

Orion® AstroCap Software Guide

For Orion Starshoot Cameras:

52098 All-In-One

52031 SAG PRO

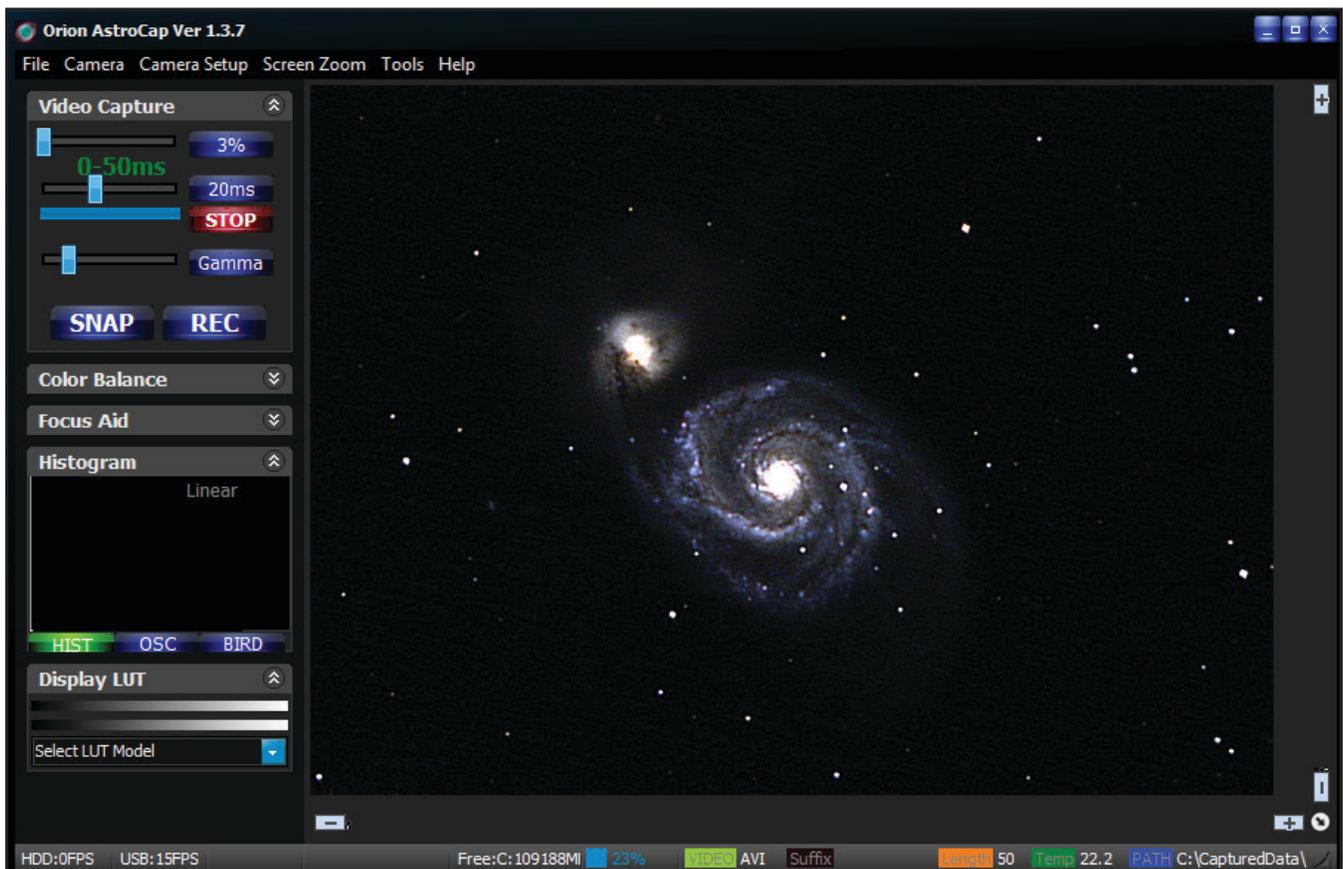


Figure 1: The Orion® AstroCap software.



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Software and Driver Installation

Download the latest software and drivers from the camera support page.

For **ALL-IN-ONE** camera users:

<http://www.telescope.com/aio>

For **SAG PRO** camera users:

<http://www.telescope.com/sagpro>

Do not connect the camera to your computer before you have installed the software.

Install the camera driver and Astrocap software.

ASCOM drivers are available for use with ASCOM compatible software such as PHD Guiding. Please note that to use ASCOM compatible software the Camera Driver, ASCOM driver and the ASCOM platform must be installed.

WDM drivers are also available to broadcast your views over the internet (AllInOne camera only)

Getting Started

Let's start by exploring the interface of the capture software "**Orion AstroCap**". Connect the camera to computer and run the "**Orion AstroCap**" software (**Figure 1**).

Camera

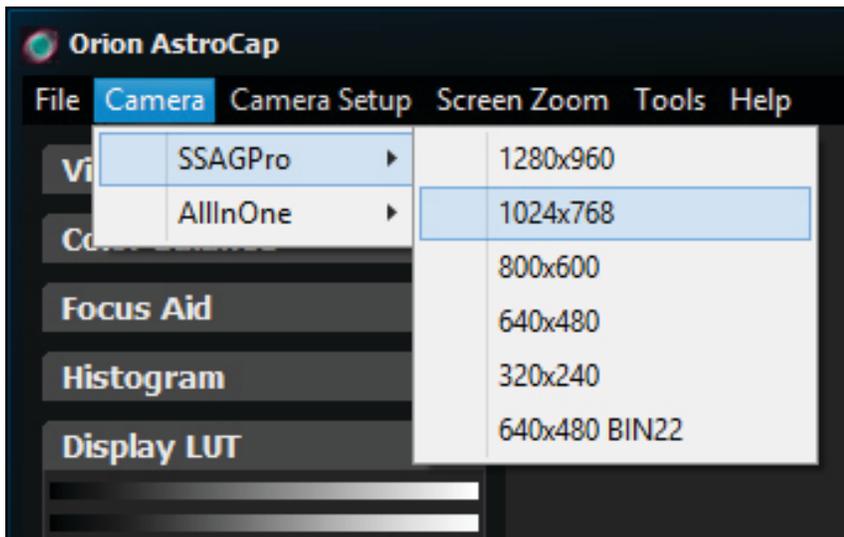


Figure 2: Connecting to camera and selecting resolution.

In order to connect with the camera, select the desired resolution from the camera drop down menu (**Figure 2**).

When the camera is plugged in, the Orion AstroCap software will recognize the camera and display a drop down list of available resolutions.

Select from the available resolutions to connect to the camera. A checkmark will appear next to the selected resolution. To change resolution first deselect the current resolution by clicking on that choice in the drop down menu then select another resolution.

If no camera is seen, check cable connections and camera driver installation.

