

## GROUP 37

## POWER STEERING

## CONTENTS

<b>GENERAL DESCRIPTION</b> . . . . .	<b>37-3</b>	FLUID LEVEL CHECK . . . . .	37-19
<b>POWER STEERING DIAGNOSIS</b> . . .	<b>37-3</b>	FLUID REPLACEMENT . . . . .	37-20
INTRODUCTION TO POWER STEERING		POWER STEERING SYSTEM AIR	
DIAGNOSIS . . . . .	37-3	BLEEDING . . . . .	37-20
POWER STEERING DIAGNOSIS		OIL PUMP PRESSURE TEST . . . . .	37-21
TROUBLESHOOTING STRATEGY . . . . .	37-3	POWER STEERING PRESSURE	
SYMPTOM CHART . . . . .	37-4	SWITCH CHECK . . . . .	37-22
SYMPTOM PROCEDURES . . . . .	37-4	TIE ROD END BALL JOINT DUST	
<b>SPECIAL TOOLS</b> . . . . .	<b>37-14</b>	COVER CHECK . . . . .	37-23
<b>ON-VEHICLE SERVICE</b> . . . . .	<b>37-16</b>	STEERING COLUMN SHAFT ASSEMBLY	
STEERING WHEEL FREE PLAY CHECK . .	37-16	SHOCK ABSORBING MECHANISM	
STEERING ANGLE CHECK . . . . .	37-17	CHECK . . . . .	37-23
TIE ROD END BALL JOINT		<b>STEERING WHEEL*</b> . . . . .	<b>37-24</b>
BREAKAWAY TORQUE CHECK . . . . .	37-17	REMOVAL AND INSTALLATION . . . . .	37-24
STATIONARY STEERING EFFORT		<b>STEERING COLUMN SHAFT</b>	
CHECK . . . . .	37-18	<b>ASSEMBLY*</b> . . . . .	<b>37-26</b>
STEERING WHEEL RETURN TO		REMOVAL AND INSTALLATION . . . . .	37-26
CENTER CHECK . . . . .	37-19	DISASSEMBLY AND ASSEMBLY . . . . .	37-29
DRIVE BELT TENSION CHECK . . . . .	37-19		

Continued on next page

## WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

**WARNING**

- *Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).*
- *Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.*
- *MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.*

## NOTE

The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (\*).

**POWER STEERING GEAR BOX AND LINKAGE\*** ..... **37-31**

- REMOVAL AND INSTALLATION ..... 37-31
- INSPECTION ..... 37-34
- DISASSEMBLY AND ASSEMBLY ..... 37-36
- TIE ROD END BALL JOINT DUST COVER REPLACEMENT ..... 37-48

**POWER STEERING OIL PUMP ASSEMBLY** ..... **37-49**

- REMOVAL AND INSTALLATION ..... 37-49
- DISASSEMBLY AND ASSEMBLY ..... 37-51
- INSPECTION ..... 37-51

**POWER STEERING HOSES** ..... **37-52**

- REMOVAL AND INSTALLATION ..... 37-52

**SPECIFICATIONS** ..... **37-55**

- FASTENER TIGHTENING SPECIFICATIONS ..... 37-55
- GENERAL SPECIFICATIONS ..... 37-56
- SERVICE SPECIFICATIONS ..... 37-56
- LUBRICANTS ..... 37-57
- SEALANTS ..... 37-57

## GENERAL DESCRIPTION

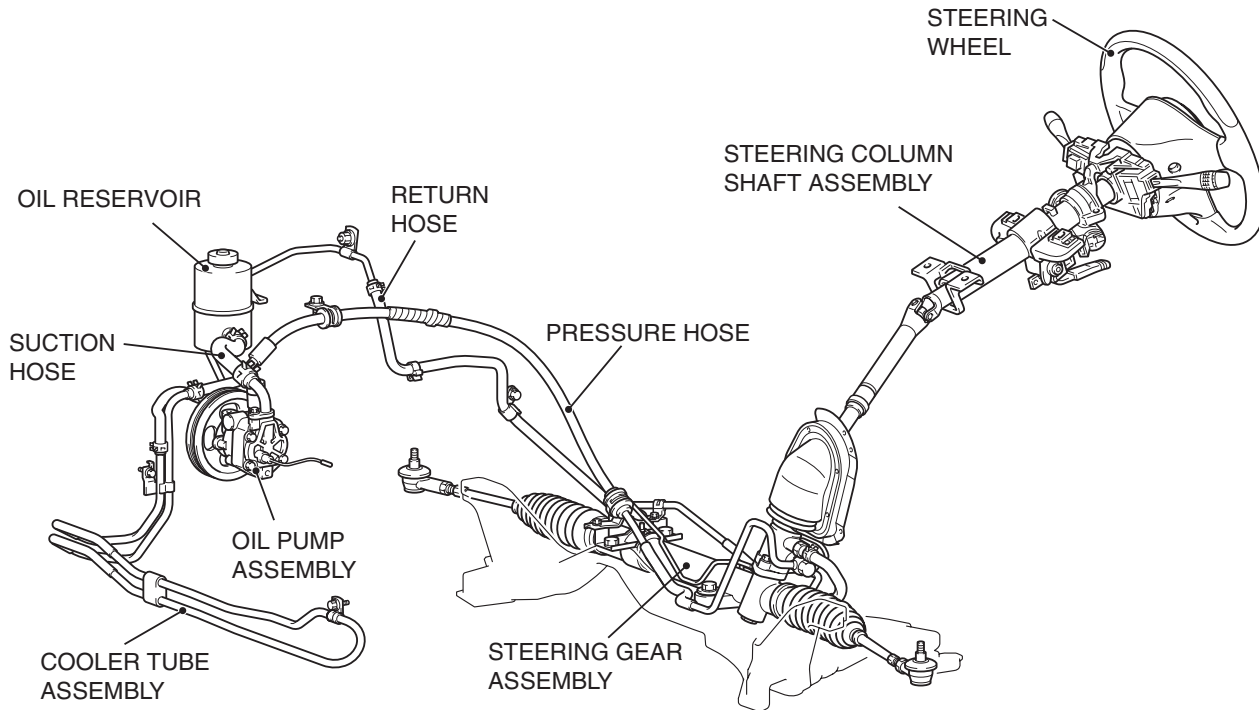
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Power steering has been adopted in all vehicles to make the steering system easier to handle.

- MOMO leather-wrapped 3-spoke steering wheel is used.
- The steering column has a shock absorbing mechanism and a tilt steering mechanism.

- A rack and pinion steering gear is used for steering that feels more direct and for ample handling performance.
- An oil pump responsive to engine RPM is used, which, with tuning for a rigid gear box mount, provides stable steering at high speeds.
- The separate oil reservoir is rubber-mounted.

## CONSTRUCTION DIAGRAM



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## POWER STEERING DIAGNOSIS

### INTRODUCTION TO POWER STEERING DIAGNOSIS

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Hydraulic power steering is used for all vehicles. Faults in the power steering can include excessive play of the steering wheel, difficult steering wheel operation, noise, vibration, and oil leaks, etc. Possible causes of these faults can include problems in the gear box, oil pump or steering linkage.

### POWER STEERING 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 power steering fault.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.

3. Find the malfunction by following the Symptom Chart.

4. Verify malfunction is eliminated.

**SYMPTOM CHART**

SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Excessive play of steering wheel	1	<a href="#">P.37-4</a>
Difficult steering wheel operation (insufficient power assist)	2	<a href="#">P.37-5</a>
Rattling noise	3	<a href="#">P.37-7</a>
Shrill noise	4	<a href="#">P.37-8</a>
Squealing noise	5	<a href="#">P.37-8</a>
Hissing noise	6	<a href="#">P.37-9</a>
Droning noise	7	<a href="#">P.37-10</a>
Squeaking noise	8	<a href="#">P.37-10</a>
Vibration	9	<a href="#">P.37-11</a>
Oil leakage from hose connection	10	<a href="#">P.37-12</a>
Oil leakage from hose assembly	11	<a href="#">P.37-12</a>
Oil leakage from oil reservoir	12	<a href="#">P.37-12</a>
Oil leakage from oil pump	13	<a href="#">P.37-13</a>
Oil leakage from steering gear	14	<a href="#">P.37-13</a>

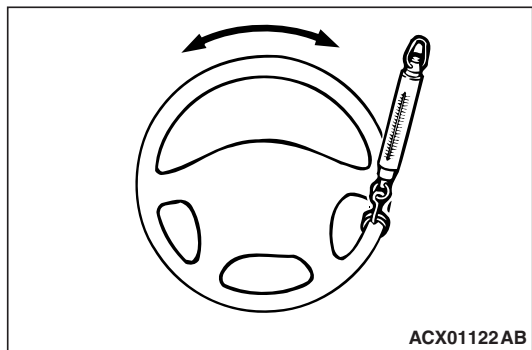
**SYMPTOM PROCEDURES****INSPECTION PROCEDURE 1: Excessive Play of Steering Wheel****DIAGNOSIS**

**STEP 1. Check for looseness at the steering shaft coupling section and at the steering wheel linkage.**

**Q: Is there any looseness?**

**YES :** Repair or replace the part. Then go to Step 3.

**NO :** Go to Step 2.



**STEP 2. Check the steering wheel free play.**

- (1) With the engine running (hydraulic operation), set the front wheels straight ahead.
- (2) Measure the play on the steering wheel circumference before the wheels start to move when slightly moving the steering wheel in both directions.

**Limit: 30 mm (1.2 inch)**

- (3) If the free play exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Apply approximately 5 N (1.1 pound) in one direction and check the play.

**Standard value (steering wheel play with engine stopped): 10 mm (0.4 inch) or less**

**Q: Does the play exceed the standard value?**

**YES :** Remove the steering gear box (Refer to [P.37-31](#)) and check the total pinion torque (Refer to [P.37-31](#)). Then go to Step 3.

**NO :** Go to Step 3.

**STEP 3. Check the steering wheel play.**

Verify that the steering wheel play is not excessive.

**Q: Is the steering wheel play excessive?**

**YES :** Repeat to Step 1.

**NO :** The procedure is complete.

**INSPECTION PROCEDURE 2: Difficult Steering Wheel Operation (Insufficient Power Assist)**

**DIAGNOSIS**

**STEP 1. Check the power steering oil pump drive belt tension.**

Refer to GROUP 00, Maintenance Service –Drive Belts [P.00-41](#).

**Q: Is the power steering oil pump drive belt tension within the standard value?**

**YES :** Go to Step 2.

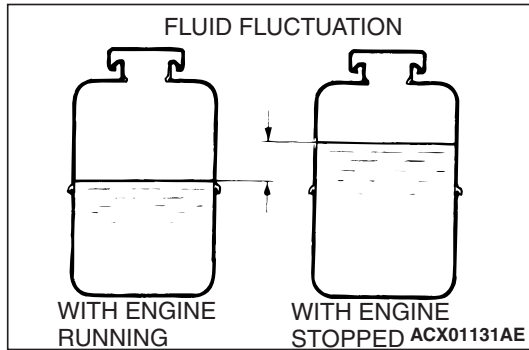
**NO :** Adjust the tension. (Refer to GROUP 00, Maintenance Service –Drive Belts [P.00-41](#)). Then go to Step 9.

**STEP 2. Check the drive belt for damage.**

**Q: Is the drive belt damaged?**

**YES :** Replace the drive belt. Then go to Step 9.

**NO :** Go to Step 3.

**STEP 3. Check the fluid level.**

- (1) Park the vehicle on a flat, level surface, and then start the engine.
- (2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C (122 – 140°F).
- (3) With the engine running, turn the wheel all the way to the left and right several times.
- (4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

**Q: Is the check result OK?****YES** : Go to Step 4.**NO** : Bleed the air (Refer to [P.37-20](#)). Then go to Step 9.**STEP 4. Check each hose for crushing or twisting.****Q: Is any hose crushed or twisted?****YES** : Repair or replace the hose. Then go to Step 9.**NO** : Go to Step 5.**STEP 5. Check for oil leaks.****Q: Are there oil leaks?****YES** : Repair it. Then go to Step 9.**NO** : Go to Step 6.**STEP 6. Check the wheel alignment (camber and caster).**Refer to GROUP 33, On-vehicle Service –Front Wheel Alignment Check and Adjustment [P.33-7](#).**Q: Is the alignment incorrect?****YES** : Repair it. Then go to Step 9.**NO** : Go to Step 7.**STEP 7. Check the gear box rack piston seal for damage.****Q: Is there damage?****YES** : Replace it. Then go to Step 9.**NO** : Go to Step 8.**STEP 8. Check for excessive tie rod end ball joint breakaway torque.**Refer to [P.37-17](#).**Q: Is there fault?****YES** : Replace the part. Then go to Step 9.**NO** : Go to Step 9.

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**STEP 9. Check the steering wheel operation.**

Verify that the steering wheel operation is not difficult.

**Q: Is the steering wheel operation difficult?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

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**INSPECTION PROCEDURE 3: Rattling Noise**

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**DIAGNOSIS**

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**STEP 1. Check for proper oil pump and steering gear installation.**

**Q: Is the oil pump and the steering gear installation correct?**

**YES** : Go to Step 2.

**NO** : Repair it. Then go to Step 4.

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**STEP 2. Check for interference of other parts with the steering column and the power steering hoses.**

**Q: Is there interference?**

**YES** : Correct the interference. Then go to Step 4.

**NO** : Go to Step 3.

---

**STEP 3. Check for noise from inside the oil pump or the steering gear.**

**Q: Is there noise?**

**YES** : Replace the part. Then go to Step 4.

**NO** : Go to Step 4.

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**STEP 4. Check for rattling noise.**

Confirm that no noise is generated.

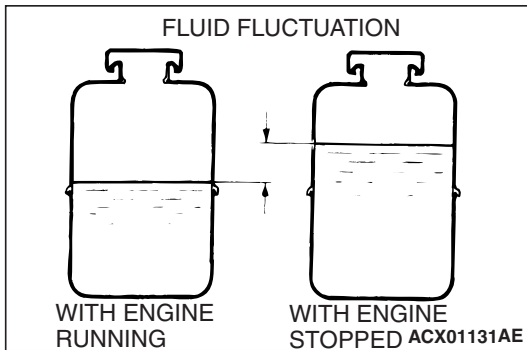
**Q: Is there noise?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

## INSPECTION PROCEDURE 4: Shrill Noise

## DIAGNOSIS

**STEP 1. Check the fluid level.**

- (1) Park the vehicle on a flat, level surface, and then start the engine.
- (2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 –60° C (122 – 140° F).
- (3) With the engine running, turn the wheel all the way to the left and right several times.
- (4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

**Q: Is the check result OK?****YES** : Go to Step 2.**NO** : Bleed the air (Refer to [P.37-20](#)). Then go to Step 3.**STEP 2. Check for seizure in the oil pump.****Q: Is there seizure?****YES** : Replace the part. Then go to Step 3.**NO** : Go to Step 3.**STEP 3. Retest the system.**

Confirm that no noise is generated.

**Q: Is there noise?****YES** : Repeat from Step 1.**NO** : The procedure is complete.

## INSPECTION PROCEDURE 5: Squealing Noise

## DIAGNOSIS

**STEP 1. Check the power steering oil pump drive belt tension.**Refer to GROUP 00, Maintenance Service –Drive Belts [P.00-41](#).**Q: Is the power steering oil pump drive belt tension within the standard value?****YES** : Go to Step 2.**NO** : Adjust the belt tension. (Refer to GROUP 00, Maintenance Service –Drive Belts [P.00-41](#)). Then go to Step 3.**STEP 2. Check for seizure in the oil pump.****Q: Is there seizure?****YES** : Replace the part. Then go to Step 3.**NO** : Go to Step 3.**STEP 3. Retest the system.**

Confirm that no noise is generated.

**Q: Is there noise?****YES** : Repeat from Step 1.**NO** : The procedure is complete.



INSPECTION PROCEDURE 6: Hissing Noise

DIAGNOSIS

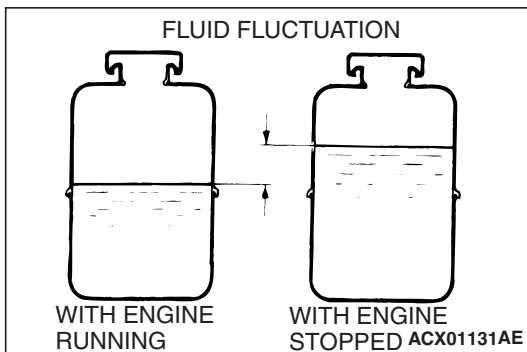
**STEP 1. Check the fluid level.**

- (1) Park the vehicle on a flat, level surface, and then start the engine.
- (2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60° C (122 – 140° F).
- (3) With the engine running, turn the wheel all the way to the left and right several times.
- (4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

**Q: Is the check result OK?**

**YES** : Go to Step 2.

**NO** : Bleed the air (Refer to [P.37-20](#)). Then go to Step 4.



**STEP 2. Check each hose for crushing or twisting.**

**Q: Is any hose crushed or twisted?**

**YES** : Repair or replace the hose. Then go to Step 4.

**NO** : Go to Step 3.

**STEP 3. Check the steering gear for damage.**

**Q: Is there damage?**

**YES** : Repair or replace the part. Then go to Step 4.

**NO** : Go to Step 4.

**STEP 4. Retest the system.**

Confirm that no noise is generated.

