

Volume

1

MALLINCAM

SkyRaider DS432CTEC



[Version 8.1]  
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# User Manual











## C1: The MallinCamSky DS432CTEC User Manual

*Use this User Manual to obtain a deep understanding of all the features of both the MallinCamSky and the SkyRaider DS432CTEC camera. See the Quick Guide for an expeditious look at getting up and running with the camera and software.*

To save time for those of you who are familiar with MallinCam imaging cameras, this User Guide will provide a Table of Contents to allow you to quickly locate the commands and controls you need in controlling the DS432CTEC camera. It will include instructions on how to install the Software and Drivers and how to connect the SkyRaider DS432CTEC Camera to your computer. This manual will provide explanations of all the camera's settings so you can get up and running quickly and can experience the wonders of video imaging.

The **ICONS** on the left are quick indications of what that section performs.

### ICON KEY

	Take Note
	Hardware connection
	Download
	Running Software
	Commands
	Camera Controls
	Warning
	Entry Step



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## Introduction

The New MallinCam SkyRaider DS432 is here at last. A video / imager with sensitivity high QE never seen before from anyone in the industry. Equipped with the new Sony Industrial IMX432 high performance CMOS sensor, sensitivity has now been made possible to match and surpass CCD sensors on the market today.

Having 9.0 X 9.0 microns pixels just like professional cameras, this new deep sky camera is a must of own for those who likes few seconds exposure to get their favorite deep sky targets live on the screen or to take pictures as well and/or, video of their observations.

The cooling system is the same as our other SkyRaider (DS10CTEC, DS16CTEC) cooled camera. MallinCam has successfully design a cooling chamber called refrigeration cooling - which subjects the CMOS sensor to cooling inside a triple sealed vacuumed sensor chamber controlled with a heating element mounted around the internal optical window to control and avoid dew formation on the optical window and surroundings. A vacuumed sealed chamber is used to eliminate the use of desiccant material and keep dew free environment permanently.

The Sony IMX432 CMOS sensor is industrial grade and made to work at a 100% duty cycle making this CMOS sensor one of the longest lasting continuous use sensors on the market. It is available in color or monochrome for the purist who demand mono performance and increase sensitivity. The IMX432LLJ and IMX432 LQJ have a diagonal of 17.6 mm (Type 1.1) CMOS active pixel type solid-state image sensor with a square pixel array and 1.78 M effective pixels. This chip features a global shutter with variable charge-integration time. Class 1 CMOS sensor is standard with this camera.

The result of this new technology, the SkyRaider DS432CTEC / DS432MTEC, is design for live visual application or video imaging. It is built to laboratory specifications, where CNC machining is used throughout to provide the rigid tolerances needed to provide precise component matching. The chamber has six stainless steel screws securing the chamber cover under 100 pounds of pressure to avoid possible air leaks into the chamber.

The internal electronics use Grade 1 components with tolerance of 0.5%, a military and aerospace standard in some cases. The camera contains 4Gb DDR3 internal memory to insure the smooth flow of data to the computer. The DS432TEC also has a built-in USB 2 hub that can support a guider or a USB type focuser or filter wheel.

So, thank you for your purchase, and let the adventure begin.

The 8 levels of binning will provide you with a very versatile camera that can perform multiple scenarios and can handle **Deep sky** as well as **Planetary** imaging.

So, thank you for your purchase, and let the adventure begin.





## The Contents of the DS432C TEC

### Specifications:



- PC Win XP, Win7, Win 8, Win 10. Mac.
- Convection Cooling
- Refrigeration Chamber
- Vacuumed Sealed Chamber
- Linear Cooling
- Built-in Heater for Optical Window Dew Removal and Chamber Temperature Control
- 100 Pound Chamber Plate Pressure Held with 6- Stainless Steel Screws
- Built-In USB 2.0 hub for Guider, Focuser, filter wheel etc.
- Four Blue LED Status Indicators (power, system, cooler, fan)
- High velocity Ultra Quiet Fan with Dual Air Output
- High-Grade Carrying Case
- Live Stacking on the Fly
- Live Star Registration, Ideal for all Motorized Alt-Az mounted telescopes
- Built-in Memories
- CDS (Correlated Double Sampling)
- 1.78 Mega Pixels CMOS ceramic color sensor
- 17.6 mm diagonal size
- Number of effective pixels 1608 X 1104 (1775232 pixels)
- Progressive Scan
- Full HD Support
- Sony IMX432 LQJ color IMX432LLJ mono Class 1 Hand Picked CMOS Sensor
- (Scientific Grade) Sealed Multi-Coated No IR Optical Window
- Pixel ( $\mu\text{m}$ ): 9.0 X 9.0 square
- Connectivity USB 3.0 (USB2 compatible)
- Variable Sensor Gain
- 4910 mv Output color, 8100 mv mono version
- Resolution: 1600 x 1100
- All Aluminum construction, precision CNC machining
- Hand crafted electronics assembly.
- One USB 3 cable operation
- 5 volts operation @900 ma.
- 12 volts DC Cooling via supplied A/C power supply
- Weight: 534 Grams (1.17 lbs)
- Dimension: 3.39 inch by 3.14 inch (10.0 cm by 8.0 cm)

### In the Box

The SkyRaider DS432CTEC includes the following standard equipment:

- MALLINCAM SkyRaider-DS432CTEC Camera
- High Precision T-mount to 2" mount Eyepiece Adapter
- 5-metre (15 ft) USB 3.0 cable.
- 12 volts dc, AC power supply.
- High-Grade Carrying Case.

### System Requirements:

- Equal to Intel Core2 2.8GHz or Higher
- Memory: 4GB or More
- USB port: USB 3.0 Port (Recommended)
- Display: 17" or Larger Recommended
- 200MB Free HDD



Updated Software and Drivers can be downloaded at the Software Downloads Window located in the **Support Tab** at [www.mallincam.net](http://www.mallincam.net)



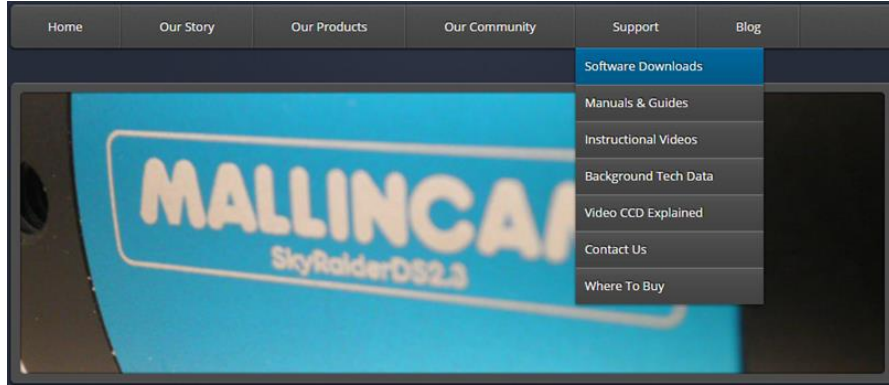
### Dimensions





## Download and Install MallincamSky

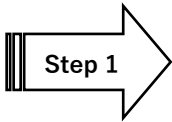
Visit the following website: [www.mallincam.net](http://www.mallincam.net). Select the **Support Tab**, then **Software Downloads**. Select and download the latest required software and drivers for your system.



- SkyRaider Series MALLINCAMSKY Complete Software Package August 23, 2020 [Click Here](#)
- SkyRaider Series MALLINCAMSKY Complete Software Package July 30, 2020 [Click Here](#)
- SkyRaider Series MALLINCAMSKY Complete Software Package November 26, 2019 [Click Here](#)
- SkyRaider Series MALLINCAMSKY Complete Software Package October 12, 2019 [Click Here](#)
- SkyRaider Series MALLINCAMSKY ASCOM Setup July 17 2019 Version 4.7.15144 .20190717 [Click Here](#)
- SkyRaider Series MALLINCAMSKY DSHOW Setup July 17 2019 Version 4.7.15144 .20190717 [Click Here](#)
- SkyRaider Series MALLINCAMSKY ST4 Setup July 17 2019 Version 4.7.15144 .20190717 [Click Here](#)



Ensure **DS432CTEC** is **NOT** connected.



Step 1

Once downloaded, place your mouse on the zipped file, **Right-Click** to pop-up an **Action Window**, and choose **Extract All ...**

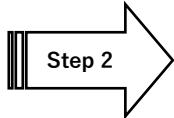
Just **Click** on the **Extract** button when the next Window pops-up. Windows should now open the actual folder that contains the software to install.



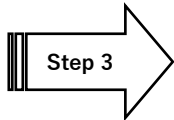
**Un-Zip** the folder, then **Double-Click** on it to open it up, revealing the 5 programs it contains (or 1 program if just downloading MallincamSky).

Name	Status	Date modified	Type	Size
ASCOMMallincamSetup	✓	2022-08-18 9:56 AM	Application	5,121 KB
MALLINCAMDshowSetup	✓	2022-08-18 9:56 AM	Application	4,913 KB
MALLINCAMLITE.dmg	✓	2022-08-18 9:56 AM	DMG File	23,804 KB
MALLINCAMLITE.x64.tar.bz2	✓	2022-08-18 9:56 AM	BZ2 File	30,635 KB
MALLINCAMLITE.x86.tar.bz2	✓	2022-08-18 9:56 AM	BZ2 File	22,086 KB
MALLINCAMSKYSetup	✓	2022-08-18 9:56 AM	Application	38,331 KB
procomsdk.20220816	✓	2022-08-18 9:56 AM	Compressed (zipp...	62,803 KB

The **ASCOM DRIVER** contains the ASCOM Drivers for the camera  
The **DIRECTSHOW DRIVER** contains the Direct Show Drivers for the camera  
The **WINDOWS APPLICATION** contains the camera control software.



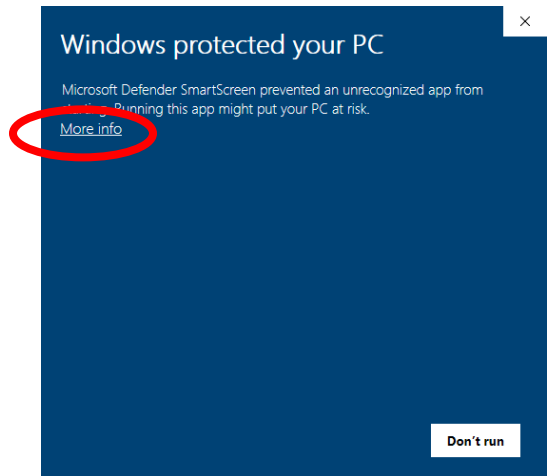
**Double-Click** on the **WINDOWS APPLICATION** folder to open it up.



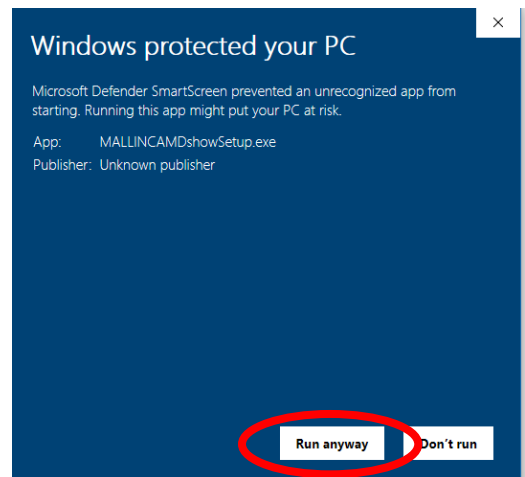
**Double-Click** on the **MALLINCAMSKYSetup** file and follow instructions to install the **MallincamSky** software and drivers onto your computer:

Your version of Windows may give you warnings and then ask you for permission to open the program (or the DirectShow program). This is just another level of security offered by Windows.

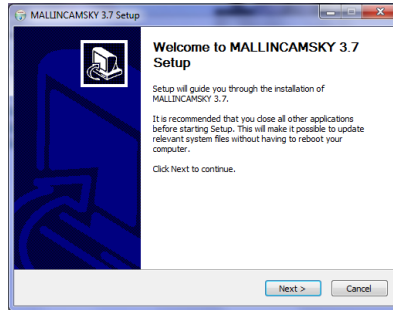
If the following screen appears, then **click** on the **More info** line. In the window. You will then be presented with another window.



Now just click on the **Run anyway** button at the bottom of this window to start the installation process.

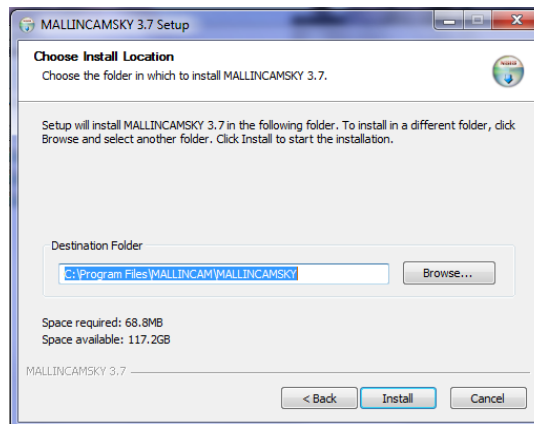


The following **MallincamSky Setup Screen** will then appear:



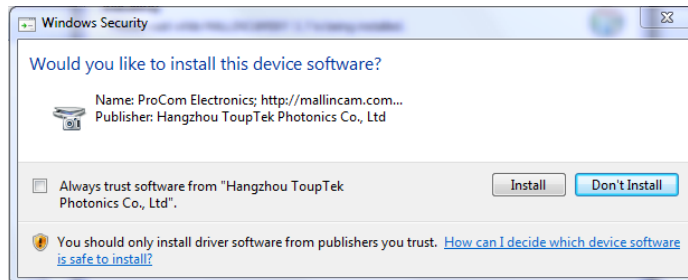
**Step 4** Click on **Next** to start the installation process.

The installation program now wants to know where you would like to install the software. Either choose your own location or select the **default**.



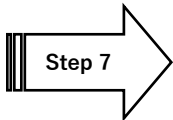
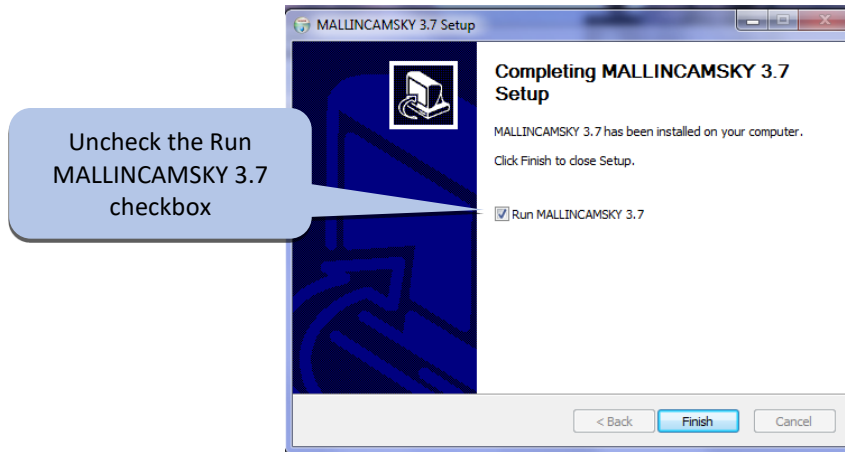
**Step 5** Click on **Install** to proceed.

Windows may again ask for permission to install the device software.



**Step 6** Click on **Install** to accept.

The **MallincamSky Software** will take about a minute to be installed. When completed, the following screen will appear:

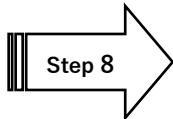


Step 7

Click on **Finish**, and the **MallincamSky** Icon will appear on your screen.



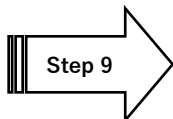
**MallincamSky** and its drivers are typically all you need to install to control the DS432C camera, but if you would like to have other image programs control of the DS432C then you can install two other optional drivers: **ASCOM** and **DIRECTSHOW**.



Step 8

**Optionally** (see **Installing the ASCOM Driver** for more in-depth details), **Double-Click** on **ASCOM DRIVER** folder, then **Double-Click** on the **ASCOMMallincamSetup** program and follow the instructions to install the **ASCOM** driver.

ASCOMMallincamSetup	2019-03-03 12:11 ...	Application	1,596 KB
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Step 9

**Optionally**, (see **Installing the DIRECTSHOW Driver** for more in-depth details), **Double-Click** on the **DIRECTSHOW DRIVER** Folder to open it up, then **Double-Click** on the **MALLINCAMDshowSetup** program and follow the instructions to install the **Directshow** drivers onto your computer.

MALLINCAMDshowSetup	2019-03-03 12:11 ...	Application	1,460 KB
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Windows may display a warning asking for permission to run the program, if it does, select **YES**.



## Connecting the DS432CTEC to your computer

Un-screw the plastic dust cover from the front of the SkyRaider-**DS432CTEC** camera (place it back in the box for safe keeping) and Screw in the 2-inch eyepiece adapter (M42 x 0.75mm) to the front of the **DS432CTEC** and inset camera into a 2" eyepiece adapter on your Telescope.



Depending upon the telescope, you may need extenders so that you can reach focus with your telescope. It is recommended that you set this up in the daytime, so you can see what you are doing (plus can aim at an easy to find tree or telephone pole).



The T2 (M 42 x 0.75 mm) female thread on the SkyRaider-**DS432CTEC** is a standard size, and numerous adapters are available to connect your camera to various devices such as filter wheels, camera lenses, filters, etc...



Now connect the 12V AC adapter to a power source and attach the other end to the camera.



Attach the 5 metre USB 3.0 cable from the back of the to the SkyRaider **DS432CTEC** to a free USB 3.0 (or USB 2.0) port on your computer.



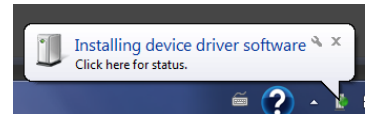
The SkyRaider **DS432CTEC** has some strict power and throughput requirements, and not all computers are created equal. If you find you are having difficulties with the following steps, it may be the USB 3.0 port on your computer. If that is the case, one option to try is: connect a Powered USB 3.0 Hub to your USB 3.0 port on your computer. This simple step can improve, both thru-put, power and distance between your computer and the SkyRaider **DS432CTEC** camera.



#### Power on the DS432CTEC



The first time the **DS432CTEC** camera is powered on and connected to the computer, Windows will finish installing its drivers will recognize the camera. A beep should be heard acknowledging the connection.



#### Using the USB 2.0 Ports on the SkyRaider DS432CTEC

The **USB 2.0 HUB** on the SkyRaider-DS432CTEC can be used to connect with various accessories, such as a guide camera, filter wheel, or electronic focuser. This will allow you better management of your cables. The integrated USB 2.0 hub on the SkyRaider-DS432CTEC is powered by a 12V external power source.





## USB 3.0 Cable Issues

USB 3.0 boasts 4.8 Gbits/s as long as your high-quality cable is within the 5-meter threshold. Anything longer and full speed is not guaranteed.

This also requires that the USB 3.0 port on your computer is not overtasked and can produce the required output power (5V at 0.9A or 4.5 Watts).

Most users that have connection issues is because the USB 3.0 cable or computer's USB 3.0 port is not making the grade (computer may continuously try to connect to the camera, the **DS432CTEC** camera name says USB 2.0 behind its name, MallincamSky cannot control/connect to the camera, nothing seems to be working).

If you are having connection issues, there are a few remedies to try:



1. Test with a short USB 3.0 cable. If you obtain a successful connection, then you know that the SkyRaider camera is OK.



2. Use a powered **USB 3.0 Hub**. Connect the hub to the computer with a short USB 3.0 Cable, then connect your longer USB 3.0 cable to the Camera.



3. Use a powered (**active**) USB extender cable. Connect that to the computer with a short USB 3.0 cable, then connect your longer cable to the Camera.



**Note:** the use of USB 3.0 extender cables and powered hubs can help provide you with longer than 5m cable runs.



# Running MallincamSky

Locate and **double-click** on the MallincamSky icon located on your Desktop to start **MallincamSky**. When the software loads, you will be able to locate under the Camera Tab the **DS432CTEC** camera name. **Click** on this name to activate the camera and thus display in the Video window what the telescope is pointing at.

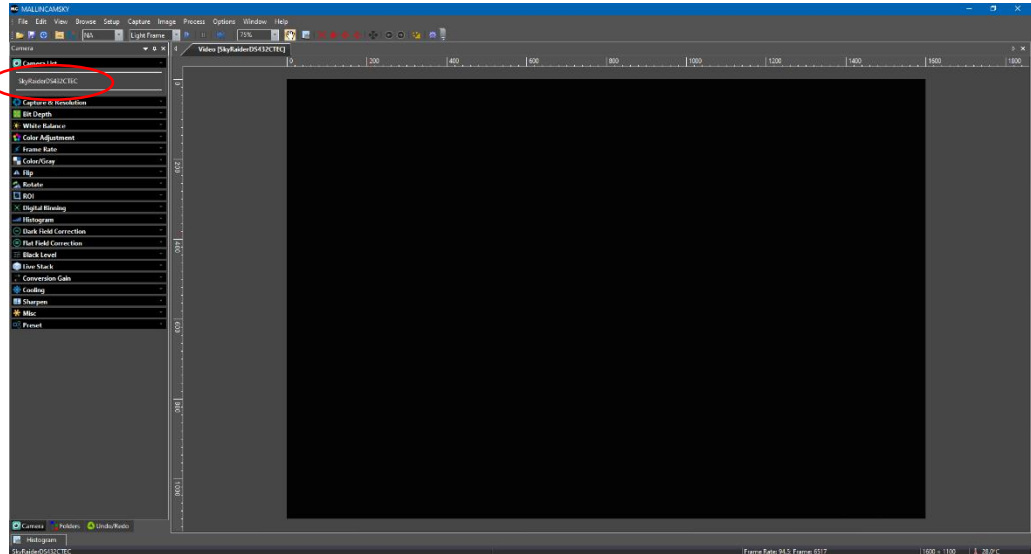


FIGURE 1.0 - MallincamSky's opening screen.

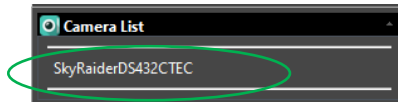


If the driver has been successfully loaded, you will see the name of the **SkyRaiderDS432CTEC Camera** in the **MallincamSky Camera List** on the upper left of the Window. You can install more than one SkyRaider Camera to your computer, but the software can only control one SkyRaider Camera at a time.

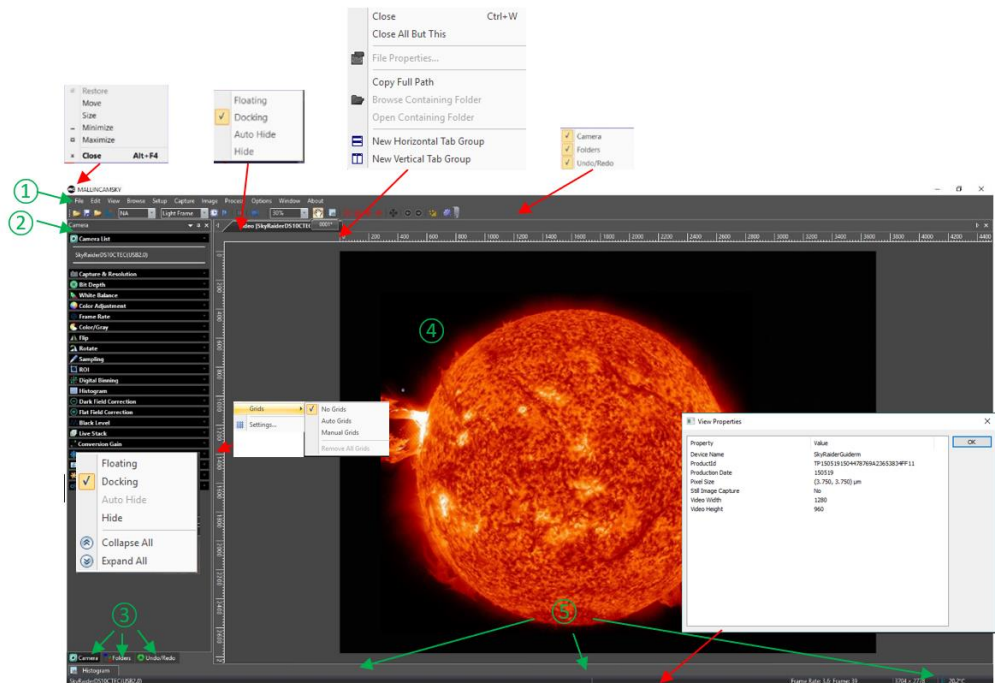
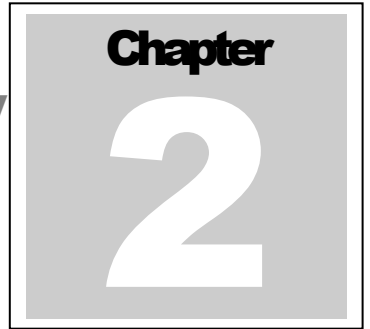
You can run multiple instances of MallincamSky at the same time, this way you can have one instance control one Mallincam camera and the other instance control the other Mallincam camera.



If you notice that the **SkyRaiderDS432CTEC** has a **(USB2.0)** behind it, then you are either using a USB 2.0 port, or the distance is too great for the USB 3.0 cable, and the system has entered USB 2.0 speeds. Remember USB 2.0 utilizes slower speeds but gives you greater distances.



## C2: The MallincamSky Window



The **MallincamSky Software Window** is segmented into a few regions to make viewing and adjusting the SkyRaider camera easy and intuitive.

- ① The **Top Menu Line** provides dropdown menus and icons to allow you to make major settings of the software.
- ② The **MallincamSky Left SideBar** provides the simple click activation and selection capabilities to control all aspects of the image and camera.
- ③ The **Left SideBar Base** provides selection options for **Camera**, **Folders**, or **Undo**. **Left Clicking** on the selection choice will fill the **Left SideBar** with its options.
- ④ The **Video Window** will contain the display image from the **SkyRaider Camera**. It is here that you will see the live video, or images.
- ⑤ The **Information Line** will indicate the current camera, current frame rate, number of frames displayed, resolution, information about captures, etc.

## Helpful Suggestions when Imaging

The following are some hints and suggestions on how to image **Planets, Sun, Moon,** and **DeepSky Objects** with the **DS432CTEC**. These are just some recommendations, so use them as you see fit. They will make more sense when you understand **MallincamSky's** controls.

You will notice the **Blue** channel is a bit weaker than the **Red** or **Green** channel, so some final colour adjustments may be required if you use third party software for enhancing your images.

### How to Image planets

Imaging planets usually requires a high magnification through a telescope and therefore using a **Barlow** lens is recommended.

Since most of us will want to enhance our planetary images, the technique of capturing short videos (between 1 to 10 minutes, depending upon planet) with the **highest frame** rate allows for the best video frames to be extracted and combined. This will reveal surface details and enhance the colours and contrasts.

Depending upon the planetary object, increasing your **Binning** will also increase the frame rate. Try different **Bin** settings to see which one produces the best frame rate and still retain planetary details.

With the **DS432CTEC**, use the **Region of Interest** (see instructions later in the User Manual). This will dramatically increase the frame rate. Also, you will want to decrease the exposure time, so by increasing the **Gain** you will reduce the exposure time and thus increase the frame rate.

A balance is needed, as increased **Gain** also increases noise. See what works best for your environment.



Some Postproduction software to help produce the best image is **PIPP** and **AstroSurface** or **AutoStakkert**.



## How to Image the Moon

When it comes to imaging the **Moon**, a large sensor and a small pixel size become essential for producing sharp high contrasted images. Just as in imaging planets, we want to capture short videos (less than 5 minutes, as the terminator shadow does move), with a decently fast frame rate. You will want to use the **1600 x 1100** at **12-bit** to provide the largest view (adding a **focal reducer** will increase the view) at the highest bit detail (but this slows down the frame per second). As always you will want to balance these values depending upon your equipment. If possible, try to use **Region of Interest** to increase the frames per second rate.

Increase the **Gain**, to shorten the exposure time (faster frames per second).



Note: that if the **Gain** is increased too much then noise will appear in the image. It's all about balance.

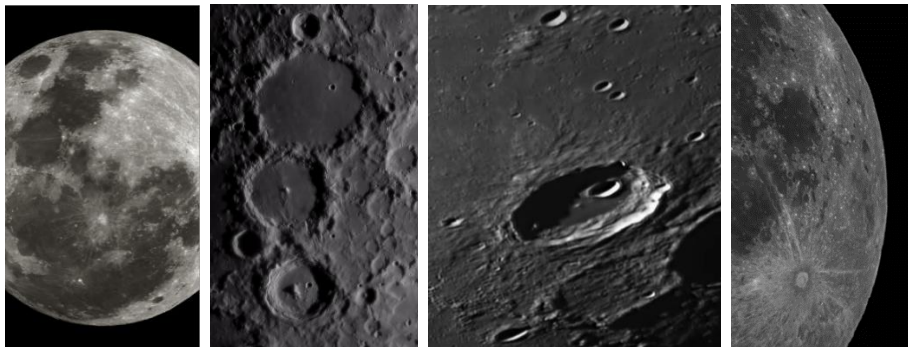
If possible, have your equipment track in **Lunar Mode**, as this will keep the current image of the **Moon** centered.

Use your **Histogram** to help ensure your image is not too bright or dark (with my equipment my histogram peak is between 50 and 100, but this depends upon phase of **Moon**).

With your video saved, use stacking and adjustment software to choose and align the best frames (you made have between 2000 to 10000 frames captured, depending upon frame rate and duration of capture).



Some Postproduction software to help produce the best image are **PIPP** and **AstroSurface** or **AutoStakkert**.



## How to Image the Sun

When it comes to imaging the **Sun**, a large sensor and a small pixel size become essential for producing sharp high contrasted images. Just as in imaging the Moon we want to capture short videos (less than 5 minutes), with a decently fast frame rate. You will need to ensure that your telescope has the correct **Solar Filters** attached.

Depending upon the required image closeups, you may choose to also include a **Barlow** (you will need to increase the exposure rate).

You will want to use the **1600 x 1100** at **12-bit** to provide the largest view (adding a **Focal Reducer** will increase the view) at the highest bit detail (but this slows down the frame per second). As always you will want to balance these values depending upon your equipment. If possible, try to use **Region of Interest** to increase the frames per second rate.

Increase the **Gain**, to shorten the exposure time (faster frames per second).



Note: that if the **Gain** is increased too much then noise will appear in the image. It's all about balance.

If possible, have your equipment track in **Solar Mode**, as this will keep the current image of the **Sun** centered.

Use your **Histogram** to help ensure your image is not too bright or dark, but this depends upon the type of **Solar Filter** you are using).

With your video saved, use stacking and adjustment software to choose and align the best frames (you made have between 2000 to 10000 frames captured, depending upon frame rate and duration of capture).



Some Postproduction software to help produce the best image are **PIPP** and **AstroSurface** or **AutoStakkert**.



## How to Image Deep Sky Objects

The **DS432CTEC** was designed for **Planetary Objects**; you may expect that it cannot image any other type of object. But you will be surprised that it can still image **Deep Sky** objects.

Since the pixel size of the **DS24CTEC** is **9 microns**, we would recommend that you experiment with **Binning** to provide you with better success by combining those pixels.

You will need to use longer exposure (between 20 and 120 seconds along with MallinCamSky's **Live stacking** enabled (**Aligned** and **Average** selected)).



You also will want to use **Dark Fields** as you may obtain some **amp glow** (due to longer exposure times) and this control will remove that.

Again, play with the **Histogram** to produce the best image you can so it presents the most amount of detail.

You will want to take many **Snapshots** of your object and then combine to increase the **Signal to Noise Ratio**.



Some Software to help produce the best image are: **PixInsight**, **DeepSkyStacker**, and **Astro Pixel Processor**.

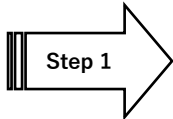


## Quick Work-Flow Procedures



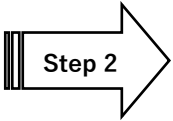
### Quick Workflow for Starting MallincamSky

So, you do not like to read manuals, and you just want to just jump right into imaging. Then this section gives you a **Quick and Dirty** method to get going. Then, I follow this section with an even more detailed section on **Planetary Imaging Workflow**, and finally a more detailed section on **Workflow on Imaging Deep Sky Objects**.



Step 1

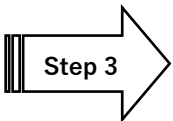
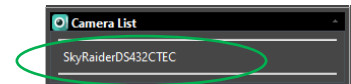
Double Click on the **MallincamSky Icon** to start the program.



Step 2

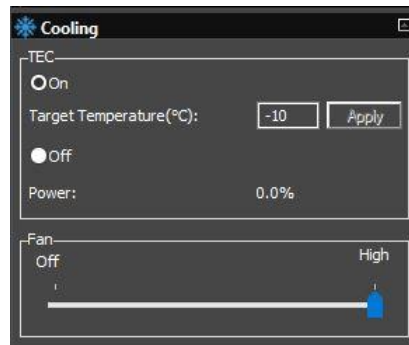
Select the **SkyRaiderDS432C TEC** from the **Camera List** in the **Camera Tab**.

With the **Camera Tab** selected on the **Left SideBar**; **Left-Click** on the **SkyRaiderDS432C TEC** (between lines in **Camera Heading**). Once the SkyRaider is selected, a black rectangle (with **SkyRaider Camera** name) will appear in the **Video Window** of the **MallincamSky** Software along with the **Horizontal** and **Vertical Rulers**, and the fan on the SkyRaider **DS432C TEC** may start running.



Step 3

Activate **TEC** from the **Cooling** tab to cool camera (set about 30° below ambient temperature). The current temperature of your camera is displayed on the bottom right corner of the MallincamSky Window.

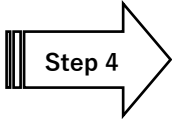


You can also turn **On** or **OFF** the fan via the Slider in the Cooling Tab



The **Mallincam SkyRaider DS432C TEC Camera** provides a processing technique called **Dark Field and Flat Field Corrections** (see Detailed Sections below for techniques and explanations on using both **Dark Fields and Flat Fields**).



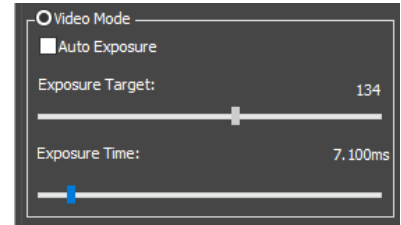


Step 4

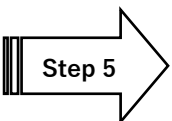
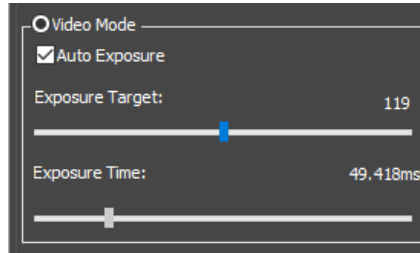
### Reduce Exposure Time to Align Telescope

As you will most likely use the camera to align and focus your Telescope, now is the time to reduce the **Exposure Time** to **1** or **2** seconds (or even less, depending upon the brightness of the object), and if not already attached to the Telescope, **remove the lens cap** from the **DS432CTEC Camera** and insert the camera into the eyepiece holder of your telescope. The shorter exposure will make it easier for you to align and focus your telescope.

Select the **Video Mode** radial button on the **Capture and Resolution Tab**. The **DS432C TEC** will start imaging and displaying what it sees, now move the **Exposure Time** slider to some value less than 5 seconds (note that the units are in milliseconds, so 1 second = 1000 ms), and align and focus your telescope. In **Video Mode**, images are automatically continuously taken once activated.



**Hint:** You can ask MallincamSky to provide you with an approximate exposure time by **checking** the **Auto Exposure** box in **Video Mode**, and then move the **Exposure Target** slider to the middle of the range. MallincamSky will automatically adjust the **Exposure Time** (and display it) for you. Now just **uncheck** the **Auto Exposure** box and the **Exposure Time** will remain at the selected value.



Step 5

### Increase Exposure Time to Image

Now is the time to expose some **Deep Sky Objects** or **Planetary Objects**. So, go back into **Trigger Mode** (if you are imaging **Deep Sky Objects**, else remain in **Video Mode** if imaging **Planetary Objects**) and adjust the **Exposure Time** to match the current target and the equipment you are using.

#### Video Mode

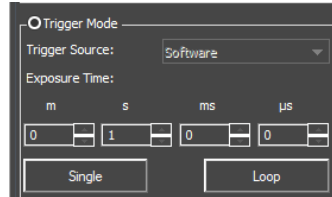
Simply adjust the **Expose Time** slider anywhere from 1 ms to 5 seconds (5000ms) so the object you are imaging is not over or under exposed.

Also play with the **Gain** Slider to see how that affects your image (don't be afraid of **Gain**).

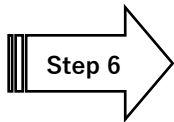


## Trigger Mode

In selecting **Trigger Mode**, the camera will wait for you to tell it to commence (**Loop**). So, enter your time in the **m(in)**, **s(ec)**, **ms**, and **us** boxes, and **Click** on the **Single** button to do just one exposure.



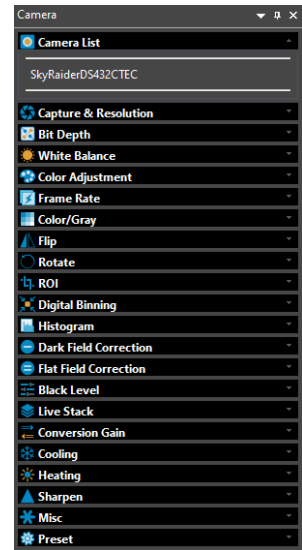
If necessary, adjust the exposure time settings and repeat. Once you are happy with the exposure time, you can now tell MallincamSky to continuously take images at that exposure by clicking on the **Loop** button. To stop the camera from imaging, again **Click** on the **Loop** button (which has now changed its name to **Stop**).



## Adjust the Parameters

Choose a parameter from the **Camera Tab** on the **Left Side Bar** and see what you can adjust, and how it affects your image.

You will have to wait until the next image is exposed to see how your adjustments look (keep an eye at the bottom of the screen to see when the next adjusted image will appear).



## Video Mode

You can adjust all the control commands in real-time to experience how the adjustment affects your image. We recommend you experiment with the **Gain**, **White Balance**, **Color Adjustment**, and **Histogram** to see how easy they are to control your image.

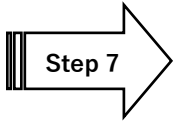
## Trigger Mode

Trigger Mode is more restrictive to what you can perform in real-time, not to mention that you will not see how your adjustment affects the image until the camera's next exposure.

The control commands available to you when Looping are: **White Balance**, **Color Adjustment**, **Frame Rate**, **Color/Gray**, **Flip**, **Histogram**, **Dark Field Correction**, **Flat Field Correction**, **Black Level**, and **Live Stack**.



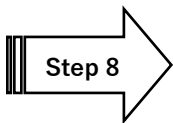
You will have to wait until the next image is exposed to see how your adjustments look (keep an eye at the bottom of the screen to see when the next adjusted image will appear).



### Have Fun and Experiment

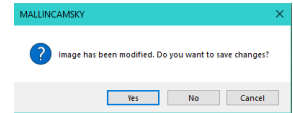
You can now spend some time to become more comfortable with the **MallincamSky** Software. The **SkyRaider DS432C TEC User Manual** will go into more detail about all the options and adjustments you can perform with the **SkyRaider** series of cameras. But do not be afraid to experiment.

As mentioned above, the **DS432CTEC** is not afraid of **Gain** so experiment with it. Also, we recommend starting with **Gamma** at a low value. These settings will give a very responsive and fast imaging machine with a great image.



### Exit

To Shutdown **MallincamSky** (after you have saved your images). Click on the **x** located on the extreme right side of the **Top-Bar** in MallincamSky. It may pop-up a message to remind you that you have not saved your images and will give you the opportunity to do so.



# Detailed Work-Flow Procedures



## Detailed Workflow of Video Imaging Planetary Objects

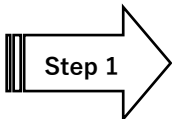
The following instructions will guide you in setting up your SkyRaider camera for imaging Solar, Lunar, or Planetary Objects.

For planetary objects, the exposure setting will be very small (as the objects themselves are usually very bright). It is recommended that you start imaging objects, such as the Moon and bright Planets, as it will allow you to become comfortable with all the adjustments that **MallincamSky** provides for you. With planetary objects, you want as much resolution and data as possible, so choose the highest resolution your SkyRaider provides.

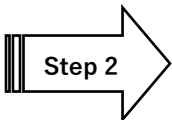


Since the exposure rate is so short, you may find that you do not need to take any **Dark Fields** preparation shots before imaging. But if you do notice warm pixels and would like to eliminate them. Then follow the step-by-step instructions located in the section called: **Dark Field Correction** later in the manual.

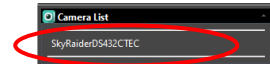
The following instructions are used as a guide to assist you in doing planetary video imaging. Don't forget, when finished with a particular step that uses a particular feature **Tab**, you can collapse the **Tab** by **Clicking** on the little **up- arrow** in the right corner of that **Tab** (This will remove, any green, red, or blue boxes which may be displayed over your image).



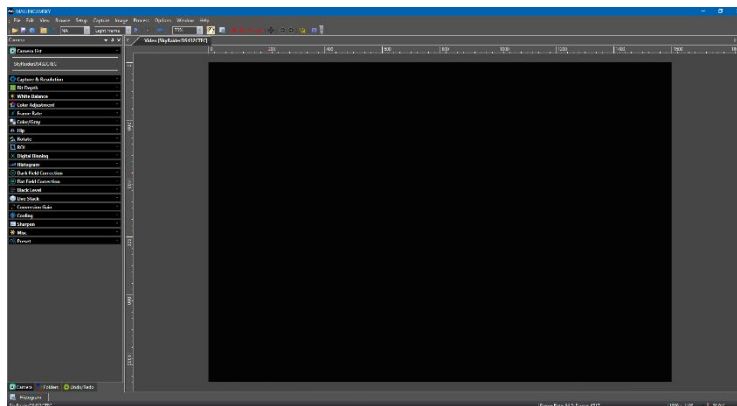
If not started, **Double Click** on the **MallincamSky Icon** on your **Desktop** to start the program.

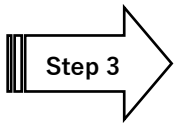


Select the **SkyRaiderDS432C TEC** from the **Camera List** in the **Camera Tab**.



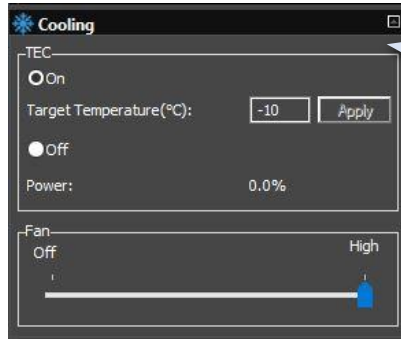
Once the SkyRaider is selected, a black rectangle (with **SkyRaider Camera** name) will appear in the **Video Window** of the **MallincamSky** Software along with the **Horizontal** and **Vertical Rulers** and if the camera is connected, it will display what it is imaging.



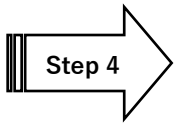


Step 3

If needed, activate the **TEC** from the **Cooling** tab to cool camera (set about 30° below ambient temperature). When **TEC** is activated, the **Fan** may automatically turn **On**. If you turn **Off** the **Fan** by moving the **Fan Slider** to **Off**, then **TEC** will also be deactivated.



Do you have your AC adapter plugged into the Camera?

