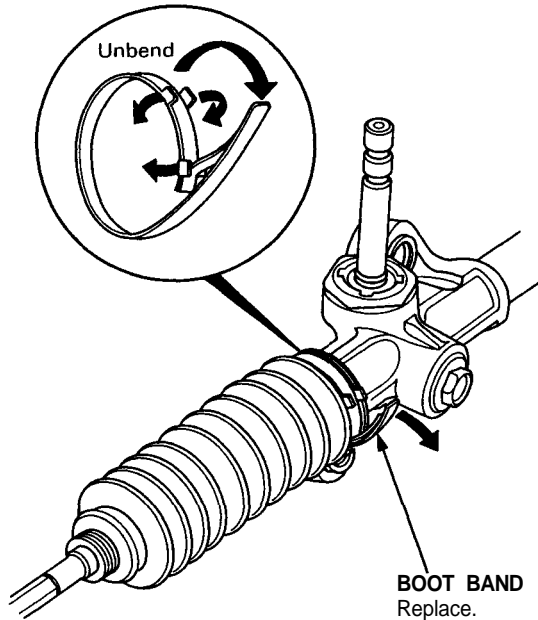


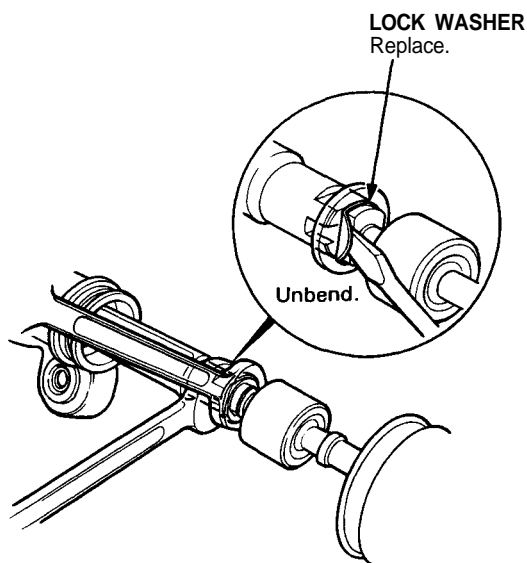
# Manual Steering

## Overhaul

1. Carefully clamp the gearbox in a vise with soft jaws.
2. Remove the boot band.



3. Pull the boots away from the ends of the gearbox, and unbend the tie-rod lock washers.
4. Hold the rack with a wrench, and unscrew the tie-rods with another wrench.

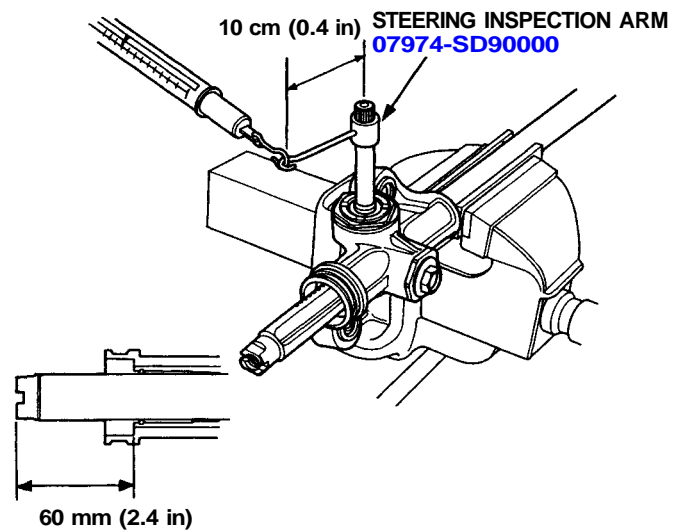


4. Before disassembly, install the special tool on the pinion shaft and check the preload.  
If the preload is out of the specification, adjust the rack guide (page 17-27).  
If the preload is still out of the specification, disassemble the gearbox and check each part.

