

GROUP 33

FRONT SUSPENSION

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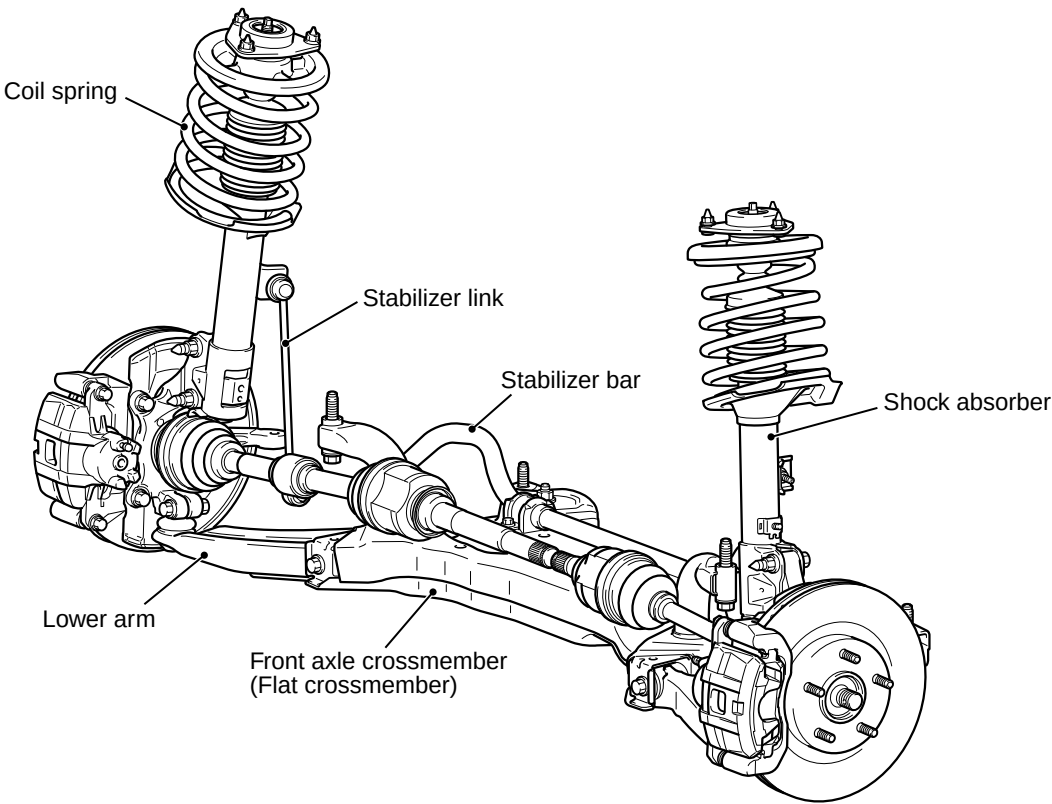
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GENERAL INFORMATION

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The MacPherson strut type suspension is adopted.

CONSTRUCTION DIAGRAM



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FASTENER TIGHTENING SPECIFICATIONS

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ITEM	SPECIFICATION
Lower arm assembly	
Lower arm to crossmember connection bolt (Front)	110 ± 11 N·m (81 ± 8 ft-lb)
Lower arm to crossmember connection nut (Rear)	110 ± 11 N·m (81 ± 8 ft-lb)
Lower arm to knuckle connection nut	71 ± 10 N·m (53 ± 7 ft-lb)
Stabilizer bar	
Stabilizer fixture bolt	31 ± 4 N·m (23 ± 3 ft-lb)
Strut assembly to stabilizer link connection nut	39 ± 6 N·m (29 ± 4 ft-lb)
Stabilizer to stabilizer link connection nut	39 ± 6 N·m (29 ± 4 ft-lb)
Strut assembly	
Strut assembly self-locking nut	60 ± 9 N·m (45 ± 6 ft-lb)
Strut assembly to body connection nut	45 ± 7 N·m (33 ± 5 ft-lb)
Strut assembly to knuckle connection nut	110 ± 11 N·m (81 ± 8 ft-lb)
Strut assembly to stabilizer link connection nut	39 ± 6 N·m (29 ± 4 ft-lb)

ITEM	SPECIFICATION
Wheel speed sensor clamp nut	11 ± 2 N·m (98 ± 17 in-lb)
Break hose clamp nut	11 ± 2 N·m (98 ± 17 in-lb)

GENERAL SPECIFICATIONS

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COIL SPRING

ITEM	SPECIFICATION
Wire diameter mm (in.)	14 (0.6)
Average diameter mm (in.)	159 (6.2)
Free length mm (in.)	345 (13.5)

SERVICE SPECIFICATIONS

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ITEM		SPECIFICATION
Toe-in mm (in)		1 ± 2 (0.04 ± 0.09)
Steering angle	Inner wheel	38°40' ± 1°30'
	Outer wheel (reference)	32°20'
Camber		0°20' ± 30' (Left/right deviation within 30')
Caster		2°57' ± 30' (Left/right deviation within 30')
Kingpin inclination		12°44' ± 1°30'
Lower arm ball joint breakaway torque N·m (in-lb)		2.2 to 4.1 (19 to 36)
Stabilizer link ball joint turning torque N·m (in-lb)		0.5 to 2.9 (4.4 to 26)

LUBRICANT

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ITEM	SPECIFIED LUBRICANT	QUANTITY
Lower arm ball joint	Lip portion of dust cover	As required
	Inside of dust cover	
Stabilizer link ball joint	Inside of dust cover	

FRONT SUSPENSION DIAGNOSIS

INTRODUCTION TO FRONT SUSPENSION DIAGNOSIS

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If the front suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of strut assembly, stabilizer

bar, coil spring, or worn or out-of-balance tires can cause these problems.

