Using the G11/GM-8 Polar Finder

Updated 12/15/2001

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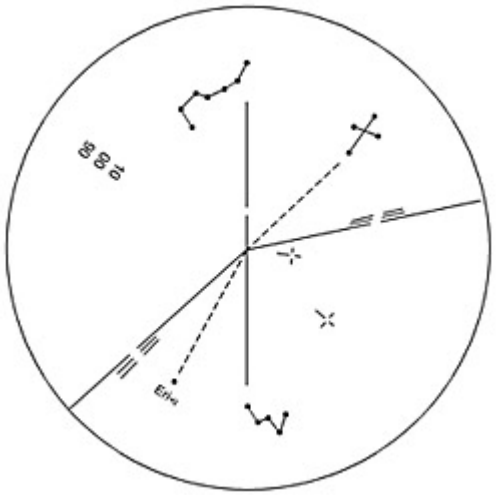
Astrophotos



In the early 90's when I got seriously back into amateur astronomy I purchased a Celestron CG-11 system which consisted of a C-11 tube assembly mounted on a Losmandy G11. Since that time, Celestron has gone on its own way and now packages its own G11 clone mount with the C-11. The information below pertains only to the old CG-11 system or standalone G11 or GM-8 mounts produced by Losmandy (Hollywood General Machining).

One of the inadequately documented items in the Celestron system package was the optional polar finder. The first step was to install the polar finder. If the documentation you got also was not adequate for installation or you don't have it because you bought a used mount, see my Polar Finder Installation notes.

Once you have the finder installed, you then have to figure out what all the marks on the reticle are used for. The marks were cryptic to me literally for years because they were not mentioned at all in the documentation supplied. However, recently this became much clearer to me when I acquired a **Kenko Sky Memo** single-axis tracking mount which has the same polar finder, and I was able to decipher enough of the Japanese instructions to figure out more of the subtleties of the polar finder. Both the Kenko tracker and Kenko polar finder (which is compatible with the Losmandy mounts) are available from Hutech Corporation (http://www.sciencecenter.net/hutech/).

Shown below is a diagram of the reticle view which has been annotated to make things clearer:

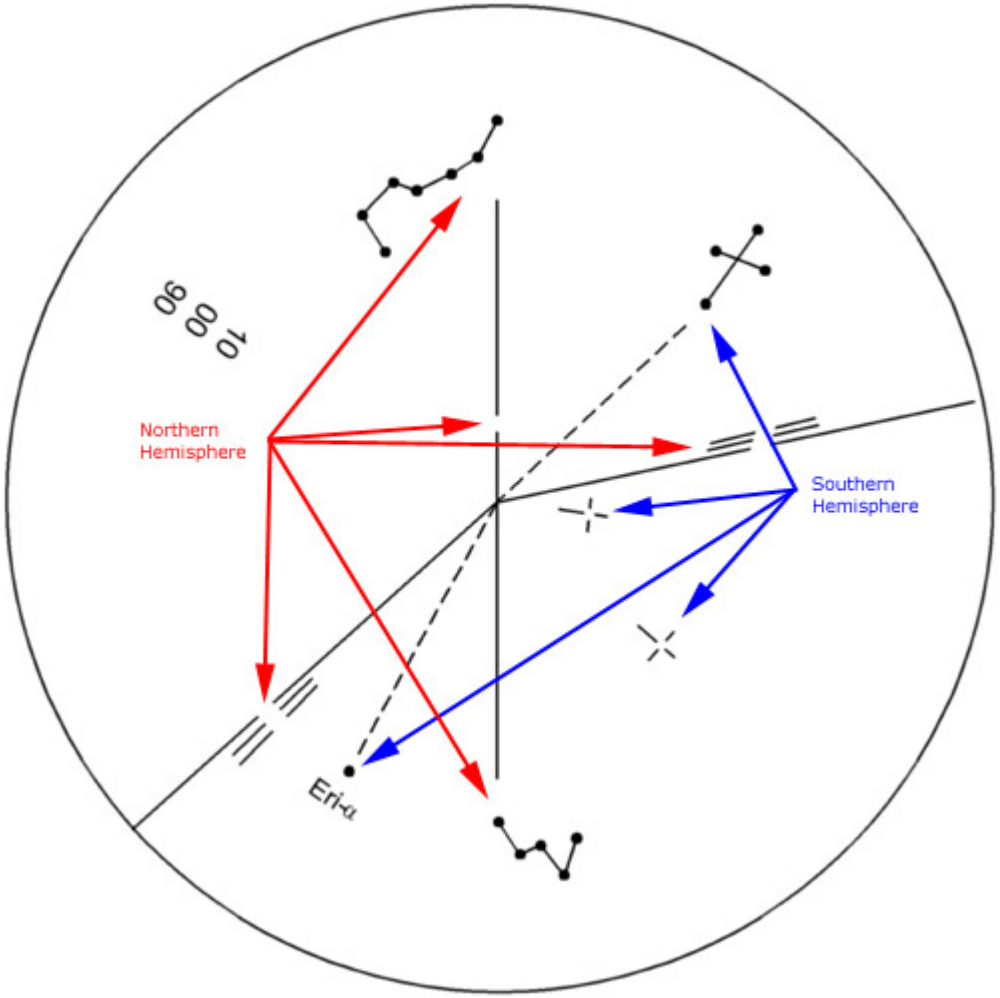


Fig. 1. Polar finder reticle.

The first thing to note is that the finder is meant to do double-duty. There are markings applicable to the Northern Hemisphere (red arrows in figure 1), and there are markings for the Southern Hemisphere (blue arrows). In some finders, the lines are actually labelled with "N.H." and "S.H." The important thing is to ignore the set that isn't relevant to you. Since I'm located in the Northern Hemisphere, that's what I'll discuss below first.

Northern Hemisphere Alignment

The second thing to note is that the constellations shown (Cassiopeia and the Big Dipper) will not be visible in the finder itself. These are used in the first step, which is to rotate the reticle until the constellation references approximately match the current sky orientation. This should

be done after first orienting the mount well enough to at least place Polaris in the view of the finder.

Once the coarse rotation has been set, you can then place Polaris in the gap (indicated in figure 2) using the azimuth and elevation adjustments of the mount. In some polar finders, the words "Place Polaris Here") are also etched on the reticle. Note that as shown in figure 2, the exact position of Polaris changes, depending on epoch.

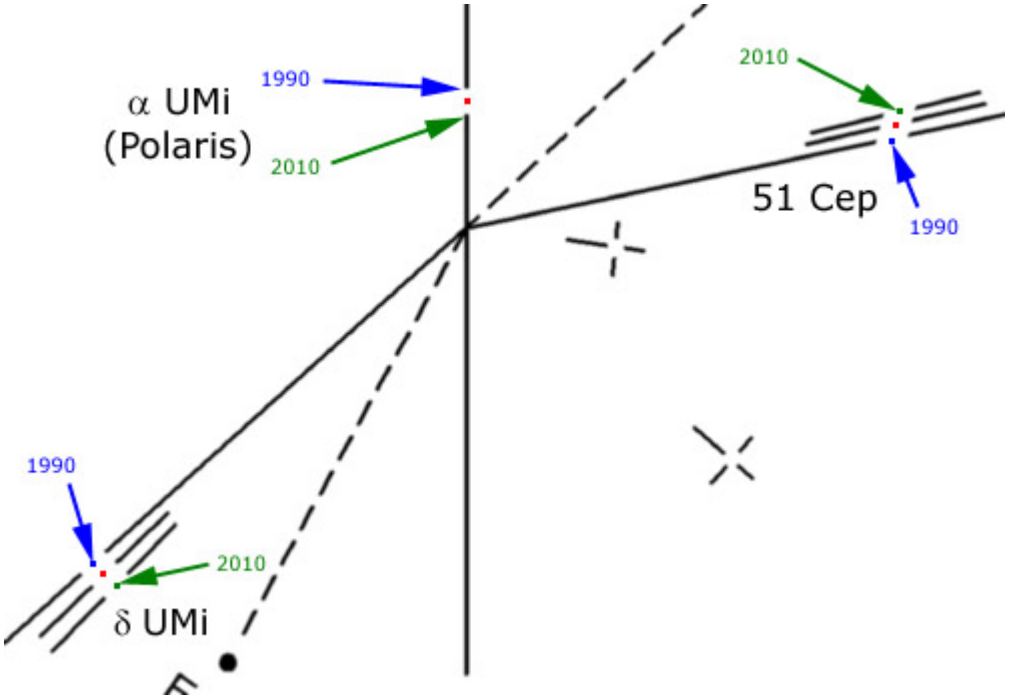


Fig. 2. Northern hemisphere star placement.

Then, using a combination of the azimuth and altitude adjustment and fine tuning of the reticle rotation, place the second brightest star (Delta Ursa Minor) in the gap indicated. In some finders, you may find the words "Place Second Star Here." The three sets of lines/gaps are for the epochs 1990, 2000, and 2010. In the diagram above, the red dot in the middle position indicates the epoch 2000 position. These may be marked cryptically with "90", "00", and "10" in some finders as shown in figure 1.