Video Capture

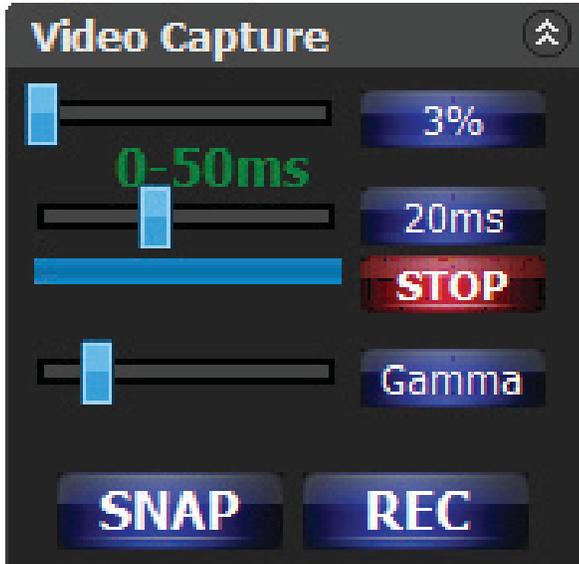


Figure 3: The video Capture interface showing Gain, Exposure, Gamma and record buttons.

GAIN: The first slider is for GAIN. (**Figure 3**) This is represented as a percentage of the total gain. Move the slider back and forth to adjust gain. By pressing the button displaying the percentage amount, a number pad pop up will appear allowing for more precise settings of the gain to be entered.

EXPOSURE: The next slider is for EXPOSURE. This is represented in microseconds, milliseconds and seconds. Move the slider back and forth to adjust exposure. By pressing the button displaying the exposure amount, a number pad pop up will appear allowing for more precise settings of the exposure to be entered (**Figure 4**). Note: Choose between micro-seconds (μs), milli-seconds (**ms**) and seconds (**s**) when selecting exposure values (**Figure 4**).

GAMMA: Gamma can be adjusted from 0.7 to 2.2. Default is **1**.

SNAP: This will take a still image in the format specified by record options.

REC: This will record a movie in the format specified by record options.

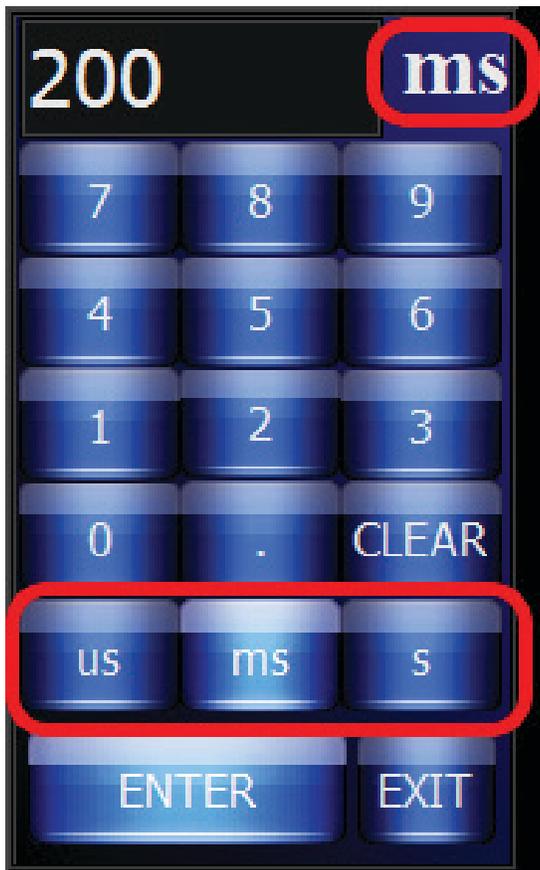


Figure 4: Exposure number pad interface.

Color Balance

Please note for mono camera users Color Balance will not be available and so this window will be minimized.

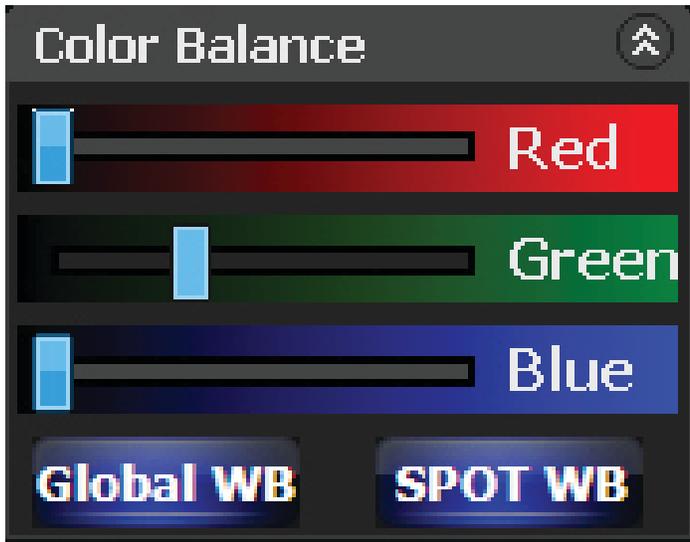


Figure 5: Color Balance interface

R, G, B Sliders - Use the sliders to manually adjust color. Please note the green slider is fixed as the ratio between RG and BG is the white balance. We recommend using the **Global WB** or **SPOT WB** instead.

Global WB Press button to automatically set the white balance.

SPOT WB – Press button and click on image to set white balance.

Focus Aid

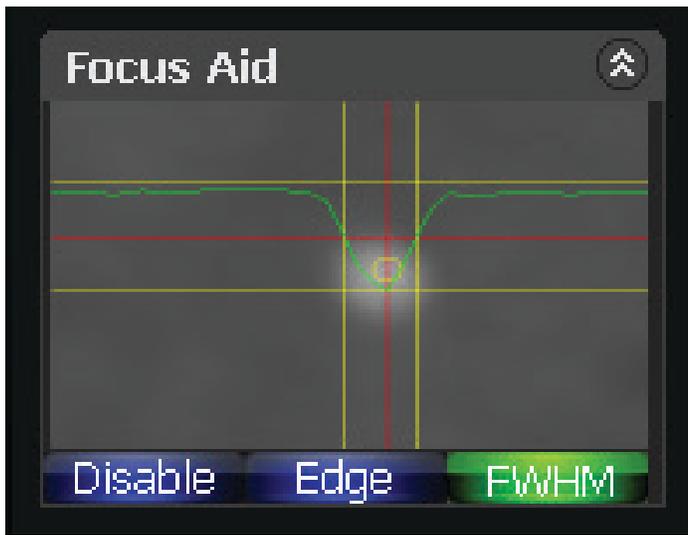


Figure 6: FWHM Focus Aid.

Select **FWHM** (Full Width Half Maximum) and double click on a bright star on the live image. A box will now appear around the star. In the Focus Aid window the star can be seen magnified (**Figure 6**). Adjust focus until the value displayed on the live screen shows the smallest value and hence will be at best focus.

