GROUP 37

POWER STEERING

CONTENTS

GENERAL INFORMATION 37-3

SERVICE SPECIFICATIONS 37-5

LUBRICANTS 37-5

SEALANTS 37-6

SPECIAL TOOLS 37-6

ON-VEHICLE SERVICE 37-9

- STEERING WHEEL FREE PLAY CHECK . 37-9
- STEERING ANGLE CHECK 37-9
- TIE ROD END BALL JOINT TURNING TORQUE CHECK 37-10
- STATIONARY STEERING EFFORT CHECK 37-10
- STEERING WHEEL RETURN TO CENTRE CHECK 37-11
- DRIVE BELT TENSION CHECK 37-11
- FLUID LEVEL CHECK 37-11
- FLUID REPLACEMENT 37-11
- POWER STEERING SYSTEM AIR BLEEDING 37-12
- OIL PUMP PRESSURE TEST 37-12
- POWER STEERING PRESSURE SWITCH CHECK 37-13
- TIE ROD END BALL JOINT DUST COVER CHECK 37-13
- STEERING COLUMN SHAFT ASSEMBLY SHOCK ABSORBING MECHANISM CHECK 37-13

STEERING WHEEL* 37-15

- REMOVAL AND INSTALLATION 37-15

STEERING SHAFT* 37-17

- REMOVAL AND INSTALLATION 37-17
- DISASSEMBLY AND REASSEMBLY 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-ECU, SRS warning lamp, 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* 37-21
REMOVAL AND INSTALLATION 37-21
INSPECTION 37-24
DISASSEMBLY AND REASSEMBLY 37-25
TIE ROD END BALL JOINT DUST COVER REPLACEMENT 37-34

POWER STEERING OIL PUMP ASSEMBLY 37-35
REMOVAL AND INSTALLATION 37-35
DISASSEMBLY AND REASSEMBLY 37-37
INSPECTION 37-37

POWER STEERING HOSES* 37-38
REMOVAL AND INSTALLATION 37-38

GENERAL INFORMATION

M1372000100434

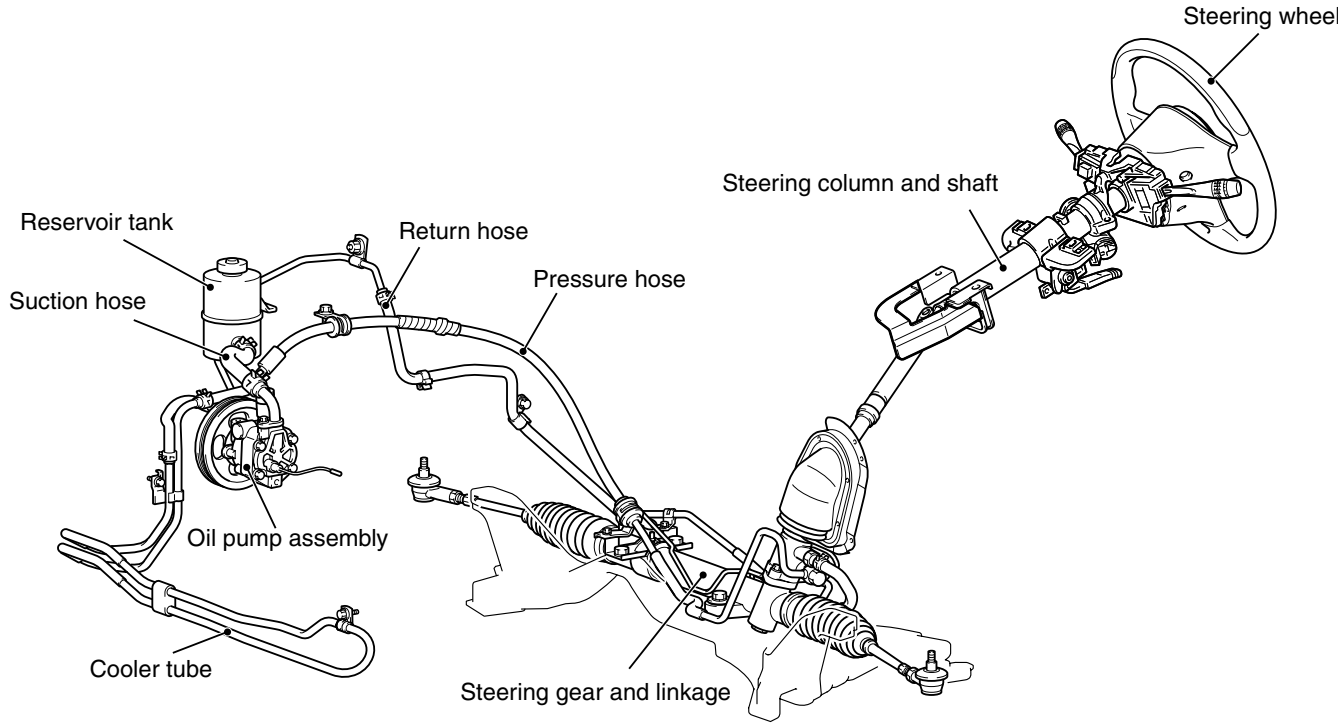
The system has been equipped with the MOMO leather 3-spoke-type steering wheel with built-in SRS airbag. The steering column is equipped with tilt steering mechanism. The power steering is an integral rack and pinion type that combines the steering gear and linkage into one light-weight and compact assembly. The steering system uses a vane oil pump with a fluid flow control system, so that steering effort varies with engine speed.

SPECIFICATIONS

Item		Specification
Steering wheel	Type	MOMO leather-wrapped 3-spoke type
	Outside diameter mm	365
	Maximum number of turns	2.1
Steering column	Column mechanism	Tilt steering
Power steering type		Integral type
Oil pump	Type	Variable capacity type (vane pump)
	Basic delivery rate cm^3/rev.	9.6
	Relief pressure MPa	8.3 – 9.0
	Reservoir type	Separate type
	Pressure switch	Equipped
Steering gear	Type	Rack and pinion
	Stroke ratio (Rack stroke/Steering wheel maximum turning radius)	68.61
	Rack stroke mm	146

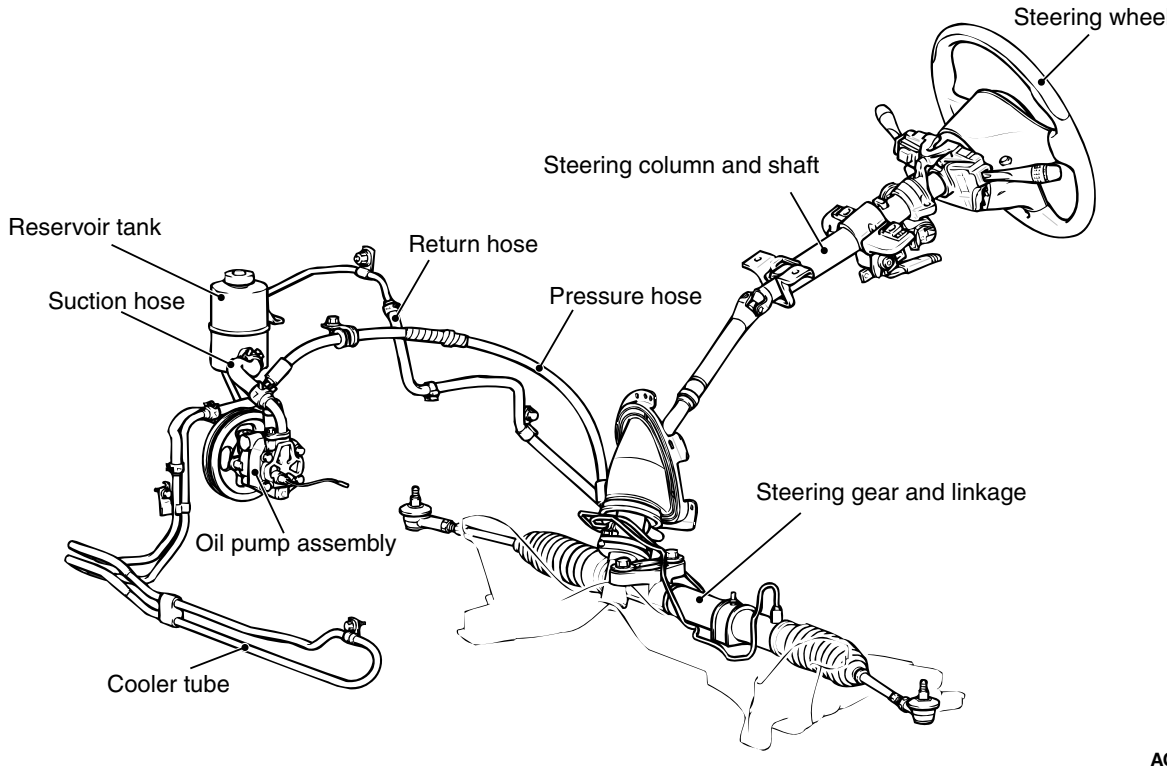
CONSTRUCTION DIAGRAM

LH drive vehicles



AC310660 AB

RH drive vehicles



AC310702 AC

SERVICE SPECIFICATIONS

M1372000300502

Item			Standard value	Limit
Steering wheel free play mm	With engine running		–	30
	With engine stopped		10 or less	–
Steering angle	Inner wheel		31°45' ± 1°30'	–
	Outer wheel (reference)		27°15'	–
Toe-in			0 ± 2	–
Tie rod end ball joint turning torque N·m			1.0 – 3.0	–
Stationary steering effort N [Fluctuation allowance N]			32 or less [6.0 or less]	–
Oil pump pressure MPa (750 ± 100 r/min).	Oil pump relief pressure		8.3 – 9.0	–
	Pressure under no-load conditions		0.2 – 0.8	–
	Steering gear retention hydraulic pressure		8.3 – 9.0	–
Oil pressure switch operating pressure MPa		OFF → ON	1.8 – 2.4	–
		ON → OFF	1.0 – 2.4	–
Total pinion torque N·m		Total rotation torque	0.8 – 1.8	–
		Torque variation	0.49 or less	–
Tie rod swing resistance N [Tie rod swing torque N·m]			8 – 27 [1.5 – 4.9]	–
Opening dimension of special tool boot band crimping tool (MB991561) mm			2.9	–
Band crimped width mm			2.4 – 2.8	–

LUBRICANTS

M1372000400435

Item		Specified lubricant	Quantity
Power steering fluid		ATF DEXRON III or DEXRON II	Approximately 1.0 L
Steering gear	Bearing	ATF DEXRON III or DEXRON II	As required
	O-ring and seal ring		
	Oil seal		
	Special tool (MB991214)		
	Bellows	Silicon grease	As required
	Tie rod end ball joint	Multipurpose grease SAE J310, NLGI No.2 or equivalent	As required
	Pinion and valve assembly	Repair kit grease	As required
	Rock assembly		
Oil pump	O-ring	ATF DEXRON III or DEXRON II	As required

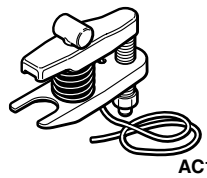
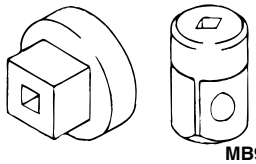
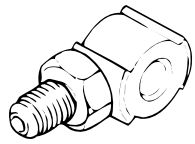
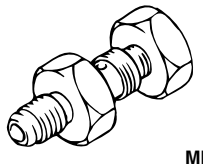
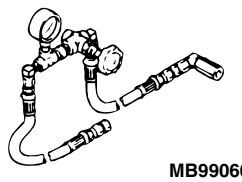
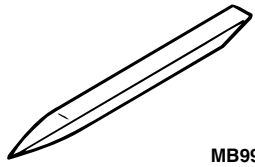
SEALANTS

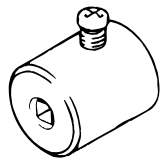
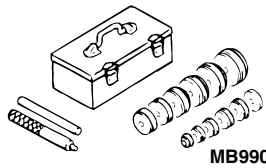
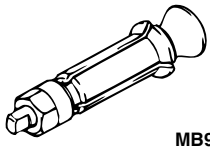
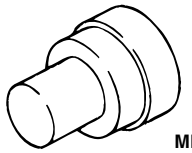
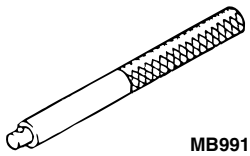
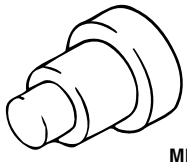
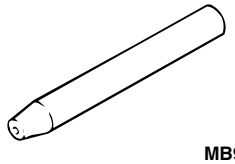
M1372000500357

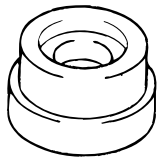
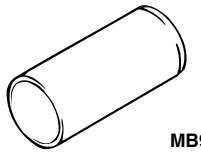
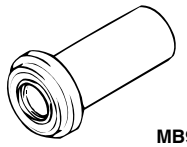
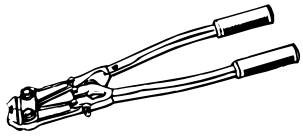
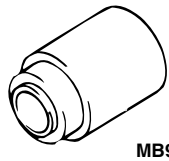
Item		Specified sealant
Steering shaft cover assembly bolt hole on the toeboard		3M ATD Part No.8513 or equivalent
Steering gear	End plug	3M ATD Part No.8661, 8663 or equivalent
	Rack support cover	

SPECIAL TOOLS

M1372000600473

Tool	Number	Name	Use
 AC106827	MB991897	Ball joint remover	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and tie rod end ball joint.*
 MB990326	MB990326	Preload socket	Tie rod end ball joint turning torque check
 MB991548	MB991548	Power steering oil pressure gauge adapter (Pump side)	Oil pump pressure test
 MB991549	MB991549	Power steering oil pressure gauge adapter (Hose side)	
 MB990662	MB990662	Power steering oil pressure gauge	
 MB990784	MB990784	Ornament remover	Cover removal

Tool	Number	Name	Use
 MB991006	MB991006	Preload socket	Steering gear total pinion torque check and adjustment
 MB991621	MB991621	Piston driver	• Rack support cover removal • Rack support adjustment
 MB990925	MB990925	Bearing and oil seal installer set	• Lower bearing removal • Oil seal and bearing installation • MB990927, MB990938, MB990939 (For details, refer to GROUP 26, Special Tools P.26-3).
 MB991120	MB991120	Needle bearing puller	Needle bearing removal
 MB991199	MB991199	Oil seal and bearing installer	Oil seal installation
 MB991197	MB991197	Bar (long type)	Oil seal installation
 MB991202	MB991202	Oil seal and bearing installer	• Needle bearing installation • Lower bearing installation
 MB991212	MB991214	Oil seal protector	Rack installation

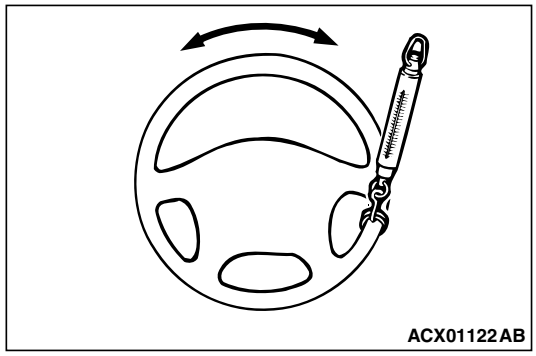
Tool	Number	Name	Use
 MB991203	MB991203	Oil seal and bearing installer	Oil seal and bearing installation
 MB991317	MB991317	Seal ring installer	Seal rings installation
 MB990941	MB990941	Torque tube bearing installer	Lower oil seal installation
 MB991561	MB991561	Boot band crimping tool	Bellows band installation
 MB990776	MB990776	Front axle base	Tie rod end ball joint dust cover installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

M1372001000311

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

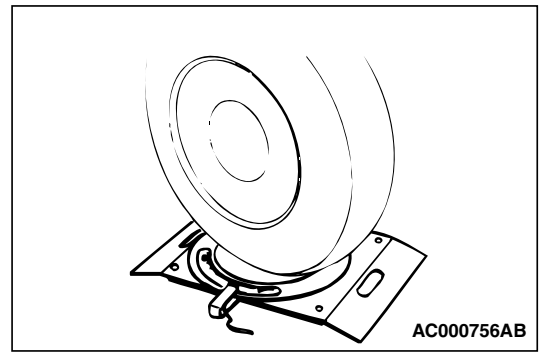
3. When the play exceeds the limit, check for the play on the steering shaft and steering linkage connection. Correct or replace.
4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Load 5 N towards the steering wheel circumference and check the play.

