

CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS(diag)
VEHICLE DYNAMICS CONTROL (VDC)	VDC
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)	VDC(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION



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General Description

FRONT SUSPENSION

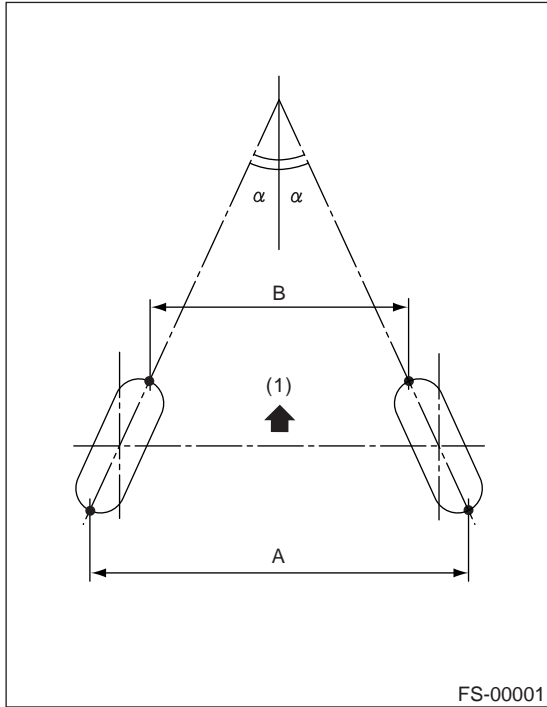
1. General Description

A: SPECIFICATION

	Model	Sedan				Wagon				OUTBACK 2.5 i, OUTBACK 3.0 R
		2.0 i	2.5 i	2.0 GT	3.0 R	2.0 i	2.5 i	2.0 GT	3.0 R	
Front	Wheel arch height [Tolerance: $+12_{-24}$ mm mm (in) ($+0.47_{-0.94}$ in)]	376 (14.8)				381 (15.0)		376 (14.8)		429 (16.9)
	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH: 45' or less)	$-0^{\circ}20'$				$-0^{\circ}15'$		$-0^{\circ}20'$		$0^{\circ}30'$
	Caster	$6^{\circ}00'$				$5^{\circ}45'$				$5^{\circ}05'$
	Steering angle (Tolerance: $\pm 1.5^{\circ}$)	Inner wheel	37.3°							37.8°
		Outer wheel	33.0°							33.5°
	Toe-in mm (in)	0 ± 3 (0 ± 0.12) Toe angle (sum of both wheels): $0^{\circ} \pm 0^{\circ}15'$								
	Kingpin angle	$13^{\circ}50'$				$13^{\circ}45'$		$13^{\circ}50'$		$12^{\circ}25'$
Diameter of stabilizer mm (in)	20 (0.79)		21 (0.83)		20 (0.79)		21 (0.83)			
Rear	Wheel arch height [Tolerance: $+12_{-24}$ mm mm (in) ($+0.47_{-0.94}$ in)]	360 (14.2)				375 (14.8)				430 (16.9)
	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH: 45' or less)	$-0^{\circ}45'$				$-0^{\circ}30'$				$0^{\circ}00'$
	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°								
	Diameter of stabilizer mm (in)	17.3 (0.68)		19.1 (0.75)		20 (0.78)		19.1 (0.75)		17.3 (0.68)

NOTE:

- Front and rear toe-ins and front camber can be adjusted. If the toe-in or camber tolerance exceeds specifications, adjust them.
- Other items indicated in the specification table cannot be adjusted. If those items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front

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

$\alpha =$ Each toe angle

C: CAUTION

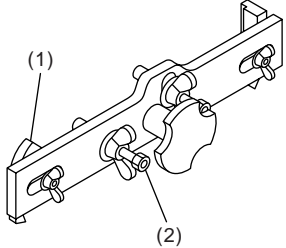
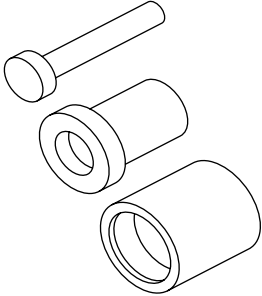
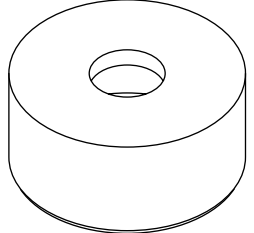
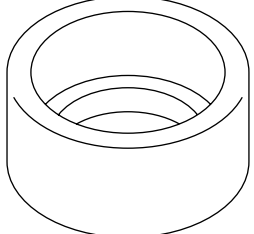
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease or the equivalent. Do not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

General Description

FRONT SUSPENSION

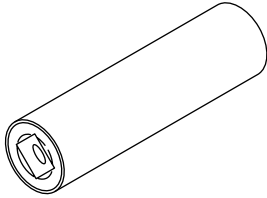
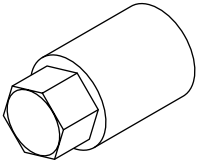
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927380002</p>	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 <p style="text-align: center;">ST-927680000</p>	927680000	INSTALLER & REMOVER SET	Used for replacing the front arm front bushing.
 <p style="text-align: center;">ST20299AG000</p>	20299AG000 (Newly adopted tool)	REMOVER	Used for replacing the front arm rear bushing. Used with BASE (20999AG010).
 <p style="text-align: center;">ST20299AG010</p>	20299AG010 (Newly adopted tool)	BASE	Used for replacing the front arm rear bushing. Used with REMOVER (20999AG000).

General Description

FRONT SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20299AG020	20299AG020 (Newly adopted tool)	STUD BOLT SOCKET	Used for removing and installing the stud bolt for front arm installing portion.
 ST20399AG000	20399AG000 (Newly adopted tool)	STRUT MOUNT SOCKET	Used for disassembling and assembling the strut mount.

2. GENERAL TOOL

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

Wheel Alignment

FRONT SUSPENSION

2. Wheel Alignment

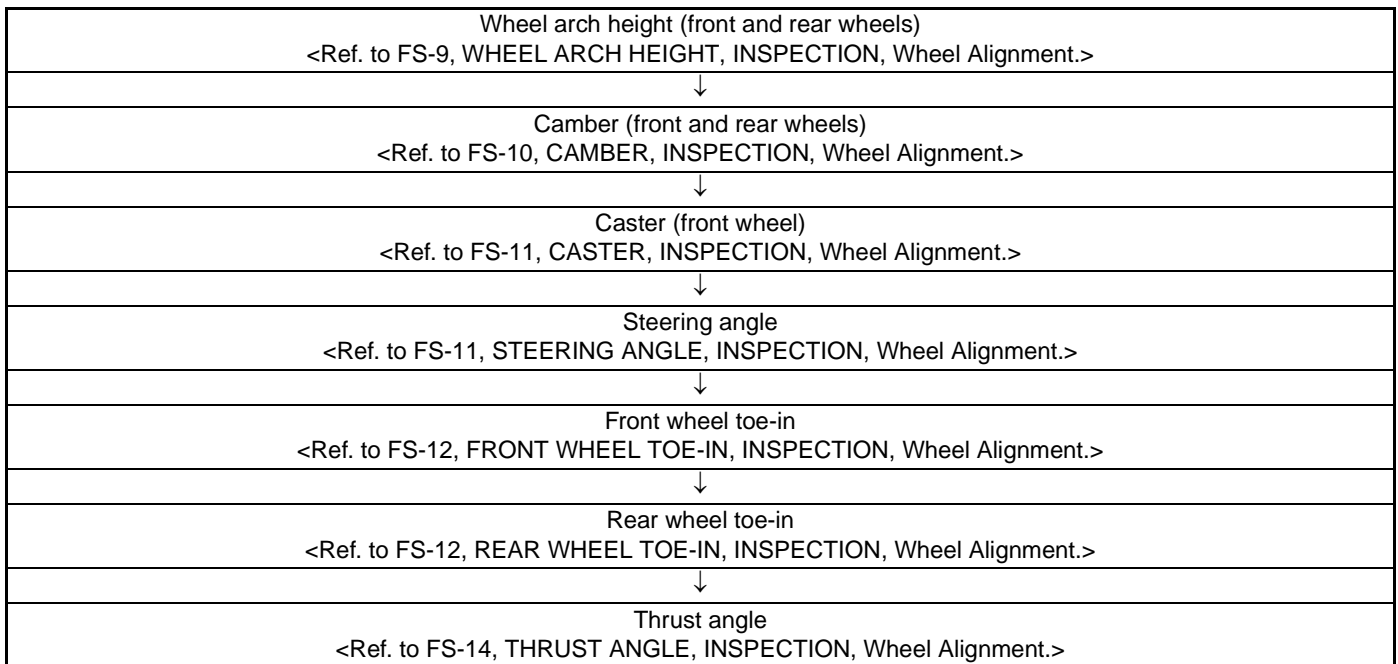
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