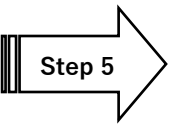


Step 4

Have your telescope pointed to the **Planetary Object** of Interest, and it is recommended that you use a **Barlow Lens** attached to your Telescope when imaging **Planetary Objects** to provide a “Larger (Longer Focal Length)” image.



Since you will want to “**push**” the capabilities of the **DS432CTEC** in displaying the Planetary object, you will require the **highest resolution** that the **DS432CTEC** can produce (see resolution section below for the three different resolutions provided), along with the largest **bits of data** (for color or shades of Black and White) for each pixel that the **DS432CTEC** is able to produce. This will provide enough data for external stacking programs to pull out the finest detail from your video images. The higher the **resolution** and **data bit** setting, the more your computer’s CPU must work, along with a larger image file (more disk space) when saved.

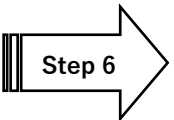
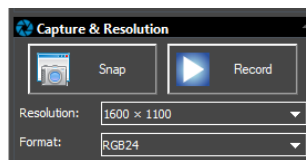


Step 5

From the **Capture and Resolution Tab** on the **MallinCamSky ToolBar**, select the **Largest** resolution values that your SkyRaider is capable of.



The **SkyRaider DS432CTEC** is capable of **1** resolution: **1600 x 1100**.



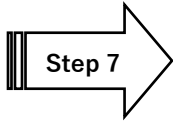
Step 6

If you are going to be saving and processing images taken with the SkyRaider, you will want to increase the **Bit depth** to **12 bits**, the highest value your DS432CTEC supports.





Since you have chosen a **High Resolution** and a **Large Bit Count**, this will slow down the **Frames per Second** rate at which the **MallincamSky** can process the images (huge amounts of data moving through the system). We will make an adjustment in a later step that will increase the **Frames per Second** rate.



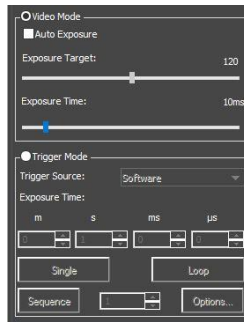
With **MallincamSky** running, **Left-Click** on the **Capture and Resolution Tab** to expand the exposure window.

- Move the **Gain Slider** all the way to the Left.
- **Click** in the **Video Mode Selector** to choose **Video Mode**.
- Make sure that the **Auto Exposure CheckBox** is **unchecked**.



The SkyRaider **DS432CTEC** has two exposure modes:

- **Video Mode**
- **Trigger Mode**



Since we are imaging planetary objects, our exposure should not exceed **5 seconds**. Therefore, we will be using **Video Mode** exclusively for setting our exposure times. **Video Mode** will continuously take and display images at the duration you set in the **Exposure Time** slider.

If you have the **Green Exposure Rectangle** on your image, then you have selected the **Auto Exposure** checkbox, just uncheck it to remove the rectangle.

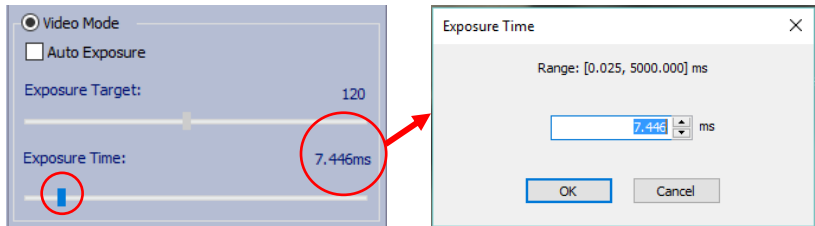
If you want to use **Auto Exposure** and the Green Box annoys you, you can **Left-Click Hold and Drag** corners of the rectangle to resize it to either cover the whole image window, or even to be a zero-size box at one of the corners of your image window. This way you can always have the **Capture and Resolution Tab** open without the annoying green rectangle in the middle of your image.

Step 8

Set the Exposure Time

Set your exposure to a small value, say **10ms** as a starting point. We are using a small amount of time, but the actual exposure amount depends upon the f/ratio, size of telescope, filters, seeing conditions, .... You can adjust the exposure using one of the three methods below:

- You can either use the **mouse button** and **Left-Click-Hold and Drag** the **Slider Marker** (This method is best for making large movements).
- You can also **Click** on the **Slider Marker**, then use the **Left** and **Right** arrows keys on your keyboard to precisely move the **Exposure Marker** (this method provides the most accurate tiny adjustments to the exposure times).
- You can **Click** on the **Exposure Time's** current setting and a pop-up window will appear that allows you to enter the required exposure time in milliseconds (This allows you to be very precise in the exposure time you require, **5000 ms = 5 seconds**).



You should be able to see the Planetary object of interest on your screen. So now adjust the **Exposure Time** to make the object bright enough match your viewing requirements. You can also adjust the **Gain** to the **Right** to brighten your image.

Step 9

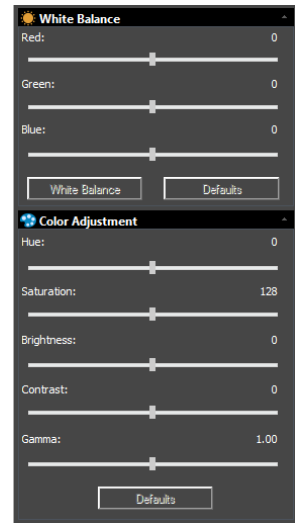
Adjust the Parameters

Now is the time to adjust the **White Balance** and **Color Adjustment** (Contrast, Gamma, ...) to your required preferences.

Located in the **Left SideBar** are the **White Balance** and **Color Adjustment** Tabs. Clicking on the Tab Title will expand the Tab displaying the controls you can adjust. **Left-Click-Hold and Drag** the sliders to tweak your image.

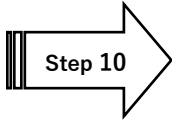
Don't forget **Gamma** setting when using the **DS432CTEC**.

If you get lost by making too many wrong adjustments, just click on the **Defaults** button to reset the image back to its original parameters.





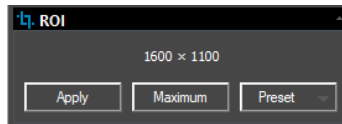
Read the appropriate sections in the **User Manual** (it is great reading, if I do say so myself) to obtain more information as to what each setting does in the **White Balance** and **Color Adjustment** Tabs in MallincamSky. There is no precise value for every user, as we all use different equipment, so this is a great time to *'play'* with the settings to see what value works best for you. Just have fun.



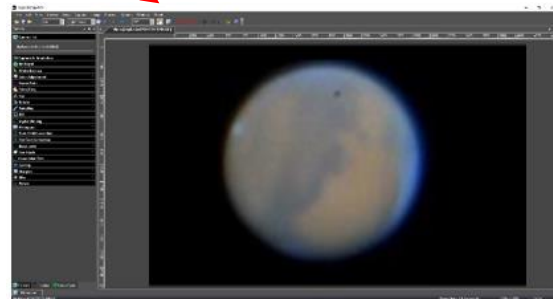
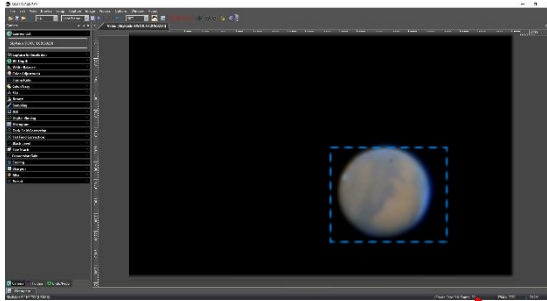
Step 10

To improve the throughput (**Frames per Second**) or if you want to isolate the planetary object, because it is very small in the **Video Window**, choose a **Region of Interest (ROI)** that just includes the image of the planetary object.

You select the **ROI** by using **Left-Click-Hold and Drag** the handles of the **Blue Rectangle** that will appear over your **Image Window** after you selected the **ROI Tab**. Once you have framed the **Blue ROI Rectangle** over your image, then **Click** on the **Apply** button in the **ROI Tab** to accept it.

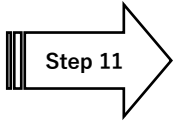


This will make the Video Screen contain just the object that was enclosed by the **ROI's Blue Rectangle**. To return to **Full Video Mode**, just **Click** on the **Defaults Button** on the ROI Open Tab.



Using the **Scroll Wheel** (or **CTRL-Scroll**, depending upon your preference settings; see **Preference** section of manual) on your **mouse**, when the mouse is over the **Image Window** will enlarge and reduce the image size in the **Image Window**.

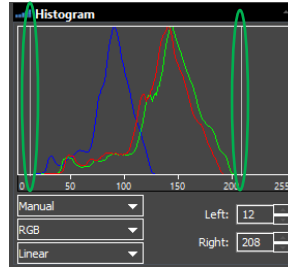




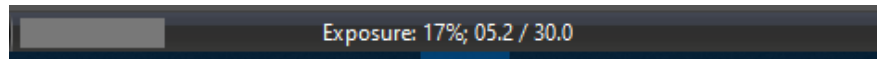
Step 11

### Adjust the Histogram

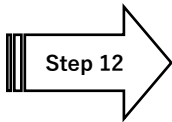
To finely adjust the image characteristics, open up the **Histogram Tab**, and either enter in the **Left** and **Right** values, or **Left Click, Hold and Drag** the two **Vertical Bars** so that you are not clipping data, on either side of the window. These adjustments will help improve the image on the screen. The **Histogram Tab** will take a bit of practice to become comfortable with it (read the section below covering the **Histogram Command** for more details). Set the exposure so that the peak of the histogram is someplace between **50** and **100**.



For any Exposure over **3 seconds** (3000 ms), you can determine how long your camera's exposure time has left by looking at the bottom of the **MallincamSky's** Window, near the middle. It will provide a real-time indicator that informs you of the time used of the exposure time that you had previously set.



The example above tells us that we have used **5.2 seconds** of our **30second** exposure.



Step 12

### Have Fun and Experiment

You can now spend some time to become more comfortable with the **MallincamSky** Software. The **SkyRaider DS432C TEC User Manual** will go into more detail about all the options and adjustments you can perform with the **SkyRaider** series of cameras. But don't be afraid to experiment.



Move the **Gain** to higher values until noise becomes an issue (usually at about 100).



Try different values of **sharpen** to see what details you can pull out of your planetary image.



If you are imaging the **Sun** in the daytime, then select **Options** from the **Top Menu Line**, then choose **Preferences**. It is here that you can set options for **MallincamSky**. If you go into **Misc.**, you can change the **Display Color Style** of the **MallincamSky** software which may be easier to see in bright daylight. If you select another **Color Style**, **Apply**, then **Left-Click** on **OK**. Choose the **Color Style** which works for you. (Use a bright **Color Style** if using computer in Daylight).



## Detailed Workflow of Video Imaging Deep Sky Objects

The following instructions will guide you in setting up your SkyRaider **DS432CTEC** camera for imaging **Deep Sky Objects (DSO)**.

For **Deep Sky Objects**, the exposure setting will be very large (as the objects themselves are usually very dim). It is recommended that practice imaging objects, such as the these, as it will allow you to become comfortable with all the adjustments that MallincamSky provides for you.



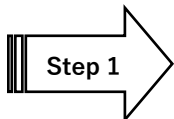
Optionally, since the exposure rate can be very long, you may need to prepare your system by taking **Dark Fields** and a **Flat Field**. If this is the first-time imaging DSO's, you may not have saved previous **Dark Fields**, so this Walk-Through will take you through the **Dark Field** preparation step.

Remember complete explanations of each of the processes and controls are provided later in the User Manual.

The following instructions are used as a guide to assist you in doing Deep Sky imaging. Don't forget, when finished with a particular step that uses a particular feature tab, you can close the Tab by clicking on the **little arrow** in the corner of a Tab (This will remove the red, green, and blue boxes which may be displayed over your image).

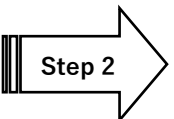


Have your SkyRaider **DS432CTEC** connected to your telescope, and since you are video imaging Deep Sky Objects, you should have a **Focal Reducer** attached. This will provide you with two benefits: first you will be presented with a larger field of view (see more of the object), and second, you will have a faster telescope (shorter exposure times).



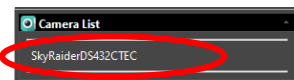
Step 1

If the program is not Started, **Double Click** on the **MallincamSky Icon** on your Desktop to start it.

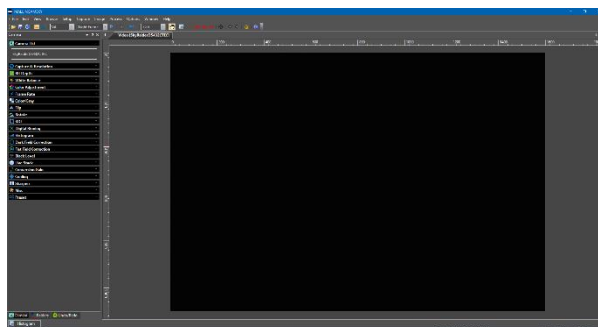


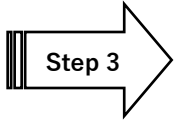
Step 2

Select the **SkyRaiderDS432CTEC** from the **Camera List** in the **Camera Tab**.



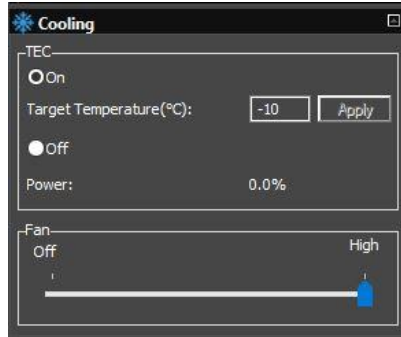
Once the SkyRaider is selected, a black rectangle (with **SkyRaider Camera** name) will appear in the **Video Window** of the **MallincamSky** Software along with the **Horizontal** and **Vertical Rulers**.



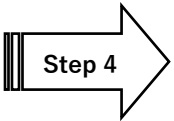


Step 3

Activate **TEC** from the **Cooling** tab to cool camera (set about 30° below ambient temperature).



Since you will want to “**push**” the capabilities of the SkyRaider in displaying the Deep Sky Object, you will require the **highest resolution** that your particular SkyRaider can produce, along with the largest **bits of data** (for color or shades of Back and White) for each pixel that the SkyRaider is able to produce. This will provide enough data for external stacking programs to pull out the finest detail from your video images. The higher the **resolution** and **data bit** values, the more your computer’s **CPU** must work, along with larger saved image files.

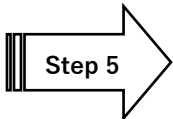
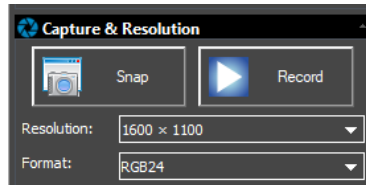


Step 4

From the **Capture and Resolution Tab** on the **MallincamSky ToolBar**, select the **Largest** resolution values that your **DS432CTEC** is capable of.

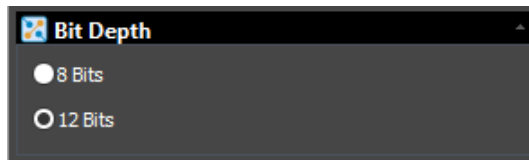


The **SkyRaiderDS432C TEC** is capable of **1** resolution: **1600 x 1100**.

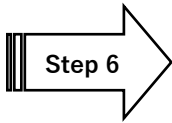


Step 5

If you are going to be saving and processing images taken with the **DS432CTEC**, you may want to increase the **Bit Depth** to **12 bits**, the highest value your **DS432CTEC** supports.



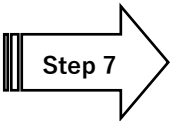
Since you have chosen a **High Resolution** and a **Large Bit Depth**, this will slow down the **Frames per Second** rate at which **MallincamSky** can process the images (huge amounts of data moving through the system). We will make an adjustment in a later step that will help increase the **Frames per Second** rate.



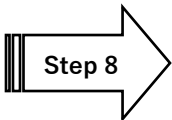
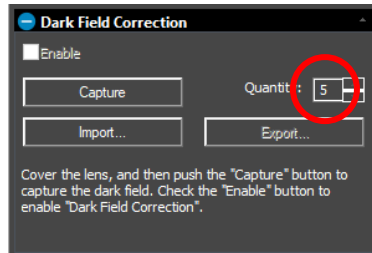
**Step 6 Take a set of Dark Fields**

Due to the Large Exposure times that you will be using in imaging Deep Sky Objects, the SkyRaider (in fact every camera no matter what the cost) will sometimes display noise such as, warm pixels and amp glow. The longer the exposure the more noise that can appear on your image. The MallincamSky software can remove this noise, by applying pre-prepared **Dark Fields** to your images, effectively removing the noise.

Either place the Lens cap over your Telescope or place the dust cover cap over your SkyRaider **DS432C TEC** camera to block any light from hitting the sensor of the camera.



Open the **Dark Field Correction Tab** on the **Left SideBar** of MallincamSky. You will normally determine the maximum exposure time that you will be using for the evening, but to get started for the first time, we will choose **5** exposures of **30** seconds. Adjust the **Quantity** to **5**.



**Step 8 Select an Exposure Time for Dark Field Correction**

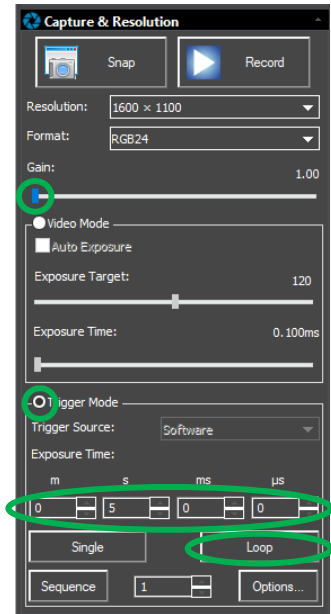
With the **Camera Tab** selected on the **Left SideBar**, **Left-Click** on the **Capture & Resolution**.

You must determine what you believe will be the maximum exposure for this session. As, you will create Dark Field's with this time (or close to it). In this example we will choose **30 seconds**.

In the **Capture & Resolution Tab**; **Click** on the **Trigger Mode Radial Button** (Trigger Mode is used to select any exposure time over 5 seconds).

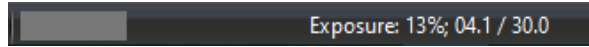
Move the **Gain Slider** to about where you would normally use it (start with **50** if not sure).

Either enter the time into the appropriate exposure **time unit boxes** or use the **up** and **down** arrows beside the chosen Exposure time unit to set your maximum time. For us, set the seconds (s) time unit to **30** for 30 seconds.

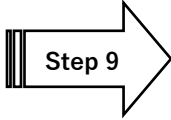




To start the SkyRaider **DS432CTEC** in taking continuous exposures, **Left-Click** on the **Loop** button. Since we have chosen **30 seconds**, you will notice, on the bottom of the Main Window of MallincamSky is the **Exposure indicator**. This shows you the current set exposure time used in the exposure.



The example on the left tells us that we have used **4.1 seconds** of our **30 second** exposure.

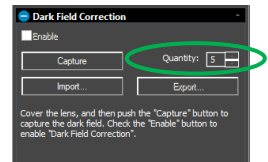


**Step 9 Take Dark Field Correction**

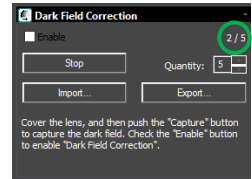
Ensure that the cover is either on the **SkyRaider Camera** or the Telescope itself is covered, then **Left-Click** on the **Dark Field Correction Tab**.

The **Dark Field Correction Tab** will expand allowing you to select the **Quantity of Dark Fields** and the option to start the **Dark Field Capture** process.

Select **5** for the **Quantity**, then **Left-Click** on the **Capture** Button (which will change its name to **Stop** in case you need to abort the Dark Field capture). The Software will display its progress above the selected **Quantity**. Remember, it is beneficial to set the Dark Field exposure time greater than the longest time you will be imaging at.



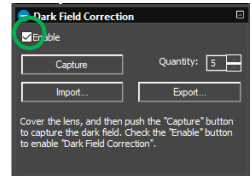
As the **Dark Fields** are being exposed, you can watch the **exposure counter** in the **Dark Field Correction Tab** go up to let you know how many **Dark Fields** have been taken (**2 out of 5** in the above example).



Once the **Dark Fields** have been taken, you have the option of saving them by **Clicking** on the **Export button** and saving them in a folder of your choice. This way you can use them again on another night.

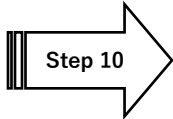
You can also import previously saved **Dark Fields** by using the **Import Button**.

When you are ready to apply the **Dark Fields** to your images (in real time), simply check the **Enable** box in the **Dark Field Tab**. Unchecking the Enable box will prevent **Dark Fields** from being applied to the images. For now leave it unchecked.



Now is the time to get busy with imaging our **Deep Sky Object** since the preliminary work is done. So, remove the Lens Cap from the Telescope, or Lens Cover from the **DS432CTEC**.

Hopefully, your telescope is mostly polar aligned, and you are ready to visit your first **DSO**, and produce an image to impress one friends, neighbors, and spouse (so you can justify spending all of your hard-earned money on those extra pieces of equipment that you just had to have for imaging).

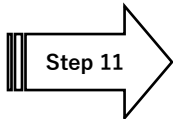


Step 10

### Focus your Telescope

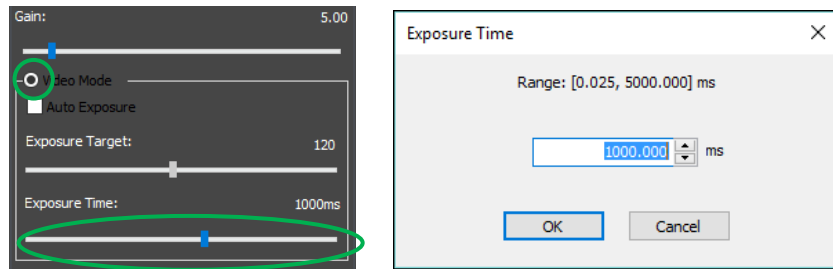
The first thing we need to do is align and verify focus of our Telescope. To do that we only need a short duration exposure (under 5 seconds), so we will use **Video Mode**.

Open the **Capture and Resolution Tab** and ensure that the **Auto Exposure** box is **unchecked**. Move the **Gain** slider to about the same value you set in the **Dark Field**, say **50**. Remember the higher the **Gain** the shorter the **Exposure Time**. We want short exposures to allow us to focus without having to wait too long until the next image refreshes.



Step 11

**Now** Select the **Video Mode** Radial indicator button, then either use the **Slider** or **Click** on the **Current Exposure Time Value** to open the **Exposure Time Window**. Enter in **1 second (1000 ms)** in this window and **Click** the **OK** button to accept.



We will use a small exposure, so we can verify that the object is someplace in the field of view (if in using **1 second** the star or object is too dim, increase exposure to **2 seconds** or increase the **Gain**). This is a great time to check your focus as the images will be updated very quickly. You can use the **Crosshair's** Icon at the top of the **MallincamSky** Window to assist in centering your object (or focus a star). **Click** on the Crosshair to activate, and again **Click** on the **Crosshair** to deactivate it.

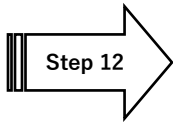


Again, if the image is too dim, try increasing either the **Exposure** or the **Gain**.

Now, you have your Deep Sky Object (or at least a dim version of it, centered in your screen. It is time to crank-up-the-volume. Well, for us, time to increase-the-exposure.

If the **Capture and Resolution Tab** is not open, then **Click** on it to expand its Window.

When imaging Deep Sky Objects, we will need to use an exposure over **5 seconds (5000ms)**, this is where the **Trigger Mode** comes in, on the SkyRaider **DS432CTEC**.



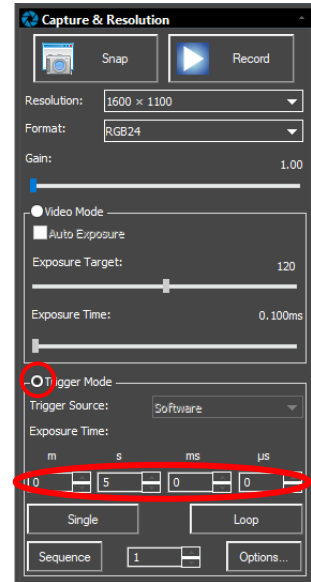
Step 12

**Image your object**

Click on the **Trigger Mode Radial** selection button to activate **Trigger Mode**.

Set your exposure to a large value, say **30s** as a starting point (we are using **30 seconds**, but the actual exposure amount depends upon the f/ratio, size of telescope, filters, seeing conditions, ...). You can adjust the exposure using one of the two methods below:

- You can **Click** in the **Time Units Box** and enter in an amount (**30 seconds**) using your Keyboard.
- You can **Click** on the **up** or **down** arrow in the **Time Unit Box** of choice to move the exposure time to your required value (**30 seconds**).

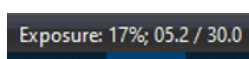


Click on the **Single Button** to take a single exposure to see if the image of the object is close to the brightness you need.

If you are satisfied with the single image, then **Click** on the **Loop Button** to have the SkyRaider **DS432CTEC** continuously take images (at 30 seconds in our example).



Since we have chosen **30 seconds**, MallincamSky will continuously display the **exposure time** and the **current amount of time captured** in the exposure info box located on the Bottom of the MallincamSky Window (MallincamSky does this automatically for any exposure over 3 seconds).



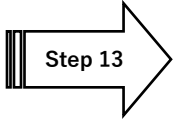
The example on the left is telling us that we have exposed **5.2 seconds** of our **30 second** exposure.



Now, we are heading into the “Art” of video imaging. You can **decrease** the **Exposure Time**, as long as you **increase** the **Gain**. But, by increasing the **Gain**, you also **increase any noise** that is present. Use your own judgment in what you are willing to accept on your image.

The **DS432CTEC** will continuously refresh the image based on the exposure time, and any adjustment you make will not be visible until the next refresh. This includes if you move your telescope; you may see streaks until the next complete refresh of the image.

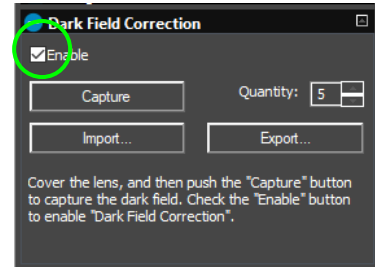
Now, that we have an image that we are happy with, it is time to enable **Dark Field** subtraction (if you took Dark Field Images).



Step 13

### Apply Dark Fields

Click on the **Enable CheckBox** in the **Dark Field Correction** Tab. Dark Fields will be automatically applied during the next image refresh, so in our example you may have to wait up to 30 seconds before the Dark fields are applied.



M57, 20 Seconds exposure, VRC 6", F/4.5 with MallinCam 0.5X focal reducer, NO Dark Field Correction. No processing, as seen live on monitor. Single frame.



M57, 20 Seconds exposure, VRC 6", F/4.5 with MallinCam 0.5X focal reducer, One Single DARK FIELD CORRECTION APPLIED LIVE, No processing, as seen live on monitor, Single frame.

You can deactivate the dark field correction at any time by **unchecking** the **enable** box in the **Dark Field Correction** Tab.

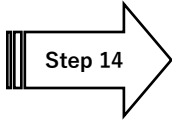


Do not forget to read the section on how to make and save Dark Fields to improve your imaging results.

Obtaining an Image of our First Deep Sky Object is enough for most to start the celebration process (again most of us will call for our spouse to have a look at the amazing image we have just produced, again trying to justify the money used in buying those extra pieces of hardware).

Next, we want to fine tune our image to perfection (at least that is what you will tell yourself), but this is a great time to get familiar with some of the adjustment options available in **MallincamSky**.





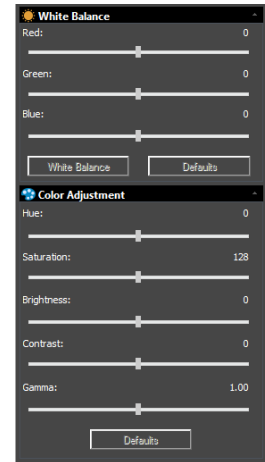
Step 14

## Adjust the Parameters

Now is the time to adjust the **White Balance** and **Color Adjustment** (Contrast, Gamma, ...) to your required preferences.

Located in the **Left SideBar** are the **White Balance** and **Color Adjustment** Tabs. Clicking on the Tab Title will expand the Tab displaying the controls you can adjust. **Left-Click-Hold and Drag** the sliders to tweak your image.

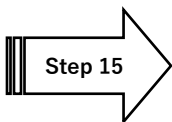
If you get lost by making too many wrong adjustments, just click on the Defaults button to reset the image back to its original parameters.



You can adjust the **Gamma** (start with a low **Gamma** value), **Brightness**, **Contrast**, ... in real time, but it will not appear on the Video Window until the SkyRaider has done its next refresh (which depends upon the current exposure time).



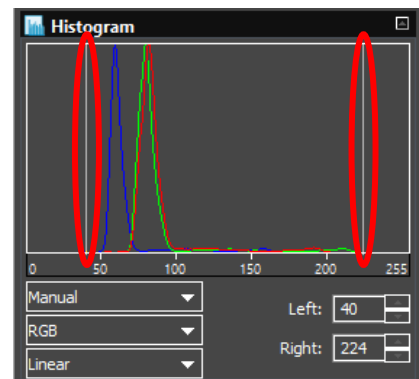
Read the appropriate sections in the **User Manual** (it is great reading, if I do say so myself) to obtain more information as to what each setting does in the **White Balance** and **Color Adjustment** Tabs in MallincamSky. There is no precise value for every user, as we all use different equipment, so this is a great time to '*play*' with the settings to see what value works best for you. Just have fun. The best part is if you mess up, there is always the **Defaults Button** to bring your image back to the way it was.



Step 15

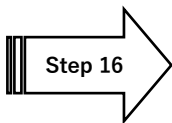
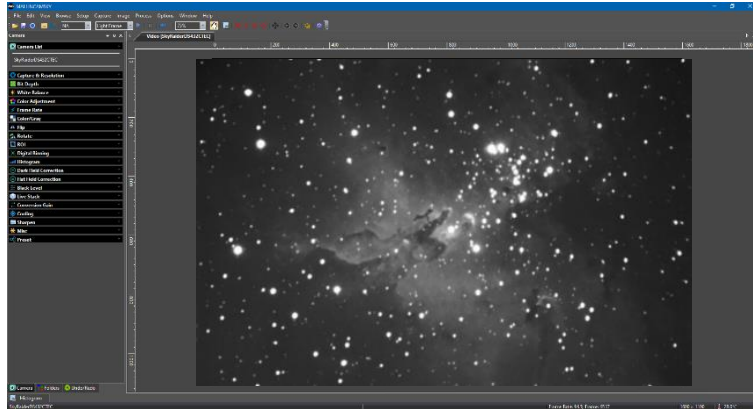
## Histogram

To finely adjust the image characteristics, open the **Histogram Tab**, and either enter in the **Left** and **Right** values, or **Left-Click-Hold and Drag** the two **Vertical Bars** so that you are not clipping data, on either side of the window. These adjustments will help improve the image on the screen. The **Histogram Tab** will take a bit of practice to become comfortable with it. For more detailed information on how to use the **Histogram Tab**, locate that section in the User Manual. Set the exposure so that the peak of the Histogram is someplace between **50** and **100**.



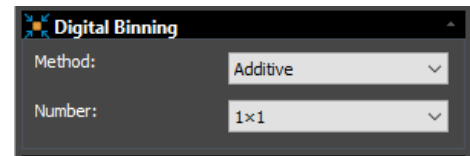
You cannot adjust **Exposure** or **Gain**, when the SkyRaider is in **loop** mode. You will need to stop the **looping**, adjust the **exposure** or **gain**, then restart the **looping**.

This is where you must take over adjusting the parameters, as each telescope, night-sky, seeing conditions are different from user to user. So, have fun and experiment with the settings and see how they affect your image. Remember, these are your images, and you decide what is best for you.



### Digital Binning

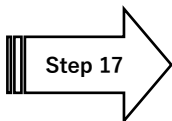
To shorten the exposure (also reduces the resolution), you have the option of selecting **Digital Binning**. You can choose no Binning (**1 x 1**) all the way to **8 x 8 Binning**. Note, you will need to re-adjust appropriate histograms, contrast, ... after choosing a different binning number. You will also notice the **Video Screen** image size is reduced to match the “digital resolution” of the Mallincam Camera when the **Digital Binning** is applied. You need only increase the **Zoom** factor to increase the size of the window.



You can also indicate if you would like the binning process to use **Additive** (sums) or **Average** algorithms.

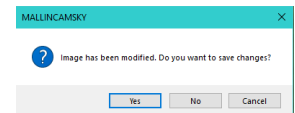


**Additive** provides a faster image (so will appear brighter), while the **Average** setting will produce a sharper image with no increase in exposure time. Play with it to see what you prefer.



### Exit

To Shutdown MallincamSky (after you have saved your images). Click on the **x** located on the extreme right side of the **Top-Bar** in MallincamSky. It may pop-up a message to remind you that you have not saved your images and will give you the opportunity to do so.


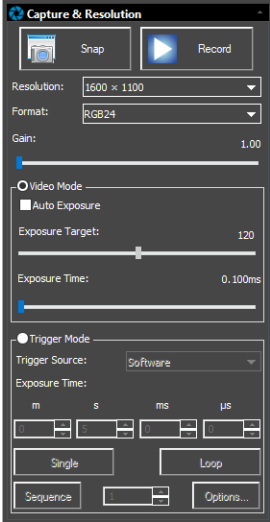


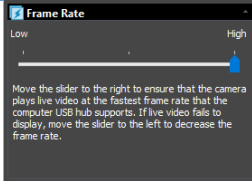
Chapter  
3


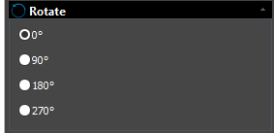
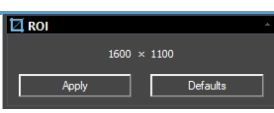
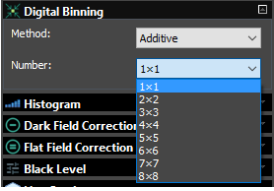
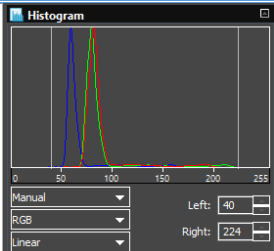
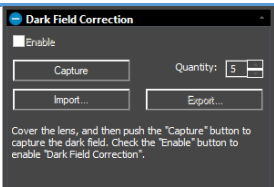


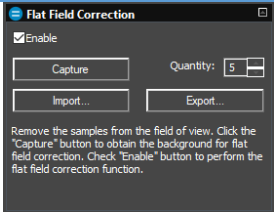

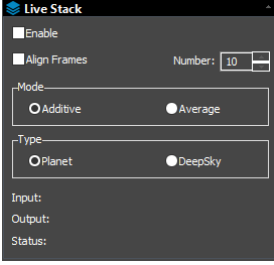
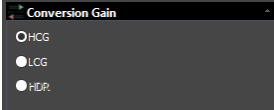
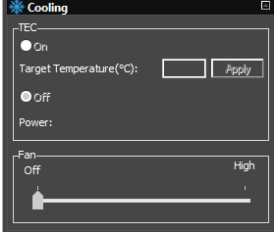
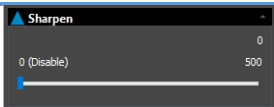
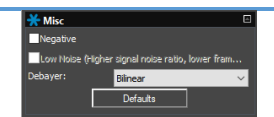
### C3: Quick Overview of the Left Sidebar

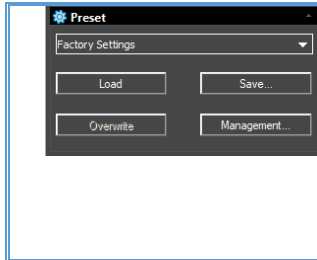
To expand the control just click on the down-arrow symbol that is located on the right of the control. The control will expand providing you will its options. You can expand as many controls as necessary, but you may need to use the slider (which automatically appears if the control information is larger than the MallincamSky Window. To close the control, just click on the little up-arrow symbol located on the right side of the control.

	<p>The <b>Camera List</b> contains the list of attached Mallincam Cameras. If a USB 3.0 camera is attached to a USB 2.0 port, then (USB 2.0) will be appended to the name. Clicking on the camera name will activate the camera and display its image in the Video Window.</p>
	<p><b>Snap</b> takes a picture of what is currently being displayed in the Video Window and places that image in its own tab with default name 0001*.</p> <p><b>Record</b> starts recording a video of what is being imaged. The recording will stop when you click on the recording button again.</p> <p><b>Resolution</b> contains the current resolution of the camera.</p> <p><b>Format</b> of the camera <b>RGB24</b>, or <b>RAW</b>.</p> <p><b>Gain</b> adjusts the amplification of the signal from the camera.</p> <p><b>Video Mode</b> displays the image in Video Window in real-time</p> <p><b>Auto Exposure</b> has MallincamSky choose best exposure for you when checked.</p> <p><b>Exposure Target</b> gives Auto Exposure some value to aim for.</p> <p><b>Exposure Time</b> allows you to set an exact exposure from 0 s to 5 s.</p> <p><b>Trigger Mode</b> displays long exposure images from 0.100 ms to 1 h in the Video Window. Activated by the <b>Loop</b> control.</p> <p><b>Exposure Time</b> allows you to set the <b>Exposure</b> time.</p> <p><b>Single</b> allows you to take a single exposure.</p> <p><b>Loop</b> allows MallincamSky to repeatedly take exposures.</p> <p><b>Sequence</b> allows you to set up a sequence of looped exposures.</p> <p><b>Number</b> determines the number of exposures in sequence.</p> <p><b>Options...</b> allows you to set the destination and format of the video sequences.</p>

	<p><b>Bit Depth</b> sets the number of bits the camera assigned to the image for Windows display. When set to <b>8 bits</b> you have <b>256</b> available colors. When set to <b>12 bits</b> you have <b>4096</b> available colors. The larger the bit depth the larger its size is and the more load it places on the CPU.</p>
	<p><b>White Balance</b> allows you to select a region of the Video image via a <b>red box</b> and do a white balance correction by clicking on the <b>White Balance</b> button.</p> <p>The <b>Red</b> slider allows you to manually adjust the <b>red</b> level in the video image.</p> <p>The <b>Green</b> slider allows you to manually adjust the <b>green</b> level in the video image.</p> <p>The <b>Blue</b> slider allows you to manually adjust the <b>blue</b> level in the video image.</p> <p>The <b>White Balance</b> button allows you to activate <b>red box</b> as the White Balance template and MallincamSky will adjust the <b>Red, Green, and Blue</b> values.</p> <p>The <b>Defaults</b> button resets the White balance to <b>red=0, green=0, and blue=0</b>.</p>
	<p><b>Color Adjustment</b> allows you to adjust its real-time various components of the video image.</p> <p><b>Hue</b> – the slider allows you to modify the indicator of <b>dominant color</b>.</p> <p><b>Saturation</b> – the slider allows you to modify the <b>intensity of color</b> in the video image.</p> <p><b>Brightness</b> – the slider allows you to modify the <b>brightness</b> of the video image.</p> <p><b>Contrast</b> – the slider allows you to modify the <b>difference in brightness</b> of the elements in the image.</p> <p><b>Gamma</b> – the slider allows you to modify the <b>captured</b> brightness to the <b>perceived</b> brightness.</p> <p>The <b>Defaults</b> button returns all the <b>Color Adjustments</b> to their default value.</p>
	<p>The <b>Frame Rate</b> control allows you via the <b>slider</b> to adjust the rate at which the <b>SkyRaider</b> camera streams its data through the USB port. If your video window does not display an image, then move the slider toward the <b>Low</b> end of the Bar, as your computer cannot handle the rate at which the data is being pushed.</p>
	<p>The <b>Color/Gray</b> command allows you to determine if you would like to view the video image in <b>color</b> or in shades of <b>grey</b>. Select by clicking in the appropriate radial button.</p>

	<p>The <b>Flip</b> command allows you to flip the video image in the <b>Horizontal</b>, <b>Vertical</b>, or <b>Both</b>. Flip in the required direction by checking the appropriate <b>checkmark</b> box. The flip command can be used to match the orientation of the image to your needs.</p>
	<p>The <b>Rotate</b> command allows you to rotate the image clockwise in four set angles: <b>0°</b>, <b>90°</b>, <b>180°</b>, and <b>270°</b>. Click in the require radial button the rotate the image.</p>
	<p>The <b>ROI (Region of Interest)</b> command presents a saleable and draggable <b>Blue box</b> which you can adjust with your mouse. Enclosing a region of your image and clicking on the <b>Apply</b> button will make the Video Window only contain what was enclosed within the <b>Blue box</b>. To return to the full Video Window click on the <b>Defaults</b> button.</p>
	<p>The Digital <b>Binning</b> command will allow you to <b>Bin</b> your displayed video image to either increase the sensitivity of the camera or improve the quality of the image.</p> <p><b>Method</b> selects style of binning (Additive or Average)  <b>Additive</b>: add pixels together (bases on the number selected) to increase sensitivity.  <b>Average</b>: adds pixels together (bases on the number selected) to increase quality of image.</p> <p><b>Number</b> determines the amount of binning selected.</p> <ul style="list-style-type: none"> <li>1: No binning</li> <li>2: 2 x 2 binning</li> <li>3: 3 x 3 binning</li> <li>4: 4 x 4 binning</li> <li>5: 5 x 5 binning</li> <li>6: 6 x 6 binning</li> <li>7: 7 x 7 binning</li> <li>8: 8 x 8 binning</li> </ul>
	<p>The <b>Histogram</b> command displays the relationship of the distribution comparing the number of pixels at a specific color level. This Realtime graph allows you to adjust the <b>dark</b> and <b>light</b> endpoints to stretch the image to reveal more detail in the shaded areas.</p> <p><b>RGB</b>: allows you to select a <b>color</b> channel.  <b>Linear</b>: displays the distribution using either a <b>linear</b> or <b>logarithmic</b> scale.  <b>Left</b>: lets you manually enter the starting <b>dark</b> region.  <b>Right</b>: lets you manually enter the ending <b>light</b> region.  <b>Manual</b>: Allows you to adjust the Histogram.  <b>Once</b>: lets <b>MallincamSky</b> select what it feels is the best values for <b>Left</b> and <b>Right</b>.</p>
	<p>The <b>Dark Field Correction</b> command will allow you to take and apply <b>Dark Fields</b>.</p> <p><b>Enable</b>: once checked will apply the previously taken Dark Fields to your video image in Realtime.  <b>Caption</b>: will take (ensure camera is covered) the <b>Quantity</b> number of Dark Fields.  <b>Quantity</b>: the number of Dark Field images to take.</p> <p><b>Import...</b>: allows you to <b>load</b> previously taken Dark Fields.  <b>Export...</b>: will allow you to <b>save</b> currently taken Dark Fields.</p>

 <p>The Flat Field Correction control panel includes an 'Enable' checkbox, a 'Capture' button, an 'Import...' button, and an 'Export...' button. A 'Quantity' field is set to 5. A text box below explains: 'Remove the samples from the field of view. Click the "Capture" button to obtain the background for flat field correction. Check "Enable" button to perform the flat field correction function.'</p>	<p>The Flat Field Correction command will allow you to take and apply Flat Fields.</p> <p><b>Enable:</b> once checked will apply the previously taken Flat Fields to your video image in Realtime.</p> <p><b>Capture:</b> will take (ensure camera is covered) the Quantity number of Flat Fields.</p> <p><b>Quantity:</b> the number of Flat Field images to take.</p> <p><b>Import...:</b> allows you to load previously taken Flat Fields.</p> <p><b>Export...:</b> will allow you to save currently taken Flat Fields.</p>
 <p>The Black Level control panel shows a slider ranging from 0 to 496, with a current value of 31.</p>	<p>The Dark Level command allows you to adjust the range of the blackness in the video image. The left end (0) is the darkest, while the right end (496) is the highest.</p>
 <p>The Live Stack control panel includes an 'Enable' checkbox, an 'Align Frames' checkbox, and a 'Number' field set to 10. It has two sections for 'Mode' (Additive and Average) and 'Type' (Planet and DeepSky). It also shows 'Input:', 'Output:', and 'Status:' labels.</p>	<p>The Live Stack control allows you to combine numerous images together in Realtime.</p> <p><b>Enable:</b> activates the stacking process.</p> <p><b>Align Frames:</b> when checked will align the frames before stacking.</p> <p><b>Number:</b> contains the number of rolling frames that will be stacked</p> <p><b>Mode:</b> determines the type of stacking that will be performed. You have a choice of Additive (produces brighter image), or Average (produces better quality image).</p> <p><b>Type:</b> Allows you to choose the type of object you are imaging, so to improve the Alignment algorithms. Choices are Planet or DeepSky.</p> <p><b>Input:</b> number of images accepted into algorithm</p> <p><b>Output:</b> number of Stacked images produced</p> <p><b>Status:</b> if alignment is successful</p>
 <p>The Conversion Gain control panel has three radio buttons: HCG, LCG, and HDR.</p>	<p>The Conversion Gain control will allow you to choose what Gain algorithm that MallincamSky should use.</p> <p><b>HCG:</b> High Conversion Gain produces a brighter image in the specific time, but more noise.</p> <p><b>LCG:</b> Low Conversion Gain produces a dimmer image in the specific time, but less noise.</p> <p><b>HDR:</b> High Dynamic Range is not available for DS432CTEC.</p>
 <p>The Cooling control panel includes a 'TEC' section with 'On' and 'Off' radio buttons, a 'Target Temperature(°C)' field with an 'Apply' button, and a 'Power' section. Below is a 'Fan' slider from 'Off' to 'High'.</p>	<p>The Cooling control will allow you to set a target temperature and activate the internal cooling mechanism. This control also allows you to activate the camera's internal fan (ac adapter must be powered on).</p> <p><b>TEC:</b> allows you to activate with the On radial button, or deactivate with the Off radial button. Once activated you can select a Target temperature and apply it.</p> <p><b>Fan:</b> via the slider, you can allow activate the internal fan in the camera.</p>
 <p>The Sharpen control panel shows a slider from 0 (Disable) to 500.</p>	<p>The Sharpen control allows you to tweak the sharpening of the finer details of the Realtime video image. The slider gives a range of 0% (which is off) to 500% (all the way to the right).</p>
 <p>The Misc control panel includes a 'Negative' checkbox, a 'Low Noise (Higher signal noise ratio, lower Fram...)' checkbox, and a 'Debayer' dropdown menu set to 'Bilinear' with a 'Defaults' button.</p>	<p>The Misc control allows you to produce an inverse or negative of the Realtime video image by checking in the checkbox.</p> <p><b>Low Noise</b> internal operation to help reduce noise on output.</p>



The **Preset** control allows you to **save** and **load** previous control settings that you have used to image of previous sessions. A **drop-down** list displays the names of previously saved presets including a **Factor Reset** for the settings.

