

This file is available for free download at <http://www.iluvmyrx7.com>

This file was not scanned to deprive Mazda of any money – it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda's dealerships could support the Rotary Engine it wouldn't be so necessary for the owners to do so.



Many thanks to Anh Diep for scanning this file.

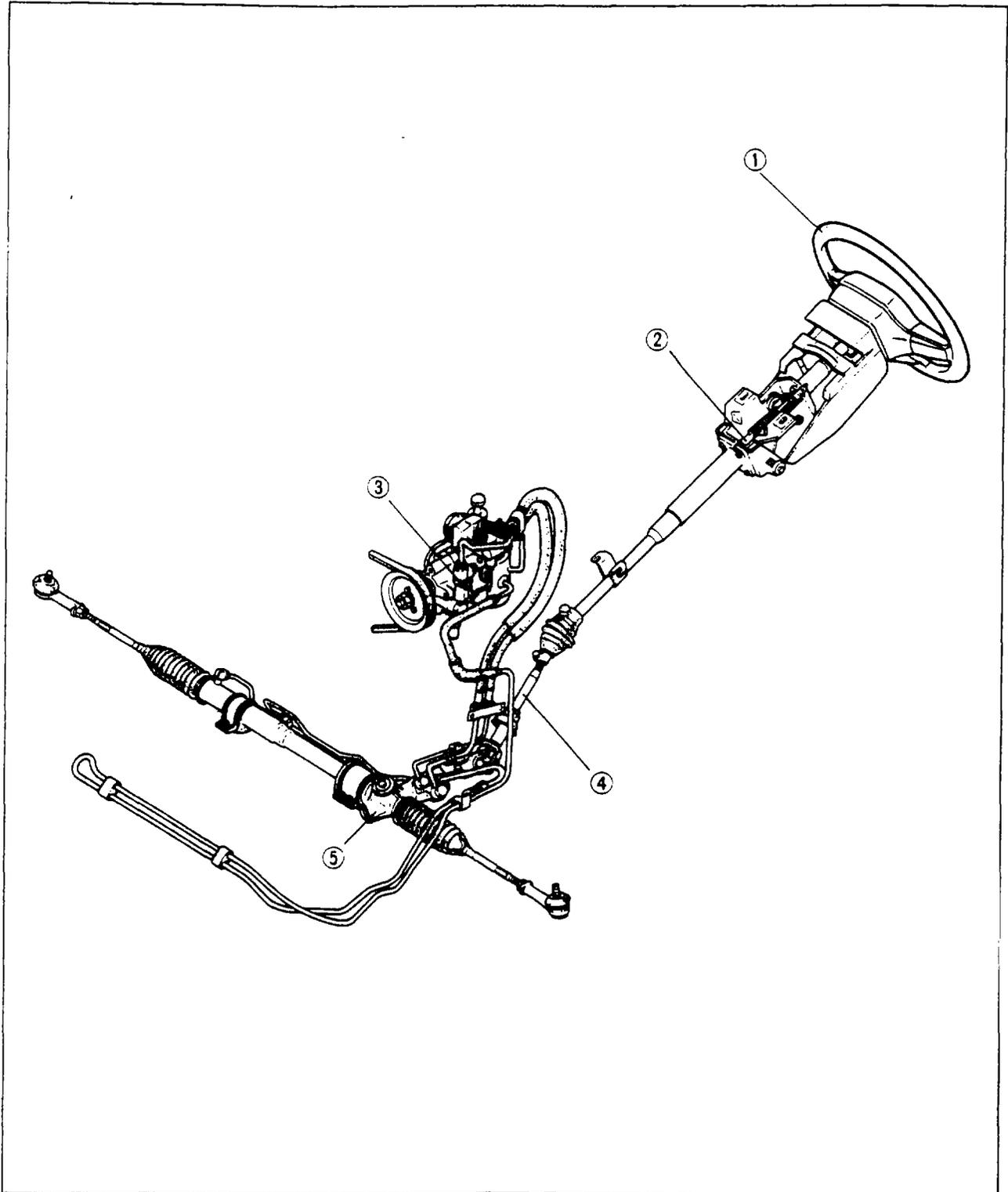
POWER STEERING SYSTEM

OUTLINE	10B— 2
STRUCTURAL VIEW	10B— 2
SPECIFICATIONS	10B— 3
TROUBLESHOOTING GUIDE	10B— 4
ON-VEHICLE MAINTENANCE	10B— 5
INSPECTION	10B— 5
POWER STEERING FLUID LEVEL	10B— 5
LEAKAGE OF POWER STEERING FLUID	10B— 6
INSPECTION AND ADJUSTMENT	10B— 7
FLUID REPLACEMENT	10B— 7
BLEEDING OF POWER STEERING SYSTEM	10B— 8
POWER STEERING PRESSURE	10B— 9
STEERING GEAR AND LINKAGE	10B—10
REMOVAL AND INSTALLATION	10B—10
DISASSEMBLY	10B—11
INSPECTION	10B—16
ASSEMBLY	10B—17
OIL PUMP	10B—23
REMOVAL AND INSTALLATION	10B—23

10B OUTLINE

OUTLINE

STRUCTURAL VIEW



67U10B-002

- 1. Steering wheel
- 2. Steering shaft
- 3. Oil pump

- 4. Intermediate shaft
- 5. Steering gear housing and tie-rod

SPECIFICATIONS

Item	Specification	Power steering
Steering wheel	Outer diameter mm (in)	380 (14.96)
Steering shaft and joints	Type	Collapsible
	Joint type	Cross joints (2)
	Tilt stroke mm (in)	35 (1.38)
Steering and linkage	Type	Rack and pinion
	Gear ratio	∞ (infinite)
	Power-assist type	RPM responsive, integral type
	Rack stroke mm (in)	144 (5.67)
	Oil	ATF type F (M2C33-F) or Dexron II
Maximum steering	Inner ($^{\circ}$)	37
	Outer ($^{\circ}$)	33
Wheel alignment	Toe-in mm (in)	3 ± 3 (0.12 ± 0.12)
	Camber angle	$0^{\circ}20' \pm 30'$
	Caster angle	$4^{\circ}40' \pm 45'$
	King-pin angle	$13^{\circ}45'$
	Trail mm (in)	14.3 (0.52)

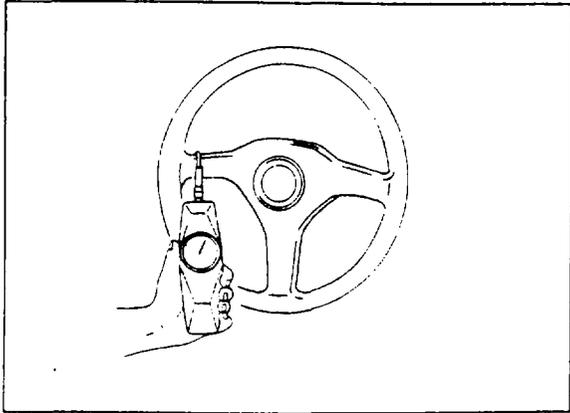
87U10B-001

10B TROUBLESHOOTING GUIDE

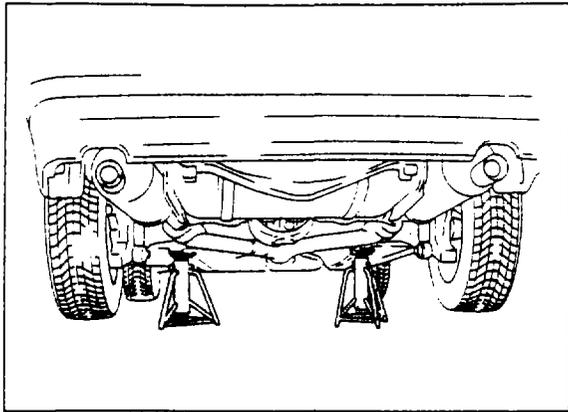
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Steering wheel movement is "heavy"	Loose or damaged belt	Adjust or replace	—
	Low fluid level, or air in fluid	Add fluid, or bleed air	—
Incorrect oil pump hydraulic pressure (requires inspection)	Crimped or twisted hose	Replace	—
	Crimped pipe	Repair or replace	—
	Leakage of fluid	Repair or replace oil pump or gear box	10B-9
	Insufficient oil pump pressure	Adjust	—
	Insufficient tire pressure	Adjust	—
	Improperly adjusted wheel alignment	Adjust	—
	Linkage ball-joint sticking	Repair	10B-12
	Steering shaft contacting something	Repair or replace	—
Poor steering wheel return	Incorrect tire pressure	Adjust	—
	Improperly adjusted wheel alignment	Adjust	—
	Linkage ball-joint sticking	Repair or replace	10B-12
	Steering shaft contacting something	Replace	—
Required steering effort is uneven	Loose belt	Adjust	10B-5
	Steering shaft contacting something; loose installation bolt (s)	Repair or tighten	—
	Steering linkage sticking	Repair or replace	10B-12
	Malfunction of steering gear	Replace	—
Steering wheel pulls to one side	Incorrect tire pressure	Adjust	—
	Improper preload adjustment, or wear of wheel bearing	Adjust or replace	—
	Improperly adjusted wheel alignment	Adjust	—
	Malfunction of steering gear	Replace	—
Fluid leakage	Problem at hose coupling	Repair or replace	10B-6
	Damaged or clogged hose	Replace	10B-6
	Damaged tank reserver	Replace	—
	Overflow	Bleed air, or adjust fluid level	10B-8
	Malfunction of oil pump	Replace or repair	10B-23
	Malfunction of gear box	Replace	—
Abnormal noise	Loose oil pump	Tighten	10B-23
	Loose steering gear	Tighten	—
	Loose oil pump bracket	Tighten	10B-23
	Loose oil pump pulley nut	Tighten	—
	Belt either loose or too tight	Adjust	10B-5
	Air in system	Bleed air	10B-8
	Malfunction inside steering gear	Replace	—
	Malfunction of oil pump	Replace or repair	10B-23
	Obstruction near steering column or pressure hose	Repair or replace	—
	Play or looseness of steering linkage	Tighten, adjust, or replace	10B-10

