Installing a MoonLite CR Newtonian Focuser

Made Easy by the MoonLite Adapter Kit

By James R. Dire, Ph.D.

Image 1 - MoonLite Model CR Newtonian focuser with a 2.37-inch drawtube, three locking screws on the drawtube compression ring, a locking knob, and a 2 inch-to-1.25 inch adapter.

It is not uncommon to want to upgrade the focuser on a factory-made Newtonian telescope. I have a vintage 10-inch f/4 Newtonian that came with fairly good single-speed 2-inch focuser. But for astronomical imaging, I really desired a two-speed focuser capable of handing a large-format CCD camera, so I decided to upgrade. This article will hopefully show how easy it is to make the change!

There are not all that many options on the market for replacement focusers. The few that are available vary quite a bit in quality and price. The best focusers I own are the Starlight Instruments Feather Touch on my Stellarvue refractor and the MoonLite on my 14-inch Dob. I decided to go with the MoonLite for this project since they sell nifty kits designed to mate their focusers to Newtonian tubes of any diameter. I purchased their Model CR Newtonian Focuser (**Image 1**) with a 2.37-inch drawtube, three locking screws on the drawtube compression ring, a locking knob, and the adapter kit. The focuser also came with a 2 inch-to-1.25 inch adapter. Altogether with shipping, I

Image 2 - Shown are the MoonLite Model CR focuser plus the MoonLite installation kit, which includes an adapter plate with radius base to match the tube diameter, two optional spacers and stainless steel fasteners.

spent $354US.

MoonLite has quite a selection of drawtube lengths to choose from. I chose the 2.37-inch length to allow enough focus play to accommodate eyepieces of various lengths and styles, as well as provide enough back focus for CCD imaging. The focuser came with a 1/2-inch spacer plate and a 1.0-inch spacer plate that can be inserted singly or together between the focuser and the adapter plate to adjust for the correct focal plane of an individual telescope.

While it's not necessary to remove the optics to replace the focuser, I recommend it. Removing the primary mirror eliminates the risk of dropping something down the tube and damaging the optics, or getting dust and grit on the mirror if new holes have to be drilled in the tube. For smaller telescopes, it is difficult to reach into the tube around the secondary and spider. For my 10-inch Newtonian, there was plenty of room to maneuver around the spider, but I did not want to risk smudging the secondary mirror or getting it dirty. So before I began, I removed all the optics from the optical-tube assembly (OTA). I used this opportunity to clean the optics and to center mark the primary mirror.

After removing the old focuser, I laid out all of the parts for the new focuser as shown in **Image 2**. The smaller sets of socket-cap bolts on the left are for securing the curved adapter plate onto the OTA. The kit only came with the longest four screws and the shortest four screws. Neither worked for my tube thickness. I called Ron Newman at MoonLite and explained the problem to him; specifically that I could not find any stainless steel #5-40 screws of any length locally. He immediately sent, via priority mail at no expense to me, the two middle length sets. Thanks, Ron!

The four larger diameter sets of socket-cap screws are for attaching the focuser to the adapter plate. The fours lengths accommodate: 1) attaching the fo-

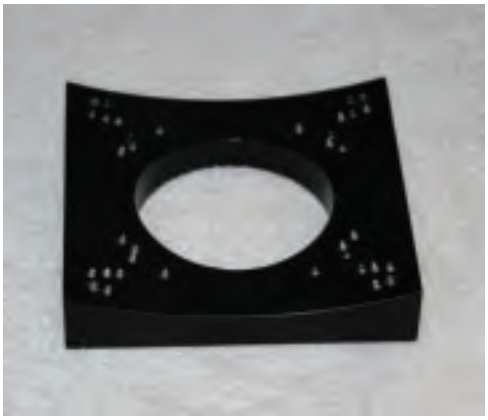

Image 3 - The curved adapter plate is predrilled with nine holes in each corner, a combination of which should match the existing four focuser mount holes drilled in most factory-made Newtonians. Unfortunately, the author's original focuser mounted with eight screw holes, none of which matched the various combinations of the adapter plate, so new holes had to be drilled.

Image 4 - To make a template for drilling the OTA, the author cut a piece of paper to the size of the curved plate and used a push pin to mark the location of the four outermost holes on the adapter plate.