Histogram

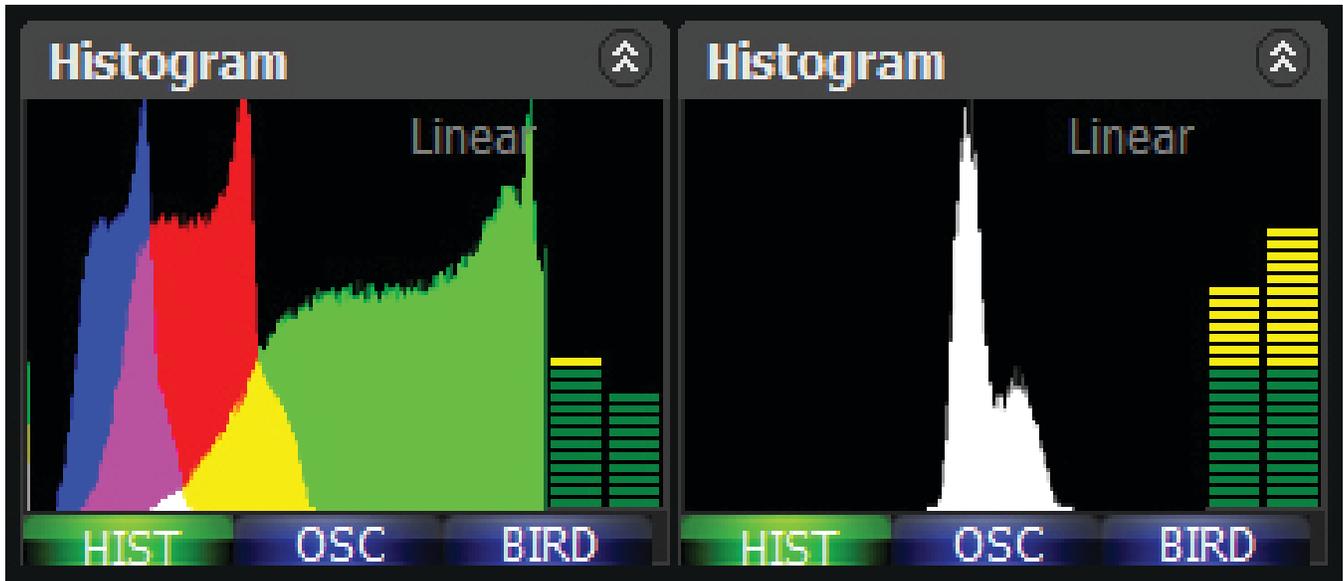


Figure 7: Histogram graph showing color camera (left) and mono camera (right).

This feature displays a histogram graph of the live image. The histogram can be used to detect under and over exposure.

Each color channel is displayed showing on the X-Axis the brightness level and on the Y-Axis the number of pixels at that tone (**Figure 7**).

For color cameras each channel will have R, G and B graphs displayed (**Figure 7** –left image).

For mono cameras only one graph will be seen (**Figure 7** – right image).

Display LUT

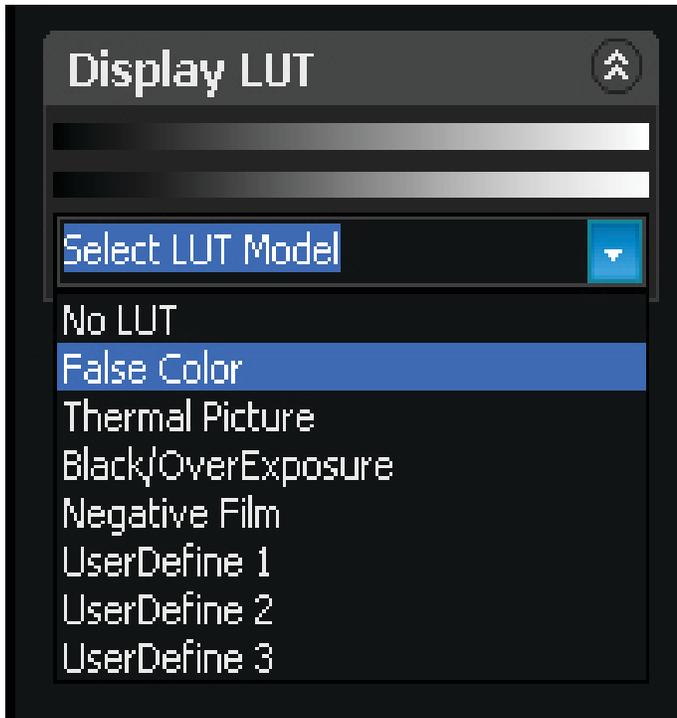


Figure 8: Color Lookup Tables.

Select from a drop down list of false color lookup tables to exchange for the real color (**Figure 8**).

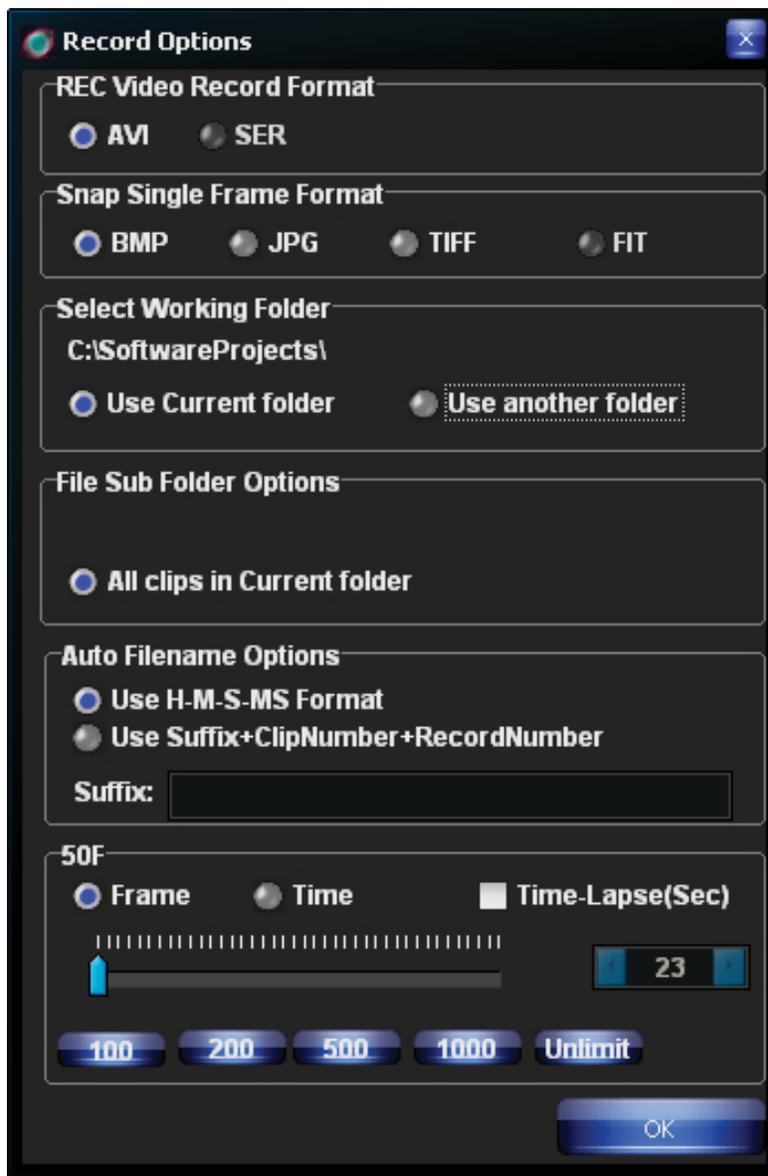


Figure 9: Record Options.

Record Options

AVI, SER, BMP, JPG, TIF & FIT:

We recommend AVI format to begin with (**Figure 9**), as this format easily stores your capture files as a video which can easily be played back without any processing and can also later be used to export to post processing software such as **MaximDL** or **RegiStax**.

SER and **FIT** formats are raw captures that can only be done when the cameracolor is disabled.

