GROUP 33

FRONT SUSPENSION

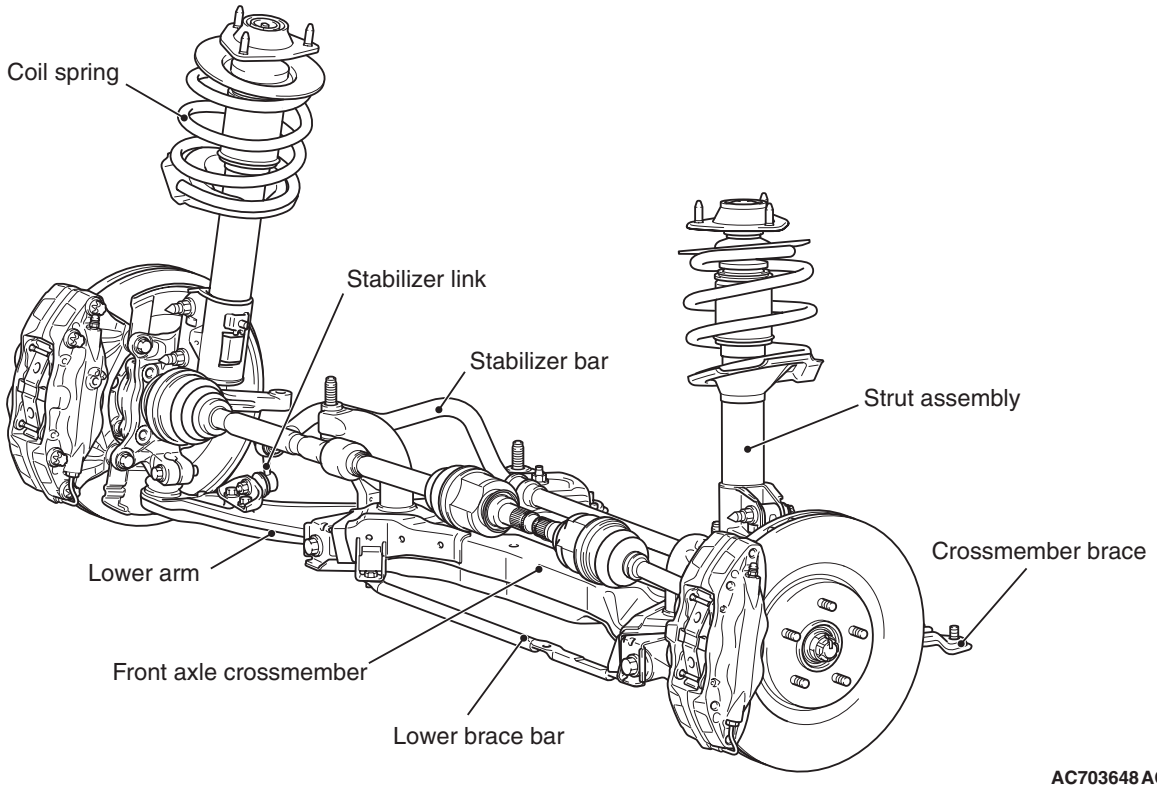
CONTENTS

GENERAL INFORMATION

M1332000101198

The MacPherson strut type suspension is adopted.

CONSTRUCTION DIAGRAM



FASTENER TIGHTENING SPECIFICATIONS

M1332008500335

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)
Lower arm to stabilizer link bracket connection bolt	39 ±5 N· m (29 ±4 ft-lb)
Stabilizer bar	
Stabilizer fixture bolt	31 ±4 N· m (23 ±3 ft-lb)
Stabilizer link bracket to Lower arm connection bolt	39 ±5 N· m (29 ±4 ft-lb)
Stabilizer to stabilizer link connection nut	39 ±6 N· m (29 ±4 ft-lb)
Stabilizer bracket to stabilizer link connection nut	39 ±6 N· m (29 ±4 ft-lb)
Strut assembly	
Strut assembly self-locking nut	61 ±9 N· m (45 ±7 ft-lb)
Strut assembly to body connection nut	45 ±7 N· m (33 ±5 ft-lb)

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Item	Specification
Strut assembly to knuckle connection nut	110 ±11 N· m (81 ±8 ft-lb)
Wheel speed sensor clamp nut	13 ±2 N· m (111 ±22 in-lb)
Strut assembly to break hose bracket connection nut	13 ±2 N· m (111 ±22 in-lb)

GENERAL SPECIFICATIONS

M1332000200396

COIL SPRING

Item	GSR		MR
	M/T	TC-SST	
Wire diameter mm (in)	14 (0.55), 15 (0.59)*	14 (0.55), 15 (0.59)*	15
Average outside diameter mm (in)	121 –159 (4.7 –6.2), 120 –160 (4.7 –6.2)*	121 –159 (4.7 –6.2), 120 –160 (4.7 –6.2)*	120 –160
Free length mm (in)	286 (11.2), 287 (11.2)*	291 (11.4), 292 (11.4)*	292