FRONT SUSPENSION DIAGNOSIS TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you

have exhausted most of the possible ways to find a front suspension fault.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the Symptom Chart and Symptom Procedures.
4. Verify malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Steering wheel is heavy, vibrates or pulls to one side	1	P.33-4
Excessive body rolling	2	P.33-4
Poor ride	3	P.33-5
Unequal ride height	4	P.33-5
Noise	5	P.33-5

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Steering Wheel Is Heavy, Vibrates or Pulls to One Side

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DIAGNOSIS

STEP 1. Check the tires.

Refer to GROUP 31, Diagnosis P.31-2.

Q:Are the tires in normal condition?

YES: Replace the tires as necessary, then go to Step 2.

NO: If out of balance, balance the tires as necessary. If excessively worn, replace the tires as necessary and go to Step 5.

STEP 2. Check the wheel alignment.

Refer to P.33-7.

Q:Is the wheel alignment correct?

YES: Go to Step 3.

NO: Adjust it, then go to Step 5.

STEP 3. Check the lower arm ball joint.

Q:Is the ball joint in good condition?

YES: Go to Step 4.

NO: Replace the lower arm assembly, then go to Step 5.

STEP 4. Check the coil spring.

Q:Is the coil spring in good condition?

YES: Go to Step 5.

NO: Replace it, then go to Step 5.

STEP 5. Retest the system.

Q:Is the malfunction eliminated?

YES: The procedure is complete.

NO: Return to Step 1.

INSPECTION PROCEDURE 2: Excessive Body Rolling

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DIAGNOSIS

STEP 1. Check for broken or deteriorated stabilizer bar.

Q:Is the stabilizer bar in good condition?

YES: Go to Step 2.

NO: Replace it, then go to Step 3.

STEP 2. Check the strut assembly for damage.

Q:Is the strut assembly in good condition?

YES: Go to Step 3.
NO: Replace it, then go to Step 3.

YES: The procedure is complete.
NO: Return to Step 1.

STEP 3. Retest the system.

Q:Is the malfunction eliminated?

INSPECTION PROCEDURE 3: Poor Ride

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DIAGNOSIS

NO: Go to Step 3.

STEP 1. Check for improper tire inflation pressure.
Refer to GROUP 31, On-vehicle Service - Tire Inflation Pressure Check P.31-7.

Q:Is the tire inflation correct?

YES: Go to Step 2.
NO: Adjust it, then go to Step 4.

STEP 2. Check for broken or deteriorated coil spring(s).

Q:Are the coil spring(s) broken or deteriorated?

YES: Replace the coil spring(s), then go to Step 4.

STEP 3. Check for strut assembly damage.

Q:Is the strut assembly damaged?

YES: Replace it, then go to Step 4.
NO: Go to Step 4.

STEP 4. Retest the system.

Q:Is the malfunction eliminated?

YES: The procedure is complete.
NO: Return to Step 1.

INSPECTION PROCEDURE 4: Unequal Ride Height

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DIAGNOSIS

NO: Go to Step 2.

STEP 1. Check for broken or deteriorated coil spring(s).

Q:Is the coil spring(s) broken or deteriorated?

YES: Replace it, then go to Step 2.

STEP 2. Retest the system.

Q:Is the malfunction eliminated?

YES: The procedure is complete.
NO: Return to Step 1.

INSPECTION PROCEDURE 5: Noise

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DIAGNOSIS

STEP 1. Check for lack of lubrication.

Q:Is lubrication inadequate?

YES: Lubricate it, then go to Step 5.
NO: Go to Step 2.

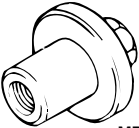
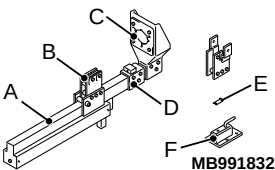
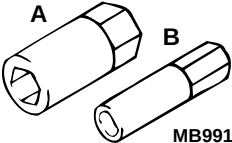
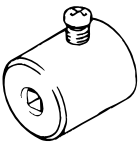
STEP 2. Check the tightened parts for looseness as well as the bushings for wear.

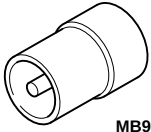
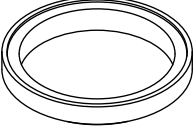
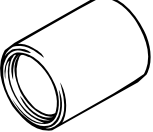
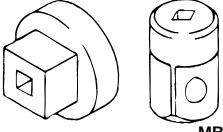
Q:Are the tightened parts and bushings in good condition?

YES: Go to Step 3.
NO: Replace it, then go to Step 5.

STEP 3. Check for broken coil spring.**Q: Is the coil spring broken?****YES:** Replace it, then go to Step 5.**NO:** Go to Step 4.**STEP 4. Check for strut assembly damage.****Q: Is the strut assembly damaged?****YES:** Replace it, then go to Step 5.**NO:** Go to Step 5.**STEP 5. Retest the system.****Q: Is the malfunction eliminated?****YES:** The procedure is complete.**NO:** Return to Step 1.**SPECIAL TOOLS**

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TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
 MB991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 MB991832	MB991832 Spring compressor set A: MB991793 Spring compressor B: MB991795 Attachment A C: MB991794 Upper plate D: MB991829 Arm bracket E: MB991831 Spacer F: MB991830 Fixture	General service tool	Front coil spring compression <i>NOTE: The coil spring can not be compressed by following conventional special tools.</i> *MB991237 Spring compressor body *MB991238 Arm set
 MB991680	MB991680 Wrench set A: MB991681 Wrench B: MB991682 Socket	-	Strut assembly and disassembly
 MB991006	MB991006 Preload socket	MB990228-01	Lower arm ball joint breakaway torque check
 MB990800AA01	MB990800 Ball joint dust cover installer	MB990800-01 or General service tool	Lower arm ball joint dust cover installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB992119	MB992119 Arm bushing & installer	-	Lower arm bushing removal and press-fitting
	MB990979 Ring	-	
 YB990890AA00	MB990890 Rear suspension bushing base	MB990890-01 or general service tool	
 MB990326	MB990326 Preload socket	General service tool	Ball joint turning torque check