- Tire inflation pressure
- Unbalanced right and left tire wear, size difference
- Tire runout
- Excessive play and wear in ball joint
- Excessive play and wear in tie rod end
- Excessive play in wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play in steering link
- Deformation and excessive play in suspension parts

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



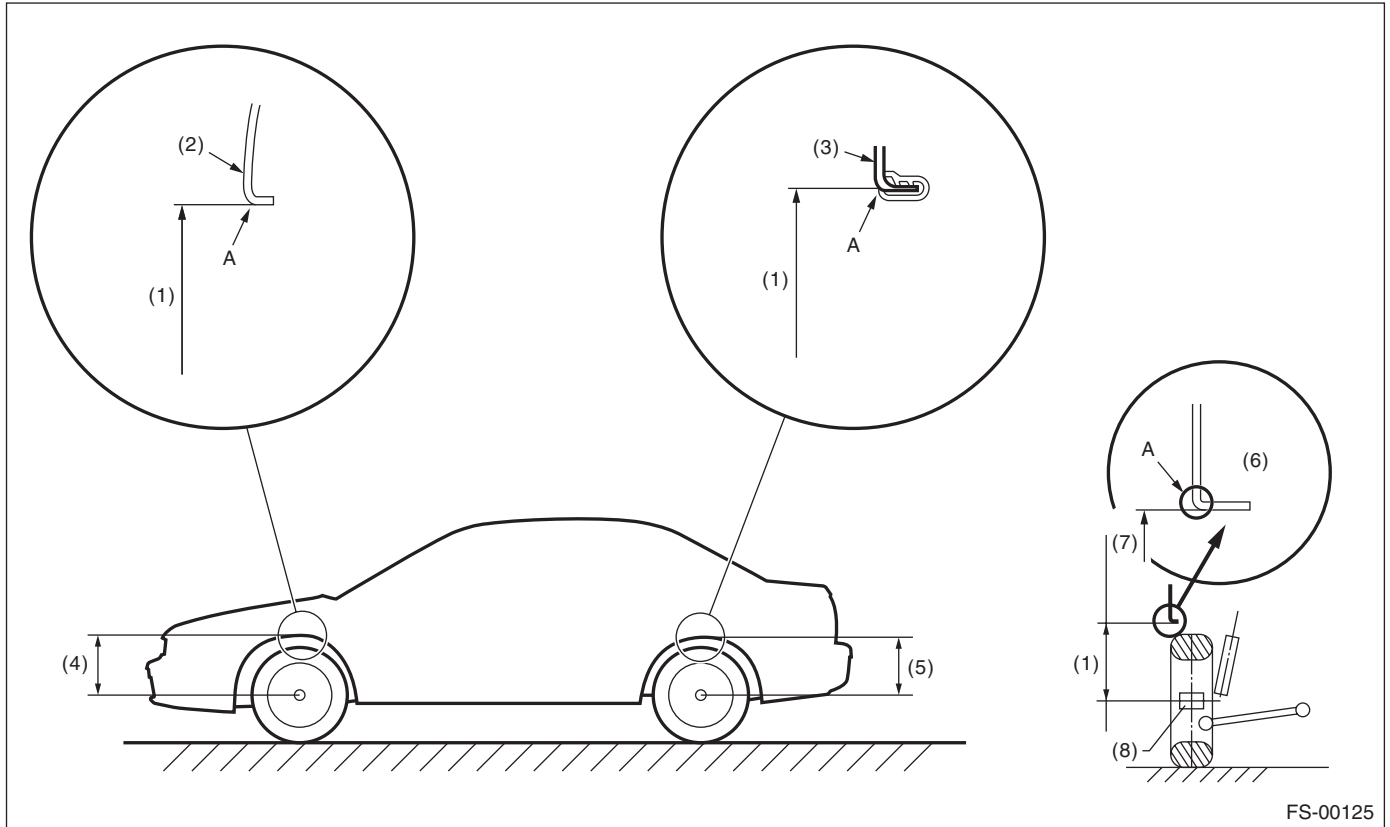
Wheel Alignment

FRONT SUSPENSION

1. WHEEL ARCH HEIGHT

- 1) Park the vehicle on a level surface.
- 2) Set the vehicle under "curb weight" condition. (Make the luggage compartment empty, install the spare tire, jack and service tools, and top up the fuel tank.)

- 3) Set the steering wheel in a straight-ahead position, and stabilize the suspensions by moving the vehicle straight more than 5 m (16 ft).
- 4) Suspend a thread from wheel arch (point "A" in the figure below) to determine the point directly above the center of wheel.
- 5) Measure the distance between the point "A" and the center of wheel.



FS-00125

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

Wheel arch height standard value mm (in) (Tolerance ± 12 mm)							
Model	Sedan				Wagon		
	2.0 i	2.5 i	2.0 GT	3.0 R	2.0 i, 2.5 i	2.0 GT, 3.0 R	OUTBACK 2.5 i, OUTBACK 3.0 R
Front	376 (14.8)				381 (15.0)	376 (14.8)	429 (16.9)
Rear	360 (14.2)				375 (14.8)		430 (16.9)

Wheel Alignment

FRONT SUSPENSION

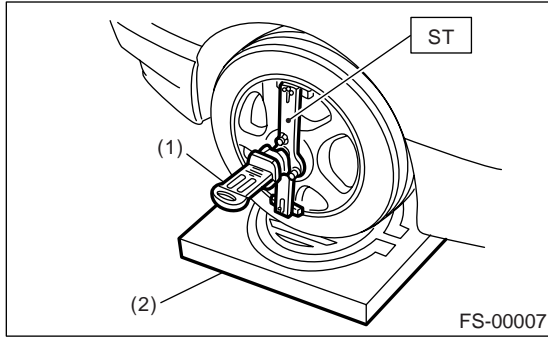
2. CAMBER

• INSPECTION

1) Place the front wheel on turning radius gauge. Make sure the ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then set the wheel alignment gauge.