**Q: Is there noise?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

## INSPECTION PROCEDURE 7: Droning Noise

## DIAGNOSIS

**STEP 1. Check the oil pump or oil pump bracket installation.**

**Q: Is the oil pump or the oil pump bracket installation correct?**

**YES :** Go to Step 2.

**NO :** Repair it. Then go to Step 3.

**STEP 2. Check the oil pump for damage.**

*NOTE: If a slight "beat noise" is produced by the oil pump when the steering wheel is turned fully and held in that position, this is not a malfunction.*

**Q: Is there damage?**

**YES :** Replace the oil pump. Then go to Step 3.

**NO :** Go to Step 3.

**STEP 3. Retest the system.**

Confirm that no noise is generated.

**Q: Is there noise?**

**YES :** Repeat from Step 1.

**NO :** The procedure is complete.

## INSPECTION PROCEDURE 8: Squeaking Noise

## DIAGNOSIS

**STEP 1. Check for interference of the wheel and the vehicle body.**

If interfering, adjust the steering angle.

- (1) Place the front wheel on a turning radius gauge and measure the steering angle.

**Standard value:**

ITEM	SPECIFICATION
Inside wheel	31° 45' ± 1° 30'
Outside wheel (reference)	27° 15'

- (2) If the steering angle is not within the standard value, adjust the toe-in.

**Standard value: 0 ± 2 mm (0 ± 0.08 inches)**

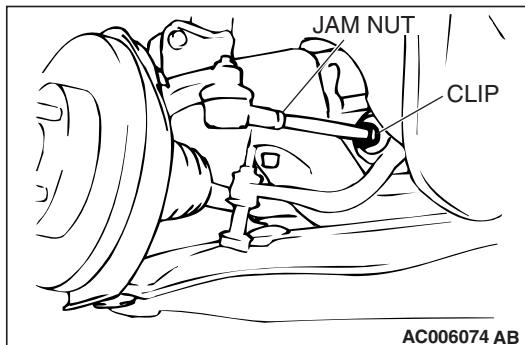
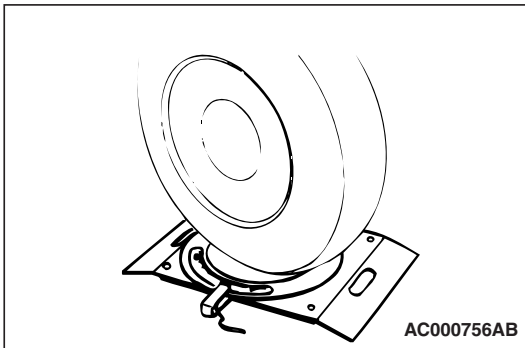
- (3) Adjust the toe-in by undoing the clip and jam nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

*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.*

**Q: Is the steering angle normal?**

**YES :** Go to Step 2.

**NO :** Adjust the steering angle. Then go to Step 3.



**STEP 2. Check the steering gear for damage.**

**Q: Is there damage?**

- YES :** Repair or replace the part. Then go to Step 3.
- NO :** Go to Step 3.

**STEP 3. Retest the system.**

Confirm that no noise is generated.

**Q: Is there noise?**

- YES :** Repeat from Step 1.
- NO :** The procedure is complete.

**INSPECTION PROCEDURE 9: Vibration**

*NOTE: A slight vibration may be felt when the stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. A very slight amount of vibration is not a malfunction.*

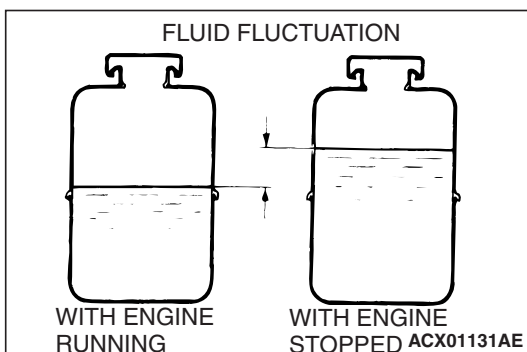
**DIAGNOSIS**

**STEP 1. Check the fluid level.**

- (1) Park the vehicle on a flat, level surface, and then start the engine.
- (2) Turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60° C (122 – 140° F).
- (3) With the engine running, turn the wheel all the way to the left and right several times.
- (4) Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running.

**Q: Is the check result OK?**

- YES :** Go to Step 2.
- NO :** Bleed the air (Refer to [P.37-20](#)). Then go to Step 3.



**STEP 2. Check the steering gear for damage.**

**Q: Is there damage?**

- YES :** Repair or replace the part. Then go to Step 3.
- NO :** Go to Step 3.

**STEP 3. Retest the system.**

Confirm that no vibration is generated.

**Q: Is there vibration?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

**INSPECTION PROCEDURE 10: Oil Leakage from Hose Connection****DIAGNOSIS****STEP 1. Check for loosening of the pressure and return tube flare nut.**

Refer to [P.37-52](#).

**Q: Is the flare nut loose?**

**YES** : Tighten it to  $15 \pm 3$  N·m ( $11 \pm 2$  ft-lb). Then go to Step 3.

**NO** : Go to Step 2.

**STEP 2. Check the hose connection and the clamp installation.**

Refer to [P.37-52](#).

**Q: Are they correct?**

**YES** : Go to Step 3.

**NO** : Repair or replace the part. Then go to Step 3.

**STEP 3. Retest the system.**

Check that no oil is leaking.

**Q: Is there oil leakage?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

**INSPECTION PROCEDURE 11: Oil Leakage from Hose Assembly****DIAGNOSIS****STEP 1. Check the hose for damage or clogging.**

Refer to [P.37-52](#).

**Q: Is the hose damaged or clogged?**

**YES** : Repair or replace it. Then go to Step 2.

**NO** : Go to Step 2.

**STEP 2. Retest the system.**

Check that no oil is leaking.

**Q: Is there oil leakage?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

**INSPECTION PROCEDURE 12: Oil Leakage from Oil Reservoir****DIAGNOSIS****STEP 1. Check the oil reservoir for damage.****Q: Is there damage?**

**YES** : Repair or replace it. Then go to Step 3.

**NO** : Go to Step 2.

**STEP 2. Check for overflowing.****Q: Is there oil overflowing from the reservoir?**

**YES** : Adjust fluid level. Then go to Step 3.

**NO** : Go to Step 3.

**STEP 3. Retest the system.****Q: Is there oil leakage?**

**YES** : Repeat from Step 1.

**NO** : The procedure is complete.

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**INSPECTION PROCEDURE 13: Oil Leakage from Oil Pump**

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**DIAGNOSIS**

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**STEP 1. Check the oil pump body for damage.**

**Q: Is there damage?**

**YES :** Replace the part. Then go to Step 3.

**NO :** Go to Step 2.

---

**STEP 2. Check the O-ring or oil seal for damage.**

**Q: Is there damage?**

**YES :** Replace the part. Then go to Step 3.

**NO :** Go to Step 3.

---

**STEP 3. Retest the system.**

Check that no oil is leaking.

**Q: Is there oil leakage?**

**YES :** Repeat from Step 1.

**NO :** The procedure is complete.

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**INSPECTION PROCEDURE 14: Oil Leakage from Steering Gear**

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**DIAGNOSIS**

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**STEP 1. Check the steering gear housing for damage.**

**Q: Is there damage?**

**YES :** Replace the part. Then go to Step 3.

**NO :** Go to Step 2.

---

**STEP 2. Check the oil-ring or oil seal for damage.**

**Q: Is there damage?**

**YES :** Replace the part. Then go to Step 3.

**NO :** Go to Step 3.

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**STEP 3. Retest the system.**

Check that no oil is leaking.

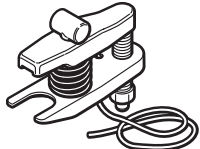
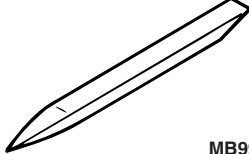
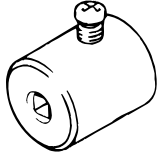
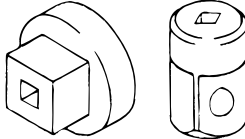
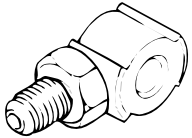
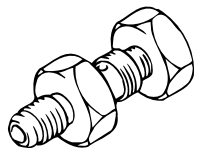
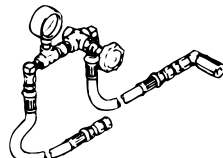
**Q: Is there oil leakage?**


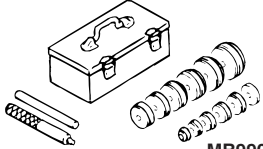
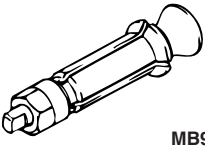

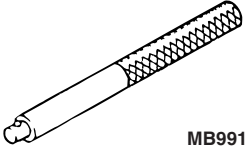

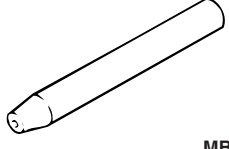
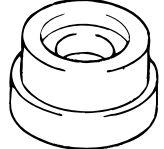
**YES :** Repeat from Step 1.

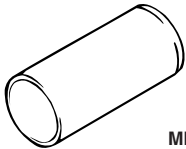
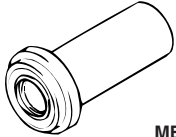
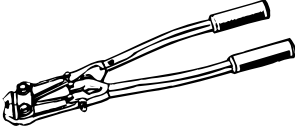
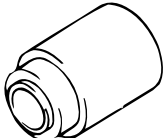
**NO :** The procedure is complete.

## SPECIAL TOOLS

M1372000600699

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Tie rod end disconnection <i>NOTE: Steering linkage puller (MB990635 or MB991113) is also used to disconnect knuckle and tie rod end ball joint.</i>
 MB990784	MB990748 Ornament remover	General service tool	Cover removal
 MB991006	MB990228 or MB991006 Preload socket	MB990228-01	Gear box total pinion torque check
 MB990326	MB990326 Preload socket	General service tool	Tie rod end ball joint breakaway torque check
 MB991548	MB991548 Power steering oil pressure gauge adapter (Pump side)	MB991548-01	Oil pump pressure test
 MB991549	MB991549 Power steering oil pressure gauge adapter (Hose side)	MB991549-01	
 MB990662	MB990662 Oil pressure gauge assembly	MB990662-01	

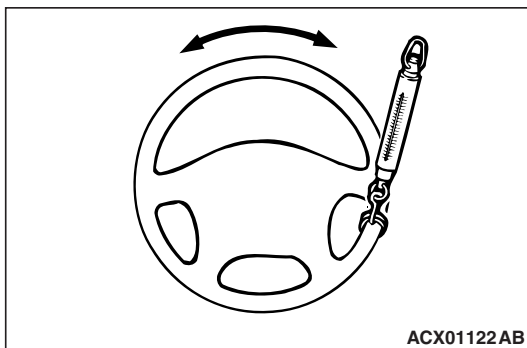
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 <p align="center">MB991621</p>	MB991621 Rack support cover wrench	–	<ul style="list-style-type: none"> <li>• Rack support adjustment</li> <li>• Rack support cover removal</li> </ul>
 <p align="center">MB990925</p>	MB990925 Bearing and oil seal installer set	MB990925-01 or general service tool	<ul style="list-style-type: none"> <li>• Oil seal and bearing installation</li> <li>• MB990926, MB990927, MB990938, MB990939 (For details, refer to GROUP 27, Special Tools <a href="#">P.27-9.</a>)</li> </ul>
 <p align="center">MB991120</p>	MB991120 Needle bearing puller	Tool not available	Needle roller bearing removal
 <p align="center">MB991199</p>	MB991199 Oil seal and bearing installer	General service tool	<ul style="list-style-type: none"> <li>• Oil seal installation</li> <li>• Rack housing bearing installation</li> </ul>
 <p align="center">MB991197</p>	MB991197 Bar (long type)	General service tool	
 <p align="center">MB991202</p>	MB991202 Oil seal and bearing installer	–	<ul style="list-style-type: none"> <li>• Needle bearing installation</li> <li>• Lower bearing installation</li> </ul>
 <p align="center">MB991212</p>	MB991214 Rack installer	–	Rack installation
 <p align="center">MB991203</p>	MB991203 Oil seal and bearing installer	Tool not available	Oil seal and bearing installation

TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
 MB991317	MB991317 Seal ring installer	Tool not available	Seal ring installation
 MB990941	MB990941 Torque tube bearing installer	MB990941-01 or general service tool	Valve housing oil seal installation
 MB991561	MB991561 Boot band crimping tool	MB991561	Bellows band installation
 MB990776	MB990776 Front axle base	MB990776-01	Dust cover installation

## ON-VEHICLE SERVICE

### STEERING WHEEL FREE PLAY CHECK

M1372001000300



1. With the engine running (hydraulic operation), set the front wheels straight ahead.
2. Measure the play on the steering wheel circumference before the wheels start to move when slightly moving the steering wheel in both directions.

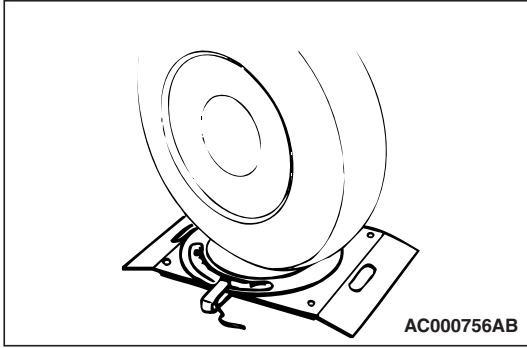
**Limit: 30 mm (1.2 inch)**

3. When the play exceeds the limit, check for the play on the steering shaft and steering linkage connection. Correct or replace.
4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Apply 5 N (1.1 pound) in one direction and check the play.

**Standard value (steering wheel play with the engine stopped): 10 mm (0.4 inch) or less**

5. If the play exceeds the standard value, remove the steering gear (Refer to P.37-31.) and check the total pinion torque (Refer to P.37-31.).





## STEERING ANGLE CHECK

M1372001100556

1. Place the front wheel on a turning radius gauge and measure the steering angle.

**Standard value:**

ITEM	SPECIFICATION
Inside wheel	31° 45' ± 1° 30'
Outside wheel (reference)	27° 15'

2. If the steering angle is not within the standard value, adjust the toe-in as follows.

**Standard value: 0 ± 2 mm (0 ± 0.08 inch)**

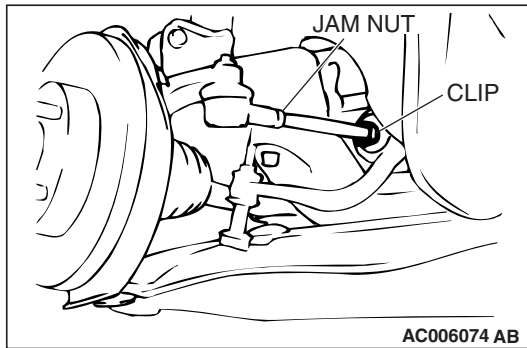
- (1) Loosen the jam nut, and unclip the bellows clip.
- (2) Adjust the toe-in by turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

*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.*

- (3) Tighten the jam nut to the specified torque, and tighten the bellows by the clip.

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

3. Recheck the steering angle.



## TIE ROD END BALL JOINT BREAKAWAY TORQUE CHECK

M1372001500253

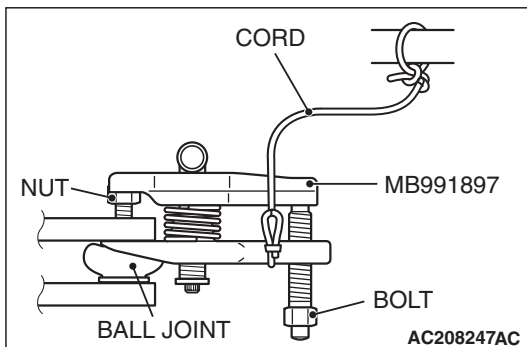
**Required Special Tools:**

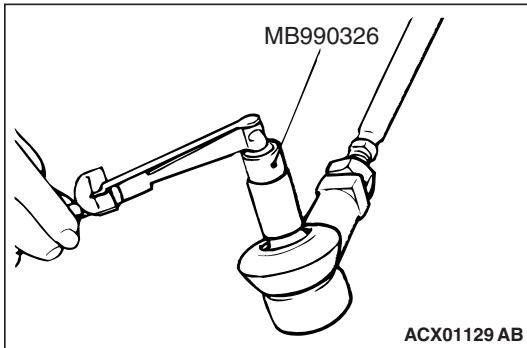
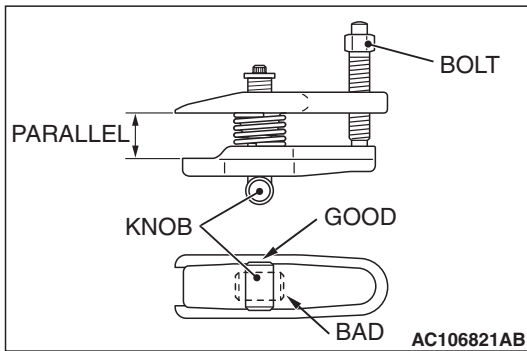
- MB990326: Preload Socket
- MB991897: Ball Joint Remover

### ⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to the ball joint threads.**
- **Hang special tool MB991897 with a cord to prevent it from falling.**

1. Install special tool MB991897 as shown in the figure.





- Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.  
*NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.*
- Tighten the bolt with a wrench to disconnect the tie rod end.

- Move the ball joint stud several times and install the nut on the stud. Using special tool MB990326, measure the ball joint breakaway torque.

**Standard value: 1.0 – 3.0 N·m (8.9 – 26.6 in-lb)**

- If the breakaway torque exceeds the standard value, replace the tie rod end.
- If the breakaway torque is under the standard value, check the ball joint for end play or ratcheting. If no end play or ratcheting, the ball joint can be re-used.

**⚠ CAUTION**

**Always use a new ball joint nut as it is a self-locking nut.**

- Install the tie rod end to the knuckle, then tighten a new self-locking nut to the specified torque.

