

Solar Imaging With a MallinCam Video Camera



Article and Photos by Scott Short

Scott's 60mm LUNT double stack with a MallinCam Hyper Color Plus Camera

Back in 1971, I lived in the Philippines. At a local store they sold a 60mm telescopes that came with a dark green glass filter which was meant for looking at the Sun. I saved up and bought it and then, under a banana tree in my back yard, I looked at the Sun. Through the filtered scope, I could make out the circle of the Sun and sunspots for the first time. It blew me away and I was hooked.

Looking back on what I know now about Solar energy, that little filter had taken on a lot of heat and was dangerous. Lucky for me I had the normal attention span of a teenager so I never stayed on a target for very long, otherwise the results could have been tragic.

Fast forward 30 years. In this publication, I learned about the MallinCam Video Camera and its amazing ability to capture deep sky objects in color, I knew I had to have one. So again I saved up my money and got this fantastic camera. Night sky wonders, that were impossible to see with eyepieces, came blazing to life and they were in

color! Then one night I asked myself, "can this work with the Sun"?

I owned a Coronado PST double stack solarscope and through trail and error, and a 2x barlow, I reach focus and videoed the Sun for the first time. The images were not very good and were blotchy and dark. With the guidance of Stephen Ramsden of the Charlie

Bates Solar Astronomy Project, www.charliebates.org, I bought a LUNT 60mm double stacked solarscope with the pressure tuner. The images were better but still not great. With further testing I came up with a combination of scope, camera and software settings that I feel have given me good results.



1971 Solar Filter

Hardware and Hook ups

The Mallincam is a remarkable camera. Rock Mallin included a stepped masking feature that allows for real-time prominence viewing as well as surface detail exposure controls. However to use these features they need to have the proper scope to computer hook up so the magic can happen.

The camera is controlled by 5 buttons on it's back. They toggle through a series of menus for exposure, gain, color balance and so on. For night viewing this can easily be done using a monitor and physically adjusting the camera buttons. Solar is a different critter all together. Because of the intense glare of the Sun, it's an exercise in frustration to first focus the scope and then pick the right exposure using a monitor. Remote cables and software are a must for good results.

For this, I use the camera control cable made by Zengineering:

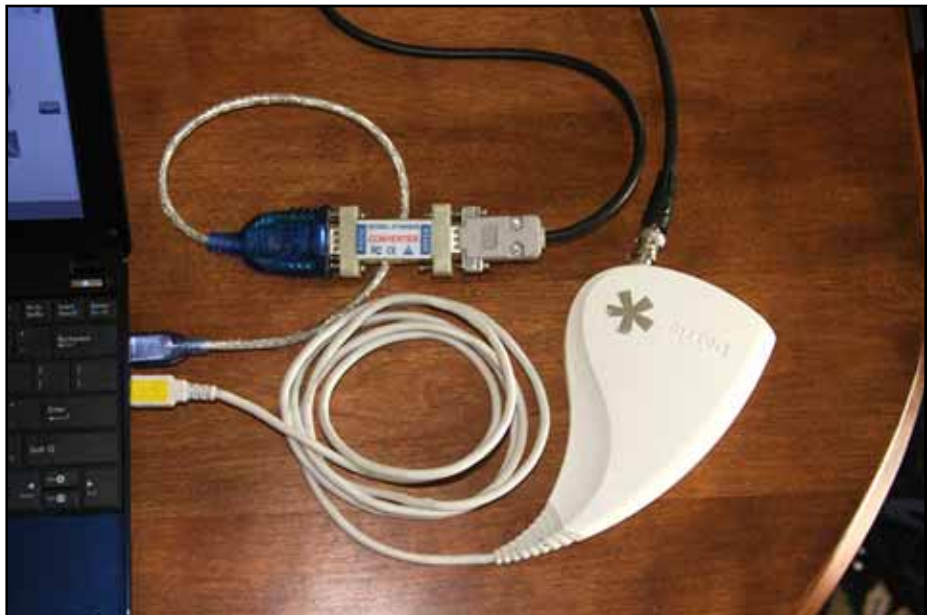
<http://www.zengine.ho8.com>

You will need to look at your camera and make sure you choose the proper cable. Next there is free software for controlling the Mallincam remotely developed by Stephan Lalonde. It is available from the Yahoo Mallincam Group under Files:

<http://tech.groups.yahoo.com/group/mallincam/>

The software name is: MallinCam_Control.msi. With that cable and the one that comes with the camera, I joined the camera power / video cable and camera control cable with zip strips so I only had to deal with one cable.

