Cloudy Nights Telescope Reviews

Coronado "Personal Solar Telescope" (PST)

by David Knisely click to email author

Coronado Technology Group
1674 S. Research Loop, Ste 436,
Tuscon, AZ 85710 http://www.coronadofilters.com
(available from various retailers)
MSRP: $500

For most observers, the sun is an interesting but rather sedate target, with little change from moment to moment. However, in very narrow passband filters centered on the Hydrogen-alpha spectral line (6562.8 Angstroms), the sun changes from a middle-aged star with a mild case of acne to a seething red ball of light with lots of detail and a few occasional fits of bad temper! Unfortunately, H-alpha filters narrow

enough to show these details in the solar Chromosphere have tended to be quite expensive, sometimes requiring some specialized setups to work properly. However, this has now changed with Coronado's introduction of the "PST" or "Personal Solar Telescope". With this little gem, H-alpha solar observing is now vastly more affordable, portable, and convenient.

Product Description

The Coronado PST is a compact solar telescope designed for low to moderate power viewing of the sun in the light of Hydrogen-alpha emission. It is a 40 mm (1.57 inch) aperture f/10 telescope with an internal etalon-based H-alpha filter having a passband width of under one angstrom (such sub-angstrom bandwidths are required to show significant disk detail). The instrument basically looks like a long gold colored tube with a black objective housing out front and a black box like rear section on the other end with an eyepiece sticking out from near the rear at right angles to the long axis of the telescope. The telescope is 15 inches long (minus the lens cover) and at maximum about 3 inches wide, although the eyepiece holder will add 2 inches to this width. The black boxy back end is 5 inches long, 2 inches wide, and 3 inches thick, with the eyepiece holder located on the upper side. The PST is solidly constructed, with surfaces being mainly metal (the back housing appears to be made of aluminum). The total weight of the instrument is only about 3 lbs, so it can be supported by even a modest camera tripod, although a small but sturdy equatorial mount or a quality tripod with a slow motion head is recommended for visual

use. Indeed, the underside of the rear portion has two 1/4-20 pitch screw holes for standard photographic tripods or other mounting hardware.

The eyepiece holder sits towards the back of the larger rear section and is standard 1.25" format with a nylon set screw. Focusing is done internally using a small metal focusing knob located on the underside of the back of the rear section. Next to and just ahead of the eyepiece holder is the 1/2" diameter round frosted glass window of the "Sol Ranger" sun finder used to help point the telescope at the sun. At the front of the box like rear section, there is a large thick knurled ring which can be rotated to tune the filter of the telescope, helping to compensate for changing environmental conditions. The tuning ring's rotation action was slightly on the stiff side, but was smooth and not too stiff to prevent tuning while looking into the scope.

The objective of the telescope shows evidence of quality highly reflective optical coatings, probably to reject off-band solar energy prior to etalon filtering. Indeed, the interior of the tube was not visible due to this reflectivity, and the reflection of the room off the objective was faintly bluish in color. The forward objective housing is capped by a thick metal lens cover which is screwed onto the housing like a threaded filter. Indeed, this threading of the objective housing is specifically designed to be used to quickly mount an external Coronado SolarMax/T-Max 40 mm filter on the front of the PST to narrow the PST's passband and increase the contrast of the disk detail. The eyepiece holder has a small red

blocking filter in its base, which, to some extent, limits the field of view of the telescope, although the field is more than enough to easily show the entire sun and quite a bit of sky around it.

The eyepiece included with the instrument is a 12.5mm Kellner (32x), which is reasonably good and has a nice rubber eyecup to help exclude ambient light and make the rather red image of the sun easier to see. As options, Coronado offers its CEMAX series of eyepieces optimized for solar H-alpha use, as well as the "MALTA" (Manual Altitude-Azimuth) mount, a miniature altazimuth mount designed for table-top use. The telescope also comes in a very nice padded case for transportation or storage, with enough room for both one eyepiece and the "MALTA" mini-altazimuth mount (some of the foam could also be potentially removed to make room for maybe one or two more small eyepieces).