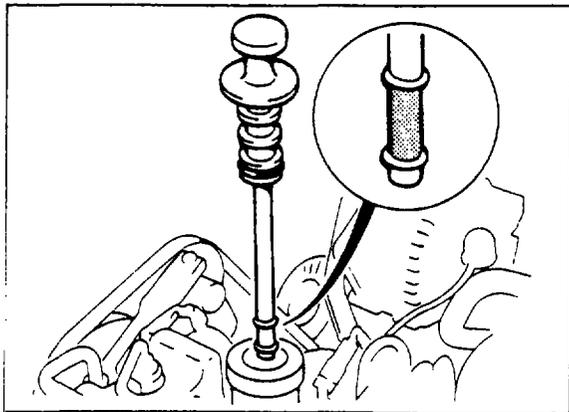
67U10B-004



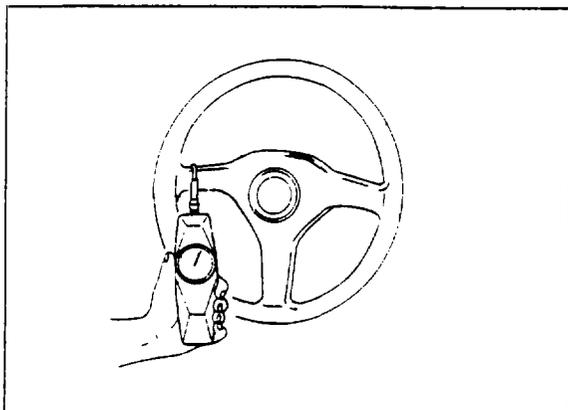
67U10B-005



67U10B-006



48G10X-610



67U10B-007

ON-VEHICLE MAINTENANCE

Inspection

1. With the vehicle on a hard level surface, move the steering wheel to put the wheels in the straight-ahead position.
2. Start the engine and warm the power steering fluid to **50—60°C (122—140°F)**.
3. Attach a spring gauge to the outer circumference of the steering wheel, and then, starting with the wheels in the straight-ahead position, check the steering effort required to turn the steering wheel to the left and to the right.

Steering wheel effort:

13.7—20.6 N (1.4—2.1 kg, 3.1—4.6 lb)
[during one turn of the steering wheel]

4. Jack up the rear of the vehicle and support it with stands.
5. Set the vehicle speed to 45 km/h (30 mph).
6. Measure the steering wheel effort.

Steering wheel effort:

22 N (2.2 kg, 4.8 lb) min.
[during one turn of the steering wheel]

4. If the measured value exceeds the standard value range, check the following points; fluid level, air in system, fluid leakage at hose or connections, function of oil pump and gear box, power steering pressure and tire pressure.

POWER STEERING FLUID LEVEL

Check the power steering fluid level.

LOOSE OR DAMAGED OIL PUMP BELT

Check the oil pump belt for looseness or damage. Adjust or replace, if necessary.

Deflection: New and used belt

11—13 mm (0.43—0.51 in)

10B ON-VEHICLE MAINTENANCE

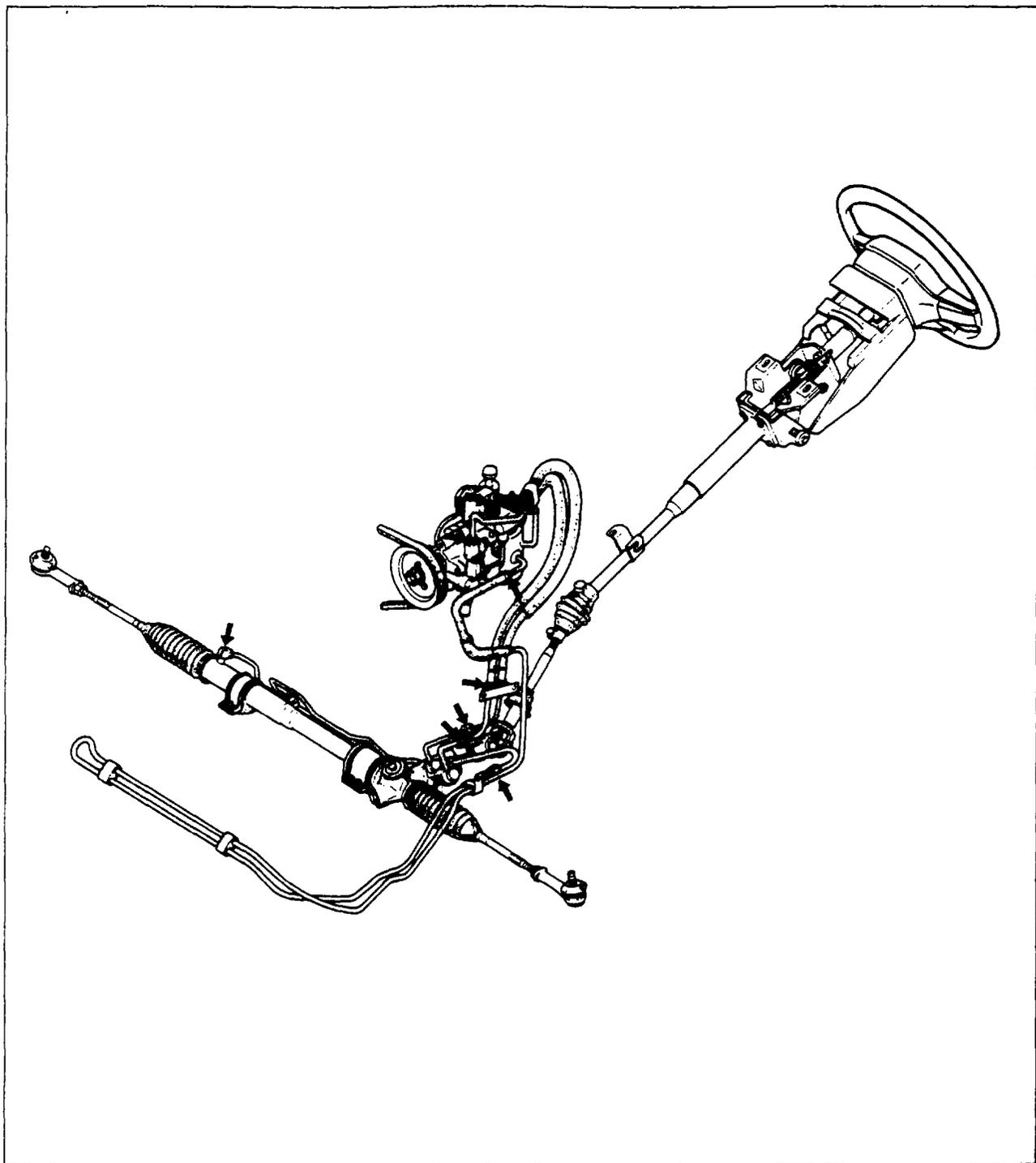
LEAKAGE OF POWER STEERING FLUID

Check the following places for fluid leakage:

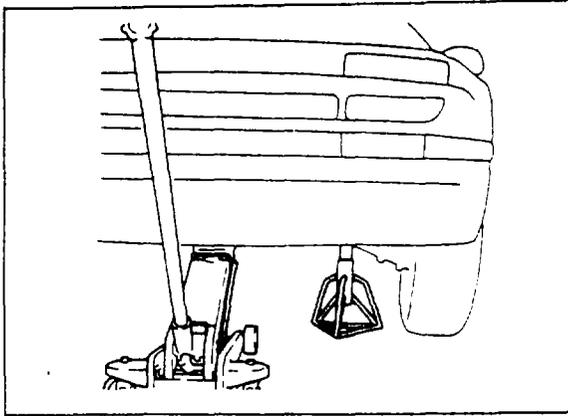
- a) Gear box
- b) Oil pump
- c) All fluid pipes, hoses, and connections

Note

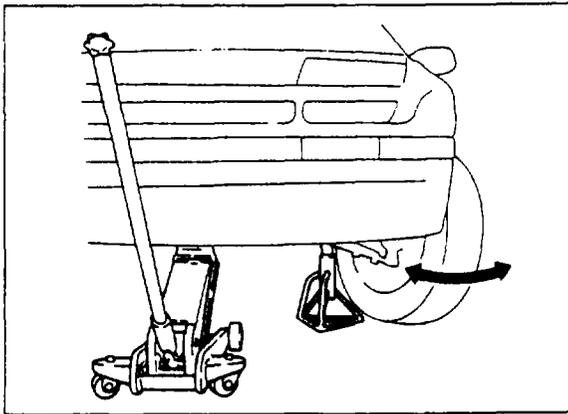
- a) Start the engine, and check for fluid leakage after turning the steering wheel fully to the left and right in order to apply fluid pressure. Do not, however, keep the steering wheel in the fully turned position for more than 15 seconds.
- b) The places where fluid leakage may occur are shown by the arrows in the figure.



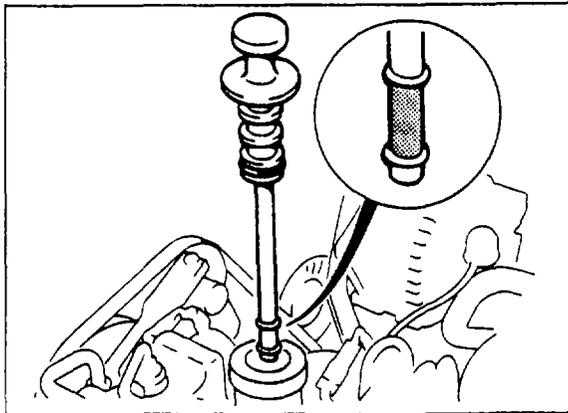
67U10B-008



48G10X-615



67U10B-009



87U10B-002

INSPECTION AND ADJUSTMENT

FLUID REPLACEMENT

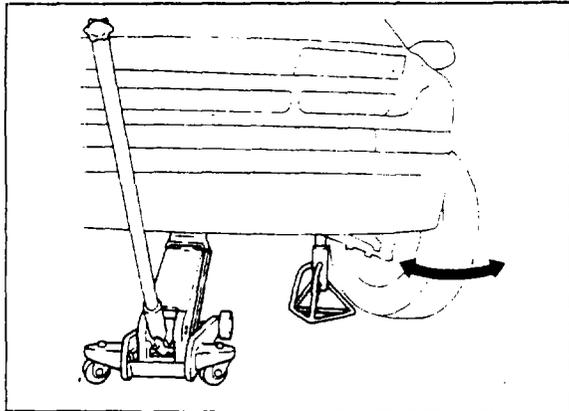
1. Jack up the front of the vehicle.