The camera control cable comes with a USB adapter and software drivers. This plugs into one of the USB ports on my computer. I did notice that the driver is port specific so I use the same USB port each time. The analog to digital signal from the camera is converted using a Dazzle video converter.



Top and Middle: Laptop and connections for imaging with the Mallincam
Bottom: All hyper switches are turned off including the TEC cooler

Top: Control cable hook ups to the back of the Mallincam video camera
Bottom right: Screen shot of AmCap software tonal controls

Power is hooked up to the user side of the combined cable and then I am ready to go.

Software and settings

There are two primary software packages that are used for solar viewing; Amcap and the Mallincam Control software.

It is very important to have the Amcap for image adjustments working first. I cut on the power to the camera and launch Amcap. Then I go to the Devices horizontal menu and pick the Dazzle video feed. Next, I go to Options and choose Video Capture Filter. There I can adjust my video signal.

After I have a signal from the camera I launch the Mallincam Control Software. Preset astronomy settings are listed, I just choose Solar. The word "Camera" will be highlighted in red while it loads. I then go to the Advanced tab to interact with the camera and make general adjustments for solar surface exposure and prominence viewing.

I click on the Color Bars check box just to make sure the camera is being controlled by the software before pointing it at the Sun. If that's OK then I'll slew to the Sun and set the tracking on the scope.

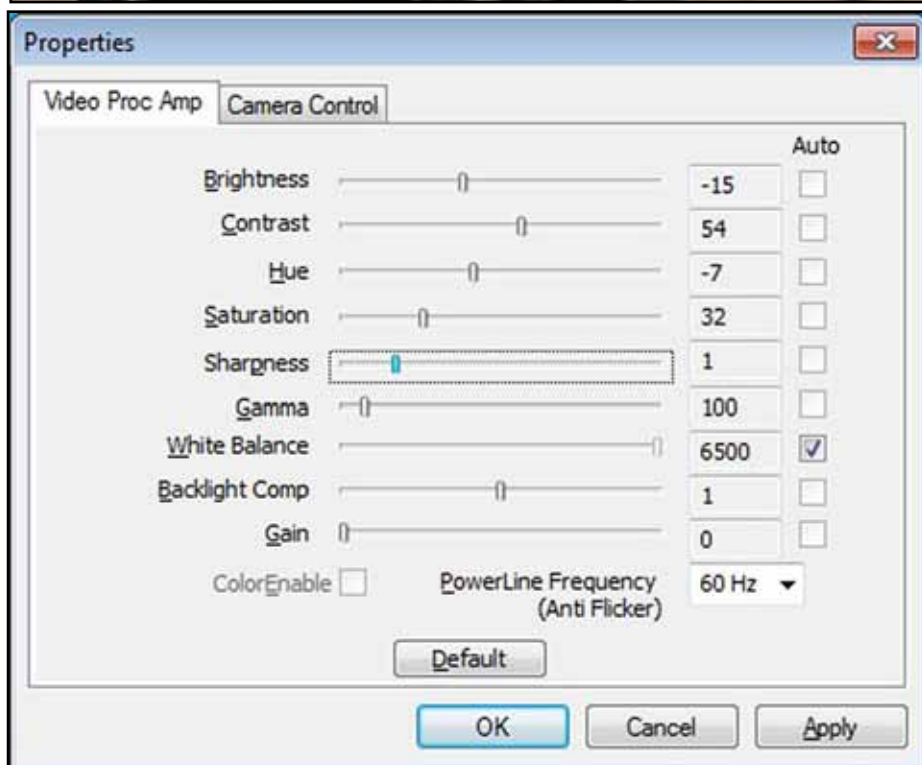
Since this set up already has a digital signal going to my computer, it is just a small step to broadcast from my telescope on a video web site like Night Skies Network.
www.nightskiesnetwork.com

This way I can share live images and interact with other amateur astronomers around the world.

Adjustments and Captures

This is where the fun begins. It is important, I found to do the adjustments in this order:

1. Get the Limb of the Sun on the screen.



2. In Amcap set the exposure controls to default.
3. Raise or lower the Exposure Control on the Mallincam Software so the image is not blown out.
4. Rough focus the telescope so that there is some detail.
5. Adjust the H-Alpha filter or filters until you see granulation and surface detail.
6. Refocus the telescope for maximum sharpness.

