



# Bob's Knobs™

## TELESCOPE COLLIMATION THUMBSCREWS

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## BOB'S KNOBS AND THE MEADE SIX-SCREW SECONDARY

For many years, Schmidt-Cassegrain telescope (SCT) designs by both Meade and Celestron had three screws on their secondary housing (Figure 1). These screws passed through the secondary housing and threaded into the secondary mirror backing plate, which was flat aluminum stock about 3/16 inches thick. The secondary mirror was attached to the other side of the plate with strong double-stick tape. Correct tension between the backing plate and the secondary housing was accomplished by a leaf spring (older Meade) or a central pivot on the inside of the secondary housing (newer Meade and Celestron).

One of the disadvantages to the three-screw design is the limited amount that a collimation screw could be turned before it became tight or loose. This amount was often less than one-half turn, so collimating became an exercise in manipulating all three screws until the secondary was both collimated and held at the correct tension by the screws. Furthermore, access to the secondary mirror required removal of the corrector plate.



Figure 1. Meade three-screw secondary.

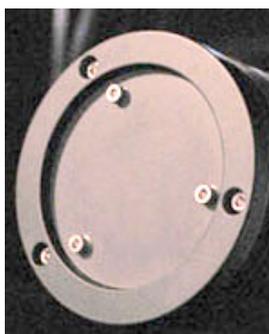


Figure 2. Meade six-screw secondary.

In 2005 Meade began shipping their SCT models with a new secondary design that has six factory screws instead of three (Figure 2). The three inner screws are collimation screws, and the three outer screws attach the secondary assembly to a fixture in the corrector plate. Each collimation screw passes through a coil spring and threads into the secondary backing plate. These springs provide tension on the secondary to hold it in position, and correct tension can be maintained over one or two turns of a collimation screw, rather than the fraction of a turn in the three-screw design. Also, access to the secondary mirror is now possible without removing the corrector plate.

We offer Bob's Knobs collimation thumbscrews for both the three-screw and six-screw Meade secondary designs. When installing knobs, it's important to remove only one collimation screw at a time, since the secondary mirror and its backing plate are held in place only by these screws. Before installing knobs on a Meade six-screw secondary, our instructions state that each factory collimation screw should be tightened until it reaches the end of its travel. This will usually occur within two or three turns. The purpose of this procedure is to compress the springs between the secondary housing and mirror backing plate. Now when a collimation screw is removed, the backing plate will remain in place so the knob thread can reach it. After all three knobs are installed, loosen each knob two to three turns to give them some adjustment room.

For the six-screw design, with its coil spring around each collimation screw, it is especially important to tighten each factory collimation screw until it becomes slightly harder to turn before installing Bob's Knobs. One of these springs (Figure 3) can easily push the secondary backing plate away from the hole in the secondary housing if a screw is removed before tightening the others. If you hear a "tink" sound and

feel a sudden release of spring tension when removing a factory collimation screw, this is probably what has happened. It's likely that neither a knob nor the factory screw can reach the backing plate to thread into it. Furthermore, the associated spring may now be free to move out of position.

If the secondary spring hasn't moved out of position, a longer screw with the same thread diameter and pitch (6-32 on most telescopes) can be threaded two or three turns into the backing plate and used to pull it outward while tightening the other two collimation screws. Now the longer screw can be removed and a knob inserted. Do not thread the long screw more than three turns into the backing plate to keep the screw from contacting the back of the secondary mirror.

It's sometimes difficult to determine whether or not a spring is still in its proper location between the back of the secondary housing and the secondary mirror backing plate. One way to check is to look into the hole. If you can see the spring, it is no longer in position. Also, if you use the above long screw method and manage to install the knobs, but can't seem to collimate the telescope, that's another indication that a spring may have moved. (The spring may also be stuck in a compressed position; see the next paragraph.) Take a look at the secondary mirror reflected in the primary. If it is tilted to the side no matter what you do with the collimation screws, a spring is probably to blame. There's no reason to panic, though; this situation is easily remedied.



Figure 3. Meade six-screw secondary springs.

One other problem that can occur with the Meade six-screw secondary is when a spring won't return to its extended position when the knobs are loosened two or three turns after installation. This can happen if a spring becomes coil-bound or the secondary assembly tilts too much and becomes stuck. The associated knob will feel very loose, as if the spring is missing, and the telescope will not collimate. In most cases you can fix this by pulling the knob in and out until the associated spring releases. If this doesn't work, disassemble the secondary and reposition the springs as described below.

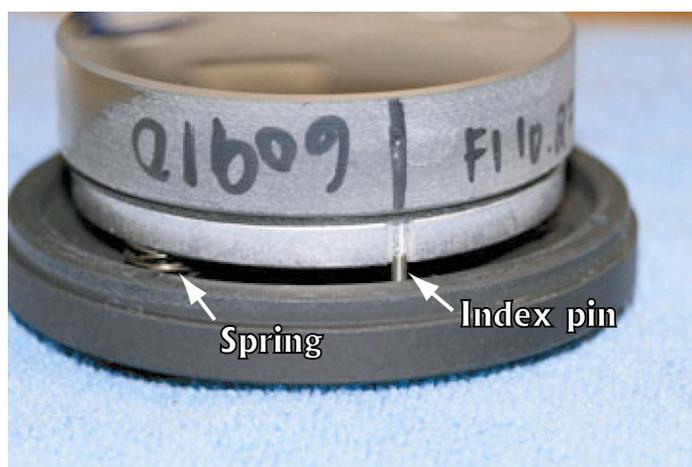


Figure 4. Meade six-screw secondary assembly removed from the OTA.

no need to mark its orientation since it will only fit into the telescope one way.

Finally, it's possible for the index pin protruding from the secondary housing (Figure 4) to jam against the secondary mirror mounting plate such that collimation cannot be adjusted.

To put the collimation springs back into their correct position, or to fix a stubborn coil-bound spring or stuck secondary, it is necessary to remove the secondary from the telescope. First, position the optical tube assembly (OTA) slightly up from the horizontal for easy access. Now remove the three outer screws using the correct Allen wrench. (Don't loosen any of the inner collimation screws.) Next, pull the secondary assembly out of the telescope. There is

no need to mark its orientation since it will only fit into the telescope one way. Figure 4 shows the assembly with the secondary mirror facing up. The mirror backing plate is slotted for an index pin that is part of the dark gray housing for proper alignment. One of the springs can be seen in its correct position, with a collimation screw (not shown) passing through it and threading into the backing plate. If a spring is stuck, you may be able to release it through gentle prodding with a screwdriver. A misaligned index pin can also be put back into place through careful manipulation. Further disassembly is

not required if the springs are still in position. Instead, adjust each screw or knob until the secondary assembly is level with the housing and the index pin is positioned correctly as shown in Figure 4. Reinstall the secondary assembly into the telescope. Perform a rough collimation and star collimation as outlined in our instructions.

If a spring has moved out of position, the secondary mirror will be tilted and the affected spring will be jammed between the housing and backing plate. While holding the mirror by its side, remove the three collimation screws/knobs. Use care since this will release the mirror assembly from the secondary housing. Now reposition the springs and reinstall the screws or knobs. You may find this easier to do with the help of an assistant. Be careful not to touch the secondary mirror reflective surface. Each screw should be threaded about three turns into the backing plate and the index pin should fit into the slot as shown in Figure 4. Reinstall the secondary assembly into the telescope. Perform a rough collimation and star collimation as outlined in our instructions.