ON-VEHICLE SERVICE

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

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Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system, wheels, and tires should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value: 1 ± 2 mm (0.04 ± 0.09 inch)

1. Adjust the toe-in by undoing the clip and jam nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

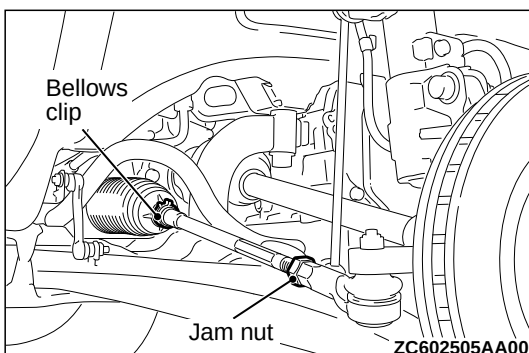
NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

2. Install the clip and tighten the jam nut to the specified torque.

Tightening torque: 52 ± 2 N·m (38 ± 2 ft-lb)

3. Confirm that the toe-in is at the standard value.
4. Use a turning radius gauge to check that the steering angle is at the standard value.

STEERING ANGLE



Standard value:

38°40' ± 1°30' Inner wheel

32°20' Outer wheel (reference)

CAMBER, CASTER AND KINGPIN INCLINATION**Required Special Tool:**

- MB991004: Wheel Alignment Gauge Attachment
- Vehicles with aluminum wheels

Standard value:

Camber 0°20' ± 0°30' (Left/right deviation within 30')

Caster 2°57' ± 0°30' (Left/right deviation within 30')

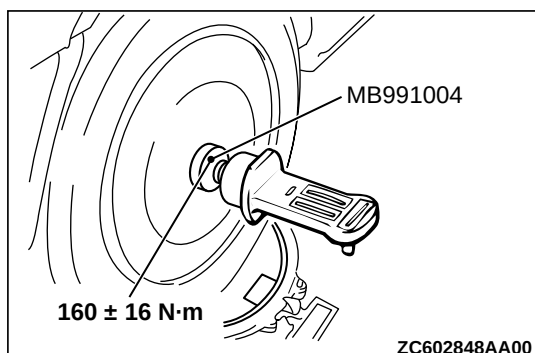
Kingpin inclination 12°44' ± 1°30'

NOTE: Camber and caster are preset at the factory and cannot be adjusted.

CAUTION

Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

NOTE: For vehicles with aluminum type wheels, attach the camber/caster/kingpin gauge to the driveshaft by using the special tool MB991004. Tighten the special tool MB991004 to the same torque 245 ± 29 N·m (181 ± 21 ft-lb) as the driveshaft nut.

**LOWER ARM BALL JOINT END PLAY CHECK**

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1. Raise the vehicle.
2. Remove the stabilizer link from the lower arm.
3. Move the lower arm up and down with your hands to check for an excessive play in the axial direction of the ball joint. If there is an excessive play, replace the lower arm assembly.

BALL JOINT DUST COVER CHECK

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1. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
2. If the dust cover is cracked or damaged, replace the lower arm assembly.

NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

STRUT ASSEMBLY

REMOVAL AND INSTALLATION

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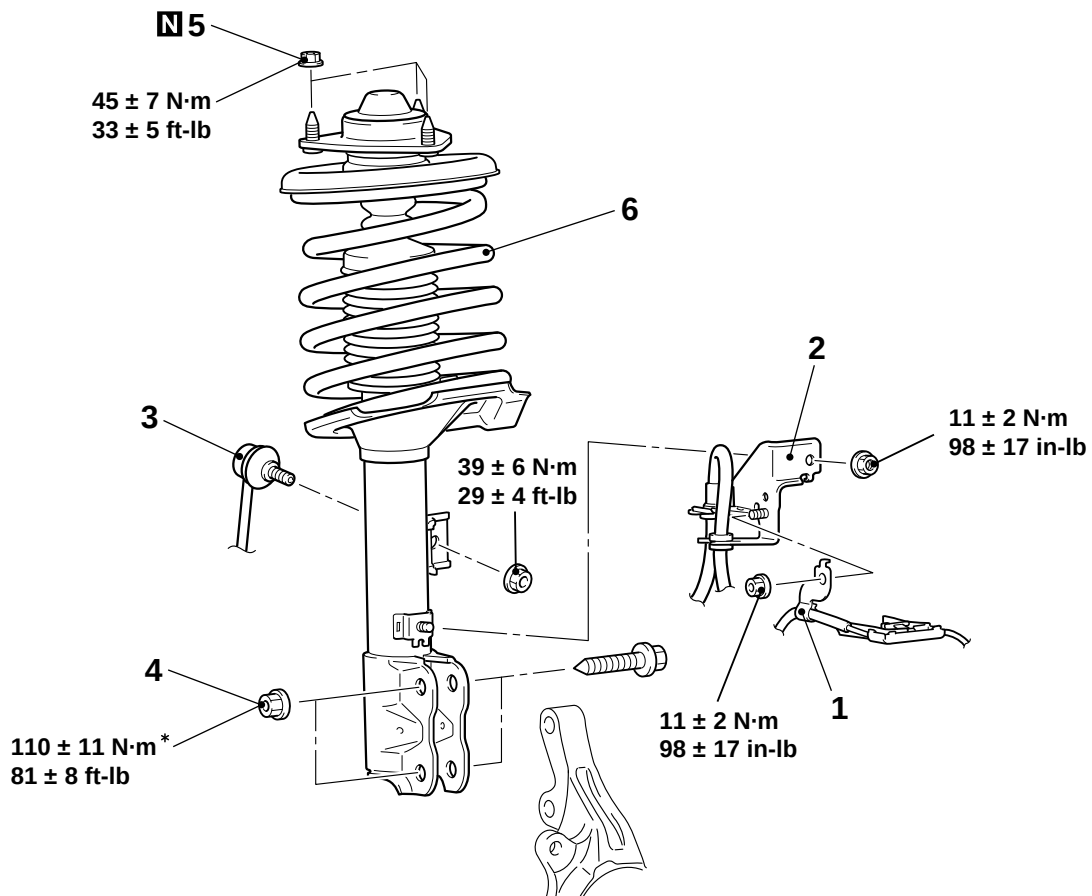
CAUTION

