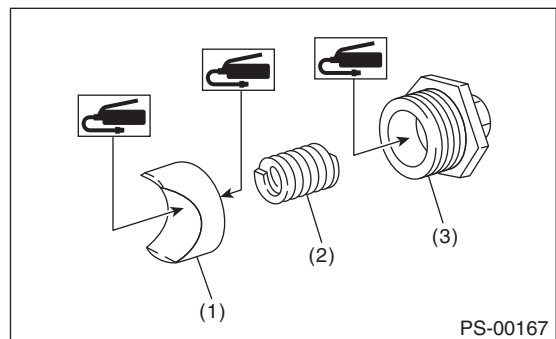
Liquid gasket:
THREE BOND 1141 (Part No. 004403006)



(1) Apply liquid gasket to 1/3 or more of the entire perimeter.

25) 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

26) Tighten the adjusting screw to the specified torque, then loosen it.

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

27) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

28) Tighten the adjusting screw to the specified torque, then loosen it approx. 30°.

CAUTION:

Do not loosen by 37° or more.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

29) Remove the tie-rod.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

30) Check that play and looseness are within specifications. <Ref. to PS-34, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

31) Install the lock nut. While holding the adjusting screw with wrench, tighten the lock nut using ST. ST 34199AJ000 SPECIAL TOOL CPS LHD

Tightening torque (lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

32) Install the tie-rod into rack.

Tightening torque:

90 N·m (9.1 kgf-m, 66.4 ft-lb)

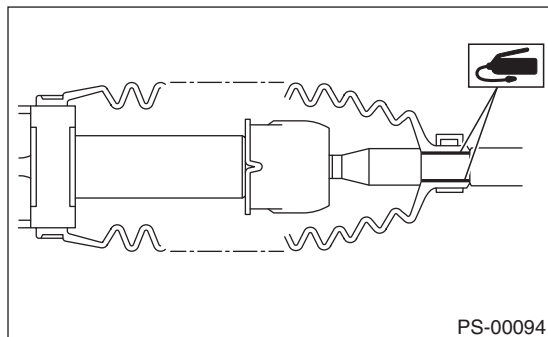
NOTE:

Check the mating face of rack and tie-rod for foreign matter such as dust etc.

33) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:

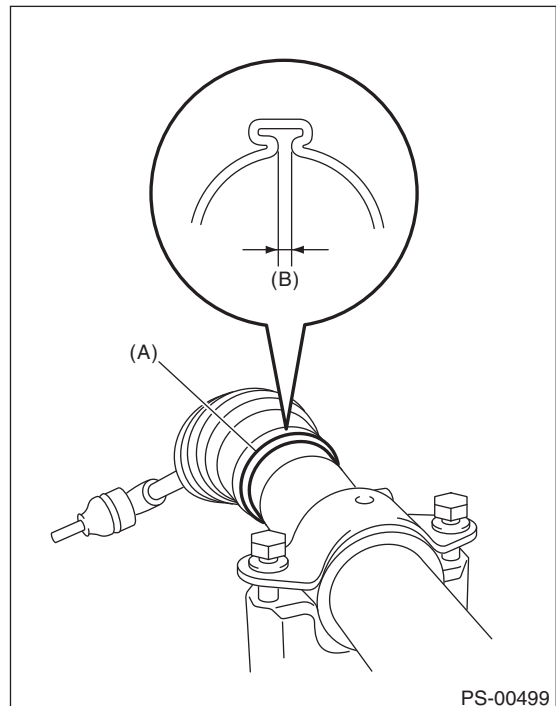
Make sure that the boot is installed without unusual inflation or deflation.



34) Using boot clamp pliers, crimp it so that the clearance of the boot band crimping section becomes 2 mm (0.08 in) or less.

NOTE:

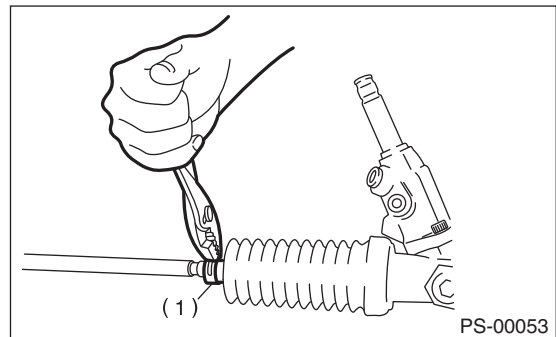
Use a new boot band.



(A) Boot band

(B) 2 mm (0.08 in) or less

35) Fix the boot end with small clip.



(1) Clip

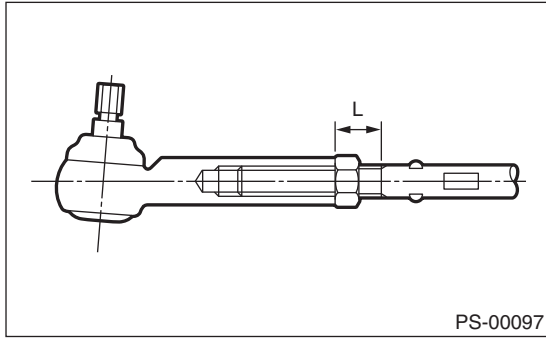
36) After installing, check that the boot end is installed to the groove of the tie-rod.