The last step is made simple with the digital zoom located on the lower left

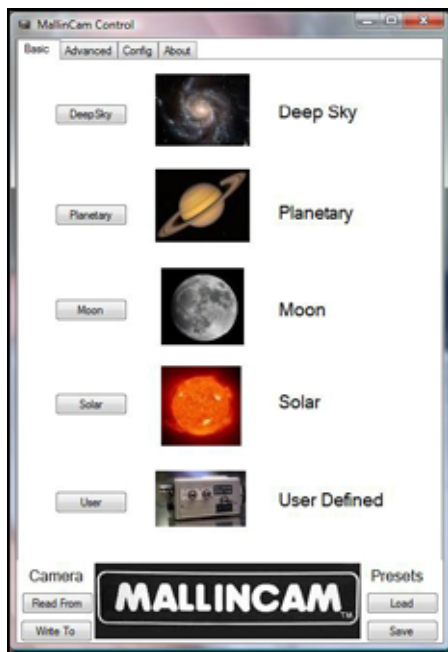
of the Mallincam Software.

Once the image is focused you can start adjusting it for detail and features. The H-Alpha band is very narrow and just a slight movement in the telescope filters will bear different results.

Amcap

After my general set up is completed, I go to AmCap to adjust the color and gradient curves. These are controlled by the Video Capture Filters menu located under Options.