2. Remove the pressure hose from the power steering oil pump and drain the fluid into a receptacle.
3. Remove the fluid from the pump by turning the engine several times using the starter. Then, turn the steering wheel fully to the right and left to draw off the fluid until no more fluid comes out of the hose.

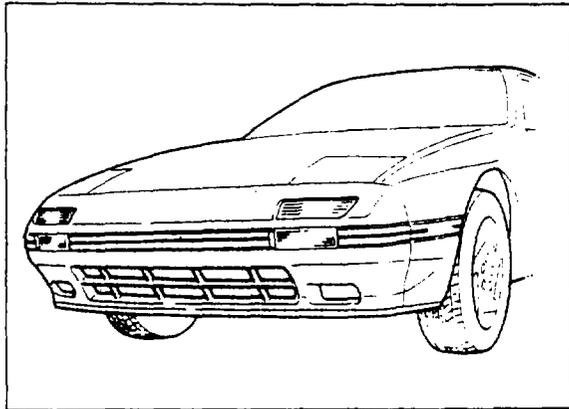
Caution

Do not start the engine. Do not run the starter for a long time.

4. Reinstall the hose onto the pump, fill with ATF type F(M2C33-F) or Dexron II and air bleed the steering gear.
5. Follow steps 2—6 "BLEEDING OF POWER STEERING SYSTEM" below.



87U10B-012



86U10X-022

BLEEDING OF POWER STEERING SYSTEM

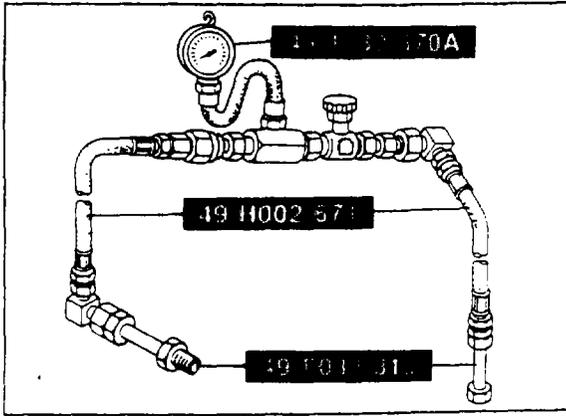
1. Check the fluid level, and add fluid if necessary.
2. Turn the steering wheel fully in both directions 5 times (engine not running).
3. Recheck the fluid level. If the level has lowered, add fluid, and repeat from step 1.

4. Start the engine, and run it at idle.
5. Turn the steering wheel fully in both directions 5 times to bleed air from the system.
6. Check that the fluid is not foamy and the fluid level has not lowered.
If a problem is found, add fluid as necessary and repeat from step 5.

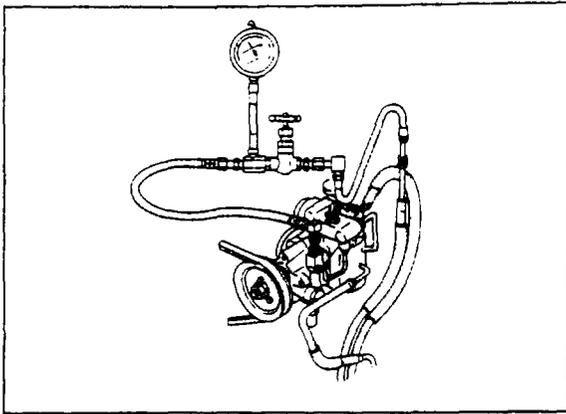
Note

If bleeding is not done completely, the following problems may appear:

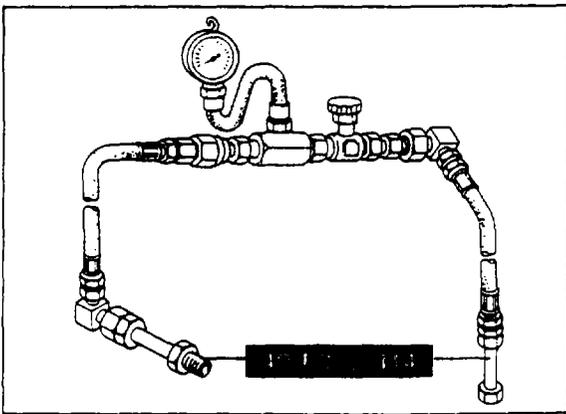
- Foamy fluid on level gauge.
- Noise from power steering oil pump.



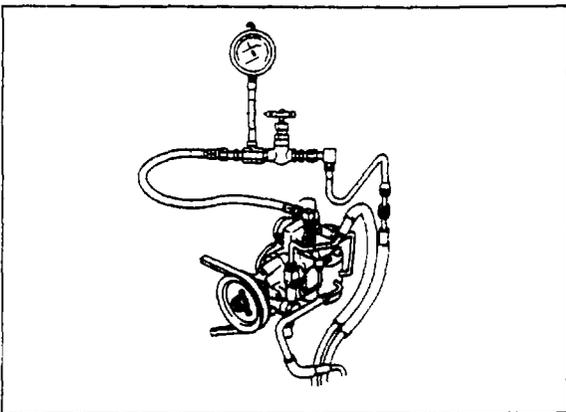
87U10B-003



67U10B-001



87U10B-004



67U10B-013

POWER STEERING PRESSURE

Main fluid pressure

1. Disconnect the high-pressure hose from the main pump, and attach **power-steering gauge set** (49 1232 670A) and adapters (49 H002 671 and 49 F032 315).

Tightening torque:

39—49 N·m (4.0—5.1 m·kg, 29—36 ft·lb)

2. Bleed the air from the system.
3. Fully open the gauge valve, and start the engine and turn the steering wheel left and right to raise the fluid temperature to **50—60°C (122—140°F)**.
4. To measure the fluid pressure generated by the oil pump, close the gauge valve completely.

Standard fluid-pressure

7,848 kPa (80 kg/cm², 1,138 psi)

At idle rpm (725—775)

Warning

If the valve is left closed for more than 15 seconds, the fluid temperature will increase excessively and adversely affect the oil pump.

If the fluid pressure is low, replace or repair the oil pump.

Sub fluid pressure

1. Jack up the rear of the vehicle and support it with stands.
2. Disconnect the high-pressure hose from the sub pump and attach **power steering gauge set** (49 1232 670A) and **adapters** (49 H002 671 and 49 F032 314).

Tightening torque:

39—49 N·m (4.0—5.1 m·kg, 29—36 ft·lb)

3. Bleed the air from the system.
4. Fully open the gauge valve, and start the engine and turn the steering wheel left and right to raise the fluid temperature to **50—60°C (122—140°F)**.
5. Set the vehicle speed to **65 km/h (40.3 mph)**.
6. Measure the fluid pressure.

Standard fluid-pressure:

294 kPa (3 kg/cm², 43 psi) min.

If the fluid pressure is low, replace or repair the oil pump assembly.