ST 927380002 ADAPTER



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

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

Model		Camber (Differences between RH and LH: 45' or less)
Sedan		$-0^{\circ}20' \pm 0^{\circ}45'$
Wagon	2.0 i, 2.5 i	$-0^{\circ}15' \pm 0^{\circ}45'$
	2.0 GT, 3.0 R	$-0^{\circ}20' \pm 0^{\circ}45'$
	OUTBACK 2.5 i, OUTBACK 3.0 R	$0^{\circ}30' \pm 0^{\circ}45'$

• FRONT CAMBER ADJUSTMENT

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

Model		Camber (Differences between RH and LH: 45' or less)
Sedan		$-0^{\circ}20' \pm 0^{\circ}30'$
Wagon	2.0 i, 2.5 i	$-0^{\circ}15' \pm 0^{\circ}30'$
	2.0 GT, 3.0 R	$-0^{\circ}20' \pm 0^{\circ}30'$
	OUTBACK 2.5 i, OUTBACK 3.0 R	$0^{\circ}30' \pm 0^{\circ}30'$

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

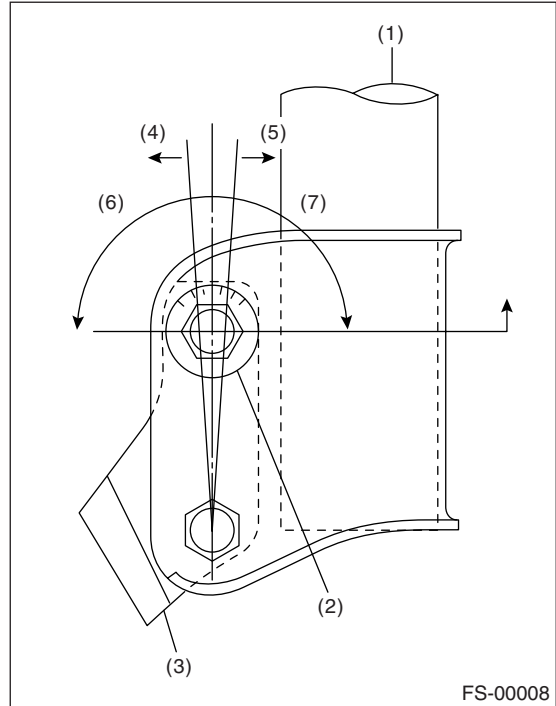
NOTE:

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

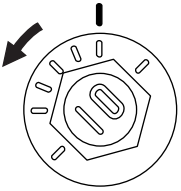
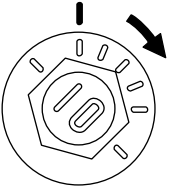
3) Turn the camber adjusting bolt so that the camber is set at specification.

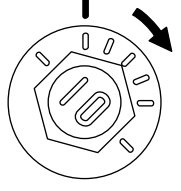
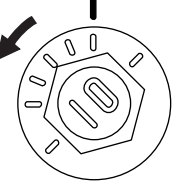
NOTE:

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



- (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.
 <p style="text-align: center;">FS-00009</p>	 <p style="text-align: center;">FS-00010</p>

To decrease camber.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
 <p style="text-align: center;">FS-00010</p>	 <p style="text-align: center;">FS-00009</p>

4) Tighten two new self-locking nuts.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

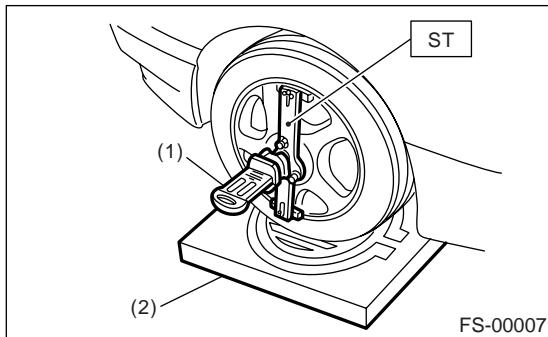
3. CASTER

• **INSPECTION**

1) Place the front wheel on turning radius gauge. Make sure the ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then set the wheel alignment gauge.

ST 927380002 ADAPTER



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

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

Model	Caster
Sedan	6°00'
Wagon	5°45'
OUTBACK	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 angle.

Model	Inner wheel	Outer wheel
OUTBACK	37.8°±1.5°	33.5°±1.5°
Except for OUTBACK	37.3°±1.5°	33.0°±1.5°

Wheel Alignment

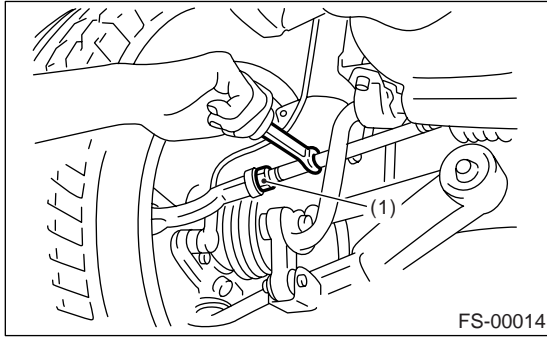
FRONT SUSPENSION

• 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 nuts

5. FRONT WHEEL TOE-IN

• INSPECTION

Toe-in:

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

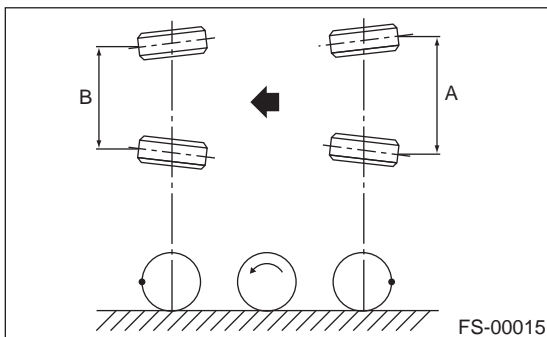
- 1) Set the toe-in gauge in the position at wheel axis center height behind the right and left front tires.
- 2) Measure the distance "A" between the marks which are put on the centers of left and right tires.
- 3) Move the vehicle forward and rotate the tires 180° .

NOTE:

Be sure to rotate the tires in the forward direction.

- 4) Measure the distance "B" between the left and right marks. Detect toe-in by the following equation:

$$A - B = \text{Toe-in}$$



• ADJUSTMENT

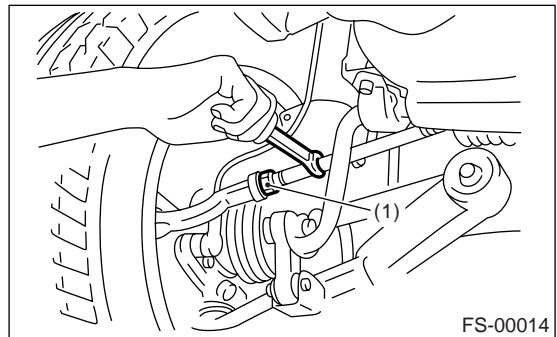
When adjusting the toe-in, adjust it to the following value.

Toe-in:

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

- 1) Check that the left and right wheel steering angle is within specifications.
- 2) Loosen the left and right side steering tie-rod lock nuts.
- 3) Turn the left and right tie rods 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 nuts

- 4) Tighten the tie-rod lock nut.

Tightening torque:

$85 \text{ N}\cdot\text{m } (8.7 \text{ kgf}\cdot\text{m}, 62.7 \text{ ft}\cdot\text{lb})$

NOTE:

Check and correct the tie rod boot if twisted.

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in:

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

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

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

• ADJUSTMENT

When adjusting, adjust it to the following value.

Toe-in:

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

Wheel Alignment

FRONT SUSPENSION

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

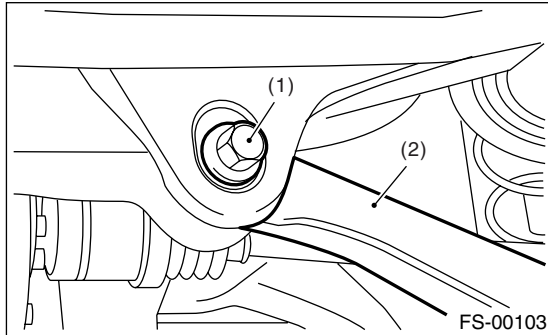
NOTE:

When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

2) Turn the adjusting bolt until toe-in is at 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. 0.6 mm (0.02 in).