This format is much smaller in data size and produces a much faster capture rate.

Image processing programs like **MaxImDL** or **RegiStax** can convert the raw monochrome images (**SER** or **FIT**) back into color.

When imaging solar system objects we recommend setting number of recorded frames to Unlimited. This will record continuously until the user presses the **REC** button again.

Timelapse

To create time-lapse images or movies click the checkbox and select number of frames delay before each image is captured (**Figure 9**).

TOOLS

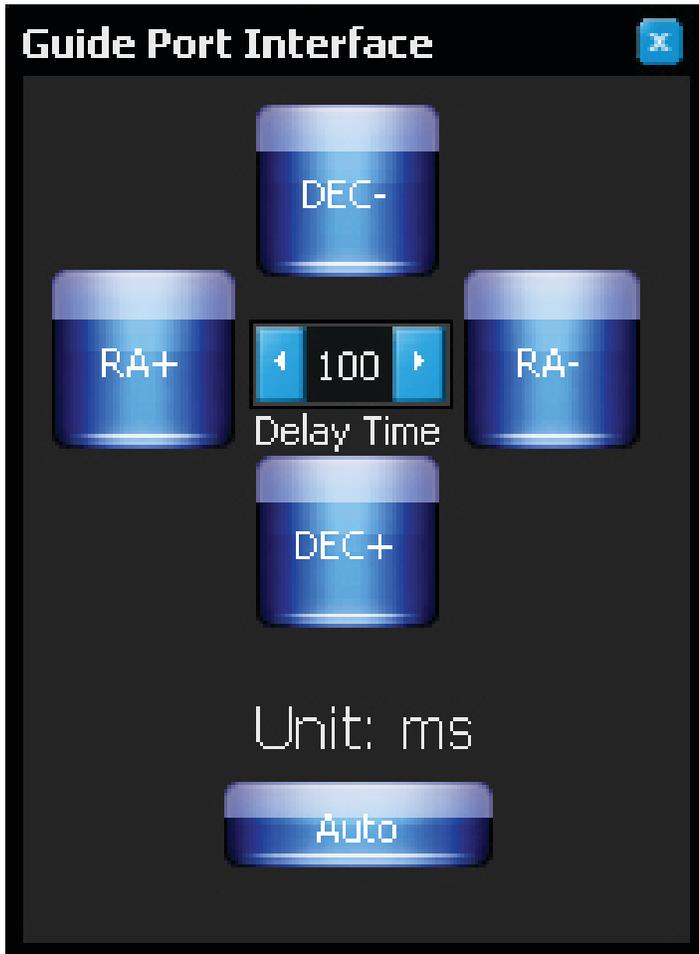


Figure 10: Guide port interface.

Guide Port Interface

Connect the StarShoot camera to mount guide port via included guide cable. The guide port interface (**Figure 10**) can be used to center objects when planetary imaging as well as provide a means to check that the guide port and cables are functioning properly.

Note: This is not for actual guiding. We recommend PHD guiding software which can be downloaded free on the camera support page.

Dark Frame Correction

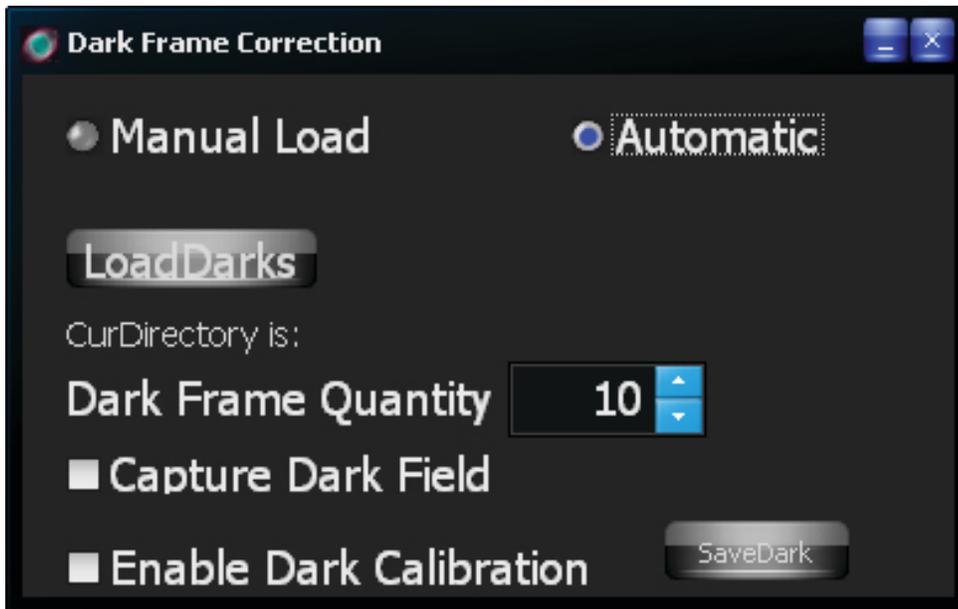


Figure 11: Dark Frame Correction interface.

All CCD and CMOS cameras have inherent noise which becomes more apparent with longer exposure images. If you require taking longer exposures (typically longer than 3 seconds) you may start to see background noise, vertical lines and bright dots (hot pixels).

To automatically remove the noise and hot pixels, dark frames are used to subtract the noise and hot pixels from the live images. Best results are accomplished by capturing many dark frames and averaging them (Median Combine) into one resultant frame.

In order create dark frames the camera must be covered so that light is blocked from passing into the sensor. If using a telescope this can easily be accomplished by placing the lens cap on the telescope.

In order to first capture dark frames select **Automatic (Figure 11)**, Next select the number of images to take (**Dark Frame Quantity**) and finally select the **Capture Dark Field** checkbox. The user will now be prompted to cover their telescope and recording will begin.

When all dark frames have been recorded according to the value in **Dark Frame Quantity**, the user will be prompted to remove the lens cap.

The user can now select either:

- 1) **Enable Dark Correction** – This will now subtract the averaged dark frames from the live image to produce a cleaner image.
- 2) **SaveDark** button to save the averaged dark frames as a **DAT** file.

Once the averaged dark frames have been saved they can be reused at any time by first selecting **Manual Load**, then clicking **Load Darks** to open file load window in order to select the previously saved Dark frame **DAT** file and finally selecting **Enable Dark Correction**.

Users may choose to record many DAT files at a variety of different exposures to save time later in the field. It is important to note that noise and hot pixels will change according to the temperature so this should also be taken into consideration.

Note: Dark frames must match the live image exposure and gain values in order to work correctly.

To test your dark frames keep the lens cap on and view the noise and hotpixels in the live image. Now select the checkbox **Enable Dark Correction**. The result should be a dark image with reduced noise.