37) 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:
24 mm (0.9 in)

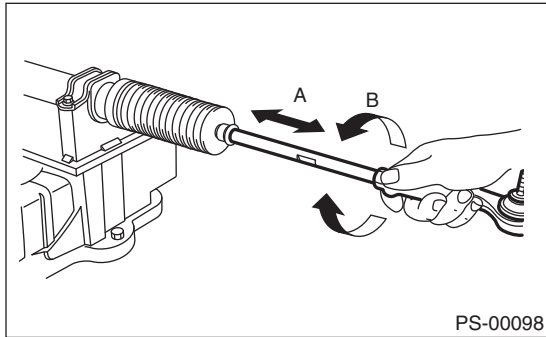


38) Inspect the gearbox as follows:

“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.



39) Remove the gearbox from ST.

ST1 926200000 STAND

ST2 34199AG000 BOSS D

40) Attach the 4 pipes to the steering body and control valve housing.

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. When 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 cast iron 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

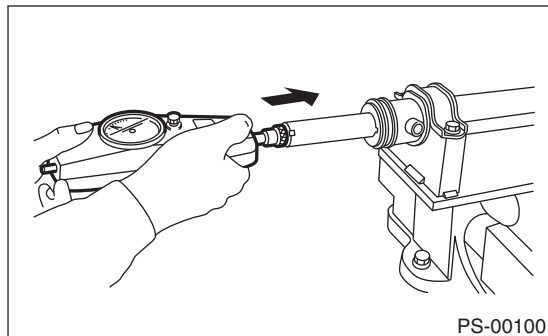
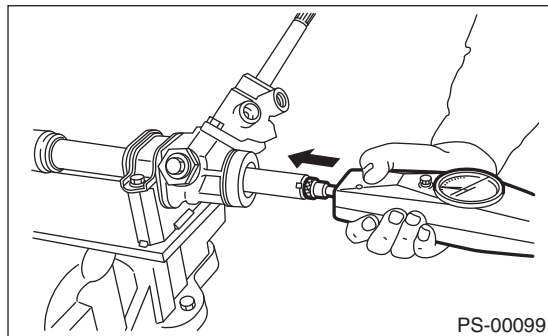
Sliding resistance of rack shaft:

Service limit

314 N (32 kgf, 71 lbf) or less

Difference between right and left sliding resistance:

20% or less



3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Service limit

Direction ← →

0.4 mm (0.016 in) or less

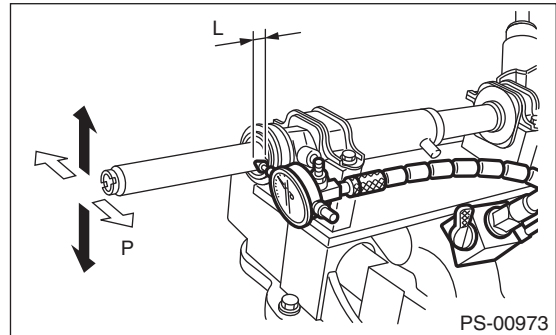
Direction ⇐ ⇐

0.6 mm (0.024 in) or less

Condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lbf)

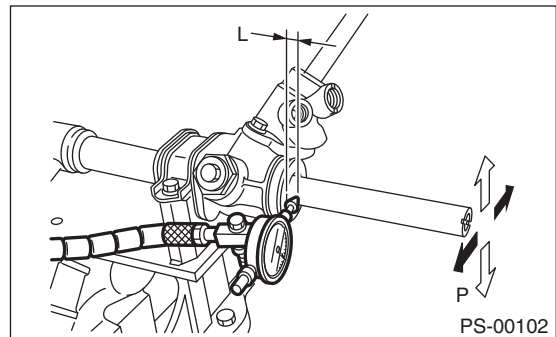


Left-turn steering:

Service limit

Direction ⇐ ⇐

0.4 mm (0.016 in) or less



4. INPUT SHAFT PLAY

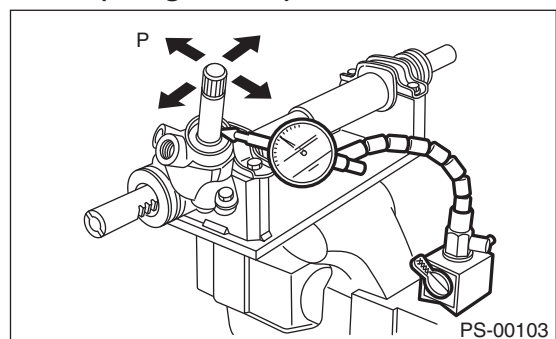
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

Condition

P: 98 N (10 kgf, 22 lbf)



In axial direction:

Service limit

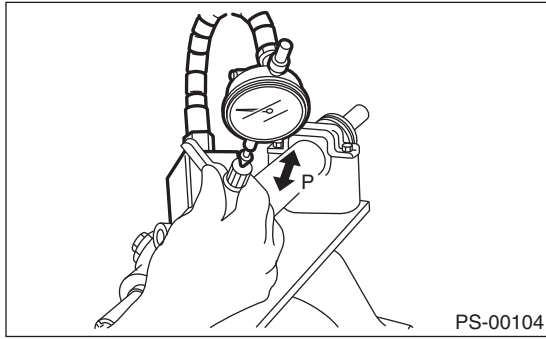
0.27 mm (0.0106 in) or less

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

Condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.