- (1) Adjusting bolt
- (2) Rear link

To increase toe-in.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
<p style="text-align: center;">FS-00018</p>	<p style="text-align: center;">FS-00019</p>

To decrease toe-in.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
<p style="text-align: center;">FS-00019</p>	<p style="text-align: center;">FS-00018</p>

3) Tighten a new self-locking nut.

Tightening torque:

120 N·m (12.2 kgf·m, 88.5 ft·lb)

Wheel Alignment

FRONT SUSPENSION

7. THRUST ANGLE

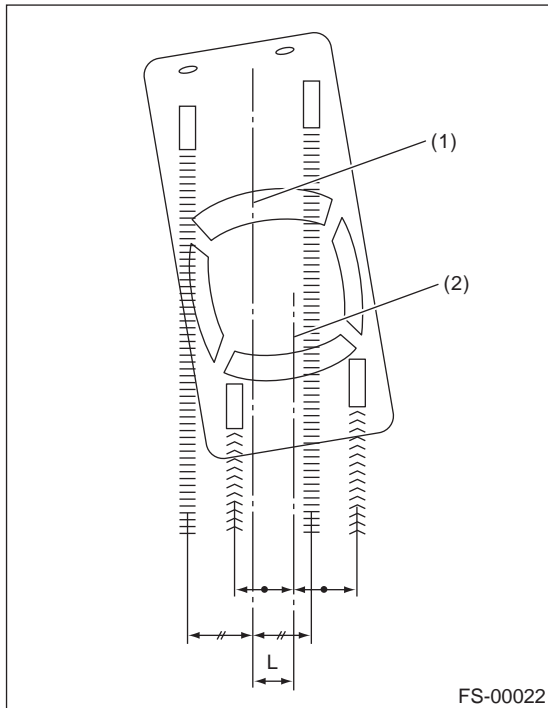
• INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Move the vehicle 3 to 4 meters (10 to 13 feet) directly forward.
- 3) Draw the center of loci of both the front and rear axles.
- 4) Measure the distance "L" between center lines of the loci of axles.

Thrust angle:

$0^{\circ} \pm 30'$

Less than 30' when "L" is less than 23 mm (0.9 in).



- (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:

$0^{\circ} \pm 20'$

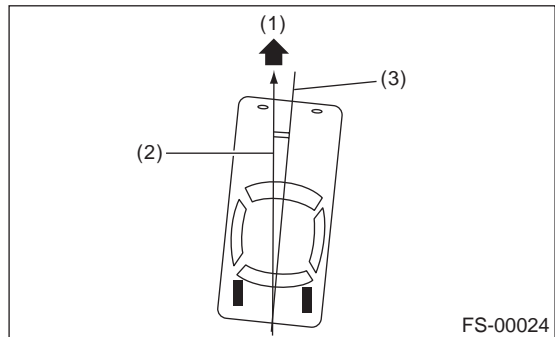
Less than 20' when "L" is less than 15 mm (0.6 in).

- 1) Make the thrust angle adjustments by turning the toe-in adjusting bolts of rear suspension equally in the same direction.
- 2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.

- 3) When the left and right adjusting bolts are turned by one graduation, the thrust angle will change approx. 17' ["L" is approx. 13 mm (0.51 in)].

NOTE:

Thrust angle refers to a mean value of left and right rear 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.



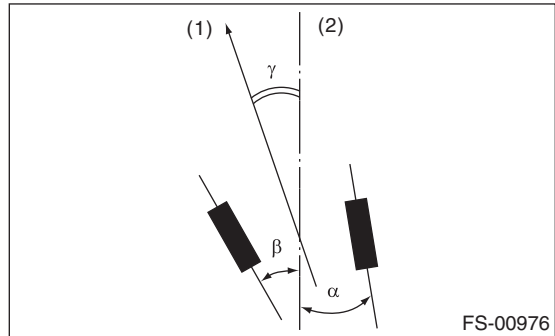
- (1) Front
- (2) Thrust angle
- (3) Body center line

Thrust angle: $r = (\alpha - \beta)/2$

α : Rear RH wheel toe-in angle

β : Rear LH wheel toe-in angle

Use only positive toe-in values from each wheel to substitute for α and β in the equation.

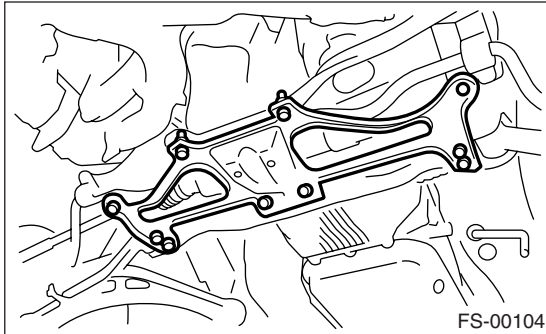


- (1) Front
- (2) Body center line

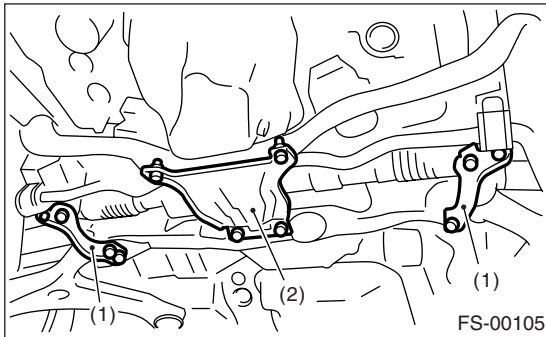
3. Front Crossmember Support Plate

A: REMOVAL

- 1) Lift-up the vehicle.
 - 2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
 - 3) Remove the bolt and remove front crossmember support plate.
- Large type



- Small type



- (1) Crossmember support plate
- (2) Jack-up plate

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Tighten the small type crossmember support plate together with stabilizer bracket.

After installing the stabilizer bracket to crossmember, tighten the crossmember support plate together.

Tightening torque:

Crossmember support plate:

60 N·m (6.1 kgf·m, 44.3 ft·lb)

Crossmember support plate (Joint tightening portion of stabilizer bracket):

25 N·m (2.5 kgf·m, 18.1 ft·lb)

Jack-up plate:

60 N·m (6.1 kgf·m, 44.3 ft·lb)

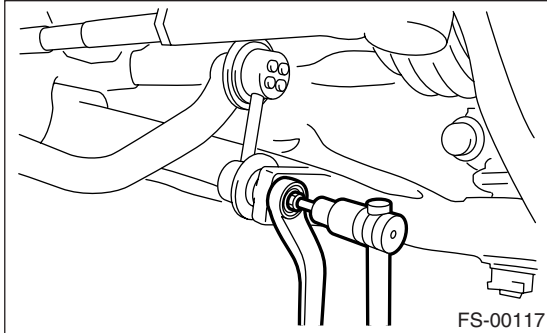
Front Stabilizer

FRONT SUSPENSION

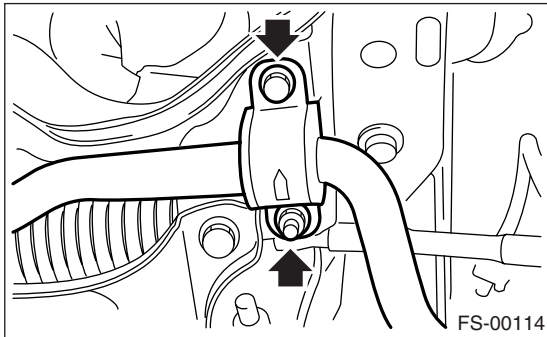
4. Front Stabilizer

A: REMOVAL

- 1) Lift-up the vehicle, and then remove the front wheels.
- 2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
- 3) Remove the front crossmember support plate. <Ref. to FS-15, REMOVAL, Front Crossmember Support Plate.>
- 4) Remove the stabilizer link.