**Tightening torque: 25 ± 5 N·m (19 ± 3 ft-lb)**

**STATIONARY STEERING EFFORT CHECK**

M1372001700503

- With the vehicle stopped on a flat and paved surface, turn the steering wheel to the straight ahead position.
- Start the engine and set the engine idle speed.

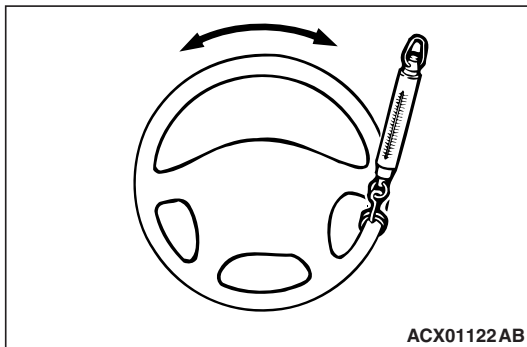
**Standard value: 850 ± 100 r/min**

- Attach a spring scale to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant change in the required steering effort.

**Standard value:**

- **Steering effort: 32 N (7.2 lb) or less**
- **Fluctuation allowance: 6.0 N (1.35 lb) or less**

- If the measured value exceeds the standard value, refer to Inspection Procedure 2 "Difficult Steering Wheel Operation (Insufficient Power Assist)" P.37-5.



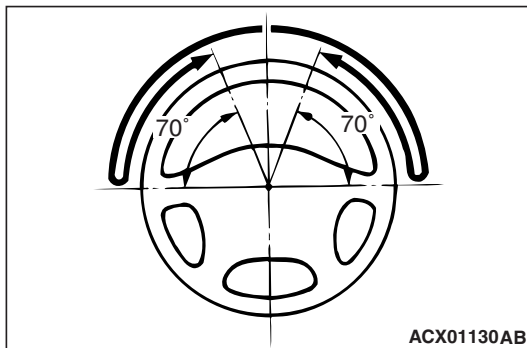
## STEERING WHEEL RETURN TO CENTER CHECK

M1372001800180

Conduct a road test:

1. Make both gradual and sudden turns and check the steering wheel return.
2. At a vehicle speed of approximately 35 km/h (22 mph), turn the steering wheel 90 degrees, hold a few seconds, then release. If the steering wheel then returns 70 degrees or more, the return can be judged satisfactory.

*NOTE: There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (Oil pump discharge amount is especially apt to be insufficient during idling.)*



## DRIVE BELT TENSION CHECK

M1372001900187

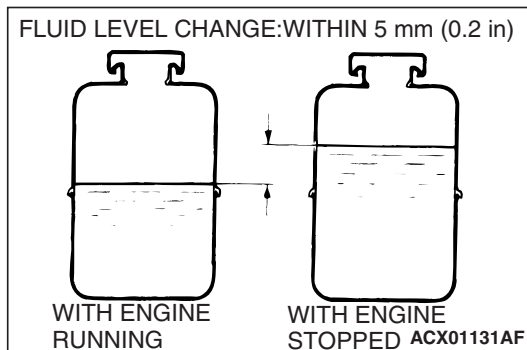
Refer to GROUP 00, Maintenance Service –Drive Belts

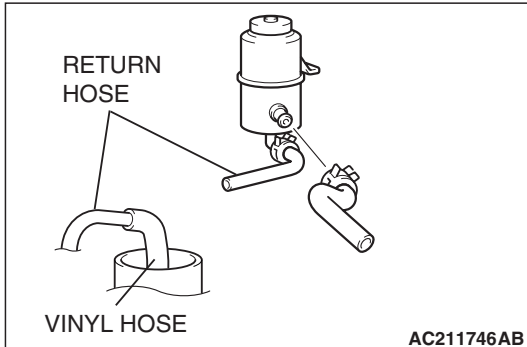
[P.00-41](#).

## FLUID LEVEL CHECK

M1372002000240

1. Park the vehicle on a flat, level surface.
2. Start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60° C (122 – 140° F).
3. With the engine running, turn the wheel all the way to the left and right several times.
4. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the fluid contains air or has milky appearance, or the fluid level fluctuate by 5 mm (0.2 inch) or more, power steering system air bleeding should be done.





M1372002100292

## FLUID REPLACEMENT

1. Raise and support the front wheels.
2. Disconnect the return hose connection, and then connect a vinyl hose to the return hose, and drain the fluid into a container.
3. Disconnect the ignition coil connectors (Refer to GROUP 16, Ignition Coil P.16-39).
4. While operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
5. Connect the return hose securely, and then secure with the clip.
6. Fill the oil reservoir with GENUINE MITSUBISHI POWER STEERING FLUID up to the lower position of the filler, and then bleed the air.

## POWER STEERING SYSTEM AIR BLEEDING

M1372002200299

Perform air bleeding procedure as necessary after replacing the steering gear, oil pump or the steering fluid lines.

1. Raise and support the front wheels.
2. Disconnect the ignition coil connectors (Refer to GROUP 16, Ignition Coil P.16-39).

### **⚠ CAUTION**

**Perform air bleeding only while cranking the engine. Do not perform air bleeding while the engine is running. If you do so, air in the fluid will be grained and air bleeding will become more difficult. During air bleeding, refill the steering fluid so that the level never falls below the lower mark on the dipstick.**

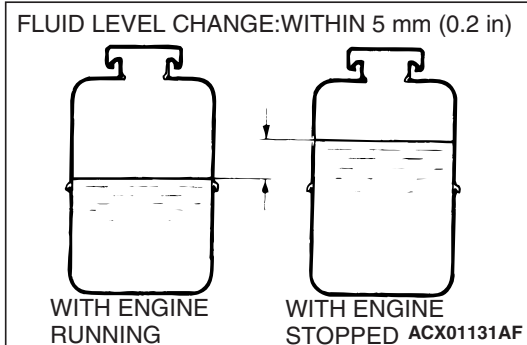
3. Turn the steering wheel all the way to the left and right five or six times while using the starter motor to crank the engine intermittently several times (for 15 to 20 seconds).
4. Connect the ignition coil connectors (Refer to GROUP 16, Ignition Coil P.16-39).
5. Start the engine (idling).
6. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
7. Confirm that the fluid is not milky, and that the level is between the high and low dipstick marks.
8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.

**⚠ CAUTION**

If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause reduce the life of the power steering components.

9. Confirm that the change in the fluid level is no more than 5 mm (0.2 inch) when the engine is stopped and when it is running.

10. If the change of the fluid level is 5 mm (0.2 inch) or more, the air has not been completely bled from the system. The air bleeding procedure must be repeated.



**OIL PUMP PRESSURE TEST**

M1372002300456

**Required Special Tools:**

- MB990662: Power Steering Oil Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)

1. Disconnect the pressure hose from the oil pump, and then connect special tools MB991548, MB990662 and MB991549.
2. Bleed air, then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60° C (122 – 140° F).
3. Start the engine and idle it at 1,000 ± 100 r/min.

**⚠ CAUTION**

The pressure gauge shut-off valve must not remain closed for more than 10 seconds.

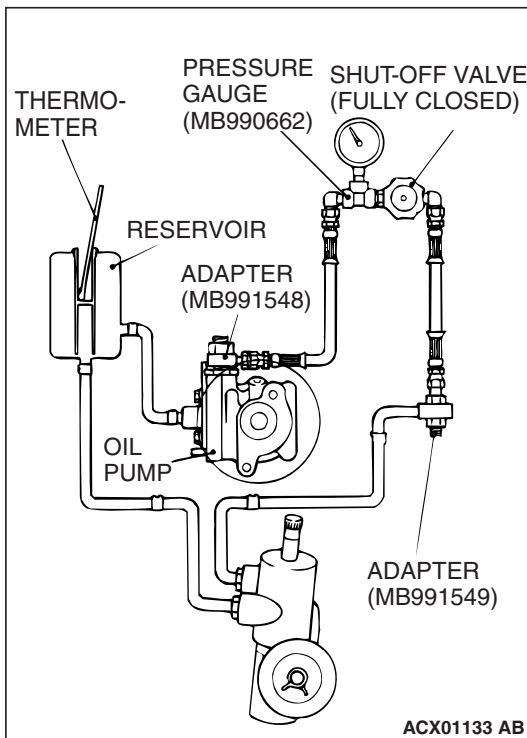
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range. Open it again immediately after checking the pressure.

**Standard value: 8.4 – 9.0 MPa (1,219 – 1,306 psi)**

5. If it is not within the standard value, replace the oil pump.
6. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

**Standard value: 0.2 – 0.8 MPa (29 – 116 psi)**

7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear, so check these parts and repair as necessary.



8. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

**Standard value: 8.4 – 9.0 MPa (1,219 – 1,306 psi)**

9. If not the standard value, overhaul the steering gear. Remeasure fluid pressure.
10. Remove special tools MB991548, MB990662 and MB991549, and then tighten the pressure tube flare nut to the specified torque.

**Tightening torque: 18 ± 3 N·m (13 ± 2 ft-lb)**

11. Bleed the system (Refer to P.37-20).

## POWER STEERING PRESSURE SWITCH CHECK

M1372007200410

### Required Special Tools:

- MB990662: Power Steering Oil Pressure Gauge
- MB991548: Power Steering Oil Pressure Gauge Adapter (Pump Side)
- MB991549: Power Steering Oil Pressure Gauge Adapter (Hose Side)

1. Disconnect the pressure hose from the oil pump, and then connect the special tools MB991548, MB990662 and MB991549.
2. Bleed air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C (122 – 140°F).
3. The engine should be idling.
4. Disconnect the connector for the oil pressure switch, and place an ohmmeter at the switch.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure, then check whether or not the hydraulic pressure that activates the switch is the standard value.

**Standard value: 1.8 – 2.4 MPa (261 – 348 psi)**

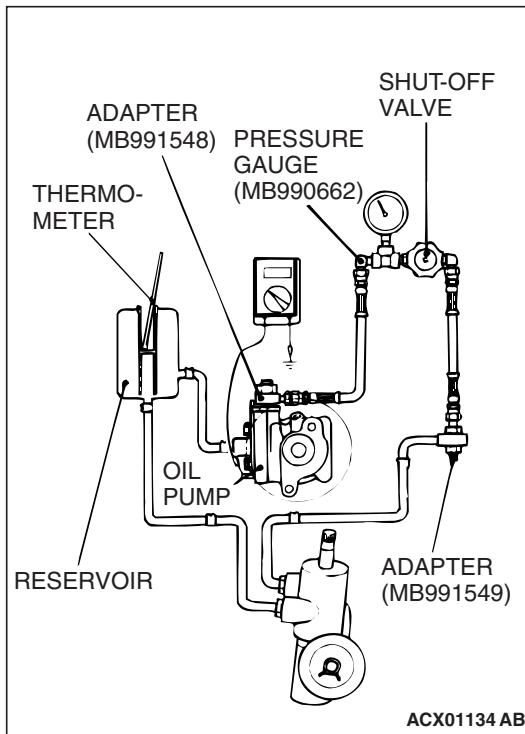
6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

**Standard value: 1.0 – 2.4 MPa (145 – 348 psi)**

7. Remove the special tools MB991548, MB990662 and MB991549, and then tighten the pressure tube flare nut to the specified torque.

**Tightening torque: 18 ± 3 N·m (13 ± 2 ft-lb)**

8. Bleed the system (Refer to P.37-20).



**TIE ROD END BALL JOINT DUST COVER CHECK**

M1372008600187

1. Press the dust cover with your finger to check whether the dust cover is cracked or damaged.
2. If the dust cover is cracked or damaged, replace the tie rod end.

*NOTE: If the dust cover is cracked or damaged, the ball joint could be damaged.*

**STEERING COLUMN SHAFT ASSEMBLY SHOCK ABSORBING MECHANISM CHECK**

M1372013500294

- If a collision accident occurs or severe impact is applied on the steering wheel, the collision energy absorbing mechanism may have operated. Once the mechanism has operated, it will be inoperative even if there is no apparent damage. Determine if the steering column shaft can be reused by the following procedure. If the collision energy absorbing mechanism has already operated, replace the steering column shaft assembly.
- If any excessive radial freeplay on the steering wheel is found with the tilt lever in the lock position, always check the steering shaft assembly.

** WARNING**

- ***If the vehicle continues to be driven after the collision absorbing mechanism has operated, the steering column shaft may be damaged while it is in use.***
- ***If there is a slack in the one-way capsule, do not attempt to repair it but replace the steering column shaft assembly.***

**INSPECTION PROCEDURE**

1. Remove the lower and upper column covers.

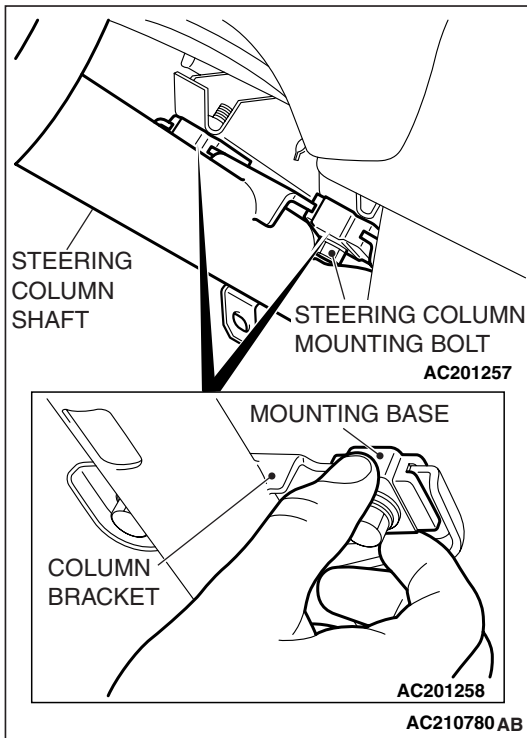
** CAUTION**

**On completion, do not release the tilt lever until the steering column has been installed.**

2. Ensure that the tilt lever is in the lock position.

*NOTE: If not, place the tilt lever in the lock position.*

3. Loosen the two upper steering column mounting bolts by two turns.



4. Hold the mounting base as shown, and then try to lock them. If there is a slack in either of the capsules, replace the steering column shaft assembly.

*NOTE: If not, place the tilt lever in the lock position.*

#### ⚠ CAUTION

1. Be careful that nothing is pinched between the mounting base and the body.
2. On completion, do not release the tilt lever until the steering column has been installed.
5. If no problem is found during the inspection, tighten the steering column mounting bolts to the specified torque.

**Tightening torque:  $12 \pm 2$  N·m ( $102 \pm 22$  in-lb)**

## STEERING WHEEL

### REMOVAL AND INSTALLATION

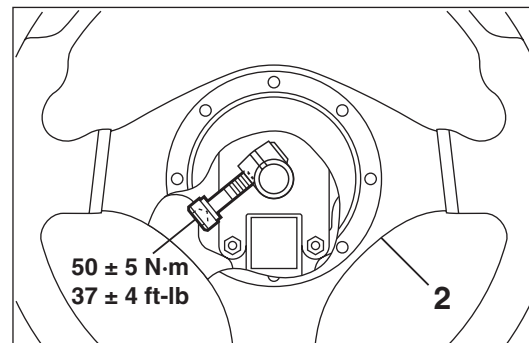
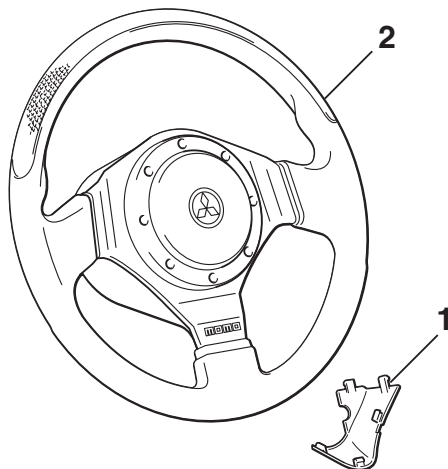
M1372011400600

#### ⚠ WARNING

- Before removing the steering wheel - driver's air bag module assembly, refer to **GROUP 52B, Service Precautions P.52B-16** and **Air Bag Module and Clock Spring P.52B-168**.
- When removing and installing the steering wheel, do not let it bump against the air bag module.

#### Post-installation Operation

- Checking Steering Wheel Position with Wheels Straight Ahead



AC211760 AB



- <<A>>  
<<B>>
- REMOVAL STEPS**
1. COVER
  2. STEERING WHEEL - DRIVER'S AIR BAG MODULE ASSEMBLY

*NOTE: For air bag module removal, refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-168.*

**Required Special Tool:**

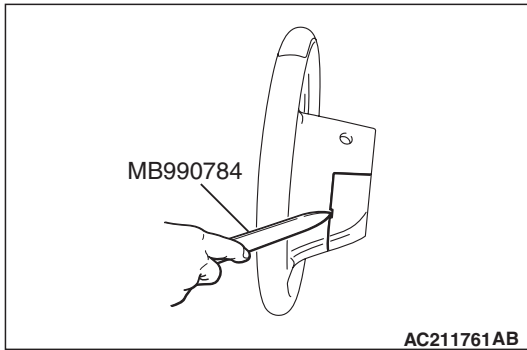
- MB990784: Ornament remover

**REMOVAL SERVICE POINTS**

**<<A>> STEERING WHEEL REMOVAL**

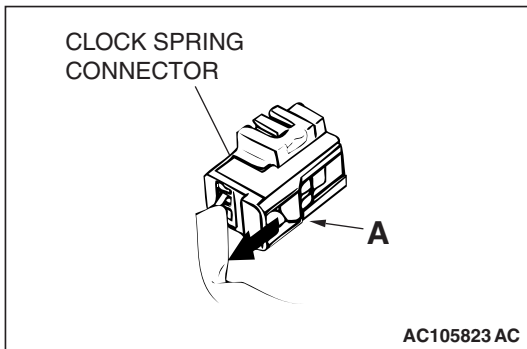
Insert special tool MB990784 at the indicated position to remove the cover.

