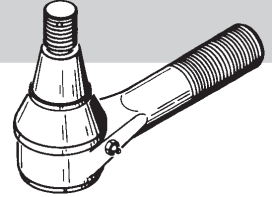


## Steering Products



### PRODUCT EMPHASIS PROGRAM

## How does Steering work?

### Steering Products

The steering linkage allows the operator the ability to direct the vehicle where they want it to go. Worn or loose steering components can damage expensive tires and be unsafe. Steering components should be inspected and, if necessary, replaced as part of a good preventative maintenance program. A troubleshooting guide is listed on the back of this pamphlet for easy reference in the future. Now let's look at the components in the steering linkage to better understand how the system works and what to do to maintain it.

### Kingpins

The kingpin is the main component in the steering system. The kingpin attaches the spindle (and ultimately the tire) to the steering axle beam. Kingpins come in many shapes and sizes, below are the most common.

#### King Pin Types



Single Lock (S)



Double Lock (D)



Ford Type (F)



Tapered (T)



Tapered & Threaded (TT)



Stepped (ST)

*These are the most common types of king pins and come in pin diameters from 15/16" to 2 1/8" and lengths from 6 1/4" to 11 1/4". Needless to say, that leaves room for many different sizes and types of kingpins. Some manufacturers will use kingpins with only a few thousandths of an inch (0.001") difference, which makes micrometers (dial, digital, or otherwise) a must to properly identify a kingpin. Using the axle code is generally a pretty safe bet for identification, but always measure the old kingpin to be sure.*

Sometimes the same kingpin will be used with different types of bushings (more about bushings in a moment) and/or thrust bearings. Again, be sure to compare the parts in the kingpin kit you purchased to all the old parts to be sure you have the correct replacement kit. Kingpins are considered ready for replacement when pin to bushing movement exceeds .015". An easy way to check this with the tire still on is to:

- 1) Jack the front wheel off the ground (use jack stands when done raising the vehicle)
- 2) Apply the service brake to eliminate wheel-bearing movement
- 3) Grab the tire at the top or bottom and attempt to move the tire in and out
- 4) Based on the wheel size, if movement is outside of the following tolerances when measured at the outer circumference of the tire, the kingpins should be replaced.

**Wheel size:** 16" or less - 1/4"  
17" to 18" - 3/8"  
Over 18" - 1/2"

## Kingpin Bushings

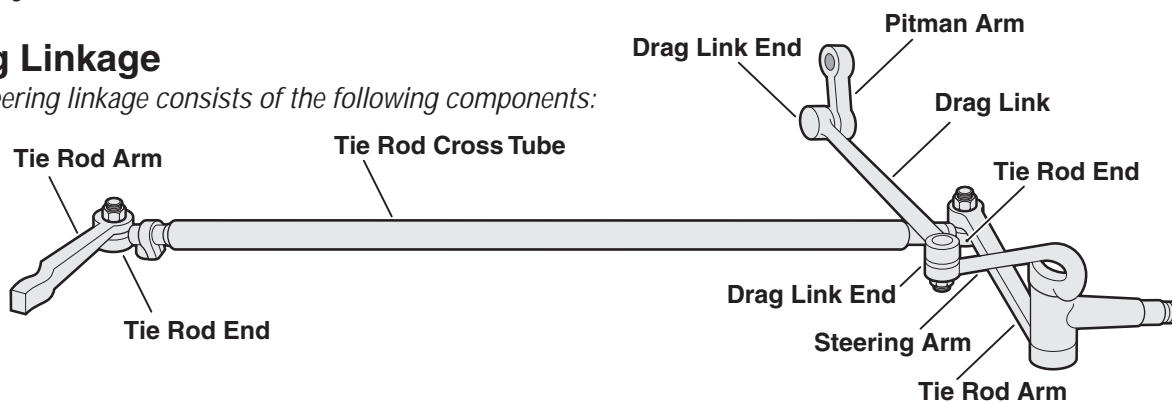
There are three types of kingpin bushings used today. The most commonly used bushing is bi-metal with a steel outer sleeve and a bronze material on the inside. Bi-metal bushings are the easiest to install and work with. Reaming a bi-metal bushing is the best way to get a good snug fit with a new kingpin.