10B STEERING GEAR AND LINKAGE

STEERING GEAR AND LINKAGE

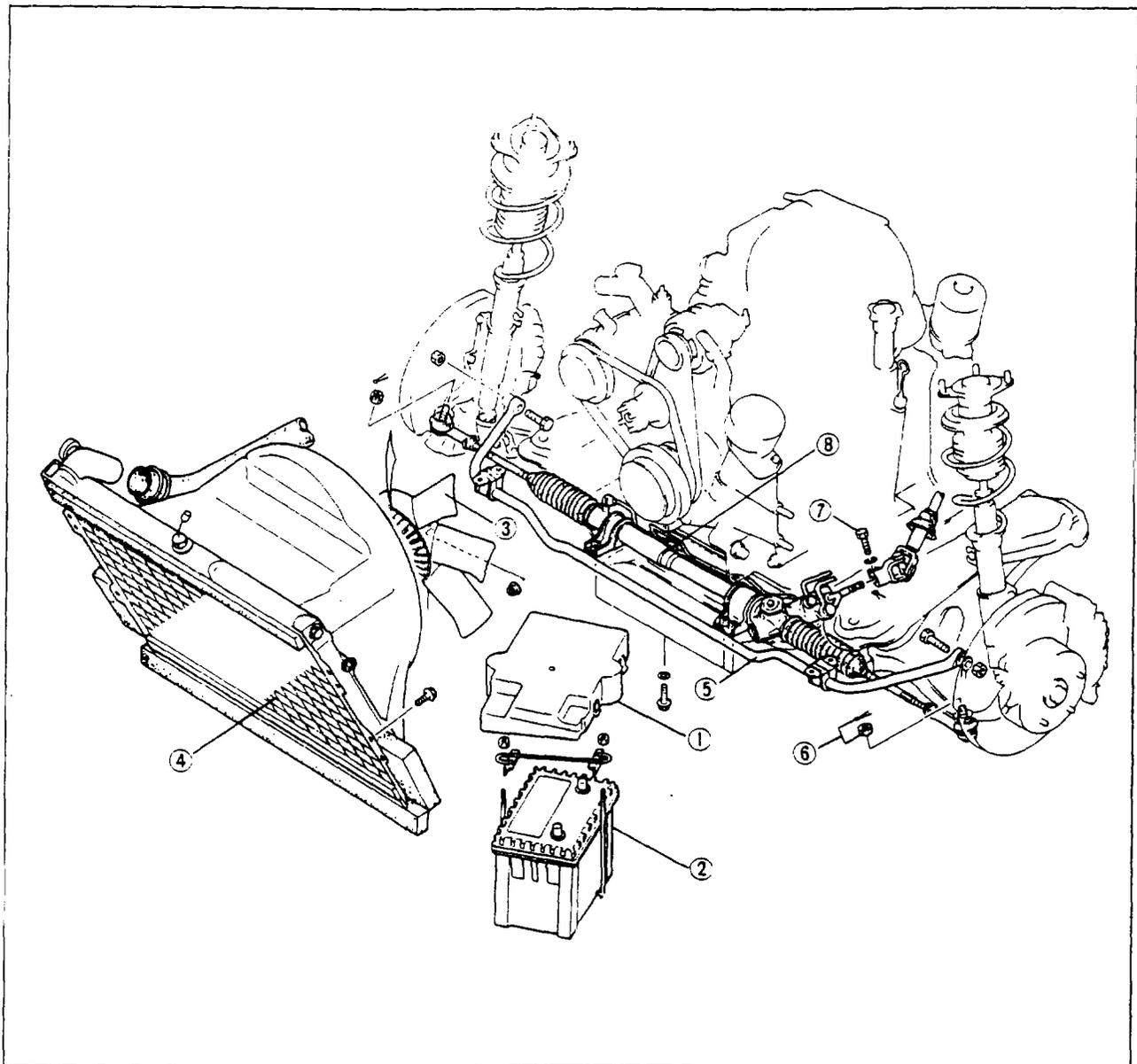
REMOVAL AND INSTALLATION

1. Jack up the vehicle and support it with safety stands.
2. Disconnect the negative battery cable.
3. Remove in the sequence shown in the figure
4. Install in the reverse order of removal.

Note

The power steering fluid will leak out when the return hose and/or the pressure hose is disconnected, prepare a suitable container for it to drain into.

67U10B-014



67U10B-015

- | | |
|-----------------------|------------------------------|
| 1. Battery cover | 5. Stabilizer |
| 2. Battery | 6. Cotter pin and nut |
| 3. Fan drive | 7. Bolt |
| 4. Radiator and cover | 8. Steering gear and linkage |

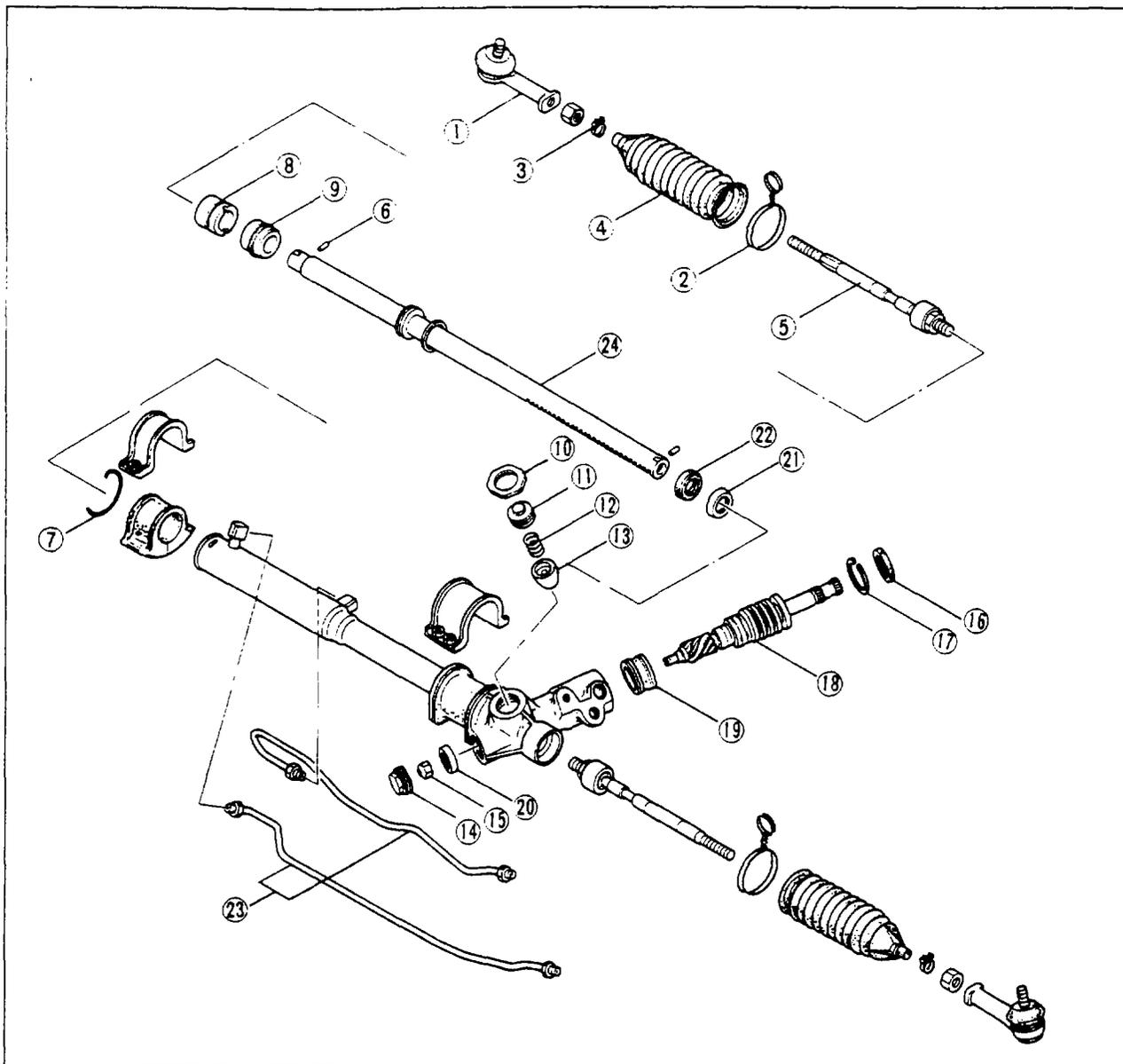
DISASSEMBLY

Disassemble in the sequence shown in the figure.

Caution

- a) In order to prevent the entrance of dirt, all disassembly and assembly should be done in a clean area.
- b) Before disassembly, plug the openings of all pipe installation fittings, and then remove all external grease and dirt from the gear and linkage.

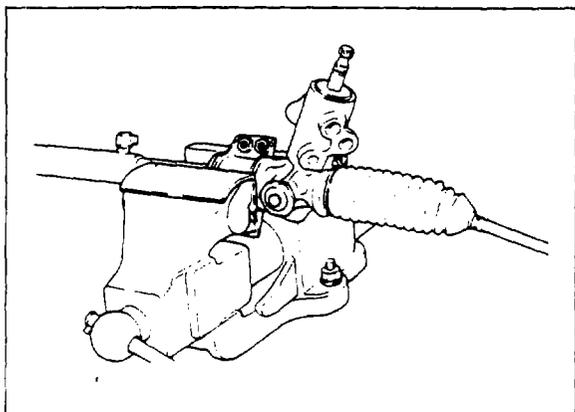
67U10B-016



67U10B-017

- | | | |
|-----------------|-----------------------------|----------------------------|
| 1. Tie-rod end | 9. Rack bushing | 17. Snap ring |
| 2. Boot wire | 10. Lock nut | 18. Control valve assembly |
| 3. Boot band | 11. Yoke plug | 19. Plunger |
| 4. Boot | 12. Spring | 20. Bearing |
| 5. Tie-rod | 13. Rack support | 21. Washer |
| 6. Spring pin | 14. Pinion plug | 22. Oil seal |
| 7. Clip | 15. Lock nut | 23. Oil pipe |
| 8. Rack stopper | 16. Dust cover and oil seal | |

10B STEERING GEAR AND LINKAGE



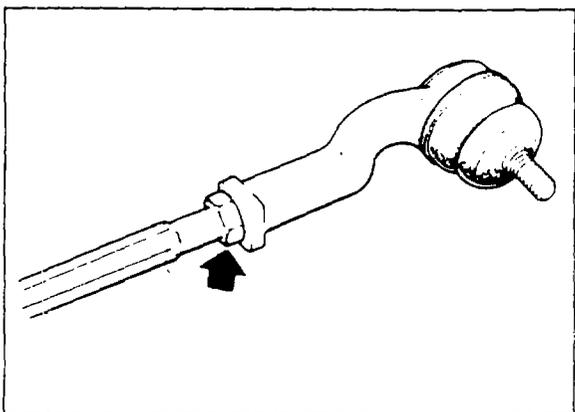
67U10B-018

Steering Gear and Linkage

Secure the gear and linkage in a vise.

Caution

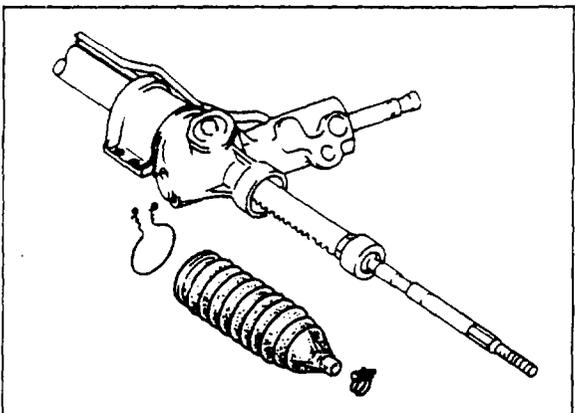
Be sure to insert protective material (such as copper plates) between the part and the jaws of the vise.



67U10B-019

Tie-rod Ends

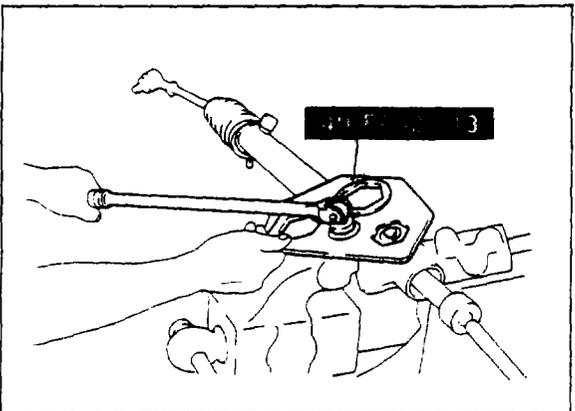
Before removing the tie-rod ends, make a mark on the threaded portion as a guide for installation.