- 5) Remove the stabilizer bracket.



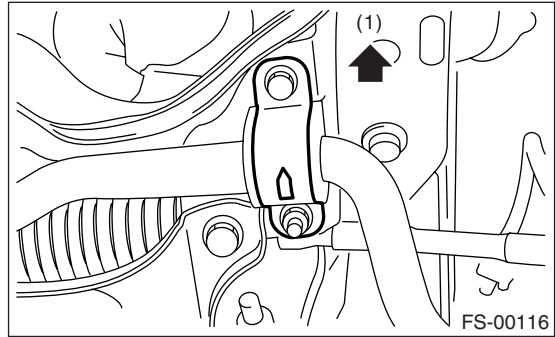
B: INSTALLATION

Install in the reverse order of removal.

NOTE:

- Use a new self-locking nut.
- Ensure that the stabilizer bushing and stabilizer have the same identification colors.
- Install the stabilizer bushing (front crossmember side) while aligning it with the paint mark on stabilizer.

- Stabilizer bracket has an orientation, so install it with the arrow mark faced to the front side of vehicle.



- (1) Front side of vehicle

Tightening torque:

Stabilizer link

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer bracket

25 N·m (2.5 kgf-m, 18.1 ft-lb)

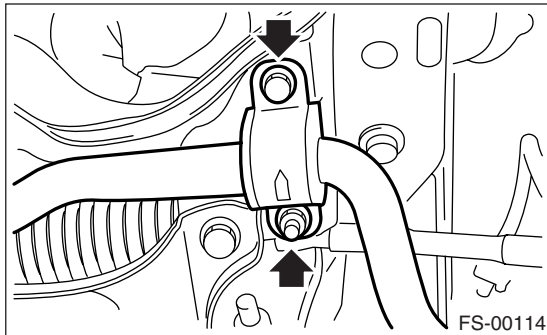
C: INSPECTION

- 1) Check the bushing for crack, fatigue or damage.
- 2) Check the stabilizer link for damage.

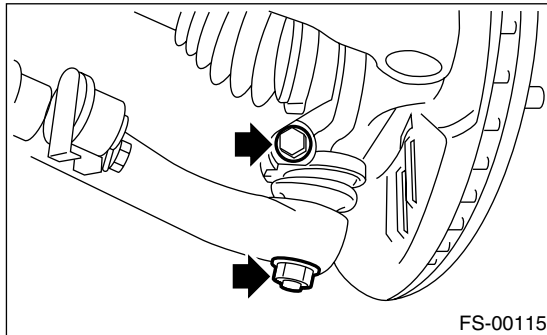
5. Front Ball Joint

A: REMOVAL

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



- 3) Pull out the pin from ball stud, remove the castle nut, and extract the ball stud from front arm.
- 4) Remove the bolt installing ball joint to housing.



- 5) Extract the ball joint from housing.

B: INSTALLATION

- 1) Insert the ball joint into housing.

Tightening torque (Bolt):
50 N-m (5.1 kgf-m, 36.9 ft-lb)

CAUTION:
Do not apply grease to the tapered portion of ball stud.

- 2) Install the ball joint into front arm.

Tightening torque (Castle nut)

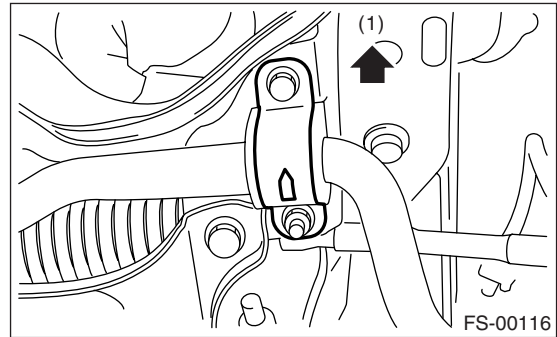
Front arm:

39 N-m (4.0 kgf-m, 28.8 ft-lb)

- 3) Retighten the castle nut further within 60° until the hole in ball stud is aligned with a slot in castle nut. Then, insert a new cotter pin and bend it around castle nut.
- 4) Install the stabilizer bracket.

NOTE:

Stabilizer bracket has an orientation, so install it with the arrow mark faced to the front side of vehicle.



- (1) Front side of vehicle

Tightening torque:

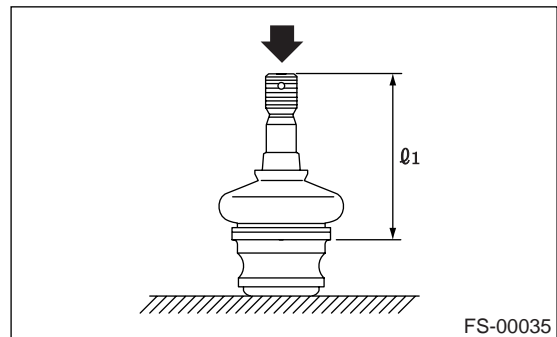
25 N-m (2.5 kgf-m, 18.1 ft-lb)

- 5) Install the front wheels.

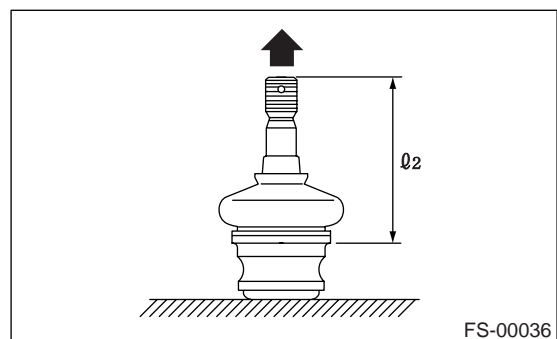
C: INSPECTION

- 1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.

- (1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension l_1 .



- (2) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension l_2 .



- (3) Determine the plays from the following formula. $S = l_2 - l_1$

Front Ball Joint

FRONT SUSPENSION

- (4) Replace with a new one when the play exceeds specified value.

FRONT BALL JOINT

Specified play for replacement S:

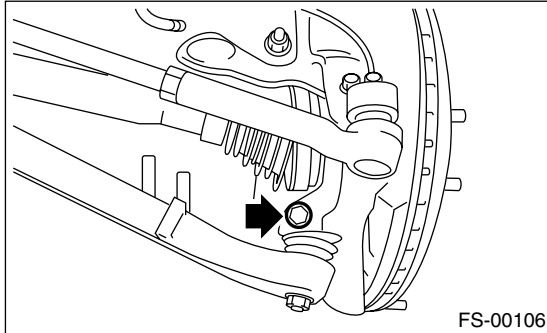
Less than 0.3 mm (0.012 in)

- 2) When the play is within specified value, visually check the dust cover.
- 3) Remove the ball joint and cover, check them for wear, damage or cracks, and then replace them if any defective part is found.
- 4) If the dust cover is damaged, replace with a new ball joint.