*NOTE: *: Optional*

SERVICE SPECIFICATIONS

M1332000301341

Item		Specification
Toe-in mm (in)		0 ±2 (0 ±0.07)
Steering angle	Inner wheel	33 ° 10' ±1 ° 30'
	Outer wheel (reference)	28 ° 10'
Camber		–1° 00' ±30' (Left/right deviation within 30')
Caster		4° 25' ±30' (Left/right deviation within 30')
Kingpin inclination		13 ° 50' ±1 ° 30'
Lower arm ball joint breakaway torque N· m (in-lb)		3.4 or less (29 or less)
Stabilizer link ball joint turning torque N· m (in-lb)	Within 10 to 30° C (50 to 86° F)	0.2 –2.0 (1.7 –17)
	Not within 10 to 30° C (50 to 86° F)	{0.2 –5.0 (1.7 –44)

FRONT SUSPENSION DIAGNOSIS

INTRODUCTION TO FRONT SUSPENSION DIAGNOSIS

M1332009000281

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

M1332009100277

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

M1332009400319

Symptom	Inspection procedure	Reference page
Steering wheel is heavy, vibrates or pulls to one side	1	P.33-4
Excessive body rolling	2	P.33-5
Poor ride	3	P.33-5
Unequal ride height	4	P.33-5
Noise	5	P.33-6

SYMPTOM PROCEDURES

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

DIAGNOSIS

STEP 1. Check the tires.
Refer to GROUP 31, Diagnosis P.31-3.

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

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.

STEP 3. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Poor Ride

DIAGNOSIS

STEP 1. Check for improper tire inflation pressure.
Refer to GROUP 31, On-vehicle Service –Tire Inflation Pressure Check P.31-8.

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.
NO : Go to Step 3.

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

DIAGNOSIS

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.
NO : 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

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.

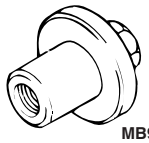
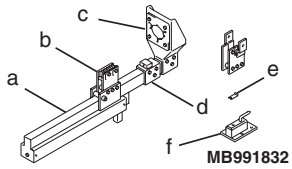
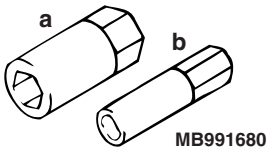
Q: Is the strut assembly damaged?
YES : Replace it, then go to Step 5.
NO : Go to Step 5.

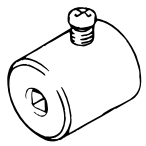
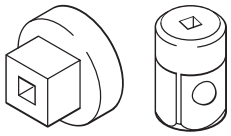
STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOLS

M1332000600907

Tool	Tool number and name	Supersession	Appli8cation
 MB991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 MB991832	MB991832 a. MB991793 b. MB991795 c. MB991794 d. MB991829 e. MB991831 f. MB991830 Spring compressor set a. Spring compressor b. Attachment A c. Upper plate d. Arm bracket e. Spacer f. Fixture	General service tool	Front coil spring compression *NOTE: The coil spring can not be compressed by following conventional special tools.* • *MB991237 Spring compressor body* • *MB991238 Arm set*
 MB991680	MB991680 a. MB991681 b. MB991682 Wrench set a. Wrench b. Socket	–	Strut assembly disassembly and reassembly

Tool	Tool number and name	Supersession	Appli8cation
 MB991006	MB991006 Preload socket	MB990228-01	Lower arm ball joint breakaway torque check
 MB990800	MB990800 Ball joint dust cover installer	MB990800-01or General service tool	Lower arm ball joint dust cover installation
 MB990326	MB990326 Preload socket	General service tool	Ball joint turning torque check

ON-VEHICLE SERVICE

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1332012400267

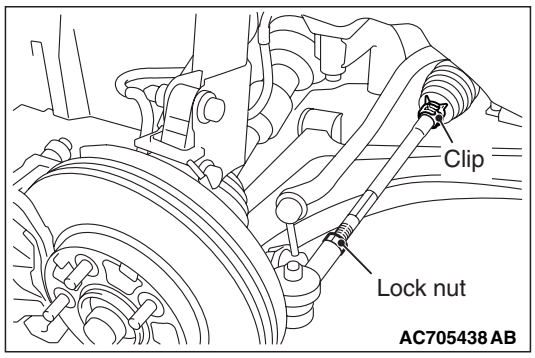
⚠ CAUTION

After performing the front wheel alignment, perform a calibration for the ASC-ECU to learn the steering wheel sensor neutral point. (Refer to GROUP 35C –On-vehicle Service, Steering Wheel Sensor Calibration P.35C-267.)

1. Before the wheel alignment measurement, maintain the front suspension, the steering system, the wheel and tires in good condition.
2. Park the vehicle on a level surface, and position the front wheel in the straight-ahead position to measure the wheel alignment.

TOE-IN

Standard value: 0 ±2 mm (0 ±0.07 inch)



1. Loosen the lock nut with the tie-rod clip removed, and then perform the adjustment by turning the tie-rod left/right at the same degree in the opposite direction.

   NOTE: The toe moves to the outside by turning the tie-rod left to the forward direction, and right to the reverse direction.
2. After adjustment, check that the steering angle is within the standard range using the turning radius gauge. (Refer to GROUP 37 –On-vehicle Service P.37-14.)