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

5. If the play exceeds the standard value, remove the steering gear (Refer to P.37-21) and check the total pinion torque (Refer to P.37-25).

STEERING ANGLE CHECK

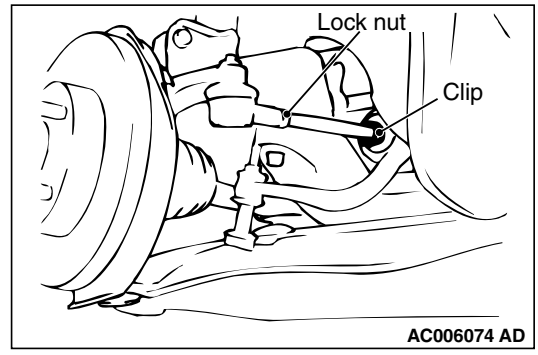
M1372001100460



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

   Standard value:

Inner wheels	31°45' ± 1°30'
Outer wheels (reference)	27°15'



2. When the angle is not within the standard value, the toe-in is probably incorrect. Adjust the toe-in.

   Standard value: 0 ± 2 mm

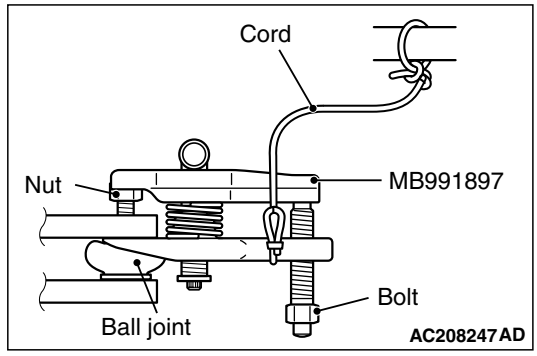
   Adjust the toe-in by undoing the clip and lock nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).
3. Recheck the steering angle.

TIE ROD END BALL JOINT TURNING TORQUE CHECK

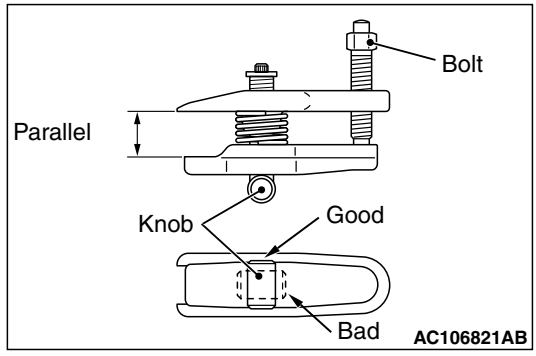
M1372001500394

⚠ CAUTION

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

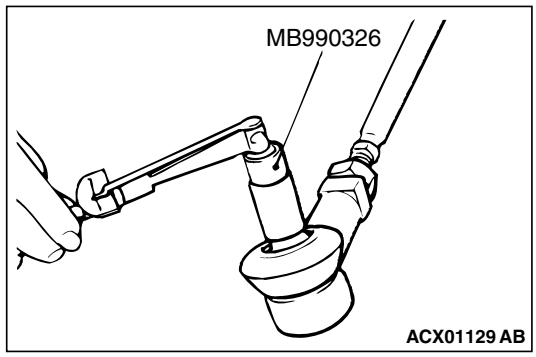


1. Install special tool ball joint remover (MB991897) as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool 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.



4. Move the ball joint stud several times and install the nut on the stud. Using special tool preload socket (MB990326), measure the ball joint turning torque.

   Standard value: 1.0 – 3.0 N·m
5. If the turning torque exceeds the standard value, replace the tie rod end.
6. If the turning torque is under the standard value, check the ball joint for axial play or ratcheting. If no axial 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.

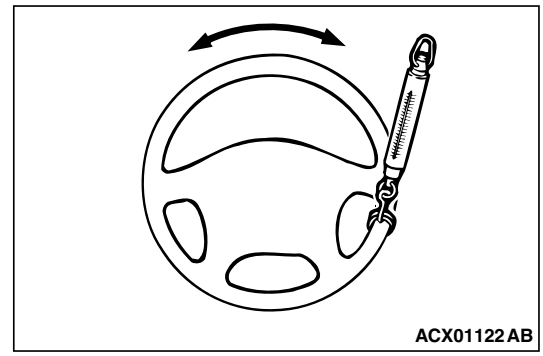
7. Install the tie rod end to the knuckle, then tighten a new self-locking nut to the specified torque.

   Tightening torque: 25 ± 5 N·m

STATIONARY STEERING EFFORT CHECK

M1372001700440

1. With the vehicle stopped on a flat and paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and set the it to 1000 ± 100 r/min.



3. Attach a spring balance 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 0.9 turns). Also check to be sure that there is no significant change in the required steering effort.

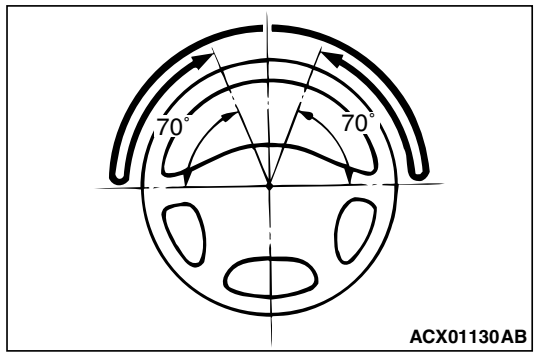
   Standard value:
   Steering effort: 32 N or less
   Fluctuation allowance: 6.0 N or less
4. If the measured value exceeds the standard value, check and adjust the related parts.

STEERING WHEEL RETURN TO CENTRE CHECK

M1372001800317

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, turn the steering wheel 90°, hold a few seconds, then release. If the steering wheel then returns 70° 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

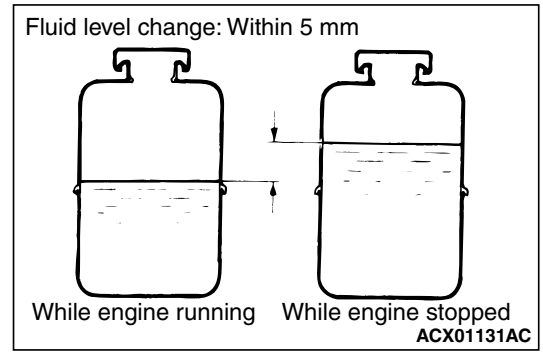
M1372001900358

Refer to GROUP 11A, On-vehicle Service – Drive Belt Tension Check P.11A-7.

FLUID LEVEL CHECK

M1372002000370

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.
3. With the engine running, turn the wheel all the way to the left and right several times.

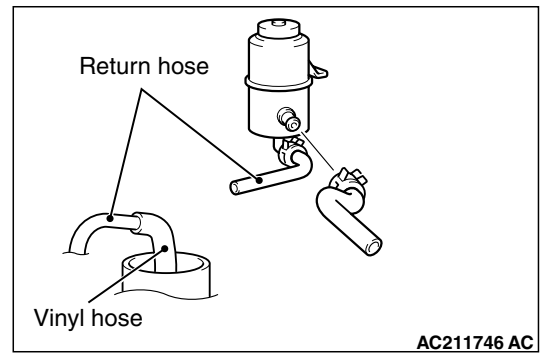


4. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm or more, air bleeding should be done.

FLUID REPLACEMENT

M1372002100430

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.16-34).
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 specified fluid up to between "MAX" and "MIN" marks, and then bleed the air.

   Specified fluid: ATF DEXRON III or DEXRON II

POWER STEERING SYSTEM AIR BLEEDING

M1372002200426

Perform air bleeding procedure as necessary after replacing the steering gear 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.16-34).

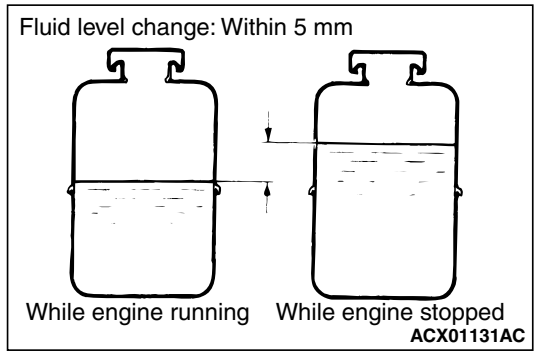
⚠ CAUTION

Perform air bleeding only while cranking the engine. If air bleeding is performed while the engine is running, air could enter the fluid. During air bleeding, refill the steering fluid supply so that the level never falls below the "MIN" mark on the oil reservoir.

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.16-34).
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 "MAX" and "MIN" marks.
8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.

⚠ CAUTION

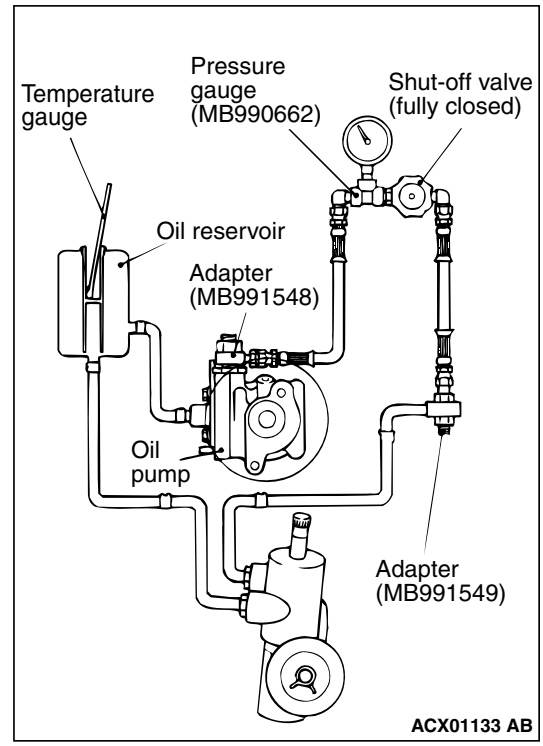
If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause reduce the life of the power steering components.



9. Confirm that the change in the fluid level is no more than 5 mm when the engine is stopped and when it is running.
10. If the change of the fluid level is 5 mm or more, the air has not been completely bled from the system. The air bleeding procedure must be repeated.

OIL PUMP PRESSURE TEST

M1372002300401



1. Disconnect the pressure hose from the oil pump, and then connect the following 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)
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.
3. Start the engine and idle it at 1000 ± 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: 8.3 – 9.0 MPa

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.

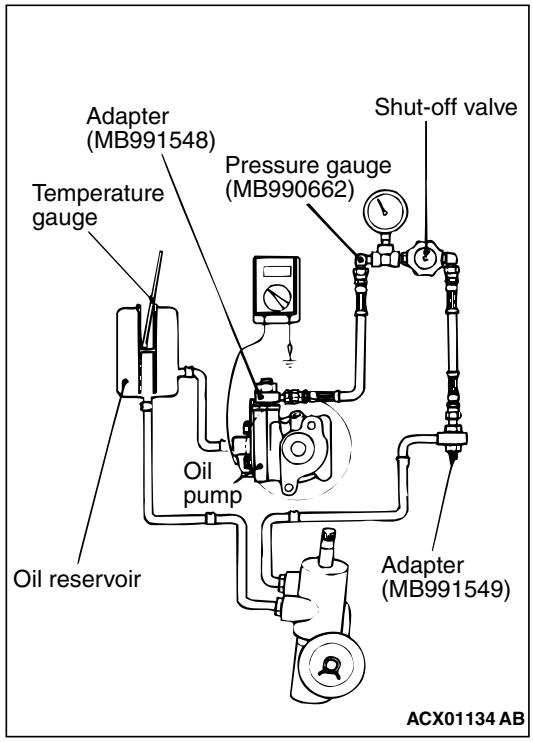
   Standard value: 0.2 – 0.8 MPa
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear, so check these parts and repair as necessary.
8. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value: 8.3 – 9.0 MPa
9. If not the standard value, overhaul the steering gear. Remeasure fluid pressure.
10. Remove the special tools, and then tighten the pressure hose to the specified torque.

    Tightening torque: 18 ± 3 N·m
11. Bleed the system (Refer to P.37-12).

POWER STEERING PRESSURE SWITCH CHECK

M1372007200421



1. Disconnect the pressure hose from the oil pump, and then connect the following 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)
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.
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
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
7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 ± 3 N·m
8. Bleed the system (Refer to P.37-12).