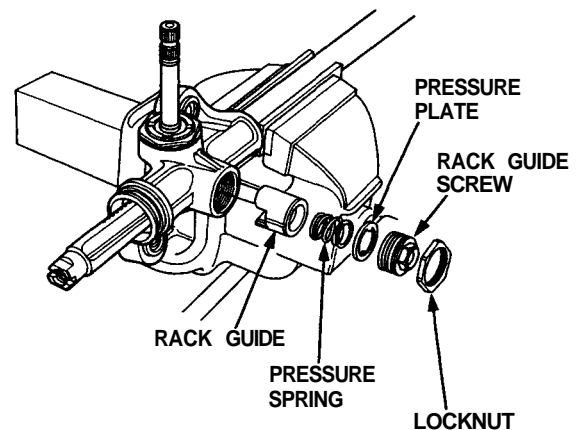
NOTE: Slide the steering rack in the cylinder until the end of the rack projects 60 mm (2.4 in) from the cylinder end. Inspection is made near this rack position.

5. Check the pinion preload with a spring scale.

Preload 7-17 N (0.7-1.7 kg, 1.5-3.8 lbs)

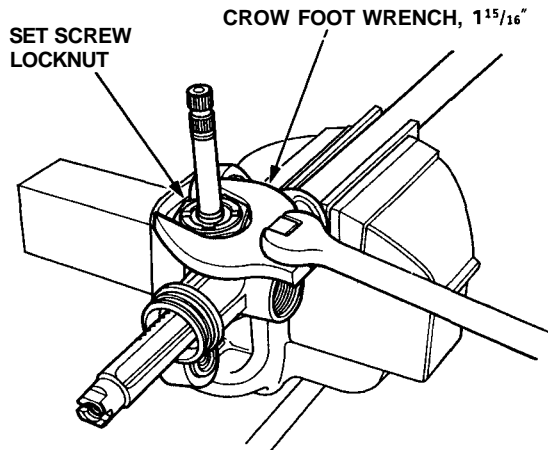


6. Loosen the locknut, and remove the rack guide screw.



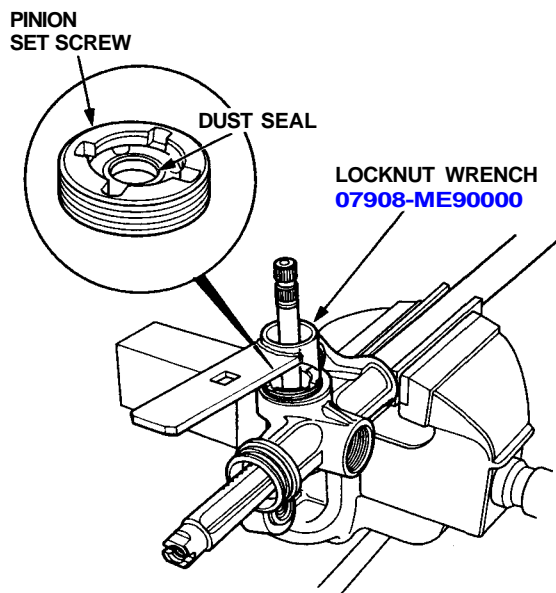


7. Remove the set screw locknut.



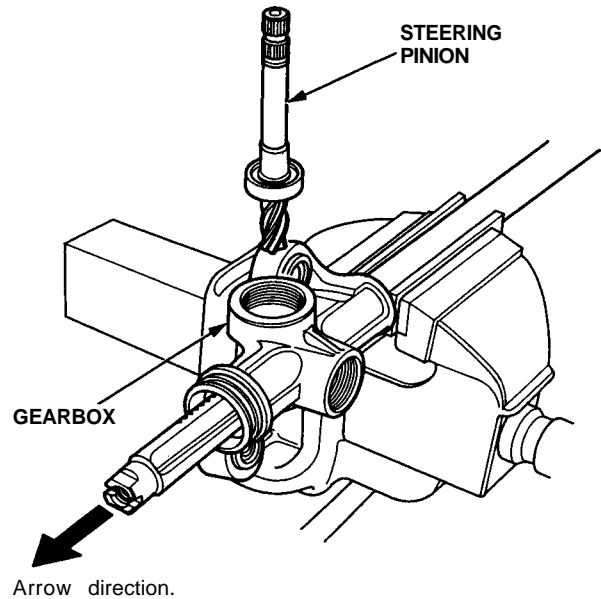
8. Remove the pinion set screw using the special tool.

- Check the dust seal for damage and remove it if it must be replaced. Refer to page 17-25 for installation.