*NOTE: Special tool MB990784 can be inserted through the notch behind the area shown.*



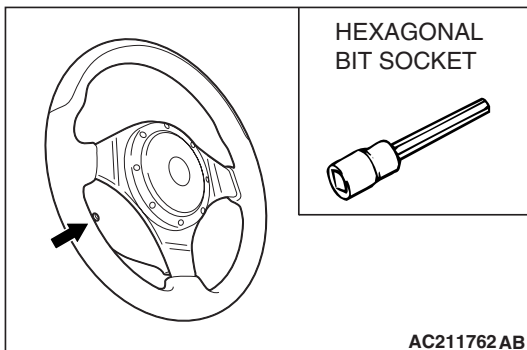
**<<B>> STEERING WHEEL AND AIR BAG MODULE ASSEMBLY REMOVAL**

1. By sliding section A of the clock spring connector as shown in the illustration in the arrow direction, disconnect the connector.



2. Loosen the bolt completely. Then, remove the steering wheel and air bag module assembly.

*NOTE: Use a hexagonal bit socket or a hexagonal wrench having an effective length of 75 mm (3.0 inches) or more in the hexagonal section and the diameter of 8 mm (0.31 inches) or more.*



# STEERING COLUMN SHAFT ASSEMBLY

## REMOVAL AND INSTALLATION

M1372003100110

**⚠ WARNING**

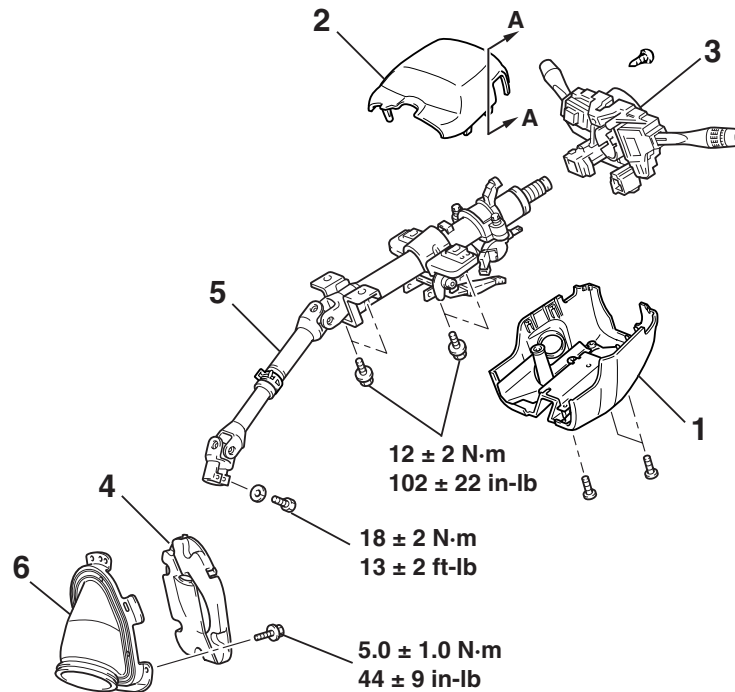
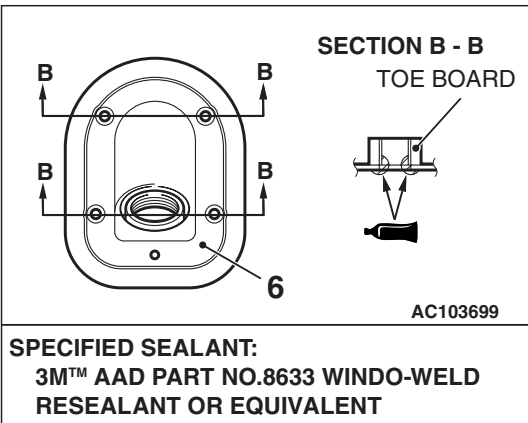
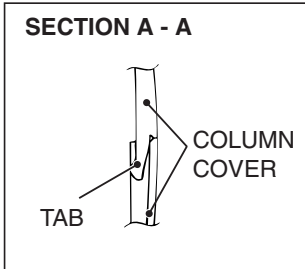
Before removing the steering wheel - driver's air bag module assembly, refer to **GROUP 52B, Service Precautions P.52B-16** and **Air Bag Module and Clock Spring P.52B-168**.

**Pre-removal Operation**

- Steering Wheel - Driver's Air bag Module Assembly Removal (Refer to P.37-24.)
- Instrument Panel Under Cover Removal (Refer to GROUP 52A, Instrument Panel P.52A-3.)

**Post-installation Operation**

- Instrument Panel Under Cover Removal (Refer to GROUP 52A, Instrument Panel P.52A-3.)
- Steering Wheel - Driver's Air bag Module Assembly Installation (Refer to P.37-24.)
- Checking Steering Wheel Position with Wheels Straight Ahead



AC310254AB

**REMOVAL STEPS**

1. LOWER COLUMN COVER
2. UPPER COLUMN COVER
3. CLOCK SPRING AND COLUMN SWITCH ASSEMBLY (REFER TO GROUP 52B, AIR BAG MODULE AND CLOCK SPRING P.52B-168).
4. SHAFT COVER

**REMOVAL STEPS (Continued)**

- <<A>> >>A<<5. STEERING COLUMN SHAFT ASSEMBLY
6. COVER ASSEMBLY

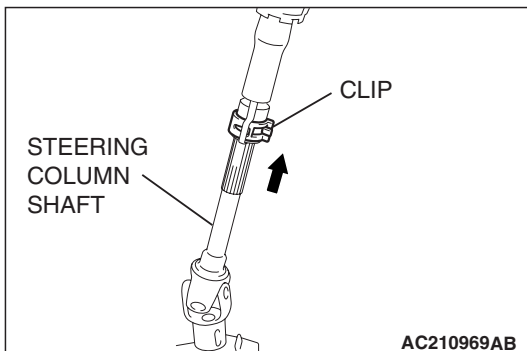
REMOVAL SERVICE POINT

<<A>>STEERING COLUMN SHAFT ASSEMBLY  
REMOVAL

**⚠ CAUTION**

The tilt lever should be held in the lock position until the steering column shaft is installed to the vehicle. If the steering column is removed with the tilt lever released, or the tilt lever is released after the steering column shaft was removed from the vehicle, the steering column cannot be reinstalled correctly. If the steering column is installed incorrectly, the collision energy absorbing mechanism may be damaged.

1. Ensure that the tilt lever is in the lock position, and remove the steering column mounting bolts.
2. Pinch the steering column shaft clip with pliers, and pull up the shaft towards the direction shown to disengage the steering column shaft assembly.



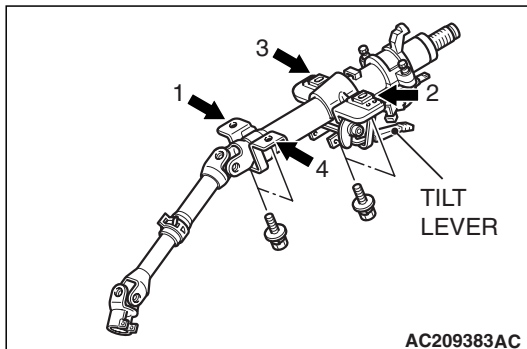
## INSTALLATION SERVICE POINT

>>A<<STEERING COLUMN SHAFT ASSEMBLY  
INSTALLATION**⚠ CAUTION**

- When reusing the steering column, do not release the tilt lever until the steering column shaft has been installed.
- When the steering column is replaced, do not release the tilt lever until it has been installed. Do not remove the tilt lever fixing band until the installation is completed.
- When installing the steering column, do not leave it fixed temporarily at only one point and make sure the column shaft is not shaken strongly. If you fail to do, the collision absorbing mechanism at the column shaft mounting location may be damaged.

Ensure that the tilt lever is in the lock position, and install the steering column. Tighten the four bolts in the order shown by hand, and then tighten them to the specified torque in the order shown.

**Tightening torque:  $12 \pm 2$  N·m ( $102 \pm 22$  in-lb)**

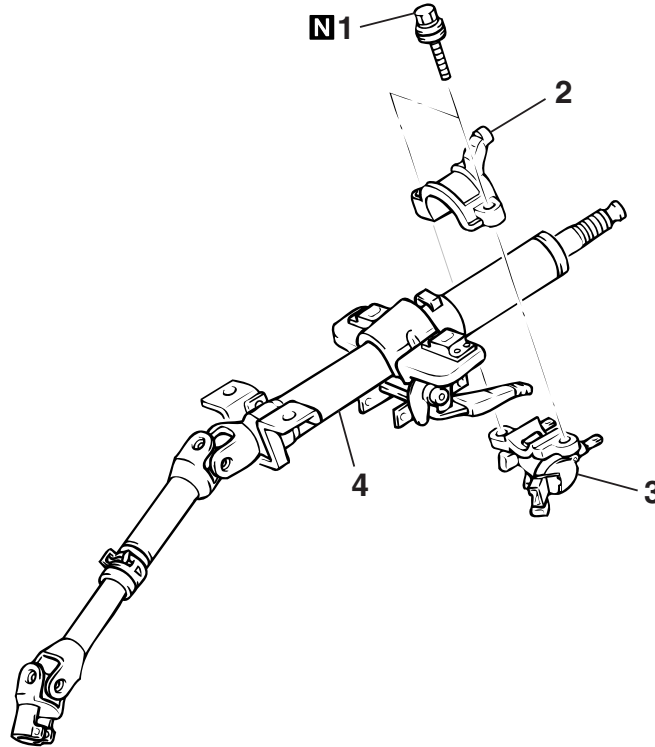


DISASSEMBLY AND ASSEMBLY

M1372015000091

**⚠ WARNING**

*Do not move the tilt lever from the lock position until the installation has completed. If you move it accidentally, the steering column cannot be reinstalled correctly.*



AC210967AC

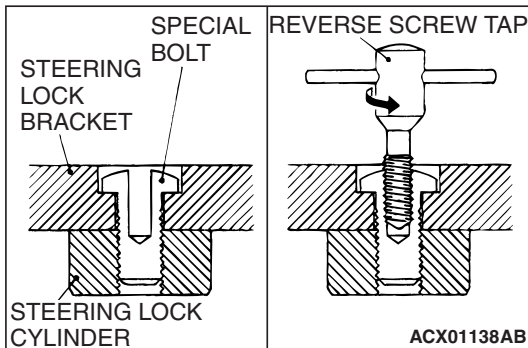
- DISASSEMBLY STEPS**
- <<A>> >>A<< 1. SPECIAL BOLT
  - >>A<< 2. STEERING LOCK BRACKET

- DISASSEMBLY STEPS (Continued)**
- >>A<< 3. STEERING LOCK CYLINDER ASSEMBLY
  - 4. STEERING SHAFT ASSEMBLY

**DISASSEMBLY SERVICE POINT**

**<<A>> SPECIAL BOLT REMOVAL**

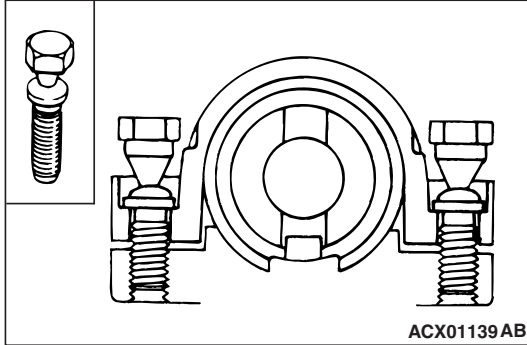
1. Drill in the special bolt a hole deep enough for the tap to stand.
2. Remove the special bolt with a left-hand tap.



**ASSEMBLY SERVICE POINT****>>A<< STEERING LOCK CYLINDER ASSEMBLY/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION****⚠ CAUTION**

The bolts must be replaced with new ones when the steering lock is installed.

1. When installing the steering lock cylinder and steering lock bracket to the steering column assembly, temporarily install the steering lock in alignment with the column boss.
2. After checking that the lock works properly, tighten the special bolts until the head is twisted off.



## POWER STEERING GEAR BOX AND LINKAGE

### REMOVAL AND INSTALLATION

M1372010900680

#### **WARNING**

*Before removing the steering gear, refer to GROUP 52B, Service Precautions (P.52B-16) and Air Bag Module and Clock Spring (P.52B-168). Center the front wheels. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.*

#### **CAUTION**

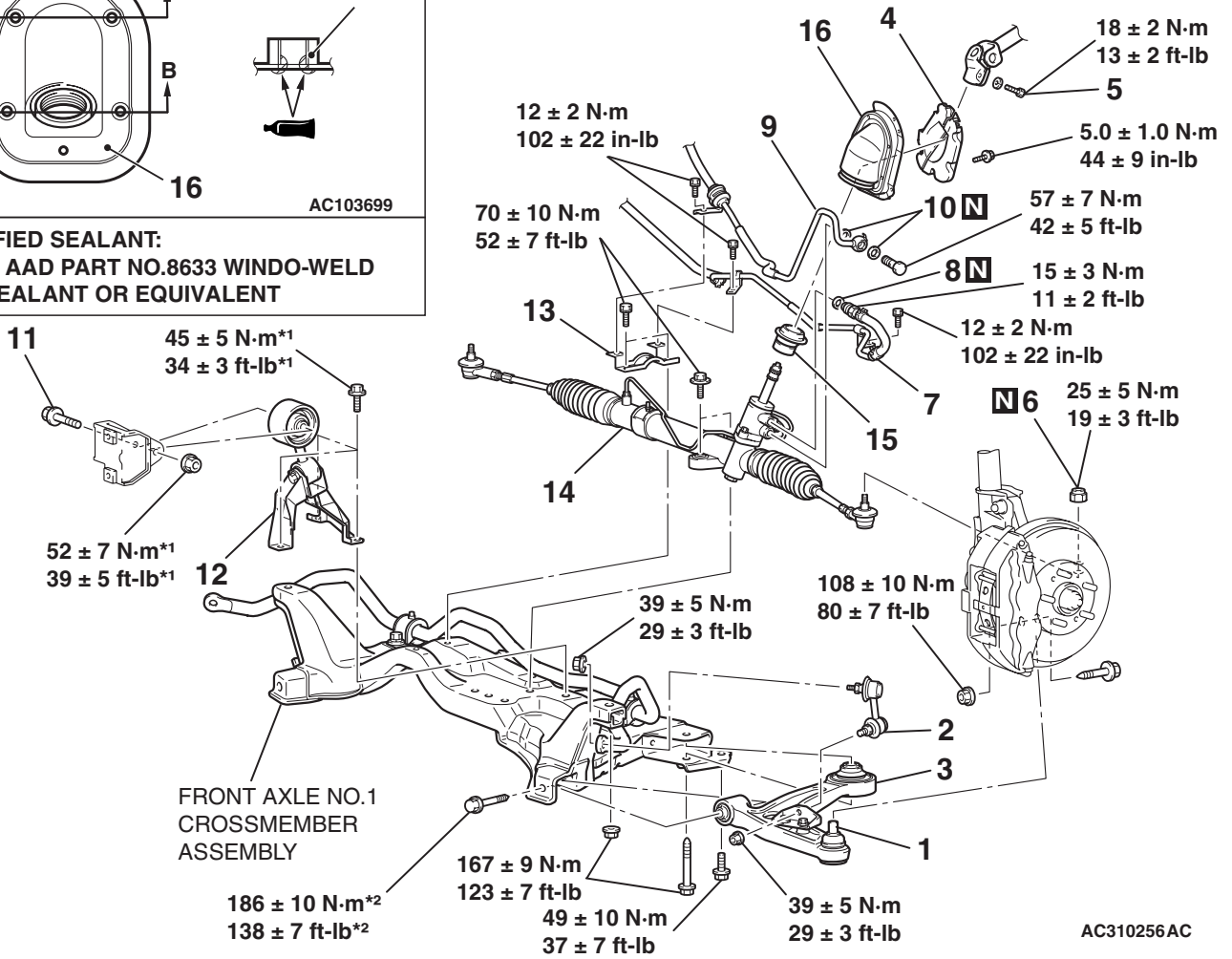
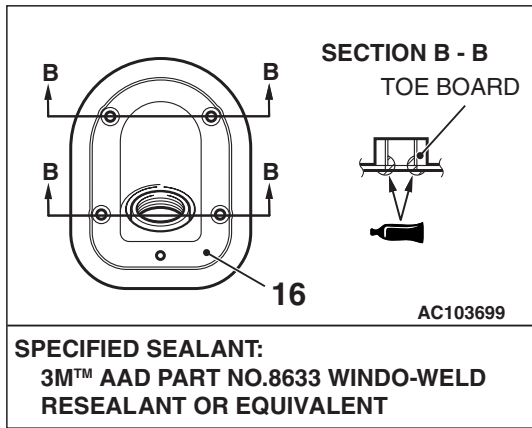
- \*1: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.
- \*2: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.
- During maintenance, take care not to contact the parts or tools to the caliper because the paint of caliper will be scratched. And if there is brake fluid on the caliper, wipe it off quickly.

#### Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37-20.)
- Steering Wheel and Air Bag Module Assembly Removal (Refer to P.37-24.)
- Clock Spring Removal (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-168.)
- Front Floor Carpet Removal
- Front Under Cover Removal (Refer to GROUP 51, Front BumperP.51-2.)
- Centermember, Crossmember Bar Removal (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-7.)