67U10B-020

Boots

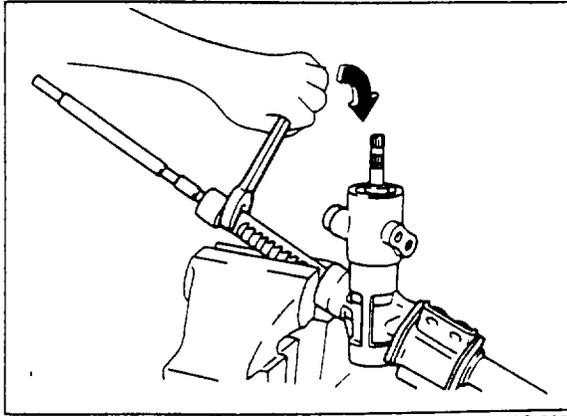
Cut the boot wire.
Remove the clip and the boot.



67U10B-021

Yoke Plug

Remove the lock nut and the yoke plug using wrench (49 F032 313).

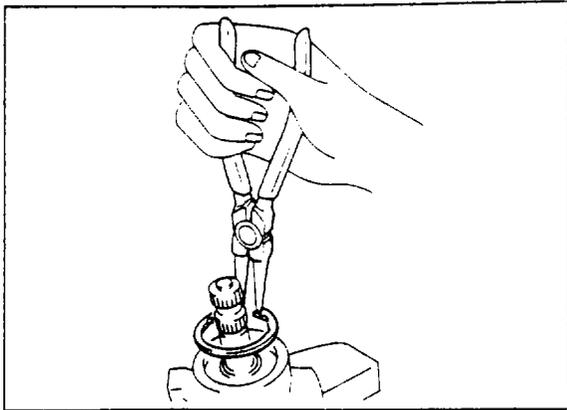


67U10B-022

Tie-rods

Remove the tie-rods after securing the rack gear in a vise.

At this time, the spring pins will be pushed up by the rack. Remove the pins.



67U10B-023

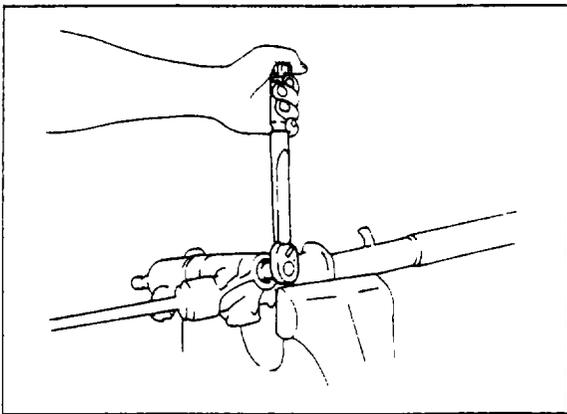
Dust Cover and Snap Ring

Remove the dust cover using a flat-tipped screwdriver.

Remove the snap ring using snap ring pliers

Note

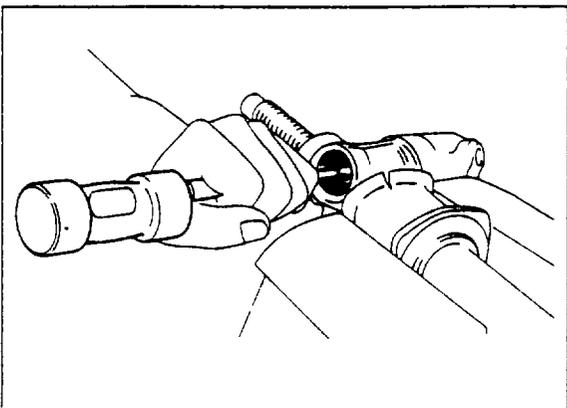
If the dust cover is damaged, replace with a new one.



67U10B-024

Pinion Plug

Remove the pinion plug and the lock nut.



67U10B-025

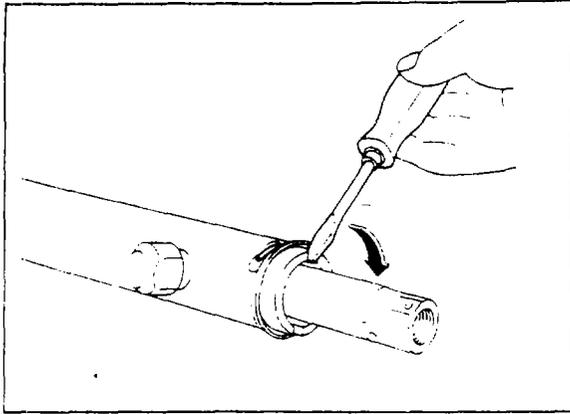
Control Valve Assembly

Place a punch on the control valve, and tap lightly with a hammer to remove it.

Note

Support the control valve assembly to prevent it from falling.

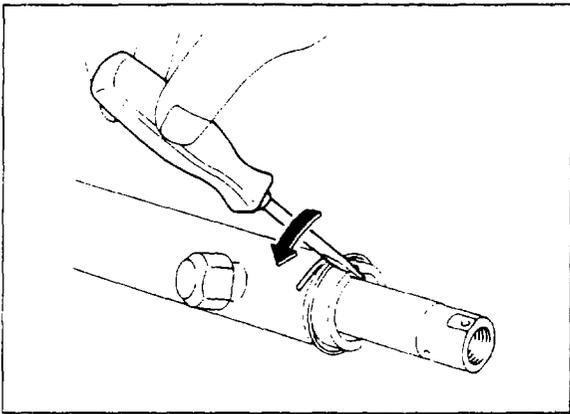
10B STEERING GEAR AND LINKAGE



67U10B-026

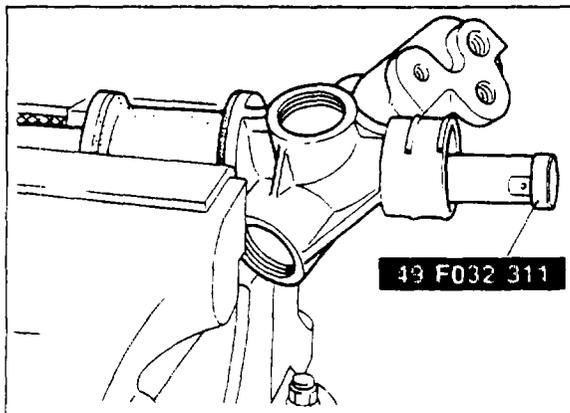
Rack Stopper

Turn the rack stopper clockwise until the end of the clip projects out.



67U10B-027

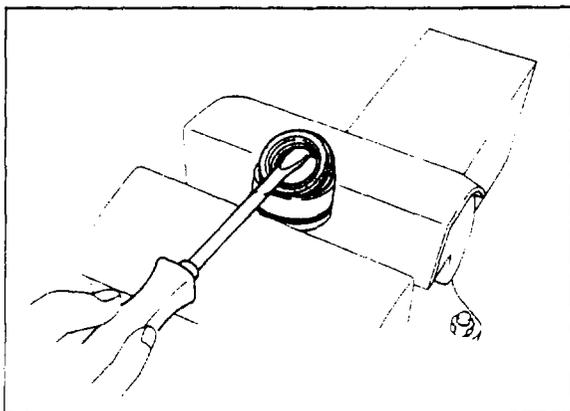
Then turn the rack stopper counterclockwise. Remove the clip and rack stopper.



67U10B-028

Rack

Set the **oil seal remover** (49 F032 311) to the end of the rack. Remove the rack assembly, (oil seal, washer and rack bushing).



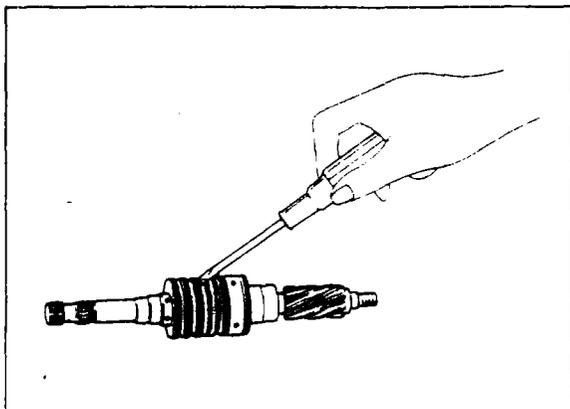
67U10B-029

Oil Seal of Rack Bushing

Remove the oil seal using a flat-tipped screwdriver.

Note

Use care when removing the oil seal, do not damage the rack bushing.



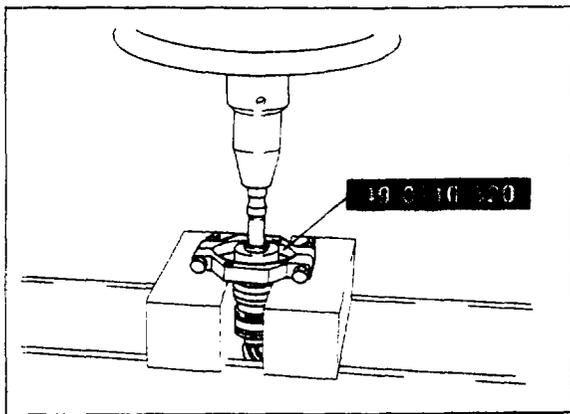
67U10B-030

Control Valve, Oil Seal and Bearing Assembly

1. Remove the "O" ring and piston ring using a small screwdriver.

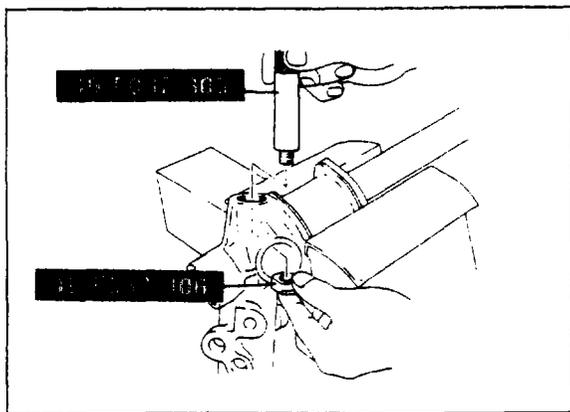
Caution

Be careful not to damage the edge of the piston ring groove or the "O" ring groove.