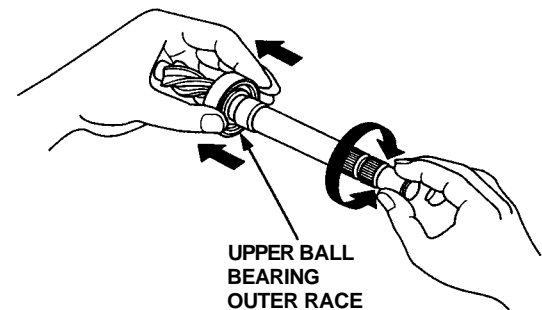
9. Move the rack toward the gearbox side (i.e. in the direction of the arrow) as far as it goes, then pull the steering pinion out when the pinion gear clears the cutout in the rack.

NOTE: The rack cannot be removed from the cylinder side.



- Check the pinion bearing movement while pulling the bearing outer race as shown.

NOTE: This type of the bearing has play. The play should not be excessive.



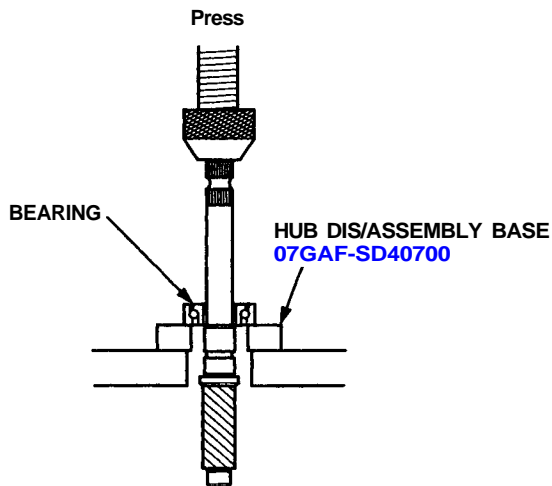
(cont'd)

# Manual Steering

## Overhaul (Cont'd)

- If the pinion bearing is noisy or has excessive play, replace the bearing using the special tools and a press.

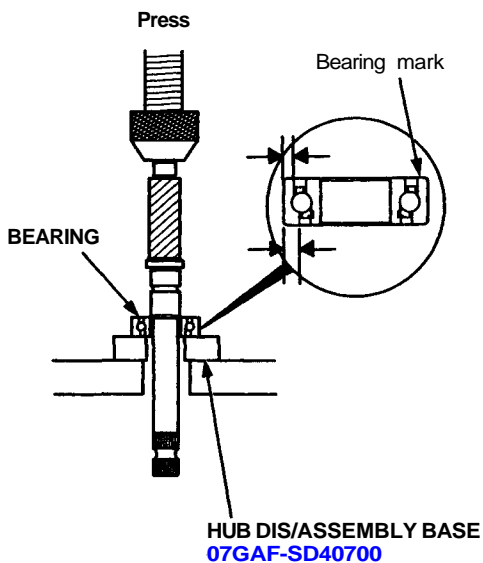
NOTE: Hold the outer race with the tool securely.



- Press the steering pinion into the new pinion bearing.

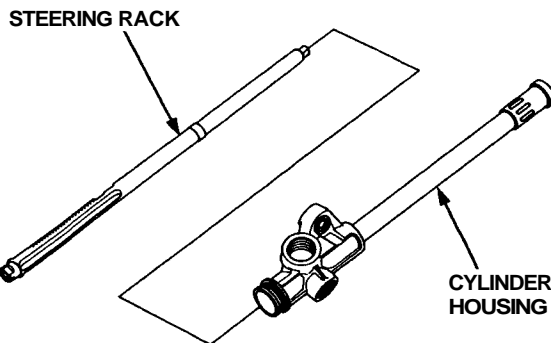
NOTE:

- Install the pinion bearing with the wider side of the inner race toward the gear.
- Hold the inner race with the tool securely.



10. Remove the steering rack from the cylinder housing.

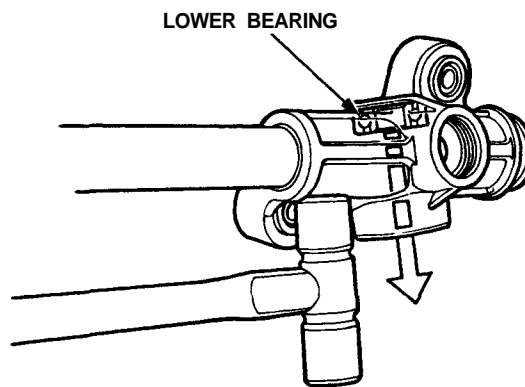
NOTE: The steering rack cannot be removed from the cylinder side.



