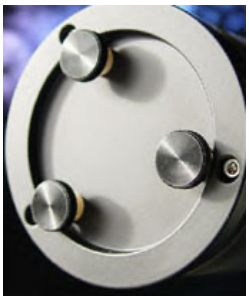

Bob's Knobs™
COLLIMATION THUMBSCREWS

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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 in their secondary housing (Figure 1). These screws passed through the secondary housing and threaded into the secondary mirror backing plate, which was a flat aluminum disk about 3/16 inches thick on a 10" SCT for example. The secondary mirror is attached to the other side of the plate with strong double-stick tape. Correct tension between the backing plate and the secondary housing is accomplished by a central pivot on the inside of the housing.

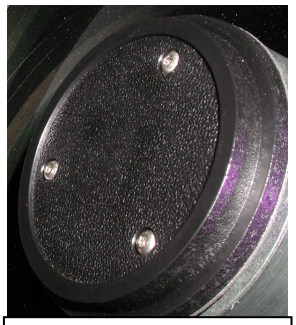

Figure 1. Meade three-screw secondary.

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

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. (Meade also made a four-screw secondary for a short time. This secondary has three collimation screws on the front and a small fourth screw on the side of the housing. To install knobs, follow the installation procedure for the six-screw secondary.) When installing knobs, it's important to exchange factory screws with knobs one 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 direct that each factory collimation screw should be tightened until it becomes slightly harder to turn. 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, especially on 12" f/10 and smaller apertures, the backing plate will remain in place so the knob thread can reach it. After all three knobs are installed and gently tightened to keep the surrounding springs compressed, loosen each knob about two turns to give them some adjustment room.

(continued)

If the collimation screws aren't tightened until they become slightly harder to turn prior to removing the first one, the surrounding spring (Figure 3) will push the secondary backing plate away from the hole in the secondary housing. 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 this happens, remove the secondary from the telescope and install the knobs as described below.

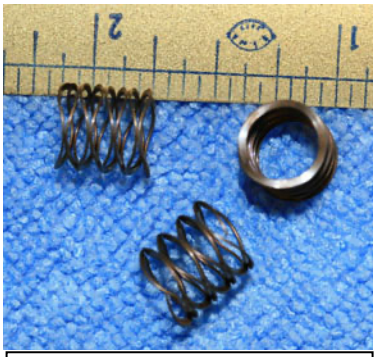

Figure 3. Meade six-screw secondary springs.

For Meade six-screw secondaries on 12" f/8, 14", or 16" Schmidt-Cassegrain telescopes, the secondary is of a larger diameter. As such, tightening the collimation screws prior to installing the knobs may still not prevent the secondary mirror backing plate from being pushed far enough away from the secondary housing that the knob screw will no longer reach it. In this case, remove the secondary from the telescope and install the knobs as described below.

SECONDARY REMOVAL AND KNOB INSTALLATION

To put the collimation springs back into their correct place and reposition the secondary so the screws can reach their holes, it is first necessary to remove the secondary from the telescope. Use clean rubber gloves and avoid touching the surface of the secondary mirror. Position the optical tube assembly (OTA) slightly up from the horizontal for easy access and to prevent the secondary assembly from falling out. 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.

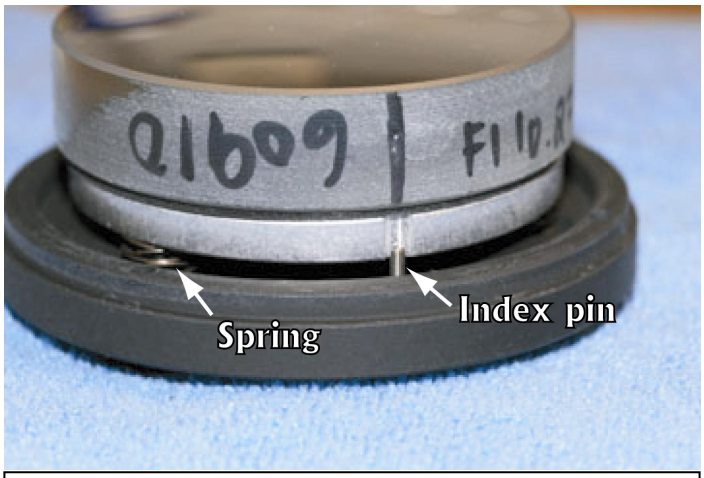

Figure 4. Meade 10" f/10 six-screw secondary assembly removed from the OTA.

Figure 4 shows the secondary assembly from a Meade 10" f/10 SCT with the secondary mirror facing up. The aluminum mirror backing plate is slotted to accept an index pin that is part of the dark gray secondary 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 the springs are still in their proper places, knobs can be installed without separating the secondary components. If instead 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 remaining collimation screws/knobs. Use care since this will release the mirror and its backing plate from the secondary housing. Now reposition the springs and reinstall the screws or knobs. To start the reassembly process, it may be helpful to temporarily remove the spacer on one of the knobs for added screw length, and (after passing it through the secondary housing and spring) screw it two turns into the secondary mirror backing plate. This will help align the other holes so the knobs with spacers can be more easily passed through their respective springs and threaded into the secondary mirror backing plate. Now remove the "starter" knob, install its spacer, check the spring position, and thread it into the backing plate. You may find all of this easier to do with the help of an assistant. Be careful not to touch the secondary mirror reflective surface. Make sure the index pin is positioned in its slot, as shown in Figure 4. Tighten each knob until the springs are compressed. If the knob becomes slightly harder to turn, it's tight enough. Now loosen each knob about two turns and check that the secondary assembly is level with the housing. Reinstall the secondary assembly into the telescope, rotating it until all three outer screw holes are aligned before inserting the screws. Perform a coarse collimation and star collimation as outlined in our instructions.