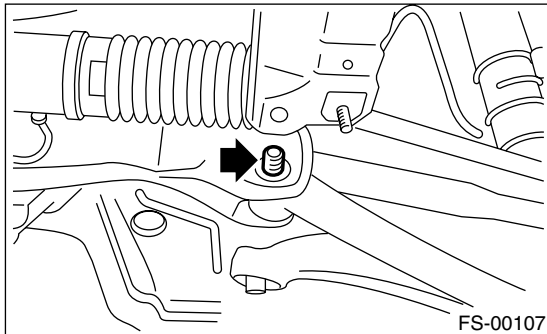
6. Front Arm

A: REMOVAL

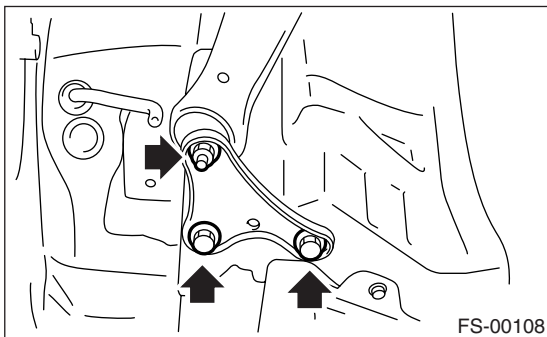
- 1) Lift-up the vehicle, and then remove the front wheels.
- 2) Remove the front crossmember support plate. <Ref. to FS-15, REMOVAL, Front Crossmember Support Plate.>
- 3) Remove the front stabilizer. <Ref. to FS-16, REMOVAL, Front Stabilizer.>
- 4) Remove the ball joint of front arm.



- 5) Remove the nut securing the front arm to crossmember. (Do not remove the bolt.)



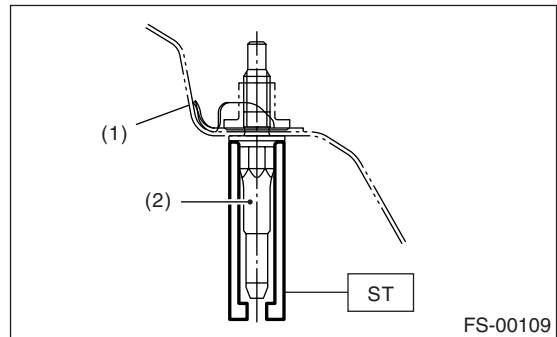
- 6) Remove the front arm support plate.



- 7) Remove the bolt securing the front arm to crossmember and extract the front arm from crossmember.
- 8) To remove the stud bolt, use ST.
ST 20299AG020 STUD BOLT SOCKET

CAUTION:

Do not remove the stud bolt without necessity. Always replace the parts with new ones when removed.



- (1) Vehicle body
- (2) Stud bolt

B: INSTALLATION

- 1) Using the ST, install the stud bolt.
ST 20299AG020 STUD BOLT SOCKET

Tightening torque:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

- 2) Using new bolts and self-locking nuts, temporarily tighten the front arm to crossmember.
- 3) Secure the front arm to body, and then install the support plate with new bolts and self-locking nuts.

Tightening torque:

Support plate-to-Front arm:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

Support plate-to-Body:

150 N·m (15.3 kgf-m, 110.6 ft-lb)

- 4) Install the ball joint into housing.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

- 5) Install the stabilizer. <Ref. to FS-16, INSTALLATION, Front Stabilizer.>
- 6) Lower the vehicle from the lift, and tighten the bolt which secures the front arm to crossmember at the state that wheels are in full contact with the ground and the vehicle is curb weight.

Tightening torque:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

NOTE:

Inspect the wheel alignment and adjust if necessary.

Front Arm

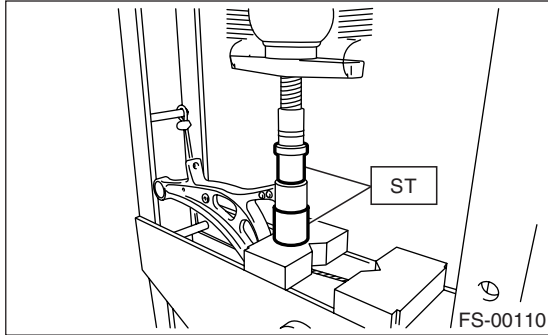
FRONT SUSPENSION

C: DISASSEMBLY

1. FRONT BUSHING

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

ST 927680000 INSTALLER & REMOVER SET

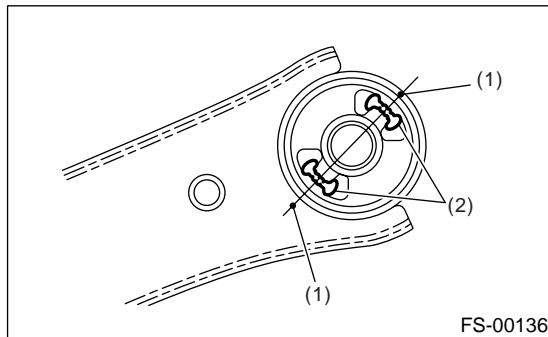


2. REAR BUSHING

1) Scribe an aligning 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.

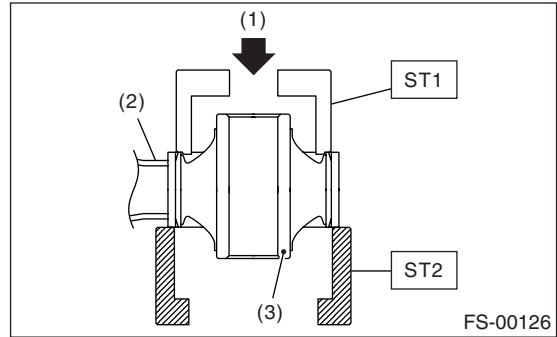


- (1) Put an alignment mark.
- (2) Recess portion

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

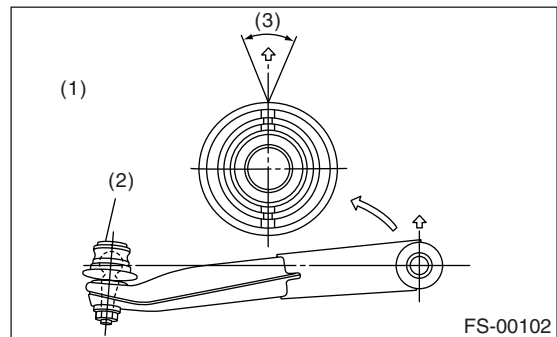
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:

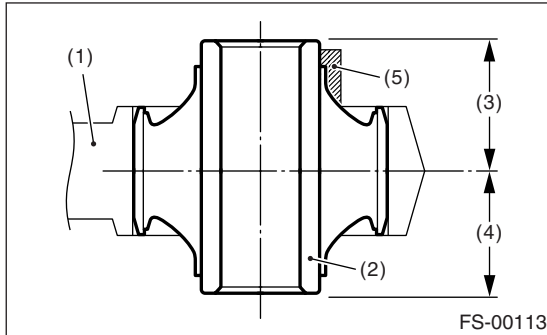
Install the front bushing in proper direction as shown in the figure.



- (1) Face the bushing toward the center of ball joint.
- (2) Ball joint
- (3) $\pm 3^\circ$

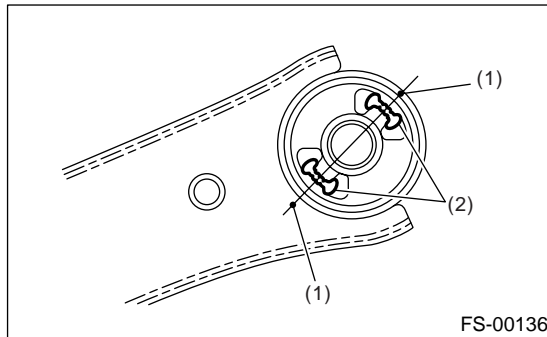
2. REAR BUSHING

1) Install the rear bushing with its longer inner cylinder faced upward and its shorter one faced downward and protruding part rearward as shown in the figure.