Live Broadcast

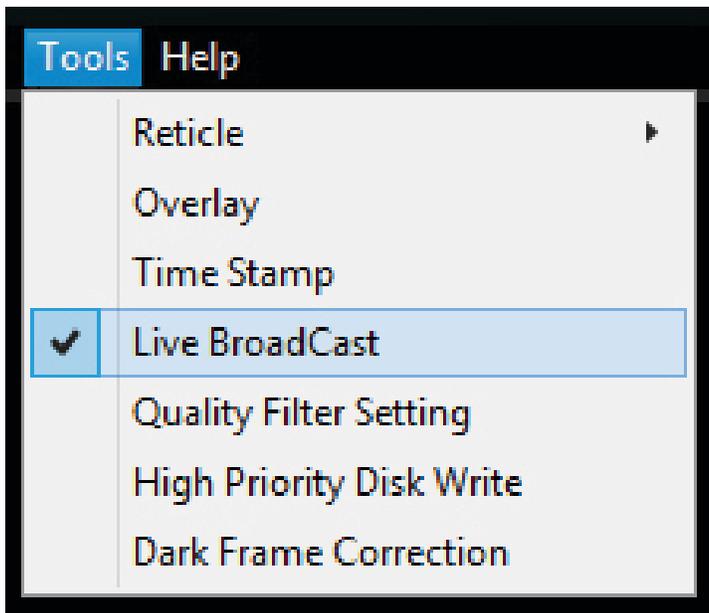


Figure 12: Selecting Live Broadcast from within AstroCap software.

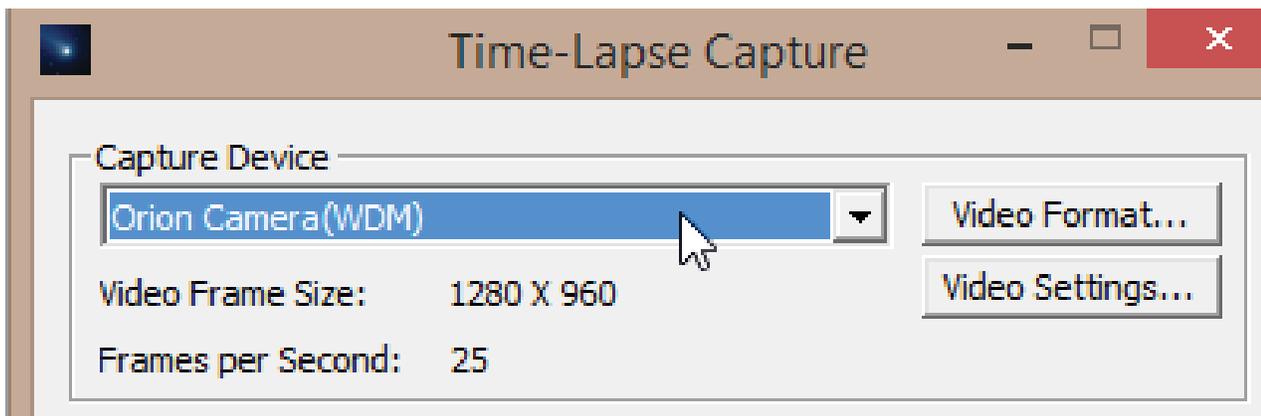


Figure 13: Selecting the live broadcast WDM driver within broadcasting software.

Included with the All-In-One camera (**SSAIO**) is a **WDM** driver. This driver enables the **SSAIO** camera to be able to broadcast video over the internet via software such as **Orion HandyAVI Lite** (Included with FishEye accessory).

Select Live Broadcast from within the tools menu of **Orion AstroCap** then Select **Orion Camera (WDM)** from within the broadcasting software.

Overlay

Select **Overlay** to see an image overlaid on top of the live video. The default Image is the Orion Logo (**Figure 14**).

Users can add their own overlay by modifying the file “**overlay.jpg**” Black will be the transparent color. Please keep resolution size same as default file at 1280 x 1024 pixels.

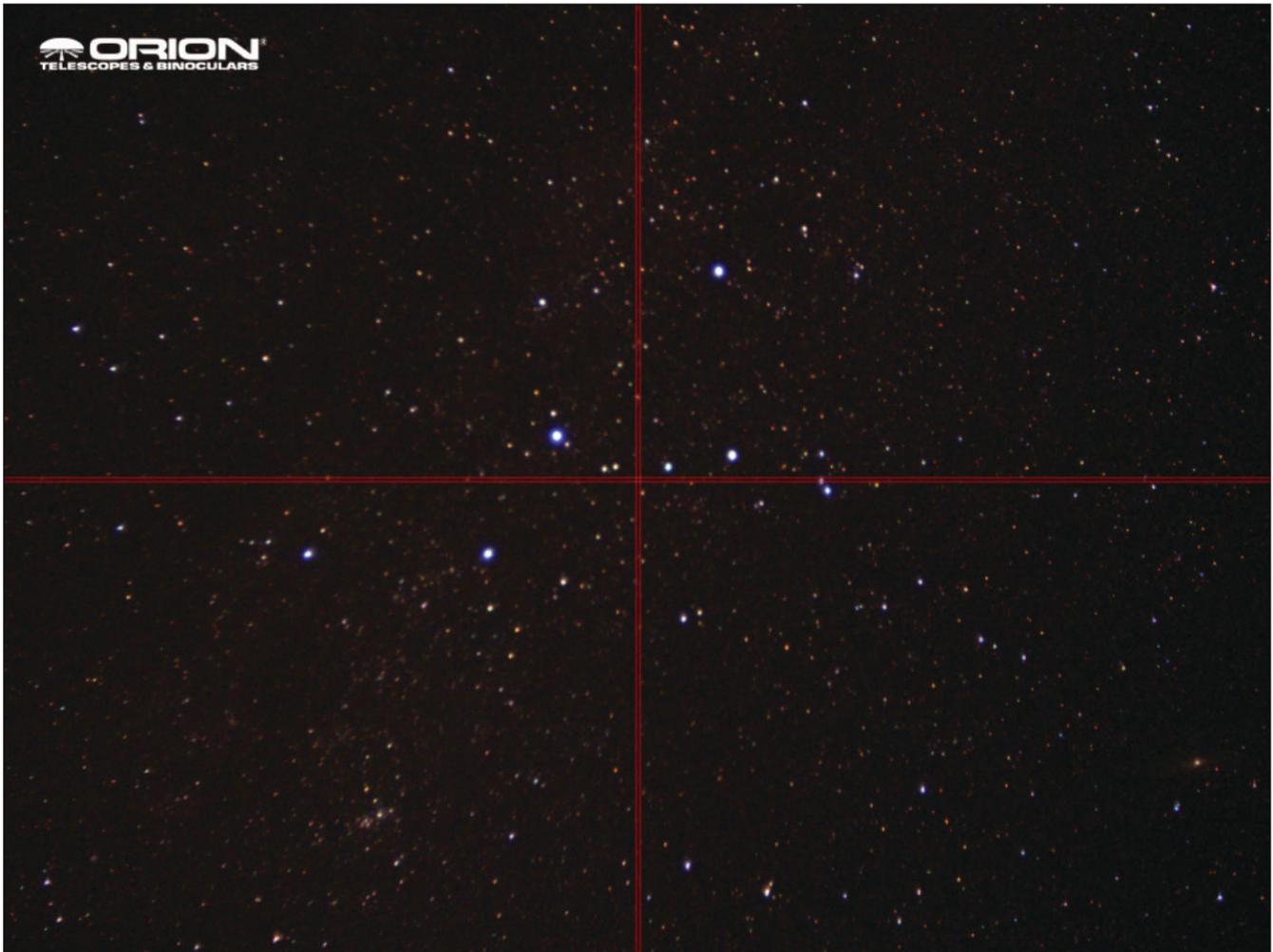


Figure 14: Overlay and Reticule activated.

