

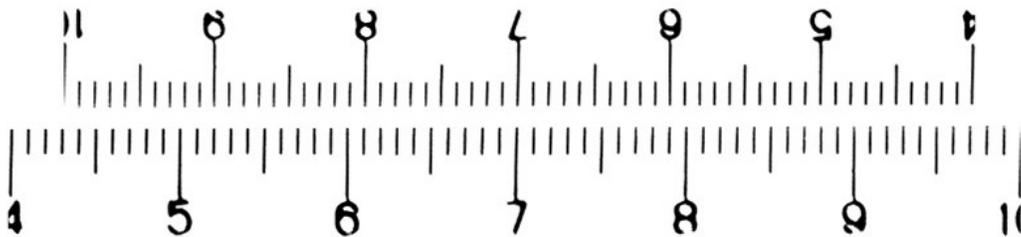
Two Focusing Aids for Astrophotography with Camera Lenses

December 19, 2007 W. John McDonald

For anyone contemplating doing wide field astrophotography using camera lenses, focusing can be a challenge. It is also quite important to get a more precise focus in astrophotography than is usually needed in terrestrial imaging but most modern camera lenses are not well suited to manual focusing. The focus rings have too little movement to provide a precise setting and the scales are usually too coarse to allow repositioning the lens once a good setting has been found. Alan Dyer has highlighted the importance of precise focus and given some suggestions for achieving it on page 87 of the November 2007 Sky and Telescope magazine. The methods and devices below are some additional ideas for focusing of camera lenses.

Aid One – the Vernier Scale:

The first useful aid is a simple Vernier Scale as shown below. This is really two scales one of which is 10% shorter than the other. By attaching one to the lens body and the



other to the focusing ring, it is possible to estimate the focus position to 1/10th of the smallest division of the longer scale. To do this you simply look at where the left index mark on the left of the short scale falls on the longer scale. Suppose it lies between 6.5 and 6.6 as shown in the image below. Then you look for which of the short division marks lines up with those of the longer scale. Suppose it is the 5th one. Then the scale



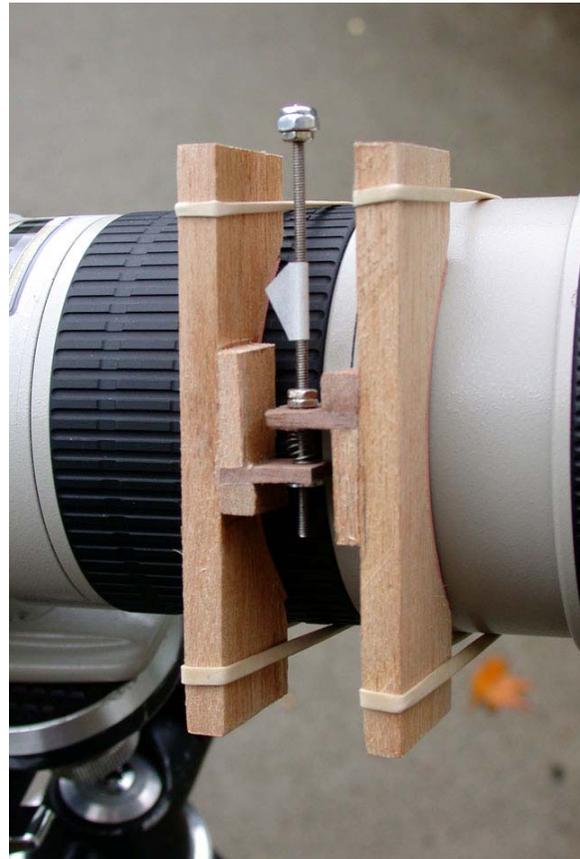
reading is 6.55. A magnifier can be used if needed and of course, a red flashlight is required in the dark.

If you wish to try this, just print an appropriate sized version of the first figure for your needs and cut each scale out. You just need a length of the short one that covers two of the large index marks but it is convenient to have a longer section of the larger scale. I have attached the scales to my lens using paper glue. For weather resistance, the scales can be covered with clear tape.

Aid 2 – Micro Focuser

The second tool is a micro focuser made from some bits of wood and a 4-40 screw as shown below. The picture is fairly self explanatory. Two plates are connected via the screw such that they can be moved relative to each other with the screw. I have a bit of reflecting tape on the screw as a tab to facilitate counting turns. One of the plates is held on the lens body and the other is attached to the focusing ring using elastic bands.

I use this tool to check for the precise focus position by taking a series of images of a bright star while keeping track of the number of turns of the screw I have made from the starting position. Once I know that number for the best focus position, I use half turns around that spot. The focuser can be repositioned very accurately so it is easy to make repeated checks and be sure of the best focus point. Then I take the vernier reading for the most precise focus point and use that to reset the focus quickly if it is disturbed for any reason. Unless there is a significant change in temperature it is not usually necessary to recheck the focus using the Micro Focuser during a session or even when setting up on a different night. Checking the vernier to make sure nothing has changed is usually sufficient. In the case of the 300 mm L series Canon lens I have, I have to use the micro focuser each night because the lens has a slip clutch on the focus ring and the relative position of the two scales will shift if the ring goes past either end of the focus travel.



Using the Focus Aids

The following is a set of steps gives precise focus quickly and fairly painlessly.

- 1) With the lens on auto focus, focus on a bright star or the moon. If possible, set the cameras to use a single autofocus point in the center of the screen. The target must be located on top of this focus point for the autofocus to work. For ease in achieving this, it helps to switch on the autofocus led light manually if you can and use it to aim at the target.¹⁾
- 2) Read and record the vernier scale position.
- 3) Attach the micro focuser and then, and only then, switch to manual focus.
- 4) Check the vernier reading and reset the focus ring if necessary using the micro focuser to get the same reading as found in step 2.
- 5) Do a series of images of a bright star with different micro focus settings. Be careful to avoid overexposure of the star. Try 1/60 second exposure at ISO 400 to start and adjust to get a visible but not too bright image.
- 6) Pick the best focused image from the series and reset the micro focuser to reproduce that setting.
- 7) Record the vernier reading that gave the best focus and the ambient temperature for future reference. If you inadvertently move the focus ring by mistake and need to reset the focus position the vernier reading will usually suffice.

Footnote

- 1) On many cameras, it is possible to select the focus point you want to use instead of having them all active. Often it is also possible to turn the indicator led on manually and have it stay on for a brief period while you center the target.