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CAMBER, CASTER AND KINGPIN INCLINATION

CAMBER

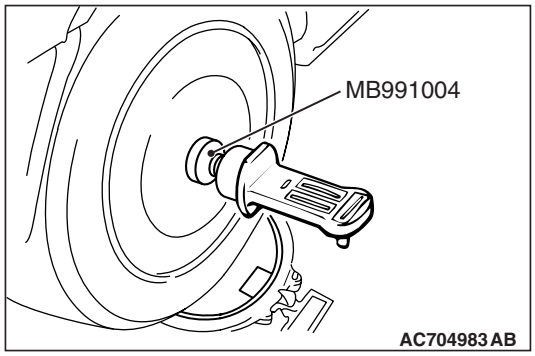
Standard value:
−1° 00' ±0° 30' (Left/right deviation within 30')

CASTER

Standard value:
4° 25' ±0° 30' (Left/right deviation within 30')
Kingpin inclination 13° 50' ±1° 30'

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

⚠ CAUTION
Do not apply the vehicle weight to the wheel bearing with the driveshaft nut loosened.



NOTE: Tighten the wheel alignment gauge attachment (special tool: MB991004) to the specified torque, then perform measurement.

Tightening torque: 144 −176 N· m (107 −129 ft-lb)

LOWER ARM BALL JOINT LOOSENESS CHECK

M1332015000224

1. Raise the vehicle.
2. Move the lower arm assembly 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.(Refer to P.33-15.)

BALL JOINT DUST COVER CHECK

M1332008600741

LOWER ARM BALL JOINT DUST COVER CHECK

⚠ CAUTION
Do not damage the lower arm ball joint dust cover during maintenance.

1. Using your fingers, press the dust cover to check for a crack or damage.
2. If there is a crack or damage on the dust cover, replace the lower arm assembly. (Refer to P.33-15.)

   NOTE: The crack or damage on the dust cover may damage the ball joint.
   If the dust cover is damaged during maintenance, replace the dust cover. (Refer to P.33-16.)

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Using your fingers, press the dust cover to check for a crack or damage.
2. If there is a crack or damage on the dust cover, replace the stabilizer link. (Refer to P.33-17.)

   NOTE: The crack or damage on the dust cover may damage the ball joint.
   If the dust cover is damaged during maintenance, replace the stabilizer link. (Refer to P.33-17.)

STRUT ASSEMBLY

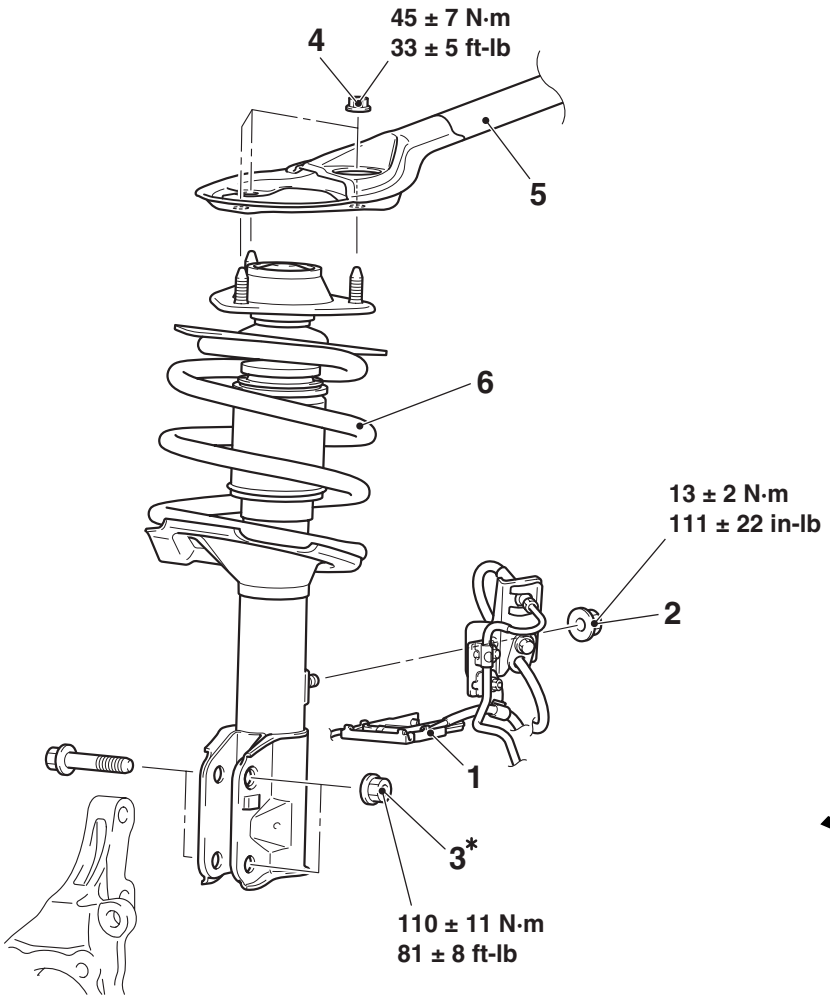
REMOVAL AND INSTALLATION

M1332001101083

⚠ CAUTION

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

Post-installation Operation
Front Wheel Alignment Check and Adjustment (Refer to P.33-7).