ST 34099PA100 SPANNER

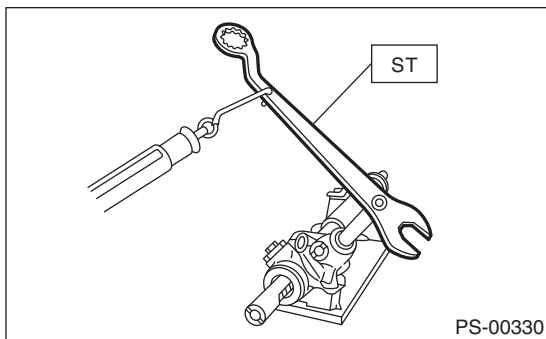
Service limit:

Maximum allowable resistance:

13 N (1.3 kgf, 2.9 lbf) or less

Difference between right and left turning resistance:

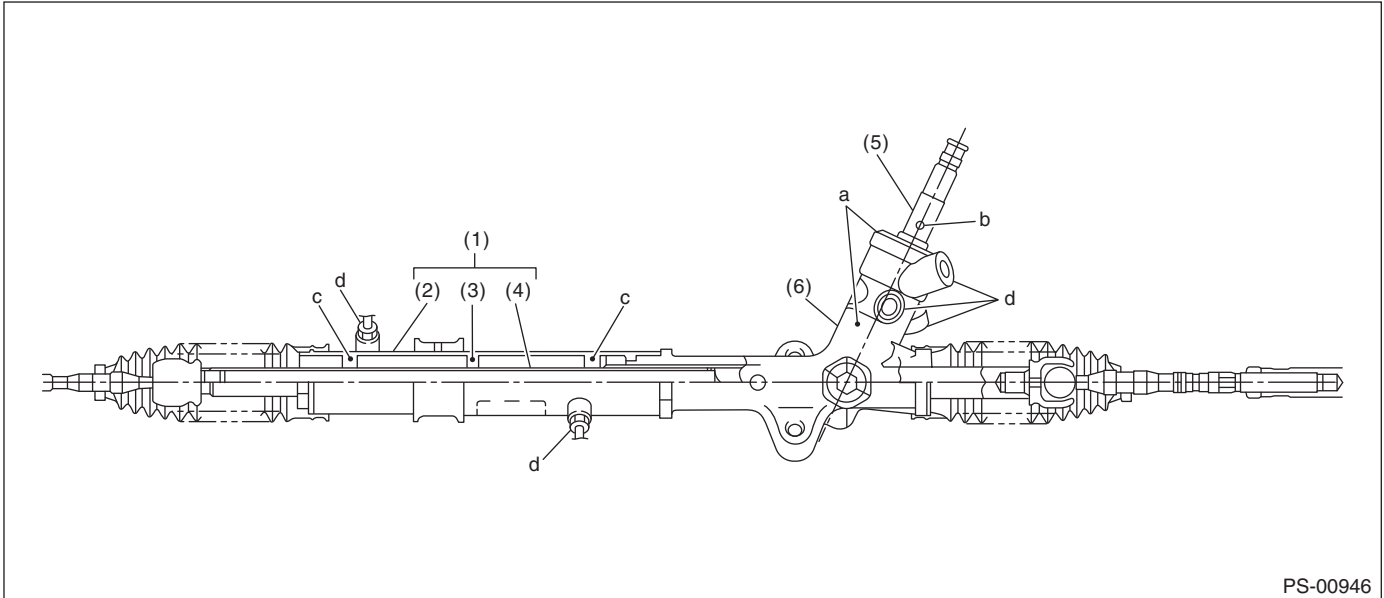
20% or less



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKAGE



(1) Power cylinder

(3) Rack piston

(5) Input shaft

(2) Cylinder

(4) Rack axle

(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 with a new part.

4) Cause and measure for oil leakage from "b".
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.

5) Cause and measure for oil leakage from "c".

The oil seal is damaged. Replace the oil seal.

6) Cause and solution for oil leakage from "d".

The pipe is damaged. Replace the faulty pipe or O-ring.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

F: ADJUSTMENT

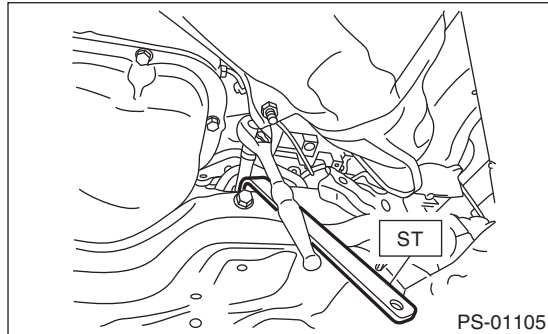
1. GEARBOX BACKLASH ADJUSTMENT (SERVICING ON VEHICLE)

- 1) Using the ST, loosen the lock nut.
- 2) Loosen the adjusting screw using ST, and apply liquid gasket to the entire area of the adjusting screw threads.

