# Binary Universe

## The Inner Circles of Collimation

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Struggling with telescope collimation? This very new application, *Collimation Circles*, might be just the ticket to ease the process.

saimons-astronomy.webador.com/software/collimation-circles

### The Dark Arts

Learning the Dark Arts is the price of admission for people entering the astronomy hobby. One must learn about combating dew and ice; one must determine how to power equipment in the field; observers are encouraged to learn star hopping; one must learn the Greek alphabet; if one procures an equatorial mount, you're staring down the barrel of polar alignment; and one must learn how to collimate his or her telescope.

It is ironic that the most recommended telescope type (the Newtonian on a Dobsonian base) is the class that regularly requires checks and adjustments to the collimation.

While documented procedures abound on the internet and in official manufacturer user manuals, these collimating directives are often poorly written, confusing matters at best, or causing the telescope user to make things worse. Be careful of the YouTube video you watch. Turn the screw on an SCT secondary mirror a quarter of a turn, and possibly you've made the alignment much worse. Turn the collimation screws counterclockwise too many times and the secondary mirror might fall out of the holder. Not good.

Over the years, I have collimated binoculars, large and small Newtonians, Schmidt-Cassegrain telescopes (SCT), Ritchey-Chrétien reflectors, and Maksutovs (MCT). That's good on one hand: I've gained experience on a variety of systems. But I don't apply these corrective actions on a frequent basis, so I get rusty. Even I have to dig out my notes to remember the steps.

Happily, the two telescopes I use most often—a vintage 1980's Celestron 8-inch SCT and Meade ETX-90 MCT—do not require regular adjustments. They "hold" their collimation well. I adjust the SCT once in a blue Moon.

The ETX is off a bit, but that's primarily due to an issue that is not easily resolved. The secondary is slipping. This is a famous known problem where the adhesive weakens at some point, allowing the spherical mirror, under the pull of gravity, to slide out of position. That said, it appears exactly the same as when I received the telescope from Charles Darrow in April 2012.

It was the Edmund Scientific 6-inch Newtonian that I cut my teeth on aligning a reflector. I haven't used this 'scope much to date—but I plan to when I finish the home-made Dobsonian base.

Collimating a large or long Newtonian is easily done by two people, one in the front and one at the back. This can however create spiralling arguments not unlike those between a driver and a navigator on a long road trip.

It was this practical problem that spurred me to try something different. One can complete the task with a camera with a live-view function. I first attempted this on 2012 August 25 . "Holy cow." I said in my blog. The process was very convenient. "I don't think I'll ever go back!"

And now there's another reason…

### Collimation Tool

There's an app for that!

If I remember correctly, it was in February or March that I spotted the post in Cloudy Nights, titled "Collimation Circles, app for easy telescope collimation." Easy collimation? Yes, please!

This thread had actually started earlier, initially created by the software developer, in December 2022.

The developer was actually prompting for feedback, essentially looking for guinea pigs—er, beta testers—for his new program and, in short order, a few people jumped into the fray, sharing observations and testing the application in different scenarios.

I was reluctant to get involved at the early stages, so I just watched from afar. I lurked. But by April and May, it was clear to me that the application was working well so I decided to give it a go. And in very short order, I was quite pleased; extremely impressed, actually. While simple on one hand, it is brilliant in terms of what it does and offers.

### Easy Installation

I decided to do testing in the Windows environment partly to avoid inevitable challenges presented by Linux. Windows experiments would afford a speedy analysis. Others on Cloudy Nights are using Linux. I might test on the Macintosh platform, but I'll need some time in my mom's office to do that.

A preliminary step was to install the framework. The developer had used a new version of the .NET coding tools from Microsoft that I had never used, so I went about downloading and launching the Version 7 package. No issues with this on John Gomez, the Dell laptop computer running Windows 10, 64-bit.

Then I downloaded the application proper from GitHub. The developer prepared a distribution for the Windows environment, assembled in a ZIP file. Again, no issues downloading and opening this archive. In fact, the program did not require a formal installation process. I was up and running after launching the main executable .EXE file from the application folder.

Thar she blows.

## Transparency

On launching *Collimation Circles*, a window is displayed (Figure 1) with various circular patterns, crosshairs, and other shapes.

Beyond these various circles and shapes, in the background of the window, you will see whatever is on your computer desktop display.

I wonder how many users hearing about this program truly understand what that means. It is a bit of a brain bender, at first glance, but the spirit of this is that you, the user, will place this window with its graphical elements over top of, and carefully aligned with, the image underneath. And the image underneath will be from your camera-acquisition software.

You can tell some people don't grasp this, as CN members were asking about if the app supported a certain camera or supported a certain acquisition program. *CC* doesn't do that—it has no acquisition capability. By design, it's simple in that regard, it relies on the acquisition being done normally by some other piece of software. *Collimation Circles* literally lies on top of the external camera software.