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Removal steps
1. Harness clip and strut assembly connection
2. Brake hose bracket and strut assembly connection

>>A<<

Removal steps (Continued)
3. Knuckle and strut connection
4. Strut mounting nuts
5. Strut tower bar
6. Strut assembly

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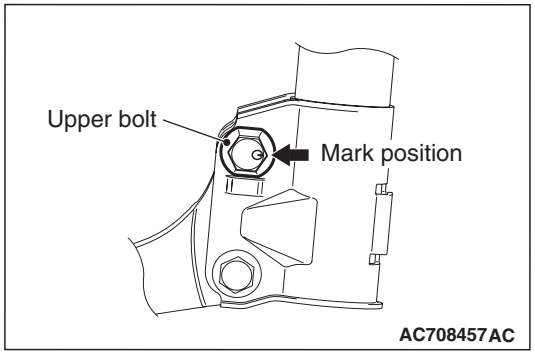
INSTALLATION SERVICE POINTS

>>A<< KNUCKLE AND STRUT ASSEMBLY CONNECTION BOLT INSTALLATION

Locate the knuckle and strut assembly upper connection bolt's marking position as shown in the figure and tighten it.



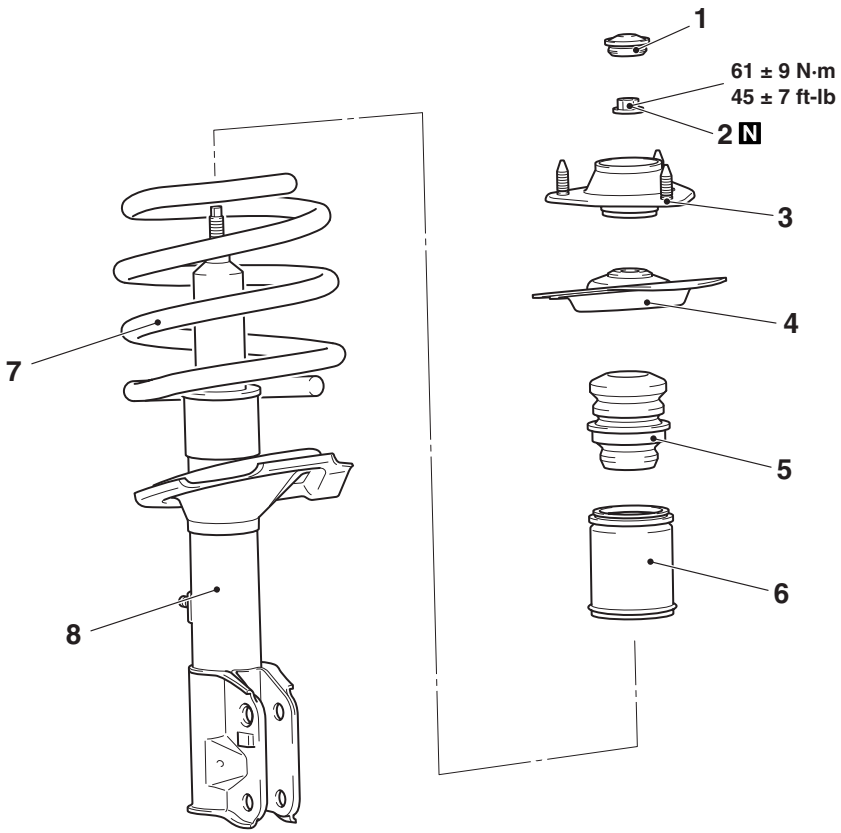
INSPECTION

M1332001200430

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

DISASSEMBLY AND REASSEMBLY

M1332001300932



		Disassembly steps
		1. Cap
<<**A**>>	>>**C**<<	2. Strut nut (Self-locking nut)
		3. Strut insulator assembly
	>>**B**<<	4. Upper spring seat

		Disassembly steps
		5. Bump rubber
		6. Dust cover
	>>**A**<<	7. Coil spring
<<**B**>>		8. Strut assembly