- (1) Front arm
- (2) Bushing inner cylinder
- (3) Longer
- (4) Shorter
- (5) Protrusion portion

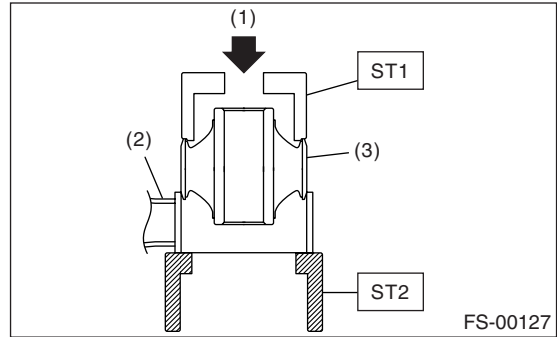
2) Align the center of rear bushing recess portion with the aligning mark on the front arm.



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

3) Using the ST and a press, install the rear bushing.

- ST1 20299AG000 REMOVER
- ST2 20299AG010 BASE



- (1) Press
- (2) Front arm
- (3) Rear bushing

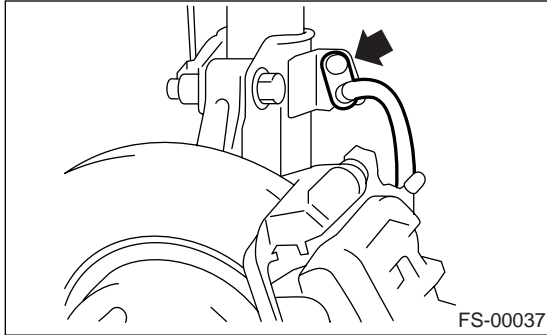
E: INSPECTION

- 1) Check the front arm for wear, damage or cracks, and correct or replace if defective.
- 2) Check the bushing for crack, fatigue or damage.

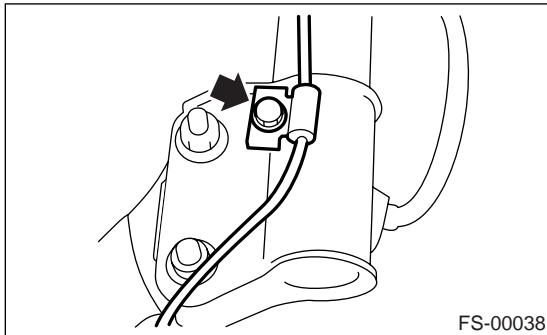
7. Front Strut

A: REMOVAL

- 1) Lift-up the vehicle, and then remove the front wheels.
- 2) Scribe an alignment mark on the camber adjusting bolt and strut.
- 3) Remove the bolt securing brake hose from strut.



- 4) Remove the bolt securing ABS wheel speed sensor harness.

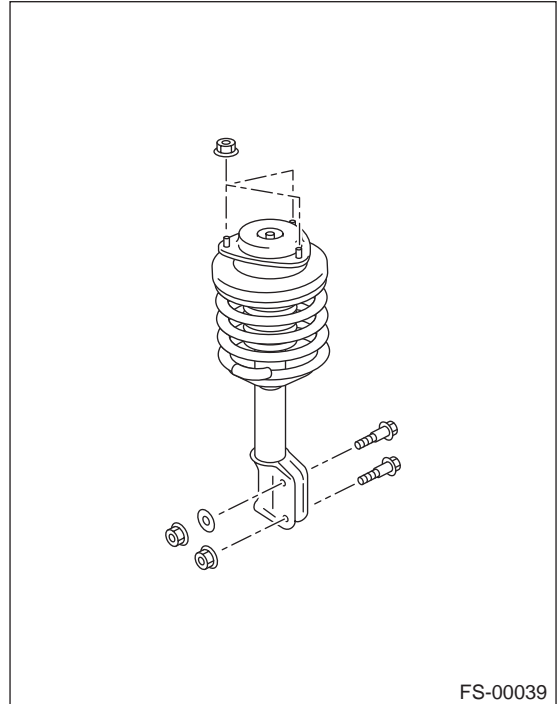


- 5) Remove the two bolts securing housing to strut.

NOTE:

While holding the head of adjusting bolt, loosen 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, 14.5 ft-lb)

- 2) Align alignment marks on the camber adjusting bolt and strut.

Using new self-locking nuts, install the strut to housing.

NOTE:

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

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

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

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

- 4) Install the bolts which secure the brake hose to strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

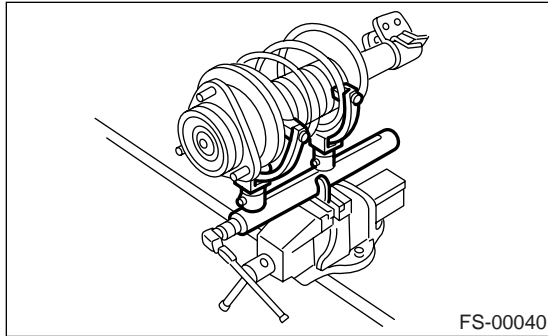
- 5) Install the front wheels.

NOTE:

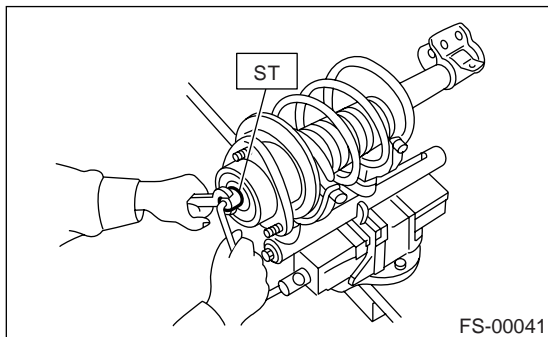
Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

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



2) Using the ST, remove the self-locking nut.
ST 20399AG000 STRUT MOUNT SOCKET



3) Remove the strut mount and upper spring seat from strut.

4) Gradually decrease the compression force of compressor, and remove the coil spring.

5) Remove the dust cover and helper spring.

D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc. on strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force production.

2) Check for presence of air

(1) Place the strut vertically with the piston rod facing up.

(2) Move the piston rod to the center of its entire stroke.

(3) While holding the piston rod end with fingertips, move the rod up and down.

(4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.

3) Air purging procedure

(1) Place the strut vertically with the piston rod facing up.

(2) Fully extend the piston rod.

(3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.

(4) Fully contract the piston rod.

(5) Repeat 3 to 4 times from the step (1).

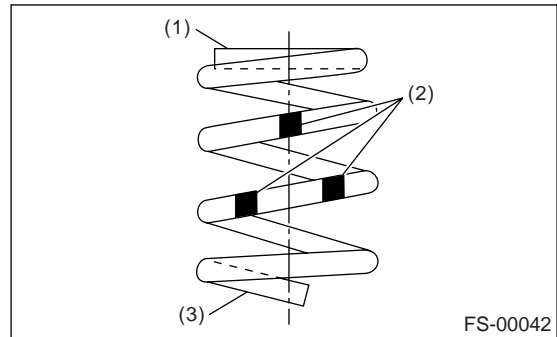
NOTE:

After completely purging air from the strut, be sure to place the strut with the piston rod facing up. If the strut is laid down and set, check for the entry of air in accordance with "Check for presence of air".

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

NOTE:

Make sure that the vertical installing direction of coil spring is as shown in the figure.

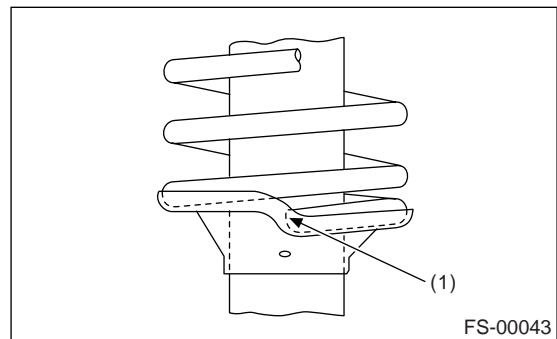


(1) Diameter is small (Upper part)

(2) Identification paint

(3) Diameter is large (Bottom part)

5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.