Reticule

Two reticules are included for use in centering targets and to use as a Digital Video Finder when used in combination with the finder bracket and 8mm lens (**Figure 14**).

Screen Zoom

Zoom is useful for aiding in manual focusing.

Zoom in on the live image and then pan around to find a target to focus on.

Focus and then zoom back out.

Time Stamp

When set overlays a timestamp on each recorded frame. This can be helpful for occultation and eclipse timing.

High Priority Disk write

This feature helps keep the display and the write to hard drive in sync.

When active this feature adds ~ 300ms delay between frames to make sure the display and hard drive are in sync. This can be beneficial for slower hard drives.

Quality Filter Setting

The quality filter setting is a software filter that helps reduce atmospheric jitter by filtering out the out of focus image.

CAMERA SETUP

Color / Mono

Select between color and mono.

12 Bit Image

When checked, **FITS** and **SER** formats become available for image and movie capture.

Files can be converted back into color post capture within software such as **RegiStax** or **MaximDL**.

We recommend 12Bit mode for Deep Space imaging. If using dark frames those too must be taken in 12Bit mode.

High Speed Readout

This feature controls the USB transfer speed. It is used to increase performance but may not work on some computers.

Camera Advanced setting

Not normally used but can aid in reducing USB problems.

USB traffic can be improved by modifying this value.

If live image seems to be dropping frames or not working at all then try setting USB traffic to 30 to reduce the FPS.

Using the Camera for the First Time

We recommend using the camera for the first time in daylight to become familiar with the software interface and camera settings.

1. Setup your telescope and use an eyepiece to locate an object outside that is 200 yards or more away.
2. Plug the **StartShoot** camera into your computer's USB port.
3. Remove the eyepiece and insert the camera into the 1.25" eyepiece holder on your telescope (**Figure 15**).
4. Open **Orion AstroCap** and select a resolution to connect to camera.
5. If the image is white on the screen, it's overexposed. Adjust the exposure and gain as needed to reduce the brightness.
6. Focus telescope until you get a sharp image on your computer screen.
7. Select **Global WB** in order to set the white balance (**Figure 7**).
8. Experiment with the different camera settings. The exposure and gain will be the most frequently used settings.



Figure 15: The All-In-One setup as the main imaging camera and the SAG PRO setup as an autoguider.

PLANETARY IMAGING

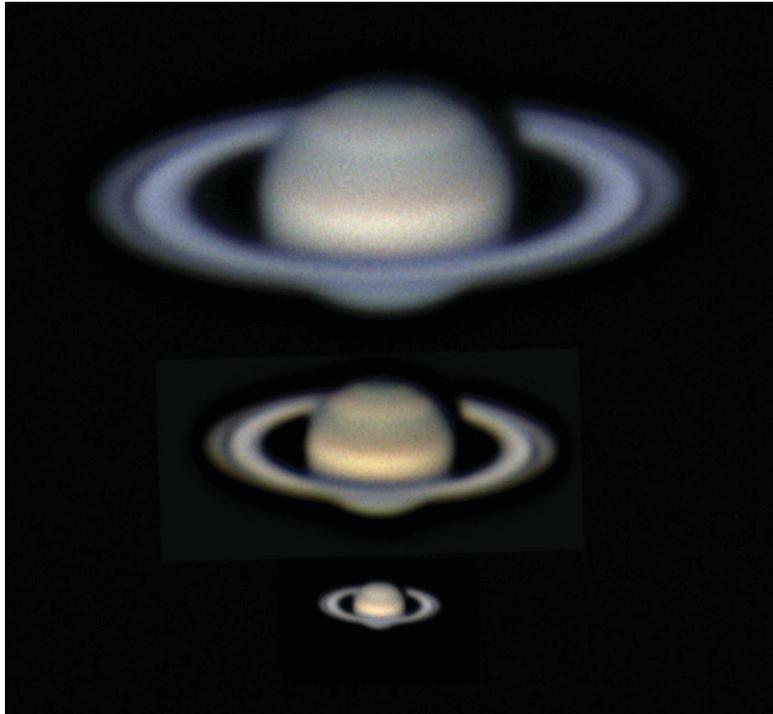


Figure 16: Top: 5x Barlow, Middle: 3X Barlow, Bottom: No Barlow.

Planetary imaging is also referred to as Solar System imaging, and includes the Moon, the Sun (with a proper full aperture solar filter!), the planets, and miscellaneous objects in Earth's orbit such as the International Space Station (ISS). The StarShoot cameras are capable of capturing all these objects in real time.

Just about any telescope is suitable when imaging the planets. The longer the focal length of the telescope, the larger and more detailed the images will appear. Unlike deep space astro-imaging, you actually want to have a long focal length and focal ratio for planetary imaging. Adding a 2x, 3x or higher Barlow to the telescope to increase magnification is not uncommon for planetary imaging (**Figure 16**). The planets and other solar system objects are relatively bright and can be imaged with a darker or "slower" focal ratio.

To help capture those brief moments of good seeing, planetary imagers can select a smaller resolution to increase frame rates.

Select **640x480 2x2** binning mode for increased frame rate and sensitivity (**Figure 4**).

Select **12bit mode** to save in **FITS** and **SER** formats and to also improve capture frame rates.

Larger resolutions are best for long exposure, wide field images whereas smaller resolutions are generally better for short exposure, high magnification images.

High power planetary imaging often leaves the best focus up to your eyes when monitoring the live image. Use the zoom tool to aid in focus.

Select the fastest exposure time possible so that images appear less blurred and set the gain as high as possible without introducing too much graininess. Experiment with your telescope and camera to find the optimum settings for your particular setup.

The best planetary images will be obtained by aligning and stacking (combining) many individual images in order to improve image contrast, brightness, and detail. A great way to obtain images for stacking is to take several seconds of video of the planet, then import the video into post processing software. When capture speed is at optimum levels, you can literally obtain hundreds of images for stacking in seconds! You save time by taking one video instead of dozens of individual pictures!

It is recommended to capture hundreds (or even thousands) of frames when planetary imaging. The large amount of frames (either still images or movie file) can then be processed later using stacking and aligning software such as RegiStax to give the best results.

Since you will be taking multiple images over a period of time, it is important you have a decent polar alignment in order to keep the planet within the field of view of the camera. To this end, having a motor drive (at least single-axis) will also be helpful. Otherwise, you will periodically need to rotate the R.A. slow-motion knob to keep the planet within the camera's field of view.

We recommend a telescope mounted on a motorized altitude-azimuth or German Equatorial mount. You can potentially capture the Moon or a planetary image with a telescope that does not track, however you may not get optimum results. The sky moves 15 arcseconds per second! If you are imaging through a long focal length telescope, you essentially need to track the object or unwanted blurring could occur.

Setup the Camera and Telescope

1. Locate and center the object you wish to image in your telescope using an eyepiece.
2. Plug the **Starshoot** camera into your computer's USB port.
3. Remove the eyepiece from your telescope and insert the **Starshoot** camera.
4. Open **Orion AstroCap** and select a resolution to connect to camera.
5. Gradually adjust the telescope focus until you get a sharp image on your computer screen.
6. Increase gain and exposure if image too dim.
7. You can use the zoom feature as a focus aid.
8. Color camera users (**SSAIO**) check that you are imaging in color; go to the Camera Setup menu, and make sure Color Camera is checked.
9. Color camera users (**SSAIO**) select **Global WB** in order to set the white balance (**Figure 7**).