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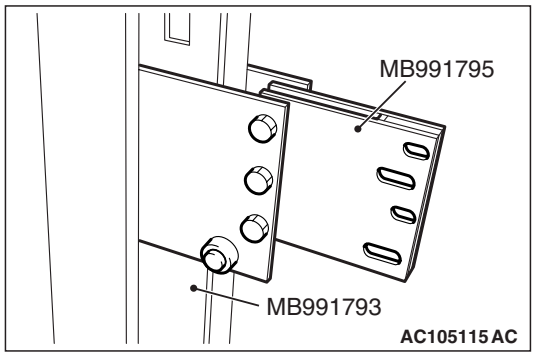
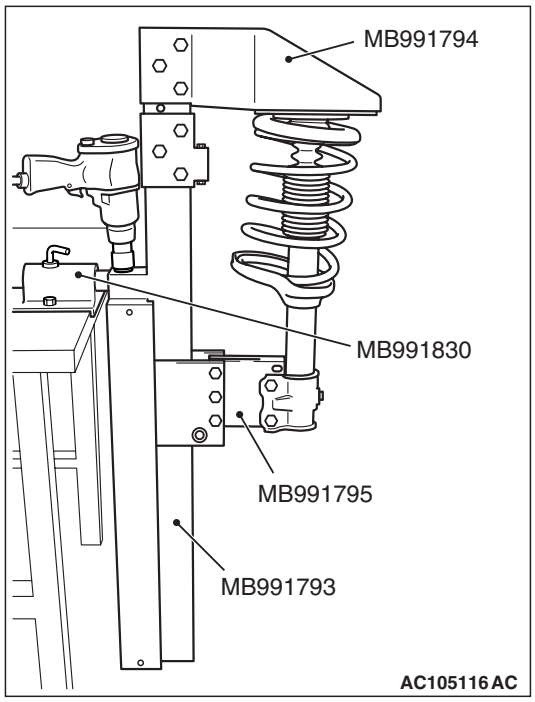
DISASSEMBLY SERVICE POINTS

<<A>> STRUT NUT REMOVAL



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

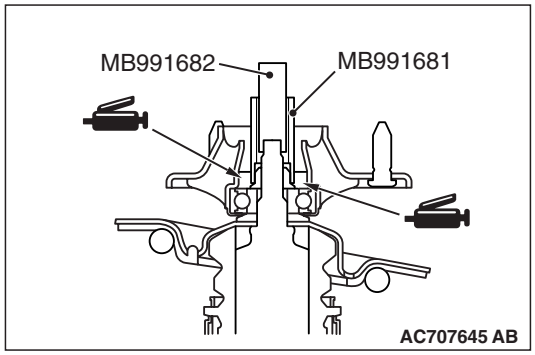


2. Set the strut assembly to the following special tools.
   - Spring compressor (MB991793)
   - Attachment A (MB991795)
   - Upper plate (MB991794)
   - Fixture (MB991830)

   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 lock nut for the piston rod inside the strut may be loose. Do not use the impact wrench to loosen the strut nut.



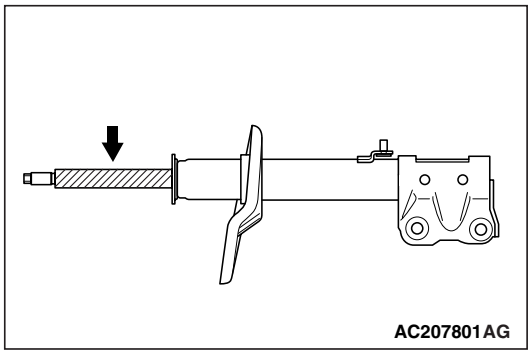
4. Use the following special tools to loosen the strut nut.
   - Wrench (MB991681)
   - Socket (MB991682)

<<B>> STRUT ASSEMBLY DISPOSAL

⚠ CAUTION

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

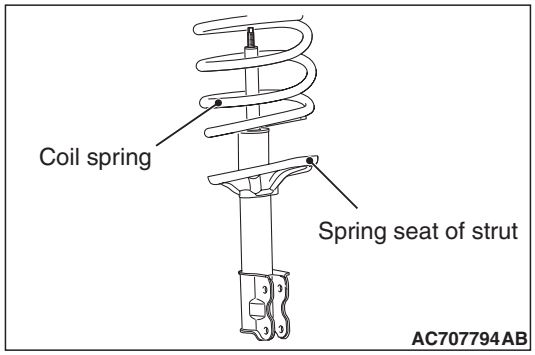
Before disposal of the strut, place the strut on the level surface with the piston rod extended, and make a hole of approximately 3 mm in diameter at the point shown in the figure to discharge the gas.



REASSEMBLY SERVICE POINTS

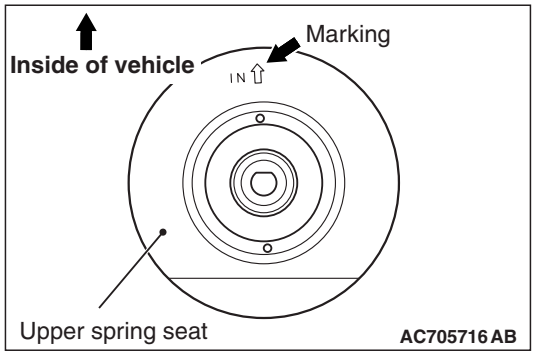
>>A<< COIL SPRING INSTALLATION

Install the coil spring to align the bottom with the shape of the strut spring seat.



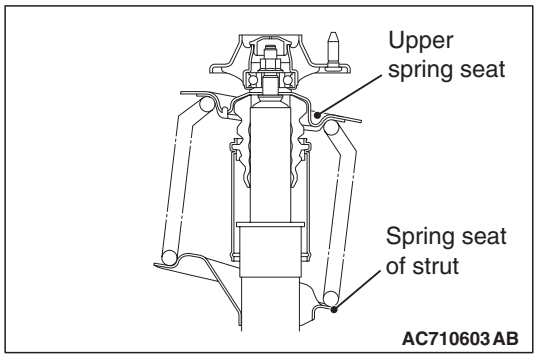
>>B<< UPPER SPRING SEAT INSTALLATION

Align the D-shaped hole with the D (cut-off) of the strut, and install the marked part shown in the figure facing the inside of the vehicle.