ST 34199AJ000 SPECIAL TOOL CPS LHD

Liquid gasket:

THREE BOND 1141 (Part No. 004403006)



- 3) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:

9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

- 4) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:

4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

- 5) Tighten the adjusting screw to the specified torque, then loosen it approx. 30°.

CAUTION:

Do not loosen by 37° or more.

Tightening torque:

4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

- 6) Install the lock nut. While holding the adjusting screw, tighten the lock nut using ST.

Tightening torque (lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

While tightening the lock nut, hold the adjusting screw not to rotate.

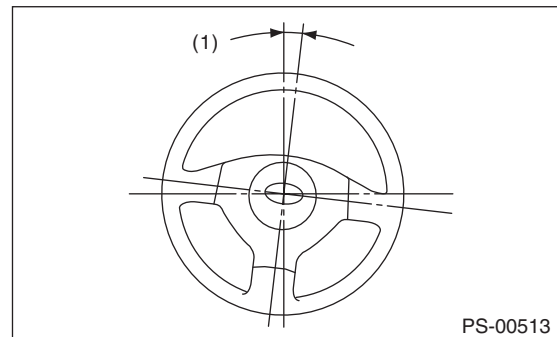
2. FRONT WHEEL ALIGNMENT ADJUSTMENT

- 1) Adjust the front toe.
<Ref. to FS-12, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
- 2) Adjust the steering angle of the wheels.

Standard of steering angle:

Model	Inner wheel	Outer wheel
225/50R17 tire	37.4°±1.5°	33.0°±1.5°
225/45R18 tire	37.4°±1.5°	33.0°±1.5°
215/50R17 tire	37.6°±1.5°	33.3°±1.5°
205/60R16 tire	37.6°±1.5°	33.3°±1.5°
225/60R17 tire	38.4°±1.5°	34.1°±1.5°
215/70R16 tire	38.4°±1.5°	34.1°±1.5°

- 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. Also check that there are no abnormal steering force, failure of the steering wheel to return or other faults.

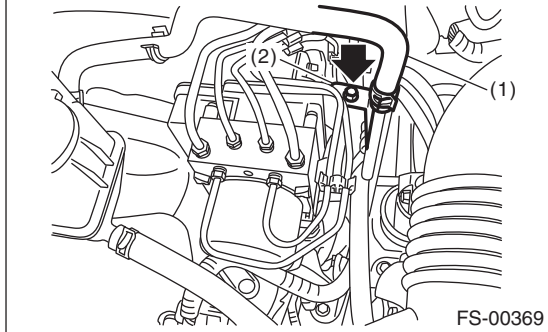
Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

6. Pipe Assembly

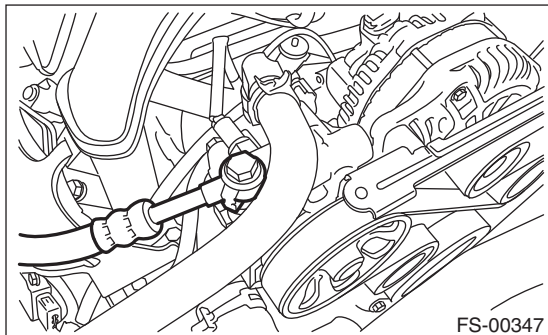
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the power steering hose bracket and power steering hose.
 - (1) Remove the clip and disconnect the hose from the pipe.
 - (2) Remove the power steering hose bracket.



- (1) Power steering hose
- (2) Power steering hose bracket

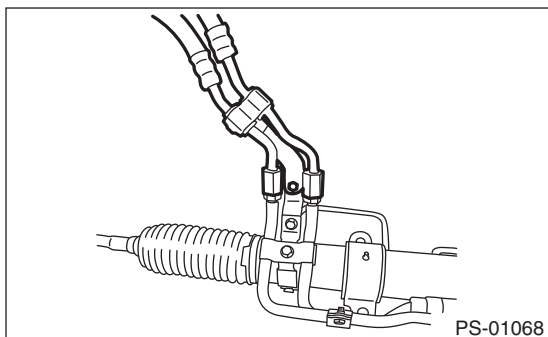
- (3) Remove the hose from power steering pump.



NOTE:

Plug the removed hose and pipe to prevent foreign matter from entering.

- 3) Lift up the vehicle and remove the under cover.
- 4) Disconnect the hose assembly from steering gearbox.



B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

<Ref. to PS-5, HOSE AND TANK, COMPONENT, General Description.>

- 2) Fill with recommended power steering fluid and perform air bleeding. <Ref. to PS-47, Power Steering Fluid.>

CAUTION:

Never start the engine before filling with fluid; otherwise the vane pump may become seized.

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.
Clamp	• Loose clamps	Replace with a new part.
Hose	• Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation	Replace with a new part.

CAUTION:

Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they 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.