The next most used bushing is composite with a steel sleeve and a plastic substance on the inside. According to the company that designed the composite bushing, you should be able to press in a set of composite bushings and install the kingpin without having to ream the bushing. Unfortunately, this scenario rarely happens. Sometimes the kingpin is too loose in the bushing, but typically it's too tight. Usually you have to ream the composite bushing to get the kingpin to fit. You can do this but be sure you use a fresh set of blades and go easy. If you try to take too big of a bite at one time the blades will catch in the plastic and chip the bushing. Once the bushing is chipped, it's ruined, and you will have to replace it.

When fitting a kingpin to a bushing, ream the bushing until the inside diameter is .001" to .003" larger than the outer diameter of the new kingpin. When you have the bushings reamed to the proper diameter and you're ready to re-install the spindles, shim the spindles for vertical endplay at .001" to .005" maximum. Be sure to use all the new seals, gaskets, o-rings, etc. to keep water, dirt and salt out. Getting a good seal on your new kingpin set will help it last the appropriate amount of time for the work your truck is doing. Proper lubrication is also essential for long kingpin life. Use multi-purpose chassis grease like 6% 12-hydroxy lithium stearate grease NLGI grade #1 or 8% 12-hydroxy lithium stearate grease NLGI grade #2.

## Steering Linkage

A typical steering linkage consists of the following components:



**Pitman Arm** - The pitman arm connects the steering box to the drag link. The steering box end is splined to match the steering box shaft, and the other end has a tapered hole to accept the ball stud of the drag link. Pitman arms are rarely replaced since they are a "non-wear" item.

**Drag Link** - The drag link connects the pitman arm to the steering arm. They come in three types and many different shapes. They are usually bent to fit a certain year, make, model of truck sometimes even down to the exact steering axle. In other words, you need a replacement just like the one you took off. Finding a "substitute" part number that will work correctly is extremely rare if not impossible.

The most common type has non-replaceable ends on both ends. When one or both ends of the drag link wear out you have to replace it. The second type has a non-replaceable end on one end and a replaceable drag link end on the other. If just the replaceable end wears out, you have the advantage of changing it and not replacing the whole drag link. The third type has replaceable ends on both ends. As long as the tube holds up, you can replace the ends on these drag links as many times as necessary. *To see if a drag link needs replaced, try to move it back and forth with just your hand. If the drag link moves more than 1/8" it should be replaced.*