TIE ROD END BALL JOINT DUST COVER CHECK

M1372008600262

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

M1372013500090

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 it has suffered 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 free play 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

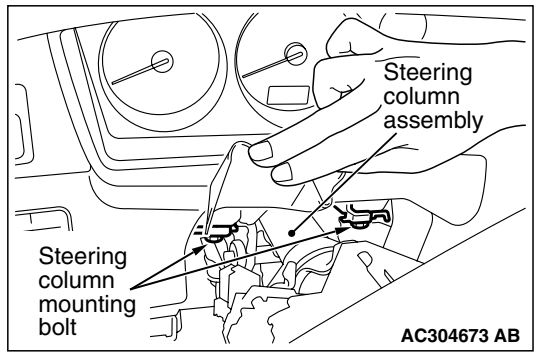
1. Remove the lower and upper column covers.

⚠ CAUTION

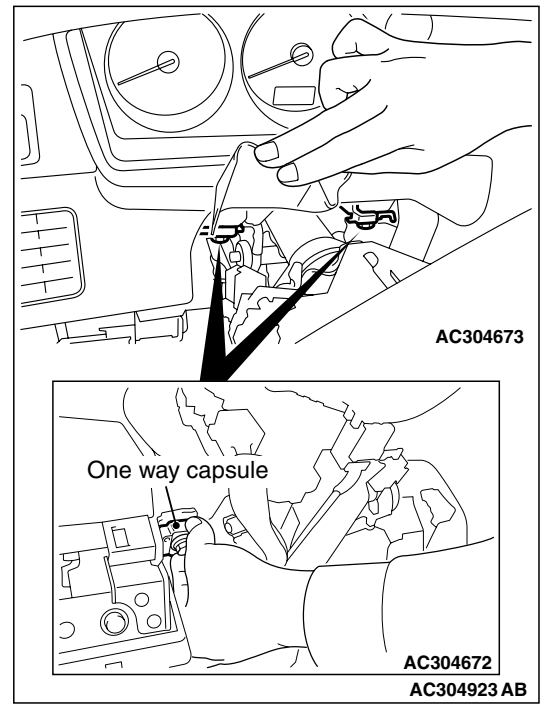
Do not release the tilt lever until the steering column has been installed to complete this inspection procedure.

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 steering column mounting bolts (upper) by two turns.



4. Hold the one-way capsules 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: When installing a new steering column shaft assembly, place the tilt lever in the lock position, if it is not in place.

⚠ CAUTION

- **Be careful that nothing is pinched between the one-way capsules and the body.**
- **Do not release the tilt lever until the steering column has been installed to complete this inspection procedure.**

5. If no problem is found during the inspection, tighten the steering column mounting bolts to the specified torque.

   Tightening torque: 12 ± 2 N·m

STEERING WHEEL

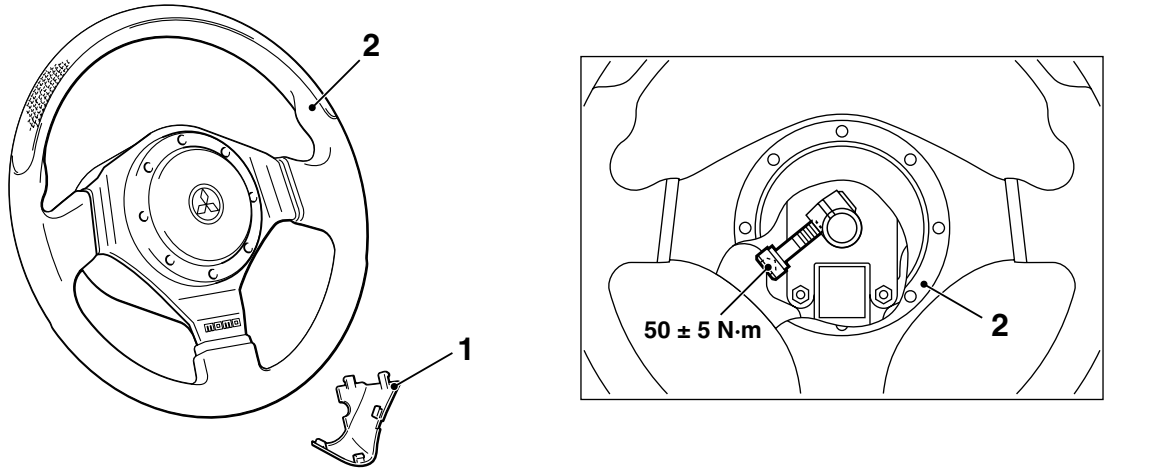
REMOVAL AND INSTALLATION

M1372011400279

⚠ WARNING

Before removing the steering wheel and air bag module assembly, refer to GROUP 52B, Service Precautions (P.52B-4) and Air Bag Module and Clock Spring (P.52B-113).

Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



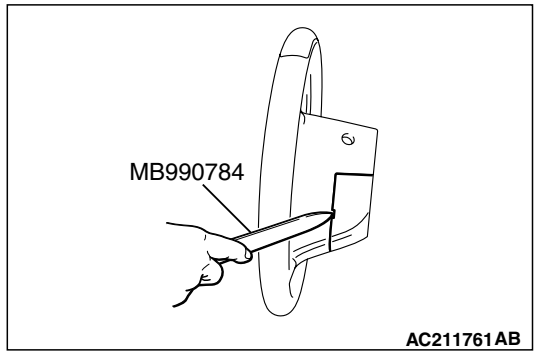
AC211760AD

Removal steps

<<A>> 1. Cover
<<B>> 2. Steering wheel and air bag module assembly

REMOVAL SERVICE POINTS

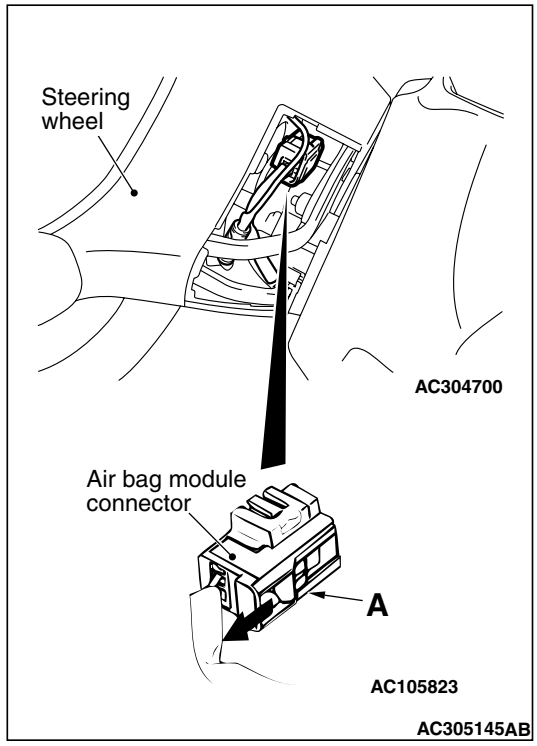
<<A>> COVER REMOVAL



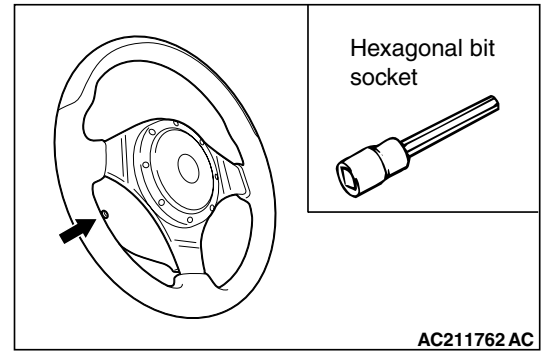
Insert special tool ornament remover (MB990784) at the indicated position to remove the cover.

NOTE: The special tool can be inserted through the notch behind the area shown.

<<B>> STEERING WHEEL AND AIRBAG 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 airbag module assembly.

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

STEERING SHAFT

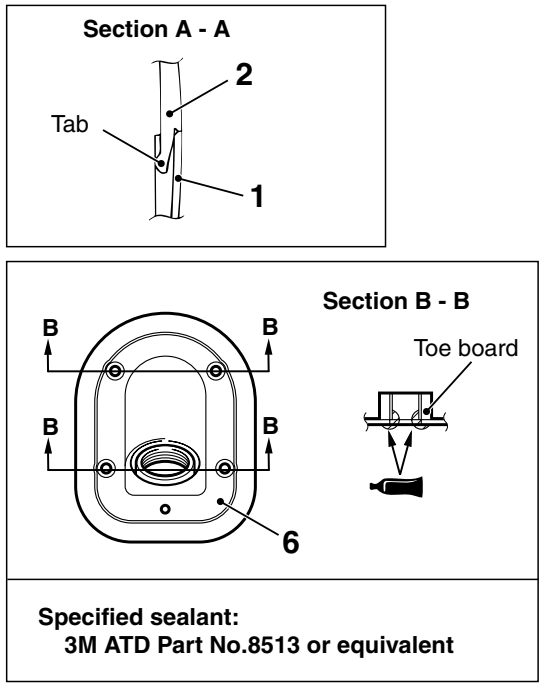
REMOVAL AND INSTALLATION

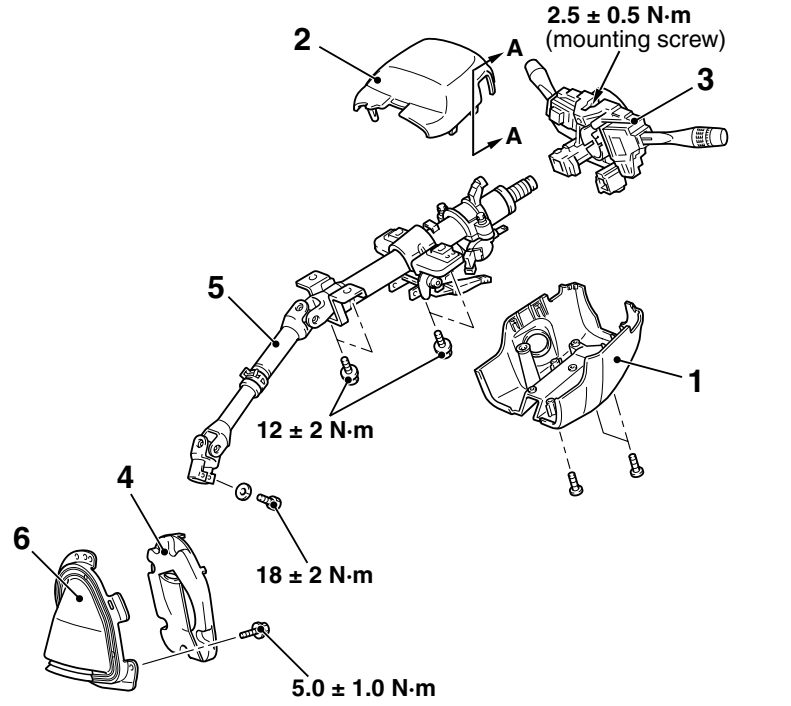
M1372011500210

⚠ WARNING

Before removing the steering wheel and air bag module assembly, refer to GROUP 52B, Service Precautions (P.52B-4) and Air Bag Module and Clock Spring (P.52B-113).

Pre-removal Operation	Post-installation Operation
• Steering Wheel and Air bag Module Assembly Removal (Refer to P.37-15). • Under Cover Removal (Refer to GROUP 52A, Instrument Panel P.52A-2).	• Under Cover Installation (Refer to GROUP 52A, Instrument Panel P.52A-2). • Steering Wheel and Air bag Module Assembly Installation (Refer to P.37-15).





AC310967AB

Removal steps

1. Lower column cover
2. Upper column cover
3. Clock spring and column switch assembly (Refer to GROUP 52B, Driver's, Front Passenger's Air Bag Modules and Clock Spring P.52B-113).

Removal steps (Continued)

4. Shaft cover

<<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 can not be reinstalled correctly. If the steering column is installed incorrectly, the collision energy absorbing mechanism may be damaged.

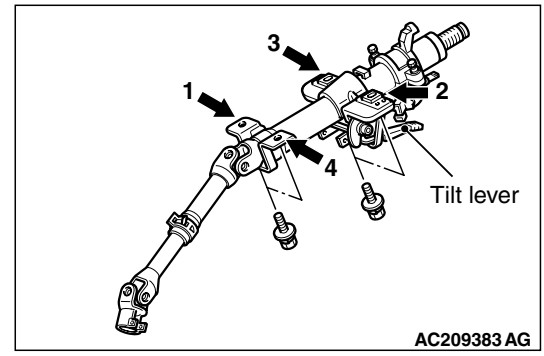
Ensure that the tilt lever is in the lock position, and remove the steering column mounting bolts.

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 has 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.**

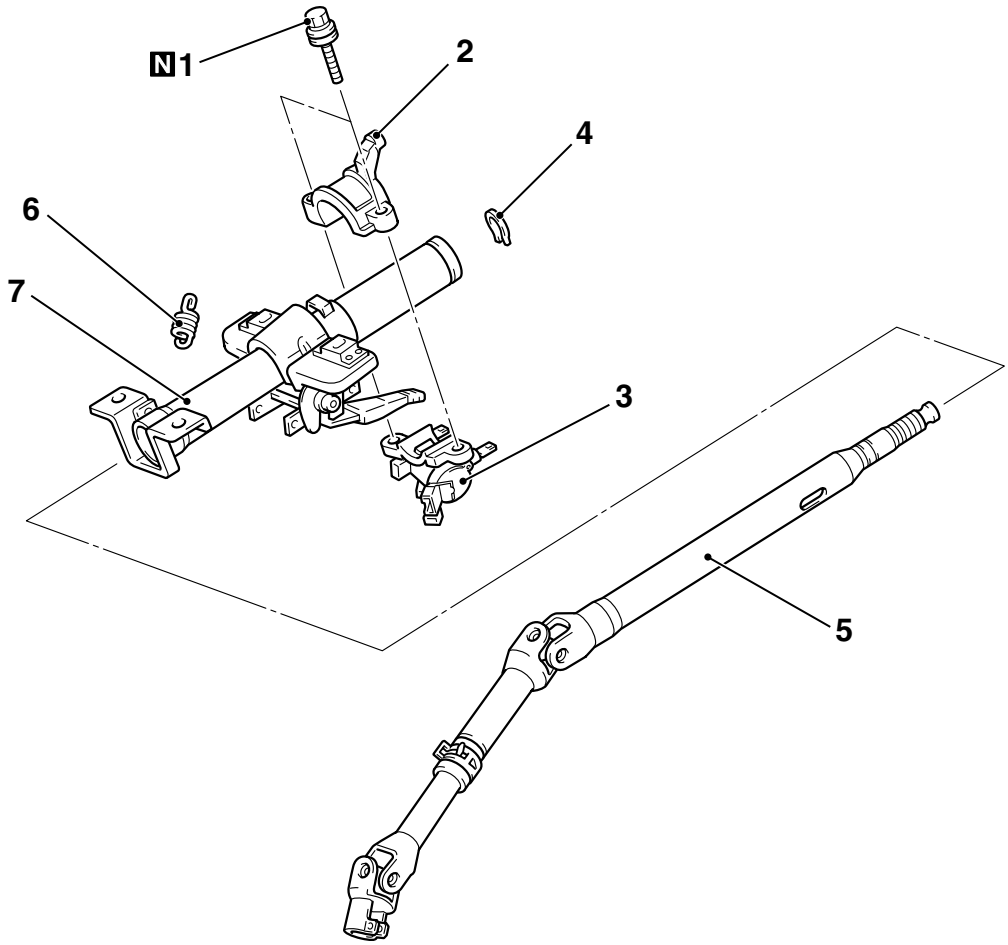


Ensure that the tilt lever is in the lock position, and install the steering column. Tighten the four bolts in the order shown by hand, and then tighten them to the specified torque in the order shown.

