

# Hazard Warning Definitions

<b>⚠ DANGER</b>	Immediate hazards which <b>WILL</b> result in severe personal injury or death.
<b>⚠ WARNING</b>	Hazards or unsafe practices which <b>COULD</b> result in severe personal injury or death.
<b>⚠ CAUTION</b>	Hazards or unsafe practices which <b>COULD</b> result in minor personal injury or product or property damage.
<b>NOTE</b>	A note gives key information to make following a procedure easier or quicker.

## Disclaimer

This Service Manual has been prepared by TRW Commercial Steering Systems for reference and use by mechanics who have been trained to repair and service steering components and systems on heavy commercial vehicles. TRW Commercial Steering Systems has exercised reasonable care and diligence to present accurate, clear and complete information and instructions regarding TRW Commercial Steering linkage components. Since this is a general service manual, the photographs and illustrations may not look exactly like the components being serviced. The procedures, therefore, must be carefully read and understood before servicing.

If inspection or testing reveals evidence of abnormal wear or damage to TRW linkage components or if you encounter circumstances not covered in the manual, **STOP - CONSULT THE VEHICLE MANUFACTURER'S SERVICE MANUAL AND WARRANTY. DO NOT TRY TO REPAIR OR SERVICE ANY LINKAGE COMPONENT WHICH HAS BEEN DAMAGED OR INCLUDES ANY PART THAT SHOWS EXCESSIVE WEAR UNLESS THE DAMAGED AND WORN PARTS ARE REPLACED WITH ORIGINAL TRW REPLACEMENT AND SERVICE PARTS AND THE UNIT IS RESTORED TO TRW'S SPECIFICATIONS FOR THAT SPECIFIC COMPONENT.**

It is the responsibility of the mechanic performing the maintenance, repairs or service on a particular TRW linkage component to (a) inspect components for abnormal wear and damage, (b) choose a repair procedure which will not endanger his/her safety, the safety of others, the vehicle, or the safe operation of the vehicle, and (c) fully inspect and test the linkage components and the vehicle steering system to ensure that the repair or service of the component has been properly performed and that the component and system will function properly.

## Patents

TRW Commercial Steering Systems linkage components are covered by several United States and foreign patents, either issued or pending.

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# Boot Seal Replacement

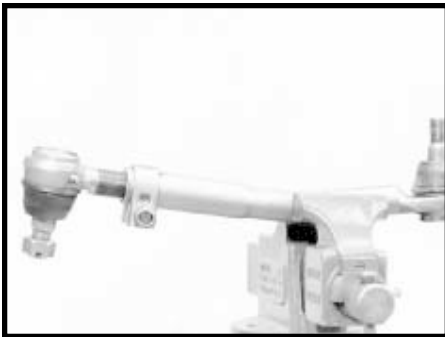
TOOL REQUIRED: A section of tubing with the inside diameter as close to the outside diameter of the boot seal (middle section) as possible.

The inside corner of the tube should be radiused (rounded) or chamfered (angled) so it will not cut the rubber during the press-on operation.



## Disconnect drag link or tie rod

1. Disconnect drag link or tie rod from the axle arm or pitman arm.



## Remove assembly

2. Remove the entire drag link assembly, leaving the socket ends in position so the assembly can be easily reinstalled.



## Remove seal

3. Press or tap on the flanged foot portion of the seal to remove it from the socket assembly. If you use a screwdriver to loosen the seal, be careful not to damage the sealing face of the socket forging.



## Clean socket area

4. Wipe off all grease and foreign material from around the ball stud and socket throat. Do not use any type of cleanser to remove the grease.



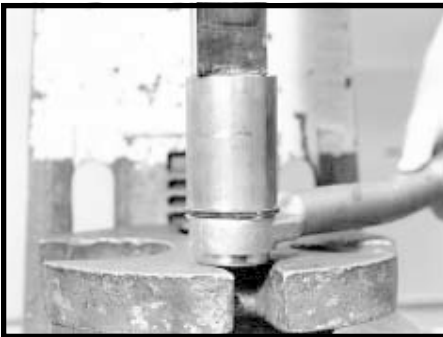
**Apply clean grease**

5. Using **#2 NLGI extreme pressure, lithium-based, moly-filled, heavy duty grease**, grease the socket throat and stud ball. Then fill the new boot seal 3/4 full with the same grease.



**Place assembly in a vise**

6. Position the socket assembly in a large vise, or on a press so that the ball stud is perpendicular to the socket stem.



**Install new seal**

7. Press on the new boot seal using the tool described below. The seal is in place when the flanged portion is seated on the machined section (sealing face) of the socket forging.