Your frame rate will depend on your exposure time and computer processor speed. Fainter objects will require longer exposures whereas bright objects like Jupiter or the Moon will require very short exposures. Start with 100ms exposure and 50% gain, and then adjust the exposure as needed for the object you are imaging.

*Imaging Tip: To speed up the frame rate, and to acquire a rough focus a little quicker, select resolution **640x480 2x2** binning mode. This will increase the frame rate and operate at 1/4th the resolution of the camera. Binning in 2x2 is also useful when using very long focal length telescopes.*

Setup Capture

Once you have achieved focus and good color, you are ready to capture and save images to your computer.

1. Go to **Record Options** menu (**Figure 7**) and **Select Working Folder**. You cannot make a new folder here, so you may want to create one using Windows Explorer ahead of time.
2. Select the **REC** Video record format and the SNAP single frame format from the available choices.
3. Select desired filename format from the auto filename options.
4. Set the number of seconds or number of frames for your capture. Keep your hard disk space in mind. Also, AVI captures are segmented into a maximum of ~2GB. **AstroCap** will automatically create a new AVI file to continue capturing if you exceed the max AVI file size.
5. Press the REC button to record a movie file in the select format.
6. The frame countdown will be displayed in the lower left corner of **AstroCap**.

View and Stack

After you have captured your images, you can review them in **RegiStax**, a freeware program downloadable from the following link.

<http://www.astronomie.be/registax/>

We recommend stacking a minimum of 50 images or more. The individual images have low bit depth (255 brightness level counts), and background noise. Additionally, the individual images may be very soft since if you're imaging at high power, with or without the use of a Barlow. Stacking will improve the potential sharpness when processing in **RegiStax**. Stacking several hundred or more images is sometimes appropriate to get the most possible detail.

Binning

The **StarShoot** cameras can bin 2x2 to achieve 640 x 480 resolution in color. Binning in color is a unique feature that provides great versatility to your planetary imaging. If you are using a telescope system with very long focal length, or if the local seeing conditions are poor, you may benefit from binning 2x2 to improve sharpness, sensitivity, and frame rate. Select resolution **640x480 2x2** binning mode (**Figure 2**).

LUNAR IMAGING



Figure 17: Lunar imaging.

Lunar imaging is similar to planetary imaging (**Figure 17**). Fast exposure times are required due to the high brightness of the moon. Similar techniques used to align and stack planetary images can also be used for lunar image processing.

The current phase of the moon will dictate the exposure setting due to the vast difference in brightness during each phase.

SOLAR IMAGING

Warning: Always use a full aperture Solar Filter when observing the Sun.

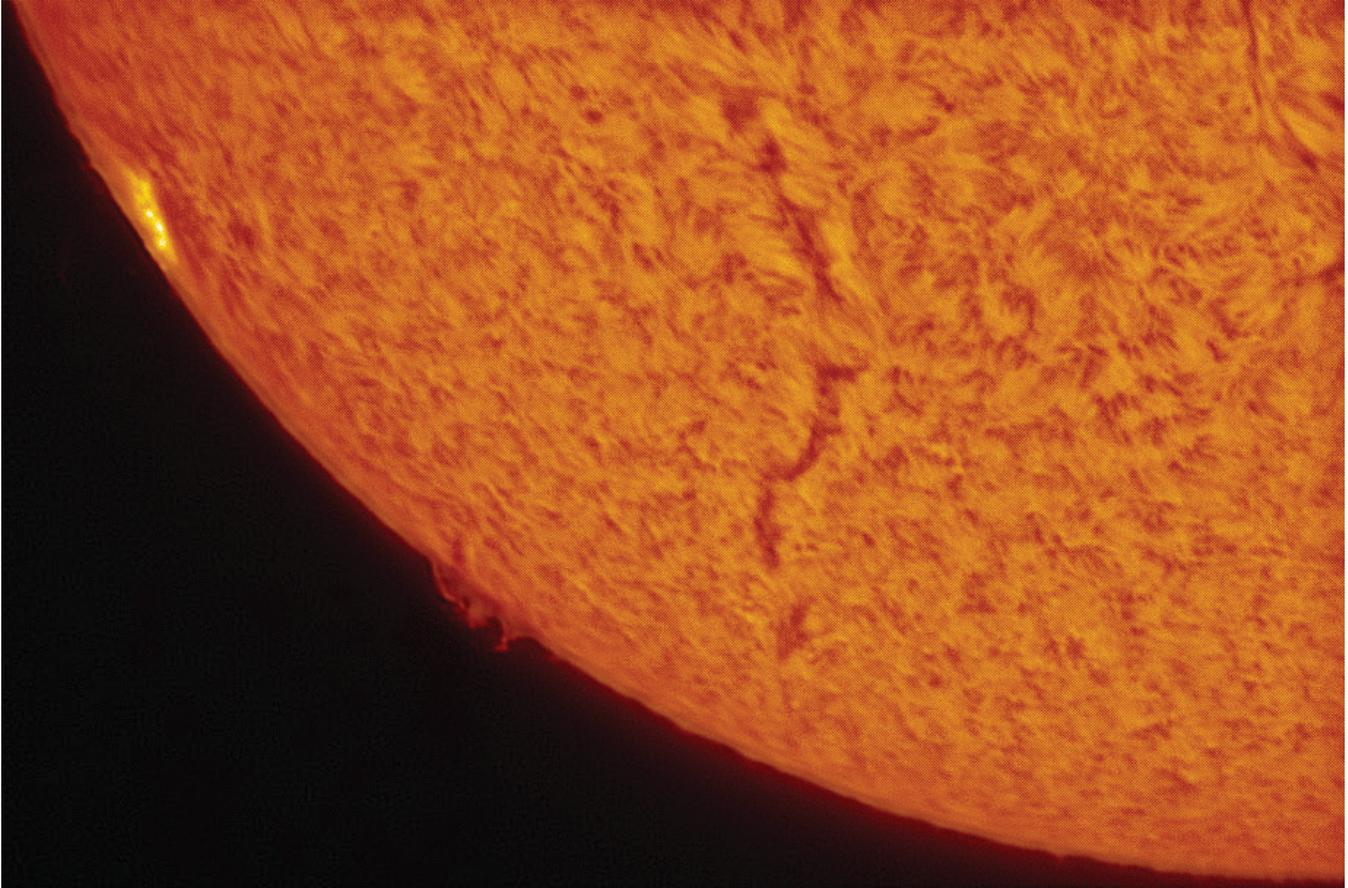


Figure 18: Solar imaging.

With a properly fitting full-aperture solar filter attached to your telescope, you can use the **StarShoot** camera to take images of the Sun and the sunspots on its surface.

(Filters available through Orion. Check the catalog or OrionTelescopes.com for more information).

Solar imaging, like Planetary and Lunar imaging requires fast frame rates and exposure times.

TERRESTRIAL IMAGING



Figure 19: Terrestrial Imaging.

Nature and scenic imaging is possible with SSAIO when used with the wide field lens, fish eye lens or a telescope.

The time-lapse feature can help create interesting movies.