Tightening torque: 12 ± 2 N·m

DISASSEMBLY AND REASSEMBLY

M1372011700140



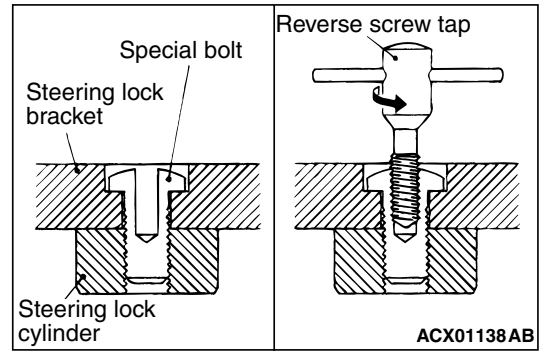
AC310968 AB

Disassembly steps

<<A>>>>A<<1. Special bolt
>>A<<2. Steering lock bracket
>>A<<3. Steering lock cylinder assembly
4. Snap ring
5. Steering shaft assembly
6. Tilt spring
7. Steering column 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.

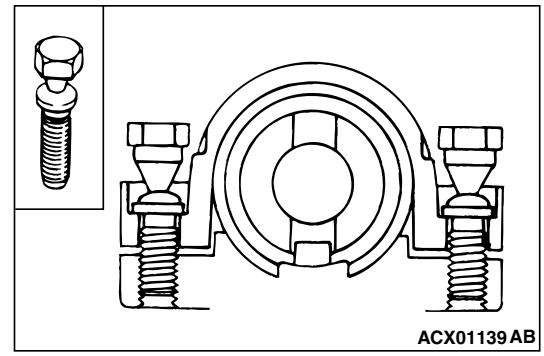
REASSEMBLY SERVICE POINT

>>A<< STEERING LOCK CYLINDER ASSEMBLY/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

⚠ CAUTION

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

1. When installing the steering lock cylinder assembly and steering lock bracket to the column tube, 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 twists off.

POWER STEERING GEAR BOX AND LINKAGE

REMOVAL AND INSTALLATION

M1372010900323

⚠ WARNING

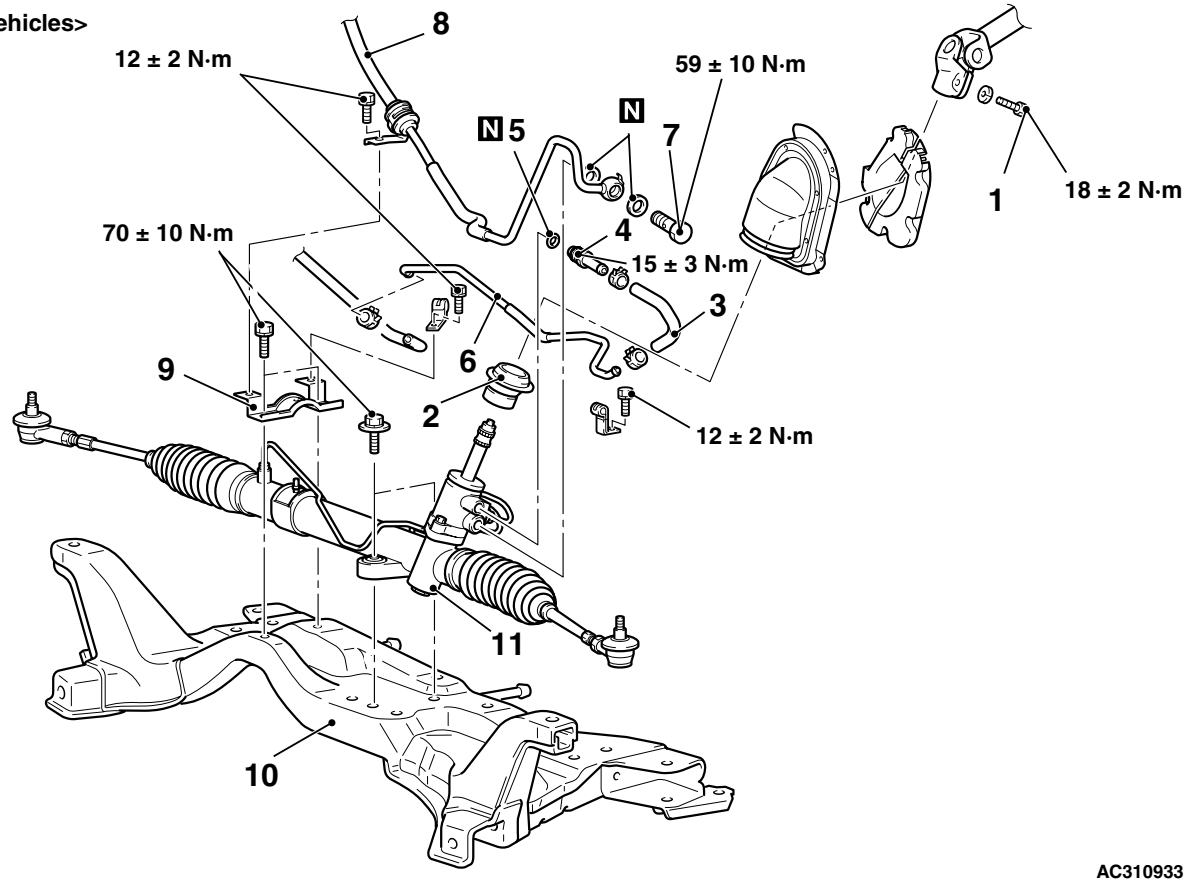
Before removing the steering gear, refer to GROUP 52B, Service Precautions (P.52B-4) and Air Bag Module and Clock Spring (P.52B-113). Centre the front wheels. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.

⚠ CAUTION

If the vehicle is equipped with the Brembo disc brake, 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 out quickly.

Pre-removal Operation	Post-installation Operation
• Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-3). • Front Axle Crossmember Bar, Front Suspension Centremember, Engine Rear Roll Stopper Rod and Bracket Assembly Removal (Refer to GROUP 32, Engine Rear Roll Stopper, Centremember P.32-11). • Lower Arm Removal (Refer to GROUP 33, Lower Arm Assembly P.33-10). • Stabilizer Bar Removal (Refer to GROUP 33, Stabilizer Bar P.33-14). • Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19). • Steering Wheel Air Bag Module Assembly, Clock spring Removal (Refer to GROUP 37A, Steering Wheel P.37-15). • Power Steering Fluid Draining (Refer to GROUP 37A, On-vehicle Service – Fluid Replacement P.37-11).	• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19). • Stabilizer Bar Installation (Refer to GROUP 33, Stabilizer Bar P.33-14). • Lower Arm Installation (Refer to GROUP 33, Lower Arm Assembly P.33-10). • Front Axle Crossmember Bar, Front Suspension Centremember, Engine Rear Roll Stopper Rod and Bracket Assembly Installation (Refer to GROUP 32, Engine Rear Roll Stopper, Centremember P.32-11). • Steering Wheel Air Bag Module Assembly Installation (Refer to GROUP 37A, Steering Wheel P.37-15). • Power Steering Fluid Supplying (Refer to GROUP 37A, On-vehicle Service – Fluid Replacement P.37-11). • Power Steering Fluid Line Bleeding (Refer to GROUP 37A, On-vehicle Service – Power Steering System Air Bleeding P.37-12). • Press the dust cover with a finger to check whether the dust cover cracked or damaged. • Checking Steering Wheel Position with Wheels Straight Ahead. • Front Wheel Alignment Check and Adjustment (Refer to GROUP 37A, On-vehicle Service – Steering Angle Check P.37-9). • Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-3).

<L.H. drive vehicles>



AC310933 AB

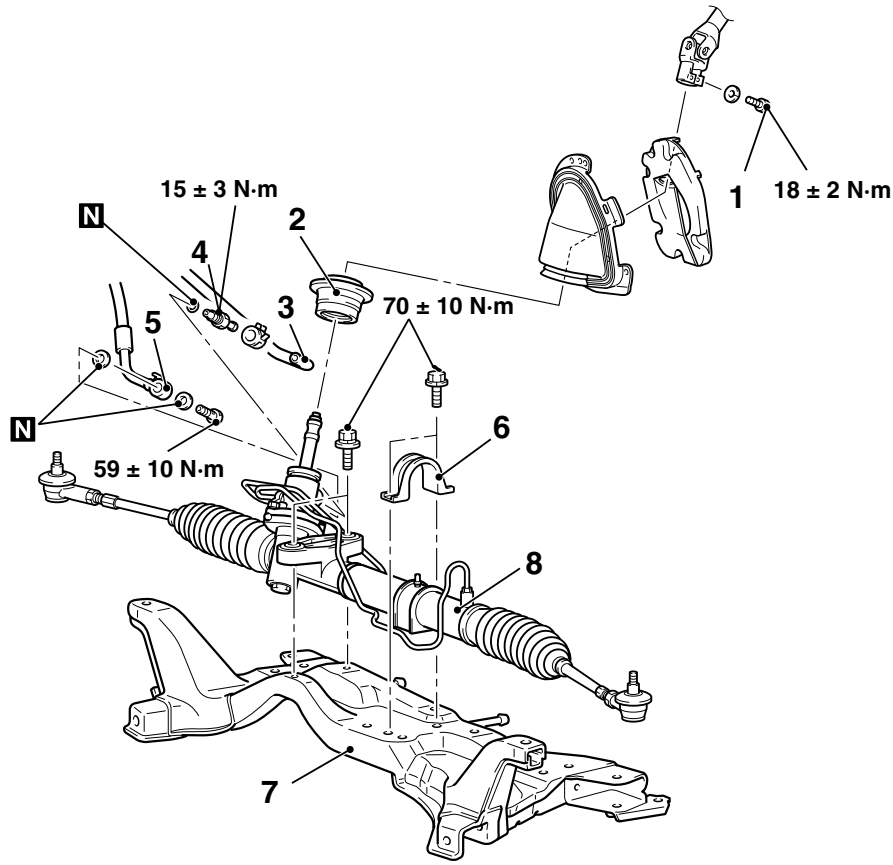
Removal steps

1. Steering shaft assembly and gear box connecting bolt.
>>A<< 2. Joint cover grommet
3. Return hose
4. Return tube
5. O-ring

Removal steps (Continued)

6. Return tube
7. Eye bolt
8. Pressure hose assembly
9. Clamp
10. Front axle No.1 crossmember
11. Steering gear and linkage

<R.H. drive vehicles>



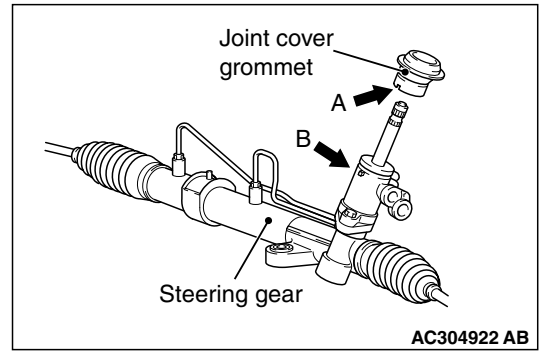
AC310934 AB

Removal steps

1. Steering shaft assembly and gear box connecting bolt.
>>A<< 2. Joint cover grommet
3. Return hose connection
4. Return tube
5. Pressure hose connection
6. Clamp
7. Front axle No.1 crossmember
8. Steering gear and linkage

INSTALLATION SERVICE POINT

>>A<< JOINT COVER GROMMET INSTALLATION



AC304922 AB

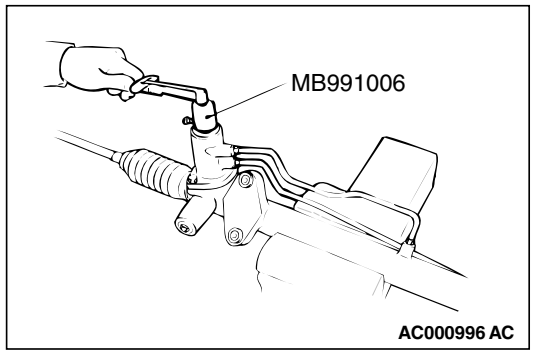
Align the joint cover grommet notch (arrow A) with the steering gear lug (arrow B), and then install the steering joint cover to the steering gear.

INSPECTION

M1372011000323

STEERING GEAR TOTAL PINION TORQUE CHECK

⚠ 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 preload socket (MB991006), rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

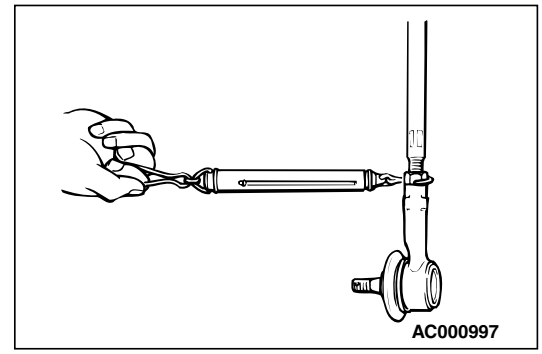
   Standard value:
   Total rotation torque 0.8 – 1.8 N·m
   Torque fluctuation 0.49 N·m or less

   NOTE: Remove the bellows from the rack housing before measuring.

   NOTE: Measure the total rotation torque by turning the special tool left and right 180° from the neutral position.
2. If the standard values are not met, adjust the pinion total rotation torque.
3. In case the adjustment is impossible, disassemble and check the components, and repair if necessary.