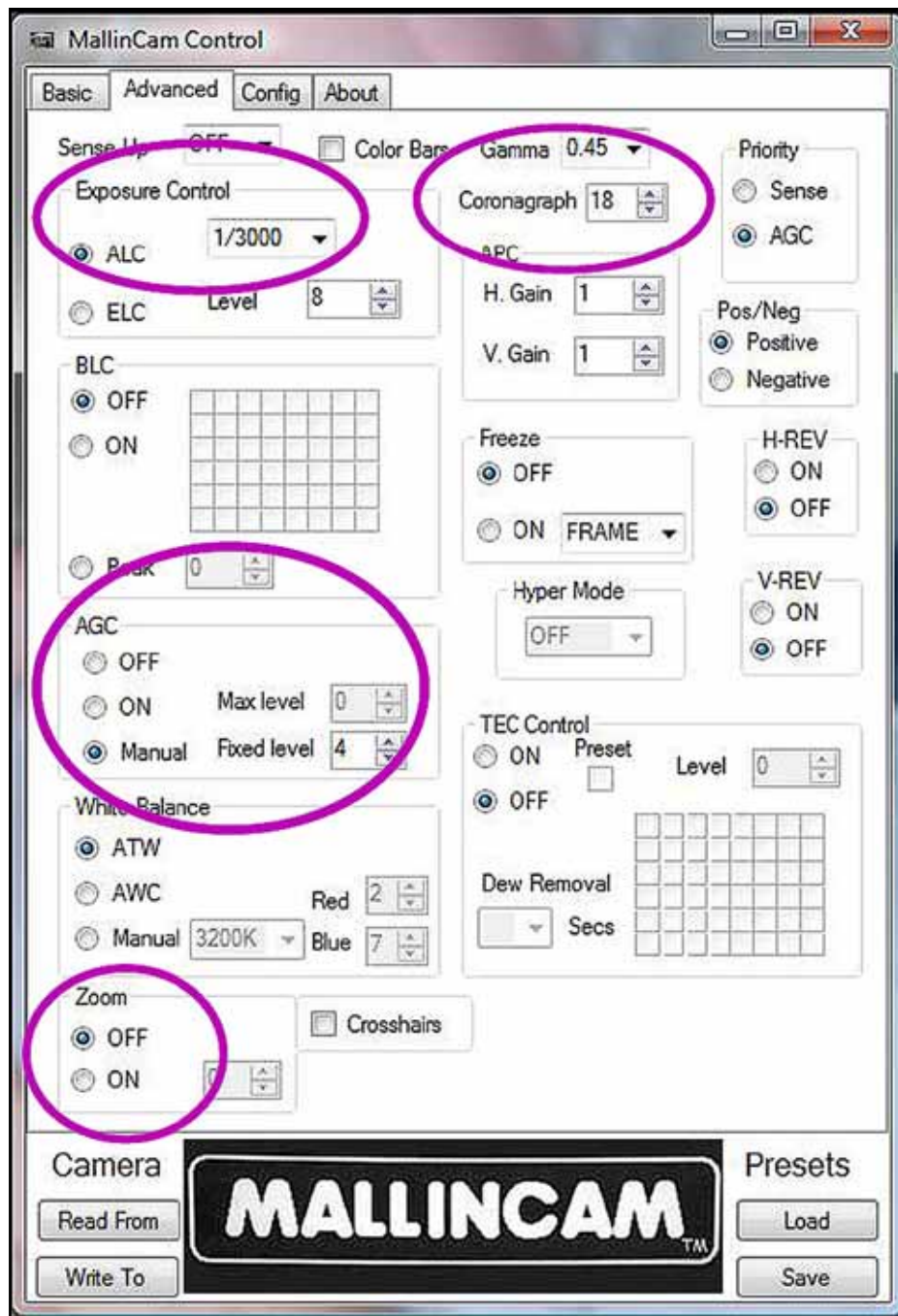
My big mistake when I first started



Above left: Main menu for MallinCam control software

Right: The three main camera controls for Solar

Bottom right: Image capture of solar filament, prominence and sunspot



Solar imaging, with the MallinCam, was one often done in printing; exaggerate the contrast for striking colors and supposedly better detail. This is wrong.

That is why, in a lot of images you see these dramatic colors and blotchy details. What is actually going on in those dynamic images, is the tonal curve is clipping the detail out of the highlight and shadow in the image area. You see cartoon vivid colors, but you lose valuable detail.

The actual way to get detail is by stretching the tonal range. This is done by starting with a linear curve of dark, mid tone and a carefully chosen brightest spot on the image or highlight. This will give you the full range of detail available in the image.

Another concept to keep in mind, is that the Shadow of a color does not necessarily mean it's dark looking. The Shadow on a tonal curve of Yellow looks very bright. However if the yellow curve is clipped for more of a cartoon looking color, you lose detail again.

The H-Alpha scope displays a very red



Top: Image of the complete solar disk

Middle: Sunspot 1089 with a filament

Bottom: Large prominence

/ magenta image. The human eye doesn't see detail in the red spectrum very well, so I adjust the Hue to make it Yellow to Green for a more "Sun" color. It also moves the hue towards Blue which is the color the human eye sees best.

Saturation is lowered until the granulation is pronounced. Too much Saturation will lead to loss of detail again since the "shadow" of the yellow color is again clipping the tonal curve of detail.

I move the Brightness down and the Contrast up slightly so the images doesn't appear too flat. I have found that these movements in the mid tone of my curve will not effect my highlight and shadow anchor points. Because of this, my detail remains intact and not clipped.

Once these are set in AmCap I usually don't need to move them. One more note on curves and filters; morning viewing and afternoon viewing seem to require different H-Alpha filter settings. Atmospheric conditions play a huge part on how the filters are set on the solarscope.

Mallincam

Now that the scope, and video feed are set, the power of the Mallincam Software can come into play.

There are four major controls that I use for Solar; Exposure Control, AGC Manual, Zoom and Coronagraph.

The Coronagraph is a masking feature that will clip and mask off highlights or bright areas that could damage the camera. Because of this you can push the camera by dropping the Exposure Control and bring out the detail of the Prominence on the Limb of the Sun. I set it to the maximum and leave it.

The Zoom is a digital zoom which really means it just drops the resolution of the image so the pixels depth is smaller and you get larger looking images. You will see a drop in detail when you do this. I use it only when I



want to take a peek at a Solar feature and focusing. If I really want to get closer I use a barlow to optically get this. It is fun though, for a quick look and see.

The tap dance between the Exposure Control and the AGC is a fine one. I usually get myself in the ball park with the Exposure Controls and enhance with the AGC or Gain. The AGC works very similar to the Saturation in AmCap. It is very easy to clip the curve and lose detail by adding too much AGC. Again, it will be colorful but you lose valuable detail.

Conclusions and Projects

A few months ago I did a 14 hour broadcast using my MallinCam on Night Skies Network. I was able to put a small camera lens on it and showed myself setting up my telescope equipment. I then put it on my solar scope and showed the activity on the Sun and then after dusk went on to do deep sky objects.

The MallinCam Video Camera is an amazing versatile godsend to amateur astronomy. It has its limitations as far



as clarity compared to some monochrome cameras. But the versatility, the real-time masking, the deep sky to solar...It is unmatched.

I know I still have a lot to learn and discover with the MallinCam. I am presently working on a time lapse project to capture filament and prominence movement over the course of several hours. It looks very promising, thanks to the amazing MallinCam video system. However the one thing I miss while doing Solar Astronomy is some-

thing I left back in the Philippines, my Banana Tree. You don't see a lot of those in Pennsylvania.

Scott Short Lives in Red Lion, Pennsylvania and has been an Amateur Astronomer since 1971. He is the Color Manager for York Container in York Pennsylvania and helped create color tonal curves used in major publications such as USA Today.



M82, M27, M51 and M16 – Single, unprocessed 14 second frames taken by Johnny Hardwick at the Joshua Tree Video Astronomy Fest using his 15" Obsession

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