>>C<< STRUT NUT INSTALLATION

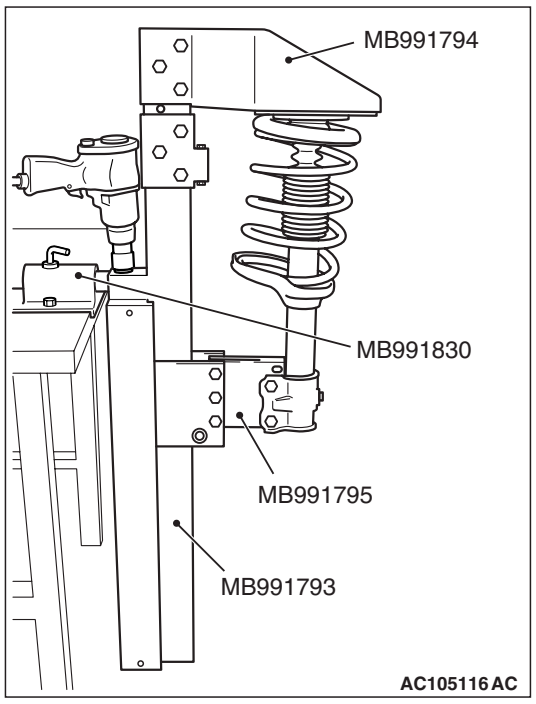
1. Check that both of the coil spring ends align with the spring seat groove correctly.



2. Align the strut spring seat hole with the upper spring seat hole.

⚠ CAUTION

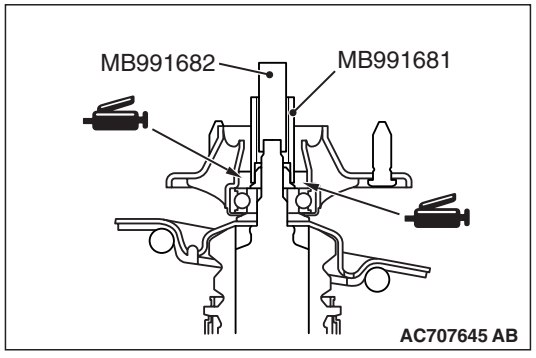
Be careful that the hand is not pinched by the coil spring when aligning the piston rod with the hole of upper insulator while compressing the coil spring.



3. While passing the strut piston rod through the hole of upper insulator by hand, slowly compress the coil spring by the following special tools.
- Spring compressor (MB991793)
- Attachment A (MB991795)
- Upper plate (MB991794)
- Fixture (MB991830)

⚠ CAUTION

The lock nut for the piston rod inside the strut may be loose. Do not use the impact wrench to tighten the strut nut.



4. Use the following special tools to tighten the strut nut to the specified torque.
- Wrench (MB991681)
- Socket (MB991682)

GREASE: Shell Retinax Grease CL0

Tightening torque : 61 ±9 N· m (45 ±7 ft-lb)

