

GROUP 37

POWER STEERING

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GENERAL SPECIFICATIONS

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ITEM		SPECIFICATION
Power steering gear box	Type	Rack and pinion
	Stroke ratio (Rack stroke/Steering wheel maximum turning radius)	45.6
Oil pump	Type	Vane type
	Displacement cm ³ /rev (cu in/rev)	8.1 (0.49)
	Relief set pressure MPa (psi)	8.8 (1,276)

SERVICE SPECIFICATIONS

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ITEM		STANDARD VALUE	LIMIT
Steering wheel free play mm (in)	With engine running	-	30 (1.2)
	With engine stopped	16.5 (0.6) or less	-
Steering angle	Inside wheel	39°	-
	Outside wheel (reference)	32°	-
Toe-in mm (in)		1 ± 2 (0.04 ± 0.09)	-
Tie rod end ball joint breakaway torque N·m (in-lb)		2.9(26) or less	-
Tie rod swing resistance N (lb) [Tie rod swing torque N·m (in-lb)]		5 - 18 (44 - 80) [1.5 - 4.9 (13.2 - 43.4)]	-
Engine idle speed r/min		650 ± 100	-
Stationary steering effort N (lb) [Fluctuation allowance N (lb)]		29 (6.5) or less [5.9 (1.33) or less]	-
Oil pump pressure MPa (psi)	Oil pump relief pressure	8.8 - 9.5 (1,276 - 1,378)	-
	Pressure under no-load conditions	0.2 - 0.7 (29 - 101)	-
	Steering gear retention hydraulic pressure	8.8 - 9.5 (1,276 - 1,378)	-
Steering gear total pinion torque N·m (in-lb) [Change in torque N·m (in-lb)]		0.6 - 1.6 (5.3 - 14.2) [0.4 (3.5) or less]	-
Opening dimension of special tool MB991561 mm (in)		2.9 (0.11)	-
Band crimped width mm (in)		2.4 - 2.8 (0.09 - 0.11)	-

LUBRICANTS

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ITEM		SPECIFIED LUBRICANT	QUANTITY dm ³ (qt)
Power steering fluid		GENUINE MITSUBISHI POWER STEERING FLUID	1.0 (1.06)
Steering gear	Bellows	Silicon grease	As required
Oil pump	Friction surface of rotor vane, cam ring and pump cover	GENUINE MITSUBISHI POWER STEERING FLUID	As required
	O-ring		

SEALANT

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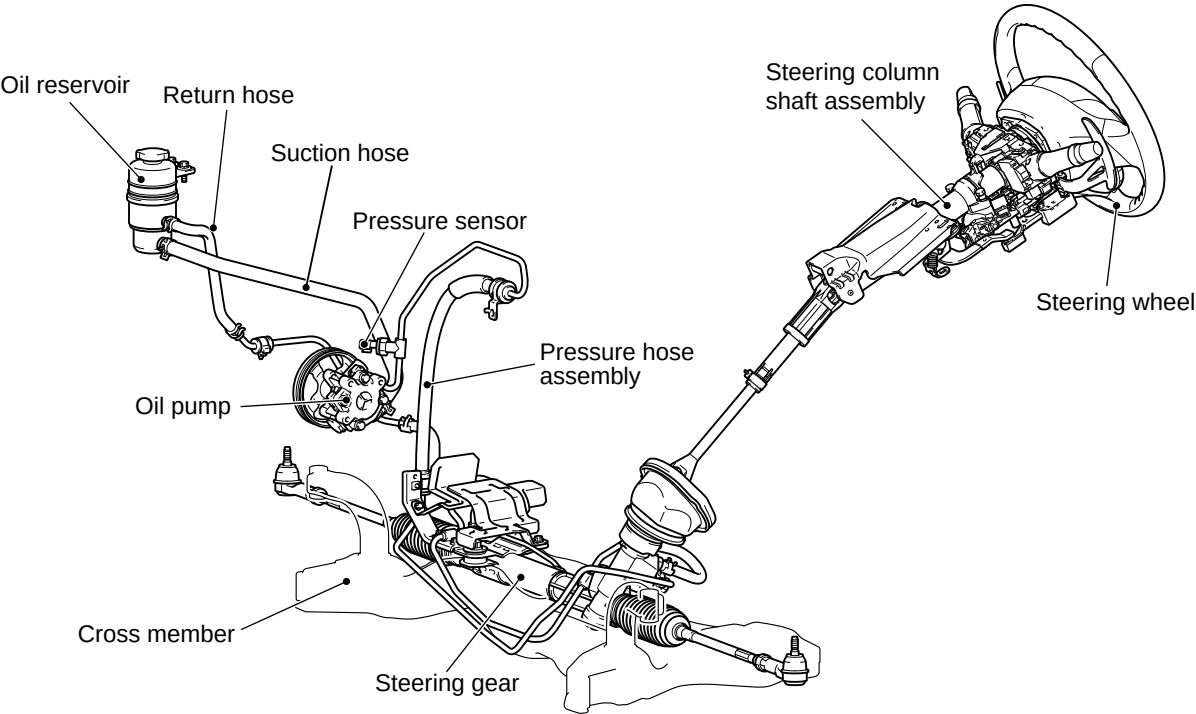
ITEM		SPECIFIED LUBRICANT	QUANTITY dm ³ (qt)
Steering gear	Bellows	3M™ AAD Part No.8663 or equivalent	As required

GENERAL INFORMATION

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The steering wheel has three spokes and is equipped with SRS (Supplemental Restraint System). The steering column has a shock absorbing mechanism and a tilt steering mechanism. The hydraulic sensor, which linearly controls the hydraulic pressure change when the wheel is turned, has been adopted to improve the steering stability.

The steering system uses a vane oil pump with a fluid flow control system, so that steering effort varies with engine speed.



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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 defects 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

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

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Excessive Play of Steering Wheel

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DIAGNOSIS

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

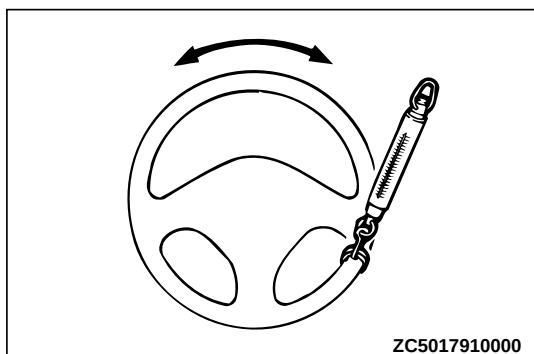
Q: Is there any looseness?

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 moving the steering wheel slightly 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. Load approximately 5 N (1.1 pound) towards the steering circumference and check the play.

Standard value (steering wheel play with engine stopped): 16.5 mm (0.6 inch) or less

Q: Does the play exceed the standard value?

YES: Remove the steering gear box (Refer to P. 37-28) 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)

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DIAGNOSIS

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

Refer to GROUP 11A, Drive belt tension check and adjustment P.11A-9.

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 11A, Drive belt tension check and adjustment P.11A-9.) Then go to Step 10.

STEP 2. Check the drive belt for damage.

Q: Is the drive belt damaged?

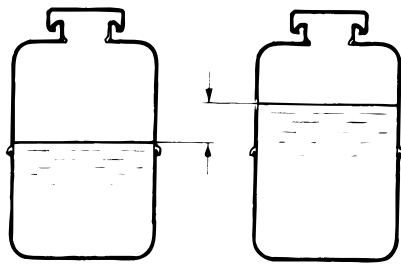
YES: Replace the drive belt. Then go to Step 10.

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.

Fluid level change: Within 5 mm (0.2 in)



With engine running

With engine stopped

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- (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 (0.2 inch) or more, bleed the air from the system. (Refer to P.37-18.)

Q: Is the fluid foamy?

YES: Go to Step 4.

NO: Go to Step 10.

STEP 4. Check for entry of air.

Q: Has air entered?

YES: Bleed the air (Refer to P.37-18). Then go to Step 10.

NO: Go to Step 5.

STEP 5. Check each hose for crushing or twisting.

Q: Is any hose crushed or twisted?

YES: Repair or replace the hose. Then go to Step 10.

NO: Go to Step 6.

STEP 6. Check for oil leaks.

Q: Are there oil leaks?

YES: Repair it. Then go to Step 10.

NO: Go to Step 7.

STEP 7. 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 10.

NO: Go to Step 8.

STEP 8. Check the steering gear and linkage for damage.

Q: Is there damage?

YES: Replace it. Then go to Step 10.

NO: Go to Step 9.

STEP 9. Check for excessive tie rod end ball joint breakaway torque.

Refer to P.37-15.

Q: Is there fault?

YES: Replace the part. Then go to Step 10.

NO: Go to Step 10.

STEP 10. 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.

INSPECTION PROCEDURE 3: Rattling Noise

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DIAGNOSIS**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.**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.**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

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DIAGNOSIS**YES:** Replace the part. Then go to Step 3.**NO:** Go to Step 3.**STEP 1. Check for entry of air.****Q: Is the power steering fluid foamy?****YES:** Bleed the air (Refer to P. 37-18). Then go to Step 3.**NO:** Go to Step 2.**STEP 2. Check for seizure in the oil pump.****Q: Is there seizure?****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

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DIAGNOSIS

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

Refer to GROUP 11A, Drive belt tension check and adjustment P.11A-9.

Q:Is the drive belt tension incorrect?

YES: Adjust the belt tension. (Refer to GROUP 11A, Drive belt tension check and adjustment P. 11A-9.) Then go to Step 3.

NO: Go to Step 2.

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

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DIAGNOSIS

STEP 1. Check for entry of air.

Q:Is the power steering fluid foamy?

YES: Bleed the air (Refer to P.37-18). Then go to Step 4.

NO: Go to Step 2.

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

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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

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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	39°
Outside wheel (reference)	32°

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

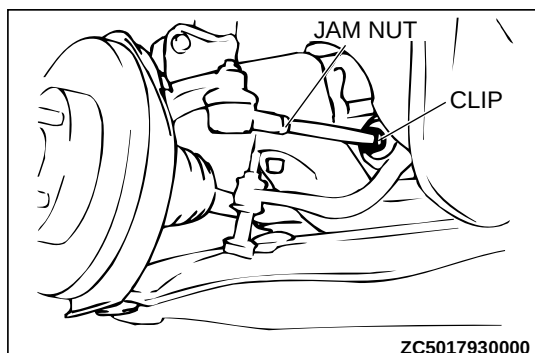
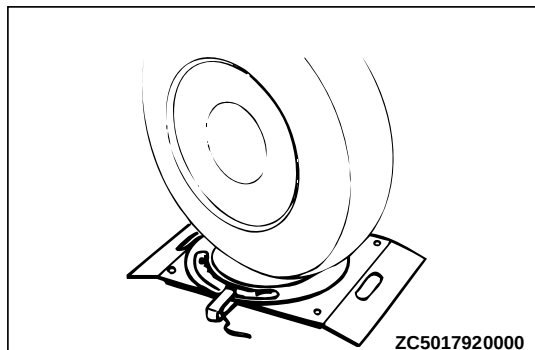
Standard value: 1 ± 2 mm (0.04 ± 0.09 inch)

- (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**

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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 for entry of air.****Q:Is the power steering fluid foamy?****YES:** Bleed the air (Refer to P.37-18). Then go to Step 3.**NO:** Go to Step 2.

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

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DIAGNOSIS

STEP 1. Check for loosening of the return tube flare nut.

Q:Is the flare nut loose?

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

NO: Go to Step 2.

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

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

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DIAGNOSIS

STEP 1. Check the hose for damage or clogging.

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

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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 to Step 1.

NO: The procedure is complete.