TIE ROD SWING RESISTANCE CHECK

1. Give 10 hard swings to the tie rod.



2. Measure the tie rod swing resistance [tie rod swing torque] with a spring balance.

   Standard value: 8 – 27 N [1.5 – 4.9 N·m]
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

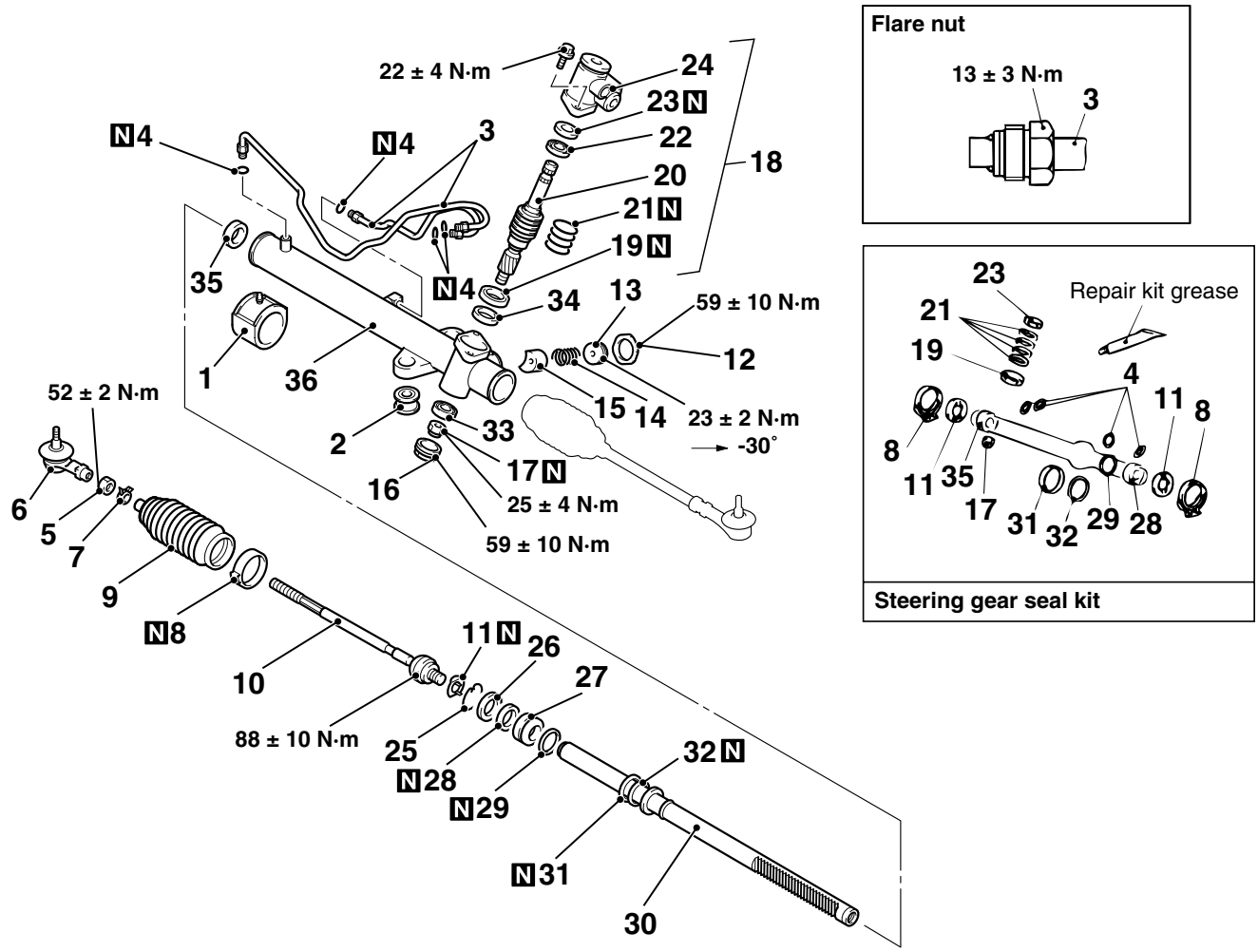
1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the tie rod end (Refer to P.37-25).

   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.37-34).

DISASSEMBLY AND REASSEMBLY

M1372011100290

<LH drive vehicles>



Steering gear seal kit

AC311001 AB

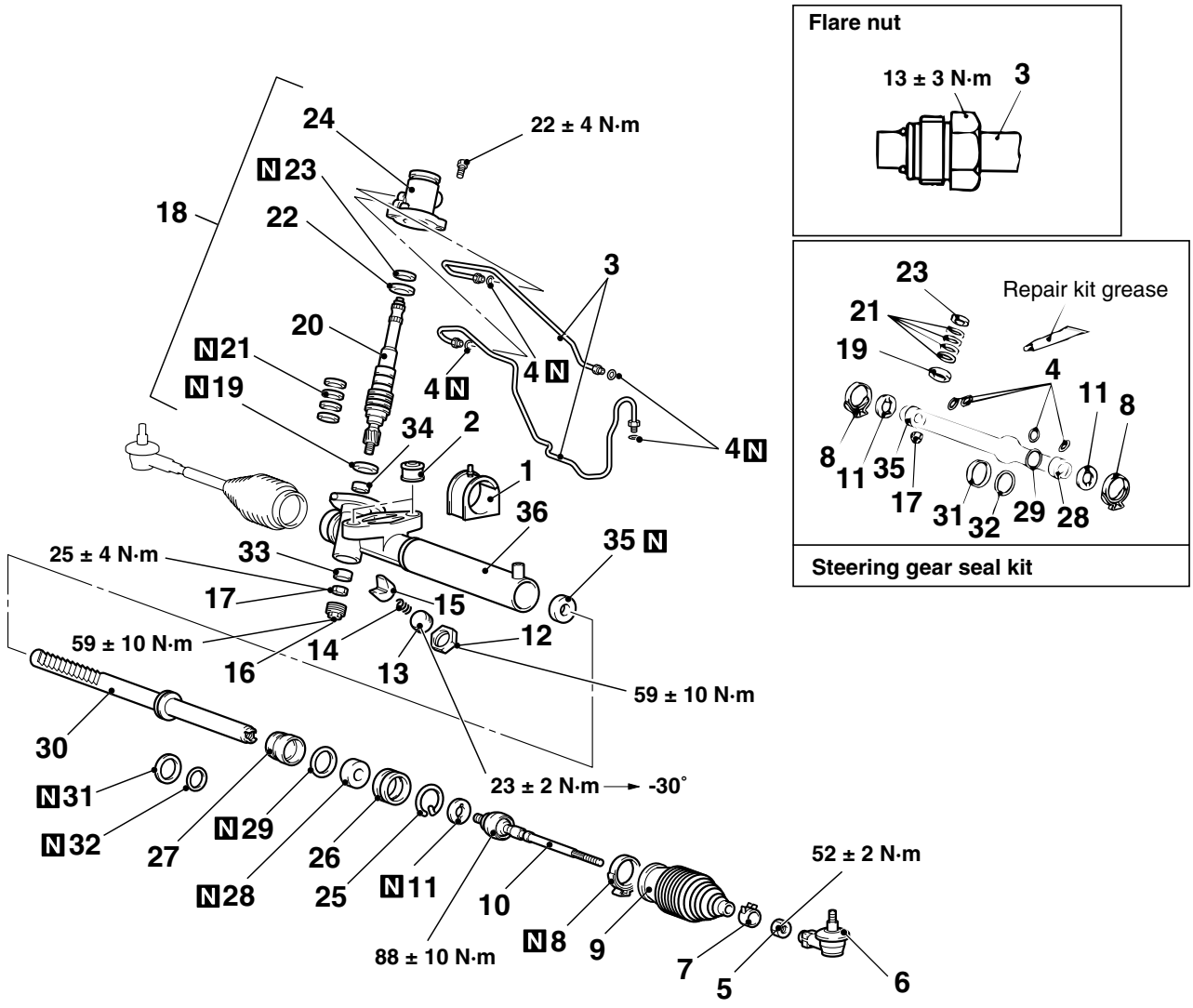
Disassembly steps

>>O<<	1.	Gear mounting rubber
	2.	Gear housing mounting bushing
	3.	Feed pipe
	4.	O-ring
>>N<<	5.	Lock nut
>>N<<	6.	Tie rod end
	7.	Clip
>>M<<	8.	Bellows band
	9.	Bellows
>>L<<	10.	Tie rod
>>L<<	11.	Tab washer
>>K<<	•	Total pinion torque adjustment
>>J<<	12.	Lock nut
<<A>> >>J<<	13.	Rack support cover
	14.	Support spring
	15.	Rack support
>>I<<	16.	End plug
	17.	Lock nut
	18.	Valve housing assembly

Disassembly steps (Continued)

<<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

<RH drive vehicles>



AC311005AB

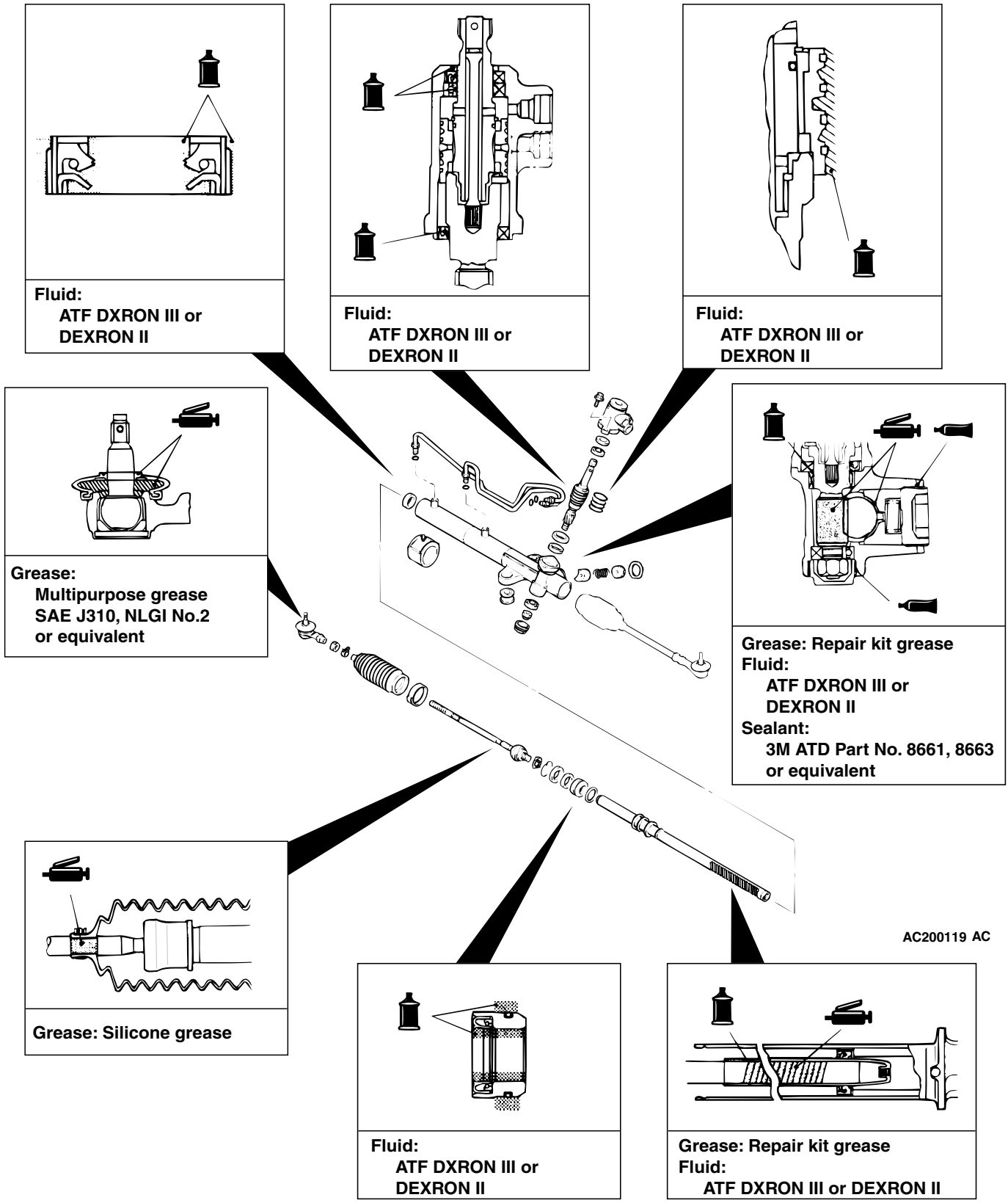
Disassembly steps

>>O<<	1.	Gear mounting rubber
	2.	Gear housing mounting bushing
	3.	Feed pipe
	4.	O-ring
>>N<<	5.	Lock nut
>>N<<	6.	Tie rod end
	7.	Clip
>>M<<	8.	Bellows band
	9.	Bellows
>>L<<	10.	Tie rod
>>L<<	11.	Tab washer
>>K<<	•	Total pinion torque adjustment
>>J<<	12.	Lock nut
<<A>> >>J<<	13.	Rack support cover
	14.	Support spring
	15.	Rack support
>>I<<	16.	End plug
	17.	Lock nut
	18.	Valve housing assembly

Disassembly steps (Continued)

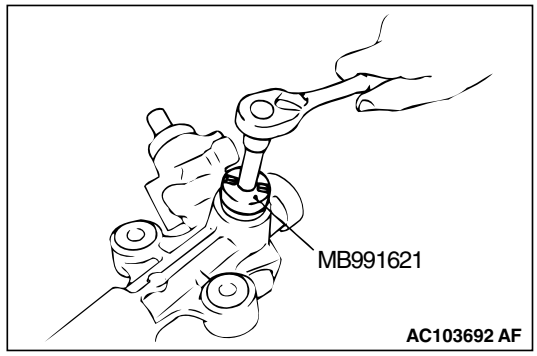
<<B>> >>H<<	19.	Lower oil seal
<<B>>	20.	Pinion and valve assembly
<<C>> >>G<<	21.	Seal ring
<<D>> >>F<<	22.	Upper bearing
<<D>> >>F<<	23.	Upper oil seal
	24.	Valve housing
<<E>> >>E<<	25.	Circlip
<<F>>	26.	Rack stopper
<<F>> >>D<<	27.	Rack bushing
<<F>> >>D<<	28.	Oil seal
<<F>>	29.	O-ring
<<F>> >>C<<	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

LUBRICATION AND SEALING POINTS



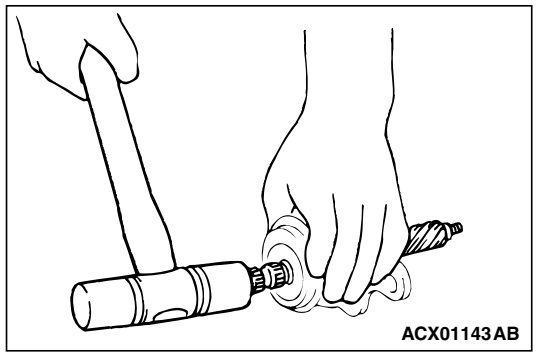
DISASSEMBLY SERVICE POINTS

<<A>> RACK SUPPORT COVER REMOVAL



Using the following special tool piston driver (MB991621), remove the rack support cover from the steering gear.