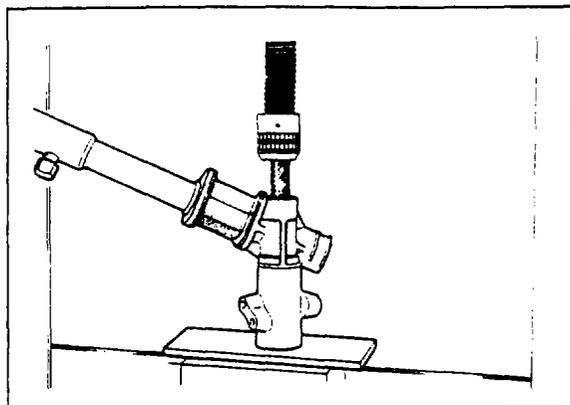
67U10B-031

2. Remove the bearing using **bearing remover** (49 0710 520).



67U10B-032

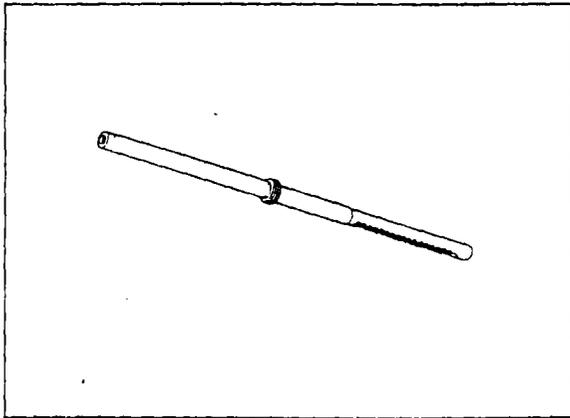
3. Set the **handle** (49 F032 305) and **body** (49 F032 306) into the rack housing.



67U10B-033

4. Remove the bearing.

10B STEERING GEAR AND LINKAGE

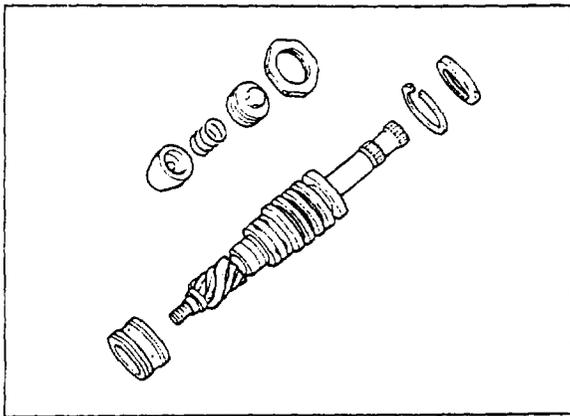


67U10B-034

INSPECTION

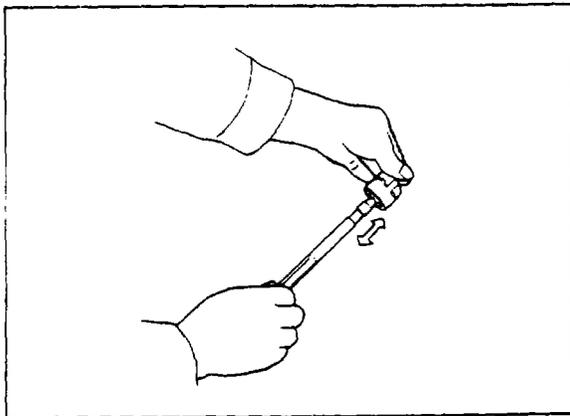
Check the following points and replace any part if a problem is found.

1. Damage to rack seal ring.
2. Wear or damage to rack teeth.
3. Looseness, abnormal noise, or sticking bearing.



67U10B-035

4. Damage to control valve seal ring.
5. Tooth wear or damage of control valve.
6. Cracking, damage, or deterioration of boots.
7. Wear of rack bushing.
8. Wear of friction surfaces of rack support.
9. Cracking or damage of gear housing.
10. Damage to friction surfaces of rack seal ring (in gear housing) and/or friction surfaces of control valve seal ring.



67U10B-036

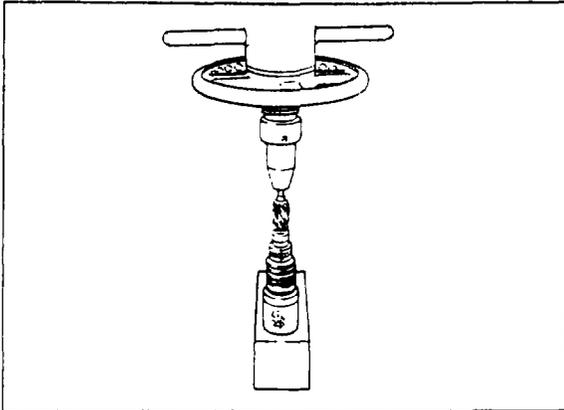
11. Looseness or sticking of tie-rod(s) and ball-joint(s).
12. Bent tie-rods and/or tie-rod ends.
13. Damage to tie-rod end boots.

ASSEMBLY

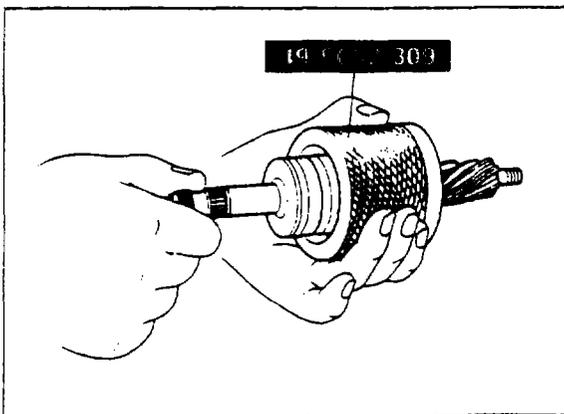
Before assembling, coat or fill the following parts with grease (lithium base, NLGI No. 2).

1. Pinion gear.
2. Pinion installation position of gear housing.
3. Friction surface and rear surface of rack support.
4. Rack teeth.
5. Tie-rod ball-joints.
6. Inside of left and right boots.

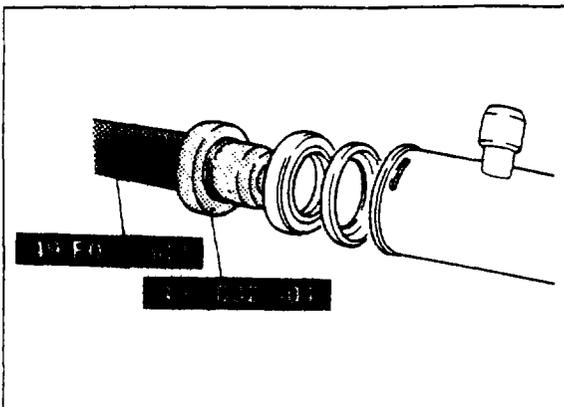
67U10B-037



67U10B-038



87U10B-005



87U10B-006

Control Valve, Seal Ring and Bearing Assembly

1. Press the bearing into the control valve assembly.

2. Apply a coat of ATF type F(M2C33-F) or Dexron II to the control valve and seal ring, and install the seal ring.

3. Insert the control valve assembly into the **seal ring former** (49 F032 309) to compress the seal rings and enable them to be assembled into the rack housing control valve assembly without damaging the rings.

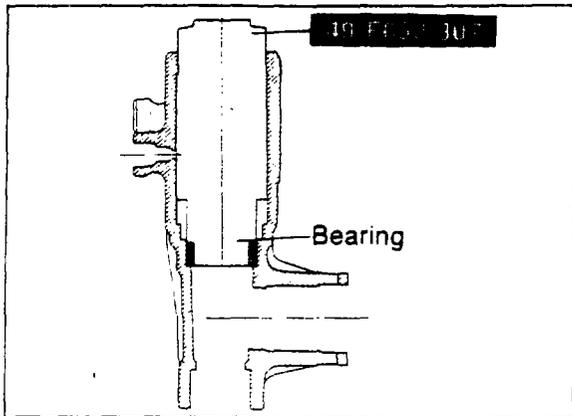
Rack Housing

1. Install the washer and the oil seal using **handle** (49 F032 303) and **body** (49 F032 304).

Note

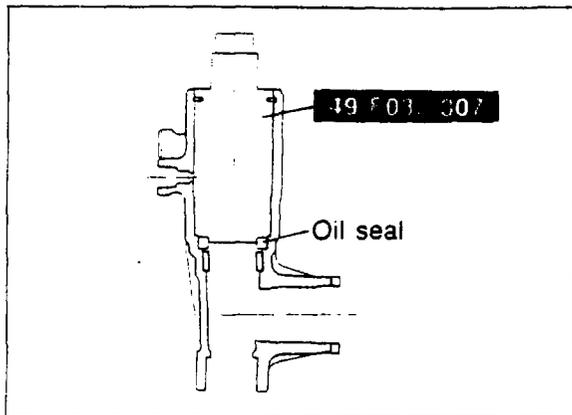
Apply a coat of ATF type F(M2C33-F) or Dexron II to the oil seal.