INSPECTION PROCEDURE 13: Oil Leakage from Oil Pump

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DIAGNOSIS**YES:** Replace the part. Then go to Step 3.**NO:** Go to Step 3.**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?****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 14: Oil Leakage from Steering Gear**

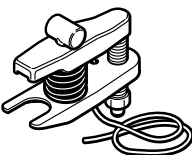
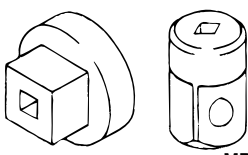
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DIAGNOSIS**YES:** Replace the part. Then go to Step 3.**NO:** Go to Step 3.**STEP 1. Check the steering gear housing for damage.****Q: Is there damage?****YES:** Replace the part. Then go to Step 3.**NO:** Go to Step 2.**STEP 2. Check the oil-ring or oil seal for damage.****Q: Is there damage?****STEP 3. Retest the system.**

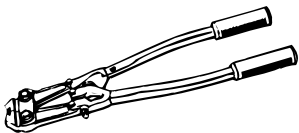
Check that no oil is leaking.

Q: Is there oil leakage?**YES:** Repeat from Step 1.**NO:** The procedure is complete.**SPECIAL TOOLS**

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TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 YB991897AA00	MB991897 or MB992011 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and tie rod end ball joint disconnection <i>NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and tie rod end ball joint.</i>
 MB990326	MB990326 Preload socket	General service tool	Tie rod end ball joint breakaway torque check

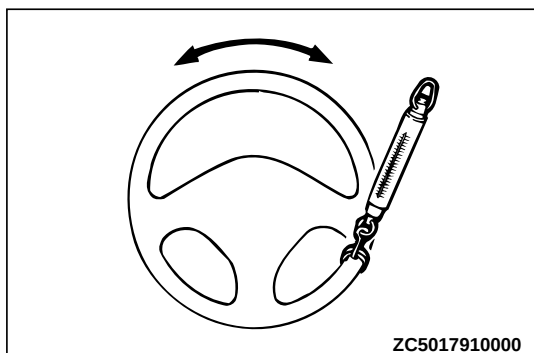
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
MB991548	MB991548 Power steering oil pressure gauge adapter (Pump side)	MB991548-01	Oil pump pressure test
MB991549	MB991549 Power steering oil pressure gauge adapter (Hose side)	MB991549-01	
MB990662	MB990662 Power steering oil pressure gauge	MB990662-01	
MB990784	MB990784 Ornament remover	General service tool	Cover removal
MB990803	MB990803 Steering wheel puller	-	Steering wheel removal
MB991006	MB990228 or MB991006 Preload socket	MB990228-01	Steering gear total pinion torque check
MB990925	MB990925 Bearing and oil seal installer set	MB990925-01 or general service tool	• Oil seal and bearing installation • MB990927, MB990938, MB990939.
MB991203	MB991203 Oil seal and bearing installer	Tool not available	Oil seal and bearing installation

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
 YB991561AA00	MB991561 Boot band crimping tool	MB991561	Bellows band installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

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1. With the engine running (hydraulic pressure applied), position the front wheel in the straight ahead direction.
2. Measure the side to side steering wheel play until the front wheels actually start moving while turning the steering wheel slightly in the left and right directions.

Limit: 30 mm (1.2 inch) or less

3. If the steering wheel play exceeds the limit value, check the steering shaft joint or steering linkage for looseness, and replace or repair the faulty components if necessary.
4. If the steering wheel play still exceeds the limit value after Step 3 is performed, position the steering wheel in the straight ahead position, and then apply the force (approximately 5 N) in the circumferential direction.

At this time, check if the steering wheel play is within the standard value.

Standard value : 16.5 mm (0.6 inch) or less

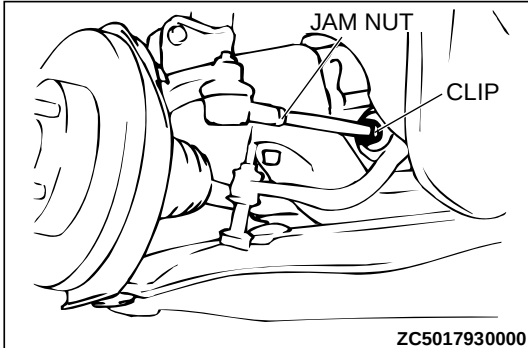
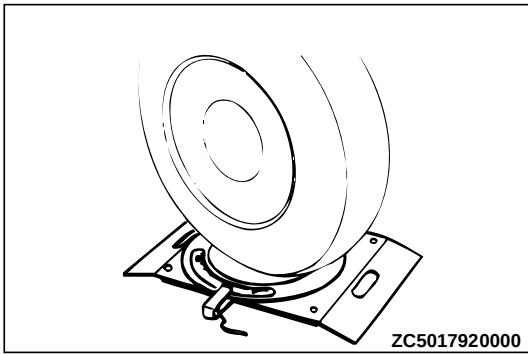
If the steering wheel play is outside the standard value after Step 4 is performed, remove the steering gear and linkage, and check and adjust the pinion total rotation torque. (Refer to P.37-31.)

STEERING ANGLE CHECK

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⚠ CAUTION

After adjusting the steering angle, always perform calibration to make ABS/ASC-ECU learn the neutral position of the steering wheel sensor. (Refer to GROUP 35C, On-vehicle Service - Steering Wheel Sensor Calibration P. 35C-192.)



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

Standard value:

ITEMS	SPECIFICATIONS
Inside wheel	39°
Outside wheel (reference)	32°

2. When the calibrated value is outside the standard value, improper toe-in adjustment may be present. Check and adjust the toe-in correctly if necessary.

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

To adjust the toe-in, remove the bellows clip of the tie-rod, loosen the locking nut, and then rotate the left tie-rod and right tie-rod in the reverse direction by an equal amount.

3. Recheck the steering angle.

BALL JOINT DUST COVER CHECK

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1. Using your fingers, press the dust cover to check for cracks or damage.
2. If there are any cracks in the dust cover or it is damaged, replace the tie-rod end.

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

TIE ROD END BALL JOINT BREAKAWAY TORQUE CHECK

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Required Special Tools:

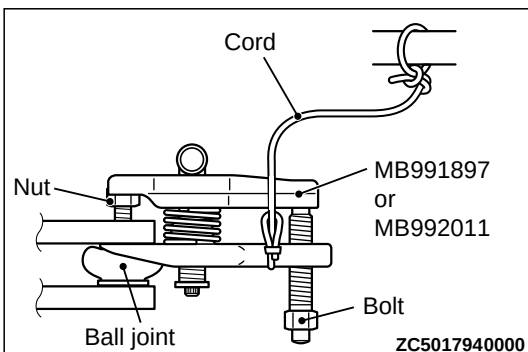
- MB990326: Preload Socket
- MB991897 or MB992011: Ball Joint Remover

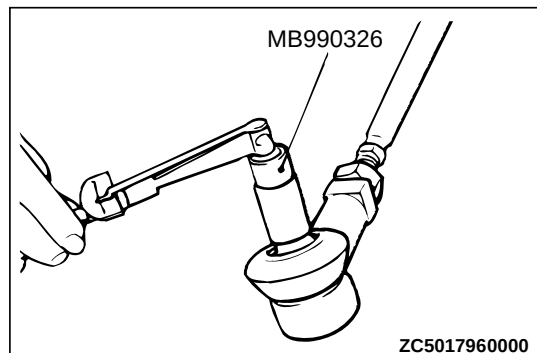
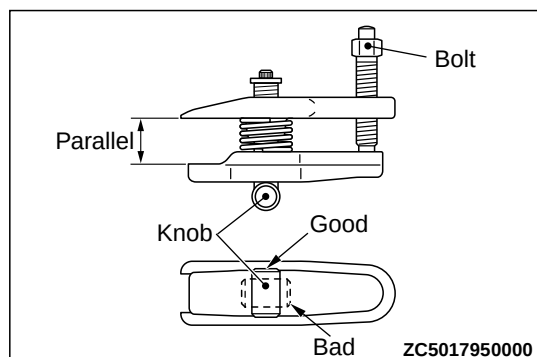
CAUTION

•Do not remove the nut from ball joint. Loosen it and use the special tool MB991897 or MB992011 to avoid possible damage to the ball joint threads.

•Hang the special tool MB991897 or MB992011 with cord to prevent it from falling.

1. Install the special tool MB991897 or MB992011 as shown in the figure.





- Turn the bolt and knob as necessary to make the jaws of the special tool MB991897 or MB992011 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 the special tool MB990326, measure the ball joint breakaway torque.

Standard value: 2.9 N·m (26 in-lb) or less

- If the breakaway torque exceeds the standard value, replace the tie rod end. (Refer to P.37-32.)
- 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

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- Park the vehicle on a level paved road, position the steering wheel in the straight ahead direction.
- Start the engine, and maintain the engine speed at 650 ± 100 r/min.
- Position the spring scale on the circumference of the steering wheel, and measure the steering force at the time when the steering wheel is turned to right or left side (within the range of one and a half turns) from the center position. At the same time, verify that the steering force does not vary excessively in both directions.

Standard value:

Steering force	29 (6.5 lb) N or less
Fluctuation band	5.9 (1.33 lb) N or less

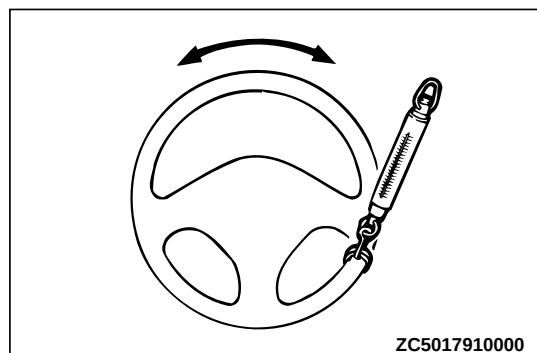
- If not within the standard value, check and adjust the suspected components.

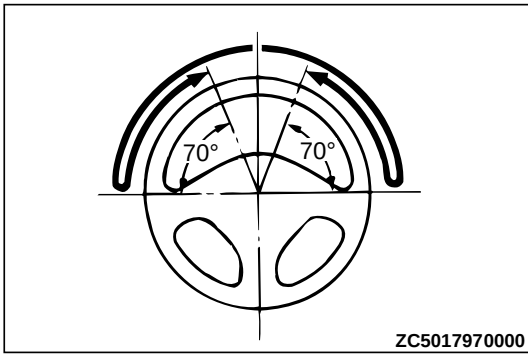
STEERING WHEEL RETURN TO CENTER CHECK

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Conduct a road test:

- 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

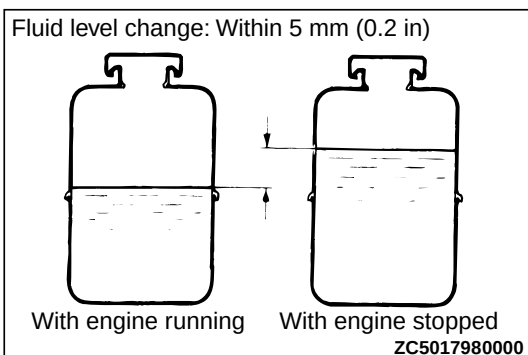
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Refer to GROUP 11A Drive belt tension check adjustment P. 11A-9.

FLUID LEVEL CHECK

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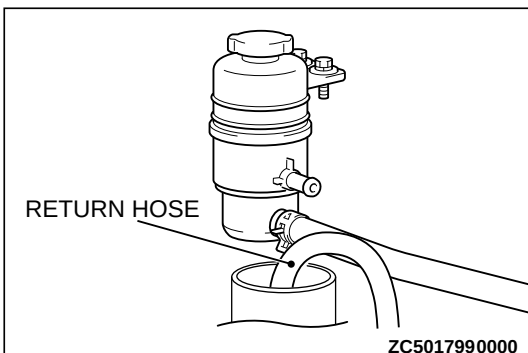
1. Park the vehicle on a flat, level surface.
2. Start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 - 60°C (122 - 140°F).
3. With the engine running, turn the wheel all the way to the left and right several times.
4. Check the fluid 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 change of the fluid level is 5 mm (0.2 inch) or more, air bleeding should be done.



FLUID REPLACEMENT

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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 16c, Ignition coil removal and installation P.16c-6).
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

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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 16c, Ignition coil removal and installation P.16c-6.)