**Load:** loads in the settings from the **drop-down** list

**Save:** saves the current control settings in the name of your choice

**Overwrite:** resaves any current setting changes using the same name

**Management:** allows you to import or export settings from other users



## C3b: Quick Overview of the Icons

The Top-Line icons provide quick access to the most often used controls not used for adjusting the image). Just click on the icon to activate. Some icons have associated Hot-Keys which also can be used by the user (or other programs).

Open	Save	Auto Capture	Browse	Thumbnail	Target	Image Type	Batch Record	Pause/Start Recording	Open Recording Folder
Ctrl-O	Ctrl-S	F7	Ctrl-B	Ctrl-T			F10		

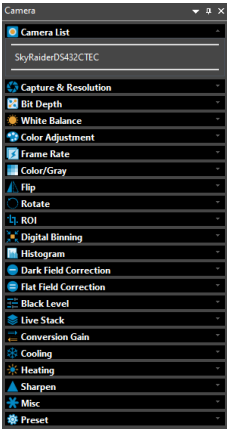
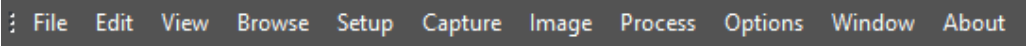
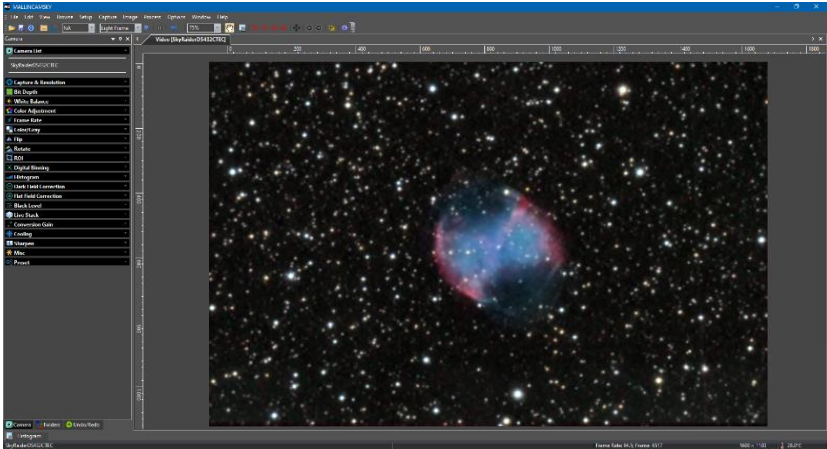
Zoom	Track	Histogram	Cross Hairs	ST4	Video Frame Advance	Stitch	Preferences	Customize
Ctrl-Scroll Wheel						Ctrl-Shit-T	Ctrl-P	
Ctrl-Num (*02345+-)								

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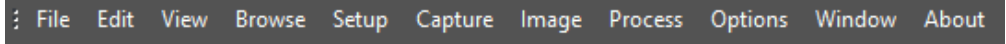
## C4: Detailed Description of MallincamSky Controls

This Chapter of the User Manual will describe in exact detail what each control on both the **Top Line Menu** and the **Icon Toolbar** does. This Chapter is best read on a rainy day or can be used to jump to the specific section that describes how to use a particular control.



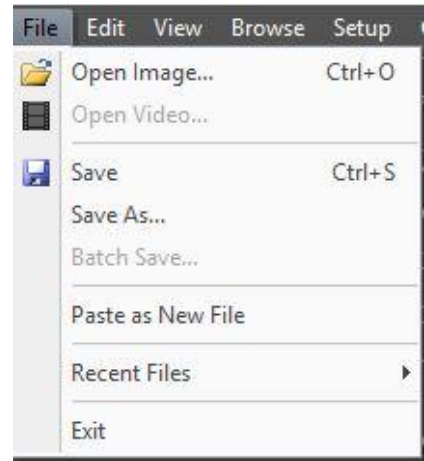


# Top Line Menu

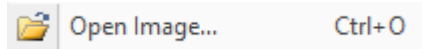


## File

This **Drop-Down Menu** will allow you to **Load** and **Save** images, play video files that are stored on your computer, and examine recent videos or images that you have view using **MallincamSky**.



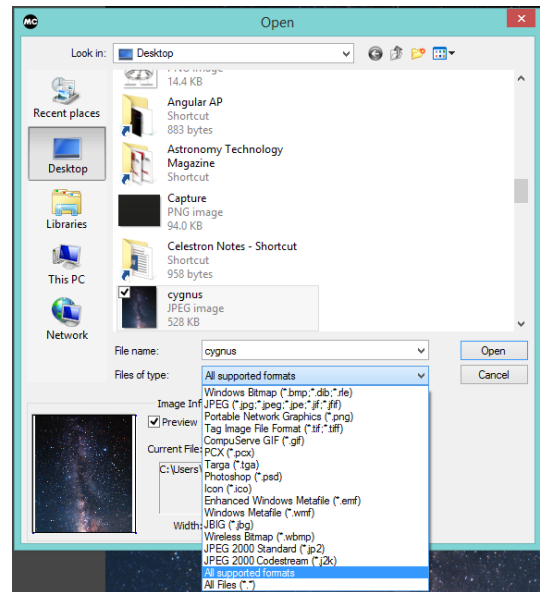
### Open Image



The **Open Image** command is used to open an existing image file. This command can also be used to **preview** an image (just check the **Preview** box to see the image), or to view its statistics and information without opening the image itself. You can use this command to quickly locate an image on your computer. **MallincamSky** supports and can open a variety of image formats. These are identified in the **Files of type** list box.

**MallincamSky** can open more than one image simultaneously by:

- **Ctrl + Left Mouse Click** on each required File, then **Left-Click** on **Open**
- **Shift + Left Mouse Click** method to highlight the files to be opened, then **Left-Click** on **Open**



When an image is opened, **MallincamSky** places it into a new image window and that image window then becomes the active image.



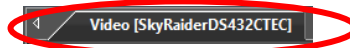
Open Video

Open Video...

Use the **Open Video Command** to open an existing video on your computer. The **Open Video** command is only enabled when no **SkyRaider Camera** is active when **MallincamSky** is running. Only a single video can be opened at a time.



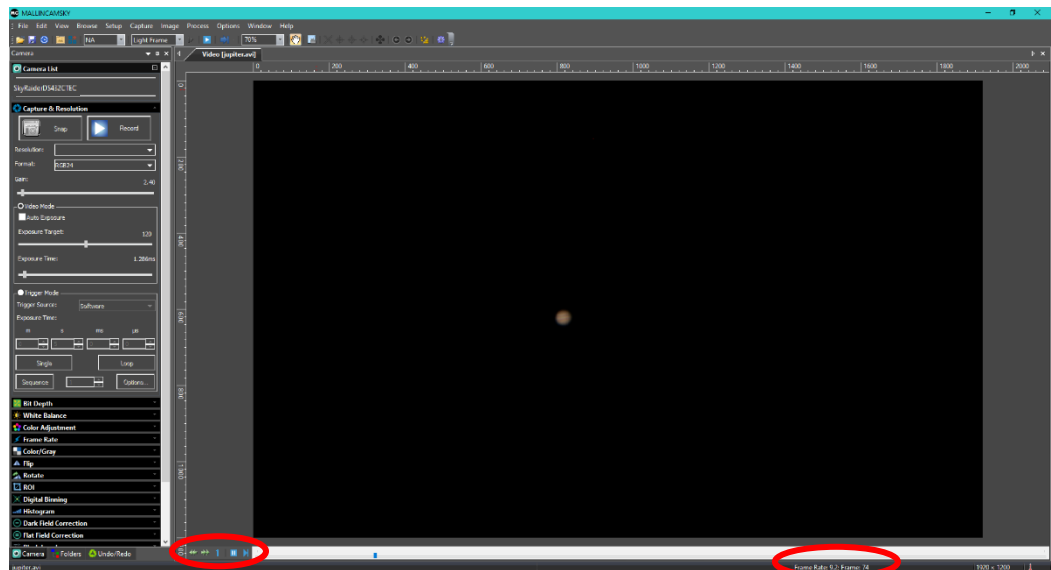
**Right-Click** on **Video [SkyRaiderDS432CTEC]** Title in **Video Window**, then choose **Close**. This will shut-down the video stream and allow you use the **File>Open Video** command.



Select the name of the file you want to open. If the file does not appear, select the option for showing all files from the **Video Files Drop-Down Button**. The video file type can be **wmv**, **asf**, **ser**, **mp4**, or **avi** format.

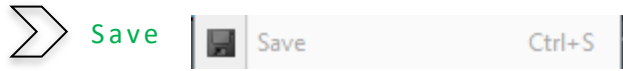
You can preview the Video by **Left-Clicking** on the **Play Button** on the **Preview Window** on the right side of the **Open Window**.

**Click** on the **Open Button** to open a video file, this will create a **New Video Window** and begin to start playing the video stream. The video window will be associated a name called "Video [XXX.XXX]" (i.e., its title bar will display "Video [XXX.XXX]", here, XXX.XXX is the video file name). **No sound will be heard** when playing the video stream.



You can control the Video with controls or slider located on the **Bottom Left** of the Video Window. Current **Frame Number** is also displayed on the **Bottom** of the Video window.

- The icons control the video speed.
- The icon can pause or run the video.
- The icon can move the Video one frame at a time.



For **Save** and **Save as...**, we are assuming you are using the **RGB** format for the camera. If you are using **RAW** format for the camera, then the saving format will only be **FITS**.

The **Save** command allows you to save a snapshot of the **image** (not live Video recording) onto your computer. The command opens a folder box for you to choose a **name**, **location**, and **format** for the image.

If you are looking at a **snapshot** of an image which you have already saved (and thus named), then the **Save** command is disabled. You will need to use the **Save As** Command to resave the image. The default "**Save as type**" will be "Window Bitmap (\*.bmp,\*.dib,\*.rle)".



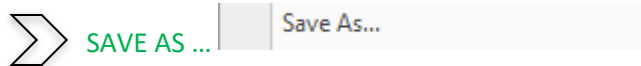
If **Format Resolution** is set to **RGB48** then the saved image will not match the viewed stacked image.

The **File>Save** command can be used to save the most recent image changes to disk (unless you have already saved and named the image, then you must use **File>Save As**). It is often performed as a precautionary measure during lengthy or involved processes to reduce the amount of reprocessing that might be required in the event of a system failure or operational error.

When an image is being closed (**Right-Click** on Image title) and you have chosen **not to save its changes** from the Popup Window, **MallincamSky** discards all changes made since the last **File>Save** operation.



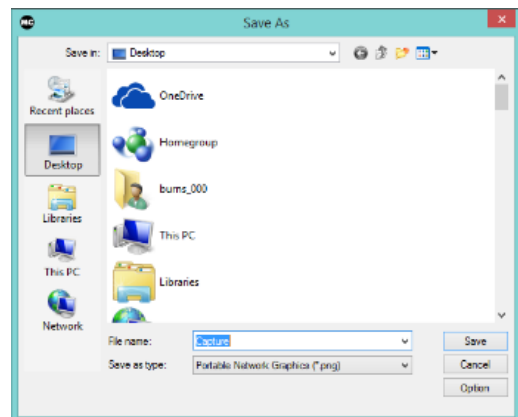
The **File>Save** command saves the contents of the entire window, unless if there was an **ROI** (Region of Interest) defined on it, in which case it will save the **ROI** contents. The **File>Save** command will be disabled if the file is not changed or the changes have been saved.



The **Save As** command allows you to save an image onto your computer with a specified file format. At the end of a **File>Save As** operation, the image window will be associated with the new file and the new format (i.e., its title bar will display the new file name).

**MallincamSky** supports the following file formats:

- Window Bitmap (\*.bmp,\*.dib,\*.rle)
- JPEG (\*.jpg,\*.jpeg,\*.jpe,\*.jif,\*.jfif)
- Portable Network Graphics (\*.png)
- Tag Image File Format (\*.tif,\*.tiff)
- PCX(\*.pcx)
- Targa (\*.tga)
- JPEG 2000 Standard (\*.jp2)
- JPEG 2000 Codestream (\*.j2k)
- MallincamSky File Type (\*.tft)
- FITS (\*.fit,\*.fits)



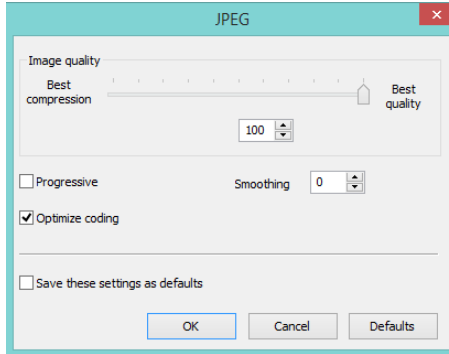
The **Save As** command has several important uses beyond simply saving an image to a new file name. **Left-Click** on the **Option** button to select the different parameters to encode the file (based on selected **Save as Type**).



For Bitmap (\*.bmp), PCX (\*.pcx), Targa (\*.tga); There is no Option choices.



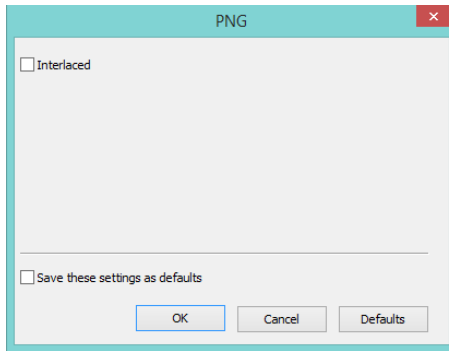
**JPEG**



<b>Image quality</b>	If you save an image in JPEG format (*.jpg), you may adjust the image quality in the edit box. The values range from 0 to 100. Default value is 75.
<b>Progressive</b>	The default is unchecked.
<b>Optimize Huffman codes</b>	The default is unchecked.
<b>Smoothing</b>	The values range between 0 and 100. The default value is 0.
<b>Save these setting as defaults</b>	When saving a file, the current settings will be saved as defaults for the next file save operation.

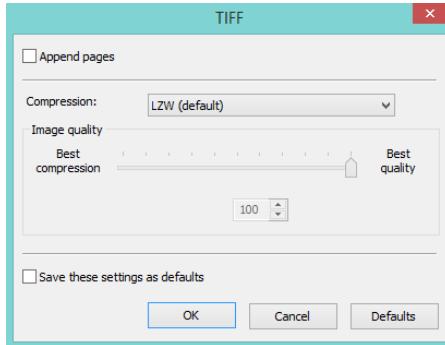


**PNG**



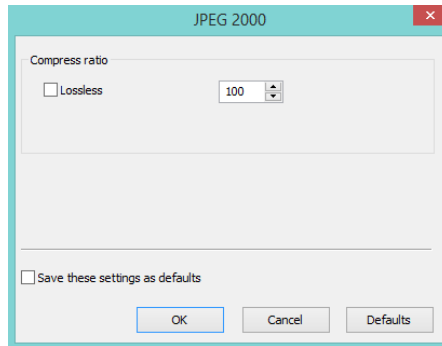
<b>Interlaced</b>	The default is unchecked.
<b>Save these setting as defaults</b>	When saving a file, the current settings will be saved as defaults for the next file save operation.

⇒ TIFF



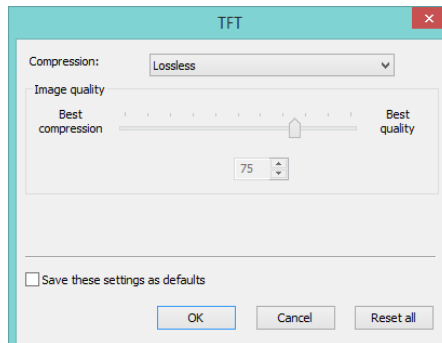
<b>Appended Pages</b>	Determine whether the current image will be saved in multiple pages' style or not.
<b>Compression</b>	Specifies a method for compressing the composite image data. For saving a 32-bit TIFF file, one can specify that the file be saved with predictor compression.
<b>Image Quality</b>	If choosing Compressions as "JPEG", the Image quality can be adjusted by the slider bar. The values range between 0 and 100. The Default value is 75.
<b>Save these setting as defaults</b>	When saving a file, the current settings will be saved as defaults for the next file save operation.

⇒ JPEG 2000

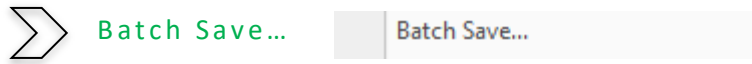


<b>Compress Ratio</b>	If choosing Compressions as "JPEG 2000", the Image quality can be adjusted by the slider bar. The values range between 0 and 100. The Default value is 0.
<b>Save these setting as defaults</b>	When saving a file, the current settings will be saved as defaults for the next file save operation.

⇒ TFT



<b>Compression</b>	Choose Lossless or JPG (Lossy)
<b>Image Quality</b>	If choosing Compressions as "JPEG", the Image quality can be adjusted by the slider bar. The values range between 0 and 100. The Default value is 75.
<b>Save these setting as defaults</b>	When saving a file, the current settings will be saved as defaults for the next file save operation.

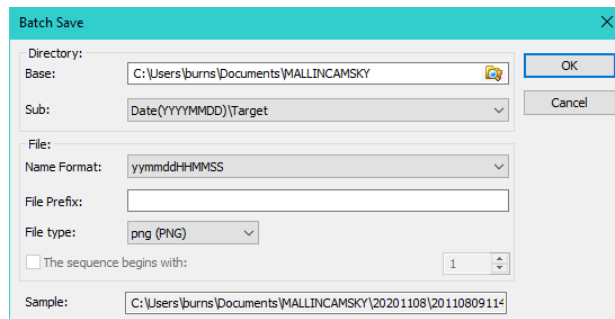


The **File>Batch Save...** command will be enabled when:

- a) Image(s) are captured from the camera using **Snap** (There will be \* after name).
- b) An image window is created by choosing the **File>Paste as New File** command.
- c) An image window is created copied from the **Undo/Redo** Sidebar.

To start the **File>Batch Save...** command, you must:

1. Choose the **File>Batch Save ...** command which will bring up a Batch Save dialog:



⇒ **Directory:** Enter the name of the drive and directory where your captured images will be saved. You may either type the path information or use the **Browse** button to locate it from the standard Windows **Browse Folder** dialog.

⇒ **Sub:** Select from the list an optional sub-director name to create within the above selected directory.

⇒ **Name Format:** The year, month, date, hour, minute and second or a number **nnnn** (sequence) are used as part of the filename. If more files are saved within a second when using a time format, a (xx) suffix is attached to the end of Name Format to avoid the possible name conflict. For the **nnnn** (sequence) "Name Format", no suffix is needed.

⇒ **File Prefix:** Enter a file name prefix for **Batch Save** when generating files names for a series of images. This prefix will be combined with **Name Format** to form a final file name naming paradigm.

⇒ **File Type:** In this combo box, select the format in which you want the image to be saved (can be BMP, JPG, PNG, TIF). **Click the Option Button** to set the different parameters for encoding the file (For BMP format, the Option will be disabled. See **File>Save As ...** command about the details of the format encoding methods).

⇒ **Sample:** The final file name is shown at the right of the Sample label for quick reference to see if you like it.

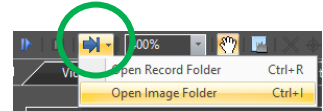
2. Once the settings are made, **Left-Click** the **OK** button to begin the file batch save process or **Cancel** to cancel the **File>Batch Save ●●●** command and return to the application.



When the **File>Batch Save●●●** command has finished, the **Title** on the **Image Tab** or **Image Window** will be modified with the file name formed in the **Batch Save dialog**.

The **File>Batch Save●●●** will perform no saving operation if the file is not modified.

To view the folder where Batch Saved images are stored, use the **open folder** icon, and choose the **open image folder** option.



Paste as New File

Paste as New File

The **File>Paste as New File** command will be enabled when there is valid image data on the Windows clipboard. (see the **Edit>Copy** command). If there is no image data on the clipboard, the **File>Paste as New File** command will be disabled (greyed out).

Choose the **File>Paste as New File** command to place the contents of the clipboard image into a new tabbed image window, which becomes the active image.

The Tab Name will be in the **XXXX\*** format (remember the asterisk reminds you that the new Tabbed image has not been saved).

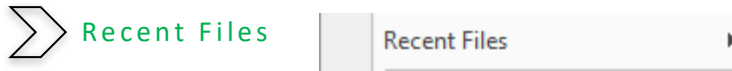
This is useful for bringing in a previously saved image (that you have selected via the operating systems **copy command**) into the **MallincamSky Image Window**. You can modify the image properties via the **Image Menu** choice (see **Image** section in user Manual).

**MallincamSky** will accept image data from other applications via the **clipboard** as long as it is in Windows Bitmap format.

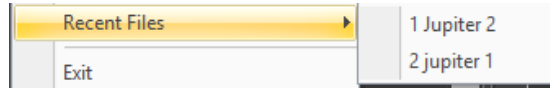


**MallincamSky** will automatically assign a digital number to the **Paste as New File** command in the created image window **Title Bar**.



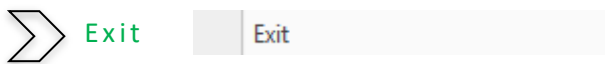
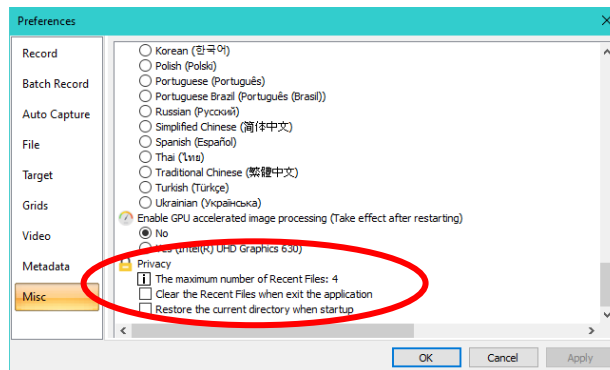


**MallincamSky** maintains 4 (the default) of the most recently opened document files under the **Recent Files** command. Choosing one of these submenus will reopen that file immediately.



The maximum number of **Recent Files** can be modified by choosing the **Options>Preferences** command and clicking the **Misc** selection. Here, clicking the **4** (default) edit box will allow you to enter the number of the Recent Files Submenu that you want. The value ranges from **0** to **8**, the default is **4**.

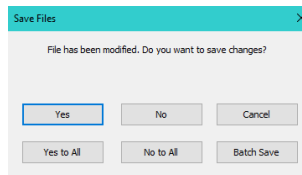
One can also check the **Clear the Recent Files when exit the application** to clear the Recent Files after exiting the **MallincamSky** application.



Choosing the **File>Exit** command will close the video window along with all of the image and browse windows. After all the windows are closed, **MallincamSky** will then shut itself down.



If an image has been modified before attempting to **Exit**, **MallincamSky** will issue a warning to ask if user wants to save the images or not.



You then have an option of saving an image, or saving all images, or discarding an image or all images.

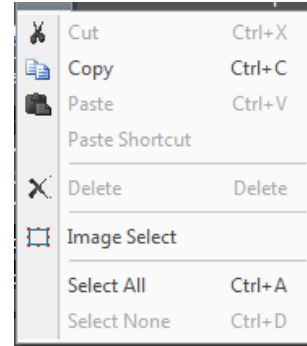




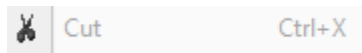
## Edit

This **Drop-Down Menu** will allow you to **Cut**, **Copy** and **Paste Layers** over your images. From the **Edit Menu** you can also select a **Region of Interest (ROI)** from your image and copy it to the **Windows Clipboard**, or even **de-select** the **ROI** if you have changed your mind.

Some of the following commands are only active when the **Folders Tab** is selected, and the Files are displayed in a **Browse Window**.



### Cut



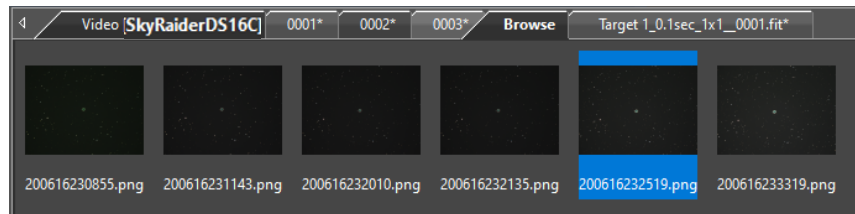
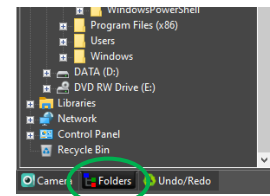
This command is used to move a File from one directory to another when using the **Folders Tab**.



**Click** on the **Folders Tab** to make it active, then **Double Click** on a **Folder** to open it up in the **Browse Window**.



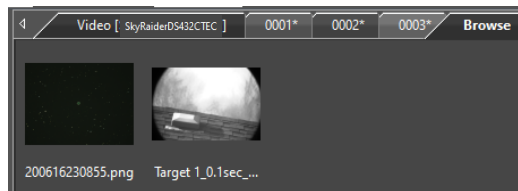
**Select** a File you would Like to Move.



Now use **Edit>Cut** (or **Ctrl-X**) to copy this into the Clipboard.



**Select** and **Open** the folder you would like to Move the File into using the **Folders Tab** (the current files in that Folder will appear in the **Browse Window**).

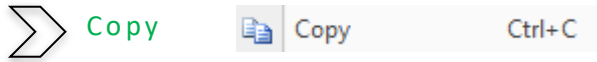


Now choose **Edit>Paste** (**Ctrl-C**).

The file will be removed from the first folder and transferred to the second folder.



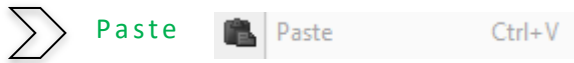
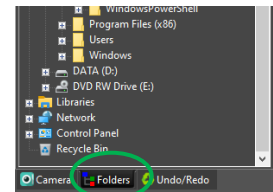
**Note:** you will find it easier to use **Microsoft Windows** to perform this task.



This **Edit>Copy** command can be used to copy a selected part of your image (see **Select Image** command) to the **Windows Clipboard**. Then you can use another software's **Paste Command** to place this selected image inside that software, or **File>Paste as New File** to paste into a new MallincamSky Window Tab.



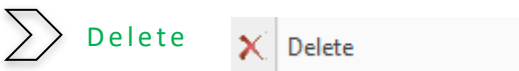
Using the **Select Image** command, you can select a region of your currently live image (using the **Left-click Hold and Drag technique**) then choose **Edit>Copy** (or **Ctrl+C**). Now you can **Paste** that selected image into another document (such as **Microsoft Word**, or **Microsoft Paint**) for later use.



This control allows you to place a **Copied File** (you have previously selected the **File** and then used **Edit>Copy**) into your currently selected folder. Remember to use **File>Paste as New File** to paste image into a new **MallincamSky** Window Tab.



This control allows you to place a **copied File Shortcut** (you have previously selected the **File** and then have used **Edit>Copy**) into your currently selected folder.



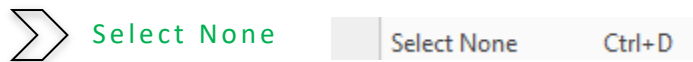
This control allows you to **delete** a selected file from your currently selected folder.



You can select a **Region of Interest** on your **Image Tab** (live or static) by using the **Left-Click Hold and Drag** technique. Once selected then you can **Copy (Ctrl+C)** the selected region and then **Paste** it into another software program or use the **File>Paste as New File** to paste image into a new **MallincamSky** Window Tab.



You use this command to select the **Whole Video Image Window** (live or static). Once selected, then you can **Copy (Ctrl+C)** the selected region and then **Paste** it into another software program or **File>Paste as New File** to paste image into a new **MallincamSky** Window.

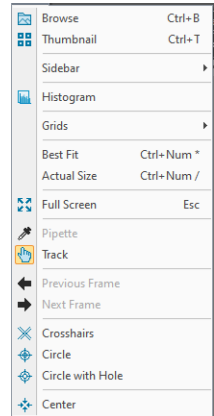


This command can be used to **De-Select** the image that was selected using either the **Image Select** or the **Select All** commands.

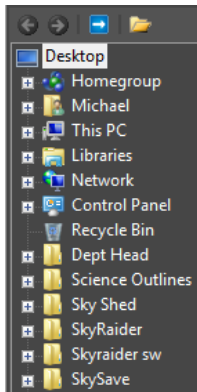


## View

This **Drop-Down Menu** will allow you to **Browse** folders, **Display** or **Remove Tabs** from the **Sidebar**, **Activate Grids** or **Reticles** on the **Video Window**, Change the **Video Window Size** to match your computer real-estate, and allow you to **move** the image around in your **Video Window**.



## Browse



The **View>Browse** command from the **View Menu** (or the **Browse Icon** on the **Icon Tool Bar**) is used to browse images under the specified directory in the **Folders Sidebar**.

The **Browse Window** resembles Windows **Explorer**. **Left-Clicking** on the **+** will expand a folder so that you can examine its contents in the MallincamSky Video Window under the Tab name **Browse**.

You can **Right-Click** on a **Folder** (or file) and the actual Windows controls will pop as in **Windows Explorer**.




As you get deeper into the **Browse Window**, you can **Back-Out** or **Move Deeper** via the **Green Left** or **Right Arrow** in the **Browse Window**.



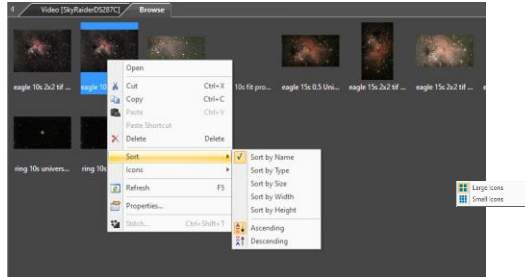
The **Blue Right Arrow** will take you to your computer's **Root Directory**.

**Left-Double Clicking** on a **Folder** will open a **Window Tab** in the **Video Window** (this **Window** will be labeled **Browse**). This **Tab** will display all the graphic files inside that Folder. If you **Left-Double Click** on a **Graphics File** inside the **Video Window**, it would open up that **Graphics File** in a new **Tab** in the **Video Window**.




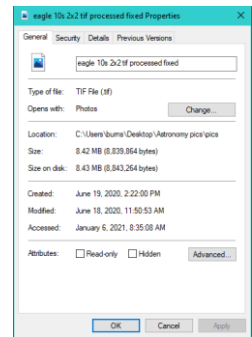
 You can adjust how you would like the files in the folder views. Just click and any image in the Browse Tab and Right-Click your mouse Button.


This will open-up a side **Tab Window** where you can select how you would like the images sorted or viewed.

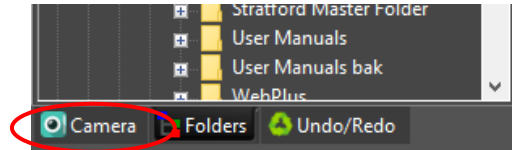


 You can view the **Properties** of a specific file.

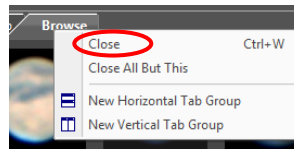
 If you select multiple files (hold down the **Ctrl Key** when **Right-Clicking** on files), you will can also now stitch the files together (see **Stitch Command** in User Manual)




 To close the **Folders Tab** on the **sidebar** and get access to the camera controls, simply **Left-Click** on the **Camera Tab** heading on the bottom of the **sidebar**.



 You can close the **Browse Tab** in the **Video Window** by **Right-Clicking** on the **Tab's Title (Browse)**, then choosing **Close**.




 The **Folder** you choose to browse to will become the default folder when you **Save** a snapshot.



The **Thumbnail control** opens an image tab and displays small (thumbnails) images of all your current loaded or **snap-shotted** images you have taken during this session. A thumbnail of the active video Window will also be displayed (this is a real time Window). This way you can compare various snapshots with the active window all in small thumbnail sizes.

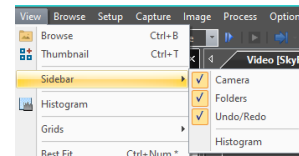



 To **Close the Thumbnail Tab**, place mouse on the Tab Heading **Thumbnail**, **Right-Click** to open up a **Side Window** and choose **Close**.

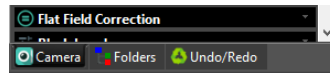


The **SideBar** can contain **4** different Tabs:

**3** of the Tabs; **Camera**, **Folders**, and **Undo/Redo** can be selected from the Tabs located at the bottom of the **Left Side Bar** while **Histogram** can be turned on and off and will display underneath the main **Imaging Window**.

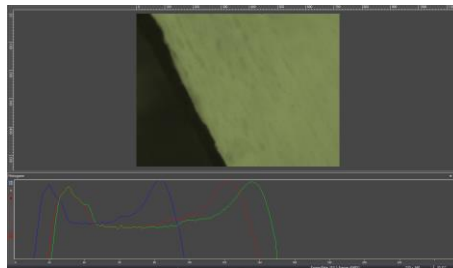


 You will see the **4** choices (each with a **checkmark** beside it), **Left-Click** on the **checkmark** to **Select** or **De-Select** which one of the **3** choices you would like to see displayed in the **Left SideBar**.



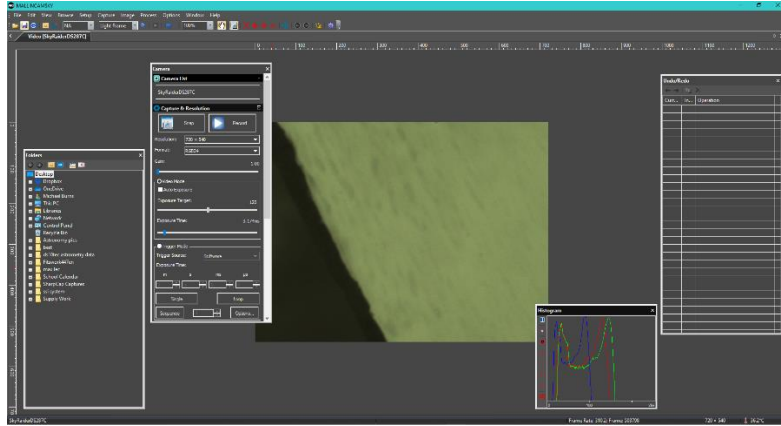
 **Left-Click** on the **Left SideBar Tab** control to activate the appropriate **Tab**.

As mentioned, the **Live Histogram** will appear underneath the **Imaging Window**.

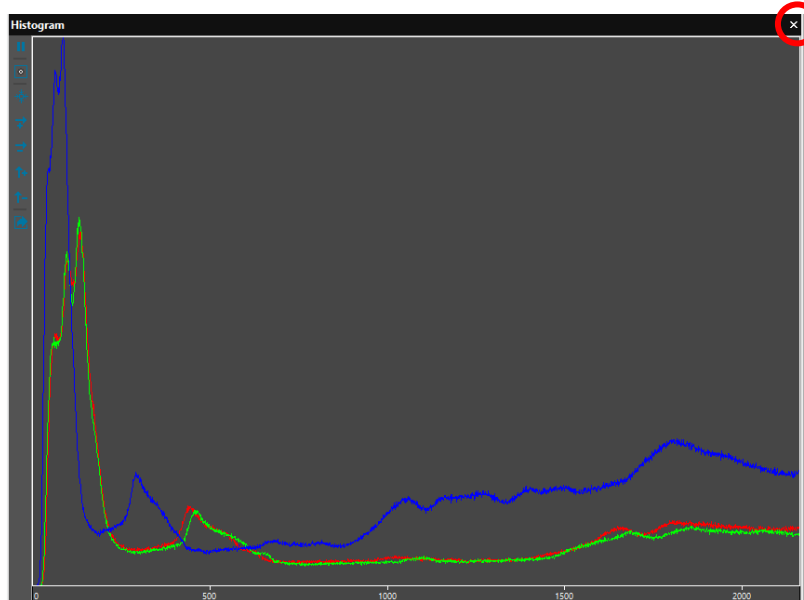




The **Tabs** on the **SideBar** can remain docked to the **SideBar** or can be free floating (as well as the **Histogram**). Just use the **Left-Click Hold and Drag** technique to move the **Tab** to another location on your **Desktop Window**.



To **Re-Dock** the **Floating Tabs** back to their **Home SideBar**, just **Left-Double Click** on its **Name** (expect for the **Histogram** where you can click on the X in its upper right corner to close it. See next section on the Histogram for more details).





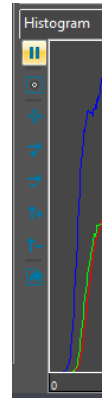
## Histogram



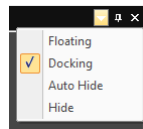
### Histogram

Selecting the **Histogram Control** splits the image screen with your live image on the top half and a live Histogram on the bottom half. You have an option to view the Histogram data as linear or logarithmic. **Clicking** on the **Histogram Control** again, closed the Histogram window.

This **Histogram** is for information only and you cannot adjust any parameters that will affect the image. We will discuss how to use the adjustable **Histogram** later in the User Manual, but for those of you familiar with **Histograms**, this graph represents the current **red, green, and blue** values of the current image being displayed. This Histogram in an informative window you cannot adjust any of the **Histogram** settings from this display to affect the image.



The **eight** icons on the left of the **Histogram** allow you to **pause** or switch between the **linear** or **logarithmic** scale, **zoom in** or **zoom out**, **display statistical data**, or even save the **output data values**.

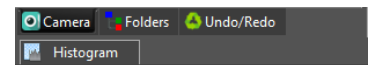


The Histogram window is movable and resizable via the **Left-Click and Hold** technique with your mouse. You can also have the Histogram window **Float**, **Remain Fixed** (docked), and **Auto Hide** by selecting this feature from the **pull-down arrow** on the upper right of the window.

The next icon (looks like a thumb tack) on the upper right of the **Histogram Window**, is the **Auto Hide** control.



Selecting this will collapse the **Histogram** and place a **Histogram Tab** underneath the **Left-Side Bar** on MallincamSky. By moving your cursor over this **Tab** will re-display the Histogram underneath the **Image Window**. Moving your mouse away from the **Histogram Tab** will again close the **Histogram Window**. To deactivate **Auto Hide** just click on the **Histogram Tab** (Histogram will now remain open, and just deselect the **Auto Hide** selection from the **pull-down arrow** on the upper right of the **Histogram Window**.

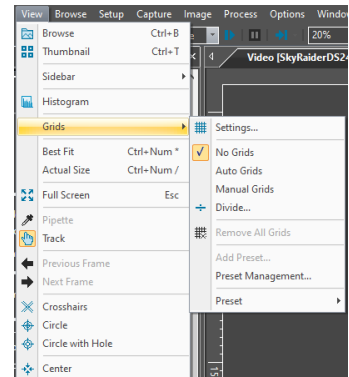


## Grids

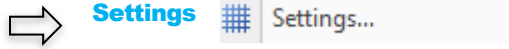
### Grids

The **View>Grids** control has the ability to display a grid overlay on top of your **Video Window**. You can use the **Auto Grid** style to create your own grid format.

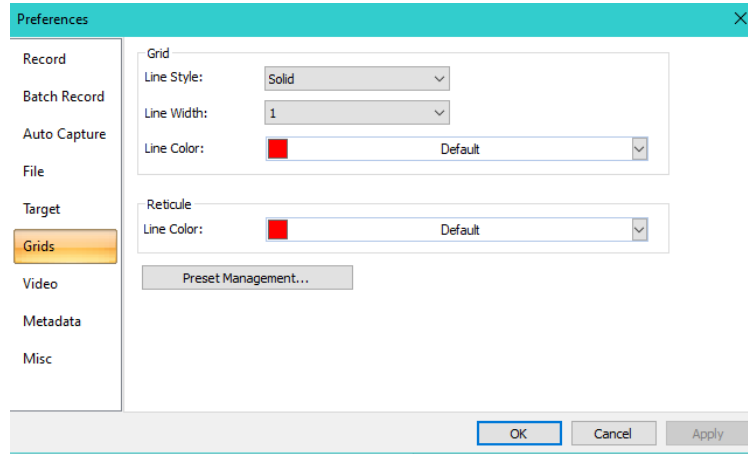
**Left-Click** on the choice you require (**No Grids, Auto Grids, or Manual Grids**) to activate.







This command will pop-up the **Preferences Window**.