If you have a dark observing location, you may also be able to see a faint third star. Place this in the third (unlabeled) set of lines/gaps, again using the altitude, azimuth, and possibly rotation of the reticle. If I am able to use the third star, I generally find that I am quite accurately polar aligned, and this considerably reduces the amount of time necessary to finish off with drift alignment. Note that this star is designated 51 Cep in my Kenko Japanese language documentation. This is apparently not a commonly used designation (I checked The Sky version 4, the Millennium Star Atlas, and a few others). As far as I can tell, it corresponds to SAO 1168, a magnitude 5.3 star.

Gotcha! #1 -- Wrong Finder Magnification

The procedure above sounds pretty straightforward, and if you're lucky, that's all there is to it. However, if you are unlucky like me, you got one of the defective polar scopes that came with some CG-11 systems! These have the problem of incorrect magnification relative to the reticle. In my setup, the two stars end up sitting not in the gaps but on the lines closer to the center (indicated by red spots in the figure 3). If you don't know this, you'll undoubtedly have pulled out some hair trying to figure out why you just can't get the stars to fit.

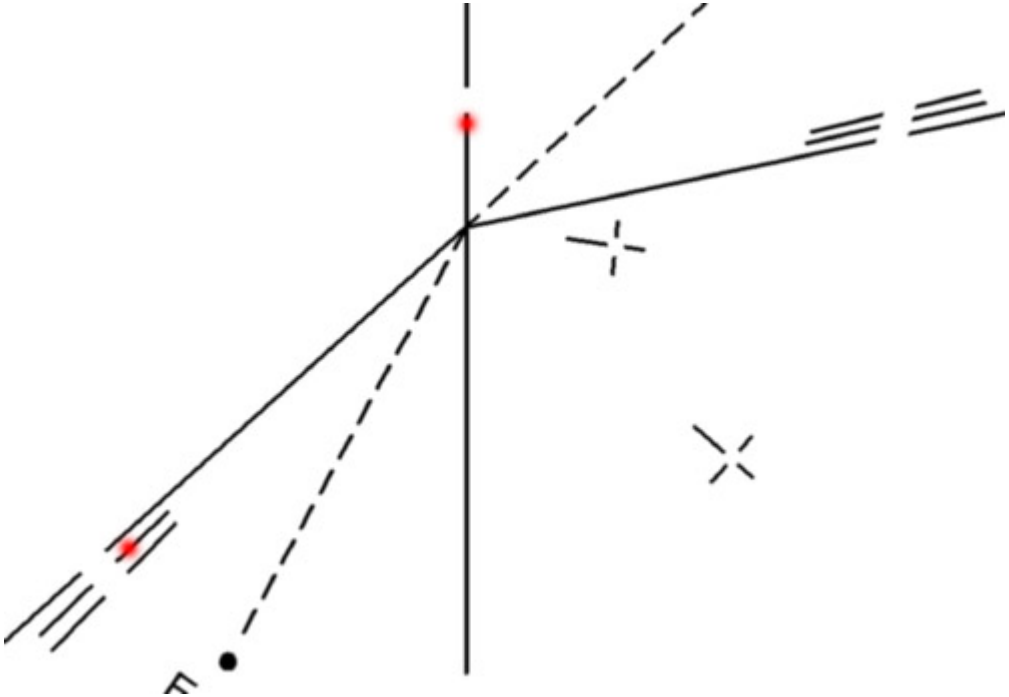


Fig. 3. Northern hemisphere star placement in bad reticles (2000).

The Story Behind the Bad Polar Finders -- When this topic came up on the Losmandy Users Group list recently, Scott Losmandy explained that the polar finders were difficult to get at the time that the Celestron CG-11 systems were being produced. So after the first few hundred units, Celestron went and had their own finders produced for them and it is these scopes which were defective -- specifically, they have the wrong magnification for the reticle markings. These scopes can be distinguished by the words "Put Polaris Here" on the reticle. As far as I am able to tell, new polar scopes sold today are fine.

Gotcha! #2 -- Reticle Illumination Too Bright

Another common problem is that the illuminator that comes with the polar finder is often too bright, obscuring the dim second and third stars. To take care of this problem I now have a custom illuminator power supply box for my G-11 (the Kenko mount has an adjustment built in) which has a rotary selector to brighten or dim the illuminator as required. An alternative low tech solution is to take a black marker or paint or nail polish and paint the LED down to the point where it isn't blinding you.