⚠ CAUTION

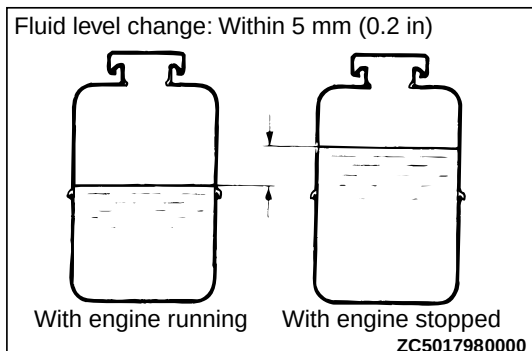
Perform air bleeding only while cranking the engine. If air bleeding is performed while the engine is running, air could enter the fluid. During air bleeding, refill the steering fluid supply so that the level never falls below the lower mark on the dipstick.

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 16c, Ignition coil removal and installation P.16c-6.)
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.

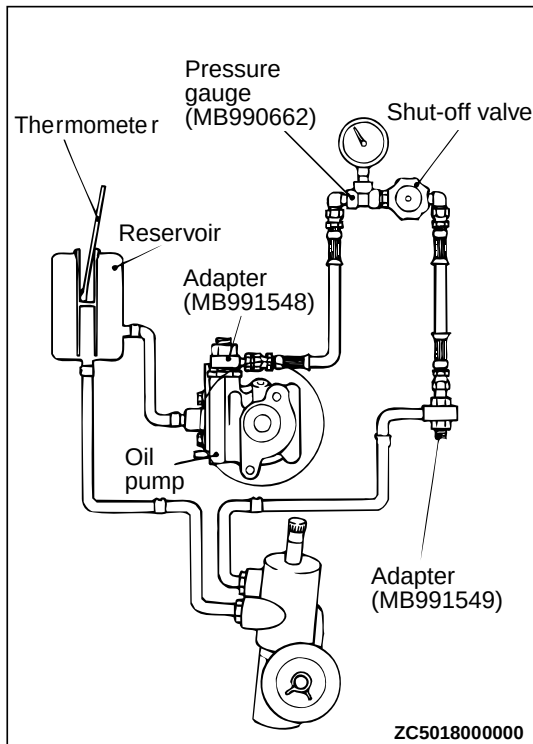


OIL PUMP PRESSURE TEST

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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, 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 650 ± 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: 8.8 - 9.5 MPa (1,276 - 1,378 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 - 0.7 MPa (29 - 101 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: 8.8 - 9.5 MPa (1,276 - 1,378 psi)

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

Tightening torque: 57 ± 7 N·m (42 ± 5 ft-lb)

11. Bleed the system. (Refer to P.37-18.)

INSPECTION OF STEERING COLUMN SHAFT ASSEMBLY IMPACT ABSORBING MECHANISM

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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 replace 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 ignition key cover, steering column lower cover, steering column upper cover, WCM, bottom cover assembly (driver's seat), side air outlet (L) and side lower panel assembly.

⚠ CAUTION

After inspection, do not release the tilt lever until the steering shaft assembly has been installed.

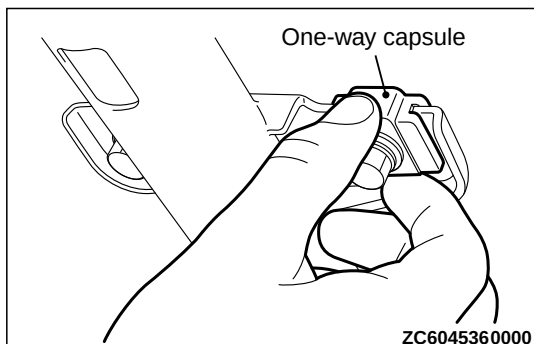
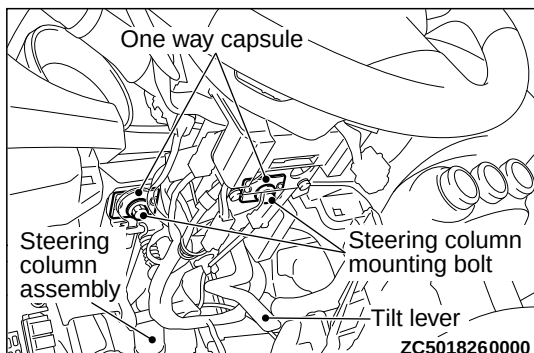
2. Ensure that the tilt lever is in the lock position.
3. Loosen the two upper steering column mounting bolts by two turns.
4. Hold the one-way capsules as shown in the figure, and then try to rock them. If there is a slack in either of the capsules, replace the steering column shaft assembly.

⚠ CAUTION

- **Be careful that nothing is pinched between the one-way capsules and the body.**
- **When the replacement, removal, or installation of the steering column shaft assembly is performed, tighten the mounting bolt of the one-way capsule side to the specified torque first.**

5. If no malfunction has been found after the inspection, hand-tighten the steering column mounting bolts, and then tighten them to the specified torque.

Tightening torque: 12 ± 3 N·m (102 ± 26 in-lb)

**STEERING WHEEL****REMOVAL AND INSTALLATION****⚠ WARNING**

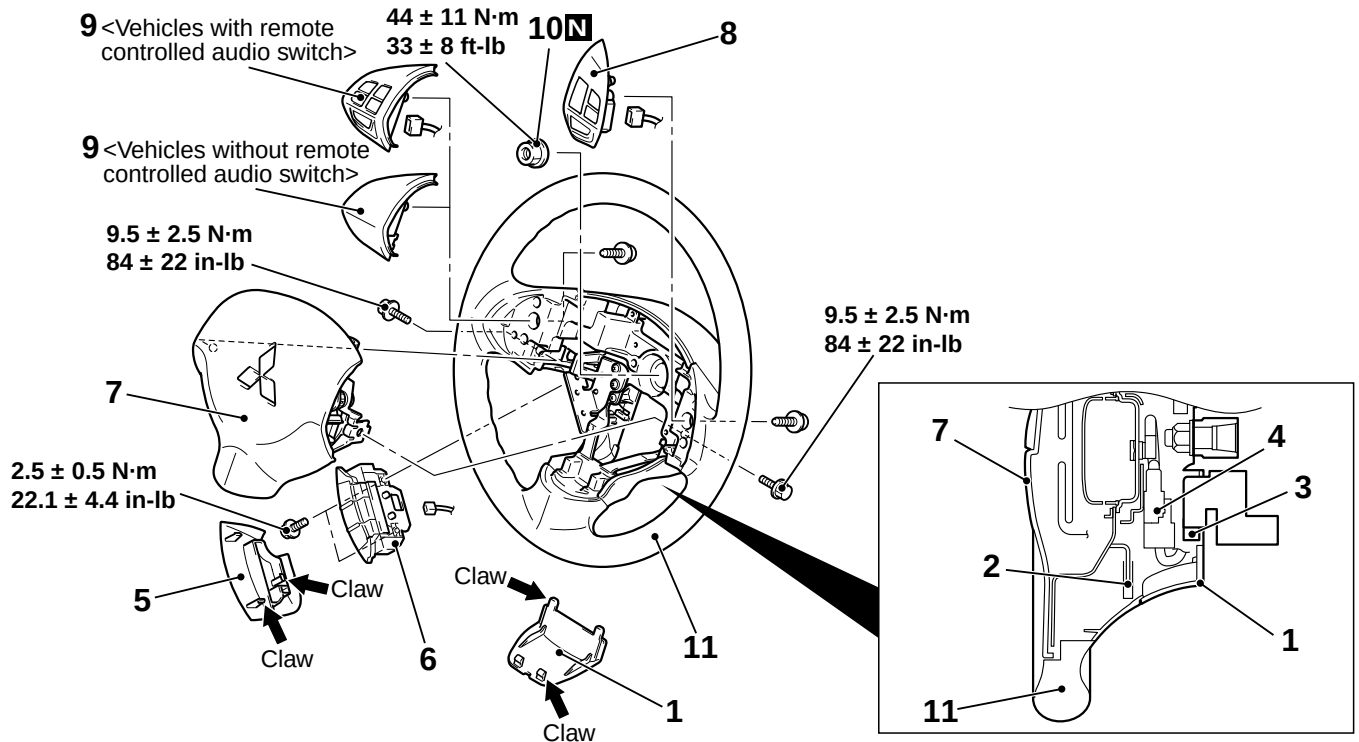
- **Before removing the steering wheel and air bag module assembly, refer to GROUP 52B, Service Precautions P.52B-28 and Air Bag Module and Clock Spring P.52B-329.**

Post-installation Operation

- Checking Steering Wheel Position with Wheels Straight Ahead

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- **When removing and installing the steering wheel, do not let it bump against the air bag module.**



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Removal steps		Removal steps	
<<A>>	1. Cover	<<C>>	7. Air bag module
>>B<<	2. Horn connector connection		8. Cruise control switch
>>B<<	3. Audio control switch connector connection <Vehicles with audio control switch>		9. Bezel switch or Remote controlled radio switch
<>	4. Air bag module connector connection	<<D>>	10. Self-locking nut
	5. Telematic cover	>>A<<	11. Steering wheel assembly
	6. Telematic switch		

Required Special Tools:

•MB990784: Ornament Remover

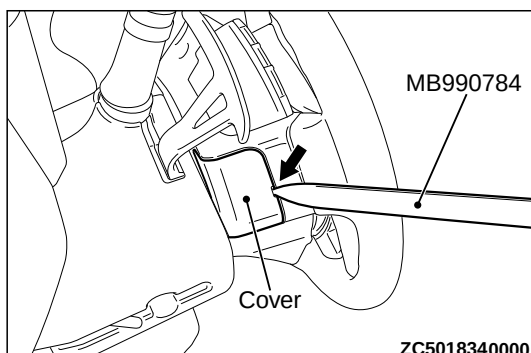
•MB990803: Steering wheel puller

REMOVAL SERVICE POINTS

<<A>> COVER REMOVAL

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

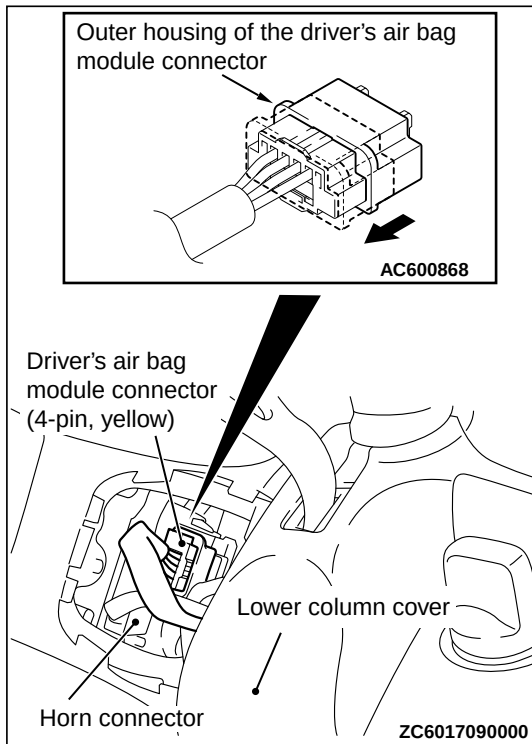
NOTE: The special tool MB990784 can be inserted through the notch behind the area shown.



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<> AIR BAG MODULE ASSEMBLY CONECTOR DISCONNECTION

Slide the outer housing of the driver's air bag module connector in the arrow direction shown, and disconnect the connector.

**<<C>> AIR BAG MODULE REMOVAL****⚠ CAUTION**

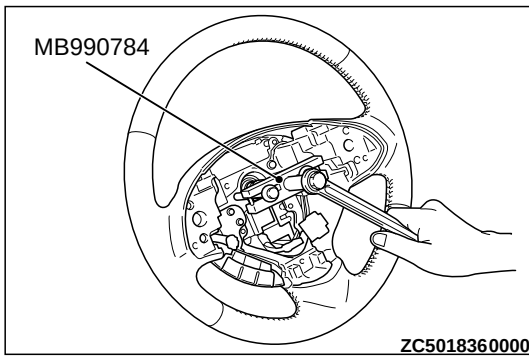
- Never use an electric tester to diagnose the air bag module circuit. Never attempt to disassemble the air bag module.
- Be sure to store the removed air bag module in a clean and dry place with a pad surface facing upward.