(1) Coil spring end face

6) Install the helper and dust cover to piston rod.

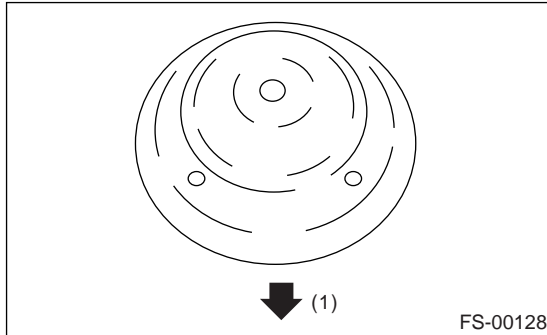
Front Strut

FRONT SUSPENSION

7) Pull the piston rod fully upward, and install the spring seat.

NOTE:

Ensure the upper spring seat is positioned as shown in the figure.



(1) Outside of body

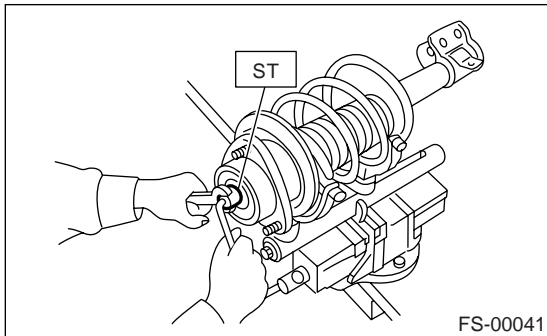
8) Install the strut mount to piston rod, and tighten a new self-locking nut temporarily.

9) 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, 41 ft·lb)



10) Loosen the coil spring carefully.

E: INSPECTION

Check the removed part for wear, damage or cracks, and then repair or replace it if defective.

1. DAMPER STRUT

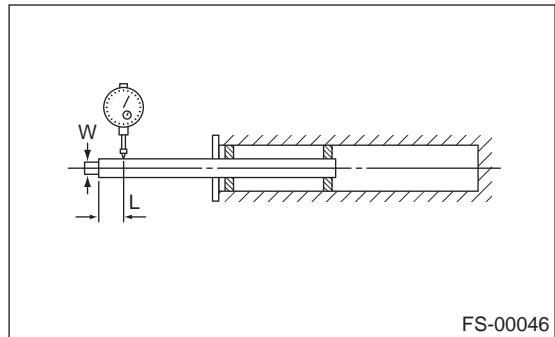
1) Check for oil leaks.

2) Move the piston rod up and down to check that it operates smoothly without any hitch.

3) Piston rod play

- Measure the play as follows:

Fix the outer shell and fully extend the rod. Set a dial gauge at the end of rod L [10 mm (0.39 in)], and then read the dial gauge indication P_1 while applying a force of W [20 N (2 kgf, 4 lb)] to threaded portion. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", and then read the dial gauge indication P_2 .



Play limit ($P_1 + P_2$):

0.8 mm (0.031 in)

If the play exceeds limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for deformation, cracks or deterioration, and then replace it with a new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

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

5. HELPER

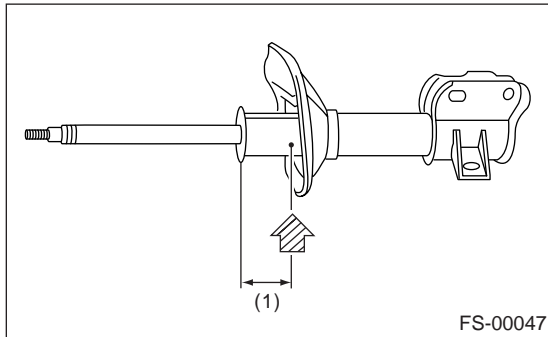
Replace it with a new one if cracked or damaged.

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 place into a fire.
- Drill a hole into struts in case of discarding struts filled with gas.

- 1) Place the strut on a level surface with the piston rod fully expanded.
- 2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.

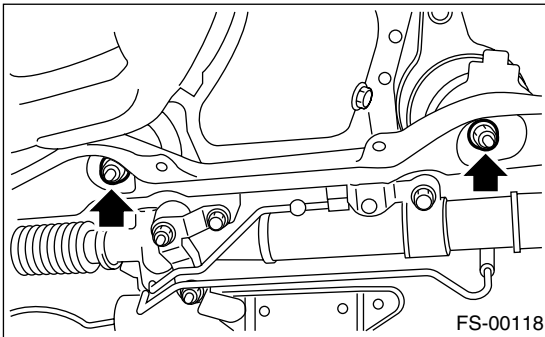


(1) 40 mm (1.57 in)

8. Front Crossmember

A: REMOVAL

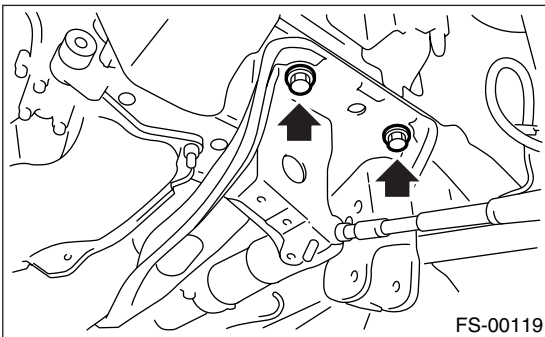
- 1) Lift-up the vehicle, and then remove the front wheels.
- 2) Remove the front exhaust pipe.
- 3) Remove the front crossmember support plate. <Ref. to FS-15, REMOVAL, Front Crossmember Support Plate.>
- 4) Remove the front stabilizer. <Ref. to FS-16, REMOVAL, Front Stabilizer.>
- 5) Disconnect the tie-rod end from housing.
- 6) Remove the front arm. <Ref. to FS-19, REMOVAL, Front Arm.>
- 7) Remove the nuts attaching the engine mount cushion rubber to crossmember.



- 8) Remove the steering universal joint.
- 9) Disconnect the power steering hose from steering gearbox.
- 10) Lift the engine approx. 10 mm (0.39 in) using a chain block.
- 11) Support the crossmember with a jack, remove the bolts securing crossmember to body, and then gradually lower the crossmember with steering gearbox as a unit.

CAUTION:

When removing the crossmember downward, be careful that the tie-rod end does not interfere with drive shaft boot.



B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Use a new bolt and self-locking nut. For the parts which are not reusable, refer to "COMPONENT". <Ref. to FS-4, COMPONENT, General Description.>
- Always tighten the bushing in the state that wheels are in full contact with the ground and the vehicle is curb weight.

Tightening torque:

Crossmember to body:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

Engine mounting to crossmember:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

Front arm-to-Crossmember:

95 N·m (9.7 kgf-m, 70.1 ft-lb)

Front arm-to-Support plate:

110 N·m (11.2 kgf-m, 81.1 ft-lb)

Support plate body:

150 N·m (15.3 kgf-m, 110.6 ft-lb)

Tie-rod end to housing:

27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

Retighten the castle nut further within 60° until the hole in ball stud is aligned with a slot in castle nut after tightening in specified torque.

Universal joint:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

Stabilizer bracket:

25 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer link:

45 N·m (2.5 kgf-m, 18.4 ft-lb)

Power steering hose-to-Steering gearbox:

15 N·m (1.5 kgf-m, 11 ft-lb)

- 2) Purge air from the power steering system.
- 3) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

Check the crossmember for wear, damage or cracks, and then repair or replace if defective.

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of the vehicle continues too long after running over bump and hump.
- 3) Large shock in bumping

Possible cause	Corrective action
(1) Breakage of coil spring	Replace.
(2) Overinflating pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of damper strut or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Tighten to specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

General Diagnostic Table

FRONT SUSPENSION