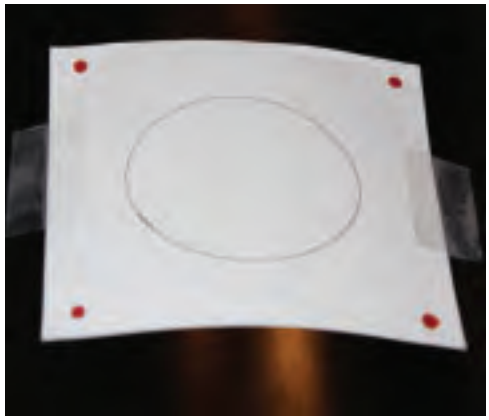

Image 5 - The author then taped the template to the OTA over the focuser hole, paying careful attention to centering the template squarely over the focuser hole. He used the same push pin to make indentations in the tube, marking the locations for the four new holes.

cuser directly to the adapter plate, 2) installing the focuser with the 1/2-inch plate, 3) attaching the focuser with the 1.0-inch plate, or 4) installing the focuser with both plates. The only tools needed were two Allen wrenches.

Because my Newtonian has a fiberglass tube, I decided to use fender washers on the inside of the tube to spread out the pressure of the tightened bolts. The fender washers did not come with the kit, but are available at most hardware stores. I slightly bent the washers in a vice to allow for the curvature on the inside of the tube. I then painted them with two coats of black rust-protection spray paint.

Image 3 shows the curved adapter plate. It comes predrilled with nine threaded holes in each corner, one combination of which should match the existing four holes used to mount the stock focusers of most factory-made 10-inch Newtonians. Unfortunately for me, my original focuser used eight bolts and none of the predrilled holes matched the pattern on my OTA, so I had to drill new holes in my tube.

I made a template before drilling the tube. I cut a piece of paper the dimensions of the curved bottom of the adapter plate and used a push pin to mark the location of the four outermost holes in the plate (**Image 4**).

I taped this to the OTA over the focuser hole, paying extra careful attention to centering the template squarely over the focuser hole, aligning the template ac-

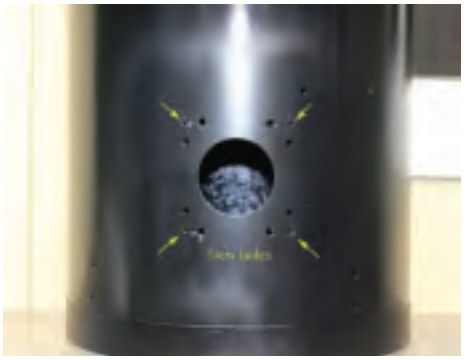

Image 6 - The author first drilled pilot holes with a handheld cordless drill using a small drill bit and then used larger diameter bits to achieve finished holes of the correct size.

Image 7 - Shown are the fender washers and bolts installed on the inside of the OTA through to the four outer threaded holes in the adapter plate.

Image 8 - The mounted adapter plate is shown secured to the OTA.

Image 9 - The author installed the MoonLite Model CR with the 1/2-inch plate to achieve proper spacing.

Image 10 - The primary mirror did not come from the factory with a center mark, so a template was made the same diameter as the mirror for positioning a DIY mark.

curately with the tube axis (**Image 5**). I used the same push pin to make indentations into the tube, marking where the four holes needed to be drilled through the tube.

I drilled pilot holes with my handheld cordless drill using a small drill bit and then used larger diameter bits until I had finished holes of the proper size. **Image 6** shows the new holes. There was a little chipping in the fiberglass around the holes I drilled, but mine don't look any worse than those drilled for the factory focuser I removed.

Once the holes were drilled, it was easy to attach the curved adapter plate. **Image 7** shows the fender washers and bolts on the inside of the tube, while **Image 8** shows the adapter plate secured to the outside of the tube.

Attaching the focuser to the adapter plate simply required inserting the proper four screws through the focuser and the 1/2-inch spacer plate and tightening them in place. The 1/2-inch plate was the only spacer needed to position the focus properly along the focal plane. **Image 9** shows the finished installation.

Like most, the MoonLite CR Newtonian focuser does not feature the push-pull level adjustment screws used in some focusers to adjust the axis of the drawtube to intersect the axis of the telescope tube at a right angle. However, with the curved adapter plate snugly against the outside of the telescope tube, I was confident the drawtube was properly aligned. I confirmed this to be the case upon replacing and collimating the optics.

I mentioned I used this opportunity to clean the optics. I removed both the primary and secondary mirrors from their cells and cleaned them in my kitchen sink. I first rinsed them with tap water and then applied a diluted solution of Ivory-brand liquid dish soap with a cotton ball to clean the surface, applying no pressure other then the weight of the wet cotton ball.