<<D>> STEERING WHEEL ASSEMBLY REMOVAL

1. Position the steering wheel in a straight ahead direction.

⚠ CAUTION

Use the special tool to remove the steering wheel since the steering column collision absorbing mechanism may be damaged.



2. Use special tool MB990803 to remove the steering wheel

INSTALLATION SERVICE POINTS

>>A<< STEERING WHEEL ASSEMBLY INSTALLATION

After centering the clock spring (Refer to GROUP 52B - Air Bag Module Clock Spring P.52B-329.), install the steering wheel assembly.

>>B<< AIR BAG MODULE CONNECTOR CONNECTION/ AUDIO CONTROL SWITCH CONNECTOR CONNECTION/ HORN CONNECTOR CONNECTION

Connect the connector securely and route the harnesses not to lie off the cover hole.

STEERING SHAFT

REMOVAL AND INSTALLATION

⚠ CAUTION

• Before removing the steering wheel/air bag module assembly, refer to GROUP 52B - Service Precautions P.52B-28 and Air Bag Module Clock Spring P.52B-329.

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• After the installation, perform a calibration for the ASC-ECU to learn the steering wheel sensor neutral point. (Refer to GROUP 35C, On-vehicle Service - Steering Wheel Sensor Calibration P.35C-192.)

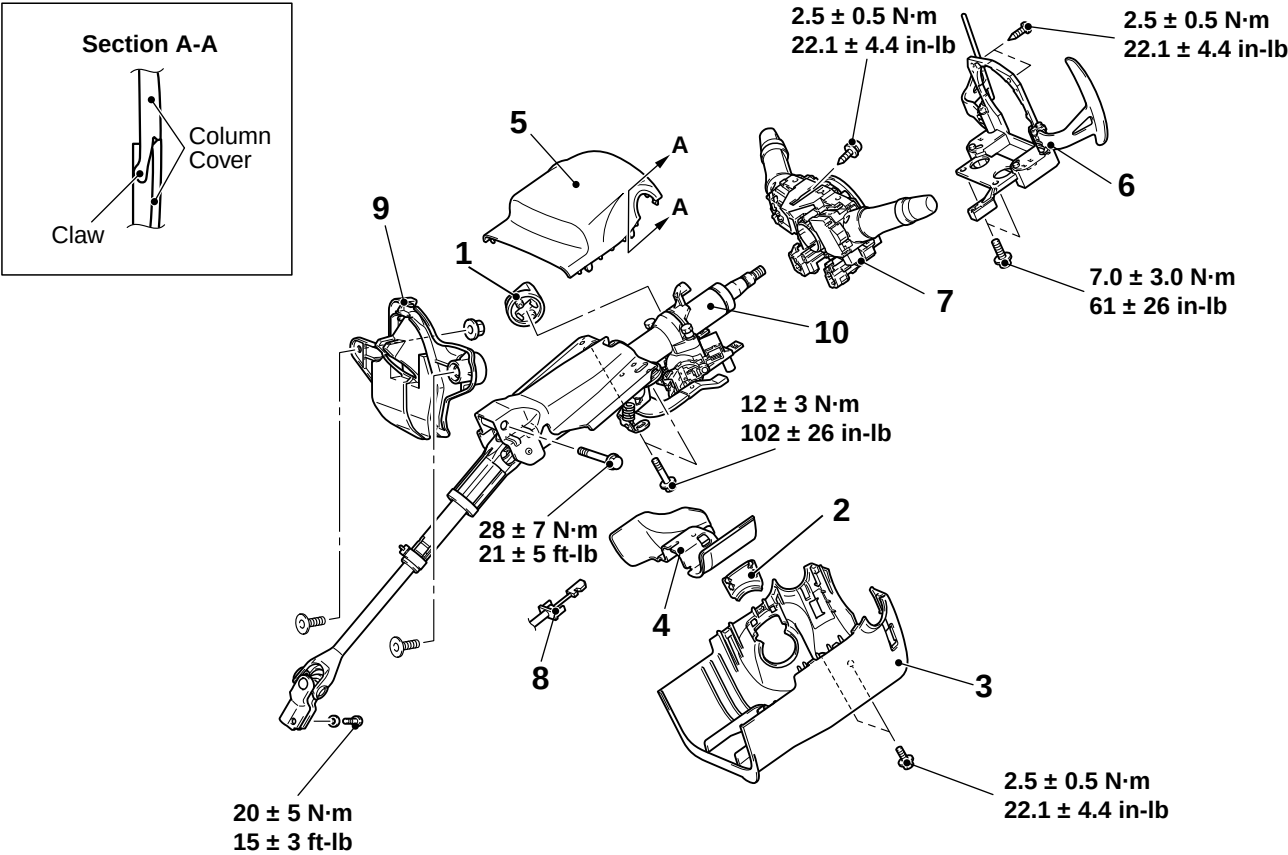
Pre-removal operation

- Air Bag Module and Steering Wheel Assembly Removal (Refer to P.37-20.)
- Bottom Cover Assembly (Driver's seat) and Side Lower Panel Assembly Removal (Refer to GROUP 52A - Instrument Panel Assembly Removal and Installation P.52A-2.)
- Lower side cover (L) Removal (Refer to GROUP 52A - Front Floor Console Assembly Removal and Installation P.52A-8.)
- WCM vehicles with WCM/Receiver Antenna Module vehicles with KOS Removal (Refer to GROUP 54Ag, Ignition Switch - On-vehicle Service - Ignition Switch Removal and Installation P.54Ag-13.)

Post-installation operation

- WCM vehicles with WCM/Receiver Antenna Module vehicles with KOS Installation (Refer to GROUP 54Ag, Ignition Switch - On-vehicle Service - Ignition Switch Removal and Installation P.54Ag-13.)
- Lower side cover (L) Installation (Refer to GROUP 52A - Front Floor Console Assembly Removal and Installation P.52A-8.)
- Bottom Cover Assembly (Driver's seat) and Side Lower Panel Assembly Installation (Refer to GROUP 52A - Instrument Panel Assembly Removal and Installation P.52A-2.)
- Air Bag Module and Steering Wheel Assembly Installation (Refer to P.37-20.)

	▪Confirm that the steering wheel is at the straight-ahead position. ▪Steering wheel sensor calibration (Refer to GROUP 35C, On-vehicle Service - Steering Wheel Sensor Calibration P.35C-192.)
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Removal steps		Removal steps	
<<A>>	1. Knob cap <Vehicles with KOS>	<>	8. Key interlock cable (Refer to GROUP 23A - A/T Key Interlock And Shiftlock Mechanisms P.23A-168.)
	2. Ignition key cover		9. Steering shaft cover
	3. Steering column lower cover	<<C>> >>A<<	10. Steering column shaft assembly
	4. Steering column protector		
	5. Steering column upper cover		
	6. Paddle shift assembly vehicles with paddle shift		
>>B<<	7. Steering wheel sensor/clock spring column switch assembly (Refer to GROUP 35C - Steering Angle Sensor P.35C-198and GROUP 52B - Driver side-passenger side air bag module clock spring P.52B-329.)		

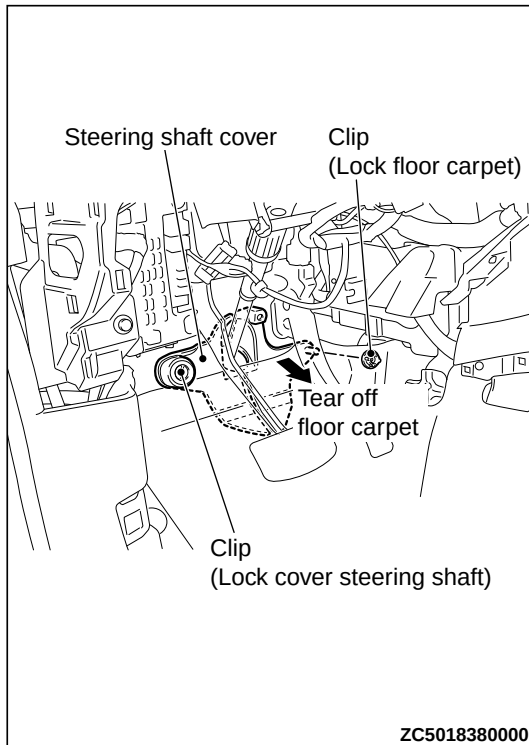
REMOVAL SERVICE POINTS

<<A>> KNOB CAP REMOVAL

Remove the knob cap while pressing the two projections.

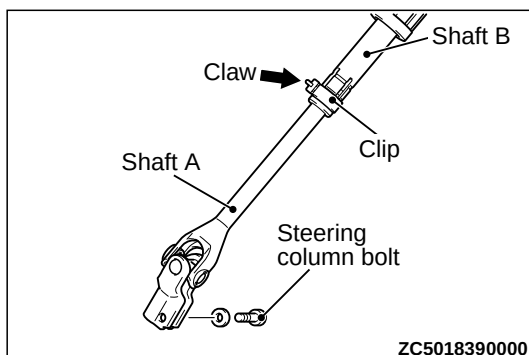
<> STEERING SHAFT COVER REMOVAL

1. Remove the clip (for securing the floor carpet), and turn back the floor carpet.
2. Remove the clip (for securing the steering shaft cover), and then remove the steering shaft cover.



<<C>> STEERING COLUMN SHAFT ASSEMBLY DISCONNECTION

1. Remove the steering column bolt connecting the steering gear to the steering column assembly.
2. Disconnect the steering gear from the steering column assembly while sliding the shaft A to the shaft B with the clip claw as shown in the figure is pinched.
3. Remove the steering column mounting bolt.



INSTALLATION SERVICE POINTS**>>A<< STEERING COLUMN SHAFT ASSEMBLY
INSTALLATION**

Ensure that the tilt lever is in the lock position, and install the steering column as below.

1. Hand-tighten the mounting bolts in the order of 1, 2, 3, and tighten them in the order of 3, 2, 1 to the specified torque.

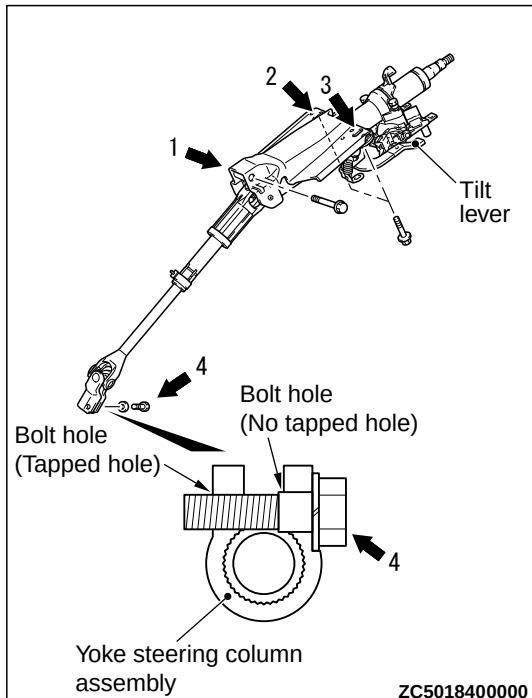
Tightening torque:

Mounting bolt 1: $28 \pm 7 \text{ N}\cdot\text{m}$ ($21 \pm 5 \text{ ft}\cdot\text{lb}$)

Mounting bolt 2, 3: $12 \pm 3 \text{ N}\cdot\text{m}$ ($102 \pm 26 \text{ in}\cdot\text{lb}$)

2. Assemble the steering column assembly to the steering gear.
3. Insert the bolt connecting the steering column assembly with the steering gear into the non-threaded bolt hole.
4. Tighten the mounting bolt 4 to the specified torque.