With the **Grid** Button selected, you can adjust the **Line Style** (Solid, Dash, Dot, or Dash-Dot), **Line Width** and **Line Color** that you are interested in, and the **color of the reticule**. You can save these selections as preferences and recall them at a later date using the **Preset Management ...** button.

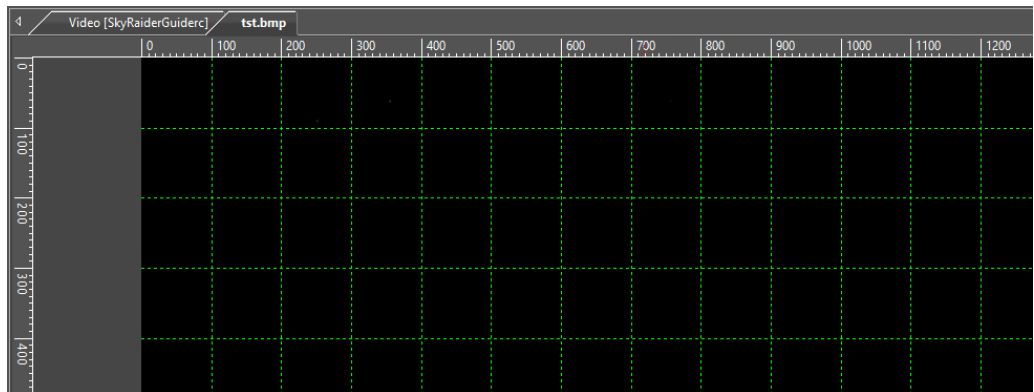


The **No Grids** control can be used to **remove** the grid overlay from the **video/Image**.

If you re-select **Manual Grids**, your previously designed **Grid Lines** will re-appear.

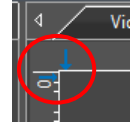


**Clicking** on this control will display the grids with color and style you had set up in the **View>Grids>Settings** Control.



➔ **Manual Grids**

Choosing this control will display two small **Right Arrow** and **Down Arrows** overlaid on the top of the **Vertical Ruler** and on the left of the **Horizontal Ruler** as shown below:



Use the **Left-Click Hold and Drag** technique to move the **Down Arrow** along the **Horizontal Ruler** to wherever you want. When it is dragging over the video/image, there will be a **Vertical Line** (in the **Color** and **Style** chosen by you) aiding you in judging where to release this line on the video/image. You can drag as many lines as you require to overlay them on the video/image.

Similarly, you can drag down as many **Vertical Lines** as you like to create **Vertical Grids**.



You can at any time, grab and move the **Arrows** to adjust the locations of the **Horizontal** and **Vertical Grid Lines**.



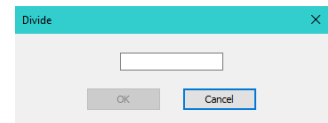
If you re-select **Manual Grids**, your previously designed **Grid Lines** will re-appear except if you choose the **Divide** option.



**Divide**



This command will draw grids on the image window with each grid being a specific distance away from the next. A popup window will appear asking you for the number that each grid will be from the next.


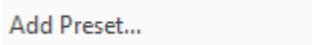


For example, if you require each grid to be 100 points from the next grid you would enter 100 into the **Divide** box and **Left-Click** on the **OK** button.



 **Remove All Grids**

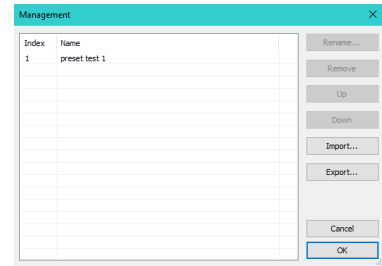
This will remove the Grid Overlay from your video/image. It will also delete your **Manual Grid Lines** settings (thus allowing you to create a new set of Manual Grid Lines).

 **Add Preset** 

This control allows you to save your current grid settings. **MallincamSky** will ask you for a name for this grid pattern.


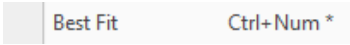
 **Preset Management** 

This command will allow you to export **your Grid Presets** or allow you to import other **Grid Presets**. This way you can pass along a grid pattern from one computer to another. A popup window will appear to allow you to manage the process. **Note:** This will not display the grids, you must use the **Preset** command below.



 **Preset** 

This command allows you to select from a list of your previously saved and imported **Grid Presets** (via **Preset Management**). The selected grid pattern will then appear on the screen.

 **BEST FIT** 


Select the control **View>Best Fit** to automatically resize the **image/video** to fit inside the **Video Window Tab**.

 **ACTUAL SIZE** 

Select the control **View>Actual Size** to **reset the Zoom** to 100% (**Actual Size** will be disabled if the **View** is already set to 100%) and place the **image/video** inside the **Video Window Tab**.

 **FULL SCREEN** 

Selecting the **View>Full Screen** control will display the video window in full screen mode. You will not see any commands or controls while in this mode.

 **Double clicking** on the image with your **left mouse button** (or pressing the **ESC** key) will return **MallincamSky** to the **Default Video Window**.



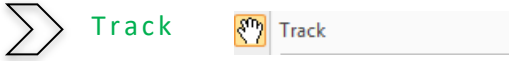
PIPETTE



Pipette

This will display the 3 channel color component numbers of a **snapshot** image. The values will be displayed at the bottom of the screen as you move your mouse over the image.

167, 174, 96



Track



Track

If the **video/image's** actual size is larger than the **video/image Window**, then this control will allow you to position the parts of the **video/image** within in the **video/image Window**. This control is activated automatically when necessary.

Its function is like scroll bars. It is an alternative to using the arrows on the scroll bars for positioning the **video/image** within the window. Position the mouse (make sure to choose a location outside a **Region of Interest** rectangle. You may need to close the **ROI** rectangle if necessary) on the actual **video/image**.

**Left-Click and Hold** (the **Open Hand** will change to a **Closed Hand**). Now drag the image around inside the video/image Window

If the **video/image** size is smaller than the **video/image Window** size, then the track operation will be disabled.



VIDEO FRAME

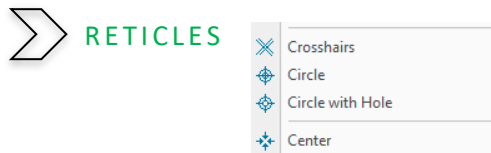


Previous Frame

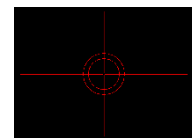
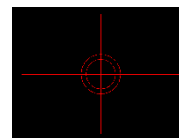
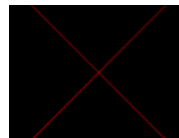
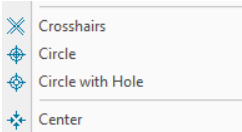


Next Frame

These controls are for when you have loaded a video **in the ser format** into MallincamSky and need to view the **Next** or **Previous** frame in this video. Note: SkyRaider Image window needs to be closed and a video loaded for this to work. It is easier to use the same commands located on the **icon bar**.

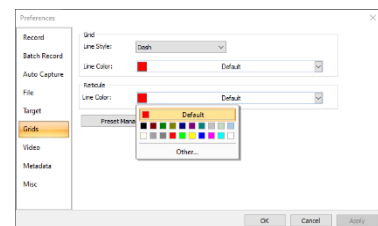


RETICLES



**MallincamSky** provides three Reticles (or crosshairs) styles to aid in aligning your telescope to a star (or another stellar object).

You can change the **color** of the Reticle via the **Option>Preferences** control in the **Top Menu Line** or the **View>Grids>Settings** command.



**Left-Click** on Reticle icon to Activate and **Left-Click** again on Reticle icon to **De-Activate**.



You can **Left-Click** and **Drag** the Reticles across the screen. Select the **Center** command to recenter the reticle on the screen.

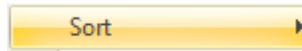


## Browse

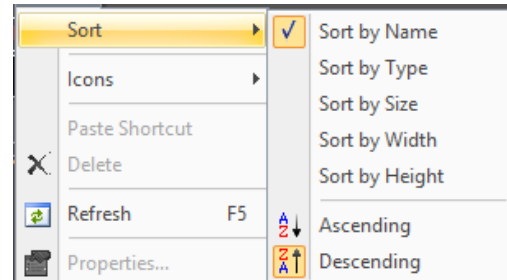
This Command Tab is used to determine how **MallincamSky** should display the graphic files when you are **viewing the Folders Tab**. This control will allow you to change the size of the image icons, determine how to sort the files, add shortcuts to the folders, delete files, refresh the folders, and even determine the properties of the image file all without having to perform these tasks thru **the Windows Environment**.



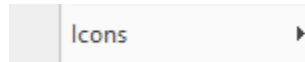
## Sort



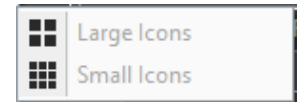
This control allows you the option of rearranging the image files via a variety of choices (**Name, Type, size, Width, and Height**. All in either **Ascending** or **Descending** order.). Just **Left-Click** on the choice that best suits your needs and **MallincamSky** will automatically rearrange the files.



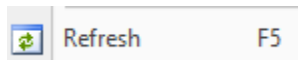
## Icons



This control allows you to display the **Graphic Files** as either **Large** or **Small** Icons. Simply **Left-Click** to make your Selection.



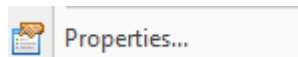
## Refresh



This control allows you to **refresh** the contents of the currently selected folder. It is useful if you are using another program to move files around while also running **MallincamSky**.



## Properties



This control will display the current File **properties** for the **Graphics File** that you have selected (This is identical to **Right Clicking** on a File while using **Windows Explorer**).



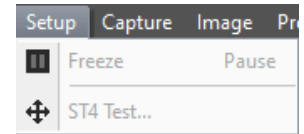
This control will display the current **Video Record Folder** (the default Video Record Folder is selected thru the **Options->Preference** Command).



This control will display the current **Image Folder** (the default Image Folder is chosen by using the **Options->Preference** Command).

## Setup

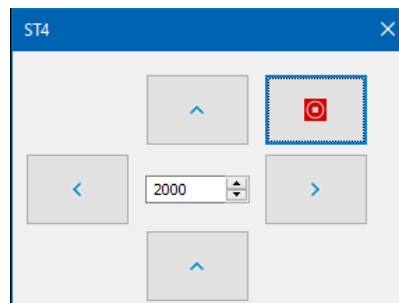
The SkyRaider **DS432CTEC Camera** does not have an **ST4** port on the camera, so this command is deactivated.



**Clicking** on this control will **Start** or **Pause** a loaded **avi** or **mp4** video. It is easier to use the **Pause Key** on your keyboard or even the **Start/Pause** icon on the **icon bar**.



The **SkyRaider DS432CTEC series** of cameras do not have a **ST4** port, so it cannot be used to **Auto Guide** using the **ST4** on your telescope mount using these commands. But, since the **DS432CTEC** has an **ASCOM** driver, PHD2 can use this camera as a guide camera using **pulse** guiding. **SkyRaider** cameras that do have a **ST4** port can test the port using this control.





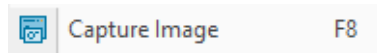
## Capture

This **Top Menu Line** command allows you a more in-depth capture routine of either a **still image** or a **video stream**.

Capture	Image	Process	Optio
	Capture Image		F8
	Auto Capture		F7
	Start Record...		F9
	Batch Record		F10



### Capture Image



During a **video preview**, you can always choose the **Capture>Image Capture** command to capture a still picture of the active video image. After the image is captured, this captured image (**still image**) will be placed as the current active window with an automated title (0001\*).



The **Snap Button** on the **Camera SideBar** can continuously shoot the image more easily. **Left-Click** this **Snap** button on the **Camera Sidebar** to capture an image.



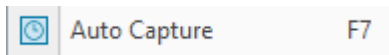
If camera **Format Resolution is RGB48**, then the **Snap** image will not match the **viewed** stacked image.



You can also just hit the **F8 key** on your keyboard to take a snapshot.



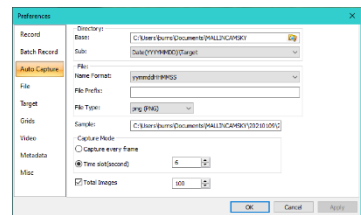
### Auto Capture



This function can capture a sequence of pictures when using either **Video Mode** or **Trigger Mode**.



First you must set up the **Location, File Format, Prefix**, and the **Number of Exposures** required in the **Options>Preferences Tab** (see **OPTIONS->Preferences->Auto Capture Tab** for more details on how to setup for **Auto Capture**).

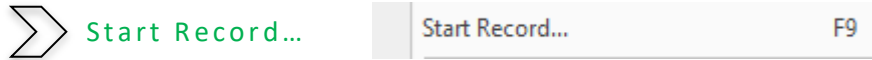


To begin the capturing process, just **Click** on this **Tab** or press the **F7 Function key** or click on the **Auto Capture** icon.



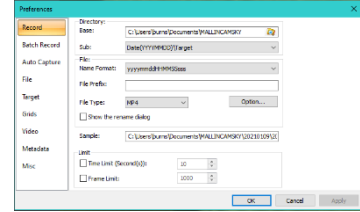
**Note: Auto Capture** name will change to **Stop Capture**, so **Click** on it if you need to abort the process.

You will see a counter on the bottom left of the screen indicating the capture process i.e., **Auto Capture 05/20** (this says taking the 5<sup>th</sup> image of the required 20).



This function can record a video of what you are viewing.

First you must set up the location, **File Format**, **Prefix**, and **Duration** required for the video in the **Options>Preferences Tab** (see **OPTIONS->Preferences->Record Tab** for more details on how to setup for **Recording Videos**).



**Duration** only works for **ser** and **avi** file formats, not for the **mp4** format.

To start the capturing process, just **Click** on this **Tab** or press the **F9** Function key. **Note:** The **Start Record** name will change to **Stop Capture**, so **Click** on it (or press the **F9** Function Key) to stop the recording process.

**Note:** it is easier to **Click** on the **Record** button on the main sidebar in the Capture and Resolution box. This button will change to **Stop Record** icon so if you click on it again the recording can be stopped.



A dialog box will open at the bottom left of the MallincamSky Window providing you with real time information about the recording process.

Record: Time=00:03; Frame=11; File=12.2M; Free=17.0G

Follow instructions in **User Manual** on using the **Record Button** on **Left Side Panel**, to record video in **Trigger Mode** as this command is identical.

The only way to view saved Videos, using **MallincamSky** is to **Right-Click** on **Video Tab** to **Close** the Video Window, then you will be able open a video using the **File>Open Video** command.

When capturing a Video, you will notice that in the **Capture & Resolution** Tab in the left window sidebar that the **Blue Arrow Record** icon has now changed to a **Red Stop** icon. **Left-Clicking** on this Button will stop the video capture process.

Use **Windows Explorer** to View your saved videos by using any Video viewing software of your choice.





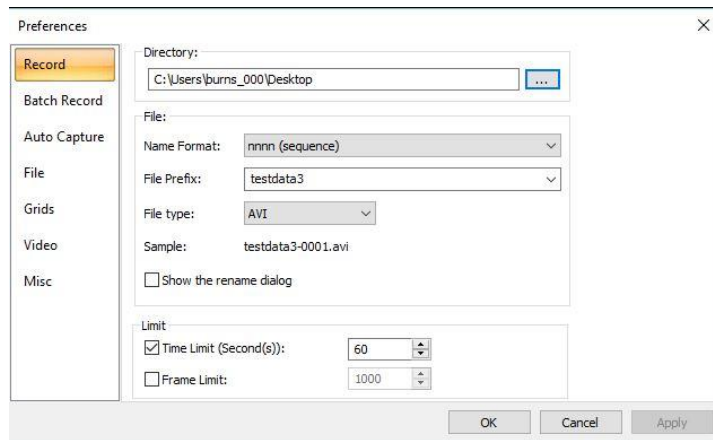
This command will allow you to save a sequence of videos onto your computer. You will need to have already chosen the **location** and **format** (only works with **ser** and **avi** formats) when saving the videos using the **Option->Preferences->Record Tab**, and the **number** and **duration** of each of the videos in the **Option->Preferences->Batch Record Tab**.



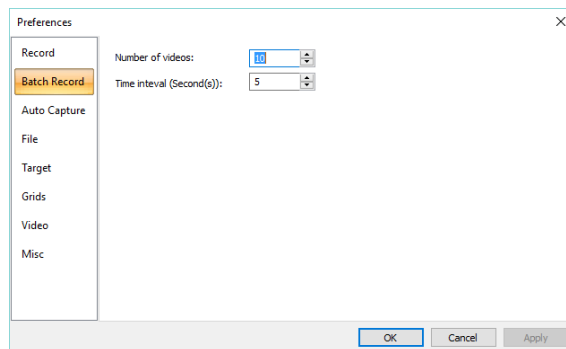
See **Options->Preferences...** Tab for more detailed information on setting up the parameters for **Batch Record**, but below is a quick walk-through.



In the **Record Tab** in **Options->Preferences...**, choose the **location** and **file type** and **duration** for recorded Video Files.



In the **Batch Record Tab** in **Options->Preferences...**, choose the **number** of Videos to be recorded, plus the **Time Interval between** each Video (as you have set the **duration** of each video in the **Record Tab**).



Once these have been set, all you need to do is **Click** on the **Batch Record Tab (F10)** in the **Capture Tab**.

MallincamSky will automatically start the recording process and the **Record Button** on the **Left-Sidebar** turns to a **Red STOP** symbol (in case you need to stop the recording process).



By **Clicking** on the **Batch Record Tab** again, MallincamSky will then abort the whole capturing process.



By **Clicking** on the **Red STOP** symbol in the **Left Sidebar**, MallincamSky will only abort the current Video sequence, but will continue with the next sequence.

MallincamSky will also provide you with a status on how the recording is going by displaying a **Status Information Line** on the bottom of its window.

It will provide you the real time status of the Recording process.

```
Batch Record: 1/10; Time=06/10; Frame=128; File=281.3M; Free=767.9G
```

And the real time status of the Pause between each Recording.

```
Batch Record: 4/10; Time=02/05; Free=766.6G
```



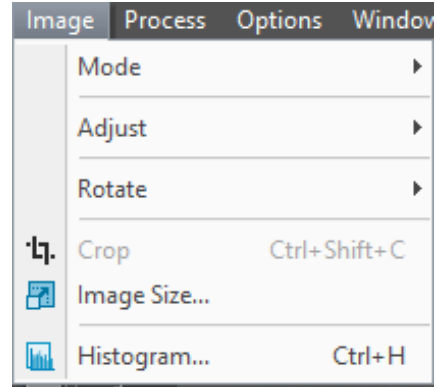
Again, I want to emphasize that the **Batch Record** control only works when you are saving the video in either the **ser** or the **avi** format. It will just continuously record if you are using the mp4 format.



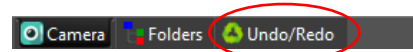
**Also Note:** it may take your computer a couple of seconds to process and save each video segment between each pause. Just be patient and let the software do its thing between each recorded segment.

## Image

The **Image Menu** will allow you to adjust the properties of any captured **still image** in an **active Image Tab** in MallincamSky video/image window. This is quite a powerful set of commands and can tweak your snapshots for amazing results. Not quite at the level of dedicated image adjusting software but maybe more than sufficient for your needs.

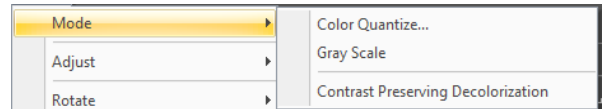


You can use the **SideBar's Undo/Redo Tab** to revert any correction you made back to a previous state.

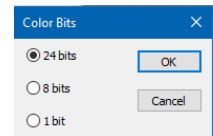


## Mode

The Mode Control will give you the ability **Color Quantize**, **Gray Scale**, and **Decolorize** the selected **still image**.



The **Color Quantize** command is widely used to change the image bit. **MallincamSky** supports the mutual changes among **24-bit**, **8-bit**, or **1-bit** images. When the **Colour Bits** dialog is opened, the default checked color bit is the current image's color bit. Check the desired bit and click **OK** to end the command. The image will be converted to the selected color bits in the image window.

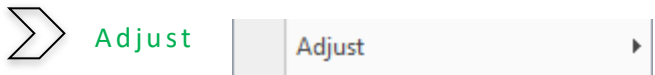


The current bit size (BPP) will be displayed on the bottom of the Image Window. BPP: 24

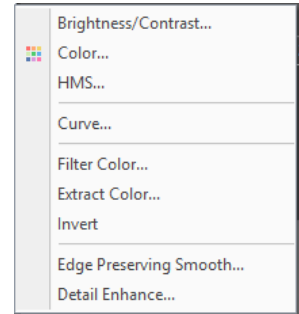
The next two controls require that you have **Color Quantized** your image.

The **Gray Scale** command is used to convert a color image (true color image or index color image) to a gray scale image. If the original image is **24-bit**, the new image will become an **8-bit** image. Other images bit size will not change.

The **Contrast Preserving Decolorization** command to convert a color image (true color image or index color image) to a gray scale image with a unique algorithm to preserved as much of the color contrast for each channel into Monochrome image. If the original image is 24-bit, the new image is 8-bit. Otherwise, the bit of the image will not be modified.

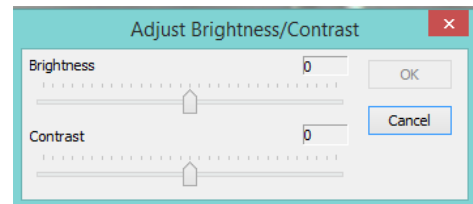


The Adjust menu will allow you to adjust the **Brightness** and **Contrast** of the image. You will be able to modify the RGB Color balance, as well as the **High-Lights**, **Mid-Tones** and **Shadows** values. Color Curves and Filtering algorithms are also in the menu control. You will have the ability to Invert the image as well as perform some Detail Enhancement procedures on the image.



### ⇒ Adjust Brightness/Contrast

The **Image>Adjust>Brightness/Contrast...** command offers simple adjustments to the tonal range of an image. This command makes the same adjustment to every pixel in the image. The **Brightness/Contrast** command does not work with individual channels and is not recommended for high-end output because it can result in the loss of details about the image.



**Brightness:** Dragging the slider bar to the left decreases the level and dragging it to the right increases the level. The numbers on the right of the slider bar display the Brightness value. Values can range from **-150** to **+150**. The **Default** value is **0**.

**Contrast:** Dragging the slider bar to the left decreases the level and dragging it to the right increases the level. The numbers on the right of the slider bar display the Contrast value. Values can range from **-150** to **+150**. The **Default** value is **0**.

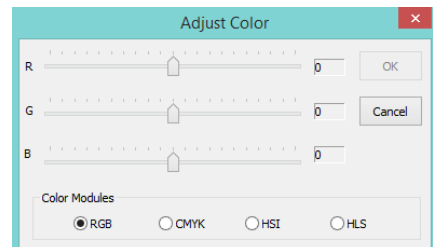
Make your adjustments to the **Brightness** and **Contrast** values and **Left-Click** on **OK** to accept.

### ⇒ Color

Choose the **Image>Adjust>Color...** command to modify the overall mixture of the colors in an image.

There are **four** color modules that are supported by **MallincamSky**:

**RBG, CMYK, HSI, HLS**





## RGB

**MallincamSky** uses the **RGB** model. It assigns an intensity value to each pixel ranging from 0 (black) to 255 (white) for each of the **RGB** components in a color image.

For example, a bright red color might have an **R** value of 232, a **G** value of 45, and a **B** value of 37. When the values of all three components are equal, the result is a shade of neutral gray. When the value of all components is 255, the result is pure white; when the value is 0, the result is pure black.

**RGB** images use three channels to reproduce up to  $2^{24}$  or 16.7 million colors on-screen. In addition to being the default mode for new Mallincam images, the **RGB** mode is used by computer monitors to display colors. This means that when working in color modes other than **RGB**, such as **CMYK**, **MallincamSky** still uses **RGB** mode for displaying on-screen images.

Although **RGB** is a standard color mode, the exact range of colors represented can vary, depending on the application or display device attached to your computer.



## CMYK

The **CMYK** mode is based on the light-absorbing quality of ink printed on paper. As white light strikes translucent inks, certain visible wavelengths are absorbed while others are reflected back to the eyes.

In theory, pure cyan (**C**), magenta (**M**), and yellow (**Y**) pigments should combine to absorb all light and produce black. For this reason, these colors are called subtractive colors. Because all printing inks contain some impurities, these three inks produce a muddy brown and must be combined with black (**K**) ink to produce a true black. (**K** is used instead of **B** to avoid confusion with blue.) Combining these inks to reproduce color is called four-color process printing.

The subtractive (**CMY**) and additive (**RGB**) colors are complementary colors. Each pair of subtractive colors creates an additive color, and vice versa.



## HSI

Based on the human perception of color, the **HSI** model describes three fundamental characteristics of colors:

**Hue** is the color reflected from or transmitted through an object. It is measured as a location on the standard color wheel, expressed as a degree between  $0^\circ$  and  $360^\circ$ . In common use, Hue is identified by the name of the color such as red, orange, or green.

**Intensity** is the relative lightness or darkness of the color, usually measured as a percentage from 0% (black) to 100% (white).

**Saturation**, sometimes called Chroma, is the strength or purity of the color. Saturation represents the amount of gray in proportion to the hue, measured as a percentage from 0% (gray) to 100% (fully saturated). On the standard color wheel, Saturation increases from the center to the edge.

 **HLS**

The **HLS** model is remarkably similar to the **HSI** color model. The main difference between them is the calculation used to produce the brightness value. In the **HLS** model, a pixel's brightness (**L**) is derived from its three (**R**, **G** and **B**) color values. That is, a pixel's brightness (**L**) is determined by the minimum and maximum values of its three-color values.



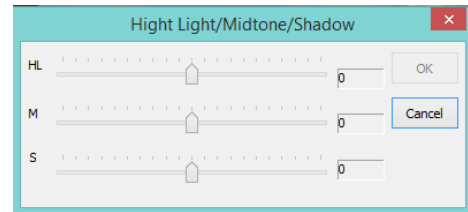
The values beside the slider bar show the color changes in various color channels.

- The **RGB** channel values can range from -100 to +100. The Default values are 0.
- The **CMYK** channel values, they can range from -100 to +100. The Default values are 0.
- In the **HSI** channel, the **H** value can range from -180 to 180, the **S** value can range from -275 to 275, and the **I** value can range from -442 to 442. The Default value are 0.
- In the **HLS** channel values, the **H** value can range from -180 to 180, the **L** value can range from -100 to 100, and the **S** value can range from -100 to 100. The Default values are 0.

 **HMS**

Select the **Image>Adjust>HMS...** command to adjust the **HL** (Highlight), **M** (Midtone), and **S** (Shadow) parts of the image.

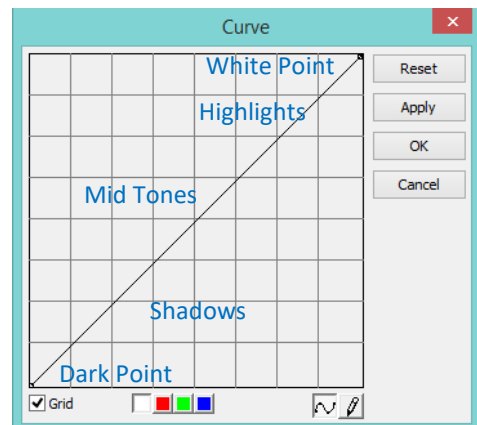
Each part's value ranges from -100 to 100. This command is only available for **24-bit** true color image.



 **Curve**

Sometimes you may desire more precise control, or more unusual, nonlinear effects. The **Curves** tool in MallincamSky provides more arbitrary remapping of the color channels (rather than the **HMS** control). It takes the input tones and allows you to selectively **stretch** or **compress** them.

Using Curves, the input-output mapping of color channels can be defined by an arbitrary cubic spline or can be drawn freehand. This flexibility provides extreme generality.



It is worth the effort to review how color curves work in graphics programs such as Photoshop (tons of information about curves on the internet).

Curves allow you to adjust **shadows**, **midtones**, and **highlights** separately.

The grid represents the ratio of input to output. When you see the straight line when you first activate curves, this indicates at every pixel brightness (from dark to light) that its input has the same value on output. Think of it as if a brightness level of ten is input its output also has a brightness level of 10. This 1 to 1 mapping produces a straight-line equation  $y=x$ .

**Output (vertical axis) = Input (horizontal axis)**

So, you can change this mapping (ratio) by moving this straight line to either decrease the intensity mapping (an input of 10 at a specific brightness level is reduced to an output of 5) or increase the intensity mapping (an input of 10 at a specific brightness level is increased to an output of 20). This allows you to either enhance or diminish tonal areas of your image to pull out good data and restrict bad data.

### Shadows

Add control points and adjust the **bottom left** corner of the RGB Curves control line to change the shadows. Moving this marker to the right compresses the darks. Moving this marker upwards diminishes the role of the darks (starts muting them). The higher you move this marker the more fade you will obtain in your image.

### Midtones

Adjust the middle of the line to adjust the **midtones**. If you drag the **Midtone** down, it acts as if the exposure is reduced. If you drag the **Midtone** upwards, it acts as if it increased the exposure.

### Highlights

Adjust the **top right** corner of the line to change the highlights. Moving this marker to the left compresses the lights. Moving this marker downwards diminishes the role of the lights (starts muting them). The lower you move this marker the more fade you will obtain in your image.



The RGB (**White** box is selected) Curves' **control line** adjusts all the pixels in the image based on their brightness, so when you make an adjustment at a particular brightness level, all other levels are also adjusted according to the shape of the line.

If you create an **S-curve** in the RGB Curves control line, it increases the appearance of contrast without extending or compressing the overall brightness.

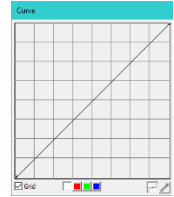
You can selectively adjust the color channels by clicking the colored square at the bottom of the RGB Curves control to selectively adjust the individual Red, Green, and Blue color channels.

**Horizontal Axis:** The horizontal axis of the curved graph represents the original intensity values of the pixels (these are the **Input levels**).

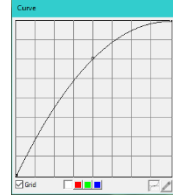
**Vertical Axis:** The vertical axis represents the new color values (these are the Output levels). Notice that in the default diagonal line, all of the pixels have identical **Input** and **Output** values.

**Curve Shape:** The Shape of the curve, as specified with the rectangle locking points, setups a map between **input** and **output** values.

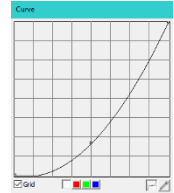
a) When you open the Curve dialog you will not a curve but a straight line. As a default, the **input** values are the same as the **output** values, so there's no change.



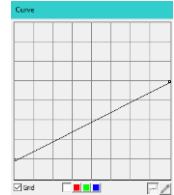
b) By **left clicking** in the center of the line and **dragging it upwards**, we make a simple curve. **Raising** the curve **increases** the overall **brightness** of the Image.



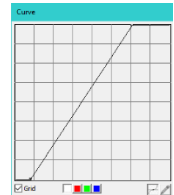
c) By **left clicking** in the center of the line and **dragging it downwards**, we make a simple curve. **Lowering** the curve **decreases** the overall **brightness** (making image darker) of the Image.



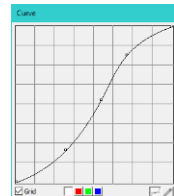
d) You can also adjust the **endpoints** of the curve. By dragging **down** the **top right point** limits the brightest part of the image while dragging **up** the **bottom left point** limits the darkest part of the image, thus reducing the image's overall contrast.



e) If we drag the **top right point** to the **left** or the **bottom left point** to the **right**, we increase the contrast of the image (either bright side or dark side).



f) If you **Click once** in the **center** of the curve to create a **control point**, and now drag just the **top half** of the curve **upwards** and the **bottom half** of the curve **downwards** to make this **S** shape. This process will increase the overall contrast of the image.




You can add as many control points to the curve as required. To remove a **control point**; just drag it off the graph or right click on the control point.


**Grid:** Checking this control will display the grid overlay on the curve, un-checking this will remove the grid line overlay.

**Color Channel:** You can use this control to adjust either the **Red**, **Green**, **Blue**, or all three channels -**RGB** (White).





**Spline:**  When this is selected (default), the curve will be smooth between anchor points. You can toggle between this and **Pencil** by clicking on the other control.

**Pencil:**  When this is selected, the curve will be a free form line between the anchor points. You can toggle between this and **Spline** by clicking on the other control.

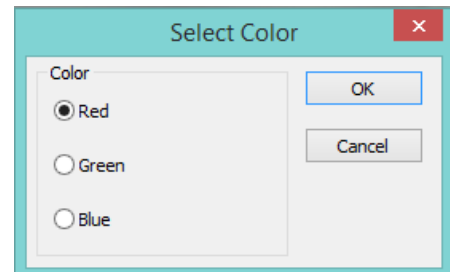


Do not be afraid to experiment (it takes a while to get really proficient in using **curves**), if you do not like what you get, you can always click on the **Reset** button (before you permanently apply changes by clicking on **Apply** button) to put everything back to normal (the **Undo/Redo Tab** can even fix the image even if you used the **Apply** button).

### ⇒ Filter Color

Select the **Image>Adjust>Filter Color** command to **filter out** a special color channel from a color image. Check either **Red**, **Green**, or **Blue** color to filter.

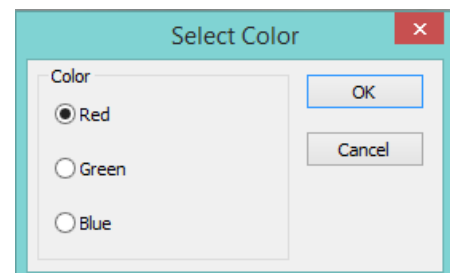
For Example, if **Red** color is checked, then only information about the **Red** channel will be discarded. The **Green** and **Blue** information will remain there.



### ⇒ Extract Color

Select the **Image>Adjust>Filter Color** command to retain a special color channel from a color image. Check either **Red**, **Green**, or **Blue** color to filter.

For Example, if **Red** color is checked, then only information about the **Red** channel will be retained. The **Green** and **Blue** information will be discarded.

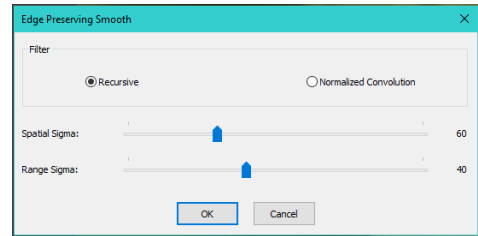


## ⇒ Invert

Select the **Image>Adjust>Invert** command to reverse the pixel values of the active image.

## ⇒ Edge Preserving Smooth

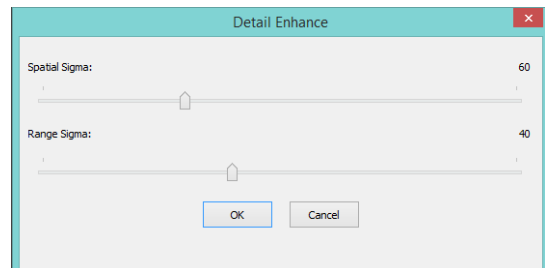
This control looks for the most homogeneous neighborhood area around each point in a picture, and then gives each point the average gray level of the selected neighborhood area. It removes noise in a flat region without blurring sharp edges, nor destroying the details of the boundary of a region. This smoothing also can sharpen blurred edges.



Choose either the **Recursive** or the **Normalized Convolution**. By adjusting the **Spatial Sigma** (like the domain) and the **Range Sigma**, you can affect how many pixels the algorithm uses when applying the smoothing. The larger these values are the more aggressive the smoothing.

## ⇒ Detail Enhance

This filter works by identifying sharp edge boundaries in the image, such as the edge between a subject and a background of a contrasting color and increasing the image contrast in the area immediately around the edge. This has the effect of creating subtle bright and dark highlights on either side of any edges in the image, called **overshoot** and **undershoot**, leading the edge to look more defined when viewed from a typical viewing distance.



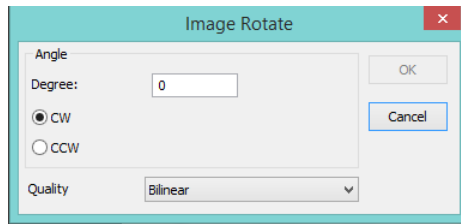
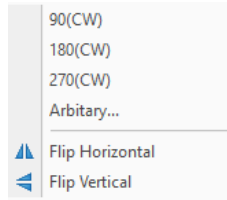
Choose either a **Recursive** or the **Normalized Convolution**. By adjusting the **Spatial Sigma** (like the domain) and the **Range Sigma**, you can affect how many pixels the algorithm uses when applying the smoothing. The larger the values are the more aggressive the enhancing.



This control allows you to rotate and or flip your image across an axis.

Your options include:

- Rotate the image 90 degrees Clockwise (CW)
- Rotate the image 180 degrees Clockwise (CW)
- Rotate the image 270 degrees Clockwise (CW)
- Rotate the image an Arbitrary degree amount.



To **Rotate** the image a specified amount (in **degrees**) in a chosen direction (**clockwise** or **counterclockwise**), **Left-Click** on the **Arbitrary** control. When this option is selected, the **Image Rotate Window** will popup, where you can enter in the required values. You also have two redrawing algorithm choices for it to use when rotating the image (**Bilinear** or **Bicubic**).



The **bilinear interpolation** technique uses a weighted average of pixels in the nearest 2-by-2 neighborhood to come up with the value of the new pixel.



The **bicubic interpolation** technique uses a weighted average of pixels in the nearest 4-by-4 neighborhood to come up with the value of the new pixel.



This control also allows you to flip your image **Horizontally** or **Vertically**.

**Flip Horizontal** reverses the image in the application area so that the top right corner of the original image is now the top left, and the top left corner of the original image is now the top right corner.

**Flip Vertical** reverses the image in the application area so that the top right corner of the original image is now the bottom right corner, and the top left corner of the original image is now the bottom left corner.



Choose the **Image>Crop** command to remove the portions of an image that you do not want so that the focus is on the part of the image that is left.

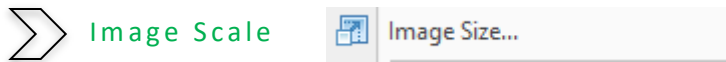
➡ First select **Edit>Image Select** (the mouse cursor will change into cross hairs) from the **Top Menu Line**.

➡ Next use the **Left-Click Hold and Drag** technique to draw a rectangle around the portion of the image you would like to keep.

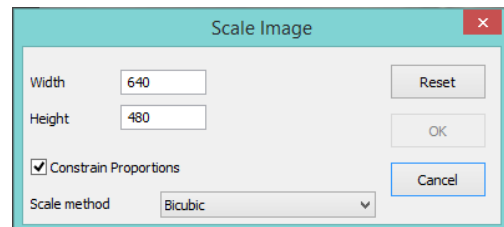
➡ Finally select **Image>Crop** and your **image window** will now only contain the portion of the original image that was inside the **Image Select's Rectangle**.

☞ When you create an **Image Select Rectangle**, you can **Left-Click Hold and Drag** the rectangle around your full image to move it to a different location.

☞ You can also resize the **Image Select Rectangle** by grabbing one of the little boxes around the rectangle and dragging the mouse to increase, decrease, or change dimensions of the rectangle.



Select the **Image>Scale...** command to change the dimensions of the image to a specified size. This process changes spatial resolution by adding (replicating) or removing (decimating) pixels to achieve the specified dimensions.



### Width and Height:

When choosing the **Image Scale** command; the dialog box displays the dimensions of the original image in pixels. The **Width** and the **Height** can be set on the new image by adding or removing pixels. If the **Constrain Proportions** are checked, the **Width** and **Height** will stay proportionate to each other. If the **Constrain Proportions** are unchecked, the **Width** and the **Height** can be set independently, but this will distort the image.

### Reset:

Resets the image's **Width** and **Height** to the original settings.

**Constrain Proportions:** To maintain the current proportions of pixel Width and Height, **check** Constrain Proportions. This option automatically updates the **Width** as the **Height** is modified, and vice versa. Otherwise, **uncheck** the Constrain Proportions button.

**Scale method:** There are 2 options for the algorithm that the **Scale method** uses to resize the image. They are: **Bilinear**, and **Bicubic**. The default scaling method is **Bilinear**.



The **bilinear interpolation** technique uses a weighted average of pixels in the nearest 2-by-2 neighborhood to come up with the value of the new pixel.



The **bicubic interpolation** technique uses a weighted average of pixels in the nearest 4-by-4 neighborhood to come up with the value of the new pixel.

Once you have selected your parameters, **Left-Click** on **OK** to make the new **Image Scale** final.



**Histogram**

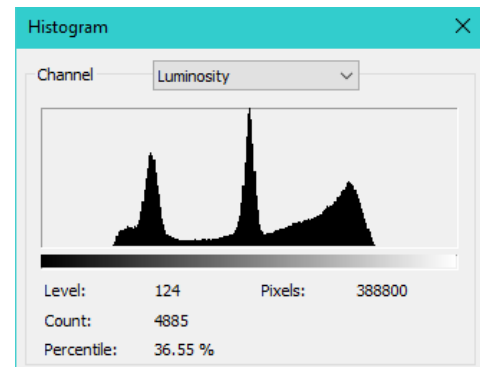


Histogram...

Shift+H

A **Histogram** illustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level. The **Histogram** shows detail in the shadows (shown in the left part of the histogram), mid-tones (shown in the middle), and highlights (shown in the right part).

A **Histogram** can help you determine whether an image has enough detail to make a good correction.



A histogram is a mathematical graph that shows you the current **tonal range** of an **image**. This way you can evaluate it and, if necessary, correct it.



**Tonal range** refers to the range of brightness levels in the image. A histogram shows us how much of the image is currently pure black, how much is currently pure white, and how much of it falls somewhere in between.

It is especially important to note that even though we are talking about brightness levels, we are **not** just talking about black and white (grayscale) images, but Histograms work equally well, and are just as important, with full color images.

This is because, even though we do not always think of color as being anything but color; yet every color in your image has its own brightness level.

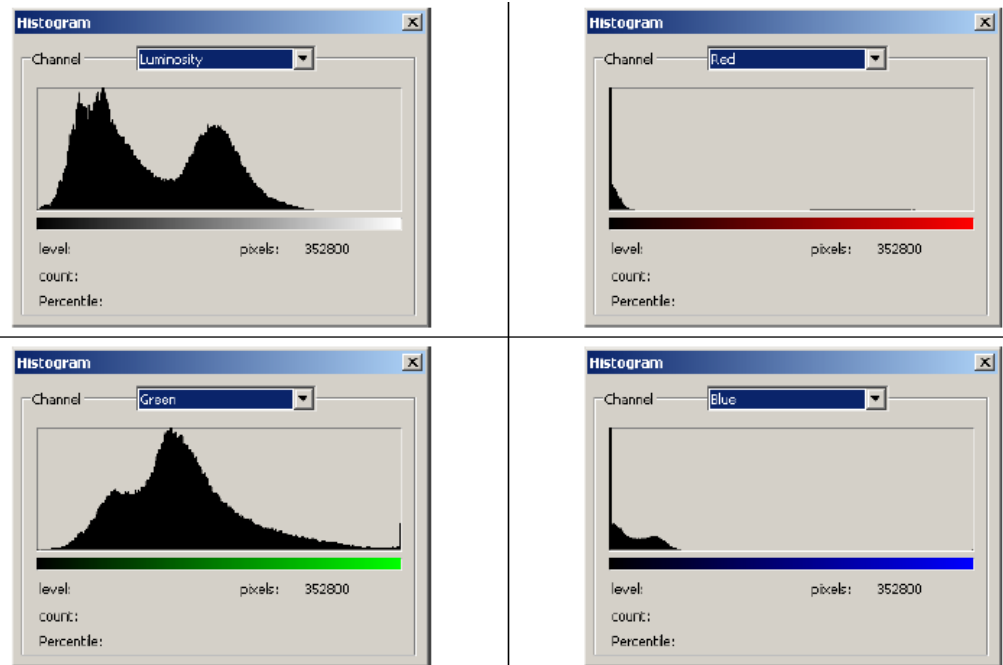
Orange, for example, are typically exceptionally light, while blues and reds are much darker. These differences in brightness values mean that color can have a huge impact on the tonal range of your image.