- Check the lower bearing and replace it if it is damaged.

Remove the lower bearing by lightly tapping with a plastic hammer as shown. If the lower bearing is hard to remove by tapping, heat the gearbox by soaking it in 212°F (100°C) water.

**CAUTION:** To avoid burns, use heavy gloves when handling the heated gearbox.



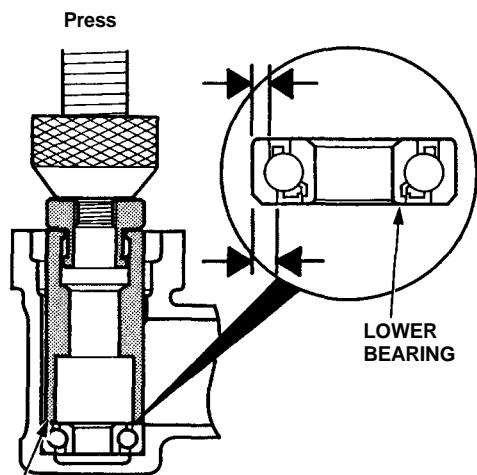
Tap with a plastic hammer to remove the bearing.



- Press the new lower bearing into the gearbox housing until it seats using a press and special tool.

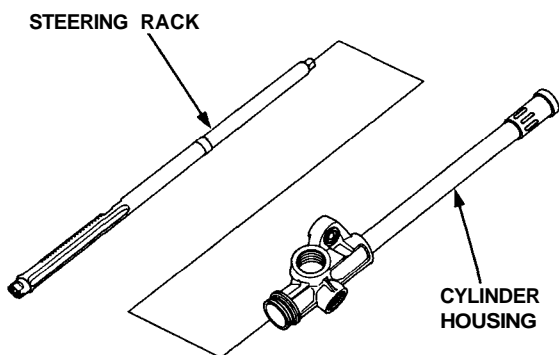
NOTE:

- Install the lower bearing with the wider side of the outer race toward the bottom of the gearbox.
- Hold the outer race with the tool securely.
- Do not allow dust and other foreign materials to enter the lower bearing.



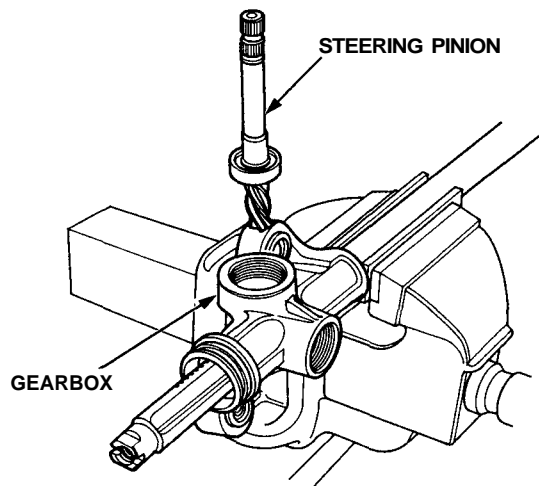
P/S ADJUSTMENT GUIDE  
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11. Insert the steering rack into the cylinder housing, being careful not to damage the steering rack sliding surface.



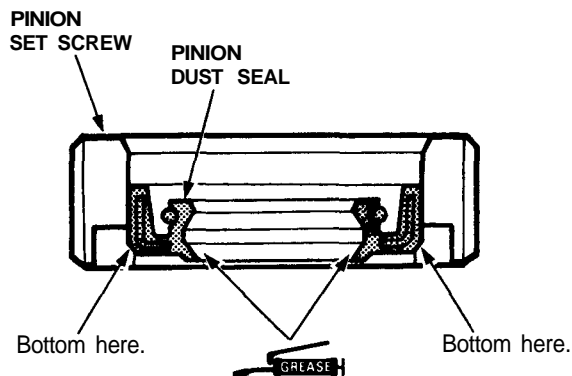
12. Install the steering pinion into the gearbox.