Tightening torque: $20 \pm 5 \text{ N}\cdot\text{m}$ ($15 \pm 3 \text{ ft}\cdot\text{lb}$)

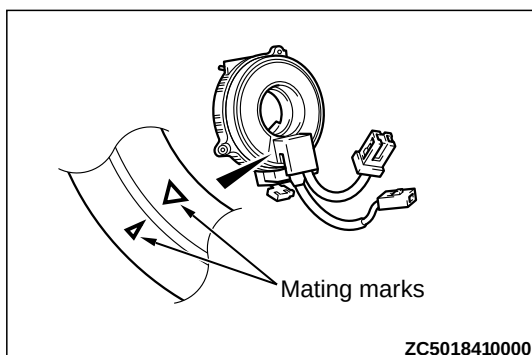
**>>B<< STEERING WHEEL SENSOR CLOCK SPRING
COLUMN SWITCH ASSEMBLY INSTALLATION****⚠ CAUTION**

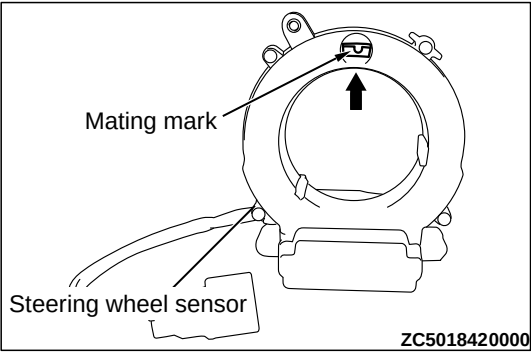
If the center of the clock spring is not correctly aligned, the steering wheel may not be turned fully or the cable inside the clock spring may be broken, causing the SRS air bag to be inoperative or operated incorrectly.

1. Align the mating marks of the clock spring.

Alignment of mating marks

- (1) Turn the clock spring clockwise fully.
- (2) Turn the clock spring counterclockwise approximately three and 3/4 turns to align the mating marks.
- (3) Install the clock spring to the column switch.





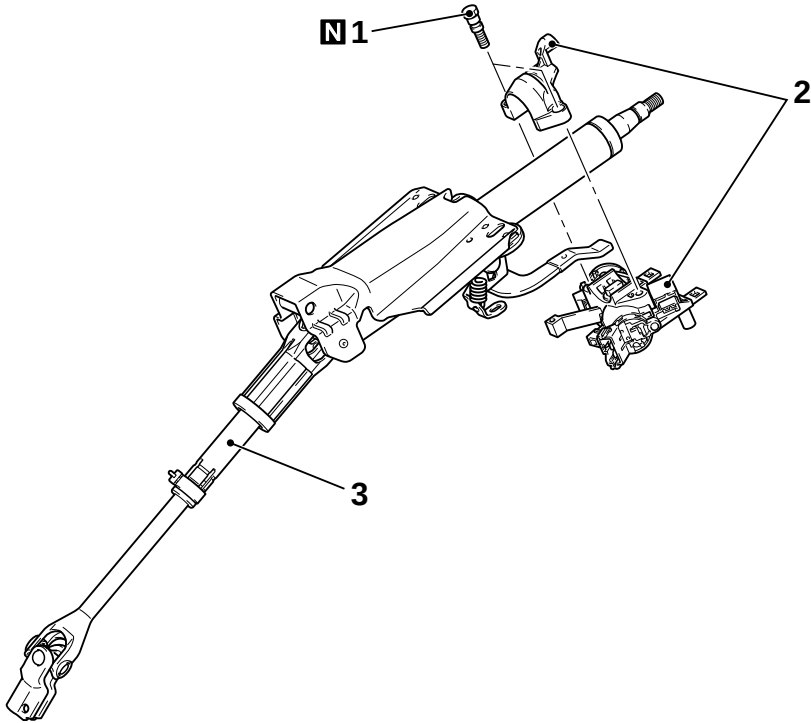
CAUTION

Be sure to align the steering wheel sensor neutral position mark. If the neutral position marks are not aligned, the steering wheel operation may damage the steering wheel sensor.

2. Align the steering wheel sensor neutral position mark.
- Alignment of mating marks
- (1) When checking the neutral position check window of the steering wheel sensor, if an arrow can be seen, turn to the direction of the arrow, and align the neutral position mark as shown in the figure.
 - (2) Install the steering wheel sensor to the column switch assembly, correctly maintaining the neutral position.
 - (3) Install the column switch assembly to the vehicle, correctly maintaining the neutral position.

DISASSEMBLY AND ASSEMBLY

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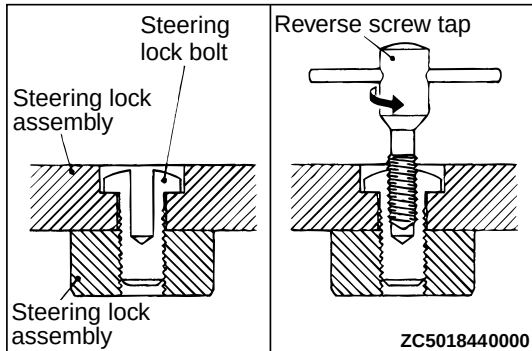
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- Disassembly steps**
- <<A>> >>A<< 1. Steering locking bolt
- >>A<< 2. Steering lock assembly

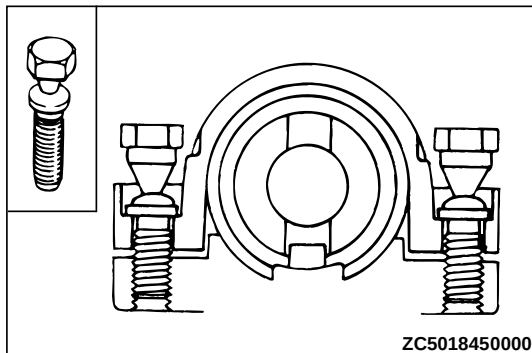
- Disassembly steps**
3. Steering column shaft assembly

DISASSEMBLY SERVICE POINT**<<A>> STEERING LOCK BOLT REMOVAL**

1. Use a drill to make a hole just deeply enough for the tap to stand on the steering lock bolt.
2. Use a left-hand thread tap to remove the steering lock bolt.

**ASSEMBLY SERVICE POINT****>>A<< STEERING LOCK ASSEMBLY/STEERING LOCKING BOLT INSTALLATION**

1. When installing the steering lock assembly to the steering column shaft assembly, temporarily assemble the steering lock assembly while aligning it with the boss on the column.
2. Make sure that the steering lock operates normally, and then tighten the steering lock bolt until its head is broken off.

**POWER STEERING GEAR BOX AND LINKAGE****REMOVAL AND INSTALLATION****⚠ CAUTION**

*Before removing the steering wheel and airbag module, refer to GROUP 52B - Service Precautions and Airbag Module and Clock Spring. Position the front wheels in a straight ahead direction. If you fail to do this, the clock spring for SRS may be damaged, making the SRS (air bag) inoperable which may cause serious injury to the driver.

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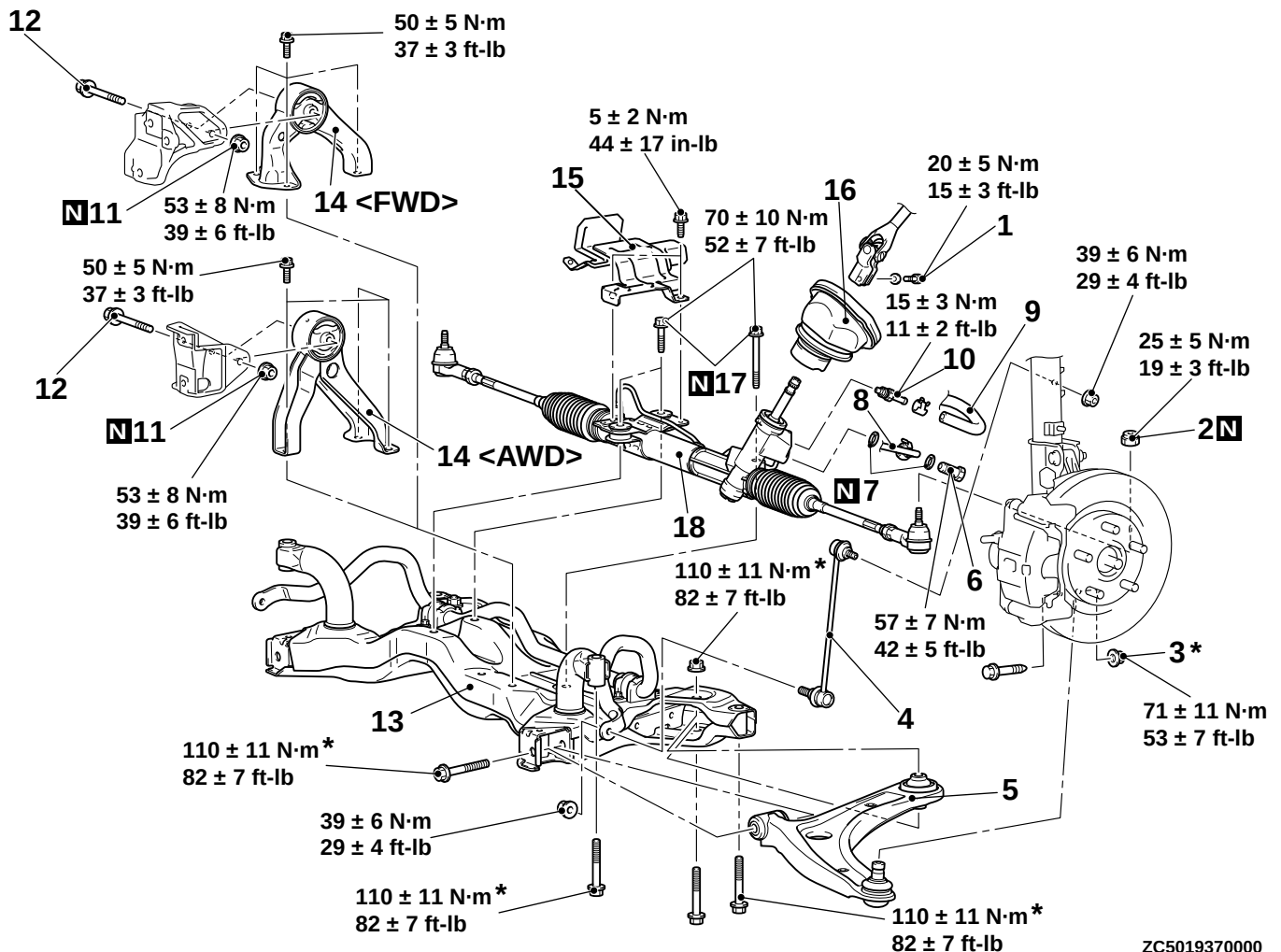
*The bolts and nuts marked with * are coated with the friction coefficient stabilizer. When removed these parts, make sure that they are free of damage, remove any dust and dirt on the bearing surfaces and the threads, and tighten to the specified torque.

Pre-removal operation

- Power Steering Fluid Draining (Refer to P.37-17.)
- Steering Wheel Assembly and Air Bag Module Removal (Refer to P.37-20.)
- Steering Shaft Cover Removal (Refer to P.37-23.)
- Engine room Under Cover Front, Engine room Side Cover, Engine room Under Cover Rear Removal (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)
- Front Height Sensor Removal (Refer to GROUP 54Ac - Chassis Electrical, Height Sensor Removal and Installation P. 54Ac-179.)
- Front Exhaust Pipe Removal (Refer to GROUP 15 - Exhaust Pipe And Main Muffler Removal and Installation P.15-16.)
- Front Roll Stopper And Centermember Assembly Removal (Refer to GROUP 32 - Engine Roll Stopper and Centremember P.32-6.)