Do a Google Search on **How to Read and Understand Image Histograms in Photoshop** to find out more information on how to use Histograms to improve your images.

Choose the **Image>Histogram** command to open the **Histogram Window**. Depending on the image's color mode, choose **R, G and B**, or **Luminosity** to view a composite Histogram of all the channels.

If the image is **RGB true color**, choose **Luminosity** to display a Histogram representing the luminance or intensity values of the composite channel.

If the image is **RGB true color**, choose **R, G and B** to display a composite Histogram of the individual color channels in color.



Do one of the following:

- To view information about a specific pixel value, **place the mouse pointer in the Histogram graph.**
- To view information about a range of values, click down **the Left-Click hold and Drag** the mouse into the Histogram to **highlight the range.**

The Histogram Window displays the following statistical information below the Histogram:

**Pixels:** Represents the total number of pixels used to calculate the Histogram.

**Level:** Displays the intensity level of the area underneath the pointer.

**Count:** Shows the total number of pixels corresponding to the intensity level underneath the pointer.

**Percentile:** Displays the cumulative number of pixels at or below the level underneath the pointer. This value is expressed as a percentage of all of the pixels in the image, from 0% at the far left to 100% at the far right.



The Histogram from **Image>Histogram** (still images) provides different information about the video/image window than the **SideBar's Histogram** (live video capture). This Control does not allow you to adjust the Histogram, but rather provides detailed information about the image.

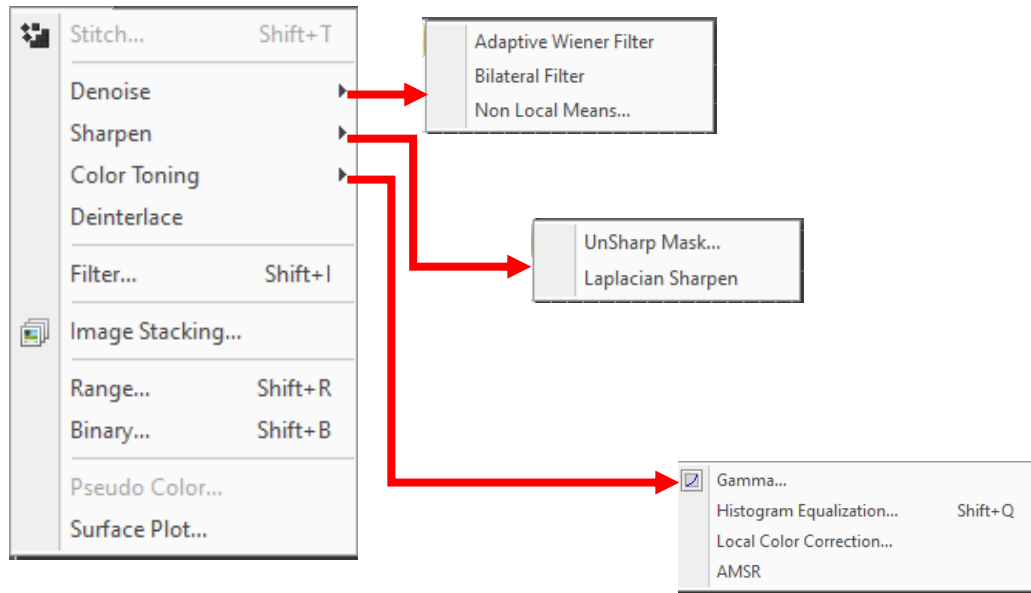
## Process

MallincamSky provides some very advanced image processing tools. You can apply these tools to your image to tweak the final output. It would take a novel to explain each of these standard graphical enhancement tools. So, I will leave it up to you to Google Search the enhancement type to see if it is something you could use.



You must **Color Quantize** your images before complete access to the Process controls. (**Image>Mode>Color Quantize** to a maximum of 24 bits)

You can use the **SideBar's Undo/Redo Tab** to revert any correction back to a previous state.





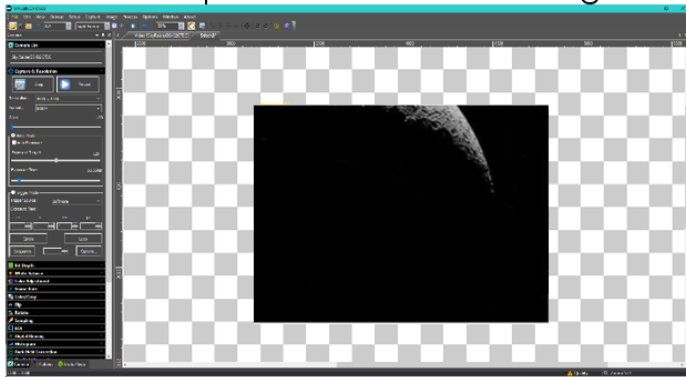






There are two ways to use the Stitch control in Mallincam Sky. One is an automated approach, while the other allows you to manually stitch together snapshots.


 **AUTOMATED**

-  Have the telescope and Mallincam Camera pointing to the area of the sky you are interested in stitching together.
-  Once the area is visible in the Video Window, **Click** on the **Stitch** icon and a **Stitch\* Window** will open which contains the real time active video inside the window frame. Using your telescope controls tweak the position of the object you are interested in.

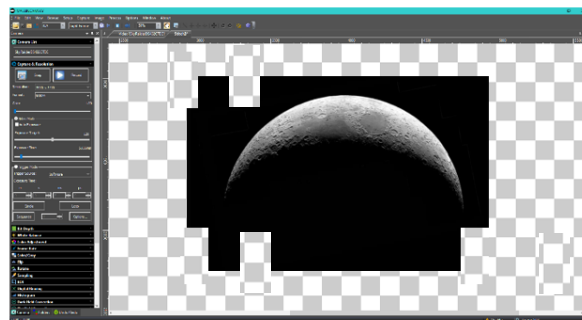


-  Now slowly move your telescope around in the location in the sky, and MallincamSky will **automatically** Stitch together that image area of the sky.

 Do not move the telescope too fast, as the algorithm needs time to synchronize the common area of the image together, so to **stitch** together a larger image.

-  Once satisfied, **Left-Click** on the **Stitch Icon** to signify you are finished and the **Stitch\*** will contain your final image.

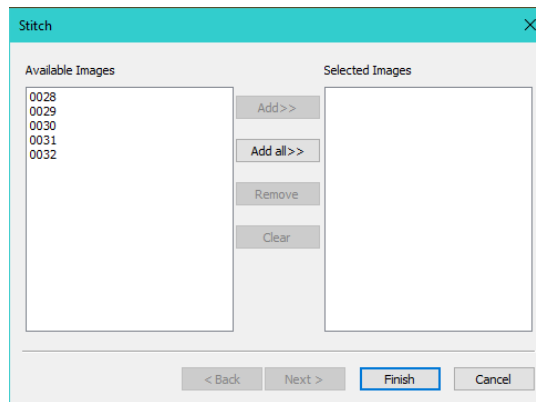
The **Stitched Tab** contains your final image, ready to be saved.



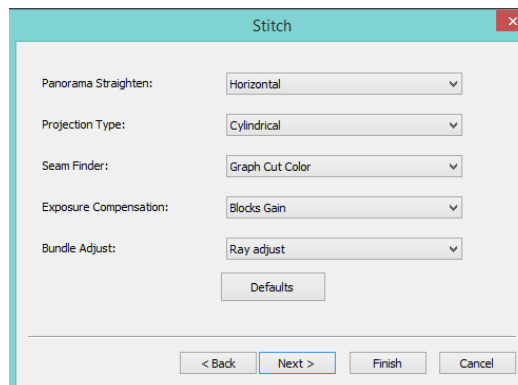
 MANUAL

The purpose on this control is to Stitch (glue) together images to create a panoramic view (image) so plan ahead with this control. Determine if you are going to create a horizontal panoramic image, or a vertical panoramic image.

- Have the camera imaging a specific location (or object), Now **Left-Click** on the **Snap** button. This will place a snapshot in the viewing box.
- Move the telescope so that you have some overlap in the image and **Left-Click** on the **Snap** button again.
- Repeat as needed.
- When you are completed taking the snaps, **Left-Click** on any of the Snapshots to make it active.
- **Left-Click** on the **Stitch Icon** and the following window will open.



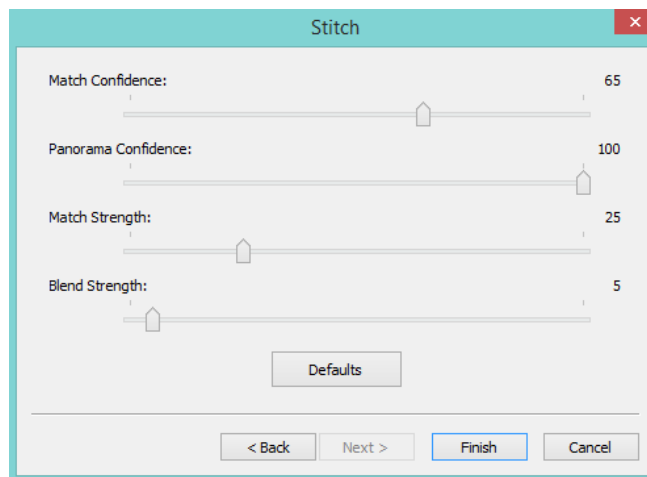
- Move as many of the available images to the selected side as you need to be stitched together by using either the **Add>>** or **Add all>>** buttons.
- **Click on Next** to move to the next step.



- Examine the options in this window and make the appropriate decisions on how you would like **MallincamSky** to Stitch the snapped images together (this is where the pre-planning comes in handy). You will still be experimenting with your decisions.

- ⇒ **Panorama Straigten:** The image stitching direction can be **Horizontal**, **Vertical**, or **None** (try this if not sure).
  
- ⇒ **Projection Type:** For image pieces that have been taken from the same location, stitched images can be arranged using one of following projection mappings: **Plane**, **Cylindrical**, **Spherical**, **Fisheye**, **Stereographic**, **Mercator** or **Transverse Mercator**.
  
- ⇒ **Seam Finder:** MallincamSky provides four Sean Finding algorithms: **None**, **Voronoi Diagram**, **Graph Cut Color**, or **Graph Cut Color Grad**.
  
- ⇒ **Exposure Compensation:** This is used to minimize the exposure differences between the stitched images. Compensation algorithms available are: **None**, **Gain**, and **Blocks Gain**.
  
- ⇒ **Bundle Adjust:** This is the process of simultaneously refining the 3D coordinates that describe the geometry in accounting for the relative motion of the images. Two algorithms are available: **Ray Adjust** and **Reprojection Error**.

Once completed, **Left-Click** on **Next** to bring up the final **Stitch Window**.



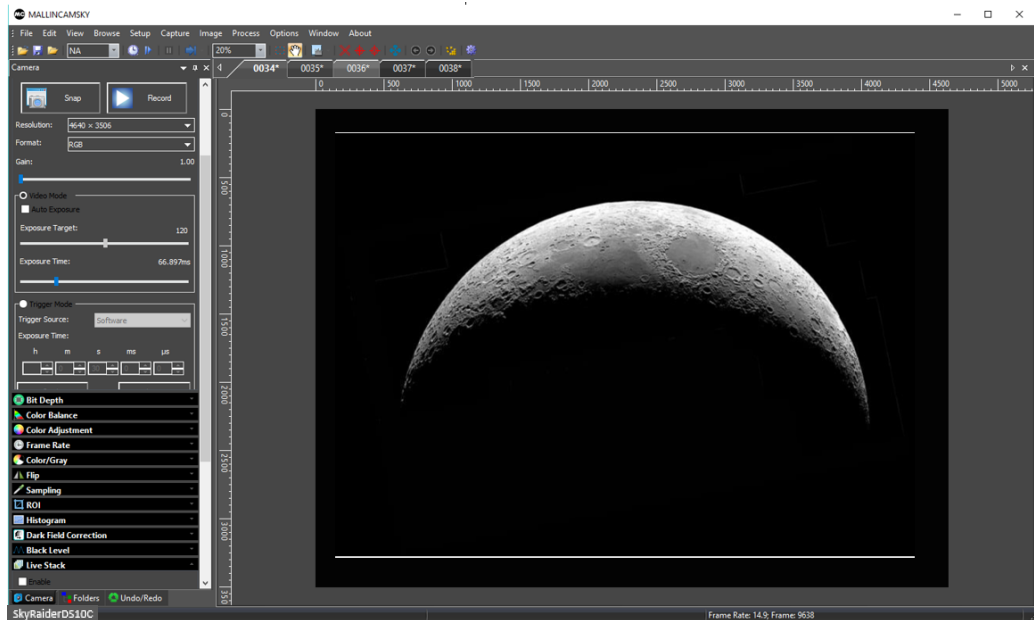
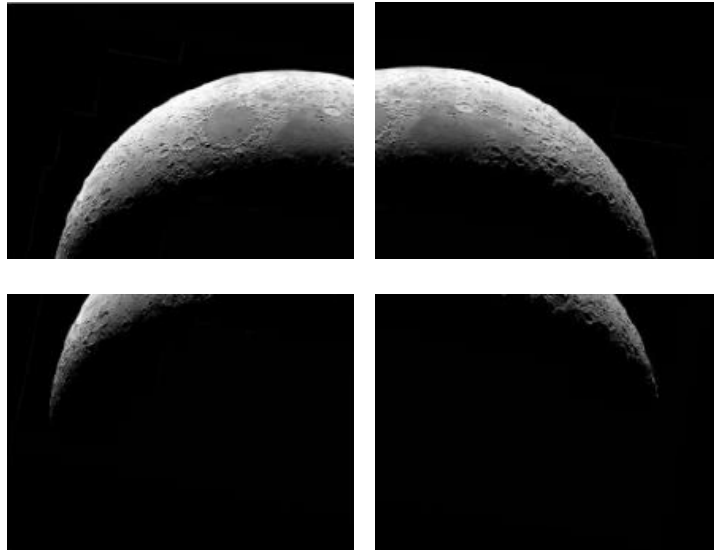
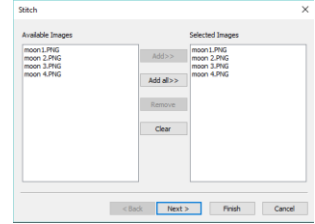
Again, make some logical guesses with the numbers on the sliders, and **Left-Click** on the **Finish** button when decisions have been made.

**MallincamSky** will work through the **Snaps** (and apply the choices you have made) and will place the final result in a new **image window** for your viewing pleasure.

You can try other **Stitching decisions** by having the **Stitched image** active in your **Video Window** and **Left Clicking** on the **Stitch Icon** again. You will notice that your original snapped image is available for you to play with and combine in other ways.



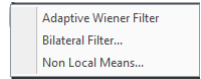
You can also load in previously saved images, via the **Open Icon**, and then make one of these images the active window. Now again selecting the **Stitch Icon**, you can combine these images into a final image.



Once you have captured stitched, or imported an image, you can have MallincamSky's image processing tools enhance the image.

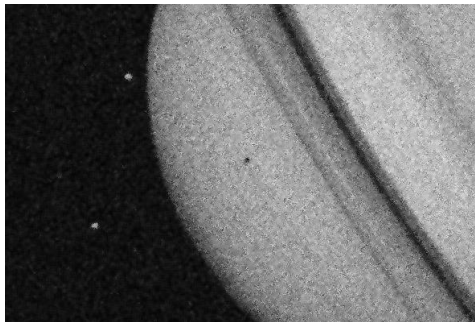


This tool offers three different techniques to help remove the noise from the image.

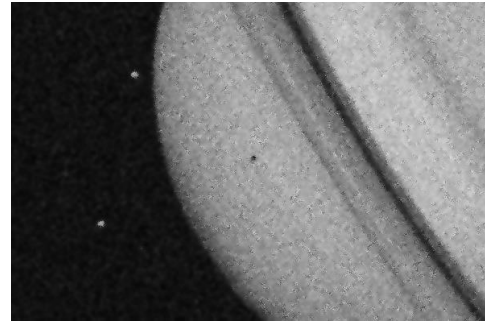


⇒ **Adaptive Wiener Filter**

The **Adaptive Wiener Filter** can preserve more image detail than the median filter, mean filter, or Gauss filter. This filter is great at removing additive noise (such as Gaussian noise) and multiplicative noise (such as Poisson noise).



Before

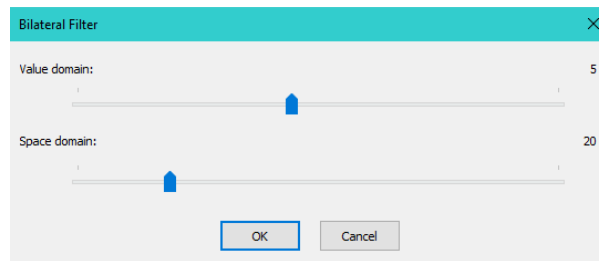


After

⇒ **Bilateral Filter**

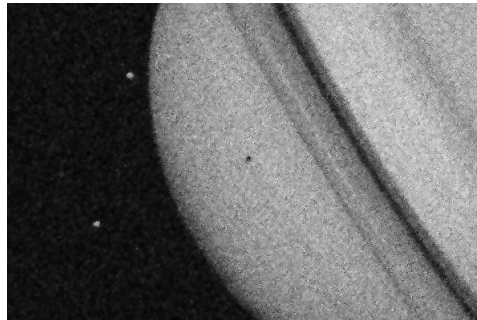
The **Bilateral Filter** is a non-linear, edge-preserving, and noise-reducing smoothing filter for images. It replaces the intensity of each pixel with a weighted average of intensity values from nearby pixels. This weight can be based on a Gaussian distribution. Crucially, the weights depend not only on Euclidean distance of pixels, but also on the radiometric differences (e.g., range differences, such as color intensity, depth distance, etc.). The Bilateral Filter is good to preserve image edge compared with Wiener filter or Gauss filter.

Once selected, a Pop-up Window will appear to allow you to adjust two parameters: The **Value Domain** and **Space Domain**.

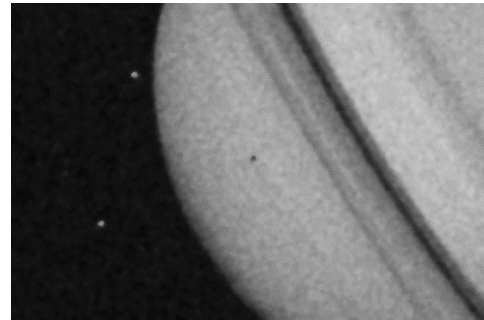


**Value Domain:** the radiometric differences (e.g., range differences, such as color intensity, depth distance the greater the value, the slower process speed).

**Space Domain:** Sigma value, the higher the value, the more effective the denoising effect.



Before

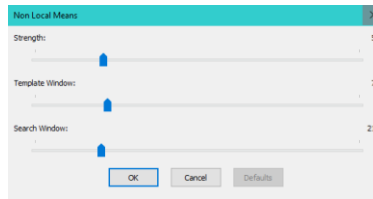


After

⇒ **Non Local Means Filter**

While the traditional local mean filter is a pixels average method around the target pixel, the Non-Local means filter is a weighted average method to average all of the image patches over the search window. The weight is determined according to the similarity between the target patch and neighborhood patches in the search window. Compared to other famous denoising algorithms, such as Gaussian, Wiener filter, total variation, and wavelet denoising, The Non-Local Means method can get better effect.

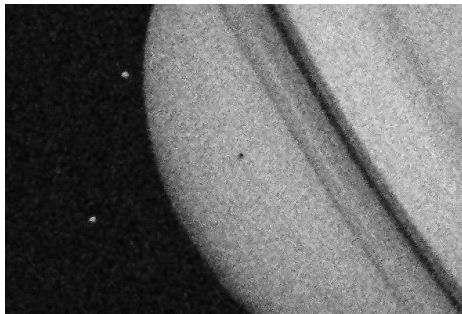
Once selected, a Pop-up Window will appear to allow you to adjust three parameters: The **Strength**, **Template Window** and **Search Window**.



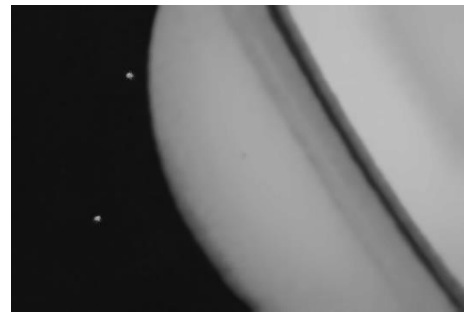
**Strength:** This slider controls the amount of denoise that is being applied to your image. The larger the value the more aggressive the effect.

**Template Window:** This is the block size that is used to calculate the weight in the weighted average (start with 7, the default, and increase).

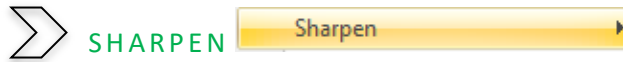
**Search Window:** This slider is used to calculate the weighted average value among image patches (the size of which was set through the Template Window). The larger the setting, the more the processing time.



Before



After



SHARPEN

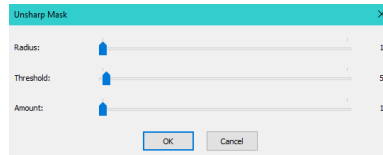
This tool provides you with the ability to sharpen the images. Two different processes are provided for you.



⇒ UnSharp Mask

The **unsharp** of the name derives from the fact that the technique uses a **blurred**, or **unsharp**, positive image to create a mask of the original image. The **unsharped** mask is then combined with the negative image, creating an image that is less blurry than the original one.

Once selected, a Pop-up Window will appear to allow you to adjust three parameters: The **Radius**, **Threshold** and **Amount**.



**Radius:**

This slider affects the size of the edges to be enhanced, so a smaller radius enhances smaller-scale detail. Higher Radius values can cause halos at the edges. As a result, fine detail needs a smaller Radius. In addition, **Radius** and **Amount** interact; reducing one allows more of the other.

**Threshold:**

Controls the minimum brightness change that will be sharpened. This value is important to prevent smooth areas from becoming speckled. The threshold setting can be used to sharpen more-pronounced edges, while leaving subtler edges untouched. Low values should sharpen more because fewer areas are excluded. Higher threshold values exclude areas of lower contrast.

**Search Window:**

This slider controls the magnitude of each overshoot (how much darker and how much lighter the edge borders become) as a percentage. It can also be thought of as how much contrast is added at the edges. It does not affect the width of the edge rims.



Before



After



⇒ **Laplacian Sharpen**

The Laplacian Sharpen technique is an example of a second derivative method of enhancement. It is particularly good at finding the fine detail in an image. Any feature with a sharp discontinuity (like noise, unfortunately) will be enhanced by a Laplacian operator. Thus, one application of a Laplacian operator is to restore fine detail to an image which has been smoothed to remove noise.



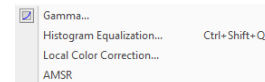
Before



After

⇒ **COLOR TONING** Color Toning ▶

Color toning is one of those final steps that can really make your photos both pop and add a very personal stylistic touch. MallincamSky provides four approaches to color toning for you to experiment with.



⇒ **Gamma**

Gamma measures the brightness of midtone values produced by the image. A higher gamma value yields an overall darker image. Dragging the slider bar to the left decreases the level, while moving it to the right increases the level. Values can range from 0 to 3.0



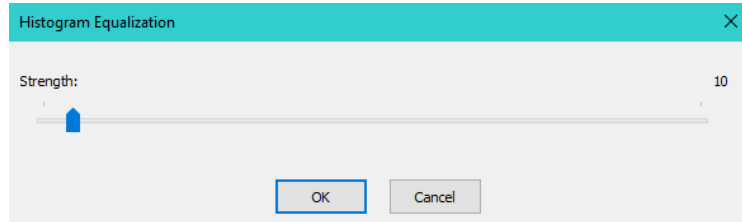
Before



After

⇒ **Histogram Equalization**

Adaptive histogram equalization (AHE) is a computer image processing technique used to improve contrast in images. It differs from ordinary histogram equalization (HE) in the respect that the adaptive method computes several histograms, each corresponding to a distinct section of the image, and uses them to redistribute the lightness values of the image. It is therefore suitable for improving the local contrast. However, AHE has a tendency to overamplify noise in relatively homogeneous regions of an image.



**Strength:** This Strength slider will affect the enhancement effect. The larger the value, the more obvious the effect.



Before



After

⇒ **Local Color Correction**

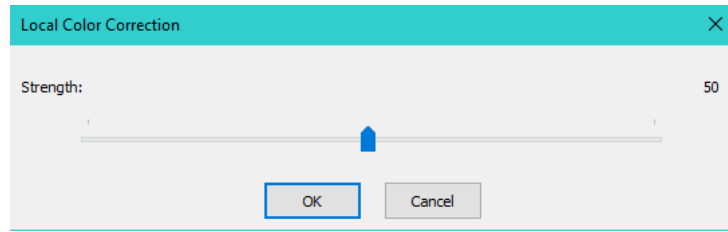
The Local Color Correction algorithm is computed in two steps:

The first part of the algorithm consists of a derivation of an input mask. The mask image is computed from the input image as the average of R, G and B values, which is  $I=(R+G+B)/3$ . The use of intensity information avoids distortions of the chroma.

The second part of the algorithm is the combination of the mask and the input image.

The combination operation consists of a power function, where the exponent is computed using the mask value previously found. If the mask value is greater than 128, it will result in an exponent less than 1, while if the mask value is lower than 128, it will result in an exponent greater than 1. Moreover, if the mask value is precisely 128, the exponent will be 1, and it will have no effect on the input image. The operation is equivalent to a pixel-wise gamma correction.

Once selected, a Pop-up Window will appear to allow you to adjust one parameter: The **Strength**.



**Strength:** This Strength slider will affect the enhancement effect. The larger the value, the more obvious the effect. It ranges from 1 to 100.



Before



After



**AMSR**

AMSR


There are limited dynamic range problems when real world scenes are captured from a digital camera and displayed on computer monitors. Tone mapping algorithms are applied to image processing to reduce the dynamic range of an image to be displayed on low dynamic range devices. Multi-Scale Retinex is one of the most popular methods for dynamic range compression, color constancy and color rendition. Here, we improve its performance by adopting the adaptive weight functions, named **Adaptive Multi-Scale Retinex (AMSR)**.



Before



After

 **DEINTERLACE** Deinterlace


Deinterlacing is the process of converting interlaced image or video, such as interlace sensor into a non-interlaced form. So, if you imported an image or video that was interlaced, this command will de-interlace it.



Before



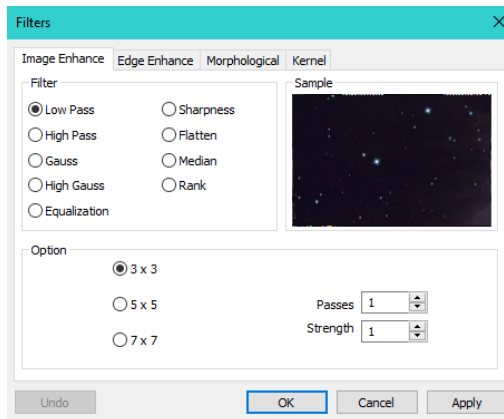
After

 **FILTERS** Filter... Ctrl+ Shift+I

MallincamSky provides an extensive set of convolution and non-convolution (morphological) filters. You can also create custom filter kernels and apply them with the Filter commands if you desire.

Choosing the Filter command will open the Filter dialog Window where each group of filters has its own property page or tab, where the Filter **type** and **size** can be selected. The filtered results are almost always written to the active image in real time, so using the **Undo/Redo Tab** can be used to remove any applied Filter operations.

 **Image Enhance** Image Enhance



Each of the Image Enhance selection also have some Options:

**3 x 3:** Checking the 3 x 3 kernel will produce a more subtle filtering effect.

**5 x 5:** Checking the 5 x 5 kernel will produce a moderate filtering effect.

**7 x 7:** Checking the 7 x 7 kernel will produces a more extreme filtering effect.

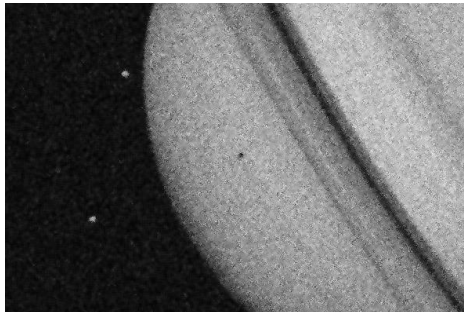
**Passes:** Applies the filter this many times on the image. When a filter is applied multiple times, its effect is amplified by each pass. An image that has been softened by one pass of the Low Pass filter will be softened further by a second pass.

**Strength:** Enter a value from 1-10 that reflects how much of the filtering has an effect on the image.

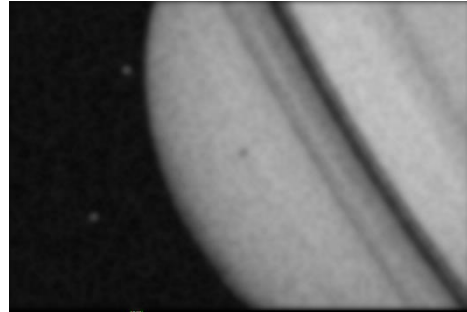
A value of 10 specifies the full strength (100%) of the filtered result applied to each pixel. Values less than 10 cut the full weight of the filter.

A value of 1 indicates that only 10% of the difference between the filtered pixel value and the original pixel value should be applied, a value of 2 indicates that 20% of the difference should be applied, and so forth.

**Low Pass:** This filter is used to soften an image by eliminating high-frequency information (this has the effect of blurring sharp edges). The Low Pass filter replaces the center pixel with the mean value in its neighborhood. The Low Pass filter can also be used to remove noise.



Before



After

**High Pass:** This filter is used to enhance high-frequency information. The High Pass filter replaces the center pixel with a convolved value that significantly increases its contrast from its neighbors. The High Pass filter leaves only elements of high contrast.



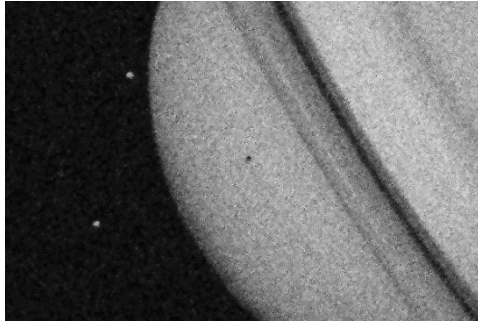
Before



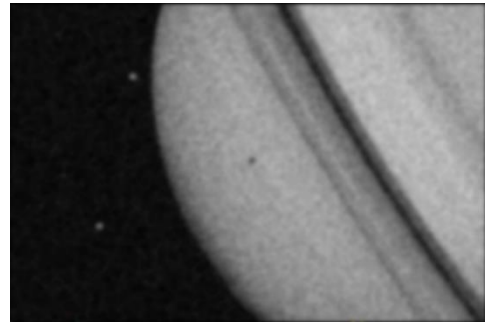
After



**Gauss:** This filter is used to soften an image by eliminating the high-frequency information by using a Gauss function. This has the effect of blurring sharp edges. The operation of the **Gauss filter** is similar to the **Low Pass filter**, but it degrades the image less than the **Low Pass filter**.



Before

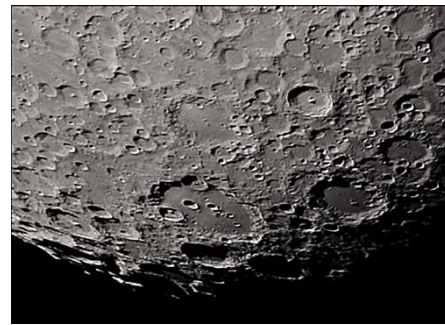


After

**High Gauss:** This filter is used to enhance fine details. This operation is similar to the unsharp masking technique (see the **Sharpen filter**), but it introduces less noise into the image. It uses a Gaussian curve type of kernel. Available in 7x7 and 9x9 kernel sizes.



Before



After

**Equalization:** This filter is used to enhance the contrast based on the histogram of the local neighborhood based on the following options:

**Window:** Image pixels statistics (min, max, histogram, mean, standard deviation, etc.) will be calculated on a small Window of the image. These measurements are then used to derive the local contrast for that area of the image. In short, an area of Window x Window around each pixel is all that is considered when modifying the intensities in the image. Larger Window produces smoother results, while small Window track small details more closely.

**Best Fit:** Choose the Best Fit button to optimize the values for the particular image. The results are achieved by stretching the local histogram to maximize the contrast between the brightest and darkest pixels in the local window region.

**Linear:** This option distributes the histogram linearly across the intensity scale. This function produces a high contrast image with the highest possible dynamic range.

**Logarithmic:** This option concentrates the histogram at the low end of the scale. This function produces a high contrast image with little dynamic image. It will tend to darken the image overall. It is useful for increasing the contrast in a very light image.

**Exponential:** This option concentrates the histogram at the high end of the scale. This function produces a high contrast image with little dynamic image. It will tend to lighten the image overall. It is useful for increasing the contrast in a very dark image.



Before



After

**Sharpness:** This filter is used to enhance fine details or refocus an image that is blurred. The sharpen filter sharpens the image using the un-sharp masking technique.



Before

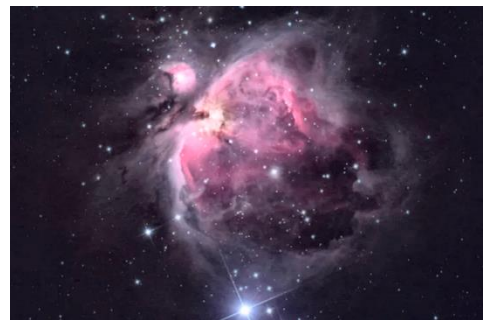


After

**Flatten:** This filter is used to enhance fine details by flattening the image.

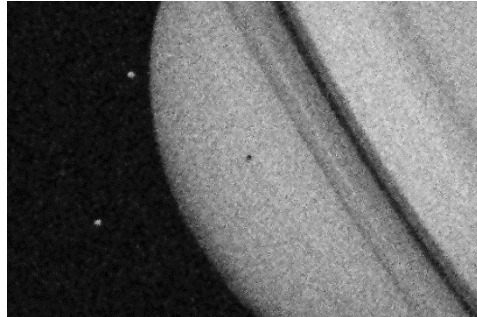


Before

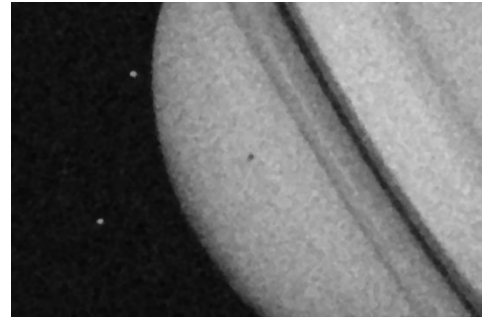


After

**Median:** This filter is used to remove impulse noise from an image. The Median filter replaces the center pixel with the Median value in its neighborhood. It will also blur the image.

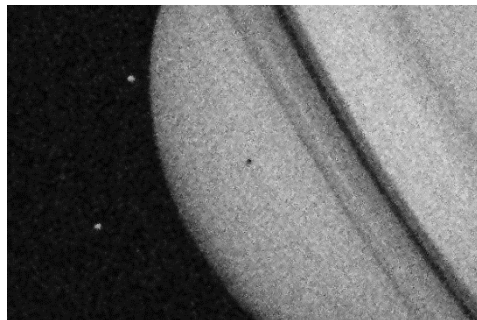


Before

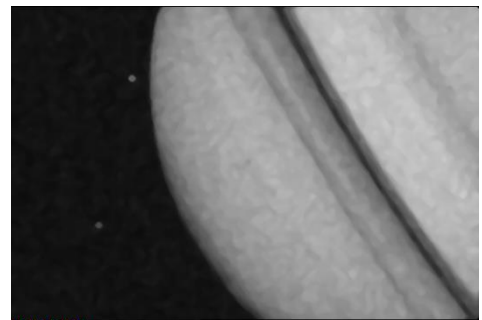


After

**Rank:** This filter is used to remove impulse noise from an image. The pixels in the kernel are ranked by order of intensity, and the pixel in that range at the rank percentage is chosen for comparison. For example, in a 5x5 kernel, there are 25 pixels. A rank percentage of 95% would choose the second-brightest pixel for comparison. If the difference between the selected pixel and the center pixel is greater than the threshold value, the Rank filter replaces the value of the center pixel with the value of the selected pixel.



Before



After

⇒ **Edge Enhance** Edge Enhance |

These filters are used to enhance edges around objects in images. Play with them.

**Sobel :** This filter is used to enhance just the principal edges in an image. The Sobel applies a mathematical formula to a 3x3 neighborhood to locate and highlight its edges.

**Roberts:** This filter is used to enhance fine edges in an image. The Roberts filter is not a convolution filter. It applies a mathematical formula upon a 4 x 4 neighborhood to produce its effect. The upper left pixel in the neighborhood is the one that is replaced.

**Sculpt:** This filter is used to apply a sculpted effect on the image.

**Horizontal:** This filter is used to detect and emphasize horizontal edges.

**Vertical:** This filter is used to detect and emphasize vertical edges.




**Morphological** Morphological

The idea of the morphological filter is a **shrink** and **grow** process. The word "shrink" means using median filter to round off the large structures and to remove the small structures and in grow process, remaining structures are enlarged back by the same amount.

- Erode:** This filter is used to modify the size of objects in the image. The Erode filter erodes the edges of bright objects and enlarges the edges of dark ones.
- Dilate:** This filter is used to modify the size of objects in the image. The Dilation filter dilates bright objects and erodes dark ones.
- Open:** This filter is used to modify the shape of objects in the image. Assuming the image contains bright objects on a dark field, the Open filter will smooth object contours, separate narrowly connected objects, and remove small dark holes.
- Close:** This filter is used to modify the shape of the objects in the image. Assuming the image contains bright objects on a dark field; the Close filter will fill gaps and enlarge protrusions to connect objects that are close together.
- Tophat:** This filter is used to detect and emphasize points, or grains, which are brighter than the background. There are 3 kernel sizes for this processing. Click the radio button to change the kernel size to the value that most closely matches the size of the grains to detect.
- Well:** This filter is used to detect and emphasize points, or grains, which are darker than the background. There are 3 kernel sizes for this processing. Click the radio button to change the kernel size to the value that most closely matches the size of the grains to detect.
- Gradient:** This filter is used to enhance edges in an image.
- Watershed:** This filter is used to separate objects that are touching. The Watershed filter erodes objects until they disappear, then dilates them again, but will not allow them to touch. The Watershed filter will not operate upon True Color images. If one wants to separate objects in a True Color image, he must first convert it to Gray Scale (see Process Frame: Image>Gray Scale).
- Thinning:** This filter is used to reduce an image to its skeleton. When choosing this filter, one must set the threshold that determines whether a pixel is part of the subject or part of the background (see Options below). The Thinning filter will not operate upon True Color images. If one wants to thin a True Color image, he must first convert it to Gray Scale.
- Distance:** This filter is used to used to show the distances of pixels within blobs to the outer boundaries of those blobs. After applying the distance filter, the background will be black (i.e. pixels with value 0). Only the area within the blobs will have non-zero values (will be white). The values of each pixel within the blob will be a count of the shortest distance from that pixel to the edge of the blob. Thus, all pixels along the blob's border will have a value of 1 (since they are one pixel away from the edge of the blob); pixels that are at a distance of 2 from the border will have the value 2, and so on. This creates a distance map of the image. The Distance filter will not operate upon True Color images. If one wants to use the Distance filter with a True Color image, he must first convert it to Gray Scale.


**Options**

If **Erode**, **Dilate**, **Open**, or **Close** filters is checked, the options will relate to the kernel size and shape.

The following options will be presented:

- 2 x 2 Square:** use the 2x2 square kernel configurations.
- 3 x 1 Row:** use the 3x1 row kernel configuration.
- 1 x 3 Column:** use the 1x3 column kernel configuration.
- 3 x 3 Cross:** use the 3x3 cross kernel configuration.
- 5 x 5 Circle:** use the 5x5 circular kernel configurations.
- 7 x 7 Circle:** use the 7x7 circular kernel configurations. This is a two-pass filter, accomplished using a 5 x 5 circle followed by a 3x3 cross.
- 11 x 11 Circle:** use the 11 x 11 circular kernel configurations. This is a three-pass filter, accomplished using a 5 x 5 circle followed by another 5 x 5 circle, followed by a 3 x 3 cross.

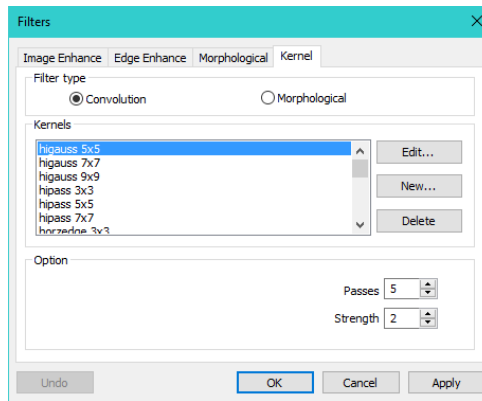


**Note:** The circular kernels are especially effective on round objects (stars) because their circular configuration preserves the circular shape of the objects better than square configurations.



**Kernel** Kernel

The idea of the Kernel Tab is to allow you to create and/or edit a filter and apply it.



Note: Do not delete or rename the **HiPass**, **LowPass**, **Laplacian**, or **Unsharp** kernel files as they are used by the Filters program.

**Filter type:** Select a Filter type, either Convolution or Morphological.

**Edit...:** Invoke the Edit Kernel dialog to modify the selected filter kernel.

**Name...:** This combo box contains the name of the selected kernel file. If you want to save the modified kernel file to the same file, leave it as it is. If you want to save the file to a new location, enter the new filename here.

**Kernel Size:** Use the controls or enter the number to change the size of the kernel. Either direction may consider one to nine pixels. As you modify the Kernel Size, the shape of the kernel representation changes accordingly. In the center of the dialog, there are white boxes containing coefficients that will be multiplied with each pixel that will be considered by the filter kernel. You can change any coefficient by clicking on it and adjust it as desired.

**Fill:** Use the control to fill every element of the kernel with a particular value. The Fill kernel dialog appears. You may enter a value between 0 and 10. Using the Fill button is useful for setting all coefficients to the same value. You may then change the coefficients that require a different value.

- Offset:** The pixel whose value is being modified is usually the center-most pixel. One may, however, designate any pixel. MallincamSky indicates the pixel to be changed by putting a box around it. Choose the X and Y Offset spin buttons to apply.
- New••••:** Select this to create a new filter kernel. The Edit Kernel dialog will appear. The functions of the dialog are the same way as the dialog for Edit••• described above), with the exception that the file name for the new kernel file must be provided.
- Delete:** Click to delete the selected filter kernel file.
- Options:** The choices in this group box will vary depending upon the kind of selected filter.



## IMAGE STACKING

**Image Stacking** control will allow you to select a saved video file, then it will do an elementary stacking process on the file.