The default view presented shows a light-coloured outer circle, and a light-coloured inner circle, three green, small disks for the screw positions, a set of red lines radiating from the centre corresponding to spider
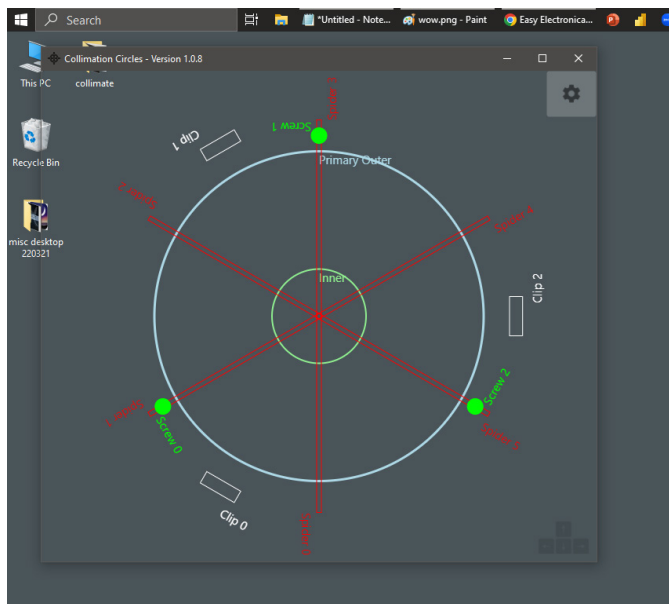


*Figure 1 —* Collimation Circles *application main window with transparent background.*

vanes, and then finally white rectangles for the clips. All these shapes and patterns are fully adjustable.

To adjust the settings in *CC*, one simply clicks the gear or cog icon at the top right.

## The Live View

Another reason I decided to drop the *Collimation Circles* application onto the Dell is because I was already using it with the *Backyard EOS* software! I could rapidly begin testing by opening *BYE* and carefully positioning the *CC* transparency window over top of the image presented by the camera in the live view in the *Backyard* software.
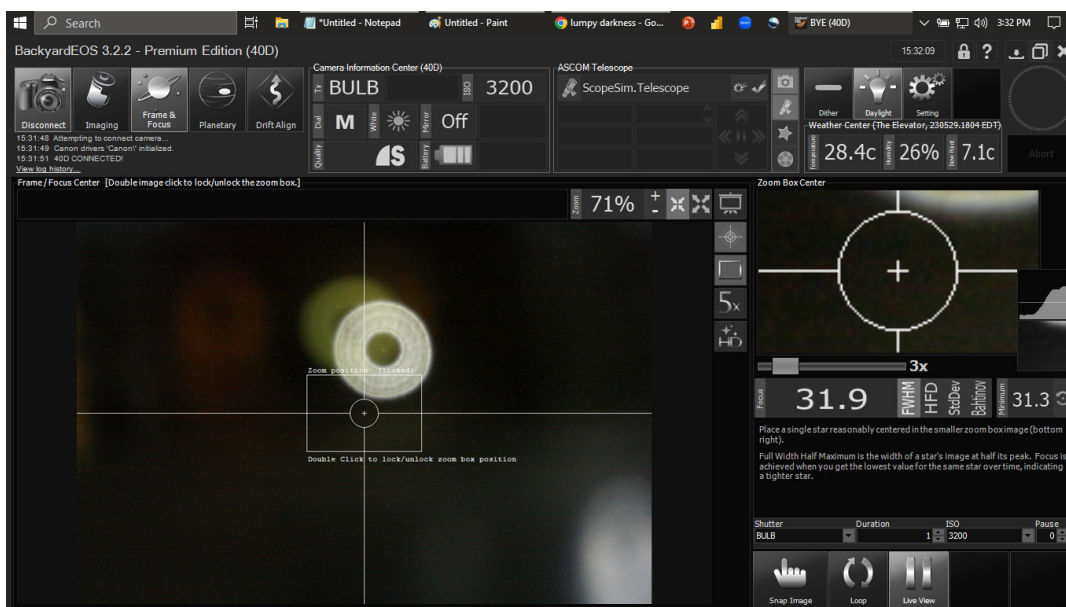


*Figure 2 — Backyard EOS showing a live view of a (false) star to assess collimation.*

In the interest of time, and with a deadline looming (er, slipping), I decided to do an indoor test with a false star. I grabbed the Orion soft-cover case with the C8 within, and I set up the optical tube assembly on a work table. I attached the Canon 40D to the output of the Williams Optics focuser. I aimed the OTA down the hall toward a shelf in the kitchen pantry. Here I had a Christmas tree decoration—a shiny, glass ball—off which I bounced the beam from a single LED flashlight. Back at the Dell computer, I launched *Backyard EOS*, switched to Frame and Focus, which flipped open the shutter. I adjusted the exposure settings to darken the scene.

With the false star so close to the OTA, 5 metres versus 347 400 000 000 000 000 metres, I had to rack the onboard focuser to an extreme limit before seeing a hint of the defocused disk of light in the camera software. Then I used the WO focuser to create a defocused ring typical of that used while collimating (Figure 2).

I zoomed in the live view in *BYE* to produce a reasonably sized disk.