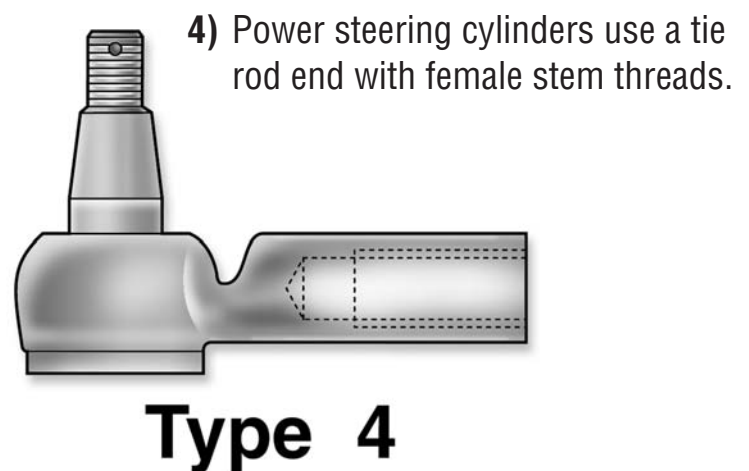
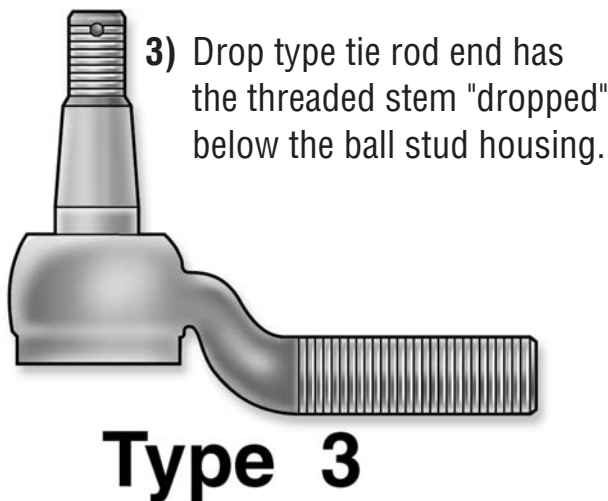
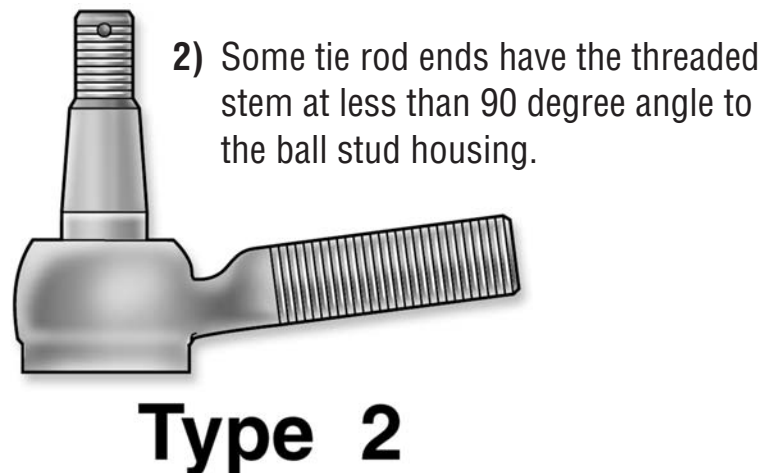
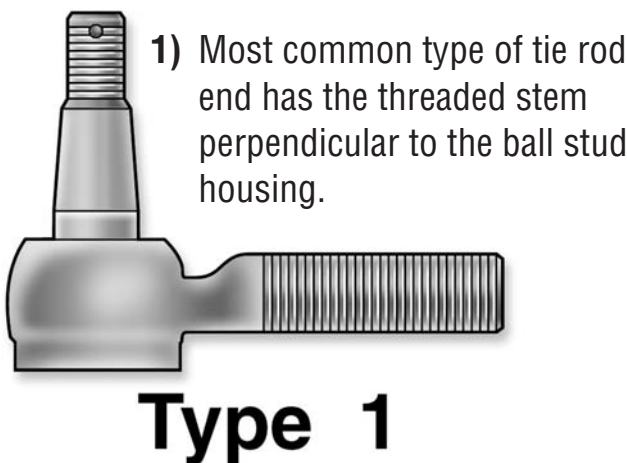
**Steering Linkage** (continued on Page 3)

**Steering Linkage** *continued*

**Steering Arm** - The steering arm connects the drag link to the driver's side spindle. Like the pitman arm, these are a "non-wear" item and rarely replaced. They are usually bent for a particular year, make, and model of truck and there are no "substitutes".

**Tie Rod Arms** - There is a tie rod arm for each spindle and they connect the spindles to each other through the tie rod cross tube. Like pitman and steering arms, these are "non-wear" items and generally not replaced.

**Tie Rod Ends** - Tie rod ends go on each end of the tie rod cross tube and attach the two tie rod arms to each other. Many times the same part is used for tie rod and drag link ends. These are high wear items in the steering linkage and are replaced regularly. To see if a tie rod end needs replaced, use the same test as outlined in the drag link section. Several common types of tie rod ends are listed below:



**Tie Rod Cross Tube** - The tie rod cross tube connects the two tie rod arms together. It has replaceable tie rod ends at both ends and is adjustable to set the toe-in of the front tires. Cross tubes should be replaced if the threads on the ends became worn or the tube gets bent. Be sure to match thread size, tube OD and length when needing a replacement part.