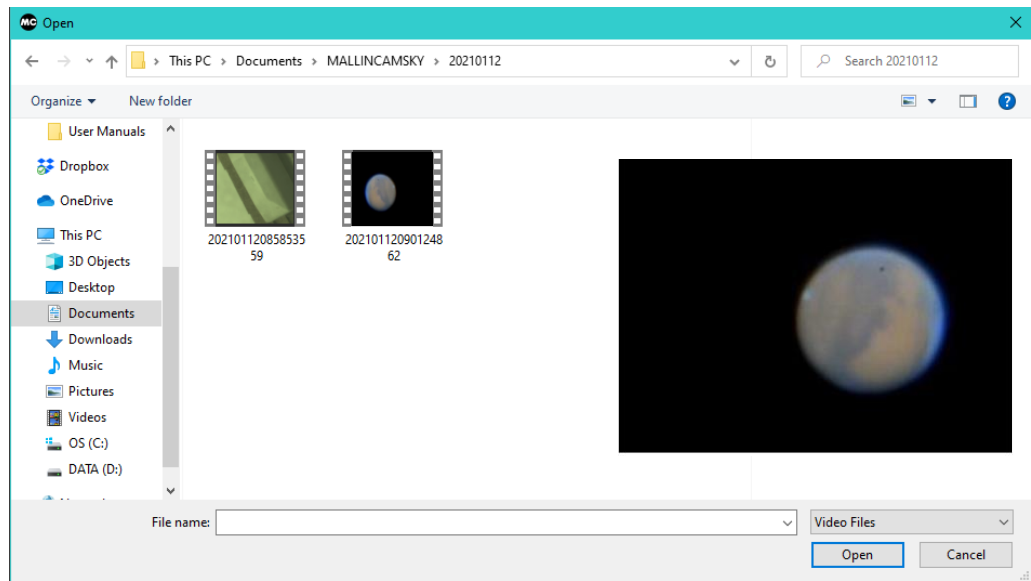
In the Image Stacking process, **MallincamSky** takes the first frame as the reference image, this means the first frame is very important and should be assure the first frame to be the right image scene and the subsequent frames have a greater overlap region with the first frame.

The stacked image signal to noise ratio is greatly improved. The stacked image may have had some black edges, this is because the images in the video have moved and in the stacking process, **MallincamSky** will added black to the image area that has no corresponding pixel in the reference image.

This Image Stacking process will not align the video images, so this control may be better suited for Deep Sky objects than for planets.



**Left-Click** on the **Image Stacking** control and **MallincamSky** will open a **Dialog Window**.

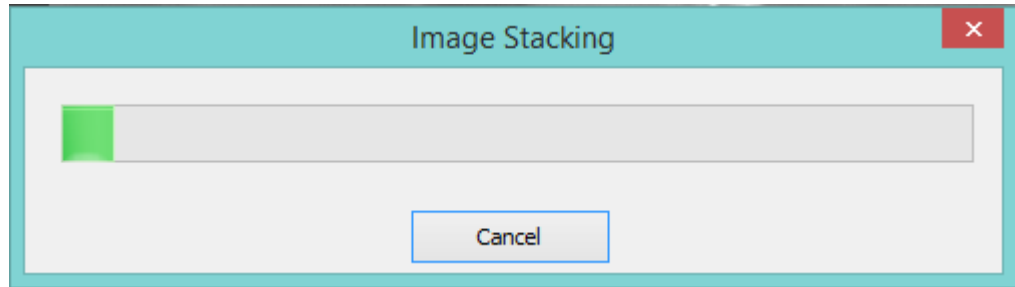


Using the **Open Dialog Window** move to the directory and **Left-Click** on the File you would like to apply the Stacking process to, then **Left-Click** on Open.



**MallincamSky** supports the following video formats for the **Image Stacking** process: wmv, asf, avi, mp4, m4v, 3gp, 3g2, 3gp2, 3gpp, mov, mkv, flv, rm, and rmvb.

**MallincamSky** will Open an **Image Stacking Progress Bar** to inform you of the process.



Once completed, the stacked image will appear in the Video/Image window. You can now apply other processing techniques to this image which as a bonus will now have a larger signal to noise ratio.

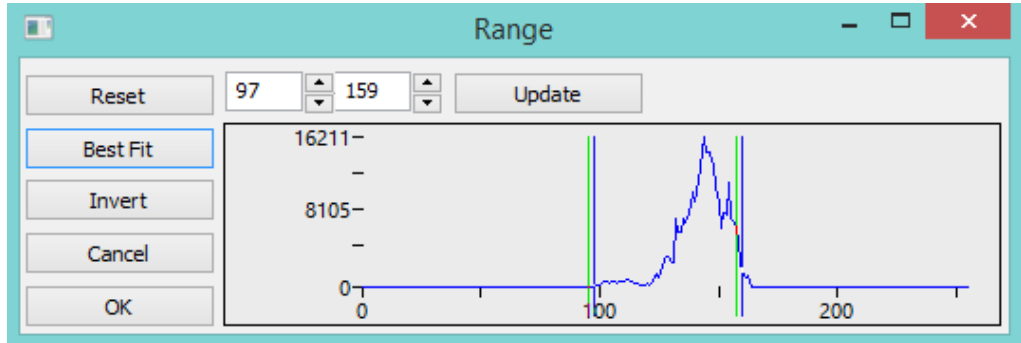




## RANGE

You can modify the color effectiveness range with the **Range** control to color sharpen your image. This control allows you to set the intensity levels of the image to increase the contrast and enhance the display in low-light situations. Choose the Range command to open the Range dialog box.

The Two vertical markers show the upper and lower limits of the intensity levels. These markers can be moved with mouse through the drag and drop method. For a color image, the histogram will reflect the red, green, and blue values with corresponding colors lines.



The two Edit controls indicates the values of the intensity levels. Choose the spin buttons to increase or decrease these values. All values between 0 and the lower limit will be black and all values between the upper limit and the upper end of the scale will be white. These two edit control values corresponding to the two vertical markers show the upper and lower limits of the intensity levels. Defaults are 0 and 255, respectively.

**Reset:** The Reset button allows Reset the black and white levels to the high and low ends of the dynamic Range.

**Best Fit:** The Best Fit button automatically sets the intensity levels to the Best Fit. Best Fit instructs MallincamSky to optimize the brightness and contrast values for the image.

**Invert:** The Invert button reverses the color of the image.

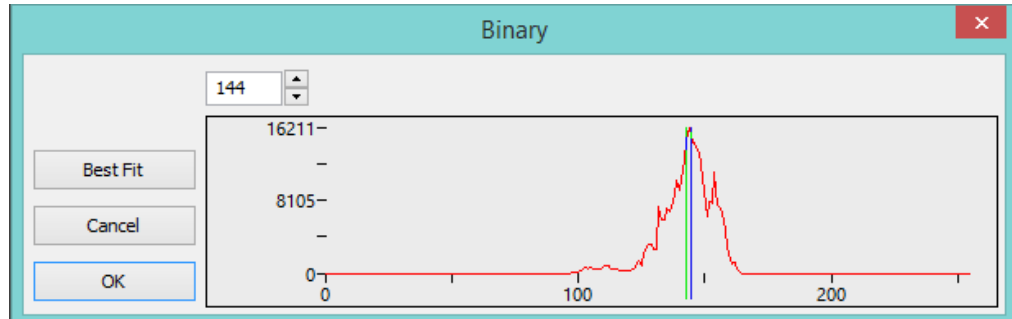
**Update:** Update will refresh the display Range with the most current image information.



## BINARY

You can modify the image of the **pixel/no pixel** count with the **Binary** control.

Binary is a kind of gray level process. If the gray of the pixel is greater than the given threshold, the pixel's color will be changed into white. Otherwise, the pixel's color will be changed into black. Although the process may lose some information, it is an important step of other processes.



The curve on the Binary dialog shows the gray distribution of the image.

The Line in the dialog indicates the threshold value. Drag the line to change the threshold or change the value in the Line position edit box (in the top left corner of the dialog) to move the Line.

The Line position edit box shows the current position value of the Line; Modifying the value will move the Line at the same time.

Click the "Best Fit" button to apply the auto threshold process to the image. It uses an automatic threshold to make the image Binary.



## PSEUDO COLOR

Pseudo Color...

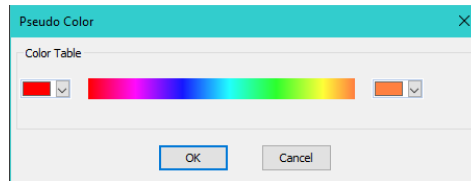
**Note:** The Image must be in Gray Scale for the Pseudo Color command to be active.

You use the Pseudo Color control to "colorize" the active monochromatic image. This is used to highlight certain features in a gray scale image such as display all densities above a certain point in red, or if the imaging device recorded thermal information, all temperatures below a certain point can be revealed in blue color.

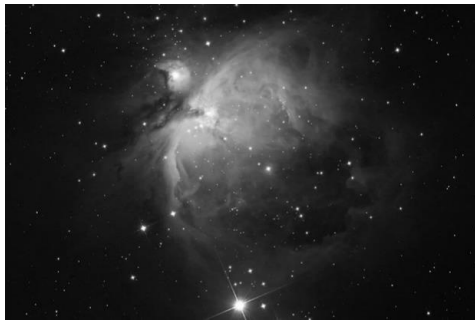
When you Pseudo Color a monochromatic image, a special palette needs to be built with which the monochromatic image is displayed. Pseudo Coloring an image does not modify the pixels' values in image bitmap (it does not convert image to true color or palette). It simply associates a Pseudo Color palette with the image that interprets the gray-level values in the image as color.

Pseudo Colored images are very similar in structure to palette class images, but they differ in a couple of important ways. First, the pixels' values in a Pseudo Colored image actually represent continuous-tone intensity information, whereas a palette image's pixels carry no intensity significance. Secondly, a palette image includes a palette table that is part of the image file.

When you activate the Pseudo Color control, a Pop-up Window will appear.



The colors used to map the gray values can be selected. The buttons at each end of the color strips will bring up the color dialog separately, which allows select the start and end colors of the range. This allows you to even create some artistic looking images.



Before



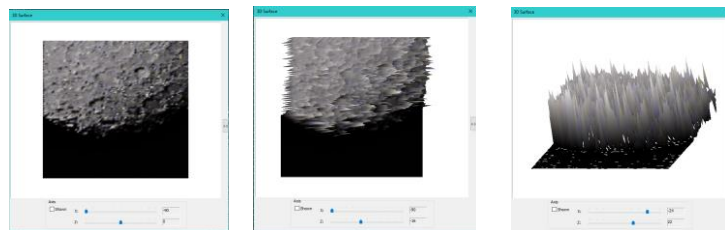
After



## SURFACE PLOT

Surface Plot...

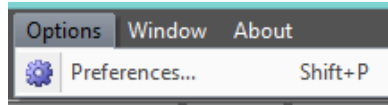
The Surface Plot tool creates a 3-D representation of the intensity of an image. When choosing the Surface Plot control, keep in mind that X=image width and Y=image height, and Z=pixel value. In the viewpoint window, the elevation and rotation of the image can be adjusted by dragging the mouse on the image.



By expanding the Surface Plot, you can activate a pseudo light source to see how it affects your 3D contour map. This is still a work in process control.



## Options



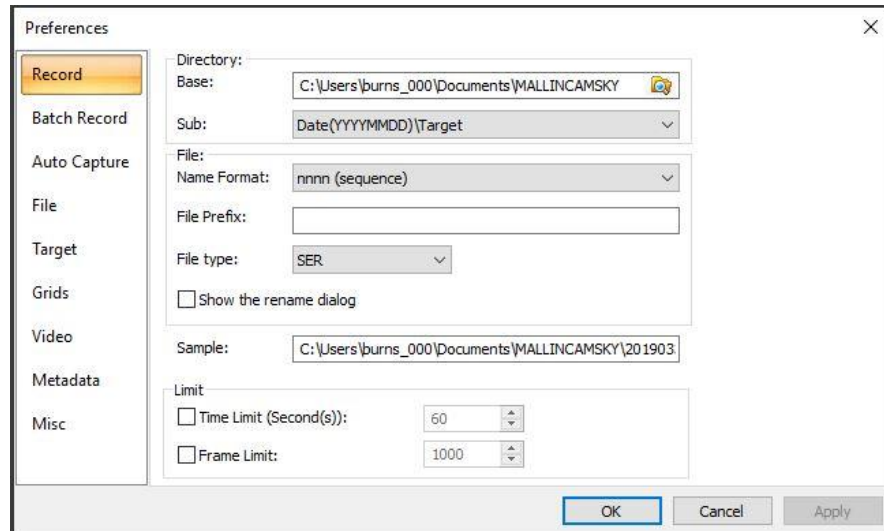
The **Options>Preferences...** Menu provides 9 Tabs, they are: **Record**, **Batch Record**, **Auto Capture**, **File**, **Target**, **Grids**, **Video**, **Metadata** and **Misc**.



## Record



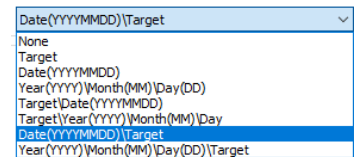
The **Options/Preference/Record** tab will allow you to set the default location, File Format, File Prefix, File Type, duration, or Frame Limit for the Video recording of the current SkyRaider camera.



## Directory:

The file **Directory** can be selected by **Left- Clicking** on the symbol in the **Base:** selector.

You can also have MallincamSky create a Sub-directory to the Primary Directory, by selecting one of the pulldown choices in the **Sub:** heading.

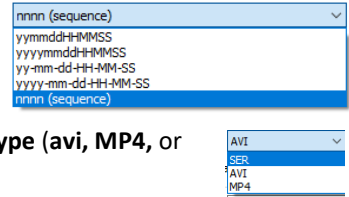






**File:**

The **File Name** allows you to select, from a pull-down list, an automatically generated name.



You can add a **Prefix** to the name, as well as choose the **File Type** (**avi**, **MP4**, or **ser** format) the video will be recorded in.



The **Sample:** box will show a location preview of where and the chosen naming convention of the video file.

Sample:



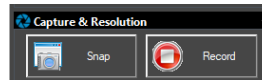
**Limit:**



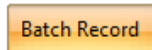
The **Limit** controls only work when you are saving in the **ser** or the **avi** format. If you select the **mp4** format, the limit commands will not be acknowledged, and you must use the **Stop** command yourself.

You can either choose to capture a **specific number of seconds** (from **0** seconds to **36,000** seconds) or a **specific number of frames** (from **1** frame to **1,000,000** frames).

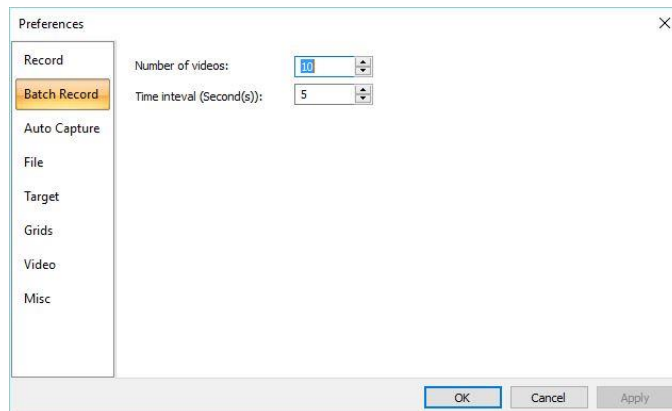
Just **Check** the box under limit and enter the required amount. If none is checked, **MallincamSky** will record until you **Stop** the recording by **Clicking** on the **Red Stop Recording** button on the **Left Side Bar** in the Screen (only available when recording is activated).



**Batch Record**

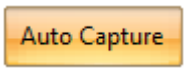


The **Options->Preferences...->Batch Record** tab will allow you to set the number of Video recordings in the batch, plus the time interval **between** each separate recording.

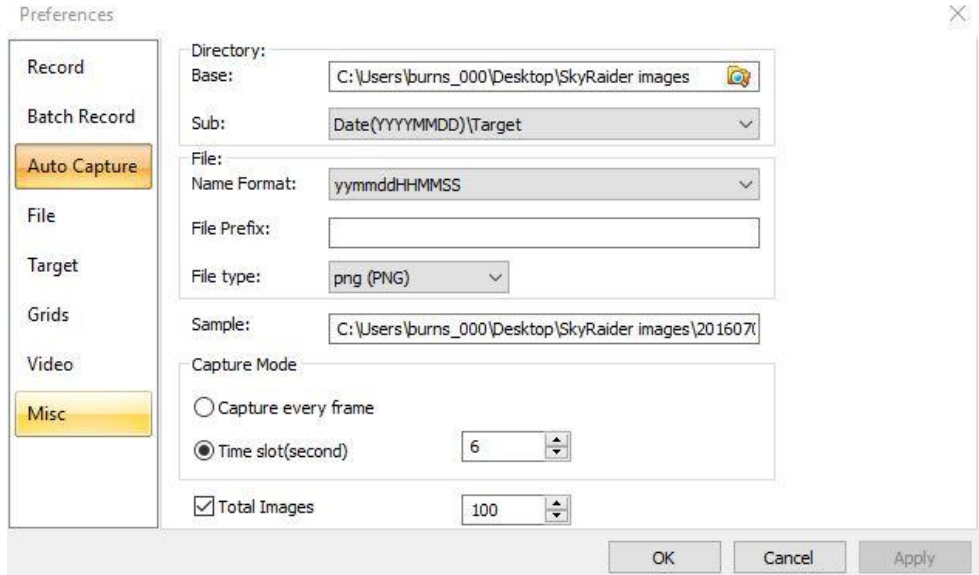


**Clicking** on **OK** accepts the settings.

➤ Auto Capture



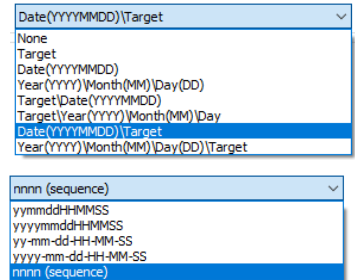
The **Options->Preferences...->Auto Capture** tab will allow you to set the **location, file format, type, interval,** and **number** of required still images for the **Auto Capture (F7)** function of MallincamSky.



➔ Directory:

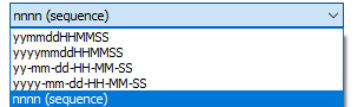
The file **Directory** can be selected by **Left- Clicking** on the  symbol in the **Base:** selector.

You can also have MallincamSky create a **Sub-directory** to the Primary Directory, by selecting one of the pulldown choices in the **Sub:** heading.

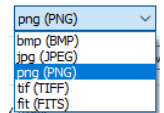


➔ File:

The **File Name** allows you to select, from a pull-down list, an automatically generated name.



You can add a **Prefix** to the name, as well as choose the **File Type (bmp, jpg, png, tif or fit format)** the image will be captured in.



The **Sample:** box will show a location preview of where and the chosen naming convention of the image file.

Sample:

⇒ **Capture Mode:**

You can either choose to **Capture every frame** or select a **Time interval** between each capture.

✦ **Capture every frame:**

If **Capture every frame** is chosen, then **MallincamSky** will capture the number of images indicated by the **Total Images** count (**do not leave unchecked**).

✦ **Time Slot:**


This Time slot (in Seconds from **2 s** to **3600 s**) is the time that **MallincamSky** waits before capturing another image (**5s** would indicate waiting another **5** seconds before capturing another image).

⇒ **Total Images:**

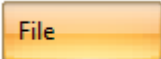
Selecting the **Total Images** checkbox will enable its number selection box. You can then enter the Total Images (from **1** to **9999**) to be captured. **MallincamSky** will stop the **Time-lapse capture** process automatically when the **Total Images** are reached.

If **Total Images** is **unchecked**, **MallincamSky** will capture the images continuously until you Click the **Capture>Stop Auto capture** command to stop the **Time-Lapse capture**.

Clicking on the **OK Button** accepts the capturing settings.

☞ To activate the Capturing process use **Capture->Auto Capture (F7)**, or **Click on the Auto Capture Icon** located on the top of the screen. 

☞ After the Time-lapse capture is started, the **Capture>Start Auto Capture●●●** menu will be changed to the **Capture>Stop Auto capture** menu. Choosing this command, or again **Clicking** on the **Auto Capture Icon** will stop the Time-lapse capture.

⇒ **File** 

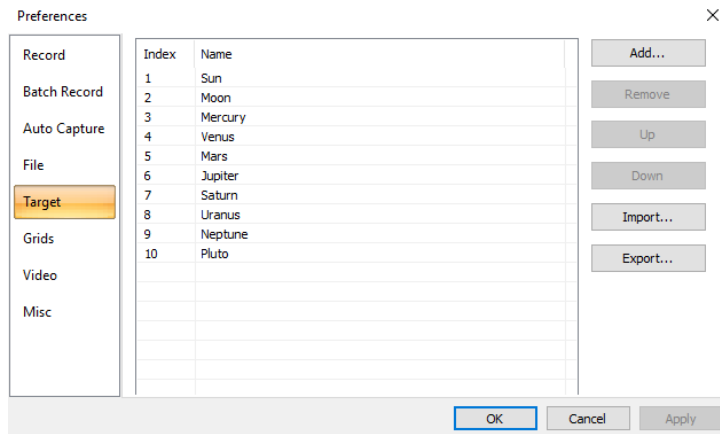
One can select various File Extensions via a checkmark for the specified file Format, to determine whether it will be displayed in the **Browse** window or not (The checked Format can be displayed in the Browse window).

Extension	Format	Abbr.	Browse
bmp	Windows Bitmap	BMP	<input checked="" type="checkbox"/>
dib	Windows Bitmap	BMP	<input checked="" type="checkbox"/>
rlc	Windows Bitmap	BMP	<input checked="" type="checkbox"/>
jpg	JPEG	JPEG	<input checked="" type="checkbox"/>
jpeg	JPEG	JPEG	<input checked="" type="checkbox"/>
jpe	JPEG	JPEG	<input checked="" type="checkbox"/>
jif	JPEG	JPEG	<input checked="" type="checkbox"/>
jfif	JPEG	JPEG	<input checked="" type="checkbox"/>
png	Portable Network Graphics	PNG	<input checked="" type="checkbox"/>
tif	Tag Image File Format	TIFF	<input checked="" type="checkbox"/>
tiff	Tag Image File Format	TIFF	<input checked="" type="checkbox"/>
gif	CompuServe GIF	GIF	<input checked="" type="checkbox"/>
pcx	PCX	PCX	<input checked="" type="checkbox"/>
tga	Targa	TGA	<input checked="" type="checkbox"/>

➤ Target 

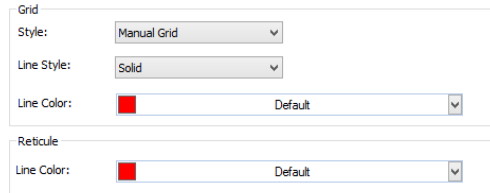
The **Target Tab** allows you to label the target that you are currently shooting. The 10 solar system objects are set as the defaults in the pull-down list, but you may change the names of the objects, rearrange the order of the objects, add new objects, export, or import list from others from this Tab.

The target list appears in the drop-down list located with the other **Top Line** icons.



➤ Grids 

The **Grids Tab** allows you to determine if you would like a **Grid** displayed on the Video Window, and if so, how should it be drawn. The Grids Control can also be used to define the color of the **Reticule** that can also be drawn over the image.



**Grid Style:** The **Grid Style** can be No Grid, Auto Grid or Manual Grid. Default is No Grid.

**Grid Line Style:** The **Line Style** for the grid can be Solid, Dash, Dot or DashDot. The Default is Solid.

**Grid Line Color:** The color of the **Grid Line**. The Default color is Red (255,0, 0).

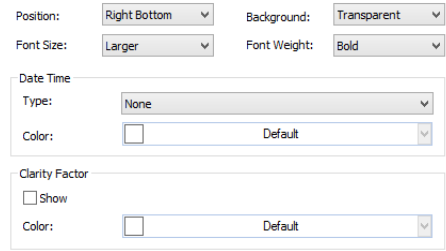
**Reticule Color:** The color of the **Reticule**. The Default color is Red (255,0, 0)



Video

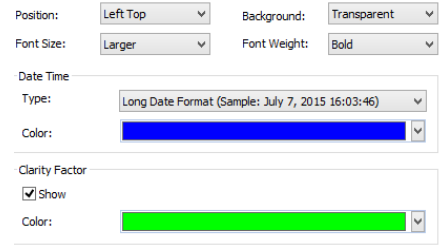
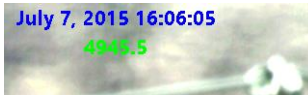


You can overlay the Date and Time on the VIDEO **Window** (With a location and color of your choice). You can also have **MallincamSky** display the **Clarity Factor** (can assist in focusing) on the image. These overlays are updated in Real-time.

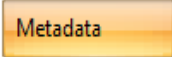


For Example:

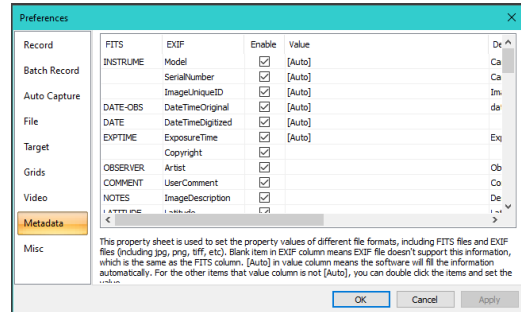
The settings on the Right will overlay the video stream with the following in the top left corner of the Video Window.



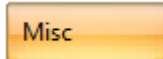
Metadata



This control allows you to determine what data is embedded inside the **FITS** and **EXIF** files when they are saved. File viewers that read **FITS** or **EXIF** (Tiff) images can then display details about how that image was taken, equipment and telescope used.

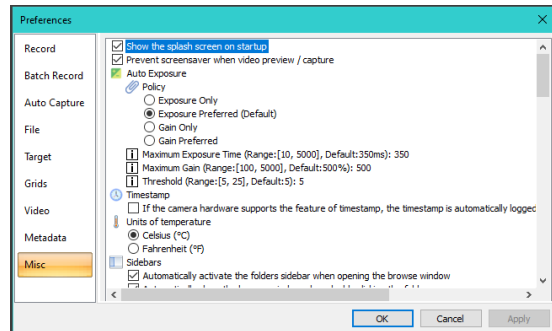


Misc



The **Misc** Tab is mainly used for the control of the MallincamSky's User Interface. It mainly includes:

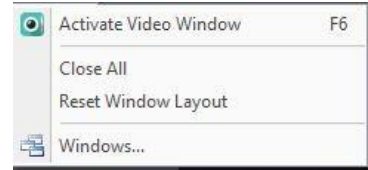
1. MallincamSky's special file format warning information.
2. Sidebars.
3. User Interface Style
4. Language.
5. Graphics accelerator
6. Privacy.



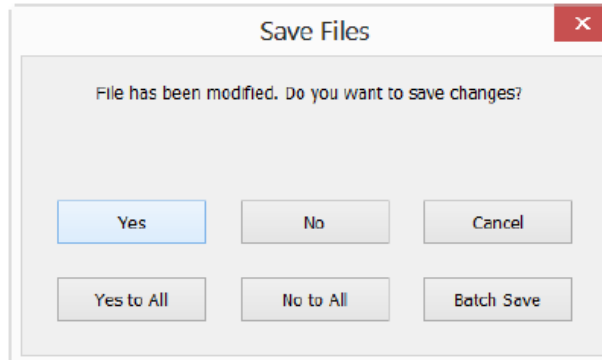
Just **Left-Click** in a **checkbox** to choose your required Option.


## Window

The menu control will close all open windows (Tabs) and it can reset the layers back to its default settings.




Selecting the **Closes All** command will close all the picture windows opened or captured inside **MallincamSky's** frame. If you have made any modifications to the pictures or if you have captured some pictures from the camera, choosing the **Close All** will pop-up a window that will let you finish the saving operations quickly.

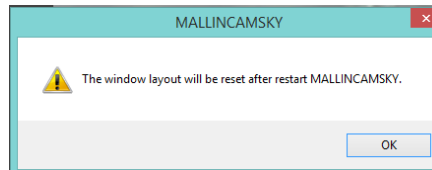


 The **Close All** will also close down the live **Video Stream** window. You can now use the **File>Open Video** to view a saved video. **Left-Click** on camera will again activate the **Video Stream** window.



Choosing this command will **reset** the **MallincamSky** window layout to the original default.

 The reset will be effective after restart.

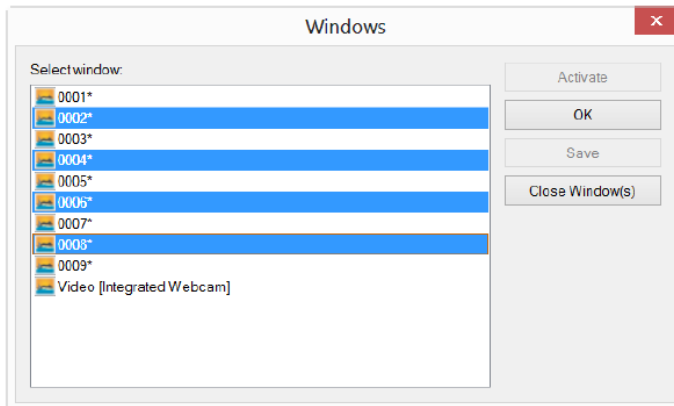




Choosing the **Windows>Windows...** control will open a dialog box that lets you manage the currently opened windows.

The dialog allows you to manage large lists of open windows by assigning them into groups. Let us say you have eight windows open but want to close four of them scattered through the list.

1. Choose the **Windows>Windows...** control.
2. Select the windows you want to close. Hold **Ctrl** or **Shift** key to select more than one at a time. Here, 4 windows are selected.

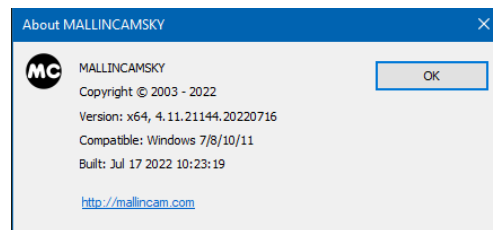
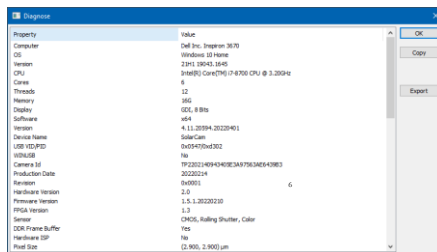


3. Click **Close Window(s)** button, those four selected windows will be closed, leaving the other files or captures available for editing.

You can use this command to switch and activate a selected window on a list by hitting **Activate**.



This control will pop-up a window that allows you to see detailed information **About** the current version of MallincamSky installed, and on the **Diagnose** Tab, detailed information about your computer system.



## MallincamSky Toolbar



### Open

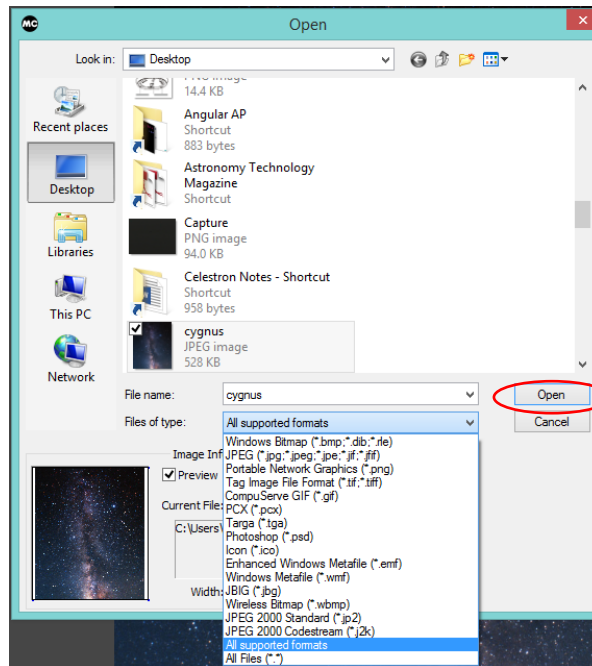
The **Open Image** command is used to open an existing image file. This command can also be used to preview an image in a preview size, or to view its statistics and information without opening the image itself. You can use this command to quickly locate an image.

**MallincamSky** supports a variety of image formats. These are identified in the **Files of type** list box.

**MallincamSky** can open more than one image simultaneously by:

- **Ctrl + Left Mouse Click** on each required file then **Left-Click** on **Open**
- **Shift + Left Mouse Click** method to highlight the files to be opened, then **Left-Click** on **Open**

When an image is opened, **MallincamSky** places it into a new image window. It then becomes the active image.

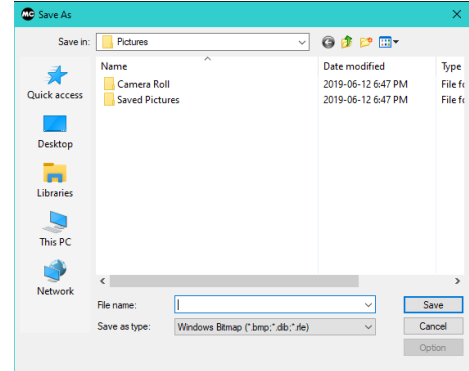


**MallincamSky** maintains, at the **File>Recent Files** submenu, a list of the last opened files.



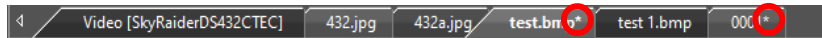


The **Save Icon** allows you to save an image (or a **snapshot** of the current video stream) onto your computer. The command immediately stores the current active video window image (or an active non-named snapshot) to the last activated folder location (the filename is listed on the window's **title bar**) while leaving the image still active in its window. The dialog box will provide you an opportunity to change the desired saving location, give a name to the image file, and choose a format.



If the image is untitled or titled with a digit, **MallincamSky** will issue the **File>Save As** dialog automatically. The default **“Save as type”** will be **“Window Bitmap (\*.bmp,\*.dib,\*.rle)”**.

You can determine which **image tabs** can be saved, by noting if there is an asterisk, **“\*”**, behind the name. If present, then that image can be saved.



The **Save Icon** can be used to save the most recent changes to disk. It is often performed as a precautionary measure during lengthy or involved processes to reduce the amount of reprocessing that might be required in the event of a system failure or operational error.

When an image is closed and told not to save its changes then **MallincamSky** discards all changes made since the last **Save** operation.



The **Save Icon** always saves the contents of the entire window, even if there is an **AOI** (Area of Interest) defined on it.



The **Save Icon** is an alternative way to save a **Snapshot** to the default File folder of an active **Video Stream** (it will ask you for a **File Name**).



The format options that your snapshot can be saved in depends upon the capture format the DS432CTEC is in. If the camera is in **RAW** mode, then the snapshot will be saved in only **FITS** format. If the DS432CTEC capture format is in any of the **RGB** modes, then you will have a selection of possible snapshot file formats.



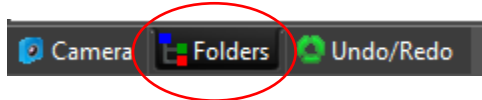
The **FITS** format will look Black and White and checkered, but this is because it is in a **RGGB** bayered format. This format is used as it provides you will the truest control of each layer in the image. You will need astro-imaging software (Astroart) to extract (debayer) the colors to perform professional quality image processing.



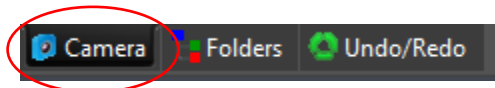
## Browse

The **Browse Icon** from the **MallincamSky Tool Bar** is used to browse images under the specified directory in the **Folders Sidebar**.

This command is identical to hitting the **Folder's Tab** at the bottom of the screen.



To return to the **Camera Bar**, just **Click** on the **Camera Tab** located at the bottom of the screen.



You can also change the order of these tabs by **Left-Click-Hold** and **Drag** on the **Tab** name.

The **Browse Window** resembles **Windows Explorer**. **Left-Clicking** on the **+** will expand a folder so that you can examine its contents.

You can **Right-Click** on a **Folder** (or file) and the actual **Windows** controls will pop as in **Windows Explorer**.



As you get deeper into the **Browse Window**, you can **Back-Out** or Move Deeper into the File Folders via the **Green Left** or **Right Arrow** in the **Browse Window**.



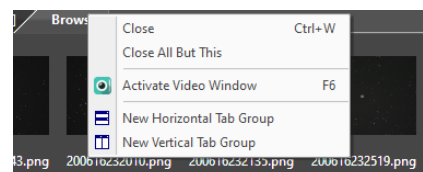
The **Blue Right Arrow** will take you to your computer's **Root Directory**.

**Left-Double Clicking** on a **Folder** will open a **Window Tab** in the **Video Window** (this **Window** will be labeled **Browse**).

This **Tab** will display all the graphic files inside that Folder. If you **Left-Double Click** on a **Graphics File** inside the **Video Window**, it would open that **Graphics File** in a new **Tab** in the **Video Window**.



You can **Close** the **Tab** in the **Video Window** by **Right-Clicking** on the **Tab's Title (Browse)**, then choosing **Close**.

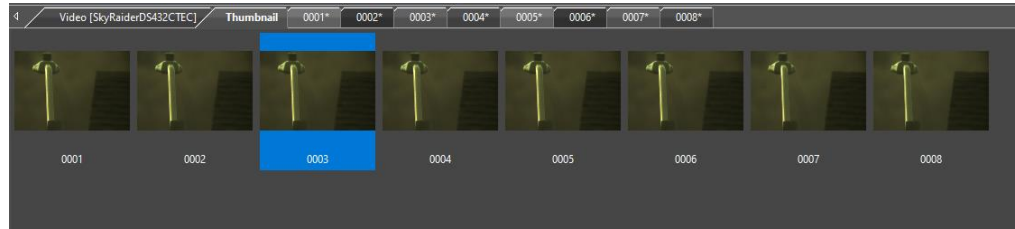




## Thumbnail



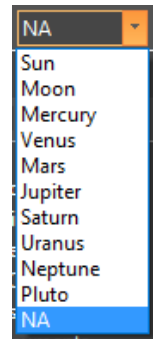
This icon creates an image window that contains snapshots of all your current image tabs. You need only click on that image to have it open that image's window.



## Target



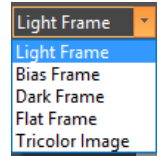
This icon allows you to give a name to the current Target that you are imaging. You can add or change names in the **Options>Preferences>Target** Tab. The Target name can automatically be used as a **suffix** for a file folder name when saving images or video captures.



## Image Type



This icon allows you to designate the type of image you are saving. This is only for your reference. Just select an image type from the drop-down list.



If you save an image in **FITS** format, then the **Image Type** will be included in the **Metadata** for that image.



## Auto Capture



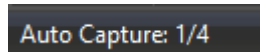
This icon activates the **Auto Capture** routine in MallincamSky.

You must have previously chosen the **File location**, **File Type/Number** of required images, and the **Time Interval** between each captured image from the **Options->Preferences> Auto Capture** Tab (see **Options** for more information).



The **Auto Capture** Icon will remain highlighted until the capture process is completed. You can **Abort** the capture process at any time by again **Clicking** on the **Auto Capture** icon.


MallincamSky will indicate the status of the **Auto Capture** process on the lower left of the MallincamSky window.



 **Batch Record**

This icon activates the **Batch Record** routine in MallincamSky.

You must have previously chosen the **File location**, **File Type/Number** of required Videos, and the **Time Interval** between each captured video from the **Options->Preferences...-> Batch Record** Tab (see **Options** for more information).

 The **Batch Record** Icon will remain highlighted until the capture process is completed. You can **Abort** the capture process at any time by again **Clicking** on the **Batch Record** icon.

MallincamSky will indicate the status of the **Batch Record** process on the lower left of the MallincamSky window.

Batch Record: 1/2; Time=04/10; Frame=77; File= 507.6M; Free=781.0G

 **Pause Video Capture**


This icon Pauses the **Batch Record** routine in MallincamSky. It will highlight when you are able to pause a video capture.


 **Open Video Folder**

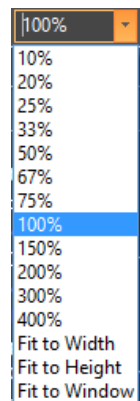
This icon will allow you to open and view either the default **Video Record** folder or the default **Image** folder. This way you can examine the results of the recording. The folders are assigned via the **Options->Preference** Tab.

 **Zoom**

The Zoom Icon allows you to **Zoom-In** or **Zoom-Out** while viewing a Video/image window. The Drop-Down list will offer you the zoom options. Just highlight the zoom option with your mouse and release the mouse button.

 You can change the **Zoom** by rolling your **Mouse Wheel** while holding down the **CTRL** key on your keyboard., if your mouse has a wheel.

 Also look at the **Hot Key's** section for keyboard shortcuts.





## Track



If the **video/image's** actual size is larger than the **video/image Window**, then this control will allow you to position the actual **video/image** within in the **video/image Window**. This control is activated automatically when necessary.

Its function is like scroll bars. It is an alternative to using the arrows on the scroll bars for positioning the **video/image** within the window. Position the mouse (make sure to choose a location outside a **Region of Interest** rectangle. You may need to close the **ROI** rectangle if necessary) on the actual **video/image**.

**Left-Click and Hold** (the **Open Hand** will change to a **Closed Hand**). Now drag the image around inside the **video/image Window**

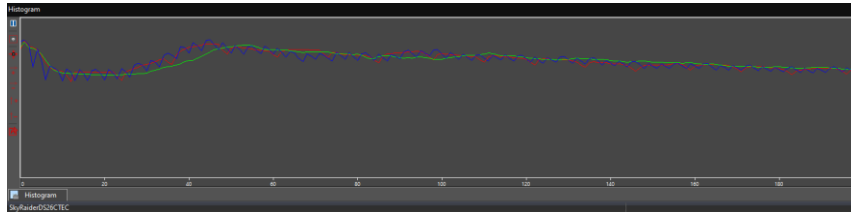
If the **video/image** size is smaller than the **video/image Window** size, then the track operation will be disabled.



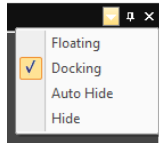
## Histogram



This icon will display a real-time **Histogram** (for information purposes) beneath the Video window being displayed. **Clicking** on the icon again will remove the **Histogram**.



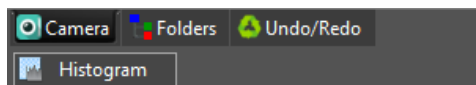
The eight icons on the left of the **Histogram** allow you to **pause** or switch between the **linear** or **logarithmic** scale, **zoom in** or **zoom out**, **display statistical data**, or **output data values**.



The Histogram window is movable and resizable via the **Left-Click and Hold** technique with your mouse. You can also have the Histogram window Minimize, resize, and **Auto Hide** by selecting this feature from the **pull-down arrow** on the upper right of the window.



Moving your cursor over the Histogram Tab now located underneath the **Left-Side Bar** on MallincamSky will re-display the Histogram if **Auto Hide** is selected.





## Reticle




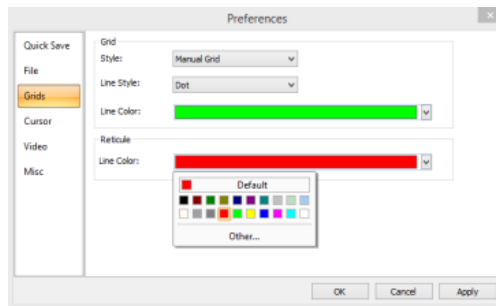
MallincamSky provides four **Reticles** (or crosshairs) to aid in aligning your telescope to a star (or another stellar object).

**Left-Click** on a **Reticle** Icon to activate it and **Left-Click** on it again to **De-Activate**.

You can **Left-Click and Drag** the location of the Reticle around the screen to center it on an object of interest.