INSPECTION

M1332001400315

- Check the bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

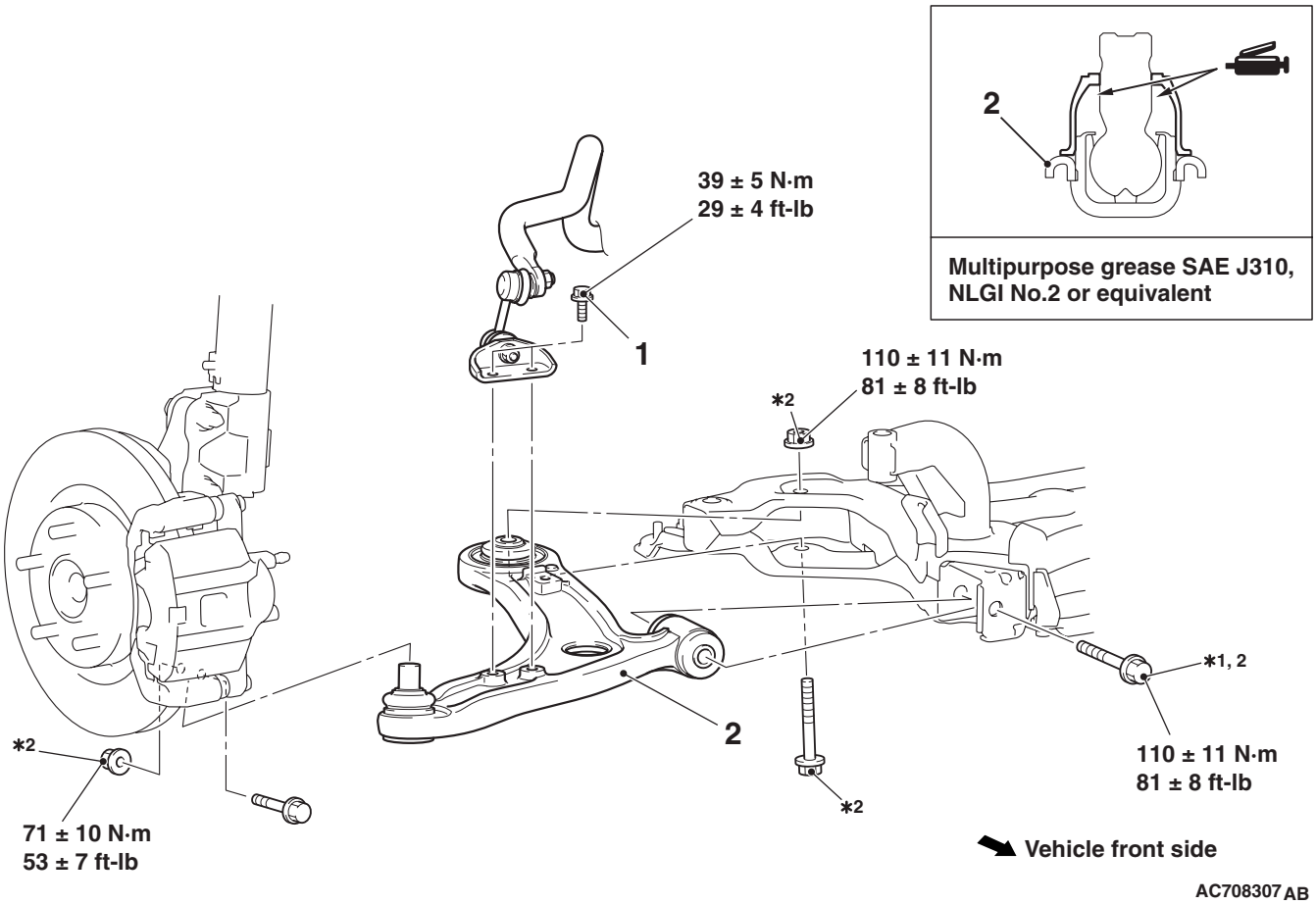
REMOVAL AND INSTALLATION

M1332001601174

⚠ CAUTION

- ***1: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle standing on the ground and the curb weight condition.**
- ***2: Indicates the bolts and nuts with friction coefficient stabilizer. In removal, ensure there is no damage, clean dust and soiling from bearing and thread surfaces, and tighten them to the specified torque.**
- **Do not damage the lower arm ball joint dust cover during maintenance. If it is damaged, replace the lower arm ball joint dust cover.(Refer to P.33-16.)**

Post-installation Operation	Post-installation Operation
• Engine room under cover (A, B, center) and engine room side cover removal (Refer to GROUP 51 –Under Cover P.51-16.)	• Engine room under cover (A, B, center) and engine room side cover installation (Refer to GROUP 51 –Under Cover P.51-16.) • Using your fingers, press the lower arm ball joint dust cover to check for a crack or damage. • Wheel alignment check and adjustment (Refer to P.33-7.)



AC708307 AB

Removal steps

1. Stabilizer link bracket and lower arm connection
2. Lower arm assembly

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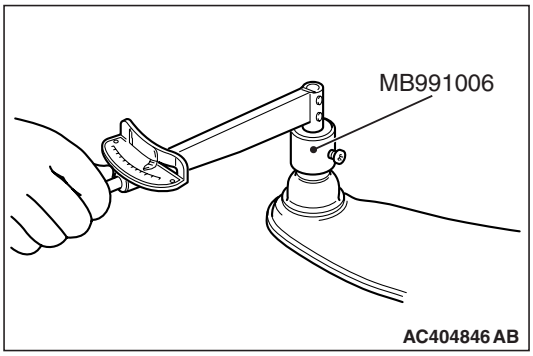
LOWER ARM CHECK

M1332001700770

LOWER ARM BALL JOINT LOOSENESS CHECK

Refer to P.33-8.

LOWER ARM BALL JOINT ROTATIONAL 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: 3.4 N· m (29 in-lb)

2. If the measured value exceeds the standard value, replace the lower arm assembly. (Refer to P.33-15.)
3. If the measured value is within the standard value, check that the lower arm ball joint has no looseness or gritty feeling. If there is looseness or gritty feeling, replace the lower arm assembly. (Refer to P.33-15.)

LOWER ARM BALL JOINT DUST COVER CHECK

Refer to P.33-8.