NOTE: Do not engage the steering pinion with the steering rack this time.



13. If the pinion dust seal was removed, drive in the new dust seal until it bottoms on the step on the pinion set screw.

14. Grease the sealing lip of the pinion dust seal.

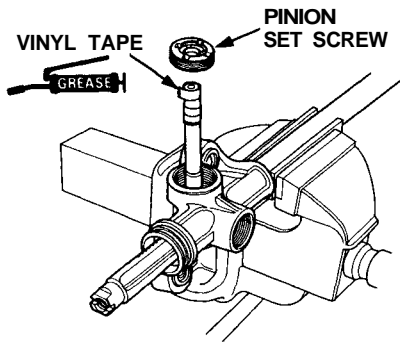


(cont'd)

# Manual Steering

## Overhaul (Cont'd)

15. Wrap the splined area of the steering pinion with vinyl tape and grease the surface of the tape.
16. Slide the pinion set screw over the steering pinion, being careful not to damage the sealing lip of the dust seal, then remove the vinyl tape.



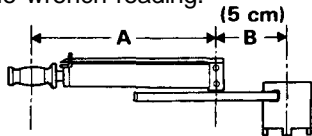
17. Tighten the pinion set screw to a torque wrench reading (indicated) of 9.4—10.4 N·m (94-104kg-cm, 84—93 lb-in).

NOTE: The above specification is the torque wrench reading (indicated) when the set screw is tightened using a torque wrench 25 cm (10 inches) long. If you tighten the set screw using a torque wrench of the different length, obtain the torque value using the following formulas.

$$A/(A+B)=Y$$

$$Y \times \text{Actual torque} = X$$

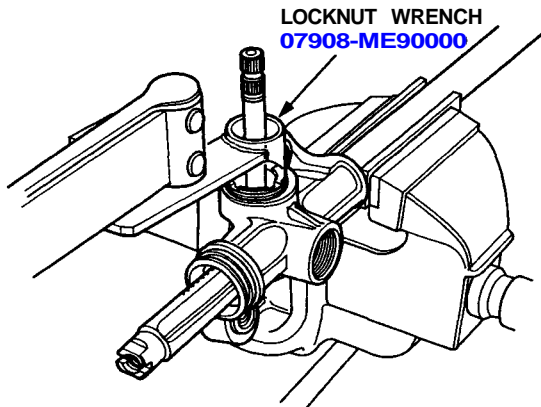
$$X = \text{Torque wrench reading.}$$



Indicated: 9.4—10.4 N·m

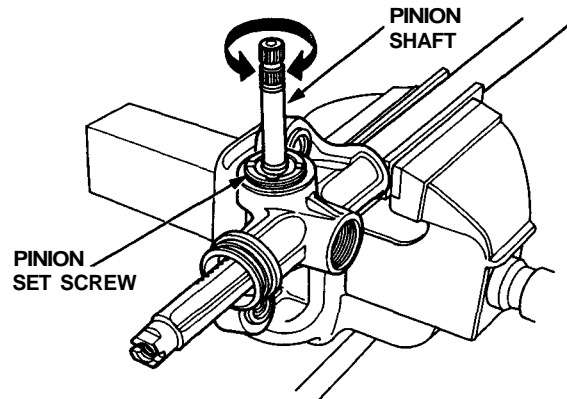
(94-104 kg-cm, 84-93 lb-in)

Actual: 8.0-10 N·m (80-100 kg-cm, 82-87 lb-in)

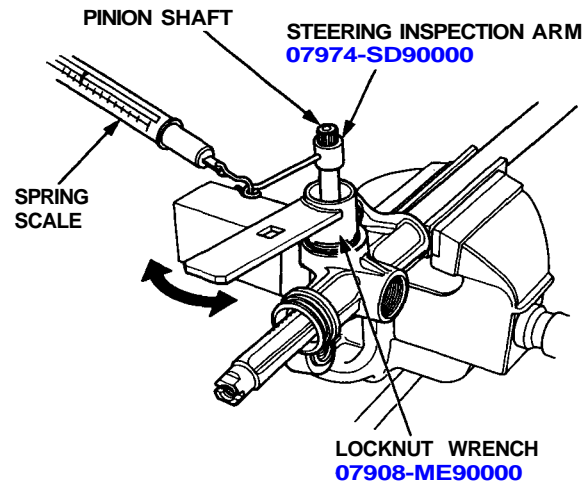


18. Turn the pinion shaft right and left several times to set it, then loosen the pinion set screw.

NOTE: Be sure that the pinion gear and rack gear are not engaged.