•As for vehicles with headlamp auto levelling system, disconnect the height sensor from the lower arm before operation to prevent damages to the height sensor. (Refer to GROUP 54Ac - Height Sensor P.54Ac-179.)

Post-installation operation

Front wheel alignment check and adjustment (Refer to P.33-7.)

•The part indicated by * is the bolt/nut with friction coefficient stabilizer. In removal, ensure there is no damage, clean dust and soiling from the bearing and thread surfaces, and tighten it to the specified torque.



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Removal steps

1. Wheel speed sensor clamp (strut side)
2. Brake hose clamp (strut side)
3. Stabilizer link and strut connection
4. Knuckle and strut connection (self-locking nut)

Removal steps

5. Stabilizer link mounting nuts
6. Strut assembly

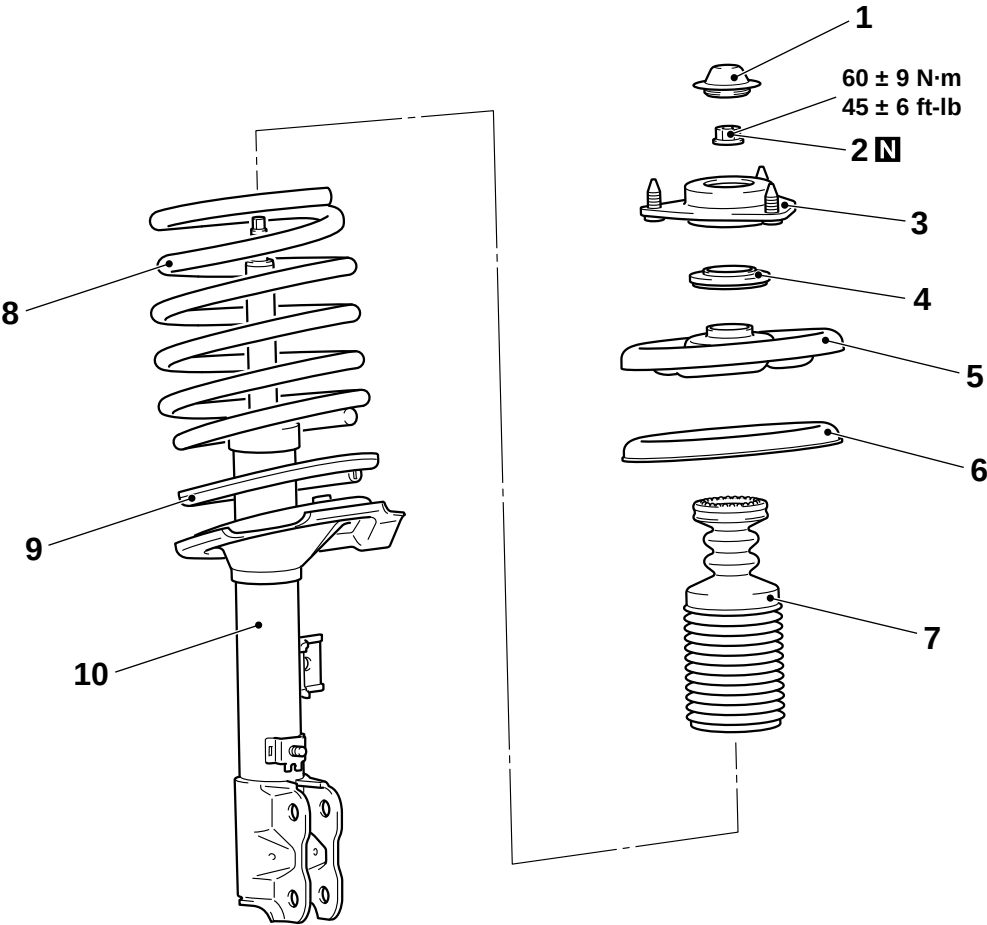
INSPECTION

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- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

DISASSEMBLY AND ASSEMBLY

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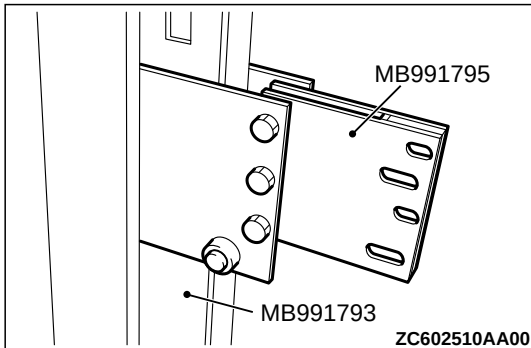
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Disassembly steps		Disassembly steps	
<<A>>	>>C<<	1.	Strut cap
		2.	Strut nut
		3.	Strut insulator assembly
	>>B<<	4.	Bearing
		5.	Upper spring seat
		6.	Upper spring pad
		7.	Bump rubber
		8.	Coil spring
		9.	Spring tube
		10.	Strut assembly

DISASSEMBLY SERVICE POINT

A STRUT NUT (SELF-LOCKING NUT) REMOVAL

1. Install the attachment A (Special tool: MB991795) to the spring compressor (Special tool: MB991793) as shown in the figure.