**⚠ CAUTION**

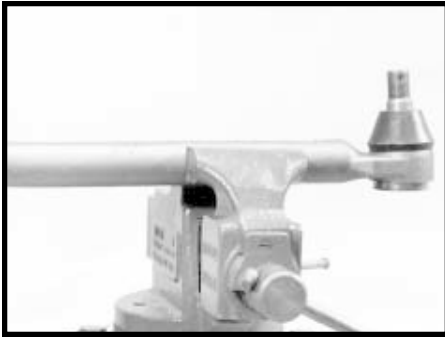
**DO NOT over-press the seal; over-pressing could cause it to deform and seal improperly. DO NOT use a screwdriver, chisel, punch, etc. on the flanged foot of the seal for installation.**



**Reinstall drag link or tie rod**

8. Reconnect the drag link or tie rod to its connection points, and tighten to vehicle manufacturer's specifications. Replace the cotter pin.

# Sliding Seal Replacement



**Disconnect drag link or tie rod**

1. Disconnect drag link or tie rod from the axle arm or pitman arm.



**Remove seal**

2. Remove the old seal by sliding it off the ball stud.



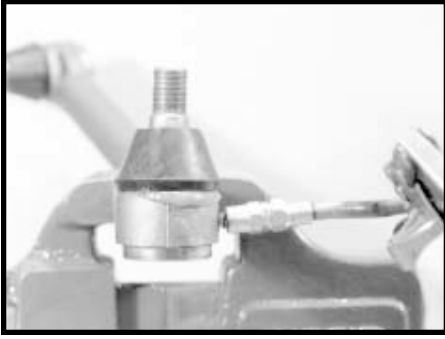
**Clean socket area**

3. Wipe off all grease and foreign material from around the ball stud and socket throat with a clean cloth. Don't use any type of chemical cleanser to remove the grease.



**Install new seal**

4. Slide the new seal over the ball stud until it seats on the shell.



**Apply clean grease**

5. Wipe off all foreign material from around the grease fitting. Apply #2 NLGI extreme pressure, lithium-based, moly-filled heavy duty grease through the fitting until it can be seen extruding past the seal.



**Reinstall assembly**

6. Reinstall the assembly and torque connections to vehicle manufacturer's specifications.

# Anti-Tilt Seal Replacement

## **⚠ CAUTION**

This seal kit should be used only for replacement of identical 8000 series 2-piece anti-tilt seals. Use of these components on any other configuration of socket and seal assembly could cause lash or lost motion while steering, and damage components.



**Disconnect linkage**

1. Disconnect the drag link or tie rod from the arm.



**Remove seal and plate(s)**

2. Remove and discard the anti-tilt seal and wear plate(s).



**Clean socket area**

3. Wipe off all grease and foreign material from around the ball stud and socket throat. Do not use any type of cleanser to remove the grease.



**Assemble seal and plate(s)**

4. Assemble the parts from the kit as shown.



**Reinstall linkage**

5. Reconnect the drag link or tie rod to the arm and tighten to vehicle manufacturer's specifications.



**Grease socket**

6. Grease the socket through the lube fitting using EP chassis lube NLGI Grade 3.



# Tie Rod End Replacement



**Loosen clamp**

1. Loosen the clamp (or jam nut.)



**Disconnect socket**

2. Disconnect the socket from the arm.



**Remove socket**

3. Unscrew the socket from the tube. Use a pipe wrench if necessary, being careful not to deform the tube.



**Install new socket**

4. Screw the new socket into the tube.

**Adjustment procedure**

5. Use adjustment and centering procedures for the type of assembly you're working on. You'll find the procedures in the On Vehicle Adjustments section of this manual.



**Torque nut**

6. Torque the clamp nut to vehicle manufacturer's specifications.

# Grease Zerk Fitting Replacement

## NOTE

Before replacing the grease zerk, check for lash in the socket. Replace the entire socket if necessary.



**Clean area**

1. Clean the area around the damaged grease zerk thoroughly.



**Remove zerk**

2. Unscrew the grease zerk and remove. If the grease zerk is broken off and cannot be unscrewed, use an E-Z Out.



**Replace zerk**

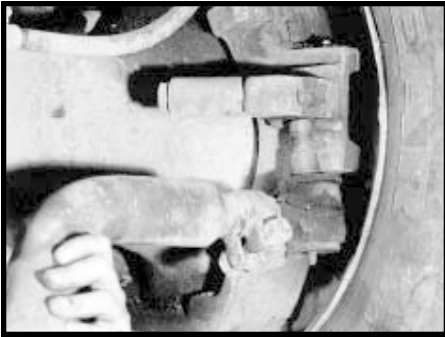
3. Screw in a new zerk of the appropriate type, size and angle. Torque to manufacturer's specifications.



**Check direction of angle**

4. If the grease zerk is angled, make sure it is angled in the proper direction. Consult manufacturer's specifications if necessary.

# Tie Rod Assembly Replacement



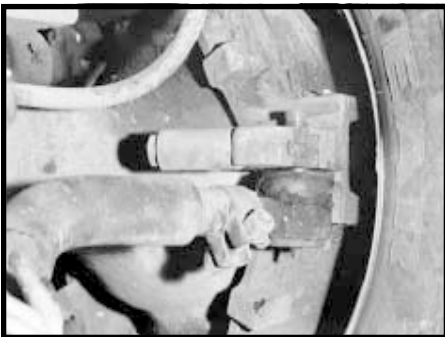
**Remove ends**

1. Remove both ends of the tie rod from the tie rod arms using the appropriate tool.



**Clean area**

2. Clean the tapered hole in the tie rod arm with a clean cloth.



**Check size of stud**

3. Push each stud of the new tie rod into the tie rod arm. Check to make sure the threads on the stud extend down into the tapered hole.