#### Post-installation Operation

- Centermember Installation (Refer to GROUP 32, Engine Roll Stopper and Centermember P.32-7.)
- Clock Spring Installation (Refer to GROUP 52B, Air Bag Module and Clock Spring P.52B-168.)
- Steering Wheel and Air Bag Module Assembly Installation (Refer to P.37-24.)
- Check the dust cover for cracks or damage by pushing it with your finger.
- Power Steering Fluid Supplying (Refer to P.37-20.)
- Power Steering Fluid Line Bleeding (Refer to P.37-20.)
- Checking Steering Wheel Position with Wheels Straight Ahead.
- Front Wheel Alignment Adjustment (Refer to GROUP 33, On-vehicle Service –Front Wheel Alignment Check and Adjustment P.33-7.)
- Front Under Cover Installation (Refer to GROUP 51, Front BumperP.51-2.)



**REMOVAL STEPS**

1. LOWER ARM BALL JOINT CONNECTION
2. STABILIZER LINK
3. LOWER ARM ASSEMBLY
4. SHAFT COVER
5. STEERING COLUMN SHAFT ASSEMBLY AND STEERING GEAR CONNECTING BOLT
6. SELF LOCKING NUT (TIE ROD END AND KNUCKLE CONNECTION)
7. RETURN HOSE AND RETURN TUBE
8. O-RING
9. PRESSURE HOSE CONNECTION
10. GASKET

<<A>>

<<B>>

<<C>>

**REMOVAL STEPS (Continued)**

11. ENGINE REAR ROLL STOPPER ROD CONNECTING BOLT
- FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY
12. ENGINE REAR ROLL STOPPER ROD AND ENGINE REAR ROLL STOPPER ROD BRACKET
13. CLAMP
14. STEERING GEAR
- >>A<< 15. JOINT COVER GROMMET
16. COVER ASSEMBLY

**Required Special Tool:**

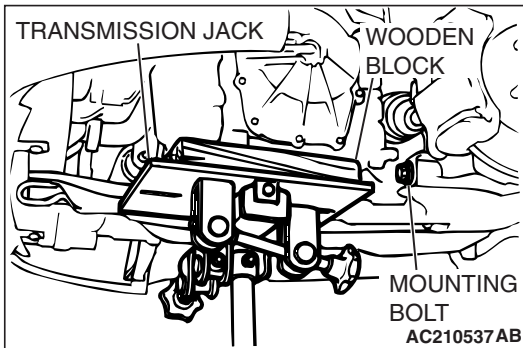
- MB991897: Ball Joint Remover



## REMOVAL SERVICE POINTS

### <<A>> LOWER ARM ASSEMBLY REMOVAL

Lift the transaxle with a transmission jack, and then withdraw the front mounting bolt on the left lower arm assembly.

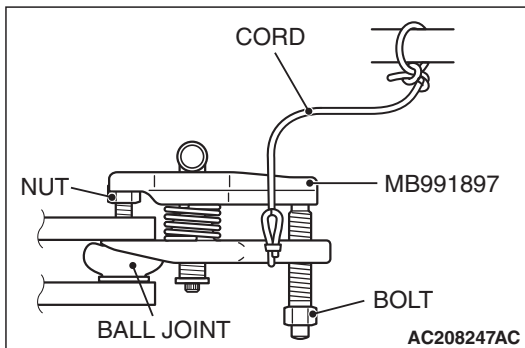


### <<B>> SELF LOCKING NUT (TIE ROD END AND KNUCKLE CONNECTION) DISCONNECTION

#### ⚠ CAUTION

- Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.
- Hang special tool MB991897 with a cord to prevent it from falling.

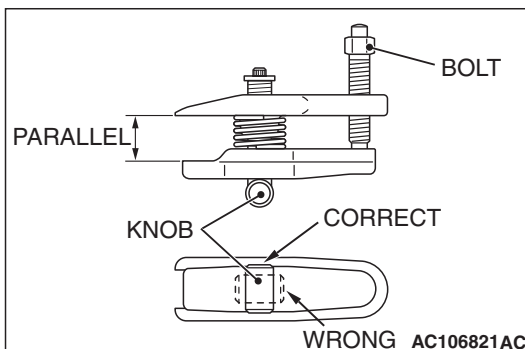
1. Install special tool MB991897 as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool MB991897 parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

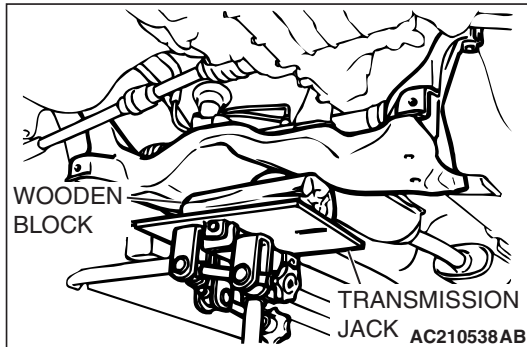
*NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.*

3. Tighten the bolt with a wrench to disconnect the tie rod end.

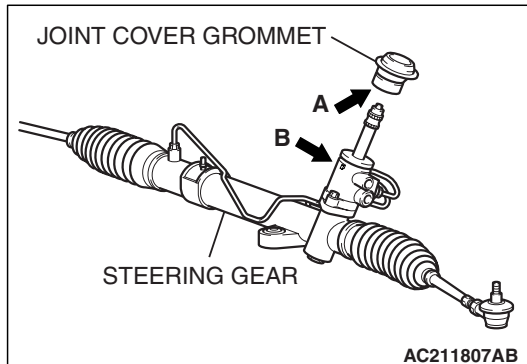


**<<C>> FRONT AXLE NO.1 CROSSMEMBER  
ASSEMBLY REMOVAL**

Retain the crossmember with a transmission jack, and then remove the crossmember mounting bolt.

**INSTALLATION SERVICE POINT****>>A<< JOINT COVER GROMMET INSTALLATION**

Align the joint cover grommet notch (arrow A) with the steering gear lug (arrow B), and then install the steering joint cover to the steering gear.

**INSPECTION**

M1372011000431

**STEERING GEAR TOTAL PINION TORQUE  
CHECK****Required Special Tool:**

- MB991006: Preload Socket

**⚠ CAUTION**

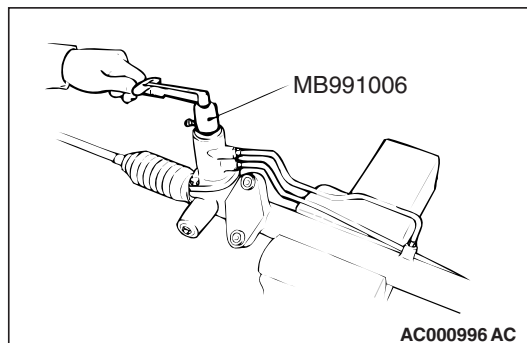
**When holding the steering gear in a vice, secure its mounting positions. If it is secured in any other place, the gear housing may become deformed or damaged.**

1. Using special tool MB991006, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

**Standard value: 0.8 – 1.8 N·m (7.1 – 15.9 in-lb)  
[Change in torque: 0.49 N·m (4.3 in-lb) or less]**

*NOTE: When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.*

*If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion torque again.*



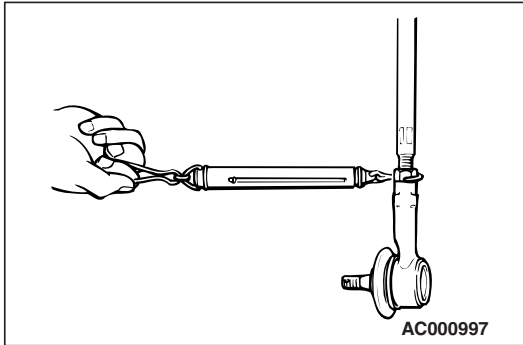
2. If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, rack support spring, or rack support, replace any parts if necessary.

### TIE ROD SWING RESISTANCE CHECK

1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring scale.

**Standard value: 8 – 27 N (1.8 – 6.1 lb) [1.5 – 4.9 N·m (13.2 – 43.4 in-lb)]**

3. If the measured value exceeds the standard value, replace the tie rod.
4. If the measured value is below the standard value, the tie rod can be re-used if it swings smoothly without excessive play.

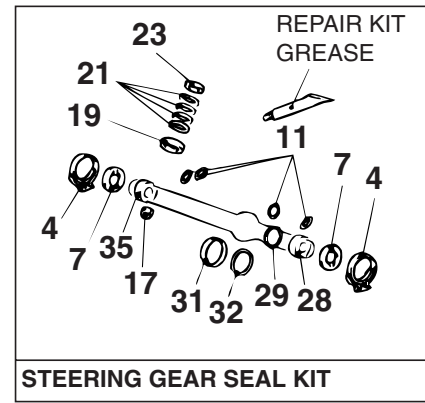
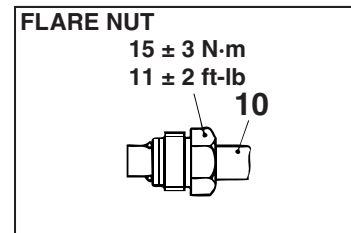
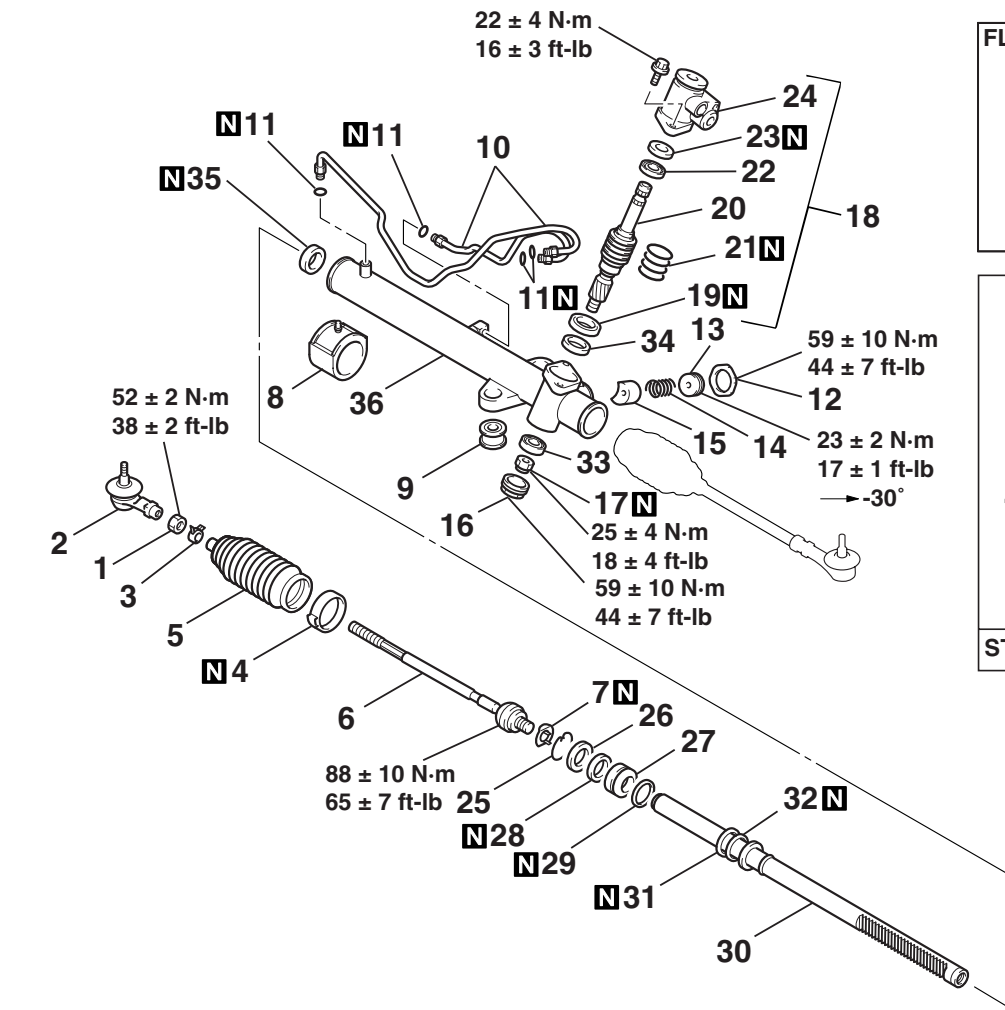


### TIE ROD END BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the tie rod end. (Refer to [P.37-36](#)).

*NOTE: Cracks or damage of the dust cover may damage the ball joint. If it is damaged during service work, replace the dust cover. (Refer to [P.37-48](#).)*

DISASSEMBLY AND ASSEMBLY



AC211818 AB

**DISASSEMBLY STEPS**

- >>O<< 1. JAM NUT
- >>O<< 2. TIE ROD END
- 3. CLIP
- >>N<< 4. BAND
- 5. BELLOWS
- >>M<< 6. TIE ROD
- >>M<< 7. TAB WASHER
- >>L<< 8. GEAR MOUNTING RUBBER CUSHION
- 9. GEAR HOUSING MOUNTING BUSHING
- 10. FEED PIPE
- 11. O-RING
- >>K<< • TOTAL PINION TORQUE ADJUSTMENT
- >>J<< 12. JAM NUT
- <<A>> >>J<< 13. RACK SUPPORT COVER
- 14. SUPPORT SPRING
- 15. RACK SUPPORT
- >>I<< 16. END PLUG

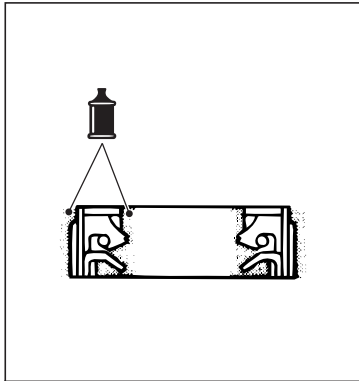
**DISASSEMBLY STEPS (Continued)**

- 17. JAM NUT
- 18. VALVE HOUSING ASSEMBLY
- <<B>> >>H<< 19. LOWER OIL SEAL
- <<B>> 20. PINION AND VALVE ASSEMBLY
- <<C>> >>G<< 21. SEAL RING
- <<D>> >>F<< 22. UPPER BEARING
- <<D>> >>F<< 23. UPPER OIL SEAL
- 24. VALVE HOUSING
- <<E>> >>E<< 25. CIRCLIP
- <<F>> 26. RACK STOPPER
- <<F>> >>D<< 27. RACK BUSHING
- <<F>> >>D<< 28. OIL SEAL
- <<F>> 29. O-RING
- <<F>> >>C<< 30. RACK ASSEMBLY
- <<C>> 31. SEAL RING
- 32. O-RING
- <<G>> >>B<< 33. LOWER BEARING
- <<H>> >>B<< 34. NEEDLE BEARING
- <<I>> >>A<< 35. OIL SEAL
- 36. GEAR HOUSING

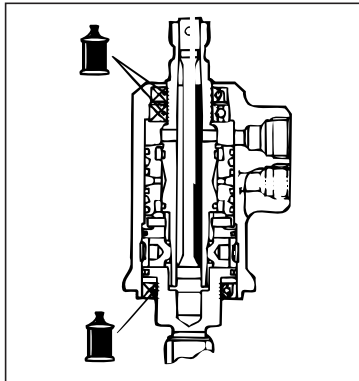
**Required Special Tools:**

- MB990776: Front Axle Base
- MB990927: Installer Adapter
- MB990938: Bar (Snap-in type)
- MB990939: Brass Bar
- MB990941: Torque Tube Bearing Installer
- MB991006: Preload Socket
- MB991120: Needle Bearing Puller
- MB991197: Bar (Long type)
- MB991199: Oil Seal and Bearing Installer
- MB991202: Oil Seal and Bearing Installer
- MB991203: Oil Seal and Bearing Installer
- MB991214: Rack Installer
- MB991317: Seal Ring Installer
- MB991561: Boot Band Crimping Tool
- MB991621: Rack Support Cover Wrench

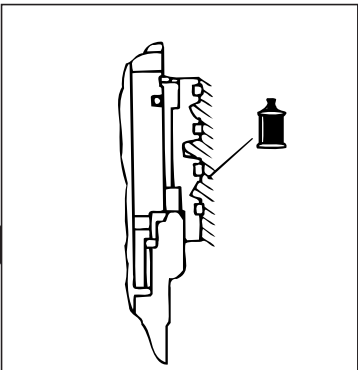
LUBRICATION AND SEALING POINTS



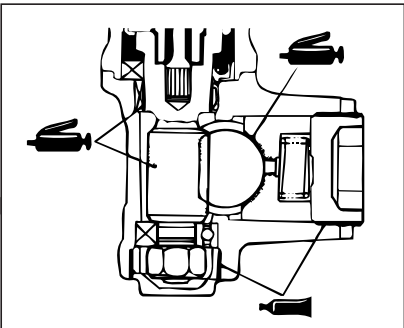
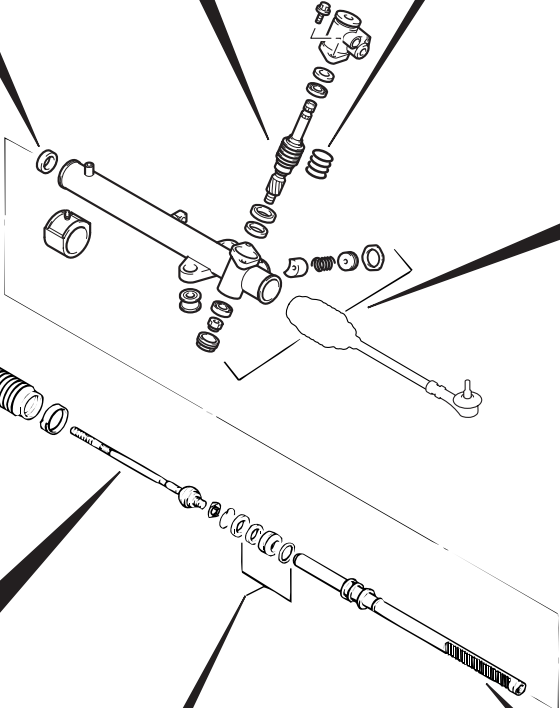
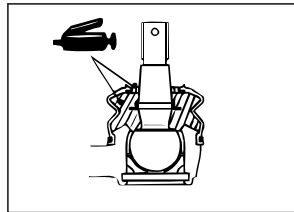
FLUID:  
GENUINE MITSUBISHI  
POWER STEERING FLUID