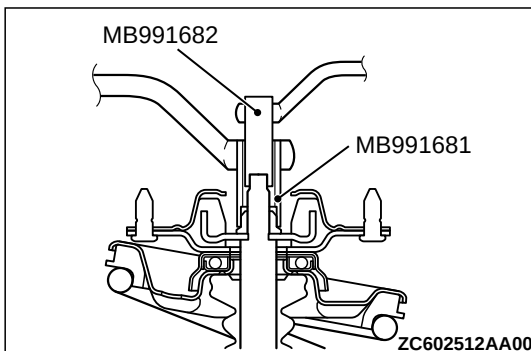
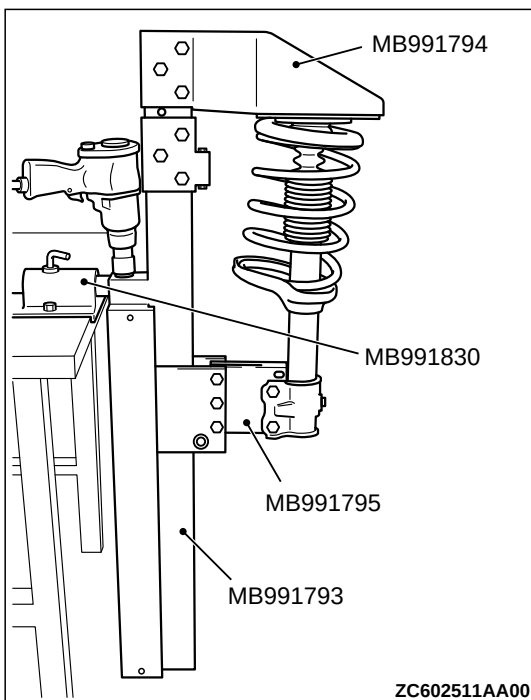


2. Set the strut assembly to the following special tools:

- Spring compressor (MB991793)
- Attachment A (MB991795)
- Upper plate (MB991794)
- Fixture (MB991830)

NOTE: Use the bolts and nuts removed from the vehicle to secure the strut assembly and tighten them lightly by hand.

3. After setting the strut assembly, operate the spring compressor and compress the coil spring by approximately 5 mm.



CAUTION

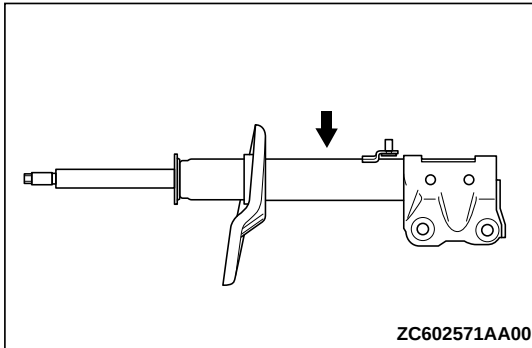
The locking nut for the piston rod inside the strut may be loose. Do not use the impact wrench to loosen the strut nut (self-locking nut).

4. Use the following tools to loosen the strut nut (self-locking nut):
 - Wrench (MB991681)
 - Socket (MB991682)

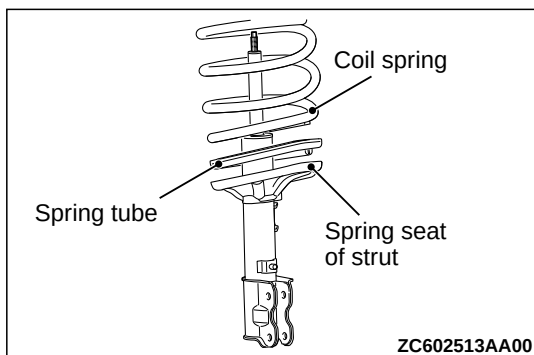
B STRUT DISPOSAL**⚠ CAUTION**

Wear the protective glasses. Although the gas is harmless, drilling chips may be blown out by the gas.

Before disposal of the strut, place the strut on the level surface with the piston rod extended, and make a hole of approximately 3 mm in diameter at the point shown in the figure to discharge the gas.

**ASSEMBLY SERVICE POINT****A COIL SPRING INSTALLATION**

1. Fit the coil spring to the spring tube securely.
2. Install the coil spring equipping with the spring tube to align the bottom with the shape of the strut spring sheet.

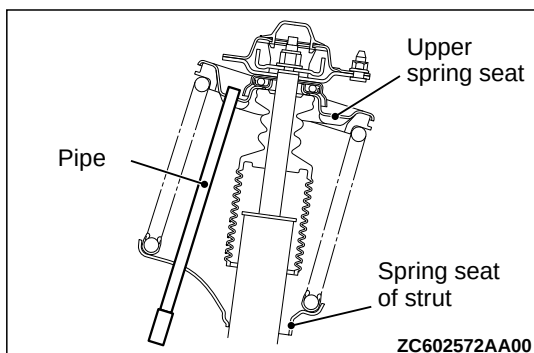
**B STRUT BEARING INSTALLATION****⚠ CAUTION**

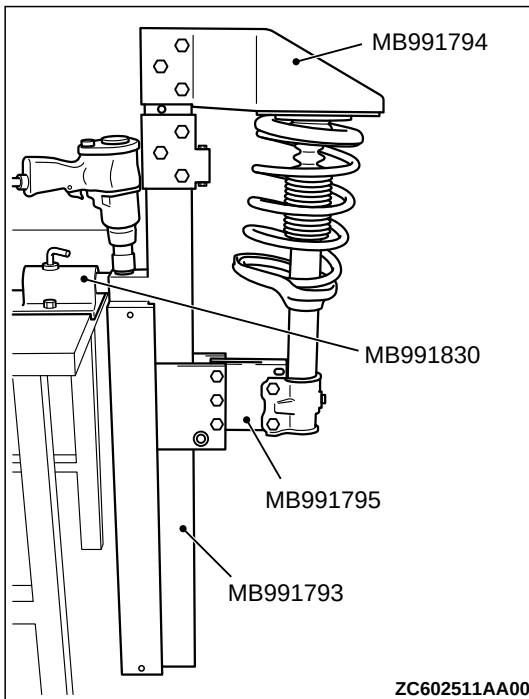
Install the strut bearing without any damage.