And finally, I dragged the *Collimation Circles* transparent window to be roughly aligned with the image presented by the camera.

## Adjusting the Patterns

The *CC* Settings window (Figure 3) shows a list on the left corresponding to the elements shown in the transparency window. Items may include an inner circle, primary outer circle, a spider, a screw, and a clip. The Add menu at the top-left allows more elements to be shown, as needed. Items in the list may be removed with the trash-can button. Items can be made active or inactive with the check-mark box.
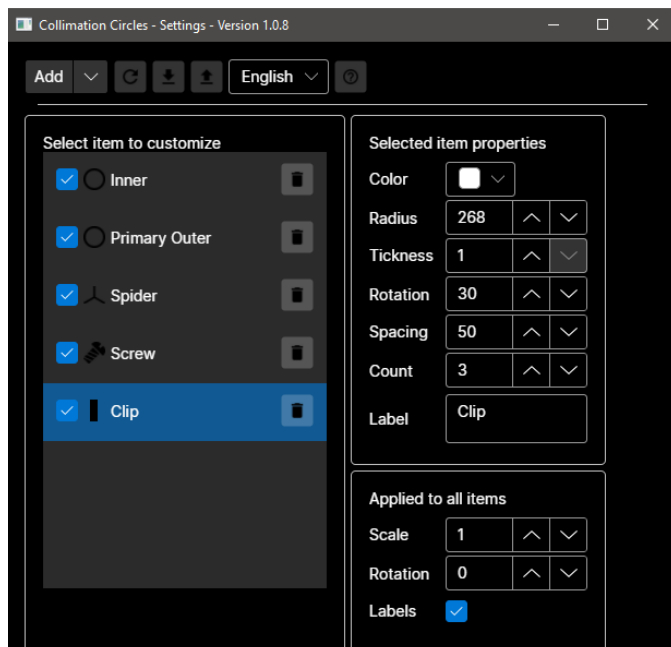
Figure 3 — The Settings screen allowing complete control over the appearance of all added shapes.

For each item, various parameters can be adjusted. For all, the colour can be set, as can the radius or distance from centre, the line thickness, and the annotation label. For some elements, e.g. the spider, a few other options are exposed: the rotation angle, spacing between lines, and the number of elements.

A master control for all objects exists at the bottom-right and here we can set overall scale and rotation.

I found this all very easy to use.

I then created templates for the SCT (Figure 4) and the Newt (Figure 5) and saved each profile using the JSON format. Handy for people who own multiple 'scopes or who have access to multiple instruments.
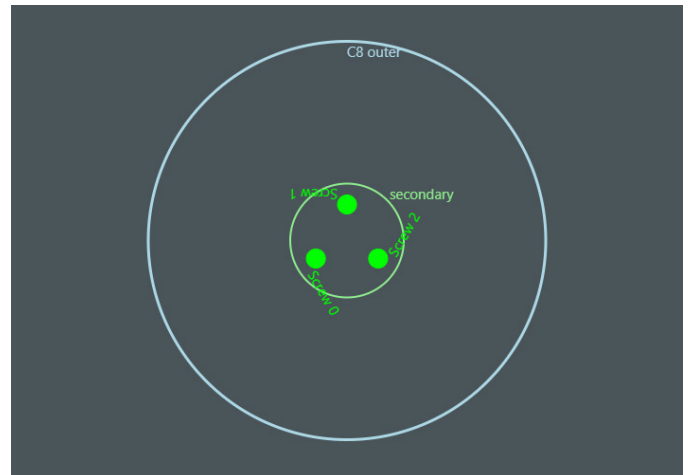
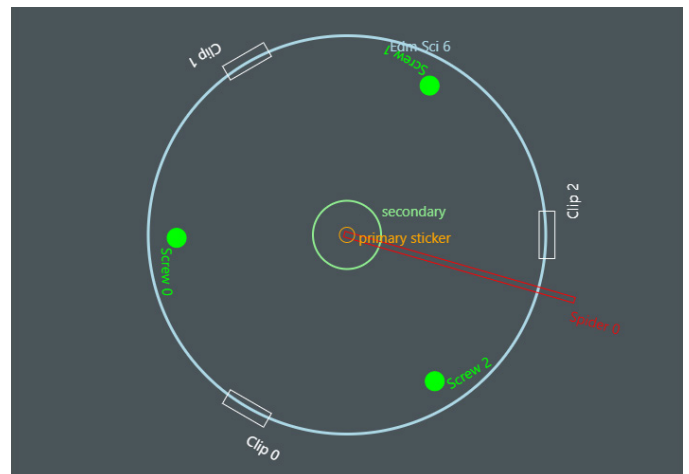Figure 4 — SCT with adjustment screws on secondary mirror.

Figure 5 — Newtonian with secondary suspended by single post and adjustment screws behind primary mirror.

It was while playing with the templates that I noted the little toolbar at the bottom right of the transparency window. Hovering, I learned of welcome keyboard shortcuts, notably to nudge the window by one pixel. Perfect!

With a tuned set of collimation circles, a telescope operator is ready to undertake the task easier than ever before.