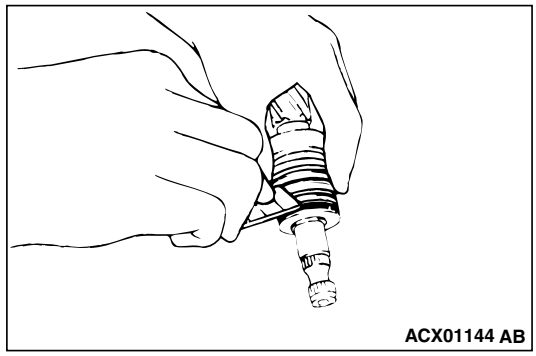
<<B>> LOWER OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL



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

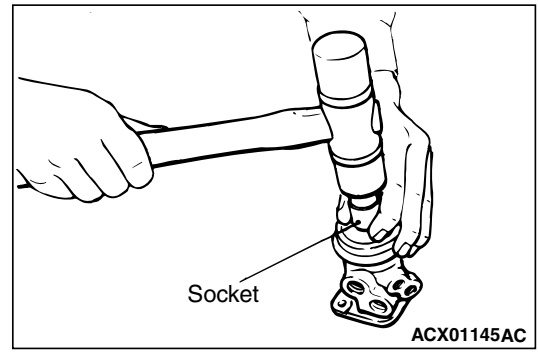
<<C>> SEAL RING REMOVAL

⚠ 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 or the rack.

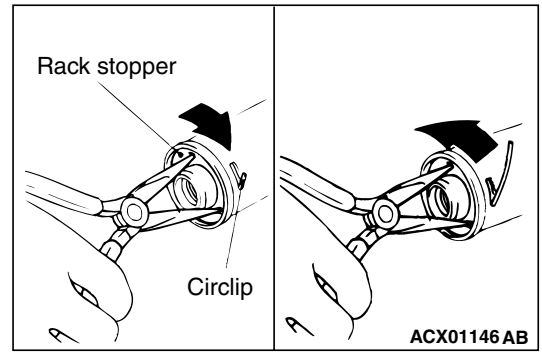
<<D>> UPPER BEARING/UPPER OIL SEAL REMOVAL



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

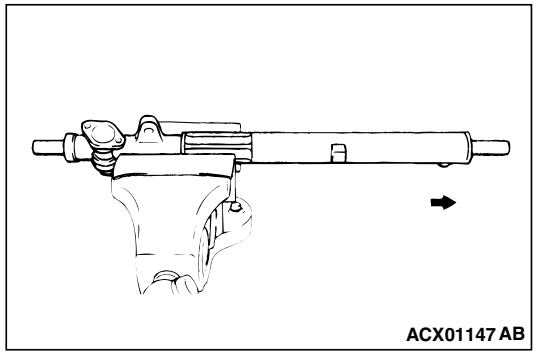
<<E>> CIRCLIP REMOVAL

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



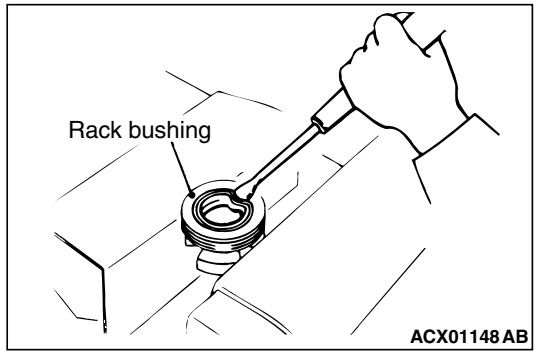
1. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
2. Turn the rack stopper anticlockwise to remove the circlip.

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



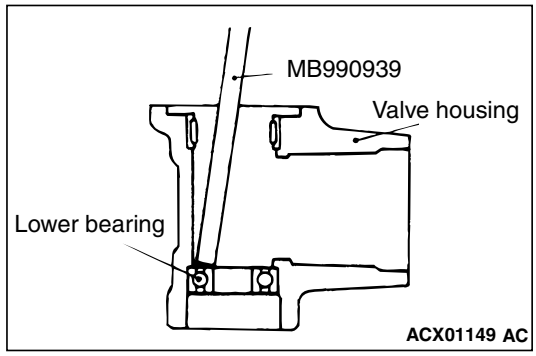
1. Pull out the rack slowly. Take out the rack stopper and the rack bushing at the same time.

⚠ CAUTION
Do not damage the oil seal press fitting surface.



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

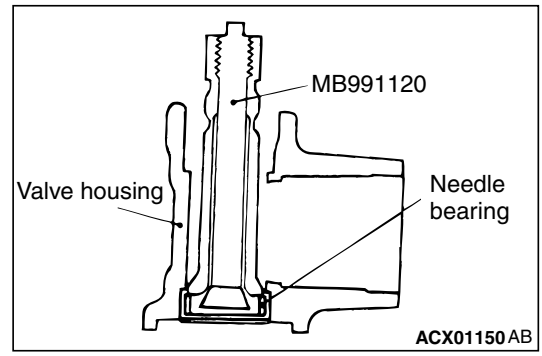
<<G>> LOWER BEARING REMOVAL



Use a brass bar or special tool brass bar (MB990939) to remove the lower bearing from the valve housing.

<<H>> NEEDLE BEARING REMOVAL

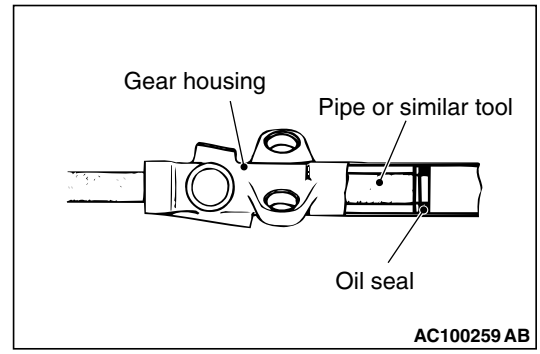
⚠ CAUTION
Do not open special tool excessively to prevent damaging housing interior.



Use special tool needle bearing puller (MB991120) to remove the needle bearing from the valve housing.

<<I>> OIL SEAL REMOVAL

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

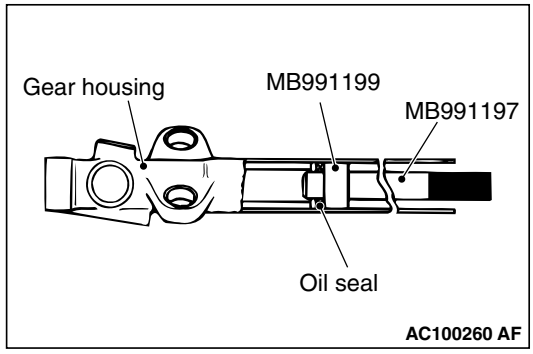


Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION

1. Apply a coating of ATF DEXRON III or DEXRON II to the both sides of the oil seal.

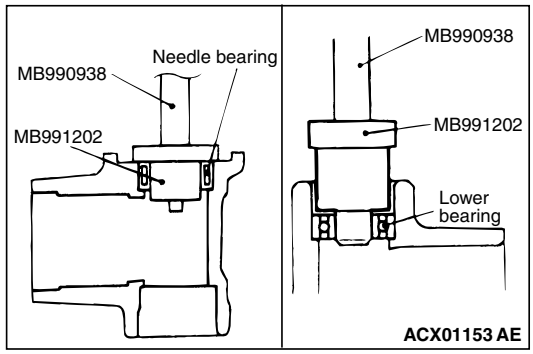


2. Using the following special tools, press the oil seal into the rack housing.
   - MB991197: Bar (long type)
   - MB991199: Oil Seal Installer

>>B<< NEEDLE BEARING/LOWER BEARING INSTALLATION

1. Apply ATF DEXRON III or DEXRON II to housing and bearing press fitting surface.

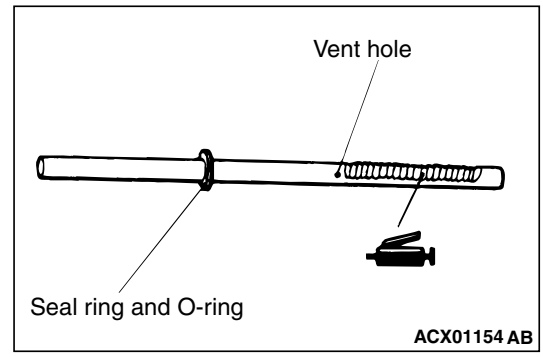
⚠ CAUTION
Press-fit straight. The valve housing is aluminium, and may become deformed if press-fit on an angle.



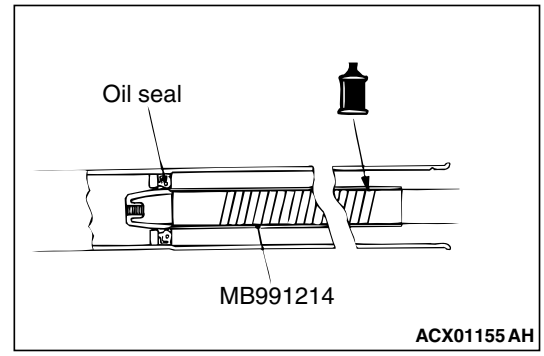
2. Press fit needle bearing/lower bearing with the following special tools.
   - MB990938: Bar (snap-in type)
   - MB991202: Oil Seal and Bearing Installer

>>C<< RACK ASSEMBLY INSTALLATION

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

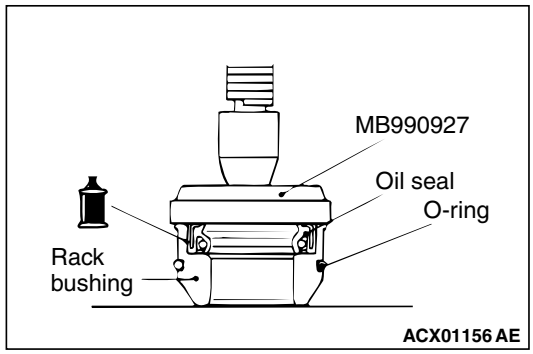


1. Apply a coating of repair kit grease to the rack teeth face.

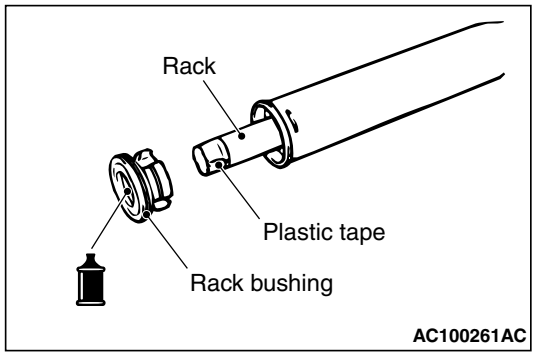


2. Cover rack serrations with the following special tool oil seal protector (MB991214).
3. Apply ATF DEXRON III or DEXRON II to special tool, and to the outer surface of the seal ring and the O-ring.
4. Align the centre of the oil seal with the rack to prevent the retainer spring from slipping. Slowly insert the rack from power cylinder side.

>>D<< OIL SEAL/RACK BUSHING INSTALLATION



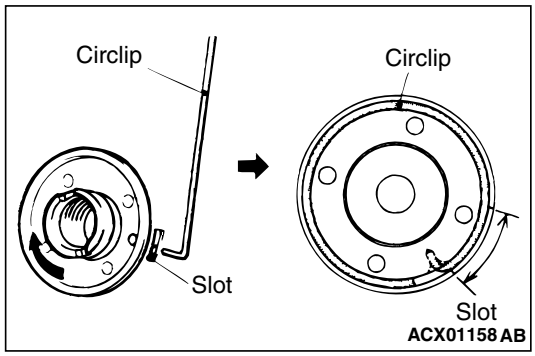
1. Apply ATF DEXRON III or DEXRON II to the outer surface of the oil seal. Using special tool installer adapter (MB990927), press in the oil seal until it is flush with the bushing end face.



2. Apply ATF DEXRON III or DEXRON II 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.

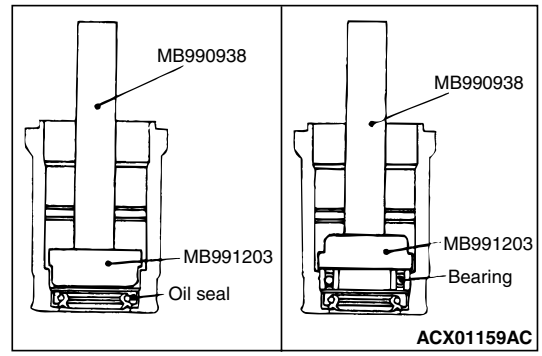
>>E<< CIRCLIP INSTALLATION

⚠ 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.

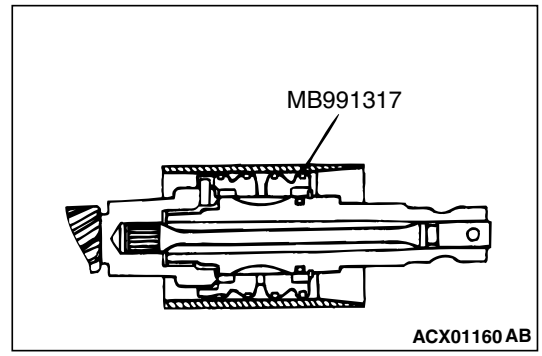
>>F<< UPPER OIL SEAL/UPPER BEARING INSTALLATION



Apply a coating of ATF DEXRON III or DEXRON II to the outside of the upper oil seal/upper bearing. Using the following special tools, press the upper oil seal/upper bearing into the valve housing.