C STRUT NUT (SELF-LOCKING NUT) INSTALLATION

1. Check that both of the coil spring ends align with the spring sheet groove correctly.
2. Align the strut spring sheet hole with the upper spring sheet hole.

NOTE: Use the pipe to align the holes easily.



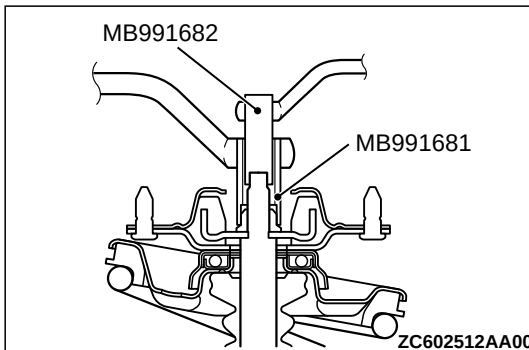


CAUTION

Be careful that the hand is not pinched by the coil spring when aligning the piston rod with the hole of upper insulator while compressing the coil spring.

3. While passing the strut piston rod through the hole of upper insulator by hand, slowly compress the coil spring by the following special tool:

- Spring compressor (MB991793)
- Attachment A (MB991795)
- Upper plate (MB991794)
- Fixture (MB991830)



CAUTION

The locking nut for the piston rod inside the strut may be loose. Do not use the impact wrench to loosen the strut nut (self-locking nut).

4. Use the following special tools to tighten the strut nut (self-locking nut) to the specified torque:

- Wrench (MB991681)
- Socket (MB991682)

Tightening torque: 60 ± 9 N·m

LOWER ARM

REMOVAL AND INSTALLATION

CAUTION

*The part indicated by ** indicates parts which should be temporarily tightened, and then fully tightened with the vehicle standing on the ground and the curb weight condition.

Pre-removal operation

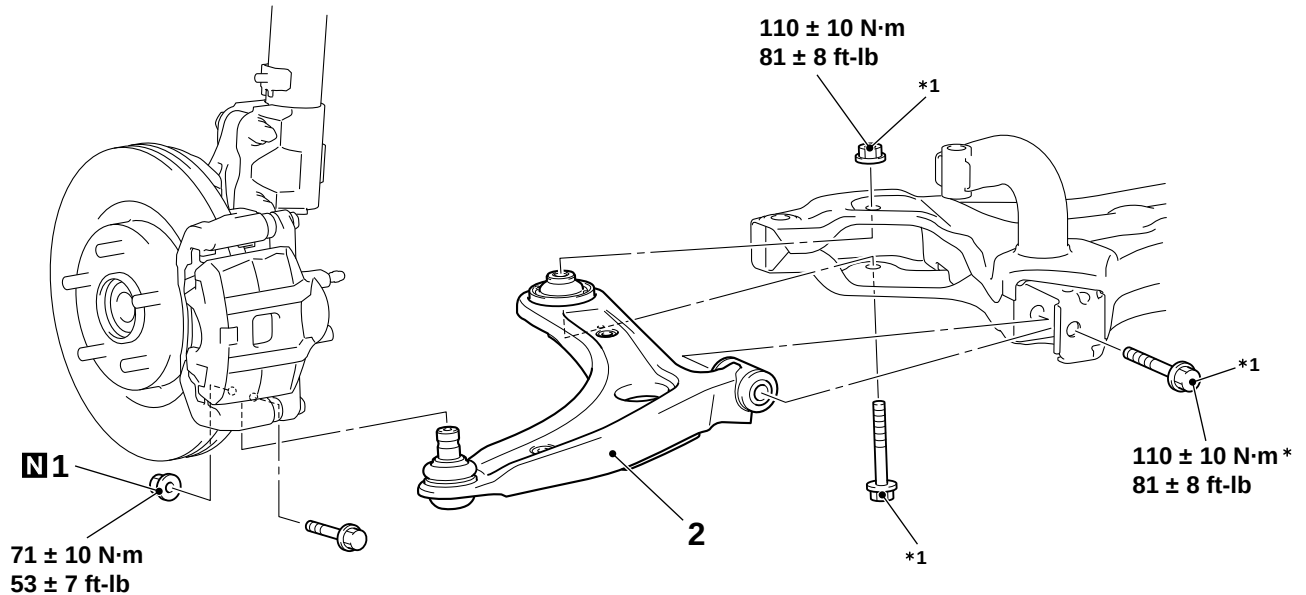
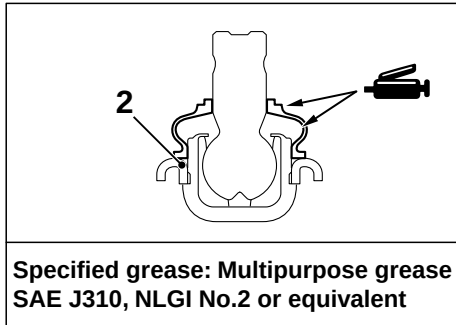
- Front height sensor removal (Refer to GROUP 54Ac - Height sensor P.54Ac-179.)