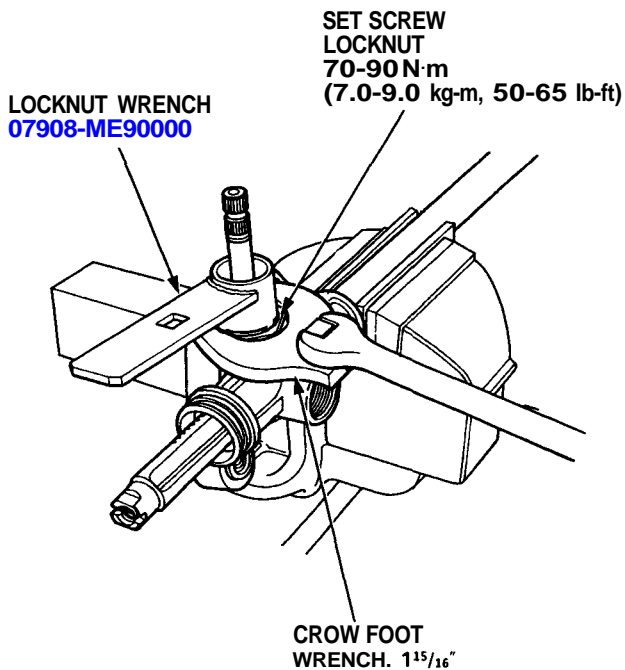


19. Install the special tool onto the pinion shaft. Attach a spring scale to the tool and pull the scale. Adjust the pinion set screw until the gauge reads 1.5—2.5 N (0.15-0.25 kg, 0.33-0.55 lb).

