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## INSTALLATION AND USE (NEWTONIAN)

For maximum performance, the primary and secondary mirrors of your telescope must be properly lined up, or *collimated*. For Newtonian-style telescopes, including the Schmidt-Newtonian and Maksutov-Newtonian, this task is usually accomplished by adjusting the secondary diagonal mirror, followed by the primary mirror, using a laser collimator or other collimation aid. The factory screws often require a screwdriver or Allen wrenches of various sizes to perform the adjustments. Bob's Knobs can simplify the collimation process by replacing the factory screws with thumbscrews for adjustment without tools.

### INSTALLATION

**When installing knobs, remove only one collimation screw at a time.** On some telescopes the collimation screws hold the associated mirror 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.**

**Primary mirror knob installation: Three factory collimation screws** – Remove a factory screw and replace it with a knob, and repeat the exchange for the remaining two screws, one at a time. If the factory collimation screw passes through a spring, be sure that the spring remains in the correct position when installing the knob.

**Primary mirror knob installation: Six factory collimation screws** – Your primary mirror may have six collimation screws instead of three. In this design, three of these screws thread into the primary mirror backing plate and adjust collimation. The other three screws thread into the rear of the tube and press against the primary mirror backing plate to lock the collimation adjustment. The two screw types often have different thread sizes. The screws may be exchanged for knobs, one at a time, in any desired order. Make sure the knob threads and factory screw threads are the same.

**Primary mirror spring replacement** – The primary mirror on many Newtonian-style telescopes is supported by a set of springs to counter the pulling force of the collimation screws. Factory springs are sometimes too weak for this task, causing the primary mirror to lose collimation as the springs sag. On some telescopes, these springs can be accessed from the bottom for replacement without removing the mirror cell. Withdraw each primary collimation screw sufficiently to allow a factory spring to be replaced by a new spring. Ensure that any spacers and washers remain in place during spring installation.

**Secondary mirror knob installation** – Remove a factory screw and replace it with a knob. Repeat for the other two screws, one at a time. Some manufacturers include a small collimation screw cover on the secondary. In most cases this cover must be removed and set aside when Bob's Knobs are installed. The cover is cosmetic only and will not affect operation of the telescope.

After installing Bob's Knobs, perform primary and secondary collimation by following the instructions in your telescope owner's manual.