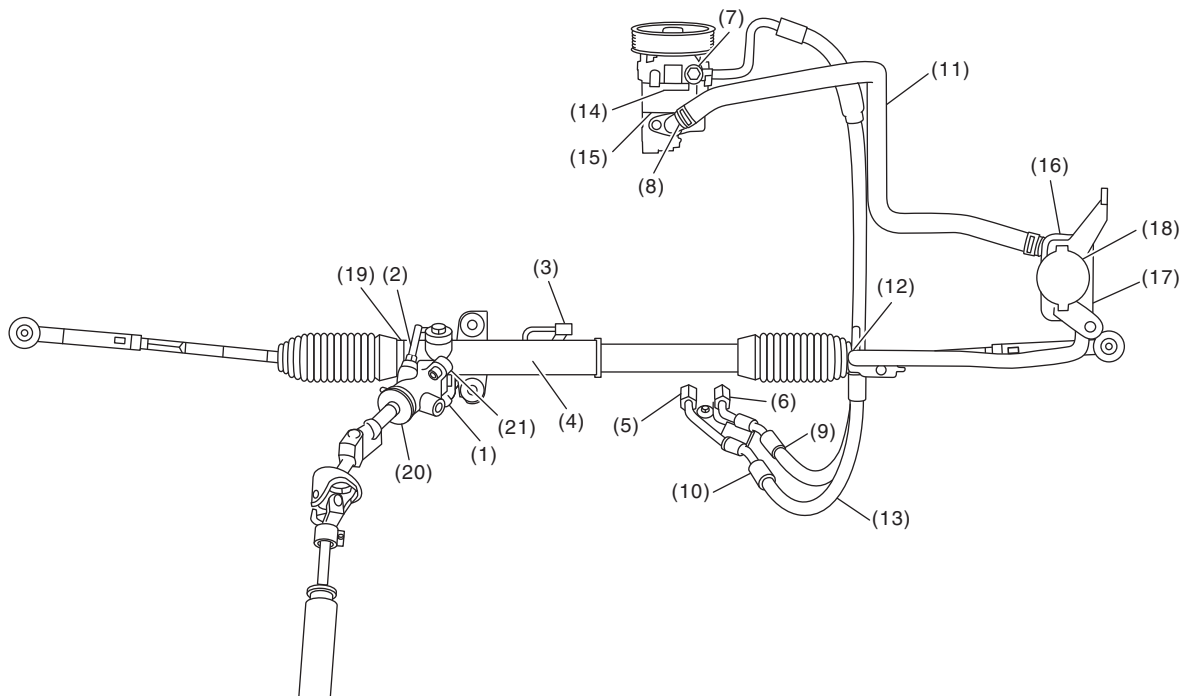
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Repair.
	Loosening of the clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customers.
	Excessive tightening torque for return hose clip	Replace.
	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-01069

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	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new part, if still no improvement, replace the gearbox 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 cast iron portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from 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.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

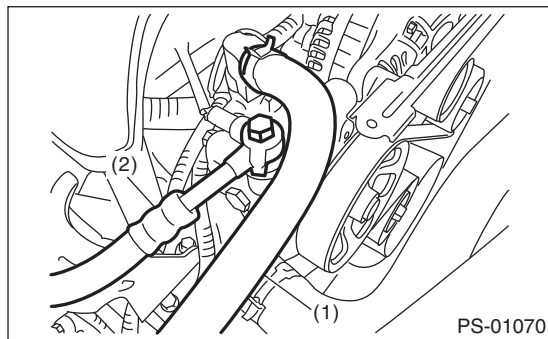
7. Oil Pump

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the V-belts. <Ref. to ME(H4SO)-42, REMOVAL, V-belt.>
- 3) Disconnect the connector from power steering pump switch.
- 4) Disconnect the pressure hose and suction hose from the oil pump.

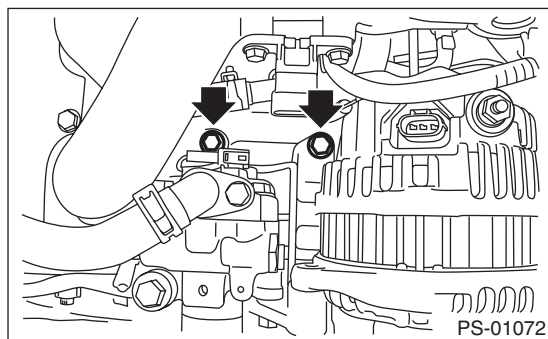
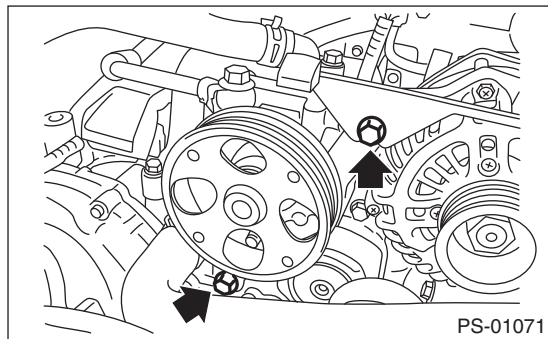
CAUTION:

- Do not allow fluid to come into contact with the pulley belt.
- Plug the ends of the hose and pipe to prevent foreign matter from entering.