10B STEERING GEAR AND LINKAGE



67U10B-041

2. Press in the bearing using **installer** (49 F032 307).

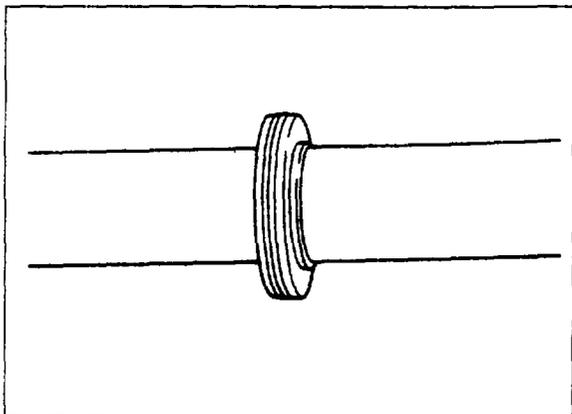


87U10B-007

3. Press in the oil seal using **installer** (49 F032 307).

Note

Apply a coat of ATF type F(M2C33-F) or Dexron II to the bearing and oil seal before installing.



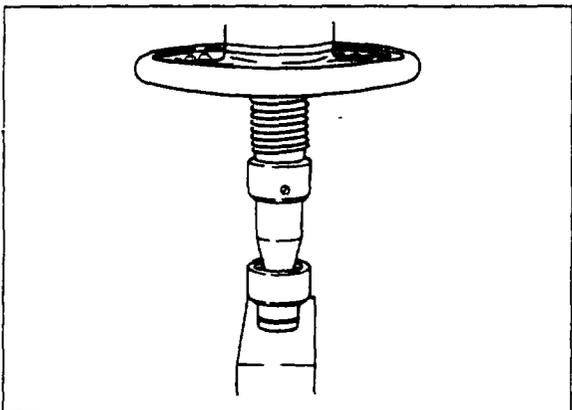
87U10B-008

"O" ring and Piston Ring of Rack

Install the "O" ring and piston ring into the piston ring groove of the rack.

Note

- a) Apply a coat of ATF type F(M2C33-F) or Dexron II to the "O" ring.
- b) Be careful not to damage the edge of the piston ring groove.



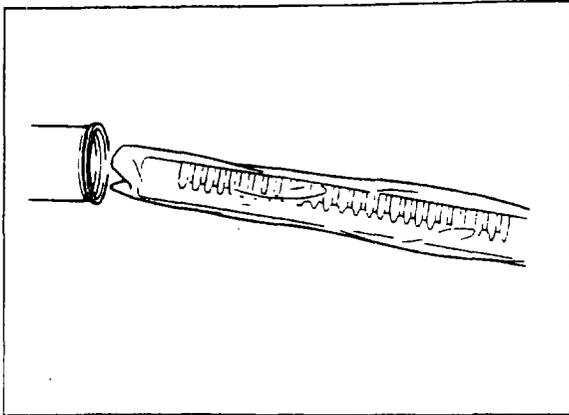
87U10B-009

Oil Seal of Rack Bushing

Press in the oil seal with a suitable tool until the surface of oil seal is level with the rack bushing. Install the "O" ring to the rack bushing.

Note

Apply a coat of ATF type F(M2C33-F) or Dexron II to the "O" ring.



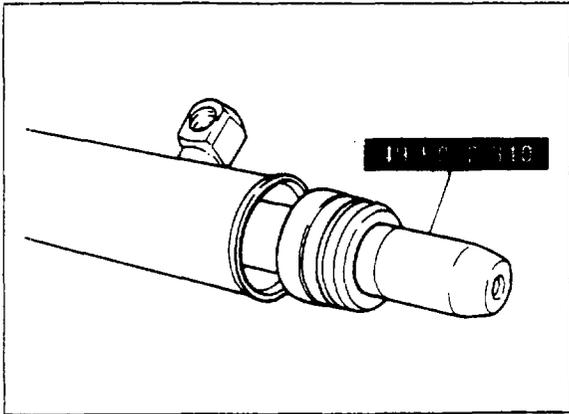
67U10B-045

Rack

Secure rack housing in a vise.
Cover the rack gear with the vinyl supplied in the seal kit.
Carefully insert the rack

Caution

If the rack gear is not covered, the inner surface of the rack bushing might be damaged by the edge of the gear.



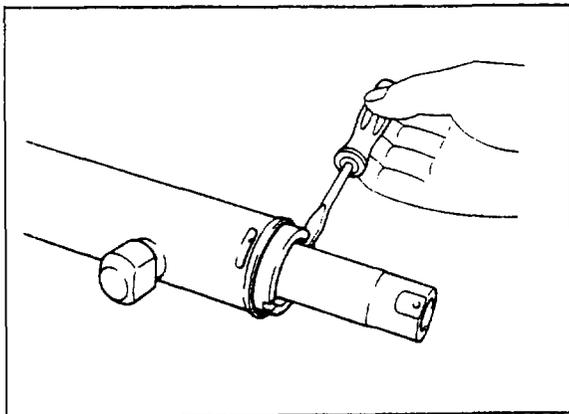
87U10B-010

Rack Bushing

Attach the **protector** (49 F032 310) to the rack, and install to the rack housing.

Note

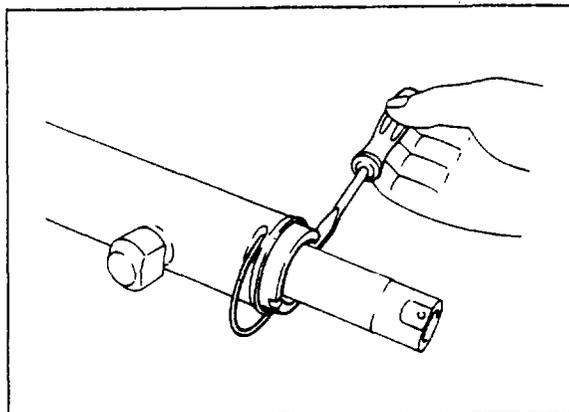
Apply a coat of ATF type F(M2C33-F) or Dexron II to the "O" ring and oil seal.



67U10B-047

Rack Stopper

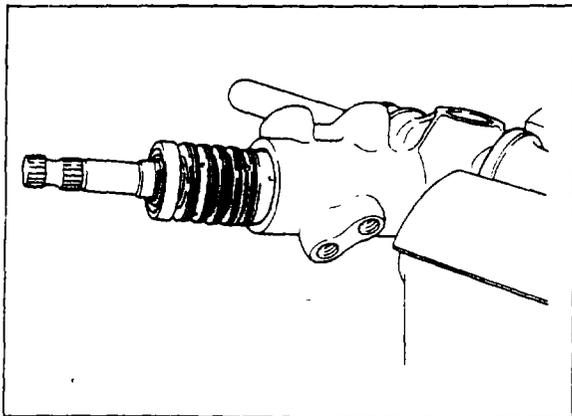
1. Install the rack stopper, and turn the rack stopper until the hole of the rack housing and hole of the rack stopper are aligned.



67U10B-048

2. Install the clip, and then turn the rack stopper until the clip is fully installed.

10B STEERING GEAR AND LINKAGE



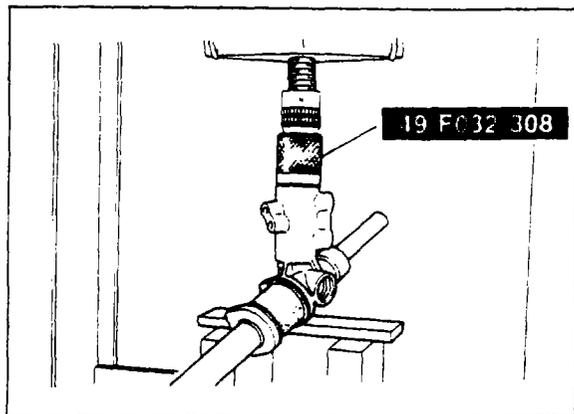
87U108-011

Control Valve Assembly

1. Install the control valve.

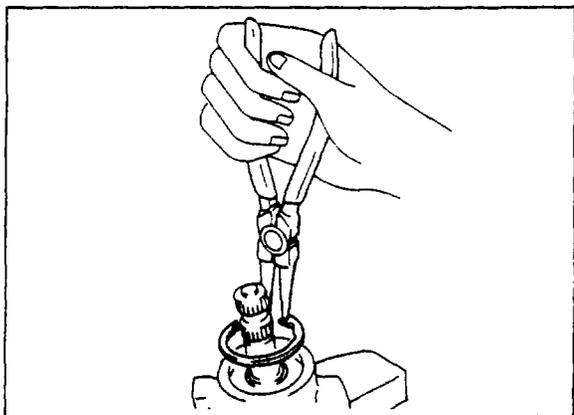
Note

Apply a coat of ATF type F(M2C33-F) or Dexron II to the control valve, bearing and "O" ring.



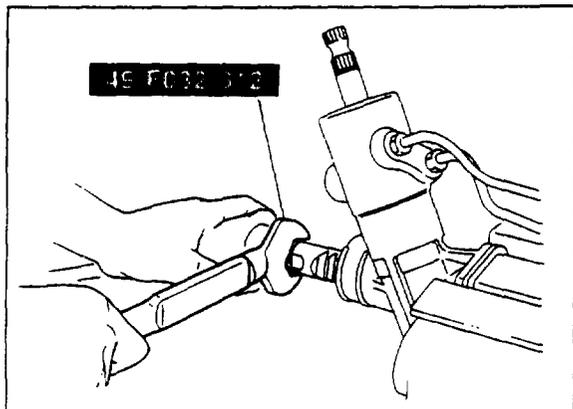
67U108-050

2. Install the oil seal using **installer** (49 F032 308).



67U108-051

3. Install the snap ring using snap ring pliers and ensure the snap ring is seated into the ring groove of the housing correctly. Install the dust seal.



67U108-052

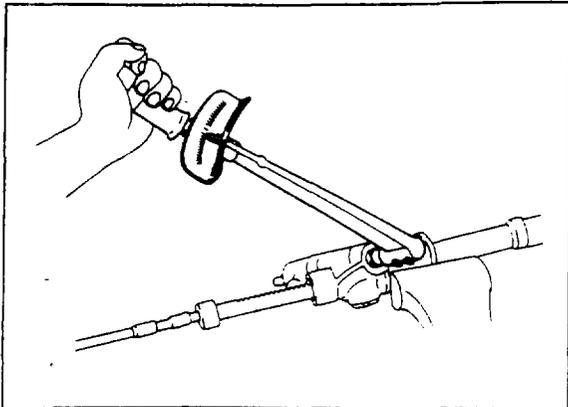
Tie-rod

Secure the rack gear in a vise, tighten the tie-rods using **wrench** (49 F032 312). Tighten the tie-rods.