## Troubleshooting front steering axles

Condition	Cause	Correction
<b>Vehicle hard to steer</b>	<ul style="list-style-type: none"> <li>· Low pressure in power steering system</li> <li>· Steering gear not assembled correctly</li> <li>· Binding king pins</li> <li>· Incorrect steering arm geometry</li> <li>· Out-of-adjustment caster</li> <li>· Worn thrust bearing</li> </ul>	<ul style="list-style-type: none"> <li>· Repair power steering system</li> <li>· Assemble steering gear correctly</li> <li>· Replace king pins</li> <li>· Service steering system as necessary</li> <li>· Adjust caster as necessary</li> <li>· Replace thrust bearing</li> </ul>
<b>Worn crosstube ends</b>	<ul style="list-style-type: none"> <li>· Severe operating conditions</li> <li>· Add-on type of power steering cylinders not installed correctly</li> </ul>	<ul style="list-style-type: none"> <li>· Operate vehicle correctly</li> <li>· Install power steering cylinders correctly</li> </ul>
<b>Bent or broken cross tube, ball stud, steering arm or cross tube arm</b>	<ul style="list-style-type: none"> <li>· Too much pressure in the power steering system</li> <li>· Cut-off pressure of the power steering system out-of adjustment</li> <li>· Vehicle not operated correctly</li> <li>· Add-on type of power steering system not installed correctly</li> </ul>	<ul style="list-style-type: none"> <li>· Adjust power steering system to specified pressure</li> <li>· Adjust power steering system to specified pressure</li> <li>· Make sure vehicle is operated correctly</li> <li>· Correctly install add-on power Steering system</li> </ul>
<b>Worn or broken steering ball stud</b>	<ul style="list-style-type: none"> <li>· Drag link fasteners tightened past specified torque</li> <li>· Lack of lubrication or incorrect lubricant</li> <li>· Power steering stops out-of-adjustment</li> </ul>	<ul style="list-style-type: none"> <li>· Tighten drag link fasteners to Specified torque</li> <li>· Lubricate linkage with specified lubricant</li> <li>· Adjust stops to specified dimension</li> </ul>
<b>Tires wear out quickly or have uneven tire tread wear</b>	<ul style="list-style-type: none"> <li>· Tires have incorrect air pressure</li> <li>· Tires out-of-balance</li> <li>· Incorrect tandem axle alignment</li> <li>· Incorrect toe-in setting</li> <li>· Incorrect steering arm geometry</li> </ul>	<ul style="list-style-type: none"> <li>· Put specified air pressure in tires</li> <li>· Balance or replace tires</li> <li>· Align tandem axles</li> <li>· Adjust toe-in specified setting</li> <li>· Service steering system as necessary</li> </ul>
<b>Vibration or shimmy of front axle during operation</b>	<ul style="list-style-type: none"> <li>· Caster out-of-adjustment</li> <li>· Wheels and/or tires out-of-balance</li> <li>· Worn shock absorbers</li> </ul>	<ul style="list-style-type: none"> <li>· Adjust caster</li> <li>· Balance or replace wheels and/or tires</li> <li>· Replace shock absorbers</li> </ul>

### Related items

Axle beams  
 Drag links & drag link ends  
 Hydraulic pump seal kits  
 King pin sets  
 Spindles  
 Steering gear seal kits  
 Steering shaft U-joints  
 Tie rod ends  
 Wheel bearings and seals

### Catalogs and support material

Catalog 217 - Light, medium & heavy truck steering  
 Technical bulletins  
 Promotional material  
 Troubleshooting guides  
 Maintenance clinics  
 Tech Service: 800-822-2042  
 Web Site: [www.daytonparts.com](http://www.daytonparts.com)