



# Bob's Knobs™

## TELESCOPE COLLIMATION THUMBSCREWS

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## INSTALLATION AND USE

For maximum performance, the primary and secondary mirrors of your Schmidt-Cassegrain telescope (SCT) must be properly lined up, or *collimated*. This task is usually accomplished by adjusting three screws on the secondary mirror housing to tilt the secondary mirror on its mounting plate until the image at the eyepiece appears undistorted. Collimation is critical and often needs to be done each time the scope is moved. Unfortunately, collimating an SCT with the factory screws can be frustrating because of the need to probe for the screws with an Allen wrench or Phillips screwdriver in the dark, and the difficulty of manipulating tools while looking through the eyepiece to judge the effects of the adjustments. Bob's Knobs greatly simplify the collimation process by replacing the factory screws with thumbscrews. While looking through the eyepiece you can reach around on most scopes and quickly adjust collimation without tools.

Before you install Bob's Knobs, swing your optical tube assembly (OTA) on its mount so you can look directly into the front from 5 to 10 mirror diameters away. You'll notice that the various primary and secondary mirror reflections form a set of concentric circles in a properly collimated scope (Figure 1). This is what you want to see again after installing the knobs. (Hint: cut a small hole in the center of a piece of white paper or cardboard and look through it to eliminate extraneous mirror reflections.)

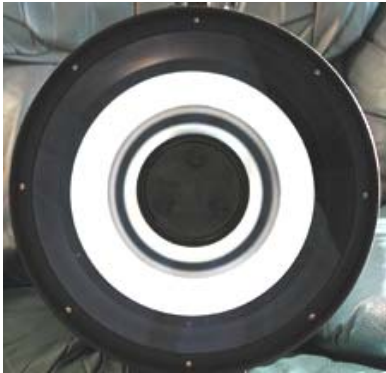
### INSTALLATION

**When installing knobs, remove only one collimation screw at a time.** On some telescopes the collimation screws hold the secondary mirror assembly in place, so removing only one factory screw at a time and exchanging it with a knob will prevent the possibility of releasing the mirror from its mount. Also, since telescope manufacturers often re-design their hardware during production, **check that the knob threads match the factory screw threads before attempting to install the knobs.** If your telescope's secondary mirror housing has a center screw, leave it alone; that's not a collimation screw.

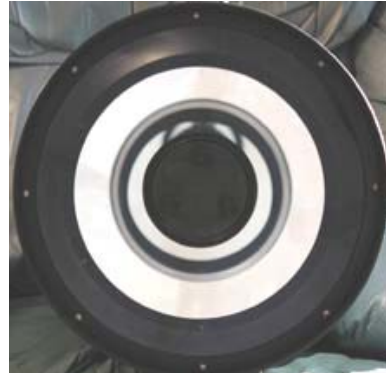
If your scope has a small collimation screw cover, remove it and set it aside. If your scope has a rotary collimation screw cover, it must remain open after installing the knobs. These covers are cosmetic only, and leaving them off/open will not affect the durability or operation of your scope.

1. If you received spacers with your knobs, place one over the threaded part of each knob. If the spacers have projections, they should be oriented away from the knob. Symmetrical spacers can be installed either way.
2. Point the OTA slightly downward so nothing can fall onto the primary mirror.
3. **Meade owners:** Tighten each factory screw until it becomes slightly harder to turn. Do not force the screw. **Celestron owners:** Loosen each collimation screw in sequence by a fraction of a turn until tension is just removed from the screws. Do not remove any of the screws during this process. **All:** Proceed with installation step 4.
4. Remove one collimation screw and replace it with a knob. Remove the second screw and replace it with a knob. Finally, remove the third screw and replace it with a knob.

5. Tighten the knobs evenly until the secondary mirror is no longer loose.
6. Now attach the dust cover and check its fit. If your metal dust cover contacts the knobs, remove the cover and press on its center from the inside to contour it slightly for better clearance. If you need additional clearance, let us know and we will send you a free set of dust cover spacers.



**Figure 1.** Mirror pattern of collimated scope.

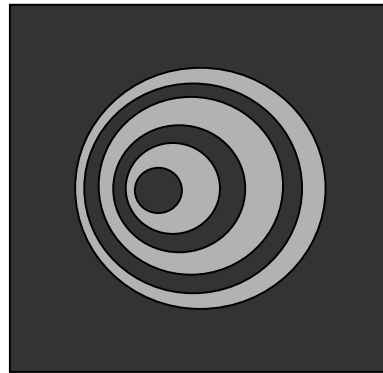


**Figure 2.** Mirror pattern of uncollimated scope.

At this point your scope will probably be out of collimation (Figure 2). Now tighten and loosen appropriate knobs until the mirrors and their reflections are once again concentric (Figure 1), and the secondary mirror is held securely. If a knob becomes harder to turn when tightening, loosen the opposite knobs slightly instead. Check your owner's manual for additional guidance for your particular scope.



**Figure 3.** Star pattern of collimated scope.



**Figure 4.** Star pattern of uncollimated scope.

### STAR COLLIMATION

Star collimation using Bob's Knobs is very simple. First, find a moderately bright star and defocus the image so the diffraction rings are prominent as seen through the eyepiece. These rings will be concentric in a collimated scope (Figure 3) or skewed if collimation is off (Figure 4). To achieve collimation, reach around and carefully adjust the knobs while looking through the eyepiece until the pattern in Figure 3 is obtained. With experience you can use the shadow of your hand on the star pattern to determine which knobs to adjust. Remember to loosen and tighten different knobs as needed so the secondary mirror assembly remains secure without over-tightening, which is indicated by a marked increase in the effort needed to turn a knob. Use your scope's slow motion controls to re-center the star in the eyepiece during the collimation process. By using higher magnification you can increase collimation precision. Check your telescope owner's manual for more information on collimation specifics.