Tightening torque:

69—98 N-m (7—10 m-kg, 51—72 ft-lb)

Install a new spring pin.



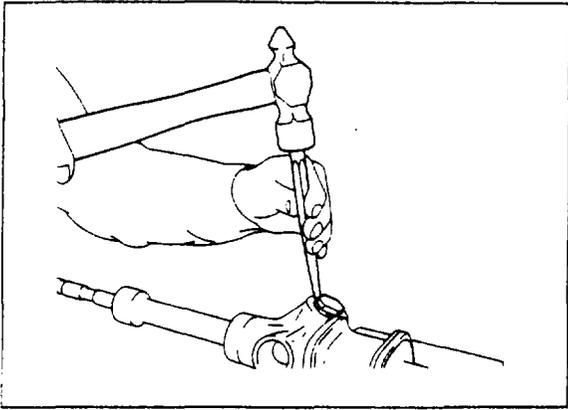
67U10B-053

Pinion Plug

1. Tighten the pinion lock nut.

Tighten torque:

20—29 N·m (2—3 m·kg, 14—22 ft·lb)



67U10B-054

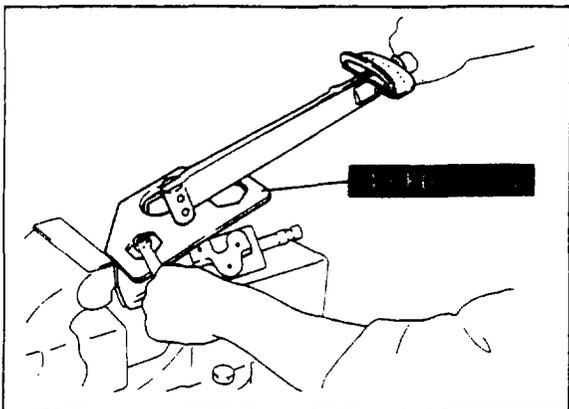
2. Tighten the pinion plug, and then stake the pinion plug using a punch and hammer.

Tightening torque:

49—69 N·m (5—7 m·kg, 36—51 ft·lb)

Note

Apply sealant to the threads of the pinion plug.



67U10B-055

Yoke Plug

1. Install the rack support and spring.

Note

Apply a coat of grease to the surfaces of the rack support and rack.

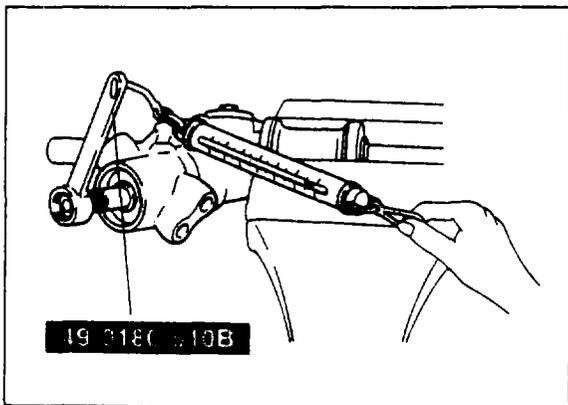
2. Tighten the yoke plug and loosen it 25°—35°.

Note

Apply sealant to the threads of the yoke plug.

Tightening torque:

20—29 N·m (2—3 m·kg, 14—22 ft·lb)



67U10B-056

From this position, retighten the lock nut using wrench (49 F032 313).

Tightening torque:

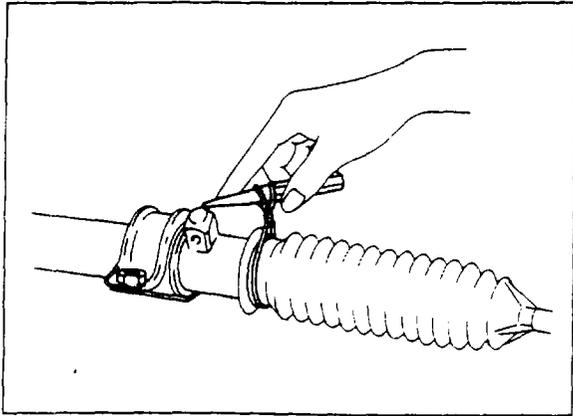
39—59 N·m (4—6 m·kg, 29—43 ft·lb)

3. Measure the pinion rotation torque, using preload attachment (49 0180 510B).

Spring gauge reading:

700—1,300 g (24.7—45.9 oz)

10B STEERING GEAR AND LINKAGE



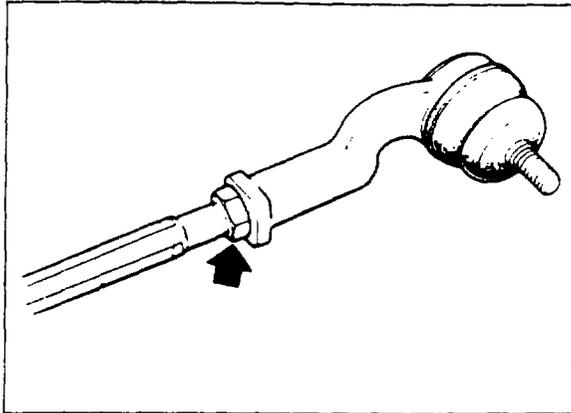
67U10B-057

Boots

Install the boot. Wrap a new boot wire around the boot twice, and then twist it 4 or 4.5 times. Attach the clip to the other end to secure the boot.

Note

Check that the boot is not twisted or dented.



67U10B-058

Tie-rod Ends

Install the tie-rod ends, align them with the marks made before disassembly.

OIL PUMP

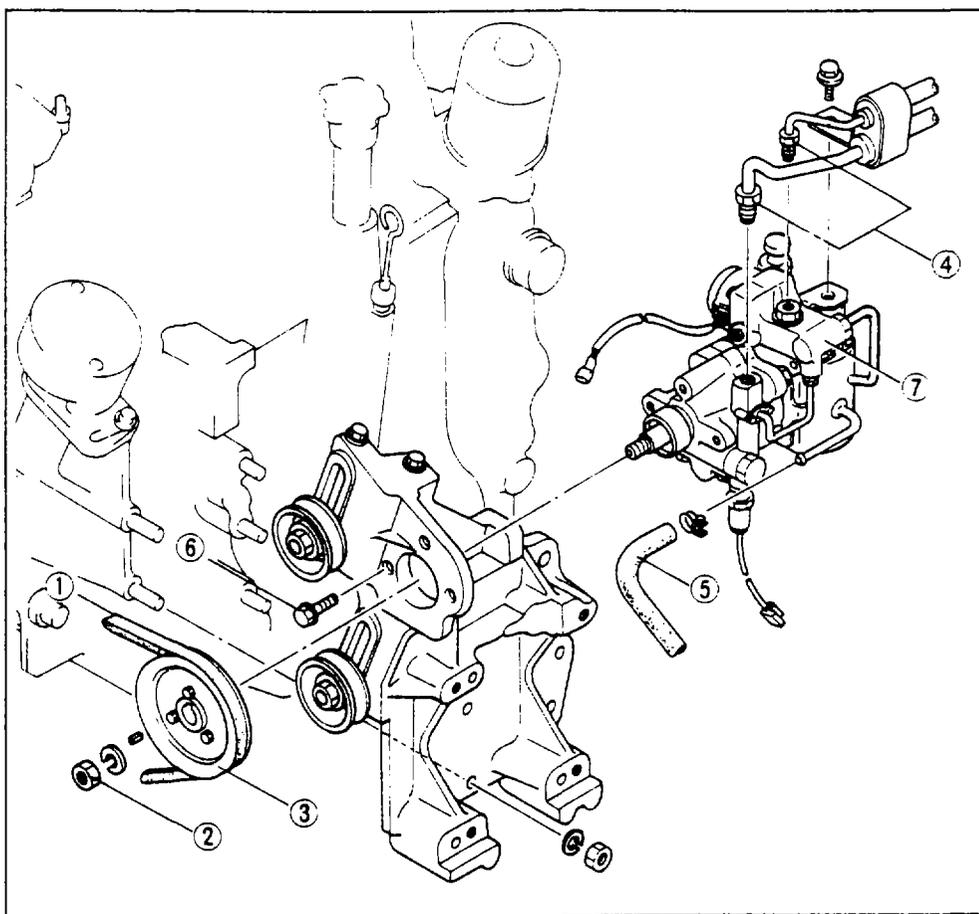
REMOVAL AND INSTALLATION

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove in the sequence shown in the figure.
3. Install in the reverse order of removal.

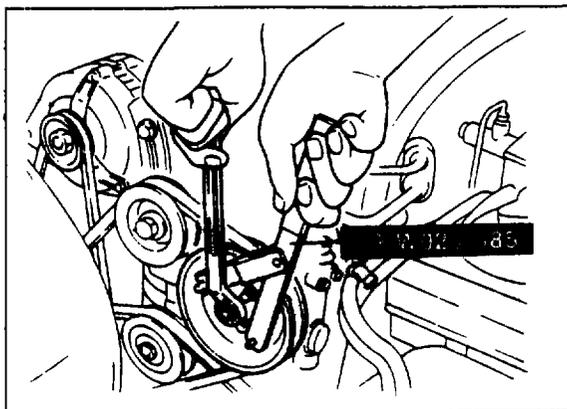
Note

- a) The power-steering fluid will leak out when the return hose and/or the pressure hose is disconnected, so prepare a suitable container for it to drain into.
- b) After installation, inspect the deflection of the oil pump belt and bleed the air from the system, then check for fluid leakage.

67U10B-059



1. Oil pump belt
2. Nut
3. Oil pump pulley
4. Pipes
5. Hose
6. Bolt
7. Oil pump



Loosen the nut of the oil pump pulley, using **adjust wrench** (49 W023 585).

67U10B-060