- (1) Suction hose
(2) Pressure hose

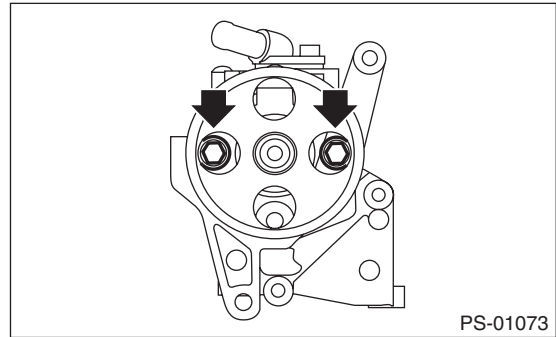
- 5) Remove the installation bolt of the power steering pump bracket.



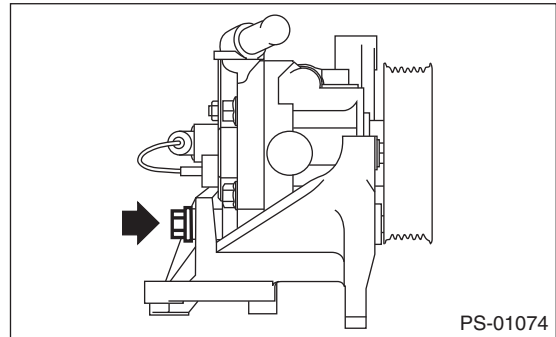
- 6) Secure the oil pump bracket on a vise and remove the bolts from front and back of the oil pump.

CAUTION:

When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



PS-01073



PS-01074

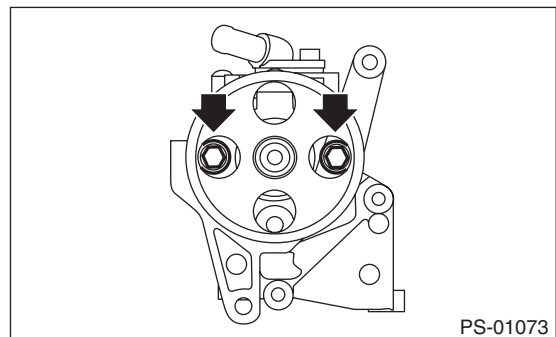
- 7) Remove the oil pump from the bracket.

B: INSTALLATION

- 1) Install the oil pump to bracket.

Tightening torque:

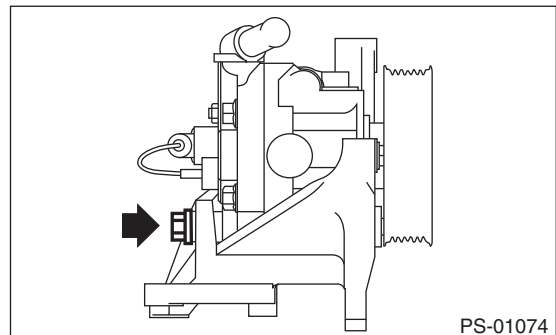
16 N·m (1.6 kgf-m, 11.8 ft-lb)



PS-01073

Tightening torque:

36 N·m (3.7 kgf-m, 26.6 ft-lb)



PS-01074

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

2) Install the power steering pump bracket.

Tightening torque:

<Ref. to PS-7, 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.

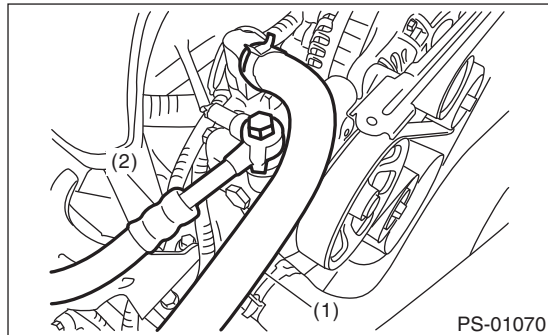
Tightening torque:

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.



(1) Suction hose

(2) Pressure hose

5) Connect the connector to the power steering pump switch.

6) Install the V-belts. <Ref. to ME(H4SO)-42, INSTALLATION, V-belt.>

7) Connect the ground cable to battery.

8) Fill with recommended power steering fluid and perform air bleeding. <Ref. to PS-47, 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	Measurement of play of bend direction and play of axis direction 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 pinch the outer portion of flow control valve or pulley portion with a vise. Otherwise this may cause deformation of outer portion and pulley. Select properly sized wood pieces.

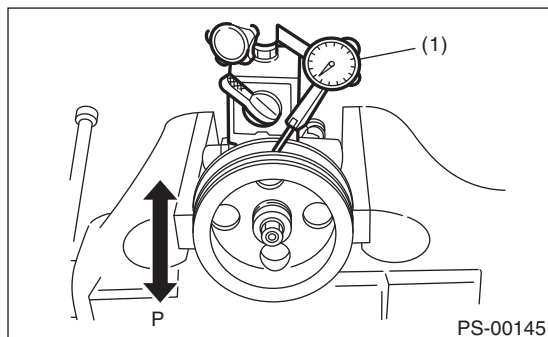
1) Play of the pulley shaft

Condition:

P: When applying a force of 9.8 N (1.0 kgf, 2.2 lbf)