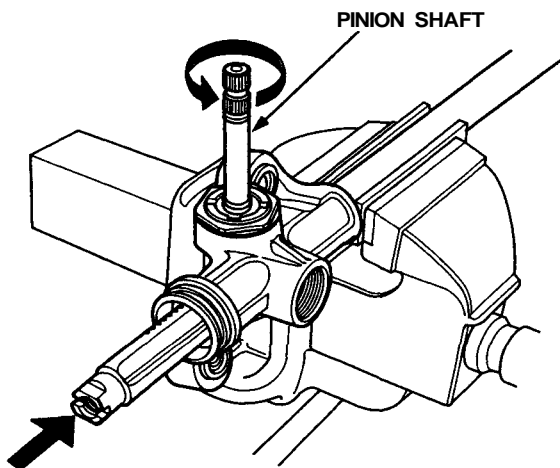




20. Install the set screw locknut, then hold the pinion set screw and tighten the set screw locknut.

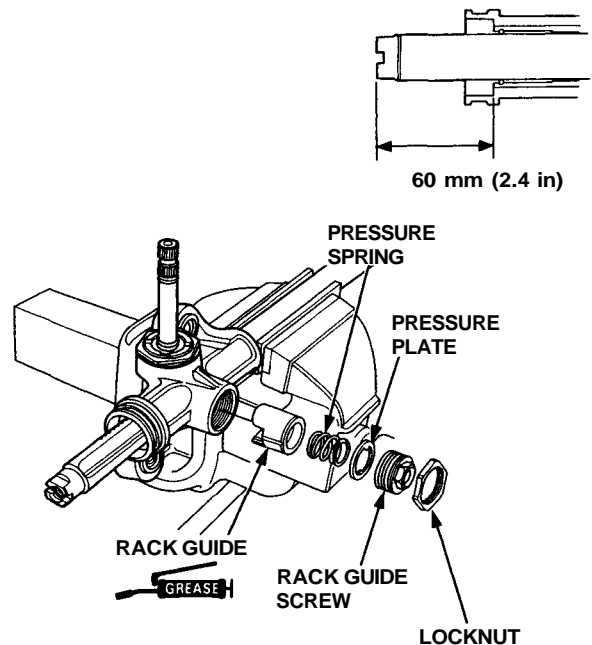


21. Turn the pinion shaft slowly, then insert the rack and engage the rack and pinion gears.

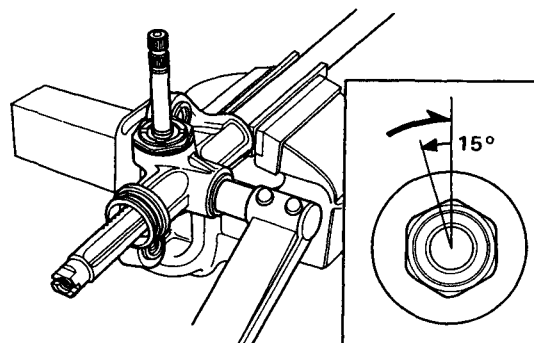


22. The system is in neutral when the rack end projects 60 mm (2.4 in) from the cylinder end.

23. Install the rack guide, pressure plate, pressure spring and rack guide screw.



24. Tighten, loosen and retighten the rack guide screw two times to 5 N·m (0.5 kg-m, 3.6 lb-ft), then back it off 15°.

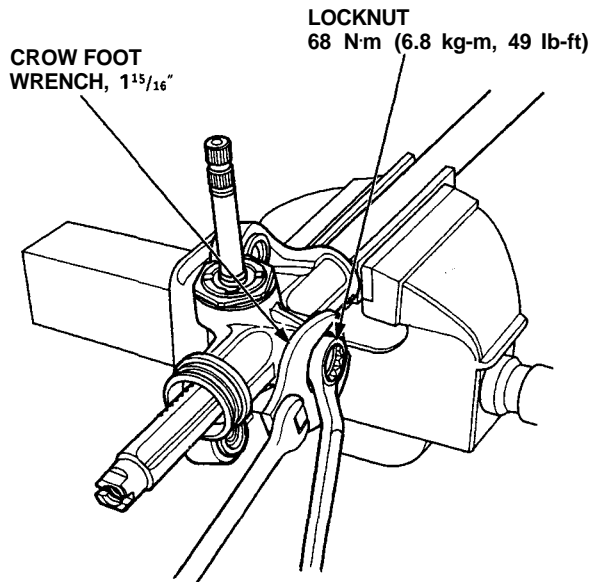


(cont'd)

# Manual Steering

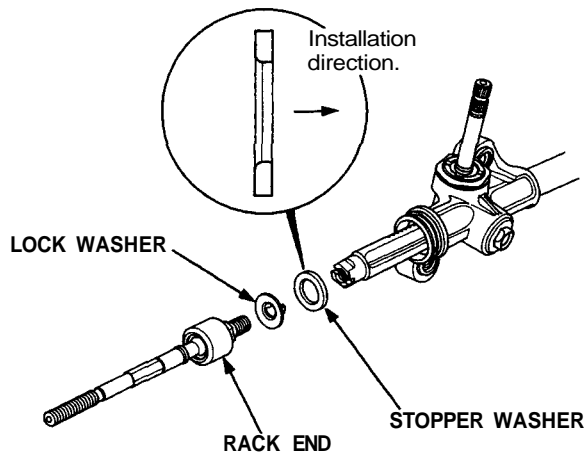
## Overhaul (Cont'd)

25. Install the lock nut on the rack guide screw, and on the locknut while holding the rack guide screw with a wrench.

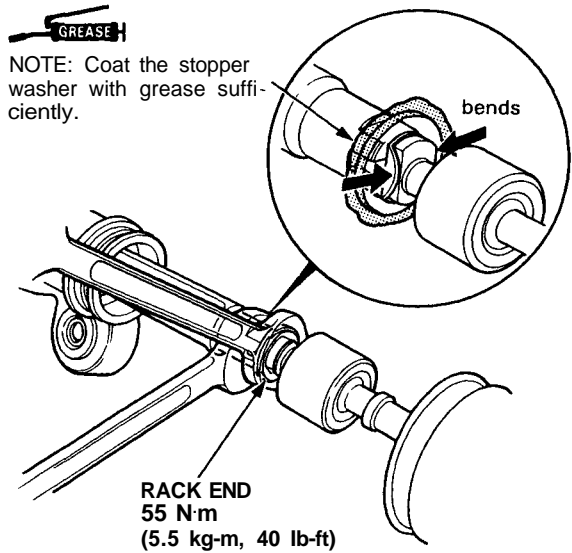


26. Screw each rack end into the rack while holding the lock washer so its tabs are in the slots in the rack end.

NOTE: Install the stopper washer with the chamfered side facing out.