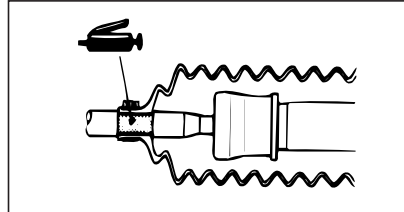
FLUID:  
GENUINE MITSUBISHI  
POWER STEERING FLUID



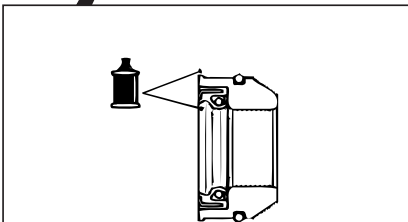
FLUID:  
GENUINE MITSUBISHI  
POWER STEERING FLUID



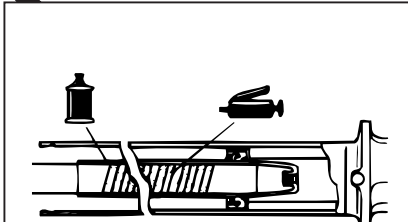
SEALANT:  
3M™ AAD PART NO. 8661,  
8663, 8672, 8678, 8679 OR  
EQUIVALENT



GREASE: SILICONE GREASE



FLUID:  
GENUINE MITSUBISHI  
POWER STEERING FLUID



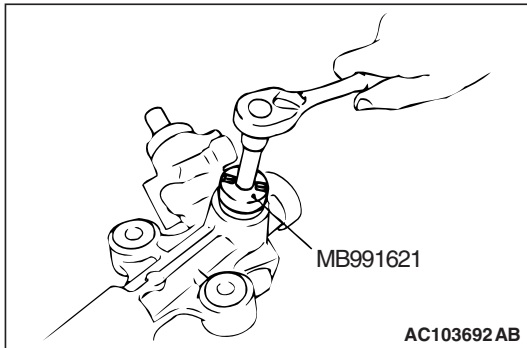
FLUID:  
GENUINE MITSUBISHI POWER  
STEERING FLUID

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## DISASSEMBLY SERVICE POINTS

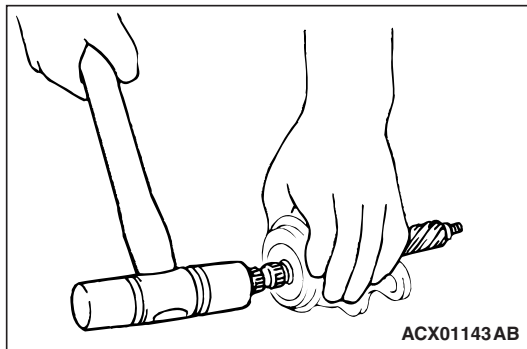
### <<A>> RACK SUPPORT COVER REMOVAL

Using special tool MB991621, remove the rack support cover from the gear box.



### <<B>> LOWER OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

Using a plastic hammer, gently tap the pinion to remove it.

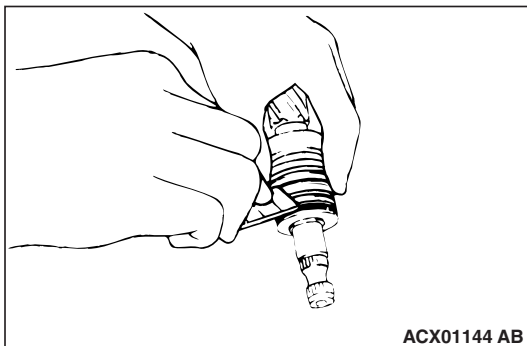


### <<C>> SEAL RING REMOVAL

#### **⚠ CAUTION**

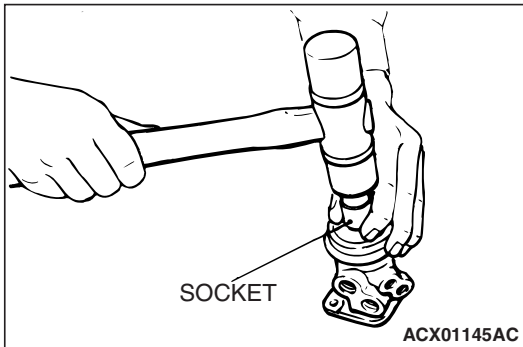
When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.

Cut the seal ring and remove it from the pinion and valve assembly and the rack.



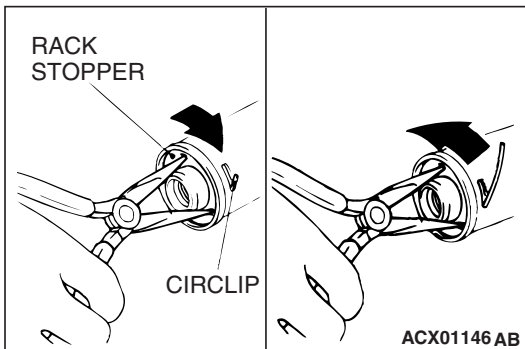
**<<D>> UPPER BEARING/UPPER OIL SEAL  
REMOVAL**

Using a socket, remove the oil seal and the ball bearing from the valve housing simultaneously.

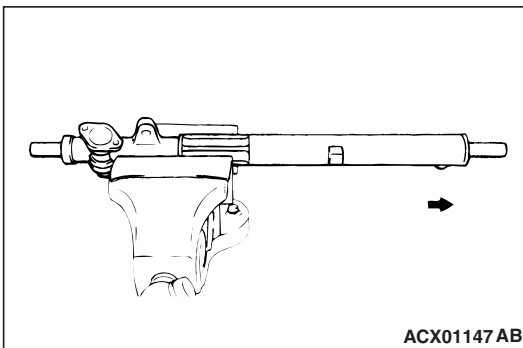
**<<E>> CIRCLIP REMOVAL****⚠ CAUTION**

If the rack stopper is first turned counterclockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.

1. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
2. Turn the rack stopper counterclockwise to remove the circlip.

**<<F>> RACK STOPPER/RACK BUSHING/OIL  
SEAL/O-RING/RACK ASSEMBLY REMOVAL**

1. Pull out the rack slowly. Take out the rack stopper and the rack bushing at the same time.

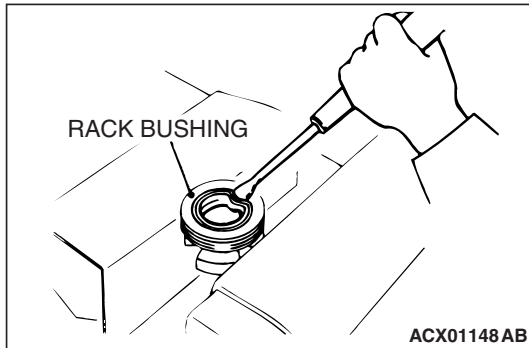




**⚠ CAUTION**

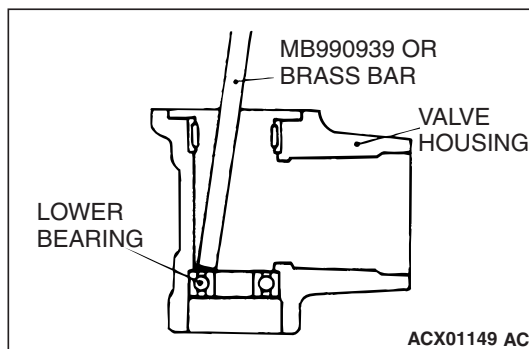
**Do not damage the oil seal press fitting surface.**

2. Partially bend the oil seal and remove it from the rack bushing.



**<<G>> LOWER BEARING REMOVAL**

Use a brass bar or special tool MB990939 to remove the ball bearing from the gear housing.

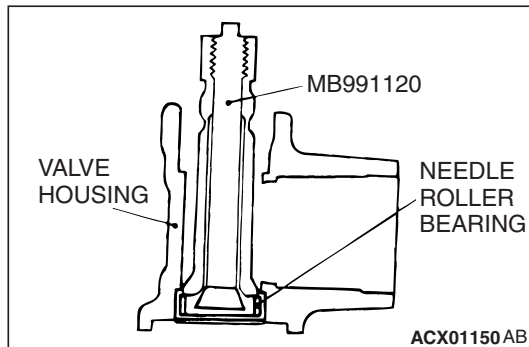


**<<H>> NEEDLE BEARING REMOVAL**

**⚠ CAUTION**

**To prevent damaging housing interior, do not open special tool MB991120 excessively.**

Use special tool MB991120 to remove the needle roller bearing from the rack housing.

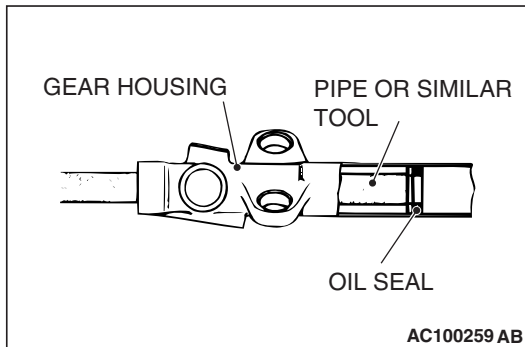


## &lt;&lt;I&gt;&gt; OIL SEAL REMOVAL

**⚠ CAUTION**

Be careful not to damage the inner surface of the rack cylinder of the gear housing.

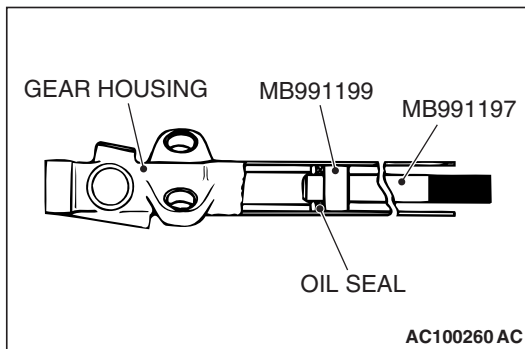
Use a piece of pipe or similar tool to remove the oil seal from the gear housing.



## ASSEMBLY SERVICE POINTS

## &gt;&gt;A&lt;&lt; OIL SEAL INSTALLATION

1. Apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID to the both sides of the oil seal.
2. Using special tools MB991199 and MB991197, press the oil seal into the rack housing.



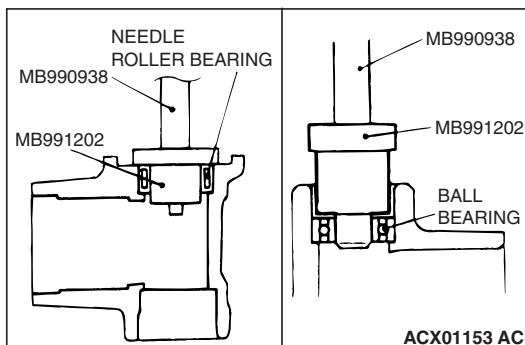
## &gt;&gt;B&lt;&lt; NEEDLE BEARING/LOWER BEARING INSTALLATION

1. Apply GENUINE MITSUBISHI POWER STEERING FLUID to housing, bearing and oil seal press fitting surface.

**⚠ CAUTION**

Press-fit straight. The valve housing is aluminum, and may become deformed if press-fit on an angle.

2. Press fit needle roller bearing with special tools MB990938 and MB991202.

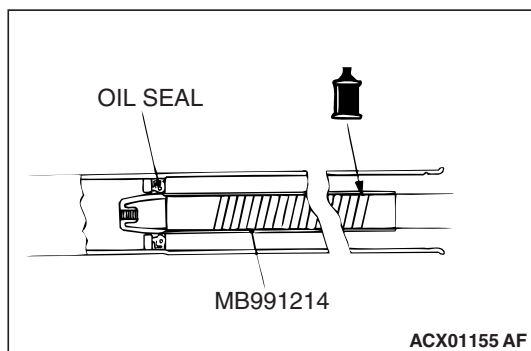
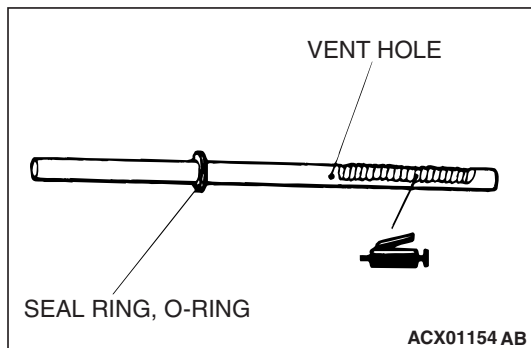


### >>C<< RACK ASSEMBLY INSTALLATION

**CAUTION**

Do not close the vent hole in the rack with grease.

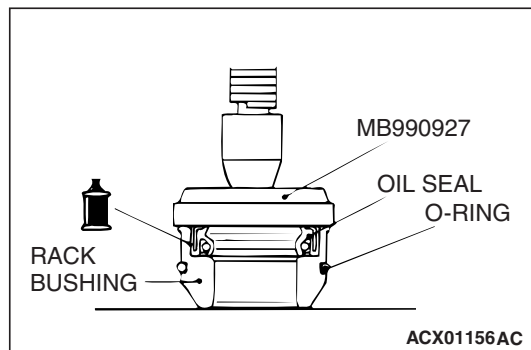
1. Apply a coating of multipurpose grease to the rack teeth face.



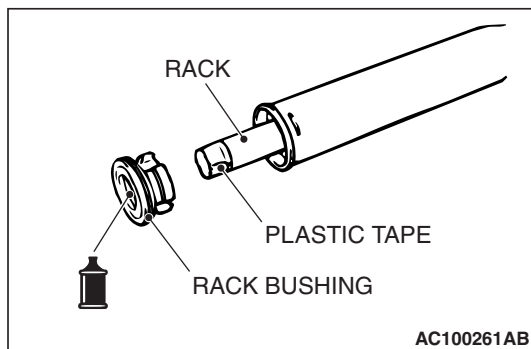
2. Cover rack serrations with special tool MB991214.
3. Apply GENUINE MITSUBISHI POWER STEERING FLUID to special tool MB991214.
4. Align the center of the oil seal with the rack to prevent the retainer spring from slipping. Slowly insert the rack from power cylinder side.

### >>D<< OIL SEAL/RACK BUSHING INSTALLATION

1. Apply GENUINE MITSUBISHI POWER STEERING FLUID to the outer surface of the oil seal. Using special tool MB990927, press in the oil seal until it is flush with the bushing end face.



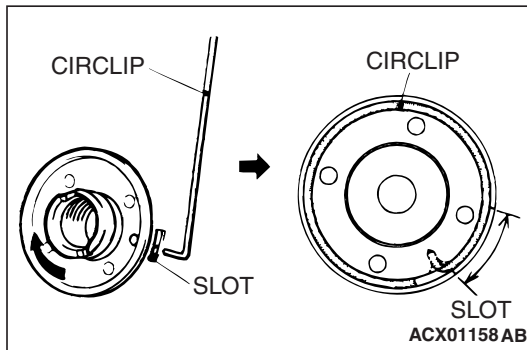
2. Apply GENUINE MITSUBISHI POWER STEERING FLUID to the oil seal inner surface and the O-ring.
3. Wrap the rack end with plastic tape, and push the rack bushing onto the rack.



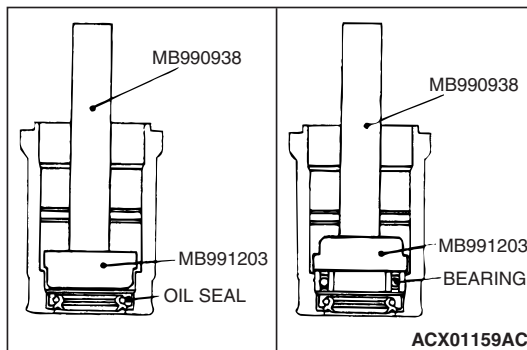
**>>E<< CIRCLIP INSTALLATION****⚠ CAUTION**

Insert the circlip to the rack stopper hole while turning the rack stopper clockwise.

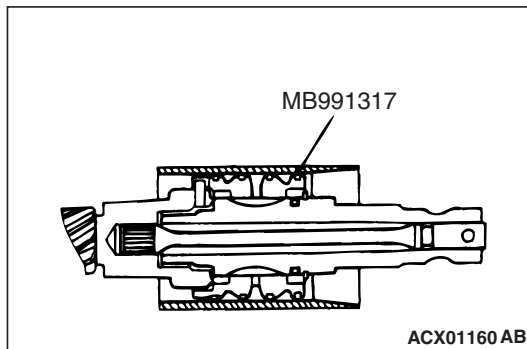
Insert the circlip to the rack stopper hole through cylinder hole. Turn the rack stopper clockwise and insert the circlip firmly.

**>>F<< UPPER OIL SEAL/UPPER BEARING INSTALLATION**

Apply a coating of GENUINE MITSUBISHI POWER STEERING FLUID to the outside of the upper oil seal/upper bearing. Using special tools MB990938 and MB991203, press the upper oil seal/upper bearing into the valve housing.

**>>G<< SEAL RING INSTALLATION**

Because the seal rings expand after installation, tighten after installing by using special tool MB991317 to compress the rings, or press down by hand.