Performance

Quite frankly, the Coronado PST is one impressive instrument which is a joy to use. I tried the PST on both my old Orion EQ-1 driven equatorial mount as well as a simple but sturdy Chinese table-top camera tripod with slow motions. In both cases, the mounting schemes succeeded, although with the equatorial mount, the direction of the eyepiece occasionally changed to some less than comfortable locations since the eyepiece holder orientation is fixed relative to the mount. For higher power and longer duration clock driven viewing, the equatorial mount worked fairly well, although it would have been nice to have the scope rotatable in some sort of ring mount. I have also seen people use the fork

mount from a Meade ETX-90 to support and drive the PST. However, the small camera tripod arrangement ended up being the one I used most, as its convenience outweighed its minor drawbacks. Using only the small camera tripod, the PST could be placed on a firm surface like my large redwood picnic table or a concrete bench to give fairly good stability. I could grab the PST in only one hand and be out observing on the patio in only a few seconds.

The scope is not dynamically balanced on such a tripod, so I had to do some fussing with the tripod's altitude locking knob initially. However, the slow motions had a lot of range, so once set up, I rarely had to adjust the gross orientation of the tripod unless I observed for more than half an hour or so. I pointed the scope initially using the "minimize the shadow" technique most solar observers tend to use. Once close to the sun, a brilliant dot of light appeared in the window of the "Sol Ranger" finder, which allowed me to fine tune the pointing. However, when the sun's image was perfectly centered in the PST's eyepiece, the dot of the sun in the Sol Ranger finder window was just a little below center rather than being dead centered as I expected. When pointing the scope, care should be taken not to block the little opening on the front of the box section at the base of the tuning ring, which is where the light for the Sol Ranger enters the box section of the scope.

For those who have never used an H-alpha filter, the prominences along the limb of the sun are easy to see, and are quite fascinating to watch. However, the visual contrast of the detail seen on the solar disk is often fairly low, sometimes requiring a little study to get the full effect of the image. The H-alpha sun images you see on some web sites or in some books have the contrast boosted enormously, so don't expect too much when you first look in. There will also be times when the sun is inactive and there are few if any prominences on the limb with not a lot of disk detail. You should be prepared for this and understand that the sun is a sort of variable star, but still worthy of long-term study. The more you look and the more experience you get, the more H-alpha details will become obvious to you.

As a long-time DayStar 0.7 Angstrom T-Scanner user, I have been a bit skeptical about the amount of detail a 40 mm aperture would show, especially with a filter that was only stated at being somewhere under one angstrom in bandwidth. What I expected to see in the PST was a small red sun with the prominences around the edges and maybe a hint of disk detail, but what I really saw just stunned me! Even without adjusting the tuning, I could immediately see the "dark mottles" (fine disk fibril detail away from active regions) quite clearly, along with plage, sunspots, and numerous bright prominences around the limb. I played with the tuning and was shocked to see a number of large dark Quiet Region Filaments (QRFs) suddenly appear on the disk. The contrast of these filaments was much higher than I was used to seeing with the T-Scanner, partly because of the lower power, but partly because of the sharpness of the PST's filter. I would have to say that the passband I was seeing was probably close to that of my T-Scanner when it is at its coldest operating temperature, as the disk detail was quite comparable. Indeed, when playing with the tuning, the plage in active regions became so bright that if I had seen the same plage brightness with my T-Scanner, I would have stated that some of these areas were at full solar flare level! I could easily pick out a few small isolated brighter spots of light known as "ephemeral regions", which are often hard to see in my T-Scanner. Sunspots sometimes had much of their penumbrae get faint or nearly vanish as I tuned the filter, showing that the passband is nice and sharp. The view was inverted but not mirrored, as is the case with a standard astronomical telescope

without a star diagonal.

I tried a variety of eyepieces and powers from as low as 16x to as high as 100x, but I ended up using mainly the range between the 32x of the included 12.5mm Kellner, and 62.5x provided by my 6.4mm Meade SuperPlossl. Most of my 1.25" eyepieces did achieve focus in the PST (except for my variable focal length 5-8mm Speers-Waler when adjusted to a focal length smaller than 7mm). With some, it took a lot of rotation of the tuning knob, but eventually a focus was achieved. I found that below 25x, much detail still remained visible, but the scale was becoming rather small for the finer features, and some vignetting was visible near the edges of the field with eyepieces longer than 20mm. Longer focal length eyepieces also seemed to show a faint circular hazy glare around the disk of the sun, which was less bothersome at higher powers. With the 12.5mm, the entire solar disk was visible in a field which probably close to but not quite a full degree across, so there was plenty of "space" around the disk to watch something large like a Disparition Brusque filament eruption. Prominences were nicely shown, and I spent one late afternoon watching one rise up and break away from the sun. The thin red spicule "fringe" was visible around the very edge of the sun, although most of the individual spicules were below the resolution of the telescope.