- MB990938: Bar (Snap-in type)
- MB991203: Oil Seal and Bearing Installer

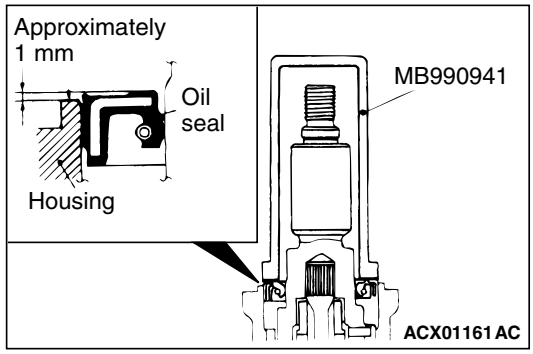
>>G<< SEAL RINGS INSTALLATION



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

>>H<< LOWER OIL SEAL INSTALLATION

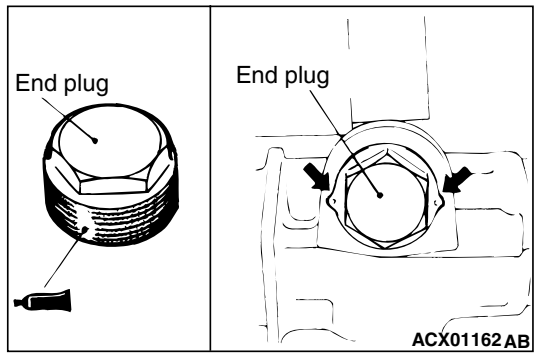
⚠ CAUTION



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

Using special tool torque tube bearing installer (MB990941), press the oil seal into the valve housing.

>>I<< END PLUG INSTALLATION



1. Apply specified sealant to the threaded part of the end plug.

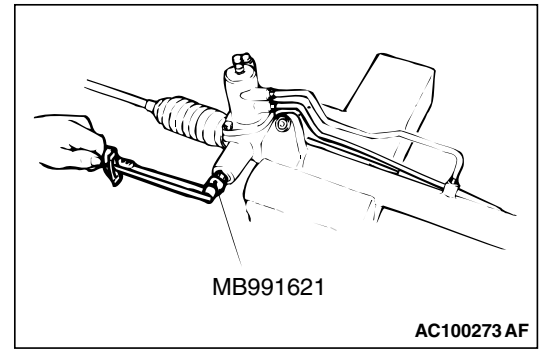
   Specified sealant: 3M ATD Part No.8661, 8663 or equivalent

2. Secure the threaded portion of the end plug at two places by using a punch.

>>J<< RACK SUPPORT COVER/LOCK NUT INSTALLATION

1. Position the rack at its centre.
2. Apply specified sealant to the threaded part of the rack support cover.

   Specified sealant:
   3M ATD Part No.8661, 8663 or equivalent

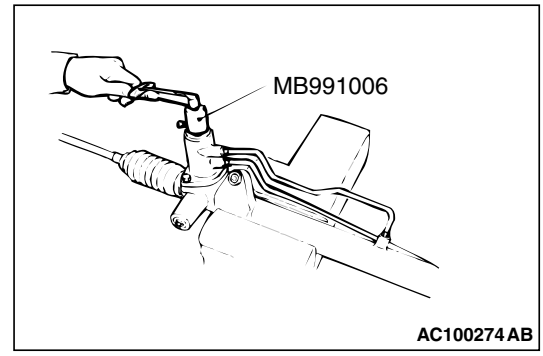


3. Use the following special tool piston driver (MB991621) to tighten the rack support cover to 23 ± 2 N·m.
4. Turn the rack support cover 30° anticlockwise.
5. Use the special tool to hold the rack support cover, and then tighten the lock nut to 59 ± 10 N·m.

>>K<< 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 preload socket (MB991006), rotate the pinion shaft at the rate of one rotation in 4 to 6 seconds to check the total pinion torque and the change in torque.

   Standard value:
   Total pinion torque: 0.8 – 1.8 N·m
   Torque fluctuation: 0.49 N·m or less

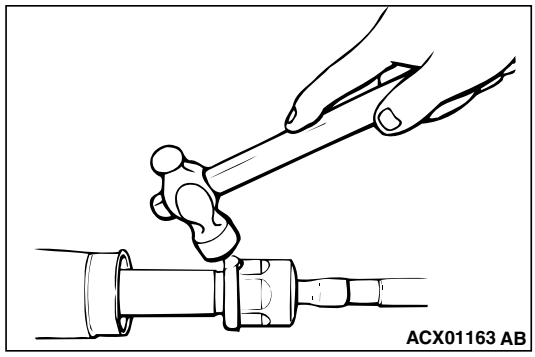
⚠ CAUTION

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

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

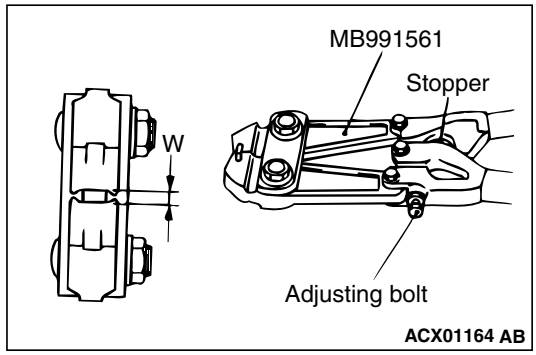
2. If the total pinion torque or the change in torque is outside the standard value, move the rack support cover 0 – 30°, and adjust the pinion torque again.

>>L<< TAB WASHER/TIE ROD INSTALLATION



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

>>M<< BELLOWS BAND INSTALLATION



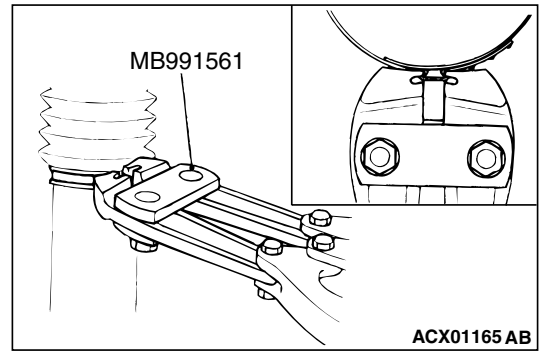
1. Turn the adjusting bolt of special tool boot band crimping tool (MB991561) to adjust the opening dimension (W) to the standard value.

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

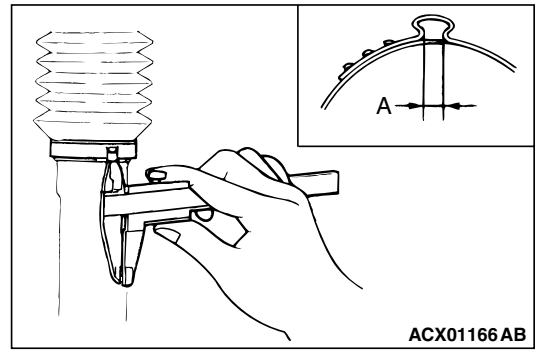
   NOTE: Do not turn the adjusting bolt more than one turn.

   Standard value (W): 2.9 mm
   <When more than 2.9 mm>: Screw in the adjusting bolt.
   <When less than 2.9 mm>: Loosen the adjusting bolt.

⚠ CAUTION
- **Hold the rack housing, and use special tool to crimp the bellows band securely.**
- **Crimp the bellows band until special tool touches the stopper.**



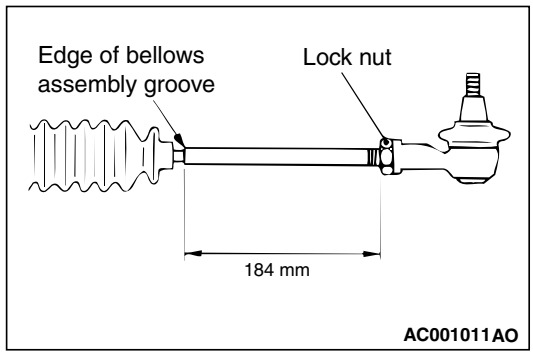
2. Use special tool boot band crimping tool (MB991561) to crimp the bellows band.



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

   Standard value (A): 2.4 – 2.8 mm
   <When more than 2.8 mm>: Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).
   W = 5.5 mm – A [Example: if (A) is 2.9 mm, (W) is 2.6 mm.]
   <When less than 2.4 mm>: 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 mm – A [Example: if (A) is 2.3 mm, (W) is 3.2 mm.]

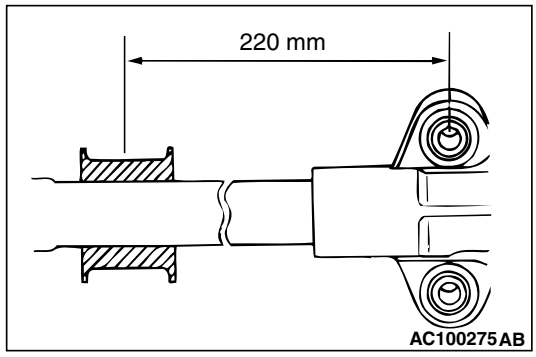
>>N<< TIE ROD END/LOCK NUT INSTALLATION



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

NOTE: The lock nuts must be tightened securely only after the steering gear is installed to the vehicle and toe-in is adjusted.

>>O<< GEAR MOUNTING RUBBER INSTALLATION

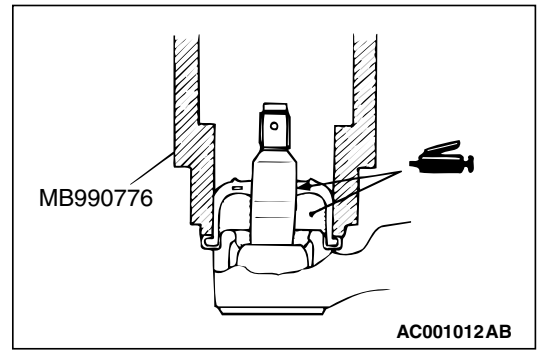


Install the gear mounting rubber to the rack housing so that the distance is as shown in the illustration.

TIE ROD END BALL JOINT DUST COVER REPLACEMENT

M1372008200327

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



1. Apply specified grease to the lip and inside of the dust cover.

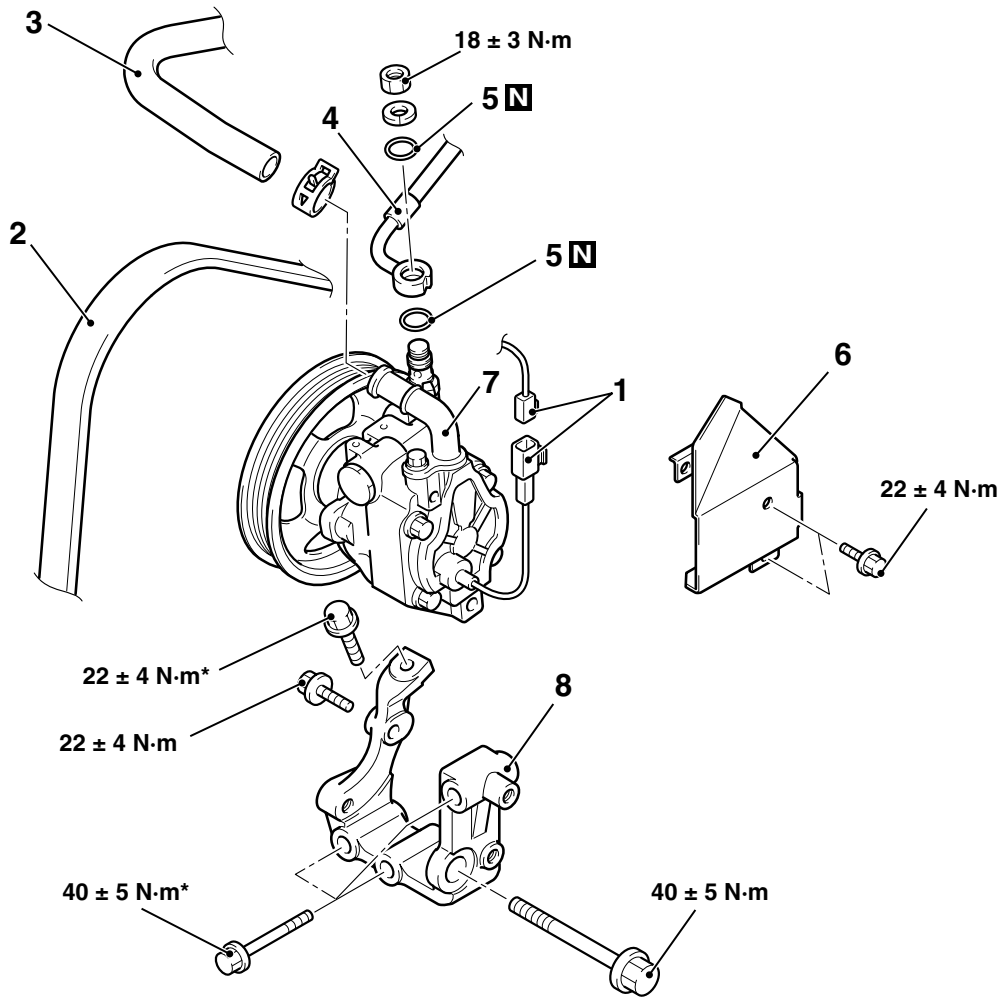
   Specified grease:
   Multipurpose grease SAE J310, NLGI No.2 or equivalent
2. Drive in the dust cover with special tool front axle base (MB990776) until it is fully seated.
3. Check the dust cover for cracks or damage by pushing it with your finger.

POWER STEERING OIL PUMP ASSEMBLY

REMOVAL AND INSTALLATION

M1372005200470

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37-11).	• Power Steering Fluid Supplying and Bleeding (Refer to P.37-12). • Drive Belt Tension Check (Refer to GROUP 11A, On-vehicle Service – Drive Belt Tension Check P.11A-7).