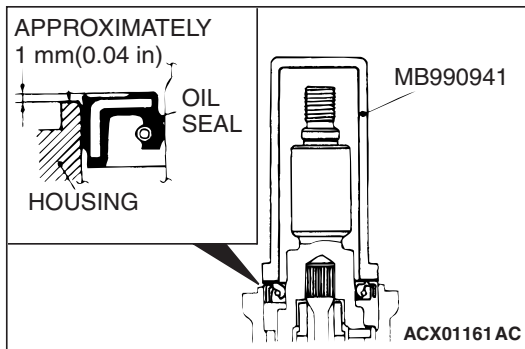


### >>H<< LOWER OIL SEAL INSTALLATION

#### **⚠ CAUTION**

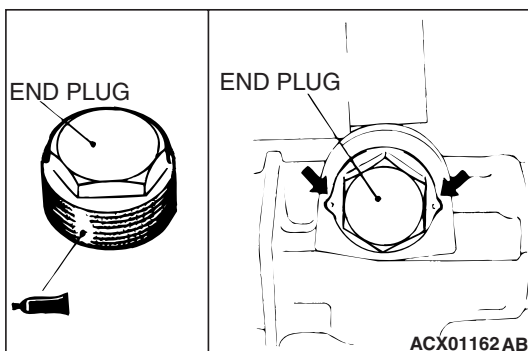
To eliminate a seal malfunction at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm (0.04 inch) from the housing edge surface.

Using special tool MB990941, press the oil seal into the valve housing.



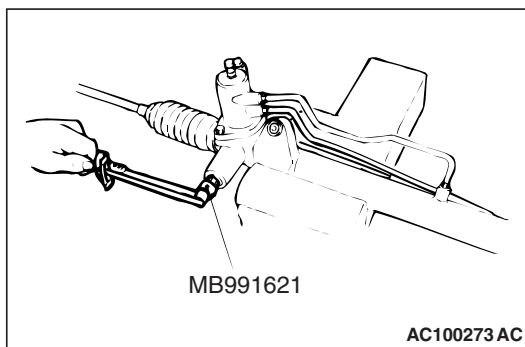
### >>I<< END PLUG INSTALLATION

1. Apply 3M™ AAD Part number 8661, 8663, 8672, 8678, 8679 or equivalent to the threaded part of the end plug.
2. Secure the threaded portion of the end plug at two places by using a punch.



### >>J<< RACK SUPPORT COVER/JAM NUT INSTALLATION

1. Position the rack at its center.
2. Apply 3M™ AAD Part number 8661, 8663, 8672, 8678, 8679 or equivalent to the threaded part of the rack support cover.
3. Use special tool MB991621 to tighten the rack support cover to  $23 \pm 2$  N·m ( $17 \pm 1$  ft-lb).
4. Turn the rack support cover 30 degrees counterclockwise.
5. Use special tool MB991204 to hold the rack support cover, and then tighten the jam nut to  $59 \pm 10$  N·m ( $44 \pm 7$  ft-lb).



## &gt;&gt;K&lt;&lt; TOTAL PINION TORQUE ADJUSTMENT

**⚠ CAUTION**

- Be sure there is no ratcheting or catching when operating the rack towards the shaft.
- Measure the total pinion torque through the whole stroke of the rack.

1. Using special tool MB991006, rotate the pinion shaft at the rate of one rotation in four to six seconds to check the total pinion torque and the change in torque.

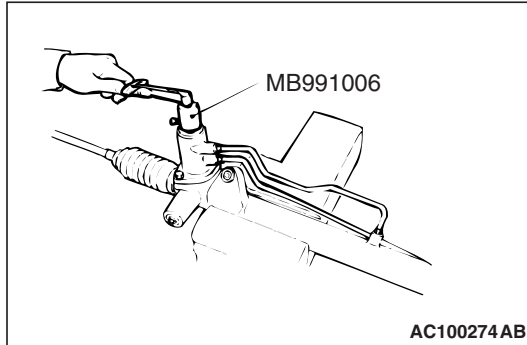
**Standard value: 0.8 – 1.8 N·m (7.1 – 15.9 in-lb)**  
**[Change in torque: 0.49 N·m (4.3 in-lb) or less]**

**⚠ CAUTION**

**When adjusting, set at the highest value of the standard value range.**

2. If the total pinion torque or the change in torque is outside the standard value, move the rack support cover 0 –30 degrees, and adjust the pinion torque again.

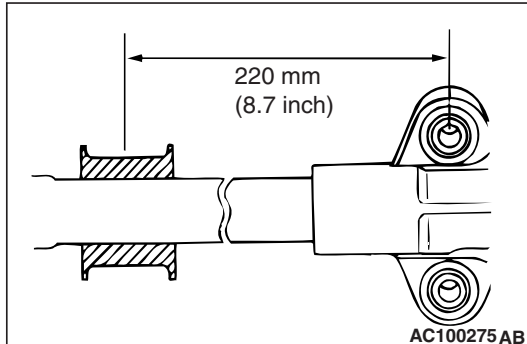
*NOTE: If the total pinion torque cannot be adjusted to the standard value within the specified return angle, check the rack support cover components and replace any parts if necessary.*



AC100274AB

## &gt;&gt;L&lt;&lt; GEAR MOUNTING RUBBER INSTALLATION

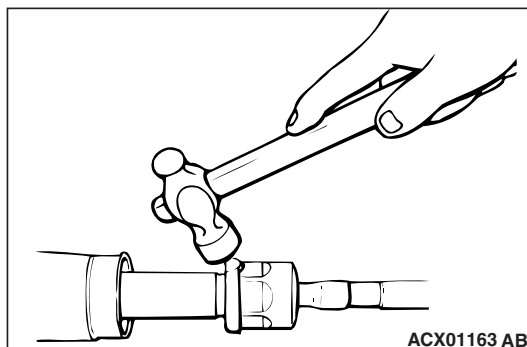
Install the gear mounting rubber to the rack housing so that the distance is as shown in the illustration.



AC100275AB

## &gt;&gt;M&lt;&lt; TAB WASHER/TIE ROD INSTALLATION

After installing the tie rod to the rack, fold the tab washer end (two locations) to tie rod notch.



ACX01163 AB

### >>N<< BAND INSTALLATION

1. Turn the adjusting bolt of special tool MB991561 to adjust the opening dimension (W) to the standard value.

*NOTE: The dimension (W) is adjusted by approximately 0.7 mm (0.03 inch) per one turn.*

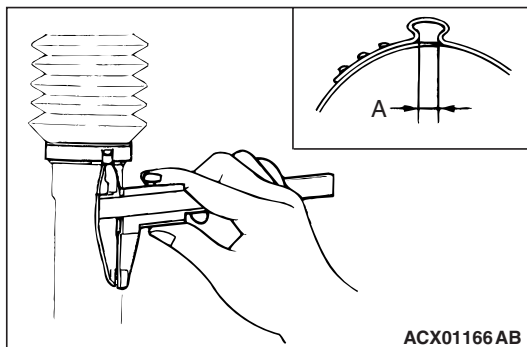
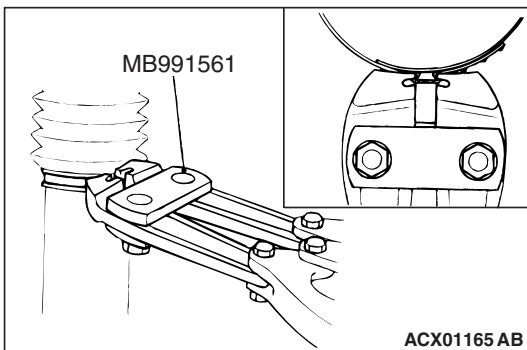
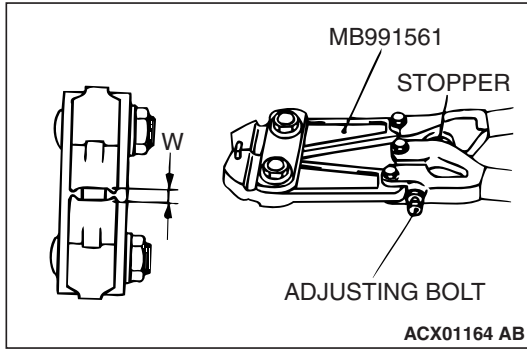
*NOTE: Do not turn the adjusting bolt more than one turn.*

**Standard value (W): 2.9 mm (0.11 inch)**

- <When more than 2.9 mm (0.11 inch)>: Screw in the adjusting bolt.
- <When less than 2.9 mm (0.11 inch)>: Loosen the adjusting bolt.

#### **⚠ CAUTION**

- Hold the rack housing, and use special tool MB991561 to crimp the bellows band securely.
  - Crimp the bellows band until special tool MB991561 touches the stopper.
2. Use special tool MB991561 to crimp the bellows band.



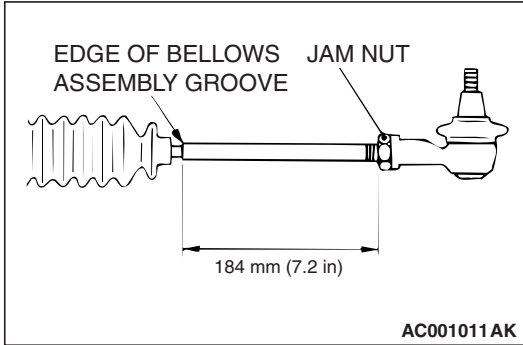
3. Check that crimped width (A) is within the standard value.

**Standard value (A): 2.4 – 2.8 mm (0.09 – 0.11 inch)**

- <When more than 2.8 mm (0.11 inch)>: Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).  

$$W = 5.5 \text{ mm (0.22 inch)} - A$$
 [Example: if (A) is 2.9 mm (0.11 inch), (W) is 2.6 mm (0.10 inch).]
- <When less than 2.4 mm (0.09 inch)>: Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).  

$$W = 5.5 \text{ mm (0.22 inch)} - A$$
 [Example: if (A) is 2.3 mm (0.09 inch), (W) is 3.2 mm (0.13 inch).]

**>>O<< TIE ROD END/JAM NUT INSTALLATION**

Screw in the tie rod end to achieve the right and left length as illustrated. Lock with the jam nut.

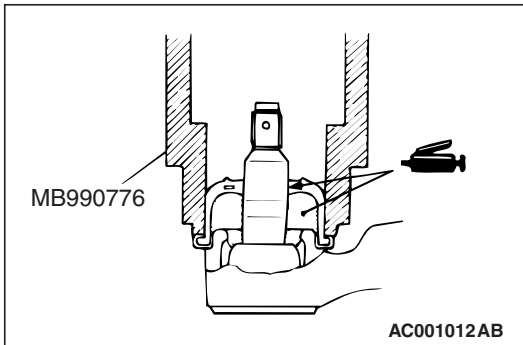
*NOTE: The locking nut must be tightened securely only after the power steering gear box and linkage are installed to the vehicle and toe-in is adjusted.*

**TIE ROD END BALL JOINT DUST COVER REPLACEMENT**

M1372008200424

If the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Apply grease to the lip and inside of the dust cover.
2. Drive in the dust cover with special tool MB990776 until it is fully seated.
3. Check the dust cover for cracks or damage by pushing it with your finger.





# POWER STEERING OIL PUMP ASSEMBLY

## REMOVAL AND INSTALLATION

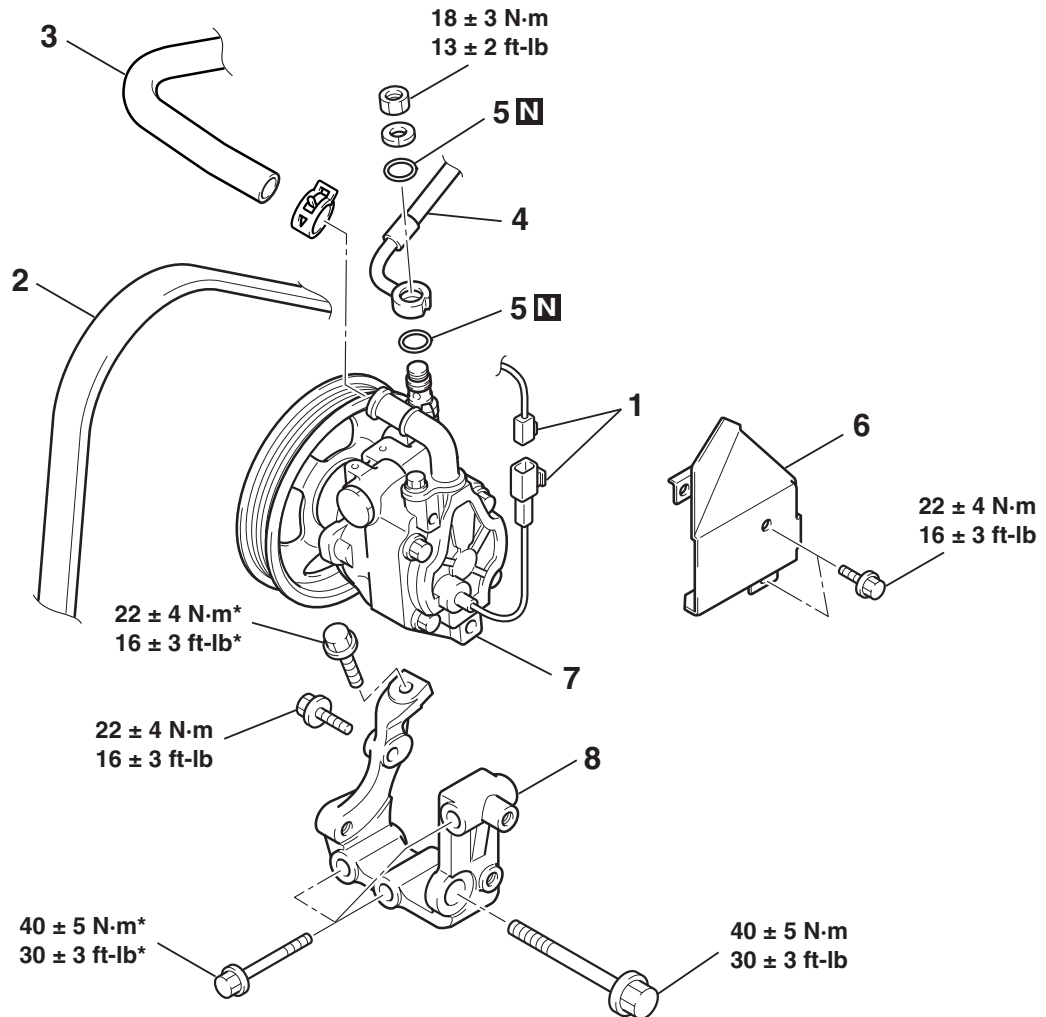
M1372005200577

### Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37-20.)

### Post-installation Operation

- Power Steering Fluid Supplying and Bleeding (Refer to P.37-20.)
- Drive Belt Tension Adjusting (Refer to GROUP 00, Maintenance Service –Drive Belts P.00-41.)



AC211828 AB

### REMOVAL STEPS

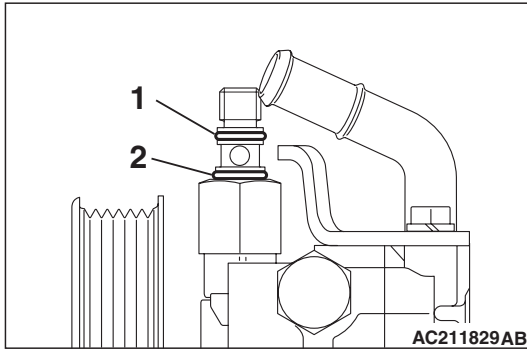
1. PRESSURE SWITCH CONNECTOR
2. DRIVE BELT
- >>B<< 3. SUCTION HOSE
- >>B<< 4. PRESSURE HOSE
- >>A<< 5. O-RING

### REMOVAL STEPS (Continued)

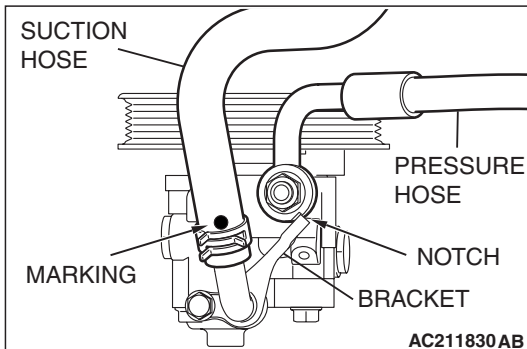
6. HEAT PROTECTOR
7. OIL PUMP ASSEMBLY
8. POWER STEERING PUMP BRACKET

## INSTALLATION SERVICE POINTS

## &gt;&gt;A&lt;&lt; O-RING INSTALLATION



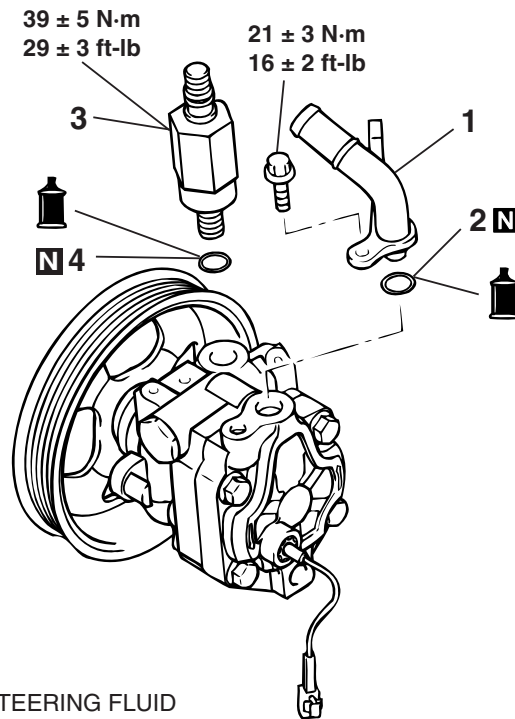
No.	ID × Width mm (in)
1	11.0 × 1.9 (0.43 × 0.07)
2	13.0 × 1.9 (0.51 × 0.07)

>>B<< PRESSURE HOSE/SUCTION HOSE  
INSTALLATION

1. Install the pressure hose so that the notch is fixed with bracket as shown in the illustration.
2. Install the suction hose so that the marking is positioned as shown in the illustration.