Post-installation operation

- Front height sensor installation (Refer to GROUP 54Ac - Height sensor P.54Ac-179.)
- Using your fingers, press the dust cover to check for a crack or damage.
- Wheel alignment check and adjustment (Refer to P.33-7.)

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*The parts indicated by *¹ are the bolts/nuts with friction coefficient stabilizer. In removal, ensure there is no damage, clean dust and soiling from the bearing and thread surfaces, and tighten them to the specified torque.



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Removal steps

1. Lower arm nut (self-locking nut)

Removal steps

2. Lower arm assembly

LOWER ARM CHECK

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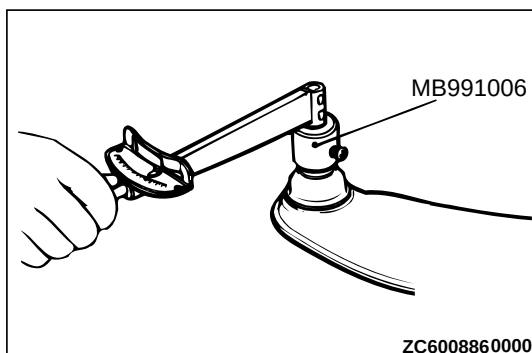
- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check all bolts for condition and straightness.

LOWER ARM BALL JOINT ROTATION STARTING TORQUE

1. Move the lower arm ball joint stud back and forth for several times, and measure the lower arm ball joint rotation starting torque using the preload socket (Special tool: MB991006).

Standard value: 2.2 to 4.1 N·m (19 to 36 in-lb)

2. If the measured value exceeds the standard range, replace the lower arm assembly.
3. Even if the measured value is within the standard range, check the lower arm ball joint that there is no looseness or gritty feeling. If there is no looseness or gritty feeling, it is judged as usable.



LOWER ARM BALL JOINT DUST COVER CHECK

1. Using your fingers, press the dust cover to check for a crack or damage.
2. If the dust cover has any crack or damage, replace the lower arm assembly.

NOTE: If the dust cover has a crack or damage, the ball joint could be damaged. If the dust cover is damaged during the maintenance, replace it.

LOWER ARM BALL JOINT DUST COVER REPLACEMENT

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Only when the dust cover is damaged accidentally during maintenance, replace the dust cover as follows:

1. Remove the dust cover.
2. Fill and apply the specified grease into the inside and lip of the dust cover.

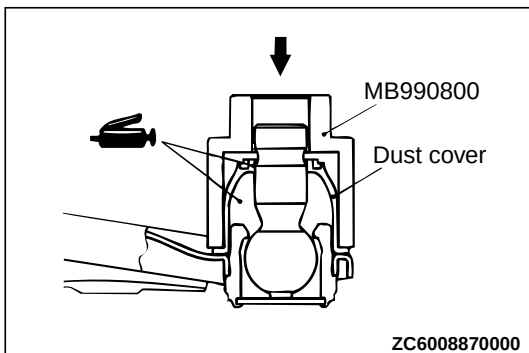
Specified grease

Shell Sunlight Grease MB2 or equivalent

Usage:

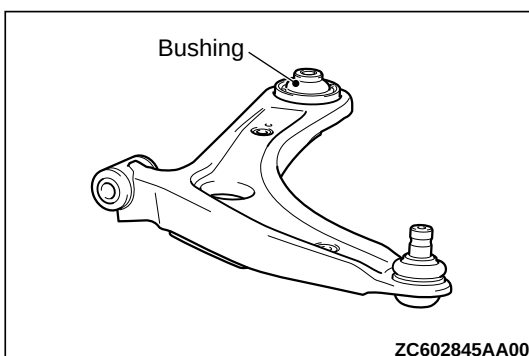
Inside of dust cover 9.0 ± 1.0 g, Lip: Adequate

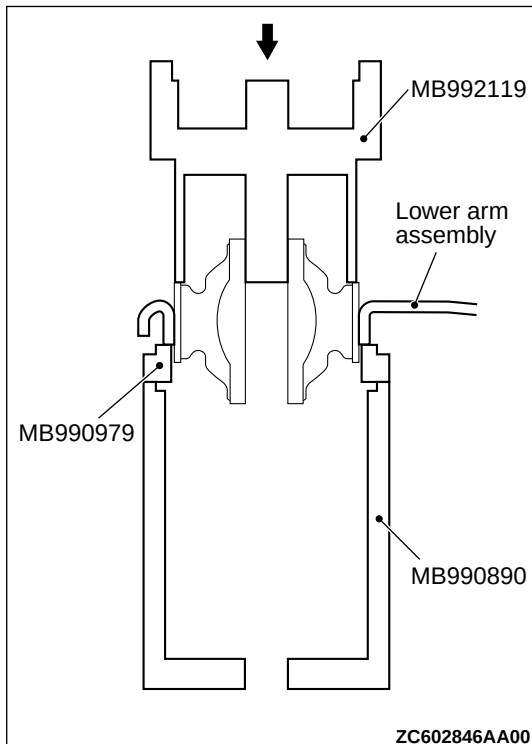
3. Use the ball joint remover & installer (Special tool: MB990800) to drive in the dust cover to the point where it contact with the lower arm assembly.
4. Using your fingers, press the dust cover to check for a crack or damage.