AC211828 AE

Removal steps

1. Pressure switch connector
2. Drive belt (Refer to GROUP 11A,Crankshaft Pulley P.11A-15).

>>B<< 3. Suction hose connection

>>B<< 4. Pressure hose connection

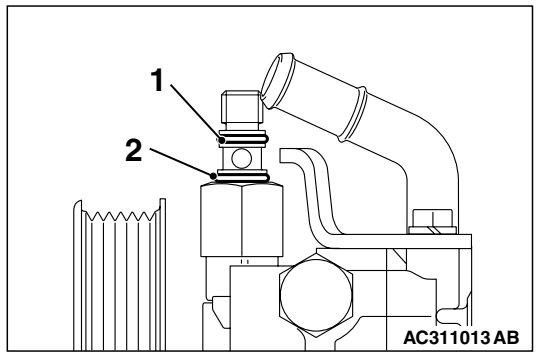
>>A<< 5. O-ring

Removal steps (Continued)

6. Heat protector
7. Oil pump assembly
8. Power steering pump bracket

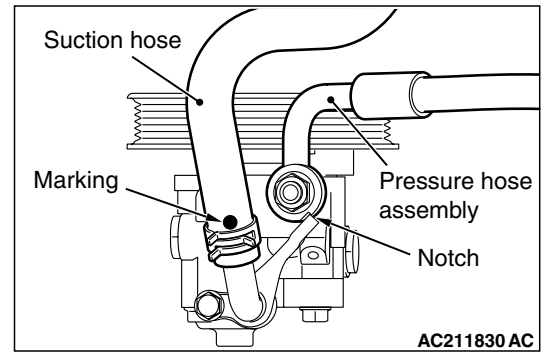
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION



No.	ID × Width mm
1	11.0 × 1.9
2	13.0 × 1.9

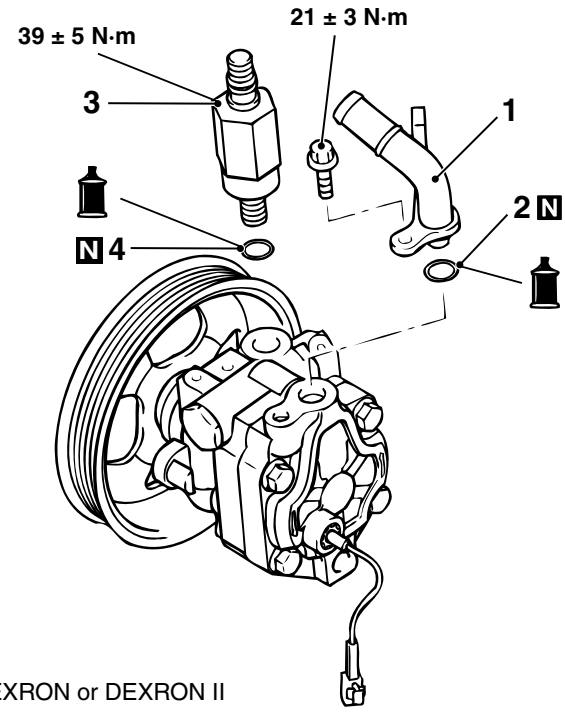
>>B<< ESSURE HOSE ASSEMBLY/SUCTION HOSE REMOVAL



Install the pressure hose assembly and suction hose as illustrated.

DISASSEMBLY AND REASSEMBLY

M1372005400418



: Automatic transmission fluid DEXRON or DEXRON II

AC211831AC

Removal steps

1. Suction connector
2. O-ring
3. Connector
4. Gasket

INSPECTION

M1372005500277

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

POWER STEERING HOSES

REMOVAL AND INSTALLATION

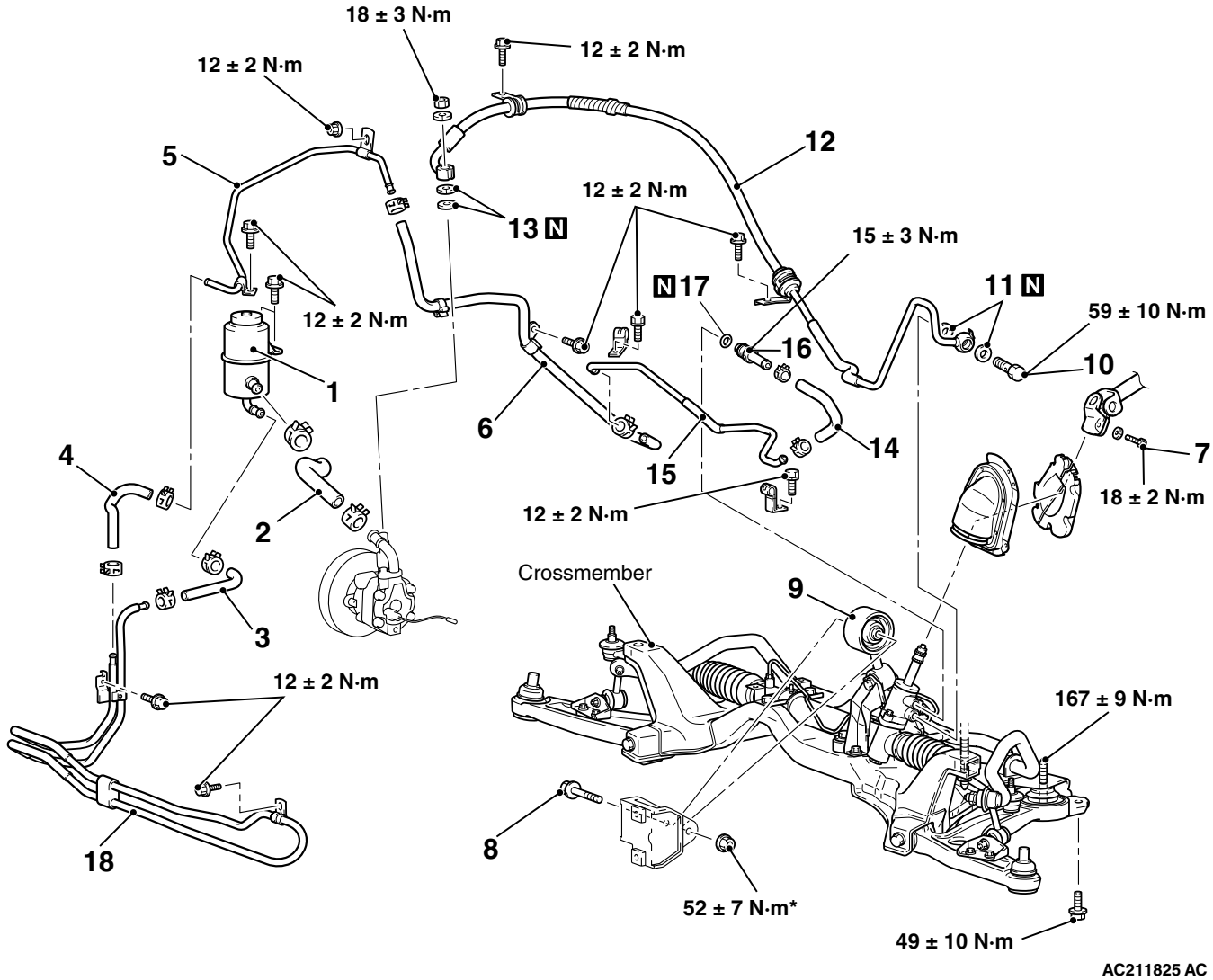
M1372005700594

⚠ CAUTION

- **Before removing the clock spring, refer to GROUP 52B – Service Precautions and Air Bag Module and Clock Spring. Also, put the front wheels in straight-ahead position. Failure to do so may damage the SRS clock spring and render the SRS air bag inoperative, which results serious driver injury.**
- **If the vehicle is equipped with the Brembo disc brake, 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 out quickly.**
- ***: Indicates parts which should be initially tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.**

Pre-removal and Post-installation Operation
- Power Steering Fluid Draining and Refilling (Refer to P.37-11).and Bleeding (Refer to P.37-12).

<LH drive vehicles>



AC211825 AC

Removal steps

1. Oil reservoir
>>B<<2. Suction hose
3. Return hose
4. Return hose
5. Return hose
- Strut tower bar (Refer to GROUP 42, Strut tower bar P.42-9).

6. Return hose
- Clock spring (Refer to GROUP 52B, Driver's, Front Passenger's Air Bag Modules and Clock Spring P.52B-113).
- Crossmember Bar (Refer to GROUP 33A, Crossmember Bar P.33-17).
- Centremember (Refer to GROUP 32, Engine Roll Stopper Centremember P.32-8).
- Front exhaust pipe (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19).

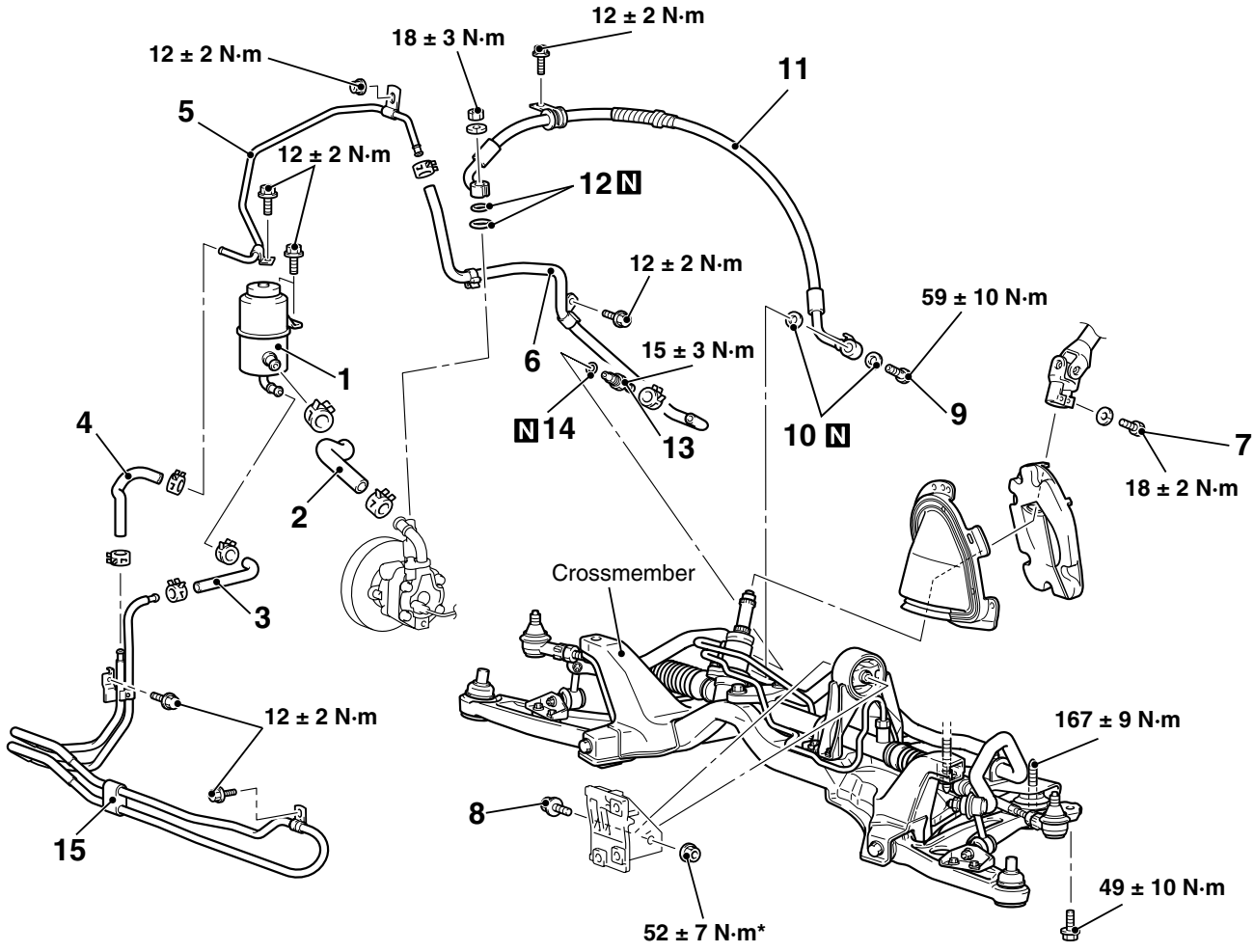
Removal steps (Continued)

7. Steering gear and joint connecting bolt
8. Rear roll stopper connecting bolt
9. Rear roll stopper (Refer to GROUP 32, Engine Roll Stopper Centremember P.32-8).

<<A>> 10. Eye bolt
11. Gasket
>>B<<12. Pressure hose assembly
>>A<<13. O-ring
14. Return hose
15. Return tube
<<A>> 16. Return tube
17. O-ring
- Front bumper (Refer to GROUP 51, Front Bumper Assembly P.51-3).
- Intercooler (Refer to GROUP 15, Intercooler P.15-7).

18. Cooler tube assembly

<RH drive vehicles>



AC310935 AB

Removal steps

1. Oil reservoir
>>B<< 2. Suction hose
3. Return hose
4. Return hose
5. Return hose
- Strut tower bar (Refer to GROUP 42, Strut tower bar P.42-9).

6. Return hose
- Clock spring (Refer to GROUP 52B, Driver's, Front Passenger's Air Bag Modules and Clock Spring P.52B-113).
- Crossmember Bar (Refer to GROUP 33A, Crossmember Bar P.33-17).
- Centremember (Refer to GROUP 32, Engine Roll Stopper Centremember P.32-8).
- Front exhaust pipe (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19).

7. Steering gear and joint connecting bolt
8. Rear roll stopper connecting bolt
<<A>> 9. Eye bolt
10. Gasket
>>B<< 11. Pressure hose assembly
>>A<< 12. O-ring
<<A>> 13. Return tube
14. O-ring
- Front bumper (Refer to GROUP 51, Front Bumper Assembly P.51-3).
- Intercooler (Refer to GROUP 15, Intercooler P.15-7).

15. Cooler tube assembly

REMOVAL SERVICE POINT

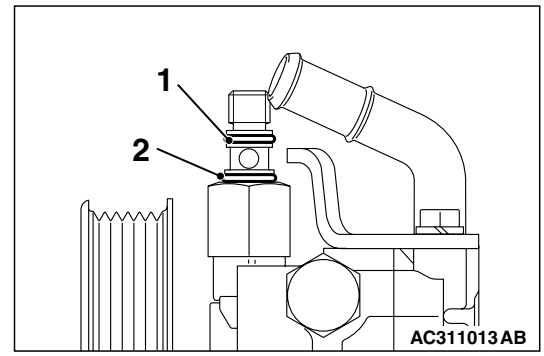
<<A>> EYE BOLT/RETURN TUBE REMOVAL

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.

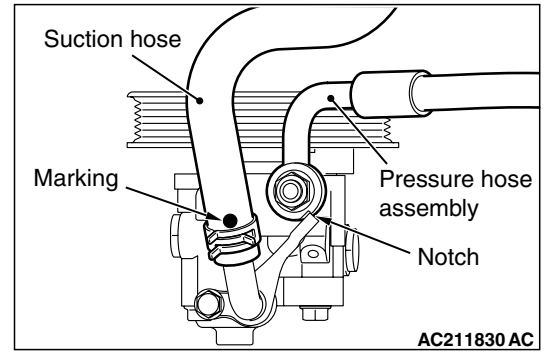
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION



No.	ID × Width mm
1	11.0 × 1.9
2	13.0 × 1.9

>>B<< PRESSURE HOSE ASSEMBLY/SUCTION HOSE REMOVAL



Install the pressure hose assembly and suction hose as illustrated.