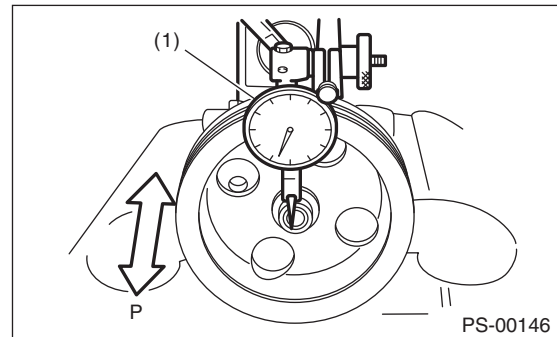
Service limit:

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)

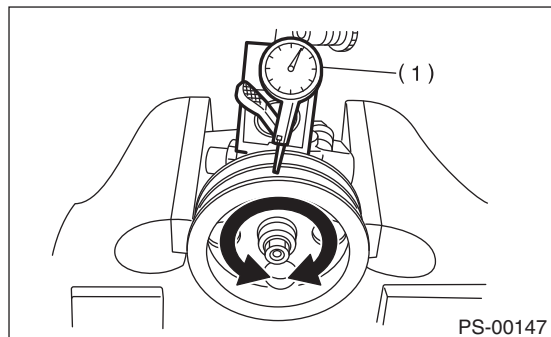
2) Deflection of the pulley groove

Service limit:

1.0 mm (0.039 in) or less

NOTE:

Read the value on one surface of V groove, set the dial gauge on the other surface, and read the value of the dial gauge.



(1) Dial gauge

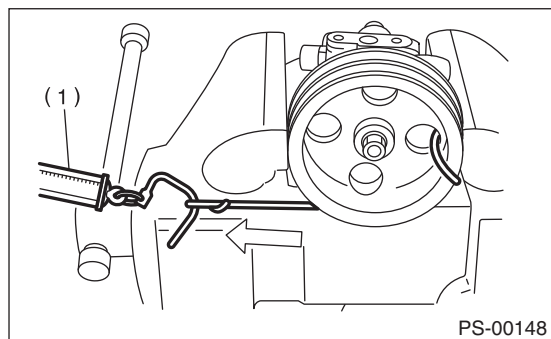
3) Rotating resistance of pulley

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-48, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
- Before attaching a pressure gauge, place cloth at locations where fluid is expected to spill. Wipe off any spilt fluid completely after the measurement.

1) Regular pressure measurement

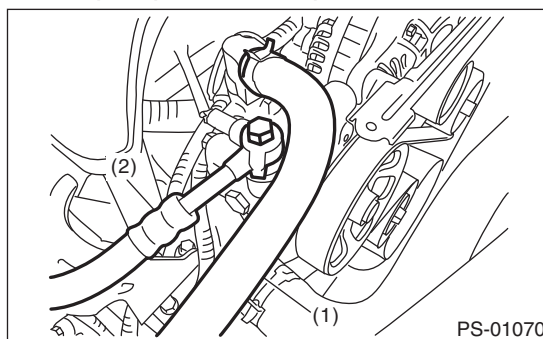
- (1) Connect the ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

- (2) Remove the air intake duct.
- (3) Disconnect the pipe C from pump.
- (4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), attach the ST2 to pump instead of pressure hose.



(1) Suction hose

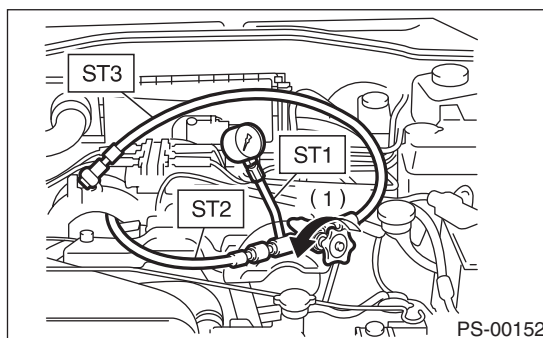
(2) Pressure hose

- (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.
- (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.

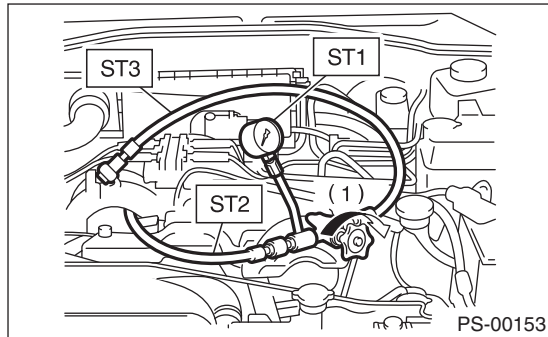
- (1) Using the STs, measure the relief pressure.
- (2) Close the valve.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

(3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

Service limit:

H4 NA model:

8,300 — 9,000 kPa (85 — 92 kgf/cm², 1,203 — 1,305 psi)

H6, turbo model:

8,900 — 9,600 kPa (91 — 98 kgf/cm², 1,290 — 1,392 psi)

(4) If it is not within the specification, replace the oil pump.