**LOWER ARM BUSHING REPLACEMENT**

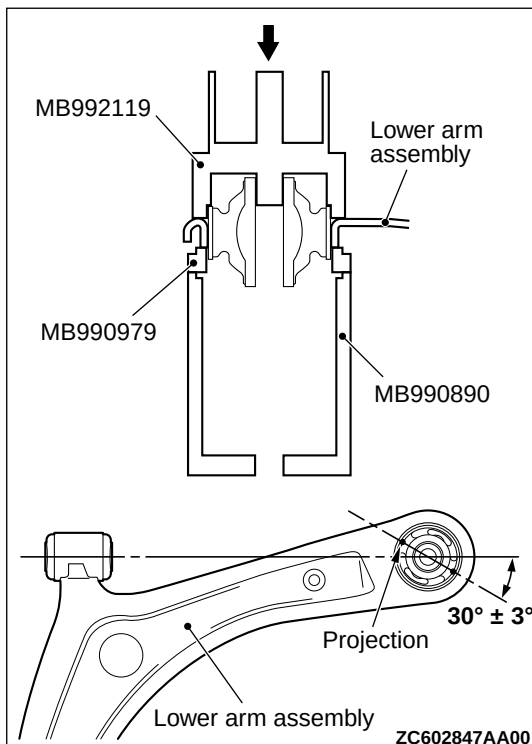
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Replace the back side bushing according to the following procedure.





1. Use the following special tools to remove the bushing:
 - MB992119 (Arm bushing remover and installer)
 - MB990979 (Ring)
 - MB990890 (Rear suspension bushing base)



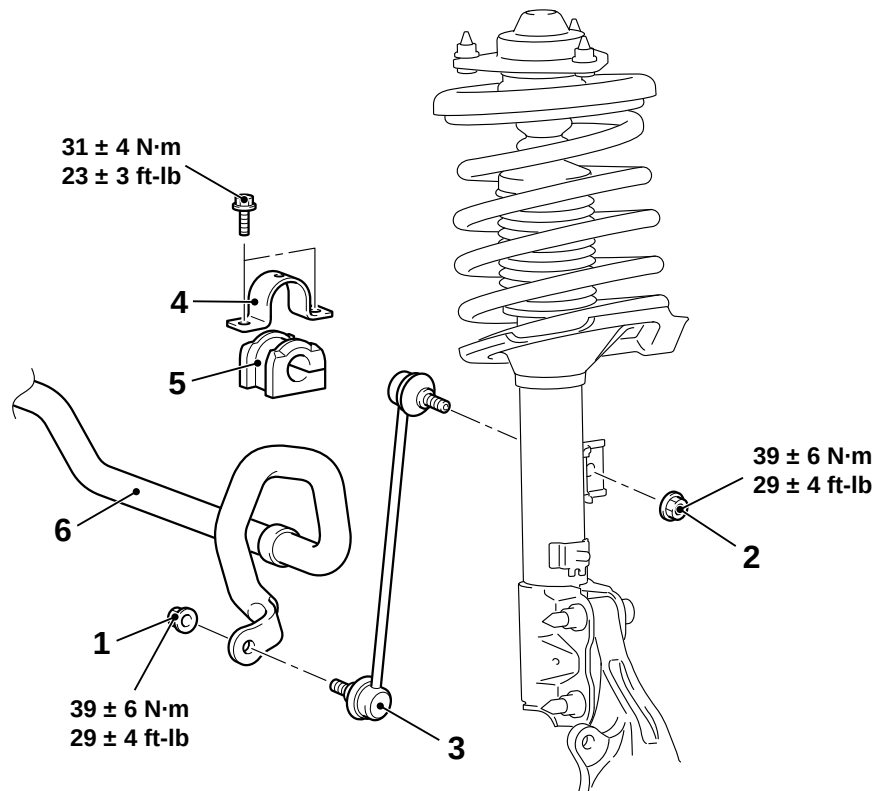
2. Use the following special tools to press-fit the bushing.
 - MB992119 (Arm bushing remover and installer)
 - MB990979 (Ring)
 - MB990890 (Rear suspension bushing base)
3. Press-fit the bushing so that the bushing protrusion is in the direction shown in the figure.
4. Press-fit the bushing until the special tool contacts with the lower arm assembly.

STABILIZER BAR

REMOVAL AND INSTALLATION

Post-installation operation

Front wheel alignment check and adjustment (Refer to P.33-7.)



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Stabilizer link removal steps

1. Stabilizer nut
2. Stabilizer nut
3. Stabiliser link

Stabilizer bushing removal steps

1. Stabilizer nut
4. Stabilizer bar bracket
5. Stabilizer bushing

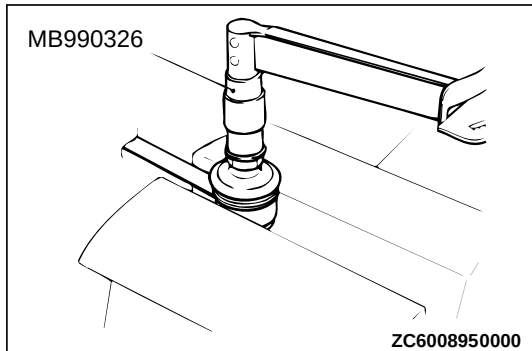
Stabilizer bar removal steps

1. Stabilizer nut
- Front axle No.1 crossmember (Refer to GROUP 32 - Crossmember P.32-7.)
4. Stabilizer bar bracket
5. Stabilizer bushing
6. Stabilizer bar

INSPECTION

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- Check the bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

**STABILIZER LINK BALL JOINT ROTATION STARTING TORQUE CHECK**

1. Move the stabilizer link ball joint stud back and forth for several times, install the stud with nut, and measure the stabilizer link ball joint rotation starting torque using the preload socket (Special tool: MB990326).

Standard value: 0.5 to 2.9 N·m (4.4 to 26 in-lb)

2. When the measured value exceeds the standard range, replace the stabilizer link.
3. If the measured value stays within the standard range, and there is looseness or gritty feeling, the component is judged as unusable and should be replaced.

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Using your fingers, press the dust cover to check for a crack or damage.
2. If the dust cover has a crack or damage, replace the stabilizer link.

NOTE: If the dust cover has a crack or damage, the ball joint could be damaged.