Post-installation operation

- Front Roll Stopper And Centermember Assembly Installation (Refer to GROUP 32 - Engine Roll Stopper and Centremember P.32-6.)
- Front Exhaust Pipe Installation (Refer to GROUP 15 - Exhaust Pipe And Main Muffler Removal and Installation P.15-16.)
- Front Height Sensor Installation (Refer to GROUP 54Ac - Chassis Electrical, Height Sensor Removal and Installation P. 54Ac-179.)
- Engine room Under Cover Front, Engine room Side Cover, Engine room Under Cover Rear Installation (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)
- Using your fingers, press the dust cover of each joint to check for a crack or damage.
- Steering Shaft Cover Installation (Refer to P.37-23.)
- Steering Wheel Assembly and Air Bag Module Installation (Refer to P.37-20.)
- Power Steering Fluid Refilling and Bleeding (Refer to P. 37-17.)
- Steering wheel straight-ahead position check
- Wheel Alignment Check and Adjustment (Refer to GROUP 33, On-vehicle Service - Front Wheel Alignment Check and Adjustment P.33-7.)



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Removal steps

1. Steering gear and joint connecting bolt <<A>>

Removal steps

2. Self-lock nut (Tie-rod end and knuckle connection)

Removal steps

3. Self-lock nut (Lower arm and knuckle connection)
4. Stabilizer link <>
5. Lower arm assembly
6. Eye bolt
7. Gasket
8. Pressure hose connection >>A<<
9. Return hose connection
10. Return tube assembly
11. Flanged nut

Removal steps

12. Engine rear roll stopper bracket connecting bolt
13. Front axle No.1 crossmember assembly
14. Engine rear roll stopper
15. Heat protector
16. Joint cover grommet
17. Flanged bolt
18. Steering gear and linkage

REMOVAL SERVICE POINTS**<<A>> SELF-LOCK NUT (TIE-ROD END AND KNUCKLE CONNECTION) REMOVAL****⚠ CAUTION**

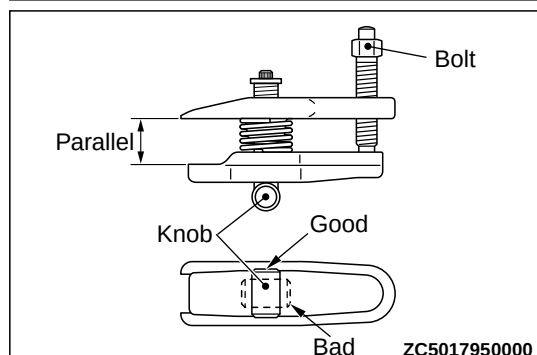
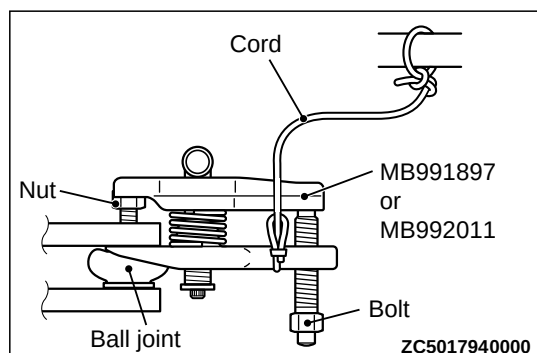
- Loosen the self-lock nut (tie-rod end and knuckle connection) from the ball joint (Do not remove). Use the special tool for the self-lock nut removal.
- To prevent the special tool from dropping off, suspend it with a rope.

1. Install the ball joint remover (Special tool MB991897 or MB992011) as shown in the figure.

2. Turn the bolt and knob to make the special tool jaws parallel, then hand-tighten the bolt. After tightening, check that the jaws are still parallel.

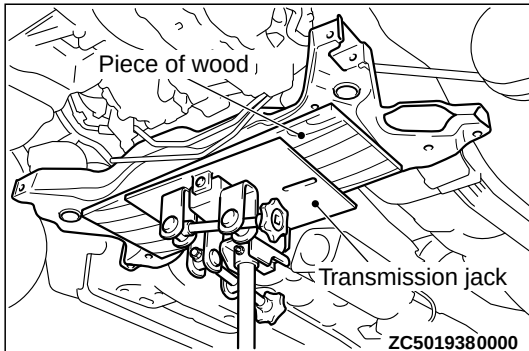
NOTE: To adjust the special tool jaws to be parallel, set the orientation of the knob as shown in the figure.

3. Unscrew the bolt to disconnect the ball joint.



<> FRONT AXLE NO.1 CROSSMEMBER ASSEMBLY REMOVAL

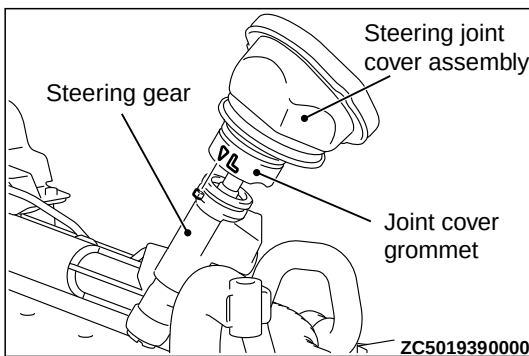
1. Jack up and support the crossmember, and remove it.
2. Check the hoses and harnesses for roughness, and then remove the front axle No.1 crossmember assembly with the rear roll stopper and the steering gear and linkage installed.



INSTALLATION SERVICE POINTS

>>A<< JOINT COVER GROMMET INSTALLATION

Install the joint cover grommet to the steering gear and linkage by aligning the mating marks as shown in the figure.



PINION TOTAL ROTATION TORQUE CHECK

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CAUTION

Secure the steering gear & linkage to the special mounting point. Fixing the steering gear & linkage to another point could deform or damage the gear housing.

1. Use the preload socket (Special tool: MB991006) to rotate the pinion at a rate of one turn per 4 to 6 seconds, and then measure the pinion total rotation torque.

Standard value:

Total rotation torque: 0.6 - 2.0 N·m (5.3 - 17.6 in-lb)

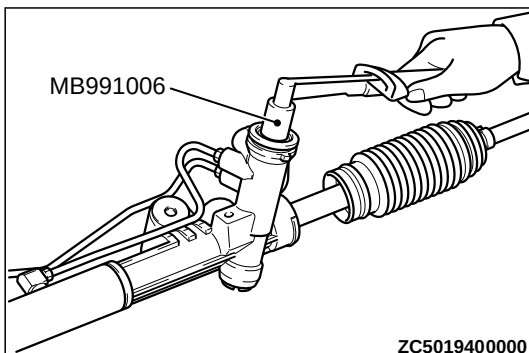
Torque fluctuation: 0.4 N·m (3.5 in-lb) or less

NOTE:

**During measurement, remove the bellows from the gear housing.*

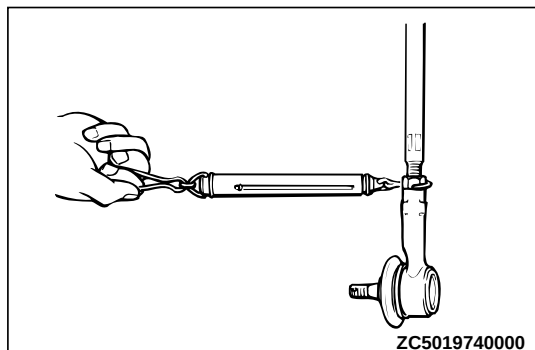
**Rotate the pinion by 180° in left and right directions from the neutral position, and measure the pinion total rotation torque.*

2. If the measurement value is outside the standard value, replace the gear housing.



TIE-ROD OSCILLATING TORQUE CHECK

M13702000902USA0000010000



1. Swing the tie-rod ten times strongly.
2. Measure the oscillating resistance (oscillating torque) using a spring scale as shown in the figure with the tie-rod end facing downward.
Standard value: 5 - 16.3 N (44 - 80 in-lb) [1.5 - 4.9 N·m (13.2 - 43.4 in-lb)]
3. If the measurement is greater than the standard value, replace the tie-rod.
4. If the measurement value is below the standard value, check the ball joint for looseness or scraping feeling. If the ball joint swings smoothly, it is judged to be usable.

TIE-ROD END BALL JOINT DUST COVER CHECK

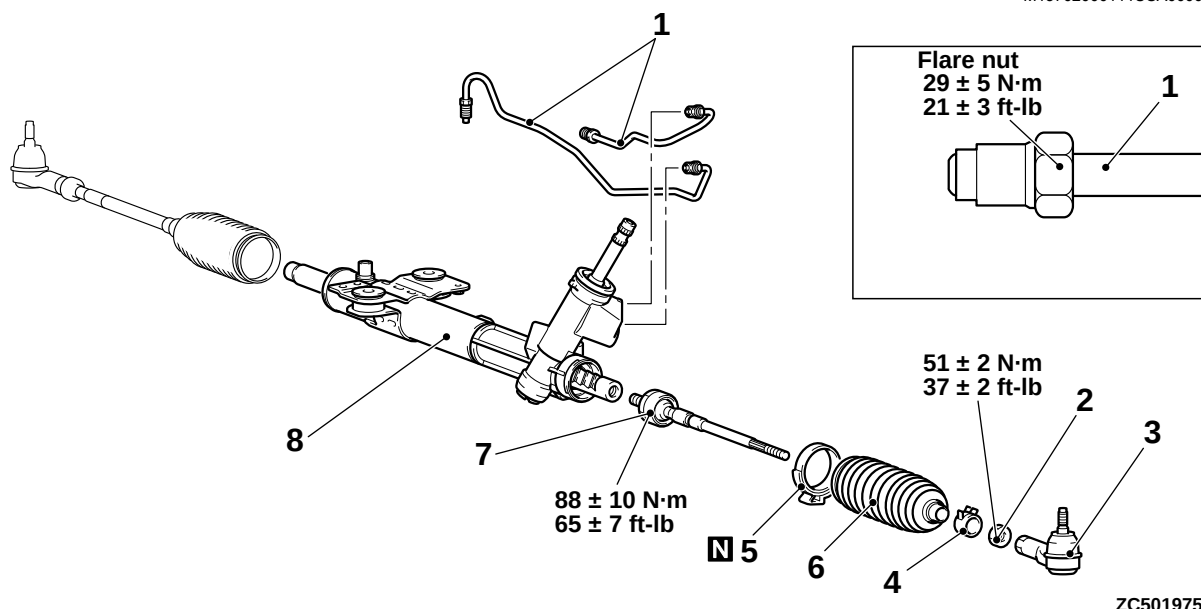
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1. Using your fingers, press the dust cover to check for a crack or damage.
2. If there are any cracks or damage in the dust cover, replace the tie-rod end. (Refer to P.37-32.)