DISASSEMBLY AND ASSEMBLY

M1372005400269



 : GENUINE MITSUBISHI POWER STEERING FLUID

AC211831AB

- DISASSEMBLY STEPS**
1. SUCTION CONNECTOR
  2. O-RING

- DISASSEMBLY STEPS (Continued)**
3. CONNECTOR
  4. GASKET

**INSPECTION**

M1372005300143

- Check the drive belt for cracks.
- Check the pulley for uneven rotation.

# POWER STEERING HOSES

## REMOVAL AND INSTALLATION

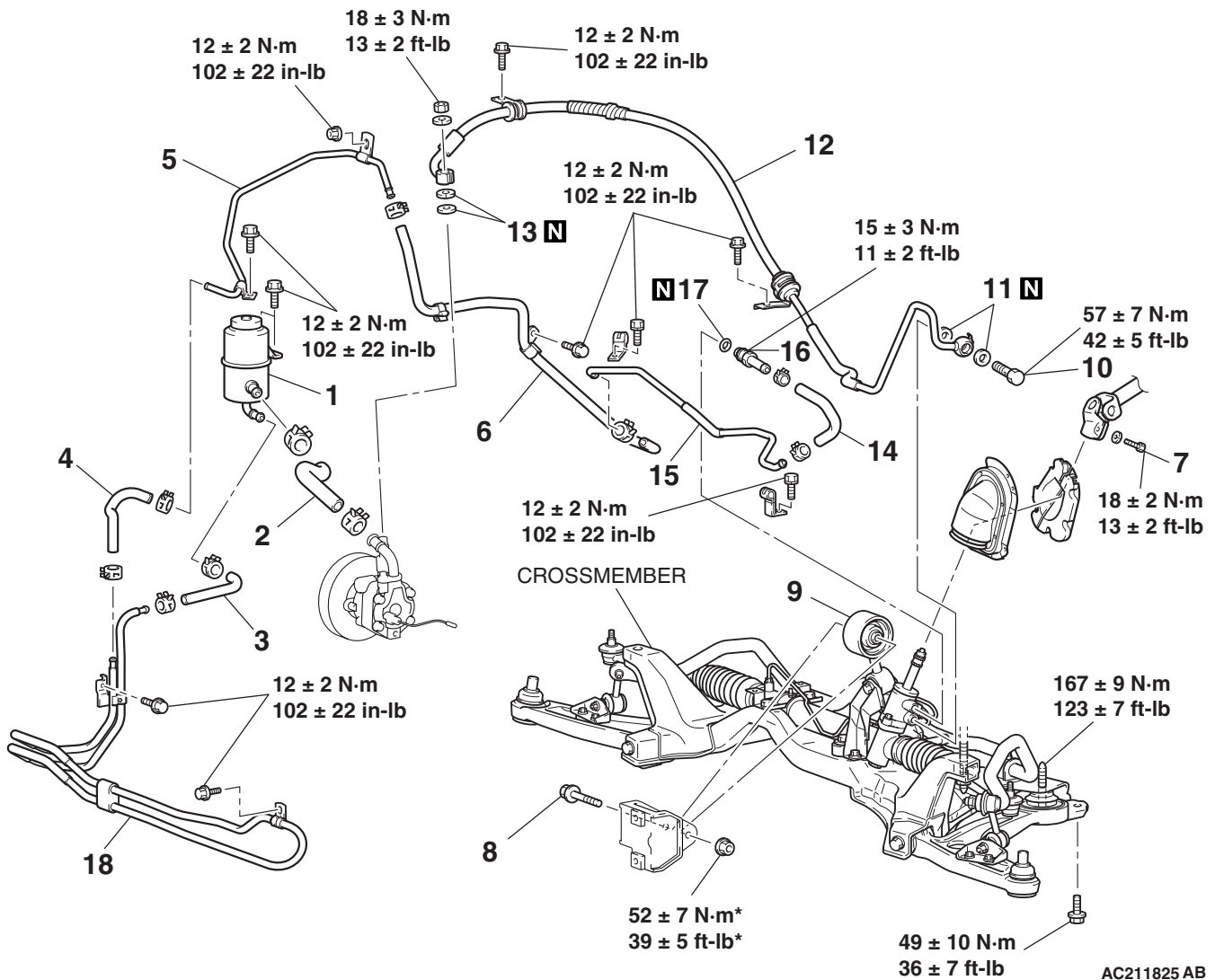
M1372005700721

### Pre-removal Operation

- Front Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2.)
- Crossmember Bar Removal (Refer to GROUP 33, Crossmember Bar P.33-23.)
- Center Member Removal (Refer to GROUP 32, Engine Roll Stopper and Center Member P.32-7.)
- Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-17.)
- Power Steering Fluid Draining (Refer to P.37-20.)
- Front Bumper Removal (Refer to P.51-2.)
- Charge Air Cooler Removal (Refer to GROUP 15, Charge Air Cooler P.15-8.)
- Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-12.)

### Post-installation Operation

- Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-12.)
- Charge Air Cooler Installation (Refer to GROUP 15, Charge Air Cooler P.15-8.)
- Front Bumper Installation (Refer to P.51-2.)
- Power Steering Fluid Supplying and Bleeding (Refer to P.37-20.)
- Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-17.)
- Center Member Installation (Refer to GROUP 32, Engine Roll Stopper and Center Member P.32-7.)
- Crossmember Bar Installation (Refer to GROUP 33, Crossmember Bar P.33-23.)
- Front Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2.)



### REMOVAL STEPS

1. OIL RESERVOIR
- >>B<< 2. SUCTION HOSE
3. RETURN HOSE
4. RETURN HOSE

### REMOVAL STEPS (Continued)

5. RETURN TUBE
- >>C<< 6. RETURN HOSE
7. STEERING SHAFT ASSEMBLY AND GEAR BOX CONNECTING BOLT

**REMOVAL STEPS (Continued)**

- 8. ENGINE REAR ROLL STOPPER ROD CONNECTING BOLT
- 9. ENGINE REAR ROLL STOPPER ROD (REFER TO GROUP32, ENGINE ROLL STOPPER AND CENTERMEMBER P.32-7.)
- <<A>> 10. EYE BOLT
- 11. GASKET
- >>B<< 12. PRESSURE HOSE
- 13. O-RING
- >>A<< 14. RETURN HOSE
- 15. RETURN TUBE
- <<A>> 16. RETURN TUBE
- 17. O-RING
- 18. COOLER TUBE ASSEMBLY

**REMOVAL SERVICE POINT**

**<<A>> EYE BOLT/RETURN TUBE REMOVAL**

1. Loosen the crossmember mounting bolts and nuts, and lower the crossmember to a position so that the eye bolts or return tube at the steering gear side can be removed.

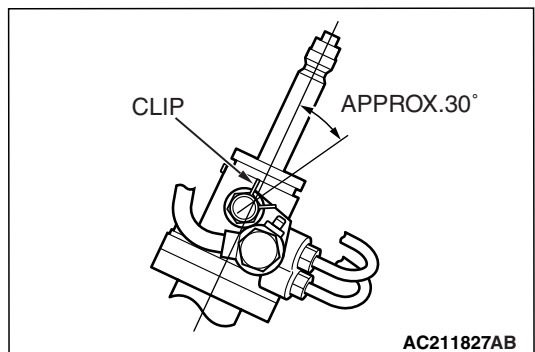
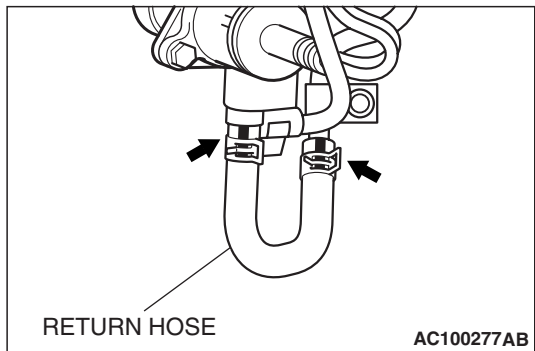
*NOTE: In this case, do not remove the crossmember mounting bolts and nuts.*

2. Remove the eye bolts or return tube.

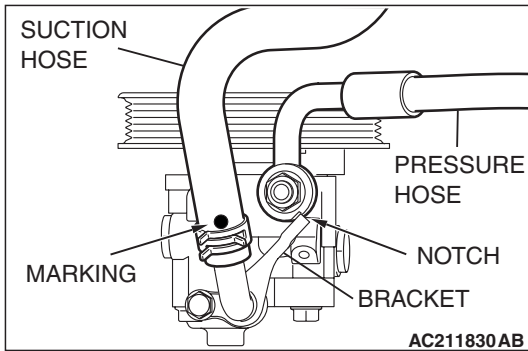
**INSTALLATION SERVICE POINTS**

**>>A<< RETURN HOSE INSTALLATION**

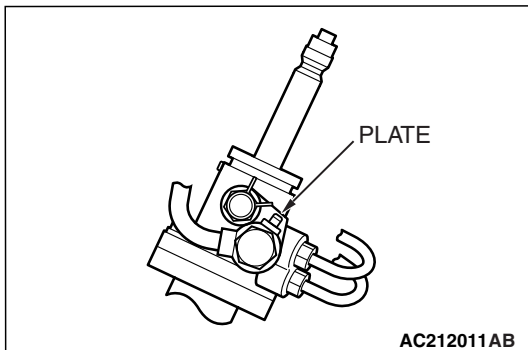
1. Install the return hose so that the marking is positioned as shown in the illustration.



2. Install the clip as shown in the illustration.

**>>B<< PRESSURE HOSE/SUCTION HOSE  
INSTALLATION**

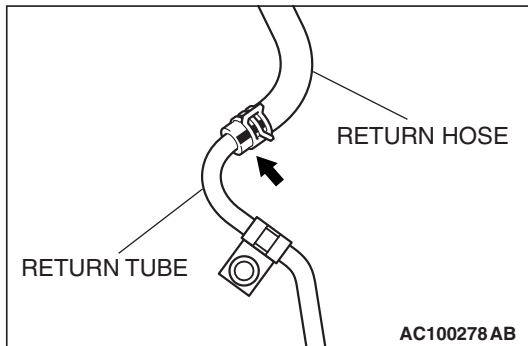
1. Install the pressure hose on pump side so that the notch is fixed with bracket as shown in the illustration.
2. Install the suction hose so that the marking is positioned as shown in the illustration.



3. Install the pressure hose on gear box side so that its plate part is positioned as shown in the illustration.

**>>C<< RETURN HOSE INSTALLATION**

Install the return hose so that the marking is positioned as shown in the illustration.



## SPECIFICATIONS

### FASTENER TIGHTENING SPECIFICATIONS

M1372008400398

ITEM	SPECIFICATION
<b>Power steering gear box and linkage</b>	
Crossmember mounting bolt	167 ± 9 N· m (123 ± 7 ft-lb)
Crossmember mounting bolt	49 ± 10 N· m (37 ± 7 ft-lb)
Crossmember mounting nut	167 ± 9 N· m (123 ± 7 ft-lb)
End plug	59 ± 10 N· m (44 ± 7 ft-lb)
Engine rear roll stopper rod connecting nut	52 ± 7 N· m (39 ± 5 ft-lb)
Engine rear roll stopper rod bracket mounting bolt	45 ± 5 N· m (34 ± 3 ft-lb)
Hose and tube mounting bolt	12 ± 2 N· m (102 ± 22 in-lb)
Jam nut	59 ± 10 N· m (44 ± 7 ft-lb)
Jam nut	25 ± 4 N· m (18 ± 4 ft-lb)
Lower arm and crossmember connecting bolt	186 ± 10 N· m (138 ± 7 ft-lb)
Lower arm and knuckle connecting nut	108 ± 10 N· m (80 ± 7 ft-lb)
Pressure hose connecting bolt	57 ± 7 N· m (42 ± 5 ft-lb)
Rack support cover	23 ± 2 N· m → 30° (17 ± 1 ft-lb) → 30°
Return tube flare nut	15 ± 3 N· m (11 ± 2 ft-lb)
Self locking nut	25 ± 5 N· m (19 ± 3 ft-lb)
Stabilizer link connecting nut	39 ± 5 N· m (29 ± 3 ft-lb)
Steering gear connecting bolt	18 ± 2 N· m (13 ± 2 ft-lb)
Steering gear mounting bolt	70 ± 10 N· m (52 ± 7 ft-lb)
Tie rod end jam nut	52 ± 2 N· m (38 ± 2 ft-lb)
Tie rod	88 ± 10 N· m (65 ± 7 ft-lb)
Valve housing bolt	22 ± 4 N· m (16 ± 3 ft-lb)
<b>Power steering hose</b>	
Cooler tube clamp bolt	12 ± 2 N· m (102 ± 22 in-lb)
Oil pump eye bolt	57 ± 7 N· m (42 ± 5 ft-lb)
Oil reservoir bolt	12 ± 2 N· m (102 ± 22 in-lb)
Pressure hose, return hose, return tube clamp bolt or nut	12 ± 2 N· m (102 ± 22 in-lb)
Return tube flare nut	15 ± 3 N· m (11 ± 2 ft-lb)
<b>Power steering oil pump</b>	
Connector	39 ± 5 N· m (29 ± 3 ft-lb)
Heat protector mounting bolt	22 ± 4 N· m (16 ± 3 ft-lb)
Oil pump mounting bolt	22 ± 4 N· m (16 ± 3 ft-lb)
Power steering pump bracket mounting bolt	40 ± 5 N· m (30 ± 3 ft-lb)
Pressure hose connecting nut	18 ± 3 N· m (13 ± 2 ft-lb)
Suction connector mounting bolt	21 ± 3 N· m (16 ± 2 ft-lb)

ITEM	SPECIFICATION
<b>Steering column shaft</b>	
Shaft cover mounting bolt	5.0 ± 1.0 N· m (44 ± 9 in-lb)
Steering column shaft assembly and steering gear connecting bolt	18 ± 2 N· m (13 ± 2 ft-lb)
Steering column shaft assembly bolt	12 ± 2 N· m (102 ± 22 in-lb)
<b>Steering wheel</b>	
Steering wheel mounting bolt	50 ± 5 N· m (37 ± 4 ft-lb)

**GENERAL SPECIFICATIONS**

M1372000200259

ITEM	SPECIFICATION	
Power steering gear box	Type	Rack and pinion
	Stroke ratio (Rack stroke/Steering wheel maximum turning radius)	68.61
Oil pump	Type	Vane type
	Displacement cm <sup>3</sup> /rev (cu in/rev)	9.6 (0.59)
	Relief set pressure MPa (psi)	8.4 – 9.0 (1,219 – 1,306)

**SERVICE SPECIFICATIONS**

M1372000300331

ITEM	STANDARD VALUE	LIMIT
Steering wheel free play mm (in)	With engine running	–
	With engine stopped	10 (0.4) or less
Steering angle	Inside wheel	31° 45' ± 1° 30'
	Outside wheel (reference)	27° 15'
Toe-in mm (in)	0 ± 2 (0 ± 0.08)	–
Tie rod end ball joint breakaway torque N· m (in-lb)	1.0 – 3.0 (8.9 – 26.6)	–
Tie rod swing resistance N (lb) [Tie rod swing torque N· m (in-lb)]	8 – 27 (1.8 – 6.1) [1.5 – 4.9 (13.2 – 43.4)]	–
Engine idle speed r/min	850 ± 100	–
Stationary steering effort N (lb) [Fluctuation allowance N (lb)]	32 (7.2) or less [6.0 (1.35) or less]	–
Oil pump pressure MPa (psi)	Oil pump relief pressure	8.4 – 9.0 (1,219 – 1,306)
	Pressure under no-load conditions	0.2 – 0.8 (29 – 116)
	Steering gear retention hydraulic pressure	8.4 – 9.0 (1,219 – 1,306)
Oil pressure switch operating pressure MPa (psi)	OFF → ON	1.8 – 2.4 (261 – 348)
	ON → OFF	1.0 – 2.4 (145 – 348)
Steering gear total pinion torque N· m (in-lb) [Change in torque N· m (in-lb)]	0.8 – 1.8 (7.1 – 15.9) [0.49 (4.3) or less]	–
Opening dimension of special tool boot band crimping tool (MB991561) mm(in)	2.9 (0.11)	–
Band crimped width mm(in)	2.4 – 2.8 (0.09 – 0.11)	–



**LUBRICANTS**

M1372000400316

ITEM		SPECIFIED LUBRICANT	QUANTITY dm <sup>3</sup> (qt)
Gear box	Bearing	GENUINE MITSUBISHI POWER STEERING FLUID	As required
	O-ring		
	Oil seal		
	Special tool (MB991214)		
	Pinion and valve assembly seal ring part		
	Bellows	Silicon grease	As required
Oil pump	Power steering fluid	GENUINE MITSUBISHI POWER STEERING FLUID	1.0 (1.1)

**SEALANTS**

M1372000500476

ITEM		SPECIFIED SEALANT
Cover assembly		3M™ AAD Part No.8633 windo-weld resealant or equivalent
Power steering gear box	End plug	3M™ AAD Part No.8661, 8663, 8672, 8678, 8679 or equivalent
	Rack support cover	

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## NOTES