After rinsing with lots of tap water, I rinsed each mirror using isopropyl alcohol. This removes any soap residue the water rinse might have missed. I rinsed off the isopropanol with tap water then used distilled water for the final rinse. I placed each mirror on a towel tilted at a 45-degree angle and let them air dry. In my experience, this simple method of cleaning telescope mirrors has never harmed a mirror coating and results in clean mirrors with no water spots every time!

My primary mirror did not come from the factory with a center mark. I made a template the same diameter as my mirror with a hole cut in the center (**Image 10**). I took a piece of thick electrical-type tape and used a hole-punch to cut a hole in the center of a small round piece. I placed the template over the mirror and used Scotch-brand tape to hold it to the sides of the mirror. I installed the hole-punched piece of black tape onto the mirror through the hole cut into the middle of the template, ensuring the holes were both concentric before pressing the center mark onto the mirror. **Image 11** shows the center mark on the newly cleaned 10-inch mirror.

Reassembling and collimating the optics were the final steps in preparing my Newtonian with its new focuser for return to service. Swapping out the focuser was an easy task, and with the new high-quality focuser, I am now able to use this telescope for CCD imaging. ATT

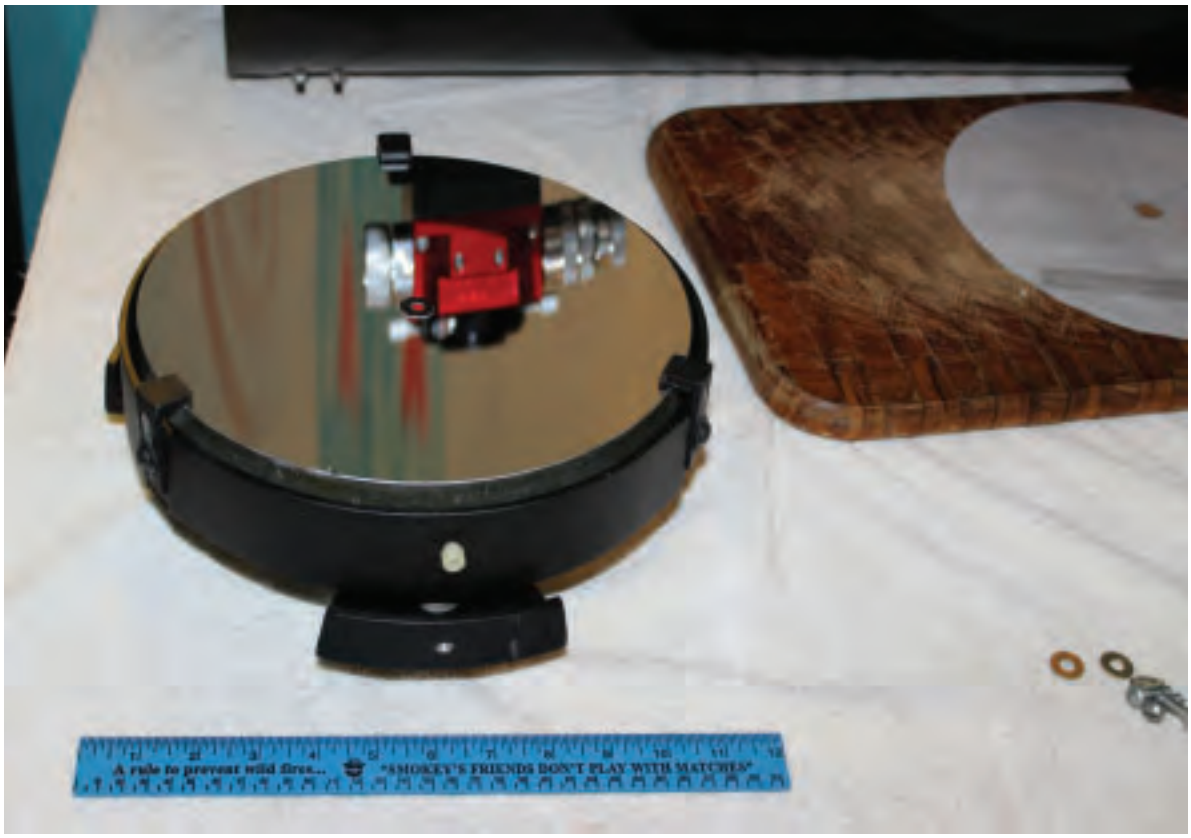

Image 11 - The author fashioned his DIY center mark from black electrical tape cut to an octagonal shape around a center hole made with a standard hole-punch.