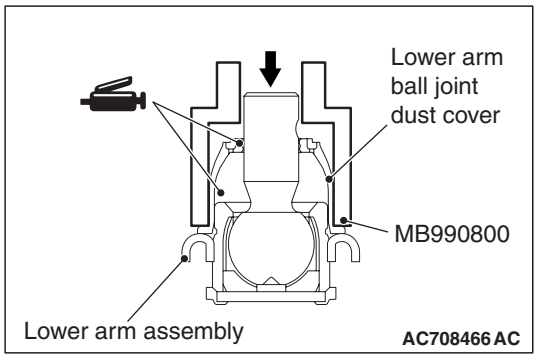
LOWER ARM BALL JOINT DUST COVER REPLACEMENT

M1332020000242

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

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

   Specified grease:
   Multipurpose grease SAE J310, NLGI No. 2 or equivalent
   Application amount:
   Inside the dust cover: 9.0 –10.0 g, Lip: Adequate amount



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

STABILIZER BAR

REMOVAL AND INSTALLATION

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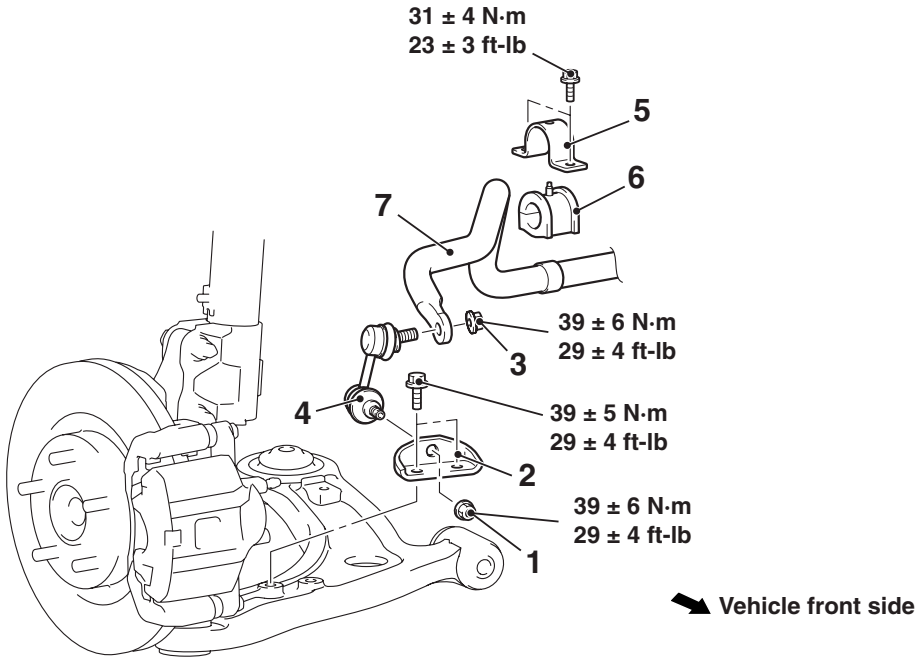

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Removal steps

1. Stabilizer nut
2. Stabilizer bar bracket
3. Stabilizer nut
4. Stabilizer link

Removal steps (Continued)

- Front axle crossmember (Refer to GROUP 32 – Crossmember P.32-10).

5. Stabilizer bush bracket

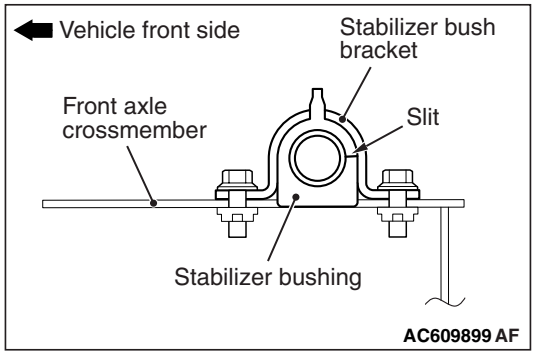
>>A<<

6. Stabilizer bushing
7. Stabilizer bar

INSTALLATION SERVICE POINT

>>A<< STABILIZER BUSHING INSTALLATION

Install the stabilizer bushing as shown in the figure.



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TSB Revision

STABILIZER LINK CHECK

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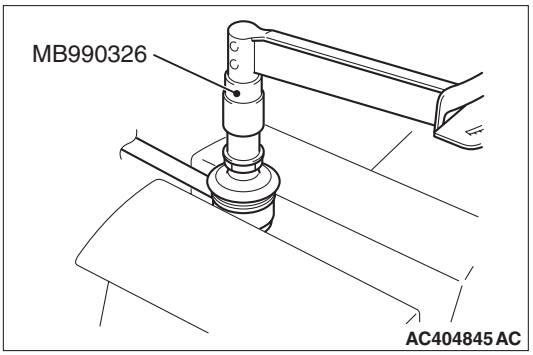
STABILIZER LINK BALL JOINT ROTATION TORQUE CHECK



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 torque using the preload socket (special tool: MB990326).

Standard value:

Within 10 to 30° C (50 to 86° F)	0.2 to 2.0 N· m (1.7 to 17 in-lb)
Not within 10 to 30° C (50 to 86° F)	0.2 to 5.0 N· m (1.7 to 44 in-lb)

2. If the measured value exceeds the standard value, replace the stabilizer link. (Refer to P.33-17.)
3. When the measured value stays within the standard range, if the stabilizer link ball joint has looseness or gritty feeling, it is judged as unusable. Then, replace the stabilizer link. (Refer to P.33-17.)

STABILIZER LINK BALL JOINT DUST COVER CHECK

Refer to P.33-8.