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

DISASSEMBLY AND ASSEMBLY

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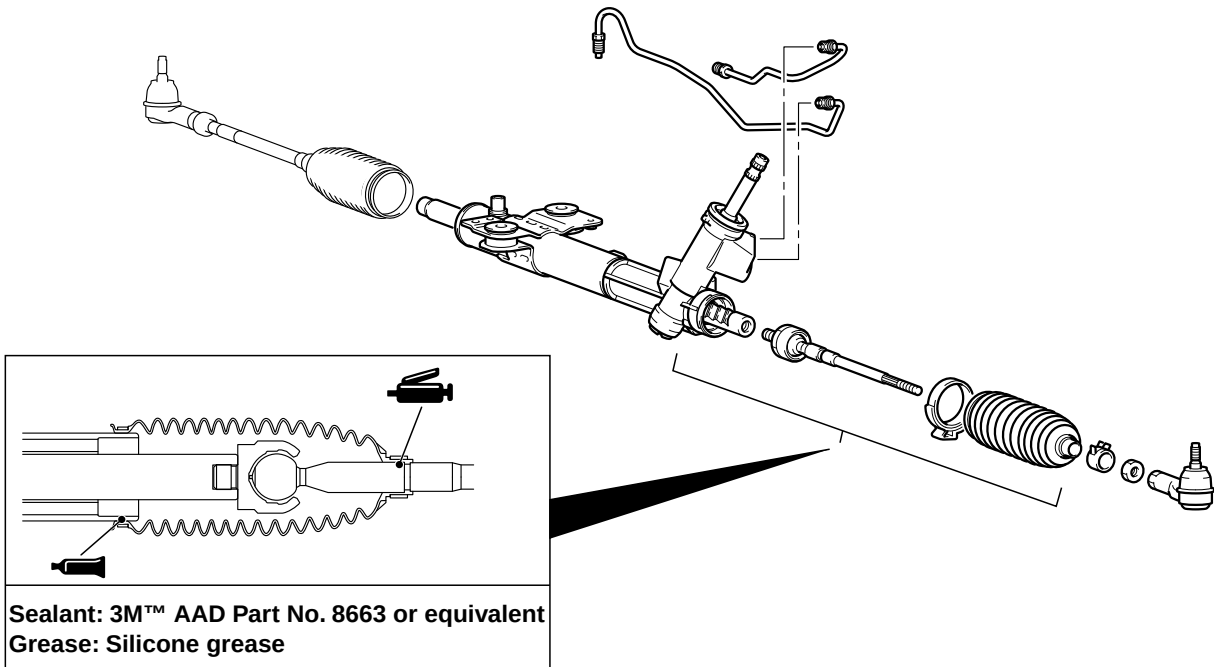
Disassembly steps

1. Feed pipe
- >>B<< 2. Locking nut
- >>B<< 3. Tie-rod end
4. Clip
- >>A<< 5. Band

Disassembly steps

6. Bellows
7. Tie-rod
8. Gear housing

GREASE/SEALANT APPLICATION POINTS



ZC5019760000

ASSEMBLY SERVICE POINT

>>A<< BAND INSTALLATION

1. Turn the adjusting bolt for the boot band clipping tool (Special tool: MB991561) to adjust the opening dimension (W) to the standard value.

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

When opening dimension is more than 2.9 mm (0.11 inch)

Tighten the adjusting bolt.

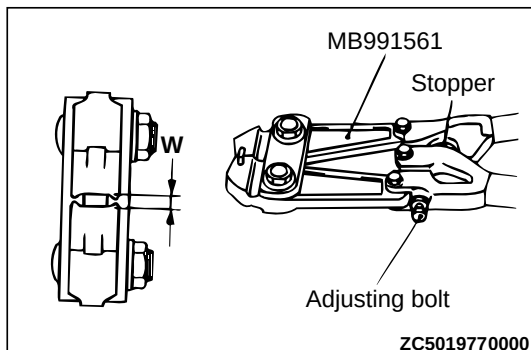
When opening dimension is less than 2.9 mm (0.11 inch)

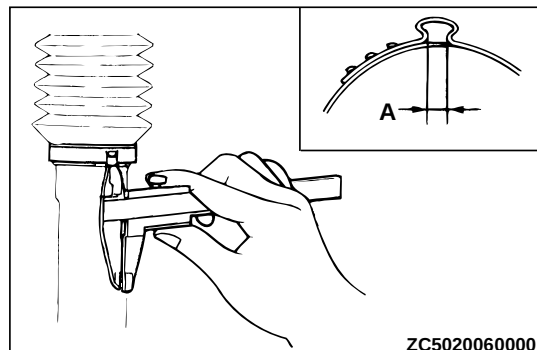
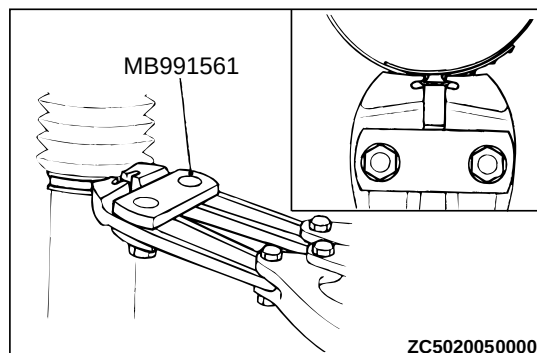
Loosen the adjusting bolt.

NOTE:

**The adjusting bolt changes W approximately 0.7 mm for each rotation.*

**Do not rotate the adjusting bolt more than one rotation.*



**CAUTION**

- Secure the gear housing, and crimp the crimping part of the band firmly with the tip of the special tool.
- Crimp the boot band securely until the special tool contacts the stopper.

2. Use the special tool to crimp the boot band.

3. Check that the crimping width of the boot band (A) is within the range of the standard value.

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

When the crimping width is greater than 2.8 mm (0.11 inch)

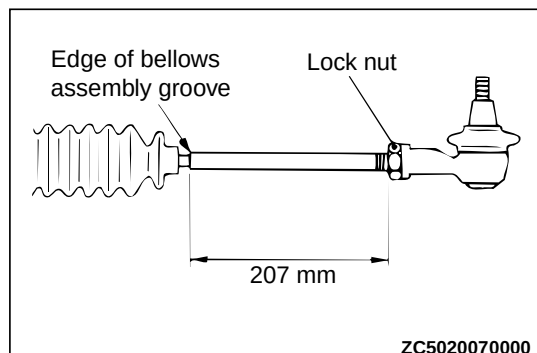
Readjust the value W described in Step 1 to the following formula, and perform the operation in Step 2 again.

W=5.5-A (Example: When A is 2.9, W is 2.6.)

When the crimping width is less than 2.4 mm (0.09 inch)

Remove the boot band, readjust the value W described in Step 1 to the following formula, and perform the Steps 2 and 3 using a new boot band.

W=5.5-A (Example: When A is 2.3, W is 3.2.)

**>>B<< TIE-ROD END/LOCKING NUT INSTALLATION**

Screw in the tie-rod to the length shown in the figure, and hand-tighten the locking nut.

NOTE: Install the steering gear & linkage to the body, adjust the toe-in, and then tighten the locking nut to the specified torque.

POWER STEERING OIL PUMP ASSEMBLY**REMOVAL AND INSTALLATION****Pre-removal operation**

- Power Steering Fluid Draining (Refer to P. 37-17.)

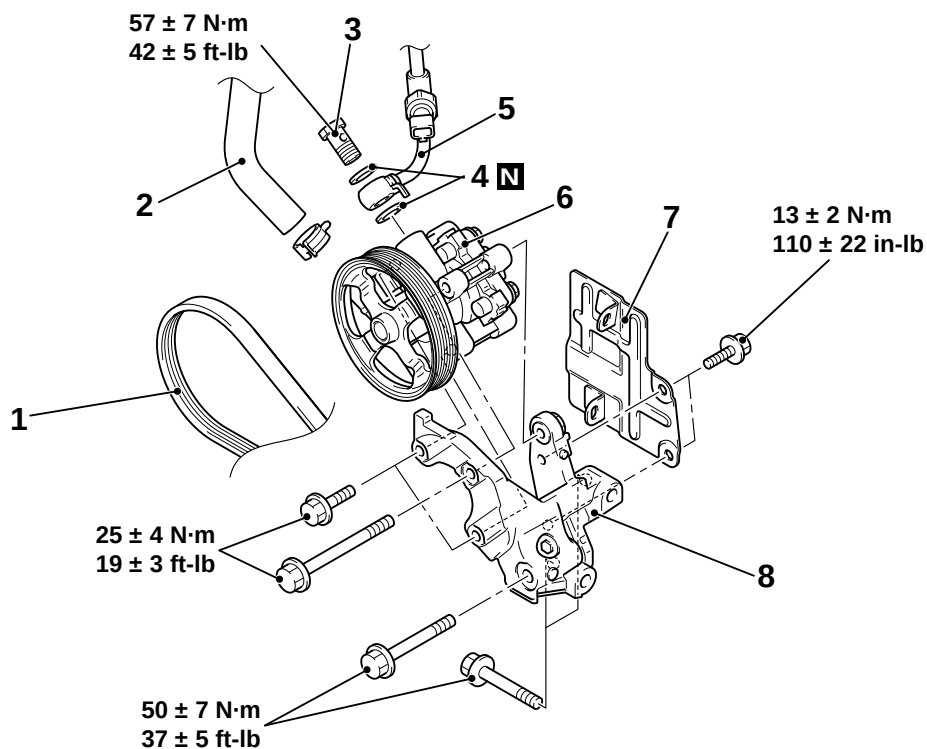
Post-installation operation

- Engine Room Side Cover (R) Installation (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)

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▪Engine Room Side Cover (R) Removal (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)

▪Power Steering Fluid Refilling and Bleeding (Refer to P.37-18.)
 ▪Drive Belt Tension Adjustment (Refer to GROUP 11A - Engine Adjustment P.11A-9.)



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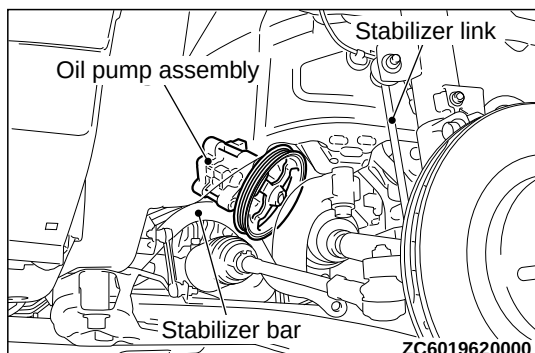
Removal steps

1. Generator and Others Belt (Refer to GROUP 11A - Crankshaft Pulley Removal and Installation P.11A-21.)
2. Suction hose connection
3. Eye bolt
4. Gasket
5. Pressure hose connection
6. Oil pump assembly
7. Heat protector
8. Power steering pump bracket

<<A>>

REMOVAL SERVICE POINTS**<<A>> OIL PUMP ASSEMBLY REMOVAL**

When removing the oil pump assembly, remove the stabilizer link and stabilizer bar bracket, shift the stabilizer bar to the left of the vehicle, and then remove the assembly from the front wheel house (right side). (Refer to GROUP 33 - Stabilizer Bar Removal And Installation P.33-16.)

**INSPECTION**

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

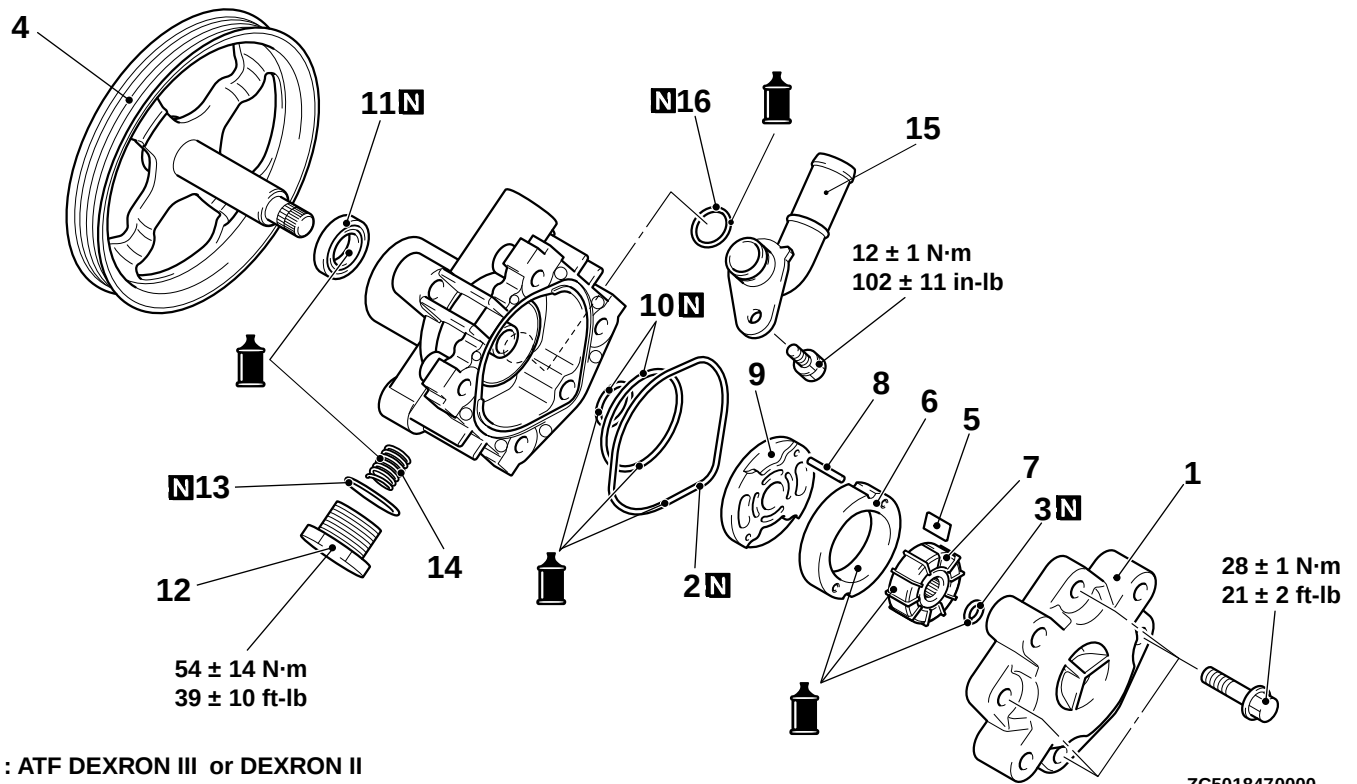
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DISASSEMBLY AND ASSEMBLY

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⚠ CAUTION

Do not use ATF-SP II M and ATF-SP III for the power steering fluid.