When using with a telescope the aperture may need to be stopped down (reduced in size) in order to reduce the brightness during daytime.

DEEP SPACE IMAGING



Figure 20: Deep Space Imaging.

Long exposures of up to 10 minutes give the user the ability to capture Galaxies, Clusters, Nebulas, Comets and even asteroids (**Figure 20**).

Note: Long exposures will require a tracking mount with decent polar alignment. For best results a guide camera should also be used.

The longer the exposure the higher the amount of noise and hot pixels therefore automatic dark frame subtraction can be used to calibrate images real time (**Figure 11**) thereby vastly reducing the post processing time later on. This feature also gives the best live view.

Focusing can be difficult with long exposures therefore it is recommended to first start with a shorter exposure in order to frame your target and get best possible focus.

Use the zoom tool and the **FWHM** focus tool in order to achieve best focus.

Select **FWHM** and double click on a bright star. A green box will appear around the star and in the Focus tool window one can see a magnified view of the star (**Figure 6**). Using the value displayed at the top of the screen as your guide, adjust focus to get this number as small as possible. When finished focusing, the exposure can be set to a higher desired value.

Take as many frames as possible for combining later in post processing software such as **RegiStax**. This will reduce noise and give best details.

DIGITAL VIDEO FINDER (SSAIO ONLY)



Figure 21: The SSAIO configured as a digital finder.

Included with the **StarShoot All-In-One camera (SSAIO)** is a finder bracket (with adjustable thumb screws) and an 8mm wide field lens (**Figure 21**). The bracket attaches to a standard finder scope saddle found on the majority of telescopes.

Loosen the thumb screw on the lens and rotate end of lens to focus. Once focused, lock down using thumb screw.

The 8mm focal length F1.2 wide field lens gives a Field of View of approximately 30 degrees (**Figure 22**).



Figure 22: The Orion Nebula as seen through the Digital finder (60 second exposure).

Tips

Focusing

One of the hardest things to do in planetary imaging is achieving good focus. You can make this process easier by simply watching the Live Video window to focus. Depending upon the viewing conditions you may notice that the image goes in and out of focus, this is due to viewing conditions. This is to be expected and one of the reasons why post processing software can bring out the best in your captured images. Focus as best as possible with the average frame being at best focus to ensure more in focus frames than out of focus. Image processing software can then be used to select the best frames to combine for best results and can also reject the poorest frames. Use the zoom feature to aid in focusing.

For long exposure deep space imaging it is best to start with a fast exposure on a nearby bright star and use the Full-Width-Half-maximum (**FWHM**) focus tool to achieve the best focus.

First double click on a bright star. A green box will appear around the star and in the Focus tool window one can see a magnified view of the star. Using the value displayed at the top of the screen as your guide, adjust focus to get this number as small as possible. When finished focusing, the exposure can be set to a higher desired value.

Refocus often throughout your imaging session. This ensures at least some of your images will have an excellent focus. It is also not uncommon for telescope movements to alter the focus slightly, so be sure to refocus for any new astro-imaging targets.

Choosing a Site for Astro-imaging

Once you have a focused image, you may find your image shifting and washed out. This can be caused by many environmental factors. Poor seeing (movement of molecules in the air, such as heat rising) and poor transparency (moisture, smoke, or other sky contaminants) will all serve to reduce image quality. That is why most major astronomical telescopes are on high mountains in thin air, to get above much of the seeing and transparency problems. Also, wind will move your telescope and affect images. Your eyes viewing through an eyepiece can change slightly to compensate for disturbances like these, but the camera cannot. Keep these factors in mind when choosing an observing site for astronomical imaging.

For the best astro-images, we recommend finding a location with dry air, some altitude, and away from city or streetlights. Even a nearby hilltop in the countryside can provide better viewing conditions than many convenient backyard locations.

Loss of Camera Connection

If the computer connection to the camera is interrupted, you will need to re-establish connection. This can happen due to several reasons; if a cable becomes unplugged, the computer “freezes”, or the software/hardware otherwise temporarily loses the data coming from the camera.

To re-establish camera connection, first close the Orion AstroCap program on your computer. Then, unplug and re-plug the camera into the computer’s USB port. Now, open Orion AstroCap and select camera resolution. The Live Video Window should now appear indicating re-established connection between camera and computer.

Using Focal Reducers and Barlow Lenses

Focal reducers serve to decrease the focal length of your telescope. This increases the field of view seen by the camera (decreases camera magnification). This can be useful for obtaining images of wider objects, such as the full Moon or a landscape vista.

Barlow lenses, or other tele-extendors, increase the focal length of your telescope, which makes the camera field of view narrower (increases camera magnification). This is useful for high-power planetary images (Figure 16). Keep in mind that when the focal length is doubled, the image will become four times dimmer, so a longer exposure may be necessary.

For best planetary imaging, you should shoot with an effective focal ratio (telescope focal length ÷ telescope aperture) of F/20 or greater. This will give you a good combination of image brightness and image scale for planets. For most telescopes, a Barlow lens will be required to obtain this focal ratio. For example, Schmidt-Cassegrain telescopes usually have a focal ratio of F/10. A 2x Barlow lens doubles the effective focal length of the telescope, which makes the focal ratio f/20. Similarly, a 3x Barlow lens will yield of focal ratio of F/30. You can also try using multiple Barlows to obtain even greater effective focal ratios. There is a limit to how large a focal ratio your telescope and seeing conditions can handle, however. Experimentation will be needed to see what your telescope is capable of in the

seeing conditions on a given night. If the image appears somewhat dim and fuzzy on the computer screen, you may want to consider removing the Barlow lens.

(Focal Reducers and Barlow lenses available through Orion, check the catalog or OrionTelescopes.com for more information).

Solar Filter

Warning: Always use a full aperture solar filter when viewing the sun.

With a properly fitting full-aperture solar filter attached to your telescope, you can use the **StarShoot** camera to take images of the Sun and the sunspots on its surface.

(Solar filters available through Orion, check the catalog or OrionTelescopes.com for more information).

Flip Mirror

As easy as flipping a switch, the Imaging Flip Mirror enables the astro-photographer to find, center and focus a target visually with a 1.25" telescope eyepiece, then photograph it with a CCD camera. All without swapping out any equipment. It's a real timer saver, making the normally tedious task of focusing with the CCD camera alone easier and quicker.

(Available through Orion, check the catalog or OrionTelescopes.com for more information).

USB Extension Cable

In many instances, it is likely a longer cable for the StarShoot camera will be needed in order to comfortably setup the telescope, camera, and computer.

(USB extension cable available through Orion, check the catalog or OrionTelescopes.com for more information).

Care and Maintenance

When the StarShoot camera is not in use, the dust cap should be replaced on the end of the nosepiece. This prevents dust from accumulating on the StarShoot camera's optical window. The optical window should only be cleaned if significant dust builds up or if the window is touched. Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the glass surface of the StarShoot camera's optical window. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, blow any loose particles off the surface with a blower bulb or compressed air. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the optical surface gently in a circular motion, then remove any excess fluid with a fresh lens tissue. Use caution, rubbing too hard may cause scratches.

(Cleaning products available through Orion, check the catalog or OrionTelescopes.com for more information).



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International: +1(831) 763-7000
Customer Support: support@telescope.com

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