**⚠ CAUTION**

**If the threads stop flush with or above the hole, the sockets are the wrong size. Do not install the wrong size sockets.**



**Install new linkage**

4. Install the new assembly, torque the ball stud nuts to vehicle manufacturer's specifications, and install cotter pins.

### Center Tie Rod

5. Center the tie rod using the appropriate procedure for the type of tie rod installed. You'll find the procedures in the On Vehicle Adjustments section of this manual.



### Check for worn taper in tie rod arm

6. With vehicle engine on, lightly rock the steering wheel while checking for looseness and movement of the stud nut. Any looseness requires replacement of the tie rod arms.

# Draglink Assembly Replacement



**Remove ends**

1. Remove both ends of the drag link from the steering arm and pitman arm using the appropriate tool.



**Clean area**

2. Clean the tapered holes in the steering arm and pitman arm with a clean cloth.



**Check size of stud**

3. Push each stud of the new drag link into the holes. Check to make sure the threads on the stud extend down into the tapered hole in both the steering arm and pitman arm.

## **⚠ CAUTION**

**If the threads stop flush with or above the hole, the sockets are the wrong size. Do not install the wrong size sockets.**

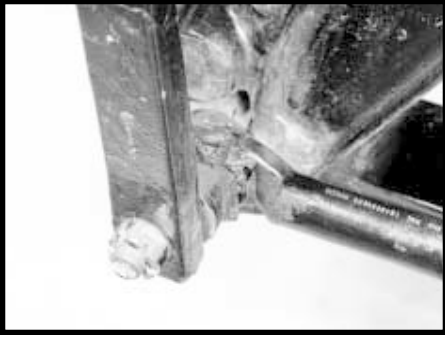


**Install new drag link**

4. Install the new assembly, torque the ball stud nuts to vehicle manufacturer's specifications, and install cotter pins.

### Center Tie Rod

5. Center the drag link using the appropriate procedure for the type of drag link installed. You'll find the procedures in the On Vehicle Adjustments section of this manual.



### Check for worn taper in connections

6. With vehicle engine on, lightly rock the steering wheel while checking for looseness and movement of the stud nuts. Any looseness requires replacement of the steering arm or pitman arm.

# Pitman Arm Replacement

## ⚠ WARNING

Don't remove the drag link connection after the pitman arm pinch bolt is removed. Doing so will deform the drag link and cause steering problems.

## ⚠ WARNING

When using a chisel to spread a pinch bolt-type pitman arm boss for assembly or removal from the shaft, maintain a firm grip on the chisel at all times. Failure to do this may result in the chisel flying loose which could cause an injury. Never leave the chisel wedged in the pitman arm boss. If you cannot remove the pitman arm from the shaft with a chisel and your hands, remove the chisel from the arm boss and use a puller only to remove the pitman arm.

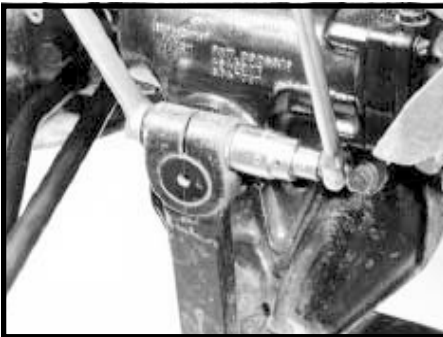
## ⚠ CAUTION

Do not use a hammer on the pitman arm to remove it from the output shaft as internal damage to the steering gear could result. Be sure there is no spreading wedge left in the pitman arm boss before tightening the pitman arm clamp bolt after assembly on the output shaft.



**Disconnect drag link**

1. Disconnect the drag link from the pitman arm using the appropriate tool.



**Remove pinch bolt**

2. Loosen and remove the pitman arm pinch bolt.



**Remove pitman arm**

3. Remove the pitman arm using a pitman arm puller.





#### Inspect splines

4. Check pitman arm internal splines for:
  - severe wear, corrosion and fretting
  - twisted splines
  - missing splines

#### **⚠ WARNING**

**If twisted or missing splines are found, be sure to inspect all internal steering gear components carefully for signs of impact damage. Follow the procedure in the appropriate steering gear service manual.**



#### Align timing marks

5. Align the timing marks on the new pitman arm and steering gear output shaft. Make sure you use the correct timing mark; consult your manufacturer's specifications if in doubt.



#### Install pitman arm

6. Spread open the split end of the arm just enough to allow the arm to slide onto the output shaft. Push the arm on with hand pressure.



#### Torque pinch bolt

7. Install the pinch bolt and torque to manufacturer's specifications.



#### Connect drag link

8. Reconnect the drag link. Torque the nut and replace the cotter pin.