The  **Reticle-Icon** will automatically re-center the selected Reticle on your image.



You can change the **color** of the **Reticle** via the **Option>Preferences** control in the **Top Menu Line**.



## ST4 Test



The **DS432CCTEC** camera does not have an auto guider ST4 port, so this control is deactivated. Note: The **DS432C** does have a guide ST4 port.



## Advance/Reverse



These icons allow you to advance or reverse the current frame when viewing an opened Video in the **ser** format.

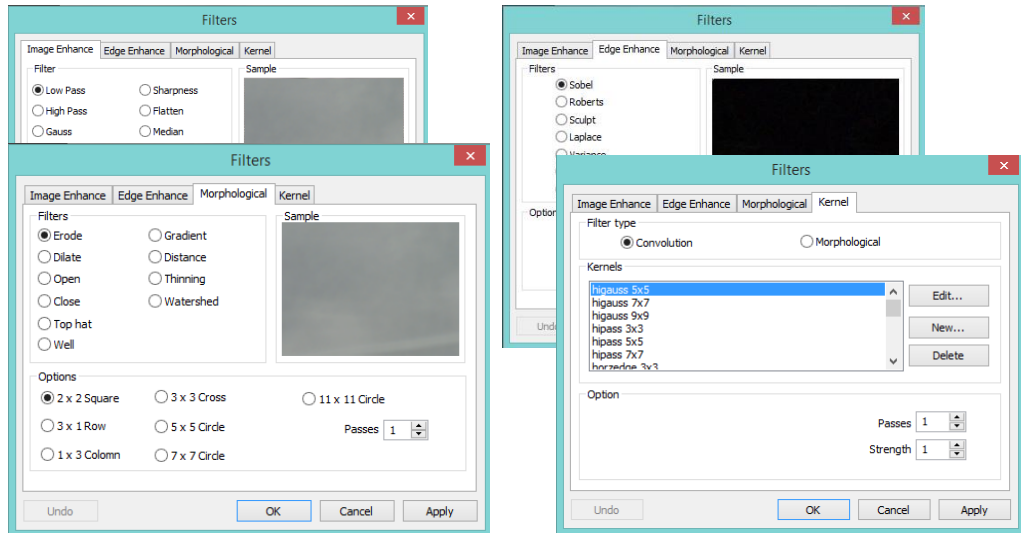


Recall: to load a video for examination and viewing first close the live camera window (this stops the camera). Then choose **File->Open Video** and select the **ser** format video to view. These icons will now become active, and you can view the video frame by frame if required.

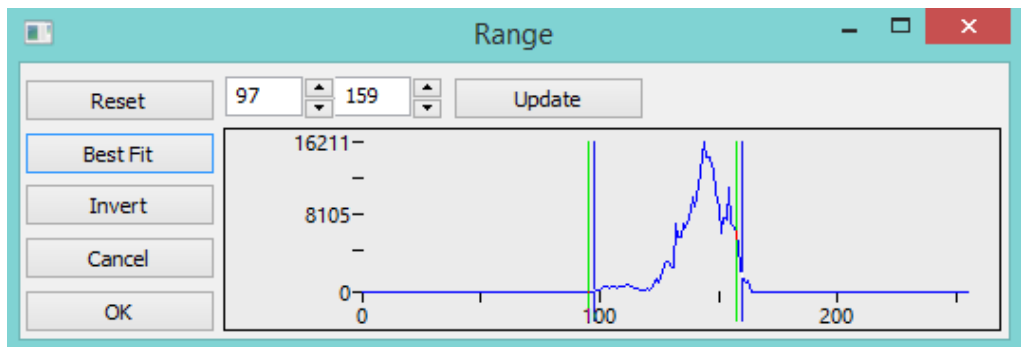


For more detailed information on using **Stitch**, see the **Stitch Control** as described previously in the **Top Line** section of the **User Manual**.

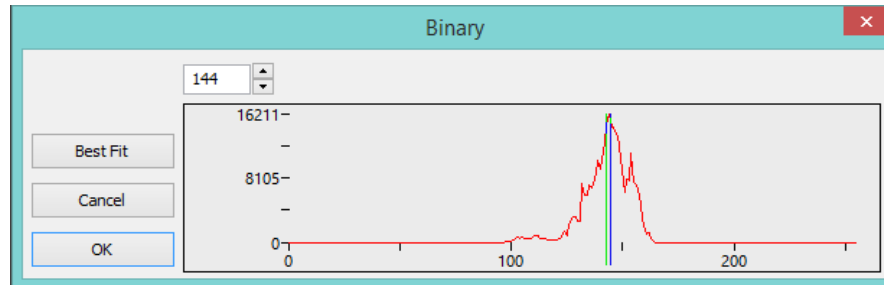
You can find **Denoise Tools**, **Sharpen Tools**, **Color Correction Tools**, and **Enhancement Filters** inside the **Process** command to sharpen your image.



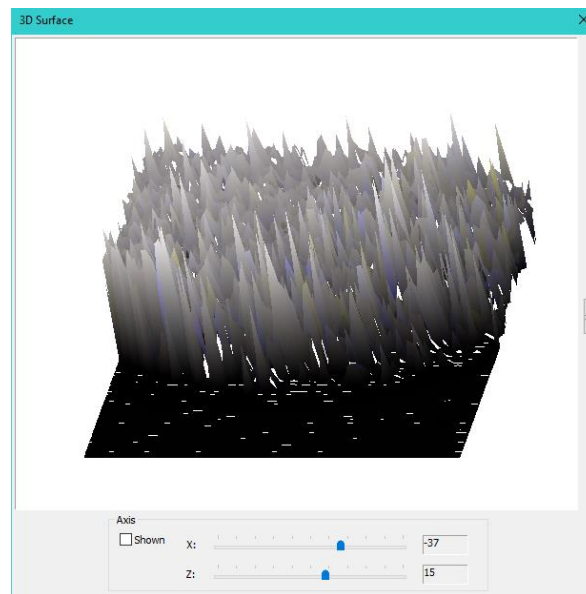
You can modify the color effectiveness range with the **Range** control to color-sharpen your image.



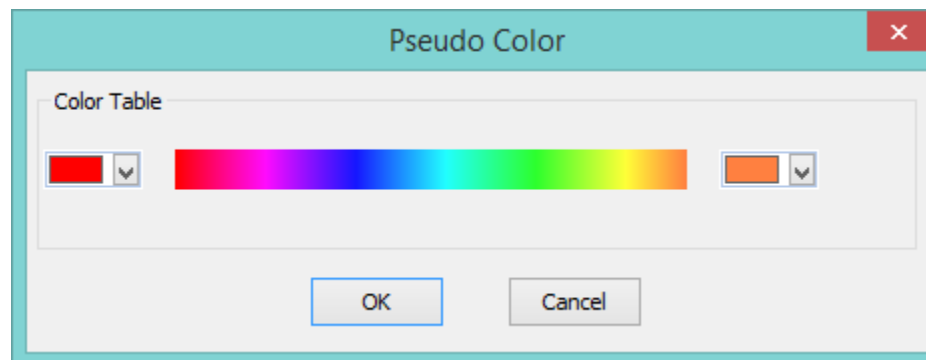
You can modify the image of the **pixel/no pixel** count with the **Binary** control.



You can examine the image as a 3-D color contour map with the **3-D setup** control.



You can apply the **Pseudo Color** application tools to turn a Black and White image into color tones.

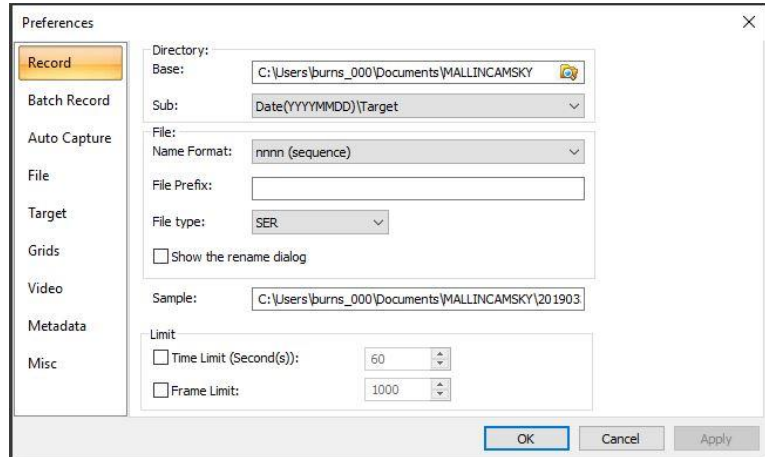


But one cool tool that is built in to MallincamSky is simply the stacking of your video frames to produce an improved image.



## Preferences

This icon opens the preferences window. This icon is identical to the **Main Tab** line **Options->Preferences....** See previous section in the **Options Tab**.



## Customize

This control will allow you to customize what appears on the **Icon Bar**.

**Left-Click** on the **Customize** Icon to display the **Add or Remove Buttons** selector.

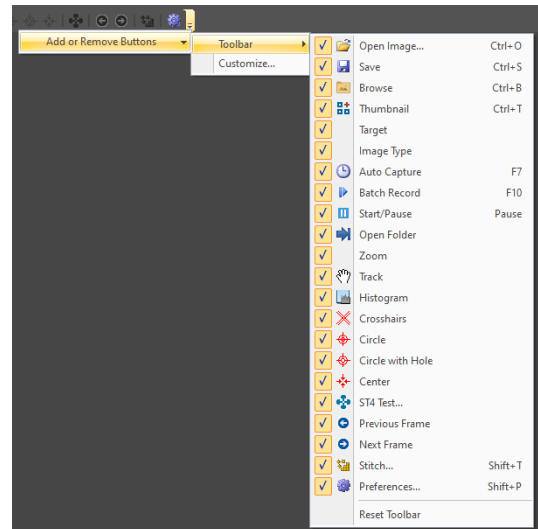
### Toolbar

Then **Left-Click** on the down-triangle to expand and select **Toolbar**.

**Left-Click** on its triangle to expand the command to show the currently displayed icons.

Select which Icons you want displayed on the Icon Bar by **Left-Clicking** on the **checkmark** to add or remove that Icon.

You can reset the **Icon** bar to its default state by **Left-Clicking** on the **Reset Toolbar** button.

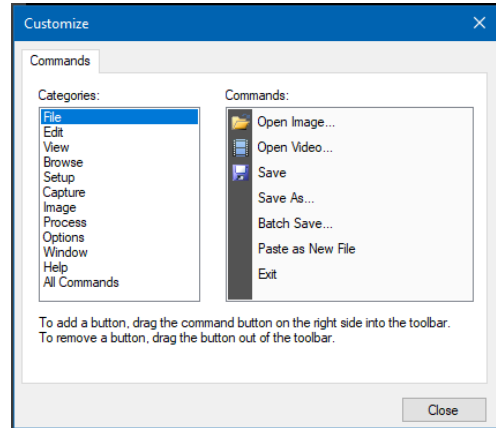


➤ **Customize**

This control will allow you to customize your **Icon Bar**, by providing a process of adding or removing other control icons to its bar.

The left **Categories Window** contains the icons specific to that category.

The **All Commands** category contains all available icons.



➡ Choose a **Category**.

➡ **Left-Click Hold and Drag** an icon from the **Commands Window** to the **Icon bar** (you will see a black marker bar appear when you move your cursor to the **Icon Bar** as position it where you would like to place the new icon).

➡ Release the mouse button, and the icon will appear where your mouse was pointing.

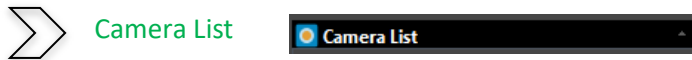
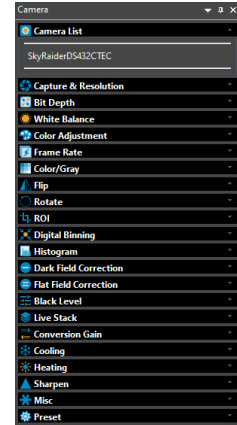


To remove an icon from the icon bar, just drag it off the icon bar.

# Controlling the SkyRaider with Left Side Bar

Once you have a connection to the **SkyRaider Camera**, your next task will be to adjust the controls that make it possible to improve the image the **SkyRaider** is capturing. These controls are located on the **Left Side Bar Menu** on **MallincamSky**.

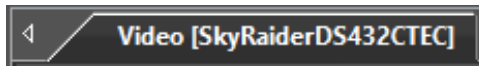
The Controls all have drop-down arrows; **Left-Clicking** on the **Down-Arrow** in the control heading will expand that control. Some controls will also display a colored rectangular box on the **Video Window** to remind you that that control is in effect. You will be able to collapse the control window by **Left-Clicking** on the **Up-Arrow** on the control heading.




The **Camera List** control lists the current **SkyRaider** cameras connected to the computer. **Left-Clicking** on the camera name (**SkyRaiderDS432CTEC**) will start the camera video window.



Once activated, you will see a tabbed frame (with **Video [SkyRaiderDS432CTEC]**) appear in the Video window after selecting the Camera from the list.

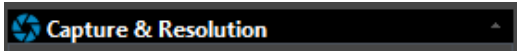


 You can only access one **SkyRaider Camera** at a time even though you may have multiple cameras attached.

 You can start another instance of **MallincamSky** and have this instance control a second SkyRaider camera at the same time as your original instance of **MallincamSky** controls the first SkyRaider camera.



Capture and Resolution



The **Capture and Resolution Tab** allows you to adjust the resolution (the **SkyRaider DS432CTEC** has 1 resolution), modify the **Gain**, and choose the type of **Exposure Mode** that you require for the camera.

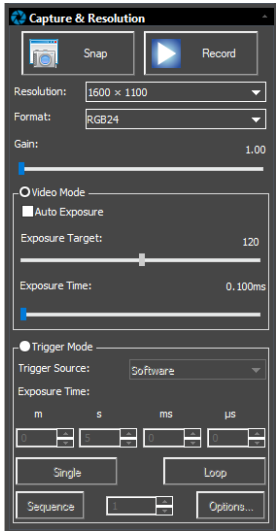


Resolution



Located at the top of this control is the **Resolution** Command. This command allows you to adjust both the display and capture resolution of the **SkyRaider Camera** (each model of the **SkyRaider Camera** will have its own resolution settings that will appear in the list). Once the resolution is set, this control will also allow you to either take a **Snapshot** of the image or save a video recording of what is currently being displayed.

**Left-Click** on the **Drop-Down** list on the **Resolution:** box to see all the allowable resolutions available for your **SkyRaider**. The **SkyRaider DS432CTEC** has one resolution: 1600 x 1100.



The **Resolution** of the sensor along with the **Focal Length** and **Optical Size** of the Telescope play a role in determining the **image size**, **resolution of the pixels**, and the **exposure rate** of the camera. Sample formulas are provided below.

Visit [https://astronomy.tools/calculators/field\\_of\\_view/](https://astronomy.tools/calculators/field_of_view/) for online calculations)

Formula	Example (10-inch F/8 Telescope)
$Focal\ Length = Aperture \times Focal\ Ratio$	$Focal\ Length = 254mm \times 8 = 2032mm$
$Focal\ Ratio = Focal\ Length / Aperture$	$Focal\ Ratio = 2032mm / 254mm = 8$
$Resolution\ ("/\ pixel) = \left( \frac{Pixel\ Size\ (\mu m)}{Focal\ Length\ (mm)} \right) \times 206.265$	$Resolution = \left( \frac{9.0\mu m}{2032mm} \right) \times 206.265 = 0.91"/\ pixel$
$Field\ of\ View\ (') = \frac{3.438 \times (Image\ Size\ (pixels) \times Pixel\ Size\ (\mu m))}{Focal\ Length\ (mm)}$	$Field\ of\ View = \frac{3.438 \times (1600 \times 9.0\mu m)}{2032mm} = 24.36'$ $Field\ of\ View = \frac{3.438 \times (1100 \times 9.0\mu m)}{2032mm} = 16.75'$


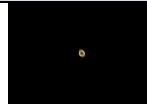




Note: The **Focal Length** of the Telescope is responsible for the **Field of View**.

Adding **Barlows/Focal Reducers** will adjust telescopes **Focal Ratio** and **Focal Length** and thus will affect the objects **Field of View** and telescope's Speed.







Sample Image Size using 10-inch F/8 Telescope:  $F/L=2032\text{mm}$  ( $0.914''/\text{pixel}$ ).

Pixels	Field of View	M42	M57	M92	Moon
1600 x 1100	24.36' x 16.75'				



Sample Image Size using 10-inch F/4 Telescope:  $F/L=1016$  ( $1.83''/\text{pixel}$ ).

Pixels	Field of View	M42	M57	M92	Moon
1600 x 1100	48.72' x 33.50'				



**Left-Clicking on Snap** will tell MallincamSky to display in a **New Tabbed Window** containing a **Snapshot** of the image that is currently being exposed by **SkyRaider Camera**. The image will appear in the **Video Display Window**, with a name which follows the naming convention **nnnn\*** (for example 0001\*).



**Note:** if the **DS432CTEC** is in **RAW** mode, then clicking on the **SNAP** button will open-up a save window, so you can choose a location to save this snapshot in **FITS** format.



**Note:** if the **Format resolution** is **RGB48**, then clicking on the **SNAP** button, will display an image, but it will **not match** the **viewed** image (reset the **FORMAT** of image to **RGB24**), as stacking adjustment not included.



Every time you **Left-Click** on **Snap**, another **Tabbed Window** with the name-number increased by one will appear in the Image Window. The image is **only displayed** in the **Video Window**; it is **not saved** on your computer.



After clicking on the **Snap** button, the snapshot of the image will become the active window, you will need to **Click** on the **Video [SkyraiderDS432CTec]** Tab to return to live imaging.



You can save the image (and thus rename it), by using the **Save icon**, or **File>Save As...** command from the **Top Menu Line**.



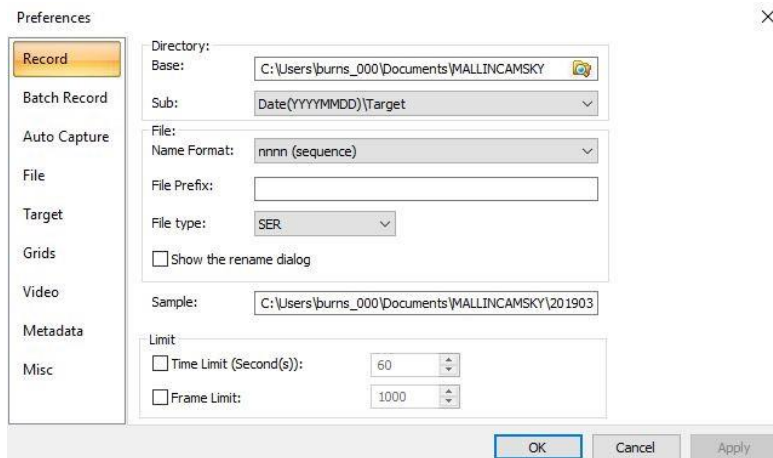
This command is only available when the Mallincam SkyRaider is in **Video Mode**.



See below for details on how to record video when in **Trigger Mode**.



Prior to pressing this icon, you should use the **Options->Preferences...** Tab to choose the default **location, name, format, and duration** of the video.



**If in Video Mode**

Make sure that **Video Mode** is selected, then **Left-Clicking** on the **Record Icon** will tell **MallincamSky** to start recording a video of what is currently being captured by the **SkyRaider** (you will now be able to see the image being recorded as the **Record Button** will activate the camera).

When the Mallincam SkyRaider is recording, the Icon will change to a **Red STOP** Symbol. By **Clicking** on the **Stop Icon**, MallincamSky will terminate the Video recording process, but the video imaging is still active.



**If in Trigger Mode**

Make sure that **Trigger Mode** is selected but **NOT Looping**. **Left-Clicking** on the **Record Icon** will tell automatically start the **Looping** in **Trigger Mode** and **MallincamSky** will also start recording a video of what is currently being captured by the **SkyRaider** (you will now be able to see the image being recorded as the **Record Button** will activate the camera).

When the Mallincam SkyRaider is recording, the **Record Icon** will change to a **Red STOP** Symbol. By **Clicking** on the **Stop Icon**, MallincamSky will terminate the Video recording process, and stop the **Looping** (camera is not imaging).

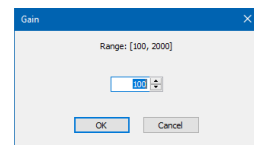


This control allows you to adjust the gain. **Gain** will brighten up the image (but it can also brighten up the artifacts). The higher the **Gain** value; the shorter the exposure that you will require. All you need to do is find the highest **Gain** value that provides you with the image you are satisfied with.

The **Gain Control Bar** has an indicator to provide you with the current Gain setting on the camera. Gain ranges from a low of 1 to a high of 250.

You can modify the **Gain** in three different ways:

- By **Left-Click-Hold and Drag** the marker bar to the required value.
- If you **Left-Click** on the **Slider Bar** (which selects it), you can use the **Left** and **Right Arrow Keys** of your keyboard to move the slider (this gives you more control).
- By **Clicking** on the **Gain number** to open up a small window where you can enter in the Gain Value (the decimal point is missing, so off by a factor on 100) or use arrows to adjust the value.





**Gain** can be modified at any time while in **Video Mode**, and thus the result will immediately be apparent after each image is refreshed. But you must **STOP** the **Looping** in **Trigger Mode** to change the **Gain**, then restart **Looping** to see its effect.



For **Deep Sky Objects**, start the Gain at about **70**. For **Planetary Objects**, start the Gain at about **5**. A high Gain on Deep Sky Objects makes them appear very quickly at a lower exposure time.

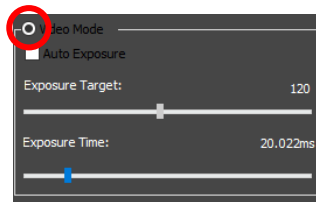
### Exposures

The Mallincam **SkyRaider DS432C TEC** camera provides two different types of exposures. **Video Mode**, where exposures up to 5 seconds are taken, and **Trigger Mode** where exposures from 100 *us* to 1 hour can be taken.



#### Video Mode

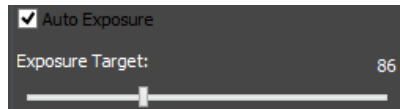
This control allows the **SkyRaider DS432C TEC** to have an exposure up to 5 seconds (5000ms), this mode is ideal for focusing the telescope and imaging the Sun, Moon, and bright planetary objects. You can have MallincamSky automatically choose the exposure by checking the **Auto Exposure** check box, or you can set an exposure time yourself (recommended).



**Video Mode** is activated by **Left-Clicking** on the **Video Mode Radial Button**.

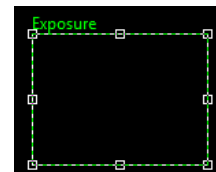


#### Exposure Target



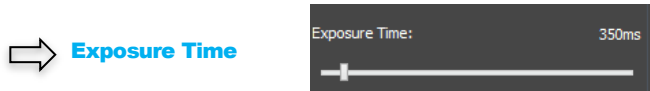
MallincamSky uses the image contained in the **Green Rectangle** to aid in determining the best method to match the Exposure target number. To use **Exposure Target**, **Auto Exposure** must be checked. You can change the Exposure Target by **Left-Click-Hold and Drag** the marker bar to the required value. If you **Left-Click** on the **Slider Bar** (which selects it), you can use the **left** and **right** arrow keys of your keyboard to move the slider (this gives you more control).

When **Video Mode** and **Auto Exposure** is selected, you will see a **Green Rectangle** (labelled **Exposure**) will appear over your **Video Window**. This **Green Rectangle** is a marked region that is a reference region for judging if the image brightness has reached the **Exposure Target Value** (When **Auto Exposure** is selected). Dragging or Resizing the **Green Exposure Rectangle** to a dark area will increase the video brightness and **Dragging** it or **Resizing** it to a bright area will decrease the video brightness.





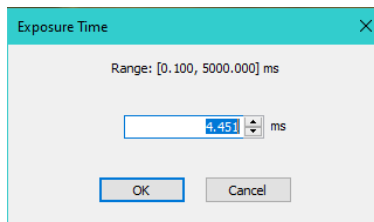
The **Green Exposure Rectangle** will be removed when you uncheck **Auto Exposure**. But if you need **Auto Exposure**, then I recommend that you enlarge the **Green Exposure Rectangle** to the full size of the **Video Window (Left-Click Hold and Drag)** or drag and reduce the green rectangle to a corner of the image window.



The current Exposure time is displayed above the Exposure Time slider. **MallincamSky** will display the exposure time in **ms**, from **0 ms** to **5000 ms**.

To use **Exposure Time**, **Auto Exposure** must be **unchecked**. You can modify the **Exposure Time** in three different ways:

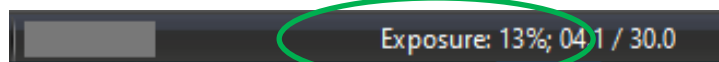
- By **Left-Click-Hold and Drag** the marker bar to the required value.
- If you **Left-Click** on the **Slider Bar** (which selects it), you can use the **Left** and **Right Arrow Keys** of your keyboard to move the slider (this gives you more control).
- If you **Left-Click** on the **Current Exposure Time Value**, a window would open, and you can enter in the exact exposure time you require. This window will also provide you the exposure limits the **SkyRaider Camera** can handle.



Do not forget to **Left-Click** on **OK** to have **MallincamSky** accept the entered exposure time.



For any exposure **over 3 seconds**, you can determine how long your camera's exposure time has been left by looking at the bottom of the **MallincamSky's** Window. There it will indicate to you the current time used of the exposure time that you had previously set.



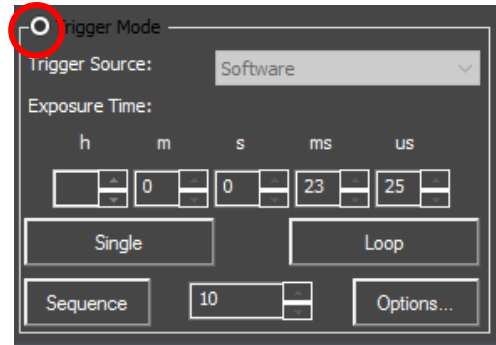
The **SkyRaider DS432CTEC** will use the following format to inform you of the current exposure condition: **Time Used/Exposure Time**

If you have enabled the **Dark Field Corrections** for this session (**Dark Fields** are stored directly in the **SkyRaider Camera** and will be deleted when the camera is turned off), the **SkyRaider** will automatically apply the best **Dark Field Correction** to your image when **Dark Field Correction** is enabled.



### Trigger Mode

**Trigger Mode** is used mainly for exposures over 5 seconds (Deep Sky Objects). It is selected by checking the **Trigger Mode Radial Button**. This mode does not require the Green Rectangle for exposure control. But rather allows you to take a **Single** image, or to continuously **Loop** images from the **DS432CTEC** to check for exposure.



You have two methods of setting your exposure to a large value:

- You can **Click** in the **Time Unit Box** of choice and enter in an amount (i.e., **30 seconds**) using your Keyboard.
- You can **Click** on the **up** or **down** arrow in the **Time Unit Box** of choice to move the exposure time to your required value (**30 seconds**).



**Click** on the **Single Button** to take a single exposure to see if the image of the object is close to the brightness you need.



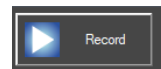
If you are satisfied with the single image, then **Click** on the **Loop Button** to have the SkyRaider **DS432C TEC** continuously take images at the entered exposure value (it will change its name to **Stop**, so you can again **Click** on the button to stop the **Looping**).



When using **Trigger Mode**, you **CANNOT** adjust the **Gain** on the fly. You must stop the **Loop**, adjust the **Gain**, check with a **Single** image, then choose **Loop** when satisfied. You **CAN** adjust **Gamma**, **Brightness**, **Contrast** on the fly in **Trigger Mode**.



You cannot **Record** a Video sequence when **Trigger Mode** is activated and **Looping**. You must first **Stop** the **Trigger Mode**, then **Click** on the **Record** button (which will start **Looping** automatically). Once you **Stop** recording, via the Record **STOP** button, **Trigger Mode** will automatically Stop **Looping**.

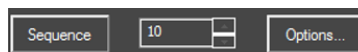


### Recording a Sequence of Images

To capture a sequence of images using the Mallincam **DS432CTEC** in **Trigger Mode**, there are a series of command controls available for you.

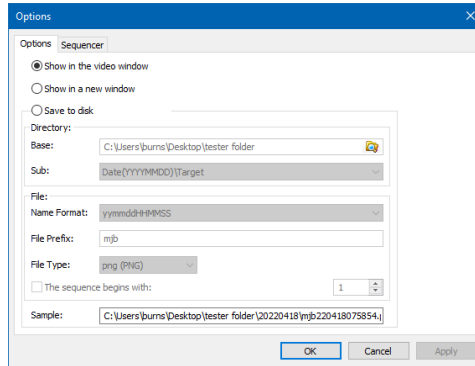


The **Sequence** command recognizes if **Live Stack** is enabled and will include that process in the output images, but you must allow time for the **Live Stacking** to complete (especially if **Align Frames** is enabled). As it may take a few images in the sequenced before the completed **Live Stacked** image is included as part of the sequence images.





Clicking on the **Options** Button opens the **Sequence Options Window**.



This Window allows you to either display the sequence of automatic captures in the **Video Window**, a **New Tab Window** on MallincamSky (not recommended... too many windows can appear) for each image in sequence, or it can **Save** the sequence images to a file. You have complete control, since you can choose a **specific directory**, a **File Prefix**, a **numbering system**, and even a **file format** to match your preferences. See above in **Options>Preference>Record** for more details on how to use Directory, Naming, and Prefix conventions.

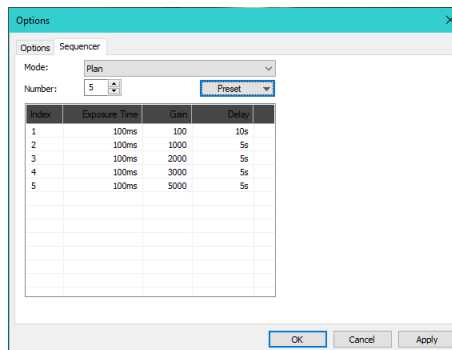
You can also set up a plan of shots, each with its own exposure and gain, along with pause time between each shot. This is different than just a sequence of shots with the same exposure time.



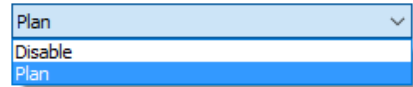
If **Name Format** is set to **nnnn (sequence)**, then **checkmark** the **The sequence begins with:** box, and choose the starting number.



Here you get to create a unique sequence of shots, each with its own **Exposure Time**, **Gain** value, and amount of **Delay** before image is taken.



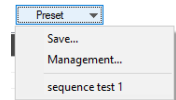
**Mode:** It is here that to either indicate that you want the **Plan** to be active or **Disabled**. If disabled, then the sequence will just produce a set number of images with current exposure settings. If the **Mode** is set to **Plan**, then the pattern of exposures will be taken following the pattern you have set up below.



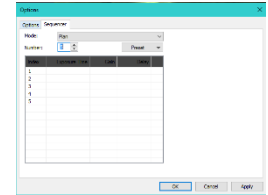
**Number:** It is here that enter the number of different exposures you want included in your **Plan**. You can have up to **255** different exposures included in a **Plan**.



**Preset:** It is here that you can **Name** and **Save** your current **Plan** using the **Save...** control. The **Management...** control allows you to **rename** and **Delete** your Plans. The list of current plans is displayed under the **Management...** control.

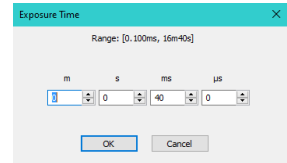


**Elements:** After you have set up the number of elements in your **Plan**, the **Index** will display the sequence number for that exposure.

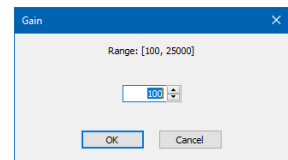


For each **Column** in a specific **Index Row**, you will enter three pieces of information: **Exposure Time**, **Gain**, and **Delay**.

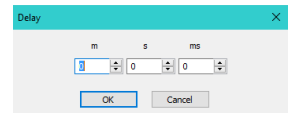
To enter an **exposure** for a specific sequence, just **double-click** in the intersecting **Index Row** and **Exposure Time** column location to open the **Exposure Time** entry box for that Row.



To enter a **gain** for a specific sequence, just **double-click** in the intersecting **Index Row** and **Gain** column location to open the **Gain** entry box for that Row.



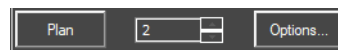
To enter a **Delay** for a specific sequence, just **double-click** in the intersecting **Index Row** and **Delay** column location to open the **Delay** entry box for that Row.



Repeat this process for each **Index Row** of your **Plan**, then **Click** on the **OK** button to accept and close the **Sequence Option Window**.



**Note:** If you Choose **Plan** in the **Mode** control, the activation button will say **Plan** rather than **Sequence** in the **Trigger** Control.



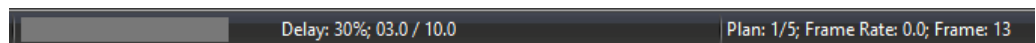


Use this control to enter in the number of images you would like MallincamSky to **Save** to your selected folder (from the **Options Command** above), or display in a **Tab**, or **Video Window**.

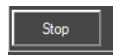


If you Choose **Plan** as the **Display Option**, then the number indicates the last number in the index to display. For example, if you have **10** exposures in your **Plan** and you entered **4** as the number, then only the first **4** exposures in your plan will be displayed (saved).

You will see the status of the Frame sequence and timer by a counter located on the bottom of the Video window if you choose **Show in Video Window** in **Options**.



**Clicking** on the **Sequence** or **Plan Button** will start the sequence capturing process. Once Sequencing, the **Sequence Button's** name will change to **Stop**. **Clicking** on the **Stop Button** will abort the sequence process.



The SkyRaider **DS432CTEC** camera **cannot be Looping** at the time you **Click** on the **Sequence Button**.

You can use this control in conjunction with the Live Stack to combine multiple exposures to create a **High Dynamic Range** image. See Chapter 8 for more detail on how to perform this.



Bit Depth



**Pixel Bit Depth** relates the number of bits assigned to produce a color (or shade of Gray). The larger the number of bits, the larger the number of assigned colors (or shades of Gray) that the camera can produce for Windows display.



In an **8-bit** image; for each color channel (Red, Green, Blue), there are **8 bits** assigned. That is, there are **256** ( $2^8$ ) shades of Red, Green, and Blue available for Windows display.

In a **12-bit** image; for each color channel (Red, Green, Blue), there are **14 bits** assigned. That is, there are **4096** ( $2^{16}$ ) shades of Red, Green, and Blue available for Windows display.

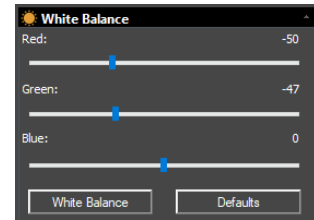
The larger the **Bit Depth**, the larger the data, and the harder the CPU must work to produce image adjustments.



White Balance



The **White Balance** control allows you to manually adjust the individual **Red**, **Green**, and **Blue** components of your image to better match your requirements. This command is available in real-time in both **Video** and **Trigger** Mode. Once this command is activated, a **Red White Balance** rectangle will appear on the screen.

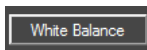


To adjust each specific colour use the **Left-Click-Hold** and **Drag** mouse technique.

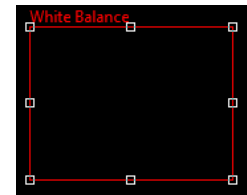
Once this control is expanded, **MallincamSky** will draw A **Red Region of Interest Rectangle** on your **Video Window**. You can adjust the size and location of this rectangle by using **Left-Click-Hold and Drag** mouse techniques.



White Balance



If your colors look “off”, the **White Balance** button is an automated way to adjust the colors to a more natural interpretation. **Drag** or **Resize** the **Red Rectangle** to a pure white area and **Left-Click** on the **White Balance Button** to establish the video **White Balance** for future video streaming process.



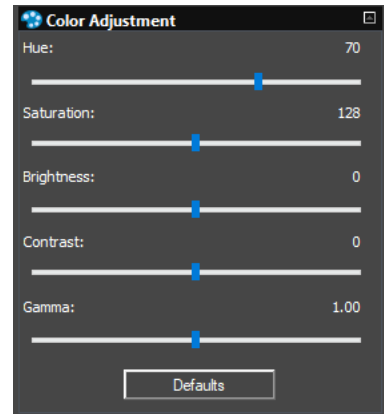
If you (or the **SkyRaider Camera**) ever get confused with what settings you have entered into the **Color Balance** control, you can reset these values back to their defaults by **Left-Clicking** on the **Default Button**.



## Color Adjustment



The **Color Adjustment** control will allow you to adjust: The **Hue**, **Saturation**, **Brightness**, **Contrast**, and the **Gamma** of the object that the **SkyRaider DS432C TEC** is exposing. All elements of this command are active in real-time in both **Video** and **Trigger** Mode.



Any changes to these commands will only be displayed after the next camera refresh. (Which for Deep Sky Objects can take a while, depending upon the exposure).

It is recommended as you become comfortable with these settings, you will determine what values are the best starting point so make a note of them so you can quickly get these values to a setting that works for you.



### Hue



This command controls the **Hue** of the Video image. **Hue** is one of the main properties of color. By adjusting **Hue**, you are changing the balance of **Red**, **Green**, and **Blue** in the image.

You can either **use the Left-Click-Hold and Drag** technique to move the slider to the left or right, or just **Left-Click** on the **Hue's** slider (this selects it), then use your **Left** and **Right** arrow keys on your Keyboard to adjust the value (small Hue adjustments are easier with this technique). The value of the **Hue** setting will be displayed above the slider.



### Saturation



This command controls the **Saturation** of the Video image. **Saturation** increases the separation of colors on a video image. It can **enhance** or **inhibit** the colors on the video image.

You can either **use the Left-Click-Hold and Drag** technique to move the slider to the left or right, or just **Left-Click** on the **Saturation's** slider (this selects it), then use your **Left** and **Right** arrow keys on your Keyboard to adjust the value (small Saturation adjustments are easier with this technique). The value of the **Saturation** setting will be displayed above the slider.



### Brightness



This command controls the **Brightness** of the Video image. **Brightness** makes the video image brighter or dimmer. This is a linear adjustment.

You can either **use the Left-Click-Hold and Drag** technique to move the slider to the left or right, or just **Left-Click** on the **Brightness's** slider (this selects it), then use your **Left** and **Right** arrow keys on your Keyboard to adjust the value (small Brightness adjustments are easier with this technique). The value of the **Brightness** setting will be displayed above the slider.

⇒ **Contrast**



This command controls the **Contrast** of the Video image. **Contrast** is defined as the separation between the brightest and darkest areas on the video image. When you adjust the **Contrast**, you increase the separation between bright and dark.

You can either **use the Left-Click-Hold and Drag** technique to move the slider to the left or right, or just **Left-Click** on the **Contrast's** slider (this selects it), then use your **Left** and **Right** arrow keys on your Keyboard to adjust the value (small Contrast adjustments are easier with this technique). The value of the **Contrast** setting will be displayed above the slider.

⇒ **Gamma**

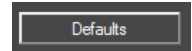


This command controls the **Gamma** of the Video image. **Gamma** adjusts the mid-tones in a non-linear manner. That is, rather than make the image look brighter; it can increase the brightness of the shadows and mid-tones, without affecting the highlights in the image (This control is like adjusting the mid-tone slider on a histogram. Start with minimum Gamma.

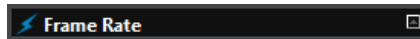
You can either **use the Left-Click-Hold and Drag** technique to move the slider to the left or right, or just **Left-Click** on the **Gamma's** slider (this selects it), then use your **Left** and **Right** arrow keys on your Keyboard to adjust the value (small Gamma adjustments are easier with this technique). The value of the **Gamma** setting will be displayed above the slider.



If you (or the **DS432CTEC**) ever get confused with what settings you have entered into the **Color Adjustment** control, you can reset these values back to their defaults by **Left-Clicking** on the **Default Button**.

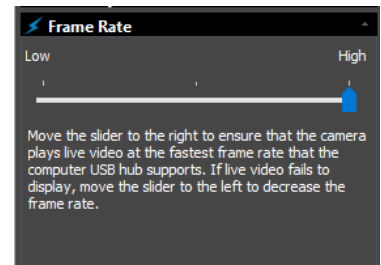


⇒ **Frame Rate**



The speed of the through-put on the USB 3.0 port on your computer can depend on many parameters that are specific to the processes running on your computer. This throughput can be affected by the current Windows environment, CPU, graphics cards.

Using the **Left-Click-Hold and Drag** technique, move the slider to the highest frame rate that your computer can support.



Start with the **Frame Rate** slider at the highest value, and only adjust lower if video image fails to appear. **Most** will find setting frame Rate towards the **Low** end of the scale better. If MallincamSky seems to freeze, lowering the Frame Rate can sometime resolve the problem.



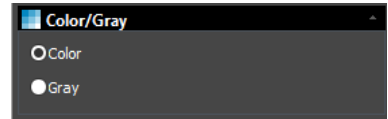


Color/Gray



This control contains commands that allow the **SkyRaider DS432CTEC** to display its displayed images in color (these colors can be adjusted using the commands seen above) or display the image in shades of grey.

Some users prefer the subtle contrast variations that a grey image provides, especially when imaging the Moon.



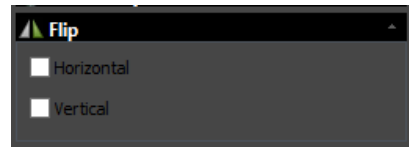
- If you require the color video to be displayed in **Color**, then **Left-Click** on the **Color** choice.
- If you require the color video to be displayed in shades of **Gray**, the **Left-Click** on the **Gray** choice.



Flip



This control allows you to **Flip** the orientation of the video image **Horizontally**, **Vertically**, or **Both**. This is a useful command, as it allows you to match the image orientation to that of the orientation of the actual object (which changes with the number of reflecting mirrors in your telescope).



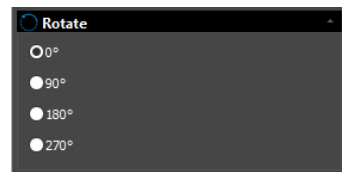
**Left-Click** to place a **check mark** in the **Horizontal**, and/or **Vertical** boxes to have the image immediately reflect your choices.



Rotate



This control allows you to **rotate** the video image, **0°**, **90°**, **180°** or **270°**. Just click on the radial button that matches your desired rotation (**0°** is back to normal).

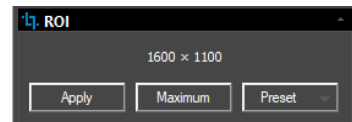


ROI



**ROI** or **Region Of Interest** allow you to isolate the rectangular portion of the video image that you may be interested in. You will lose your **Dark Field** using this control.

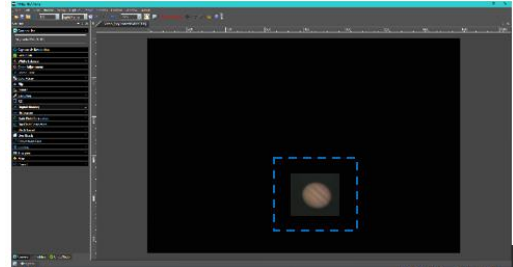
When you are recording video images of planetary objects, the size of the video can grow very quickly. The **ROI** allows you to instruct MallincamSky to only show and save a specific area of the screen (a smaller region that just contains the image of the planet as indicated by a blue rectangle). This has 2 benefits: smaller files sizes, and as a bonus will allow for a faster frame rate.