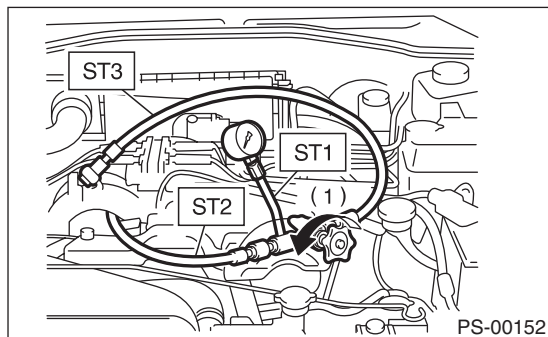
3) Measure the working pressure.

(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:

H4 NA model:

8,300 — 9,000 kPa (85 — 92 kgf/cm², 1,203 — 1,305 psi)

H6, turbo model:

8,900 — 9,600 kPa (91 — 98 kgf/cm², 1,290 — 1,392 psi)

(4) If it is out of specification, measure the steering effort. <Ref. to PS-51, 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

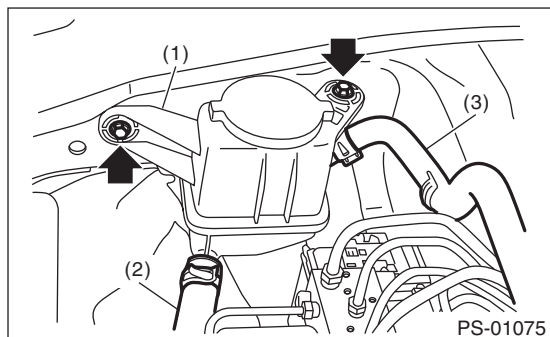
A: REMOVAL

- 1) Drain fluid from the reservoir tank.
- 2) Disconnect the hose from reservoir tank.

CAUTION:

Plug the ends of the hose and pipe to prevent foreign matter from entering.

- 3) Remove the reservoir tank from the body.



- (1) Reservoir tank
- (2) Suction hose
- (3) Return hose

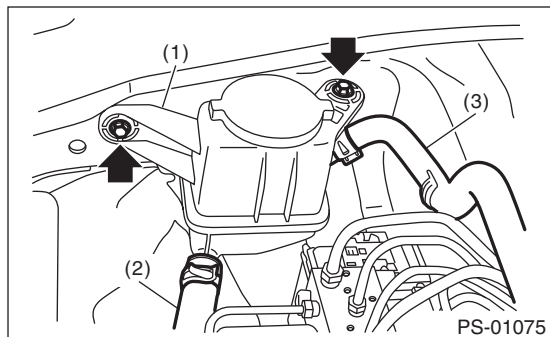
B: INSTALLATION

- 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-47, 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

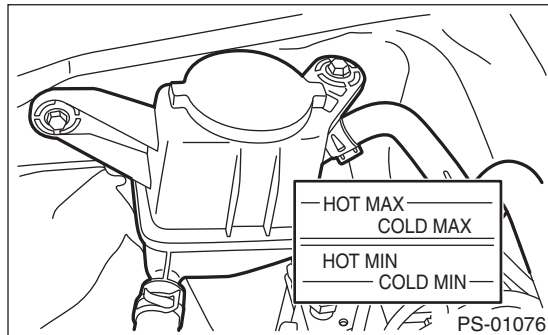
Recommended power steering fluid
SUBARU ATF or DEXRON III

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 fluid level is 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) Drain the power steering fluid.
- 3) Add the specified fluid to reservoir tank at "MAX" level.
- 4) Maintaining the fluid level of Step 3), continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface.
- 5) 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 4) again.
- 6) Start the engine and let it idle.
- 7) 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 3).

Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.

8) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat step 3) again.

9) Lower the vehicle, and then idle the engine.

10) 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).

11) In case the following happens, leave it about half an hour and then do step 7) to 10) 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.

12) 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 specification *1 - Improper wheel out of specification *1 - Tires not properly inflated	Replace or reinflate.
	3. Fluid - Low fluid level - Air entry in fluid - Dust entry in fluid - Fluid deterioration - Insufficient warming up for fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed - Lower idle speed - Excessive drop of idle speed at engine start or steering wheel turning *3	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-43, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-51, 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-51, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 When the width of tires or wheels is wider than standard, power steering system load increases. 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 season, fluid becomes cool and the steering effort gets heavy due to increased resistance. 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 season or with insufficient warm up of engine, an excessive drop of the idling causes heavy steering effort. 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 parts for deformation. Replace or correct if necessary.
	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.
	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	Repair 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) When engine operates (when operating steering wheel)	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)?	Go to step 2.	Adjust the backlash.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?	Go to step 3.	Perform the inspection or adjustment around the suspension part.
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 joint. (Yoke on steering column side) <Ref. to PS-19, 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 joint. (Yoke on gearbox side) <Ref. to PS-19, 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-35, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the turn resistance of the steering gearbox less than 13 N (1.3 kgf, 2.9 lbf)? Is the difference between right and left sides less than 24%?	Go to step 11.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	CHECK GEARBOX. Measure the sliding of gearbox. <Ref. to PS-34, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of the steering gearbox less than 314 N (32 kgf, 71 lbf)? Is the difference between the right and left sliding resistances less than 20 %?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.