If you don't have the resources to make your own dimmer and the kludge solutions above don't appeal to you, a third-party product which recently came to my attention is the the AstroElectric Polar Scope Dimmer Controller, a nicely done low cost unit available on the web from Mike Cressy at http://www.4saleusa.net/astroelectric/. Just unplug your polar scope battery pack and plug this in. The knob controls the intensity of the LED, and unplugging turns off the unit which contains its own pair of AA batteries. I am told newer units also switch off by turning the intensity knob all the way down.

Gotcha! #3 -- Mis-centered Reticle

One final item which may trip you up is the possibility that the reticle may not be centered properly. The symptom of this problem is excessive dec tracking error even though you have carefully aligned your mount with the finder. To check and possibly adjust this, you will have to first carefully drift align your mount, then try to rotate the reticle to its proper position. If you find that you cannot do this, you can try adjusting the 3 tiny setscrews (0.035" hex wrench on most finders) which are on the same surface that the illuminator screws into. Some users have reported cracking the reticle by tightening the screws too much so extreme care should be used. Please note that I have not done this myself, so I can't say how easy it is to do (or mess up). If you don't feel confident doing this, it may be best to simply note the offset for the pole position relative to the markings on the reticle.

Southern Hemisphere Alignment

Southern Hemisphere alignment appears to be harder to do because of the lack of bright stars, but the basic procedure is the same. In this case, the Kenko mount instructions recommend first using a compass to set the mount up in approximate alignment towards the pole.

Next, rotate the reticle until the Southern Cross and Alpha Eridani are in the correct approximate orientation (again not actually visible in the reticle).

Finally, place the stars of Octans in the indicated positions using the mount's altitude and azimuth adjustment as well as fine tuning of the reticle rotation. Note that the edges of the tick marks are used also to indicate the exact positions for the epochs 1990 and 2010.

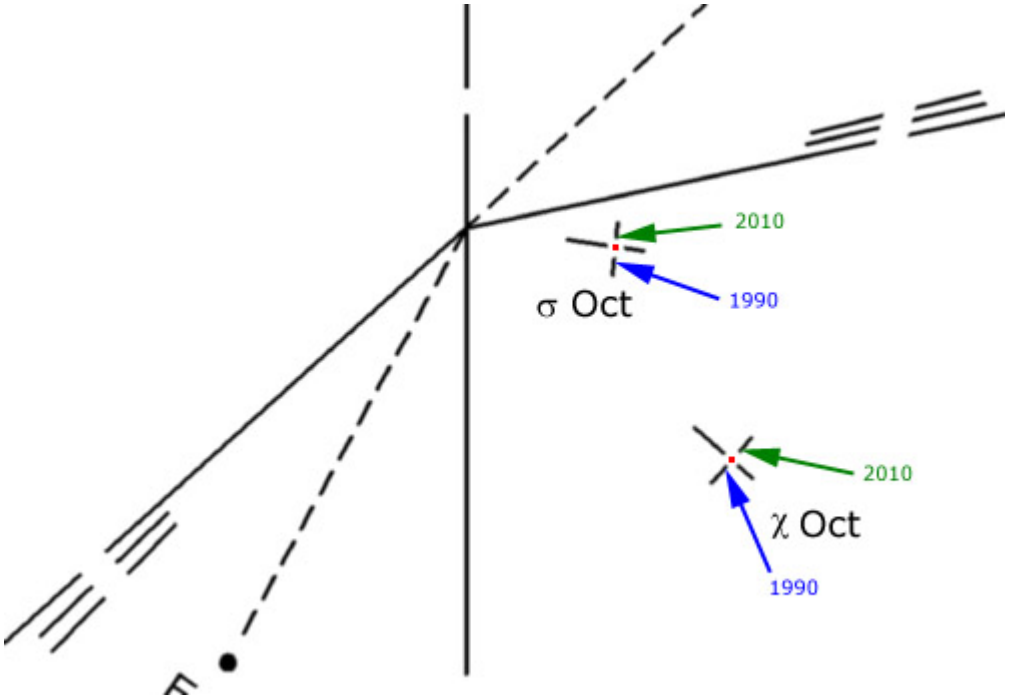


Fig. 4. Southern hemisphere star placement.

Since both reference stars are practically in line with the pole, I would expect that alignment would not generally be as good as for the Northern Hemisphere. I haven't had a chance to personally try the Southern Hemisphere procedure, so someone down there will have to let me know if it works as advertised.

At any rate, no matter how well you set up using the polar scope, final adjustment for astrophotography via a telescope or long telephoto lenses must be done with drift alignment. For wide angle photography away from the poles, this alignment may be adequate.

Many thanks to the Losmandy user group for enlightenment on numerous details!