I spent a lot of time at 40x using a simple 10mm Sirius Plossl, as it offered a good compromise between image size and the need to adjust the tripod for manually tracking the sun. At that power, a large active

region was showing some very fine filament detail including an active region filament that sinuously curved over some plage and almost touched the edge of a sunspot. Even some arch filament detail in areas where flux emergence was going on was easily visible, which again surprised me a bit. I also had the CEMAX 18mm eyepiece and the CEMAX 2x Barlow for evaluation, which I used successfully together to yield 44x and a nice level of detail. I found the Tele Vue 2.5x Powermate also worked quite well to give me access to some slightly higher power views in the PST. On the whole, the level of detail visible in the PST is somewhat comparable to the full-disk patrol images found on the Big Bear Solar Observatory site, although again, the contrast of those observatory images will be higher than what is seen visually. I attempted some imaging with my little pocket digital camera held up to the eyepiece, but the red intensity was too great for the little thing to handle and the pictures did not come out well. I did manage to capture some of the filaments, the plage, the larger sunspots, and the larger prominences with the camera, but the images do not do the actual view in the eyepiece justice. There are a few people who have successfully used digital cameras with the PST, so check out the Coronado web site if you wish to see what they have done.

The tuning effect of the internal filter of the PST seemed to allow me roughly three different kinds of views:

1. Maximum plage brightness and maximum large filament darkness.
2. Greatest dark mottle and fine filament/fibril detail on disk.
3. Nearly white-light view (detuned to where only sunspots and limb darkening are visible).

I suspect that the point of maximum plage brightness and filament darkness is towards one of the "wings" of H-alpha, so it may be possible to track some doppler shifted features using the tuning. Certainly, the prominences changed their shape and intensity a bit when the tuning was adjusted. Like many etalon-based H-alpha filters, the contrast of the on-disk detail in the PST varied slightly depending on exactly where the sun was in the field of view and how the scope was tuned. One side of the sun might show just a tad higher contrast than the opposite side, but the difference was often fairly small. I did notice just a hint of a little astigmatism in the view of small details near the diffraction limit of the scope, but again, it was fairly minor. I compared the higher power views in the PST to that of my 3.4 inch Maksutov equipped with my 2.5x Powermate and 0.7 Angstrom T-Scanner. The T-Scanner and larger aperture scope resolved somewhat more small scale detail than the PST, but the contrast of the PST detail that was visible was slightly higher than that seen in my T-Scanner. The T-Scanner is also bothered by high temperatures which forces a stronger "tilt" to the etalon (increases the passband width and reduces the contrast), but the PST detail seemed nearly unaffected from temperatures as low as 65F to as high as 95F.

I did have a chance at the Nebraska Star Party to look through a SolarMax 40 filter on a Tele Vue refractor, and the view through the PST was fairly similar. The high power views of in the PST began to get noticeably fainter much beyond about 70x, with little increase in detail. I tried using my 2.5x

Powermate with the 12.5mm (80x), and I could still see a lot of detail, but I preferred using something a bit lower. I even tried about 100x, but that was simply a little too much for the instrument to handle. However, the limited aperture does mean that daytime seeing rarely seriously degrades much of the detail that the PST is capable of showing. Indeed, while taking a break from writing this review, I sat down on my front porch on the south side of my house and got a fairly nice view with the PST of a sun only about 25 degrees above the western horizon! I might eventually want something of a larger aperture, but that will cost a lot more, so for now, the PST has really satisfied my H-alpha cravings.

Summary

What I like about the PST (Personal Solar Telescope)

1. Great views with high contrast and tunability in such a small scope.
2. Very portable and easy to use.
3. Well built.
4. Great price for what it gives you!

What I did not like about the PST (well, not very much, but if you insist.....)

1. Fixed attach point not allowing eyepiece orientation to be changed to suit the user's needs, especially for equatorial mounts.
2. THE FACT THAT IT TOOK SO LONG BEFORE SOMEBODY FINALLY CAME UP WITH THIS THING!!

The Coronado PERSONAL SOLAR TELESCOPE (PST) is a wonderful piece of equipment which should make viewing the sun vastly more enjoyable than it is with simple white-light filters. For its price, it is probably the best way for anyone to get into viewing the sun in H-alpha.

Discuss this in the Cloudy Nights Forums