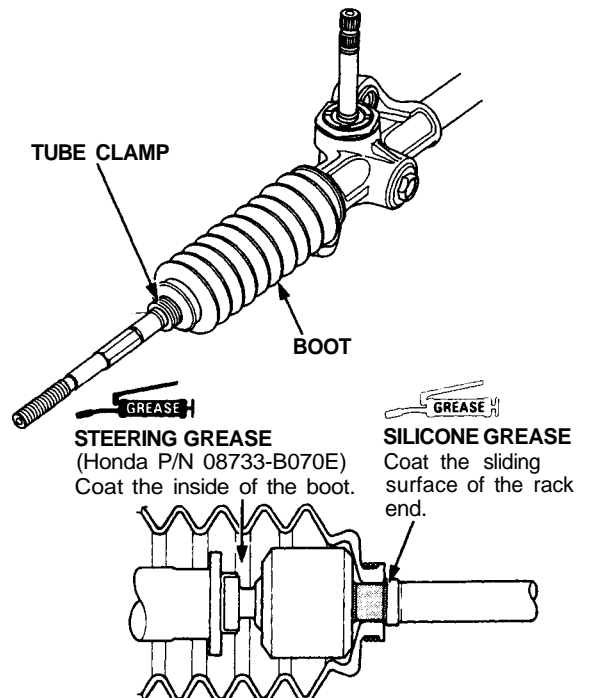
27. Tighten the rack end securely, then bend the lock washer back against the flat on the flange as shown.



28. Install the boots on the rack end with the tube clamps.

NOTE:

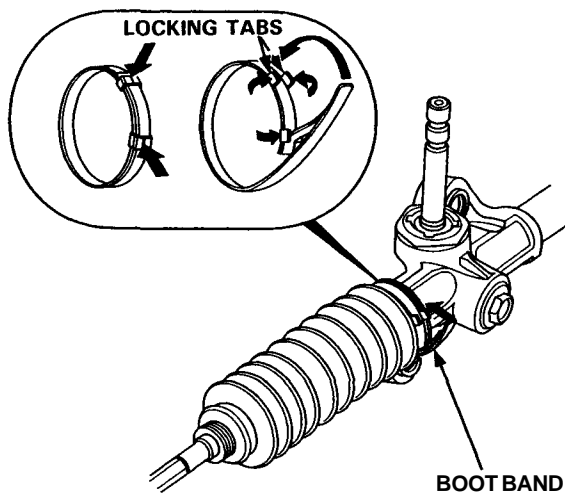
- Coat the rack end and inside of the boot with the grease.
- Before installing the boot, be sure that the pressure inside of the boot is the atmospheric pressure.
- Install the boot band with the rack in the straight ahead condition (i.e. right and left tie-rods are equal in length).



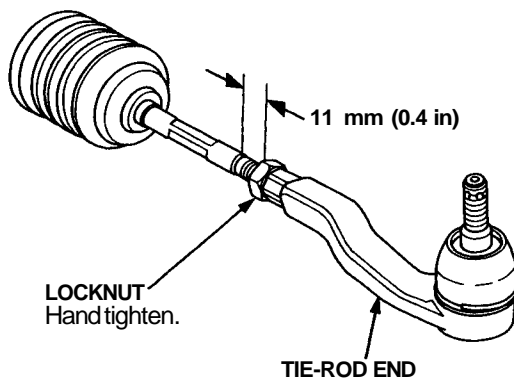


29. Install the new boot bands on the boot and bend both sets of locking tabs.
30. Lightly tap on the doubled portions to reduce their height.

NOTE: After assembling, slide the rack right and left to be certain that the boots are not deformed or twisted.



31. If the tie-rod ends were removed, install the tie-rods on the right and left rack ends and screw them in until the threaded section is 11 mm (0.4 in) in length.



32. Install the gearbox on the front crossbeam (see page [17-20](#)).
33. Check the wheel alignment and adjust if necessary (see [section 18](#)).