Oil pump seal kit	Oil pump cartridge kit	Oil pump pulley and shaft kit

DISASSEMBLY STEPS

1. Pump cover
2. O-ring
3. Snap ring
4. Pulley and shaft
5. Vanes
- >>C<< 6. Cam ring
7. Rotor
8. Pin
9. Side plate

DISASSEMBLY STEPS

- >>A<< 10. O-ring
- >>B<< 11. Oil seal
12. Plug assembly
- >>A<< 13. O-ring
14. Flow control spring
- >>A<< 15. Suction connector
- >>A<< 16. O-ring

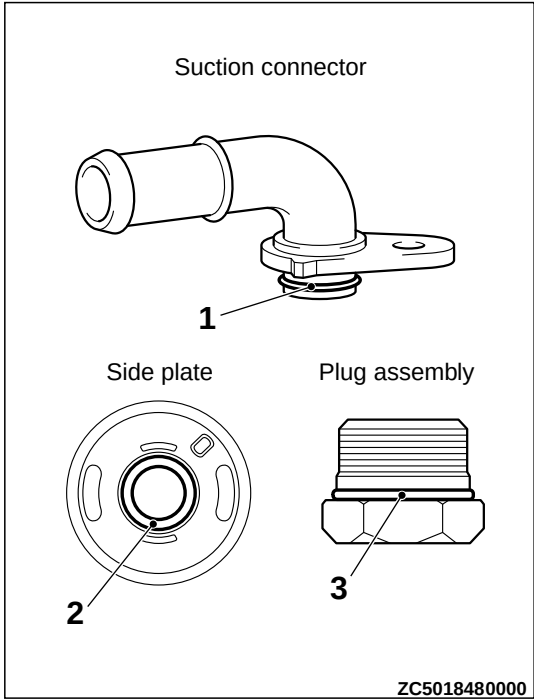
Required Special Tools:

*MB990938: Bar (Snap-in type)

*MB991203: Oil Seal and Bearing Installer

ASSEMBLY SERVICE POINTS

>>A<< O-RING INSTALLATION

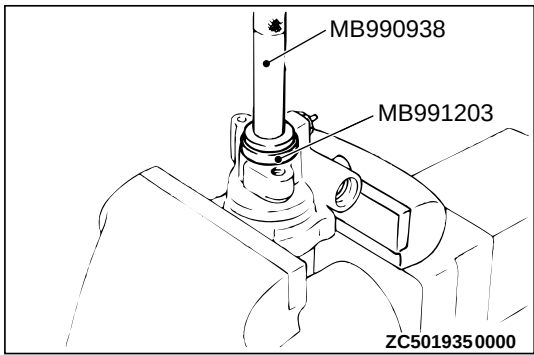


NO.	ID × WIDTH mm (in)
1	15.8 × 2.4 (0.62 × 0.09)
2	14.8 × 1.9 (0.58 × 0.07)
3	21.0 × 1.9 (0.83 × 0.07)

>>B<< OIL SEAL INSTALLATION

Use the following special tools to install the oil seal.

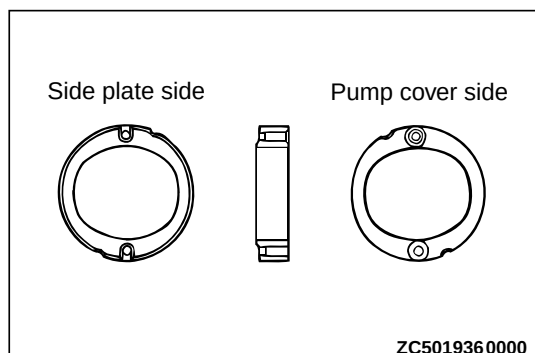
- Installer bar (MB990938) [Including in the bearing and oil seal installer set (MB990925)]
- Oil seal and bearing installer (MB991203)



>>C<< CAM RING INSTALLATION

⚠ CAUTION

Be sure to install the cam ring in the correct direction as shown.



Install the cam ring as shown in the illustration.

INSPECTION

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- Check the pulley and shaft for wear or damage.
- Check the rotor and vane groove for "stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.

POWER STEERING HOSES

REMOVAL AND INSTALLATION

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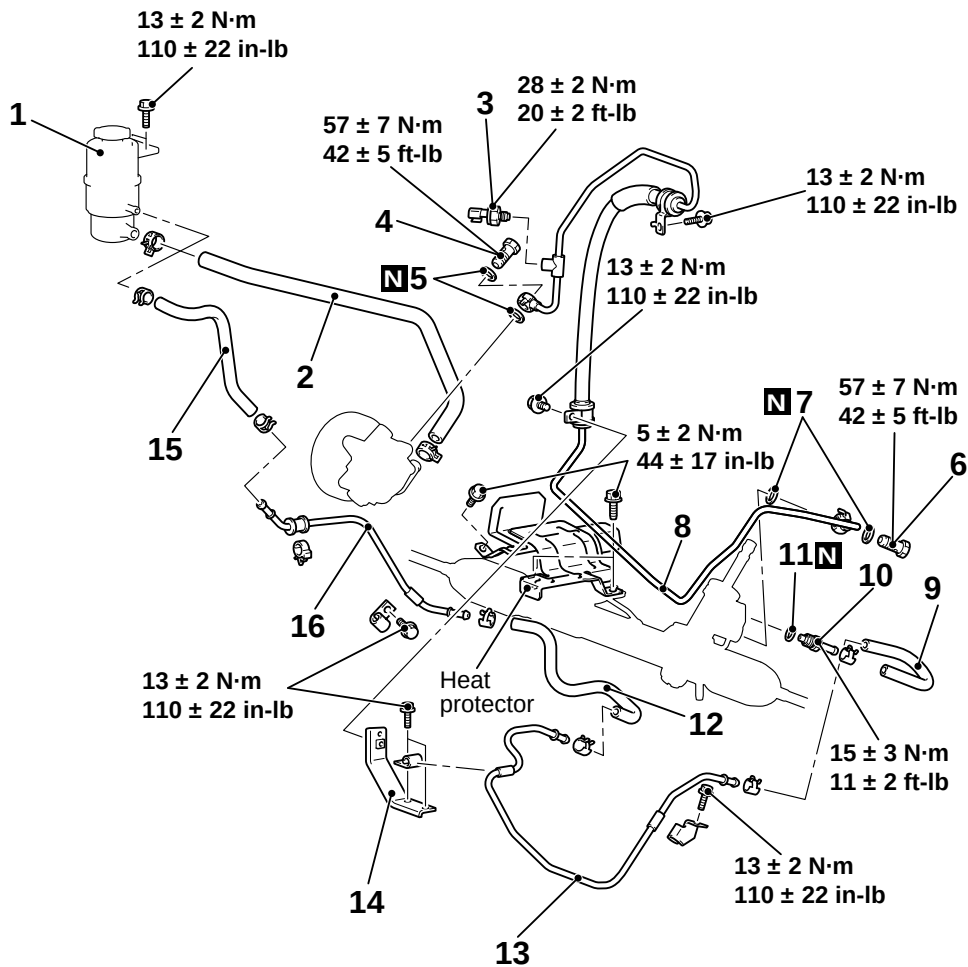
Pre-removal operation

- Power Steering Fluid Draining (Refer to P.37-17.)
- Engine room Under Cover Front, Engine room Side Cover, Engine room Under Cover Rear Removal (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)
- Propeller Shaft Assembly Removal (Refer to GROUP 25 - Propeller Shaft Removal and Installation P.25-5.) <AWD>
- Front Exhaust Pipe Removal (Refer to GROUP 15 - Exhaust Pipe And Main Muffler Removal and Installation P.15-16.)
- Front Roll Stopper And Centermember Assembly Removal (Refer to GROUP 32 - Engine Roll Stopper and Centremember Removal and Installation P.32-6.)

Post-installation operation

- Front Roll Stopper And Centermember Assembly Installation (Refer to GROUP 32 - Engine Roll Stopper and Centremember Removal and Installation P.32-6.)
- Front Exhaust Pipe Installation (Refer to GROUP 15 - Exhaust Pipe And Main Muffler Removal and Installation P.15-16.)
- Propeller Shaft Assembly Installation (Refer to GROUP 25 - Propeller Shaft Removal and Installation P.25-5.) <AWD>
- Engine room Under Cover Front, Engine room Side Cover, Engine room Under Cover Rear Installation (Refer to GROUP 51A - Under Cover Removal and Installation P.51A-18.)
- Power Steering Fluid Refilling and Bleeding (Refer to P. 37-17.)

POWER STEERING
POWER STEERING HOSES



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Removal steps

- 1. Oil reservoir
- 2. Suction hose
- 3. Power steering oil pressure sensor
- 4. Eye bolt A
- 5. Gasket A
- 6. Eye bolt B
- 7. Gasket B
- 8. Pressure hose assembly

Removal steps

- 9. Return hose C
- 10. Return tube assembly G
- 11. Gasket C
- 12. Return hose G1
- 13. Return tube C
- 14. Hose bracket
- 15. Return hose G2
- 16. Return tube G

REMOVAL SERVICE POINTS

**<<A>> PRESSURE HOSE ASSEMBLY, RETURN TUBE B
REMOVAL**

Remove the heat protector, and push the engine assembly and transaxle assembly toward the front of the vehicle to widen the clearance. Then, remove the pressure hose assembly and the return tube B.

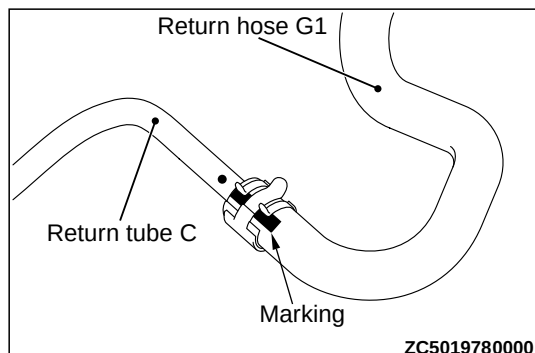
NOTE:

**When pushing the engine assembly and transaxle assembly, check that the propeller shaft assembly, front exhaust pipe, front roll stopper, and center member assembly are already removed.*

INSTALLATION SERVICE POINTS

>>A<< RETURN TUBE B/RETURN HOSE C INSTALLATION

1. Align the marking as shown in the figure and connect the return hose G1.



INSPECTION

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POWER STEERING OIL PRESSURE SENSOR CHECK

Refer to GROUP 13Ab - Diagnostic trouble code chart P. 13Ab-44.

NOTE: The engine ECU diagnoses the power steering oil pressure sensor and sets the diagnostic trouble code if any malfunction occurs.

