

## General

In some instances it is important to keep the optical axis of the primary mirror pointed in the same direction as the mechanical axis of the tube. This is important for Newtonian telescopes that are equatorially mounted with a computerized pointing system (i.e., a “GOTO” mount). Some types of Dobsonian-mounted scopes that use digital setting circles also require these two axis to be aligned. If these two axis are not coincident, there will be pointing errors with these types of mounts. To keep these two axis coincident, the secondary mirror should be positioned with *full offset*. This means the secondary is moved a small amount *away* from the focuser, and *towards* the primary mirror by the same amount.

It is important to note that *offsetting has no effect on optical quality* (assuming the telescope is collimated properly), and that the collimation procedure is the same with, or without, offset. A telescope that incorporates no offset simply has the optical axis slightly askew from the mechanical axis, but otherwise it has no detrimental effects. For Newtonian telescopes mounted on simple Dobsonian mounts it is not important to offset the secondary mirror. In addition, small offsets under about 1/16” (1.5 mm.) can be accomplished without building it into the spider simply by decentering the spider when it is installed. There is about an 1/8” gap between the tip of the spider and the tube wall just for this purpose. Thus, *the majority of spiders can be ordered without the built-in offset*.

In cases where offsetting is required, the primary advantage of building the offset into the spider is the elimination of the uneven gaps between the ends of the spider vanes and the tube inside wall. This gap can grow quite large for large and/or fast telescopes where large offsets are required. Custom offset in **ProtoStar** spiders is achieved by decentering the spider hub during manufacture, resulting in a spider with unequal vane lengths.

## Calculating the Offset Requirement

The amount of offset your telescope needs is a function of the primary and secondary mirror sizes, as well as the focal length, and is given by\*;

$$\text{Offset} = \frac{(D_p \times D_s)}{(4 \times F)}$$

where;

- D<sub>p</sub>** = primary mirror diameter
- D<sub>s</sub>** = secondary mirror diameter
- F** = focal length of the primary mirror

*Example:* A 16” f/4 telescope with a 3.10” secondary mirror would require an offset of (16 in. x 3.10 in.)/(4 x 64 in.) = 0.194 inches. Remember, the secondary should be moved this amount in two directions; both away from the focuser and towards the primary mirror.

\* This formula is an approximate solution. It is given here for simplicity, and is sufficiently accurate for typical Newtonian configurations.

## Installation Orientation of the Spider Support

Mounts manufactured with offset will have unequal spider vane lengths. Thus, it is important to install the spider with the proper orientation with respect to the focuser. **Figure 1** illustrates how to properly install the spider. On heated models, look for the red LED power indicator light on the face of the spider hub. For non-heated models, look for a circular mold mark. In either case, this mark should be oriented opposite the focuser. On 3-vane models, the short vane is marked with a small white dot at the tip of the vane. This vane should be opposite the focuser.

Ideally, if you install the spider such that there are even gaps between the vane ends and tube wall the offset will be perfect. In practice this may not occur because of irregular tube shapes, varying wall thicknesses, and manufacturing tolerances. Thus, it is recommended that you recheck for proper offset after installation.

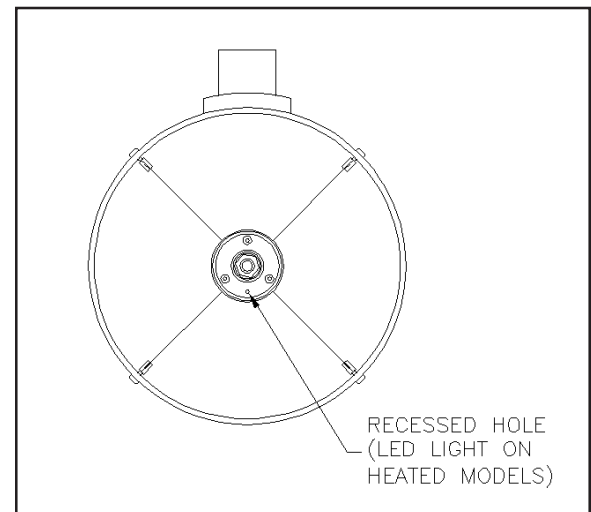


FIGURE 1  
Offset Spider Orientation

## A Note About Offsetting Towards the Primary Mirror

A common mistake made when offsetting the secondary is to shift the secondary down towards the primary mirror so that it actually appears decentered when using the sight tube. *The secondary mirror should always appear centered within the sight tube, regardless of whether offset is used or not.* Though this may sound counter-intuitive at first, remember that the illusion caused by *perspective* will automatically establish the needed offset towards the primary mirror. Yes, it is really that simple.

## Technical Assistance

If you have a special application, or a question not covered in this paper, feel free to call us for free technical support. We want your **ProtoStar** diagonal mount to perform trouble-free as much as you do. Call (614)-785-0245 between 9:00 am and 5:00 PM (Eastern Time Zone) and we will be glad to help you as we are able to.