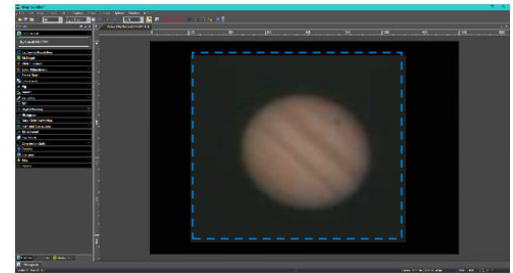


The **ROI** command only works in real-time while the **SkyRaider DS432C TEC** is in **Video Mode**. To set **ROI** in **Trigger Mode**, the **Looping** must be stopped. Then **ROI** can be adjusted and then **Applied**, then restart **Looping** to see the adjusted region.

When selected, a **Blue Rectangle** will appear over your **Video Window**. You can adjust it using the **Left-Click-Hold and Drag** technique or **Left-Click-Hold and Drag** to place it over a specific portion of your **Video Window**.



Once you have resized and placed the **Blue ROI Rectangle** on your **Video Window**, **Left-Click** on the **Apply Button** to select this as the **New Video Window**. Then the **Next Refresh** will fill in the **ROI** window.



You can then resize the **New Video Window** by either the **Drop-Down Size** command in the **MallincamSky Tool Bar** or by scrolling the wheel on your mouse (if your mouse has a scroll wheel).

This command allows you to **Zoom** in on a specific area of your original Video image.

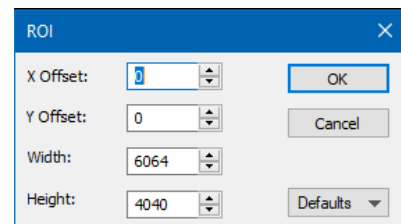
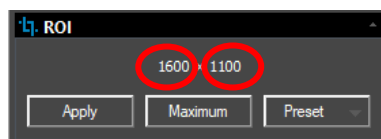


If you (or the **DS432CTEC**) ever get confused with what settings you have entered into the **ROI** control, you can reset the **ROI** to its full screen by **Left-Clicking** on the **Default** Button or **Maximum** Button. You may need to set **Fit to Window** in the **Drop-Down Size** command in the **MallincamSky Tool Bar**.



If you are trying to improve the frame rate (frames per second) when viewing planetary objects. Selecting a **Region of Interest** around the planet will allow MallincamSky to only capture that **ROI** portion of the whole image. As a result, the frame rate will dramatically increase.

You can also manually set the size of the **ROI** by **clicking** on either the **horizontal** or **vertical** size indicator in the **ROI Tab**. A Window will open-up that allows you to manual select the Horizontal or Vertical size as determined by you.

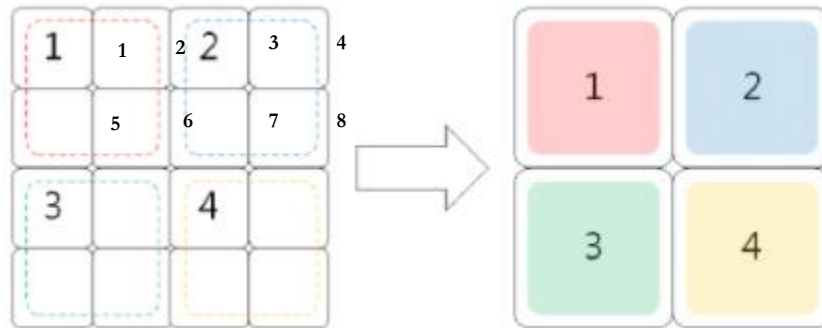




Digital Binning

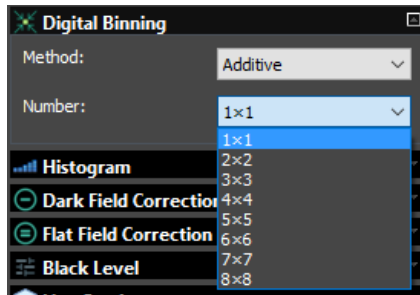


This process allows you to increase the sensitivity of the Mallincam Camera by providing you the option of combining sensor cells together to increase the photon capture area. For example, a 2 x 2 binning will link 4 cells (in a 2 by 2 array) together, so you have about 4 times the capture area than one cell. But remember nothing is free, it gives up the number of horizontal and vertical pixel resolution by that same factor. You can have the Mallincam either Avera the pixels or Add the pixels. The supported Binning available is 1x1, 2x2, 3x3 and 4x4. As an added bonus, Digital Binning helps increase sensitivity and reduces noise to some extent by improving Signal to Noise Ratio.



As a user, you will decide as to what level of Digital Binning you will use. You can use a shorter exposure time to achieve an image, but the image will cover more space on the chip.

When you select the **Digital Binning** Tab, it opens to provide the following settings:



Method

You have two choices here, either **Additive** or **Average**. **Additive** will shorten the exposures as it adds the values of the combined pixels. **Average** will keep the exposure about the same, but it will average the combined pixels, so producing a sharper image for the resolution. For Deep sky objects you might choose **Additive** to produce an image quickly, and **Average** to produce a sharper image with more detail. For Planets and the moon, try **Average** to see if it improves your image's detail. Trial and error to see which is best for your environment.

⇒ **Number**

You now have the choice of the type of resolution and binning to use:

Binning	1600 x 1100
1 x 1	1600 x 1100
2 x 2	800 x 550
3 x 3	532 x 366
4 x 4	400 x 274
5 x 5	320 x 220
6 x 6	266 x 182
7 x 7	228 x 156
8 x 8	200 x 136



For each higher **binning level** you choose, the video screen window size will reduce (as you are combining more pixels as one), effectively lowering the number of pixels in the image resolution. You can use the Zoom controls to increase the image size to your needs.



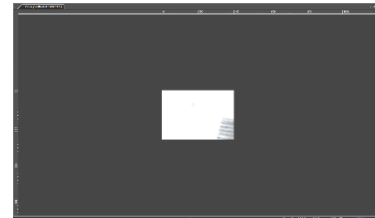
1 (additive)



2 (additive)



3 (additive)



4 (additive)

You will notice that the brightness of the image will dramatically increase with the larger binning number when **Additive** is chosen (resolution will decrease), so you will need to adjust the exposure setting accordingly.

**Usage suggestion in digital binning.**

Use the large value **4 x 4** or **3 x 3** to shorten the exposure time, so that you can quickly locate (and if necessary, focus) the deep sky image you are interested in. Then choose a smaller **2 x 2** or **1 x 1** binning to produce a more detailed (higher resolution) image.

The DS26, DS2.3, DS432, and DS432 cameras have large chips, so using binning setting will still provide enough resolution (and Size) to image most deep sky objects.

**Dark Field subtraction in Digital Binning**

You must make **Dark Fields** with the same **Digital Binning** settings as you image, or else weird looking effects will occur. We suggest saving a set of **Darks** for each of the binning modes.

Use a naming convention and/or a file location so that it is easy to not only choose the correct Darks for a binning setting, but with-in that binning setting a Dark that match your exposure and other settings.



If you find that the video window size doesn't want to return back to its **1 x 1** full screen, just select **Video Mode**, then return back to **Tigger Mode**.



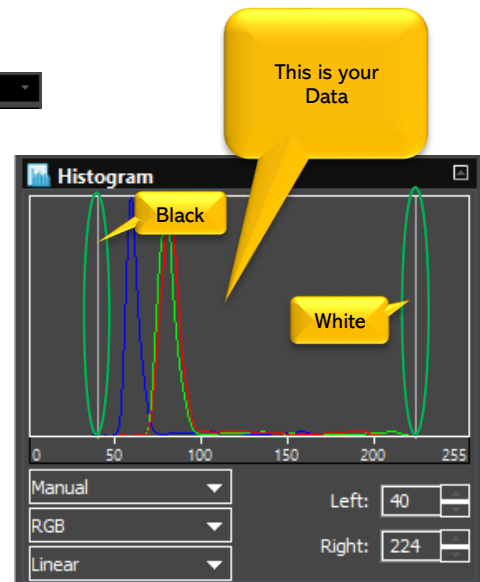
**Histogram**



A **Histogram** illustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level. The **Histogram** shows detail in the shadows (shown in the left part of the histogram), mid-tones (shown in the middle), and highlights (shown in the right part). See Appendix for more information on **Histograms**.

A **Histogram** can help you determine whether an image has enough detail to make a good correction.

The **Top Segment** in the expanded **Histogram Control** shows the **real-time Histogram** of current active video.



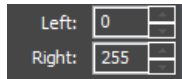
This **Histogram** control, as compared to the top line **Icon Histogram control** allows you to make real-time adjustments to the settings to improve the image.

Two vertical **line markers** (white) show the **upper** and **lower** limits of the intensity levels. These markers can be dragged with mouse (**Left-Click-Hold and Drag**), or you can enter in specific values (**left** and **right**) to place the vertical Line markers.

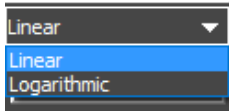
You use the **Histogram** to aid you in determining the best exposure value for your particular object. But try not to get too aggressive, as you can easily clip (remove) important data from your image. Since you are Astro-imaging, the bump of the histogram should be about ¼ from the left as the image will contain a larger amount of black.



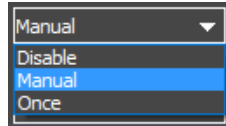
If you are looking at a color image, the **Histogram** will reflect the **RGB** (Red, **Green** and **Blue** channels histogram at the same time) values with shading of the same color. You can also use the **Pull-Down** to select the **Histogram** for just the **Red**, or just the **Green**, or just the **Blue** channel.



You can also directly enter the desired values in the **Left** or **Right** boxes below the **Histogram chart** for both **Left** and **Right** Histogram boundaries.



You can select how you would like the Histogram data displayed. You have a choice of either **Linear** or **Logarithmic** (makes small graph values visible).



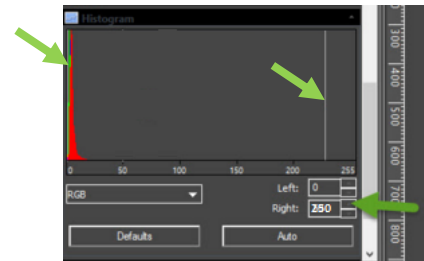
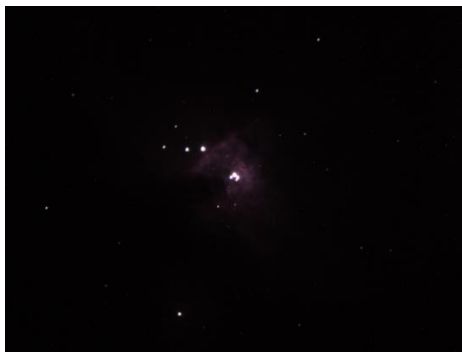
You have three options for adjusting the histogram. **Manual** allows you to adjust the Histogram markers (bars or values). **Once** will have MallincamSky automatically select the best **Left** and **Right** locations for the Histogram. **Disable** will set the **Left** value to **0** and the **Right** value to **255**.

Set the exposure so that the **Peak of the Histogram** is some place between **50** and **100**.

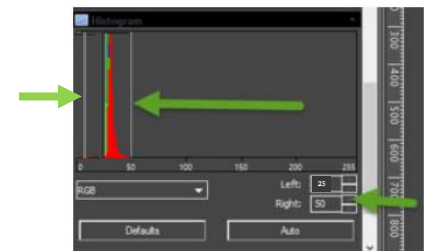
To illustrate what you can do with the Histogram, I have (thanks to **Jim Meadow's** amazing images) included some before and after pictures.

- **Increasing the Left Bar Darkens** the image
- **Decreasing the Right Bar Brightens** the image

The following Before image is a 3 second exposure with **Left at 0** and **Right at 250**



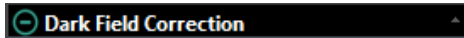
The following **After** image, same 3 second exposure, with the **Left at 25** and the **Right at 50**



Notice that in both Histograms, the data was **mostly** to the left. This tells us we have some exposure room to play with. Do not forget **Gain** and **Brightness** also has a role as well.



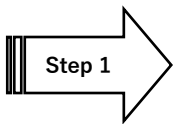
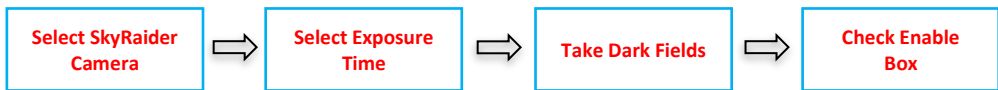
Dark Field Correction



What makes the **Mallincam SkyRaider** series of cameras unique is the built-in ability to take **Dark Fields**.

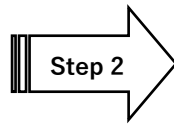
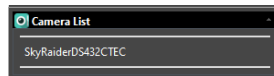
The best explanation of what a **Dark Field** is came from **Simon Hanmer**. See Appendix for his explanation.

To have the **SkyRaider** camera to automatically apply **Dark Fields**, you need to follow the following procedures before imaging.



Step 1

Select the **SkyRaiderDS432C TEC** from the **Camera List** in the **Camera Tab**.



Step 2

Select an **Exposure Time** for **Dark Field Correction** and **Start Exposing**, at this point **Dark Fields** are not being created, it is just the DS432C taking timed images.

With the **Camera Tab** selected on the **Left SideBar**, **Left-Click** on the **Capture & Resolution**. The **Exposure & Gain Window** will expand allowing you to select the exposure time for the **Dark Field**.

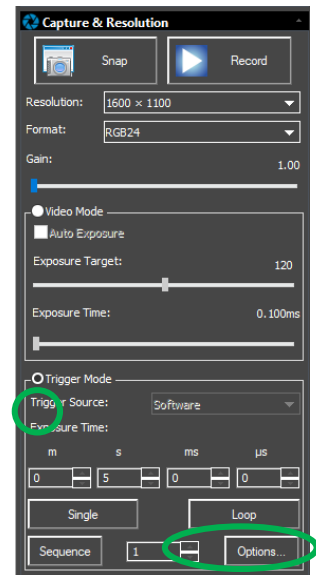


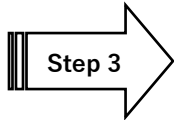
You must determine what you believe will be the maximum exposure for this session. As, you will create **Dark Field's** with this time (or close to it). Also, to want to try to match the other settings in the **DS432CTEC** in the **Dark Field** as you would have when imaging the Object.

If you are taking a maximum exposure under 5 seconds, then select **Video Mode**, but since most **Deep Sky Objects** will require an exposure of over 5 seconds, choose **Trigger Mode**.

Either enter the time into the appropriate boxes or use the up and down arrows beside the chosen Exposure time unit to set your maximum time.

Start the SkyRaider **DS432CTEC** taking continuous exposures by **Left-Clicking** on the **Loop** button.



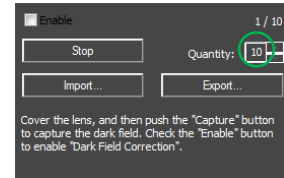
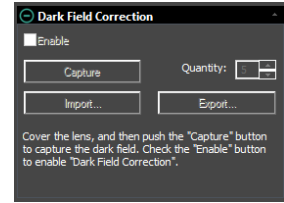


Step 3

Ensure that the cover is either on the **SkyRaider Camera** or the Telescope itself is covered, then **Left-Click** on the **Dark Field Correction Line**.

The **Dark Field Correction Line** will open allowing you to select the **Quantity** of **Dark Fields** and the option to start the **Dark Field Capture** process.

Select up to **99** (it is recommended to start from 5 to 10) for the **Quantity**, then **Left-Click** on the **Capture Button**. MallincamSky will now create the **Dark Fields**. The Software will display its progress above the selected **Quantity**. Remember, it is beneficial to set the **Dark Field** exposure time greater than the longest time you will be imaging at. The longer your intended exposure, the larger the suggested **Quantity** of **Dark Fields** you should take.



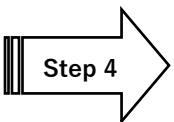
As the **Dark Fields** are being exposed, you can watch the **exposure counter** in the **Dark Field Correction Tab** go up, and on the bottom right side of the MallincamSky window, you will see a counter letting you know how long is left in that particular exposure.



Once you have finished taking your **Dark Fields**, do not forget to **remove the lens cap** on your camera (or Telescope), so that you can continue imaging your object (I won't mention any names...).



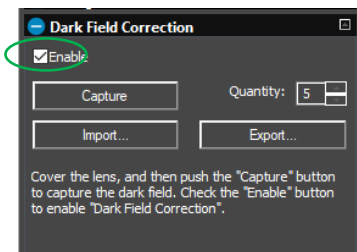
Once you have collected your **Dark Fields**, you can then **save** them with the **Export Button** (choose a location and File name that allows you to locate the correct **Dark Fields** in case you would like to reuse them. Name the folders so that it is easy to retrieve **Dark Fields** that match the current imaging plan (60 s times 5). You can load previously saved **Dark Fields** via the **Import Button**. Just browse to the folder where you saved them when you used the **Export Button**.



Step 4

To activate the **Dark Field's** just **Left-Click** in the **Enable check box** in the **Dark Field Correction's** box to have **Dark Fields** applied in real time to your images.

To image without using **Dark Fields**, just uncheck the **Enable checkbox**.



It is important that you try to match the **Dark Fields** with the same **resolution, gain, black level, gamma,**... as you would with your image, else the results will not look as great as they could.





## Flat Field Correction

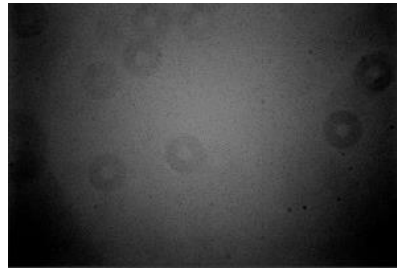
Flat Field Correction

### Introduction:

When imaging using a CCD/CMOS device, and when trying to use those images for scientific purposes, it is essential to reduce the amount of unwanted signal and unwanted noise from each image frame. The optical path “noise” (some of which is actually signal), is such a problem that many astronomers had to suffer with. The resolution to this problem came from the use of Flats and applying those Flats to the images.

### Optical Path Noise:

Telescopes, CCD/CMOS chips, filters, lenses all block light as well as transmit light. They also harbor dust, fingerprints, and other unwanted shadow producing things in the light path. The result of such optical path obscuration is an unevenly illuminated CCD/CMOS chip. These noise variations are usually caused either by variances in sensitivity from pixel to pixel, or by the telescope optics. Main causes due to the telescope are vignetting and out-of-focus dust on one of the lenses in the optical system. This is a real challenge for anyone doing real science or pushing their images to the highest level. Optical path vignetting, and other physical path obstructions will also cast large, non-discernable shadows onto your CCD/CMOS, causing poor even-illumination across the image field. Flat fields are used to remove variations in the brightness of pixels across the CCD chip. The plan is to then “subtract” this consistent noise from the images being produced by the camera.



### Taking Flats:

A Flat Field is an image taken of an evenly illuminated object like the dusk sky, or a special illuminated white card hanging on the wall of the observatory or even a white T-shirt placed over the telescope. This is not a Flat Frame (a Flat frame is a save able image)



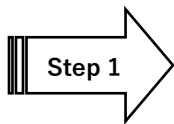
These images are ideally taken through the telescope:

- at the same temperature as your nightly images
- through the same filter/s as your nightly work.
- Do not change your imaging train (this includes adding or subtracting filters, extenders, reducers, or even rotating the camera) after you have taken your flats.
- with integration times to allow the flat to produce an image that captures “noise”, but Flat images should never bloom, but should also not be less than a second in integration time.

For precision work, 5 to 30 or more flats at an exposure of not greater than a couple of seconds. You want an image that shows the faults, not one that is over exposed. Practice, Practice, and yes, even more practice to get the flats correct. Each flat will then be averaged together to create a master flat which is then divided out of your light frame on a pixel-by-pixel basis.

Visit the following site for before and after images when applying Flats:

<http://theworldofastronomy.blogspot.ca/2016/04/astrophoto-flat-field-illustration.html>

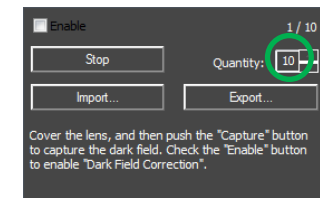
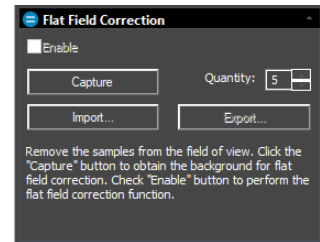


Step 1

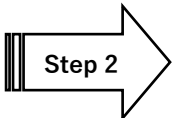
Ensure that you are pointing the telescope at your **Flat Field** source (dusk sky, white board), select an exposure time, then **Left-Click** on the **Flat Field Correction Line**.

The **Flat Field Correction Line** will open allowing you to select the **Quantity of Flat Fields** and the option to start the **Flat Field Capture** process.

Select up to **99** for the **Quantity**, then **Left-Click** on the **Capture Button**. The Software will display its progress above the selected **Quantity**. Remember, the more images you select the more averaged will be the **Flat Field**.

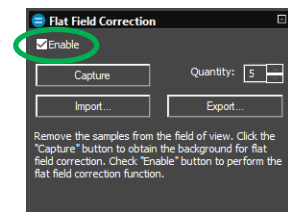


As the Flat Fields are being exposed, you can watch the **exposure counter** in the **Flat Field Correction Tab** go up, and on the bottom right side of the MallincamSky window, you will see a counter letting you know how long is left in that particular exposure.



Step 2

To activate the Flat Fields just **Left-Click** in the **Enable check box** in the Flat Field Correction’s box. All subsequent images will have the Flats automatically removed.



To image without using **Flat Fields**, just uncheck the **Enable checkbox**. You can **import** or **export** the data for your **Flat Fields**, but remember this is not an Image File, it is a data file.



## Black Level



Black Level is defined as the level of brightness of the darkest (blackest) part of the image. In technical terms, the black level is the pixel level (in electrons, or volts) which corresponds to a pixel value of zero. The Black level adjustment on the MallincamSky allows you to adjust that value using the slider.



The slider provides you with a range of subtle darkness adjustments from a starting point of **0** to an end point of **31**. In using this control, you can tweak your image to slightly “brighten” (towards level 31) or “dim” (towards level 0) the starting point for the image’s blackest location.

Using this slider allows you to define what you believe (based on your current image) should be the optimum black. This control is most useful when you are experiencing a glow due to a bright object near the object you are imaging, and you want to tweak the darkness.

You can use the **Black Level** to shift the peak of your histogram towards the right, this way it moves the left most starting point away from the left side and thus you can avoid clipping the blacks from the image.

Since MallincamSky gives you, the ability to choose the **Black Level** for the camera, you can use this feature to assist in reducing the **amp glow** present in your image, You can also use the Black Level to create a well-balanced dark background against the stars in your image.

Just have fun and experiment, as every telescope and seeing conditions provide for a different environment for the SkyRaider.



Live Stack

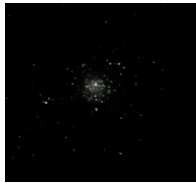


**MallincamSky** comes with the ability to stack images to improve the signal to noise ratio. This feature will allow you to stack short exposures to produce an image that otherwise would have required a larger exposure time. Thus, you will obtain a brighter image that contains less noise. It also provides a technique of averaging images to reduce noise and improve overall final preview. This command allows users, whose equipment will not allow for long exposures (such as Alt-Az Mount), the ability to combine images on the fly (but can also be very beneficial to all mounts).

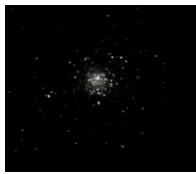
The following images captured live illustrate the advantages of Stacking:



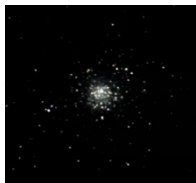
M5, a **single** 5 second exposure using SkyRaider DS432CTEC on 10" VRC.



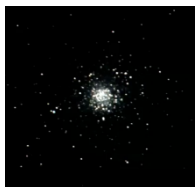
M5, **two** 5 second exposures stacked using SkyRaider DS432CTEC on 10" VRC.



M5, **three** 5 second exposures stacked using the SkyRaider DS432CTEC on a 10" VRC.



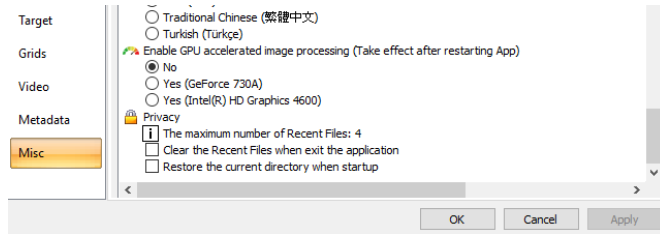
M5, **four** 5 second exposures stacked using the SkyRaider DS432CTEC on a 10" VRC.



M5, **five** 5 second exposures stacked using the SkyRaider DS432CTEC on a 10" VRC.

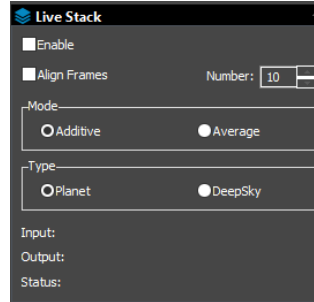


**Live Stacking** can task your CPU and USB port (plus other internal Windows OS stuff). If your computer has a **GPU** (Graphics Processing Unit), then you can tell MallincamSky to use it via the **Options>Preference>Misc** control.

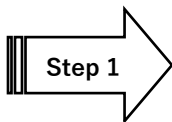


**Left-Clicking** on this command will open the **Live Stack Window**

We will see that there at two types of stacking (**Additive** and **Average**). You will use **Additive** to increase the image brightness, and you will use **Average** to decrease the noise (becomes less grainy).



Here you can activate the stacking by check-boxing **Enable** and you can have MallincamSky **Align** the frames by checking the **Align Frames Box**. You can select the number of frames you would like stacked in the **Number Box**. You can tell MallincamSky if you would like the images **Added** (made brighter), or **Averaged** (made sharper), plus indicate is you are stacking **Planets** or **Deep Sky Objects**. This command will provide a live status of its stacking process in this Window.



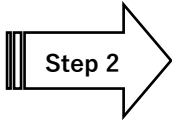
Step 1

First select the object Type (**Planet** or **DeepSky**)



**Planet:** Aligns on large objects in the image.

**DeepSky:** Aligns on the stars in the image. **We recommend using DeepSky**



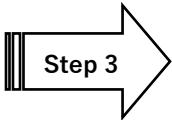
Step 2

Now select how you would like the images Stacked, (**Additive**) or Averaged (**Average**) by making a selection in the **Mode Box**. We recommend using the **Average** setting since it will produce a smooth detailed image.



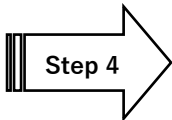
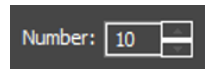
**Additive:** Adds the corresponding pixels. The more frames that are added, the fainter details then become more apparent and can very quickly increase the image brightness. (We recommend only using for outreach).

**Average:** Takes an average of the corresponding pixels to help reduce the grain and thus improve the images (noise) in the image. If this is selected, the Number command (see below) does not play a role. This command will continuously average the next image into the previous average images. After about 20 to 30 average stacked images, changes become hard to notice.



Step 3

Next enter the **Number of Frames** you would like stacked. You can stack from **1 to 99** Frames. This control only works with the Additive stacking command above.

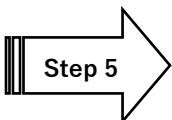


Step 4

Now determine if you would like the Stacking process to **Align** the Frames. This will produce a better Image but will take a bit longer. The process examines the image and determines alignment stars for the process. If there are not enough alignment stars, then the command will indicate that there is a problem, and you may need to increase the gain or exposure to produce more stars for the alignment routine.

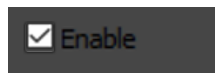


We recommend aligning the frames, so check the **Align Frames Box**. (Else you may obtain a Pink Floyd psychedelic effect for the image).




Step 5

**Start** the Stacking by checking the **Enable Box**.



The stacking process will keep you informed with its status by indicating to you what the current **input** stacking number is, what the current **output** (how many frames are stacked), and via the status, if there are any issues.


If you told **MallincamSky** to stack 5 images, then when the 6<sup>th</sup> image is taken, it will keep displaying just the last 5 images stacked (the first image will be removed, this is a rolling stack).



Input:  
Output:  
Status:



You can disable the Stacking process by just **unchecking** the **Enable Box**.



Enable



Do not be afraid to also turn on **Dark Field** Subtraction to help eliminate the background noise.



If the Status tells you, it has an alignment failure (Not enough Stars), then just increase the gain. This should make more stars available to the alignment algorithm, so try again.



Conversion Gain

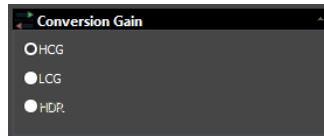


A **Higher Conversion Gain** means higher sensitivity, as one signal electron can be more easily detected. The high-CG sensor shows a noticeably clear responsivity advantage; however, the tradeoff is clearly seen in the much lower full-well capacity as the sensor's linear range ends at a much lower exposure.

- **Low Conversion Gain (LCG)** for large charge handling capacity in bright scenes.
- **High Conversion Gain (HCG)** mode with increased sensitivity and low read noise for lowlight scenes, providing tremendous benefit for real time imaging.

The LCG mode is comparable to the old NO GAIN, while the HCG mode was comparable to the 2x gain is HCG. The tradeoff is the effective-lower readout noise and doubling the signal output, while halving the dynamic range.

Use the appropriate mode to either push the sensitivity (decreases the dynamic range) or increase the dynamics range (decreases the sensitivity). The choice depends upon the object being images. Experiment.



**HDR** is not available in the **DS432CTEC** camera.

The following images illustrate the benefits of using **HCG**. In both images the exposure time was the same. The left image had **LCG** checked, while the right image has the **HCG** checked.



LCG



HCG



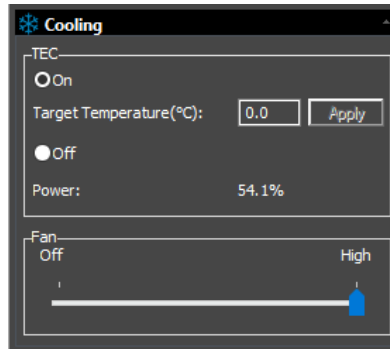


The **12V power cable** must be attached to the **DS432C TEC** for the **FAN** and **TEC** features to be available.



The MallinCam **DS432CTEC** comes with both a **Fan**, that can aid in cooling the camera when conditions are getting warm, and a **TEC (Thermoelectric Cooler)**.

The internal **TEC** unit is controlled with the **MallinCamSky** software, allowing you to set the temperature. The **SkyRaider DS432C TEC** is designed for consistent, reliable Deep-Sky imaging at up to about **20°C to 30°C** below the ambient temperature.



Activate **TEC** by clicking on the radial **On** button, then enter a **Target Temperature °C** value into the box (**0°C** is recommended, but some users are having the best success at **-10°C**). It is also recommended that the temperature value you enter in the box be no more than **45°C** cooler than the ambient temperature the **DS432CCTEC** camera is sitting in.

The ideal temperature choice will of course depend upon many factors (ambient temperature, humidity, gain...), so you will need to experiment with your system. I was having best success at about **-10°C** with the gain set at 400.


So, if the temperature is **30°C** outside where the camera is located, then set the Target Temperature to **0°C** and then **left-click** on the **Apply** button to activate it (the **FAN** and **TEC** lights on the back of the camera will light up to indicate activation).




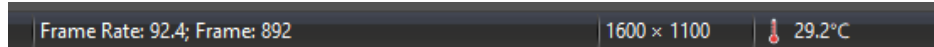
Once activated, it will take a few minutes for the temperature inside the **DS432CCTEC** to stabilize. The power capacity that the **TEC** inside the camera is currently using is displayed inside the **TEC** box.





When the temperature is stabilized, this power reading should be well below 100%.


 If the power continues to remain at 100%, then change the **Target Temperature's** value to a lower number (as too much effort is used to cool the camera).


 MallincamSky displays the current temperature of the **SkyRaider DS432CCTEC** on the bottom right corner of the screen.

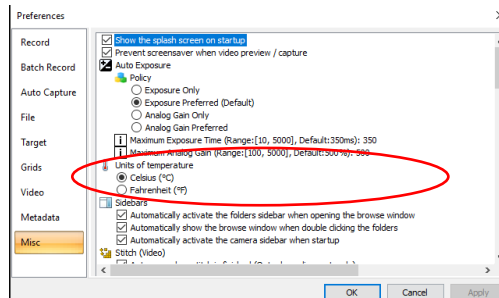



 If the **Fan** is turned **Off**, then **TEC** is automatically turned off, and the **Fan** automatically turns to **High** when **TEC** is activated. If you are finished using **TEC**, leave the fan **On** to allow sensor to climatize itself to the current temperature.

 Remember that it is wise to create **Dark Frames** with **TEC** on if you are using **TEC** (this way you have a set **with TEC** and a set **without TEC**). Most expert imagers will even create a set of dark frames for a specific range of temperatures. But, hey that is up to you and how much effort you need to put into the preparation for that perfect image.

 If you save an image in **FITS** format, the temperature reading is included in the **FITS Header** for that image.

 For our American friends, you can change the Temperature unit form **Celsius** to **Fahrenheit** in the **Options->Preference->Misc** location.



 When finished for the evening, turn off the **TEC** prior to turning off the camera to allow it to naturally climatize itself to the current temperature.



Heating



This control is not available with the DS432CTEC camera. This control allows you to slowly heat up the camera around the sensor to help reduce (remove) any fogging that might occur due to a humid environment. Use the slider to increase the heat setting or disabling it to turn it off.



Sharpen



This control allows you to sharpen the image. Remember that being too aggressive will induce some rough edges around your images. Just use the slider to sharpen the image from none to 500%. When the **Sharpen** slider is moved to 0, then the sharpen algorithm is disabled.

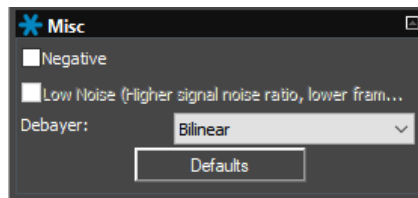


Misc

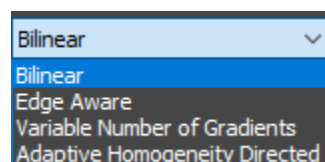


Currently this control will allow you to display the image in its **inverse**. That is, a white background with black stars. Just use the check box to activate and uncheck to return to normal image mode.

There is also a **Low Noise** filter which may help if you are obtaining some fine-grained noise. Just experiment with this to see if it helps (or not) with your image.



**Debayer** allows you to choose debayer algorithm for DS432CTEC to use working with the image.



### Bilinear

This is the easiest method we can use to **demosaic** a Bayer image. The concept behind this method is that since there is a very high probability that the value of a missed pixel is very similar to the value of its existing adjacent pixel. We can interpolate the missing value in each channel by taking the average of its adjacent pixels.

This is the default algorithm used and we recommend leaving the **DS24CTEC** with this process.

### Edge Aware

Since most of the artifacts are on/near the edges, instead of blindly doing bilinear interpolation you do edge aware interpolation. For example, below if you are trying to find the green value at position B, you will only take the average of the green values with smaller gradient. i.e., first you compute the difference of horizontal green values and vertical green values and pick the option with lower difference and take the average of those two green values.

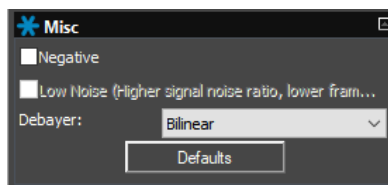
### Variable Number of Gradients

The VNG method stands for Variable Number of Gradients. It works on a 5x5 pixel neighborhood around each source pixel. The method first computes intensity gradients in the eight directions around the current pixel. Then it computes a threshold and takes only gradients below this threshold. In the last step, the missing color components for the pixel are interpolated from neighboring pixels along the directions of the remaining gradients. This method preserves edges much better than bilinear interpolation. It also produces much less color artifacts and less chrominance noise.

### Adaptive Homogeneity Directed

(AHD) is widely used in industry, but older and slower algorithm. It selects the direction of interpolation so as to maximize a homogeneity metric, thus typically minimizing color artifacts.

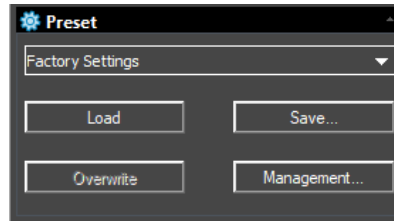
There is also a low noise filter which may help if you are obtaining some fine-grained noise. Just experiment with this to see if it helps (or not) with your image.



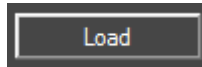


The **Preset** control allows you to:

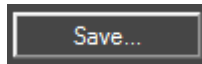
**Load** a previous set of camera control parameters or **Save** the current camera control parameters for another session. The parameters include most of the settings in the **SideBar** including the **Rectangle Regions of Interest**.



The **Drop-Down** control provides a list of previous (if any) saved parameter settings. Just select the parameter session that you require from the list.

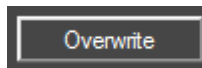
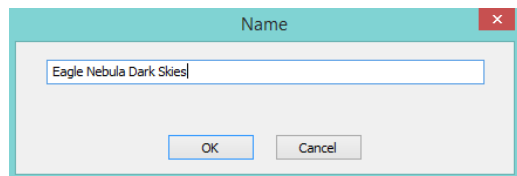


**Left-Click** on the **Load** command and it will load the control parameters from the above file in the **Drop-Down List**.

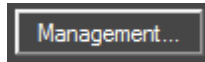


**Left-Click** on the **Save** command and **MallincamSky** will open a window that will allow you to give a name to the current sessions, and then will save the current camera parameters under that name (see **Management command** below).

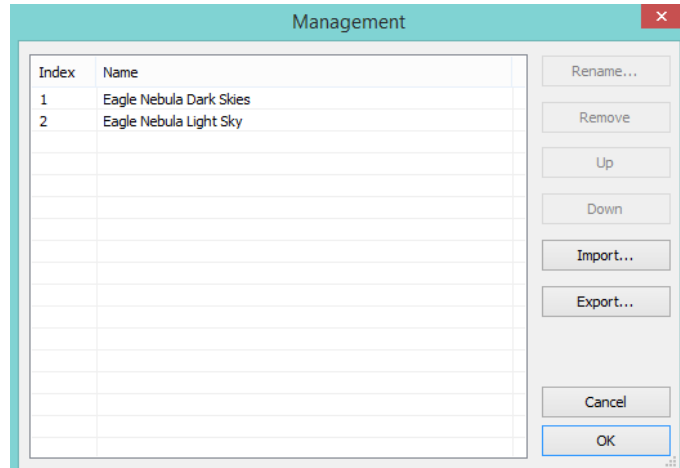
Give a **Name** that is easy to determine what the parameters in the file contain. That is, choosing a name like **Eagle Nebula Dark Skies**, would indicate that the parameters in the File are designed for the Eagle Nebula when you have great dark skies.



**Left-Click** on the **Overwrite** command and it will overwrite any setting changes you made to the current parameter file.



Left-Click on the **Management** command and a **Management Dialogue Window** will open.



This **Dialog Window** will allow you to:

- **Rename** the **Preset File** name
- **Remove** the **Preset File** from the computer
- **Re-order** how the Parameter names appear in the list.

The **Management Dialog** will also allow you to export **all** the **Parameter Files** to a **\*.pgt** file, so that you can send this **\*.pgt** file (which contains **all** of your parameter files) to a colleague.

The **Management Dialog** will also allow you to import a friend's **set** of parameter files (single **\*.pgt** file which contains **all** of their parameter files) into your MallincamSky folders.



When you import a set of parameter files into your system, **it will overwrite all your Preset files**. So, use caution. See **Hint** below.



After you have created a list of parameter files that you are using. **Save** them in a **Preset File Folder** (pick a **location** and **name** for **This Folder** such as **Preset Files**) on your computer under a name that indicates that these files are yours (such as **Michael's SkyRaider-DS432CCTEC Preset Files for New Hamburg**).

This way you can save another **set** of Preset files for another **SkyRaider Camera** In the same folder (**Preset File Folder**) this way you can load Preset files for a specific camera. Also, you can also include other colleagues Preset files in the same Folder (**Anita's SkyRaider-DS432CCTEC Preset Files for Toronto**). This allows you a method to reload your Preset files after trying colleagues (and not have them overwritten).

#### **Preset File Folder**

- Michael's SkyRaider-Dsc Presets File for New Hamburg
- Michael's SkyRaider-DS432CCTEC Presets File for New Hamburg
- Michael's SkyRaider-Dsc Presets File for Mount Forest
- Michael's SkyRaider-DS16CCTEC Presets File for Mount Forest
- Anita's SkyRaider-Dsc Presets File for Toronto
- Anita's SkyRaider-DS24CCTEC Presets File for Toronto

#### **Michael's SkyRaider-DS432CCTEC Preset File for New Hamburg**

- Eagle Nebula Dark Skies
- Eagle nebula Light Skies
- Focus and Go to Parameter

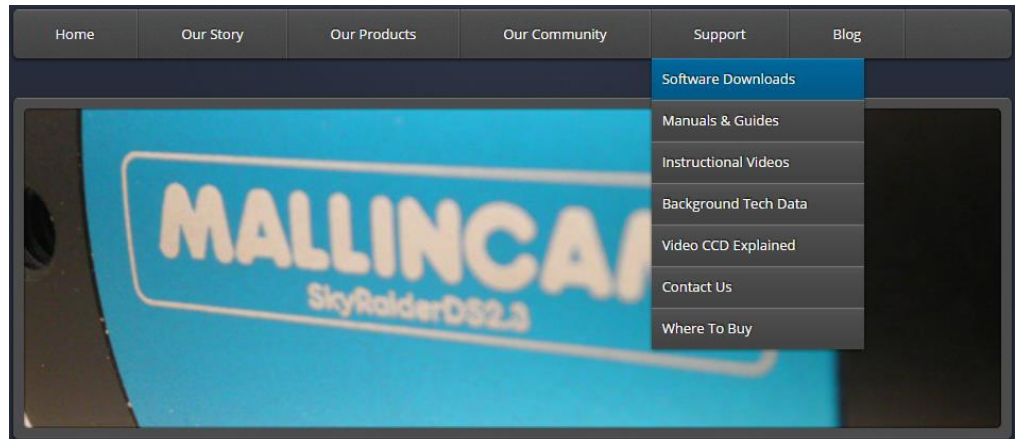
Chapter

5

C5: Installing Optional Software



Visit the **Software Downloads** Page in the Support Tab located on the website:  
[www.mallincam.net](http://www.mallincam.net)



Locate the latest version from the list and **Click** on the Blue **Click Here** Button to download the Drivers and MallincamSky Software for a Windows PC.

SkyRaider Series MALLINCAMSKY Complete Software Package May 26, 2022. [Click Here](#)

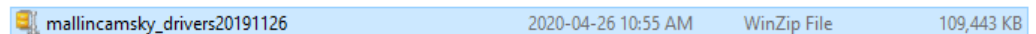


If you have a Mac, or Linux computer, there are drivers and software located in the downloaded zip file.

Your Browser should download a zipped file called mallincamsky2019mmdd (the last eight numbers may be different as they will change if software is updated)

Place your mouse on the zipped file, **Right-Click** to pop-up an **Action Window**, and choose **Extract All ...**

Just **Click** on the **Extract** button when the next Window pops-up. Windows should now open the actual folder that contains the software to install.





**Double-Click** on the extracted folder to open it up, revealing the main Driver and Software folder, **Double-Click** on this to open it up, revealing its contents.

Name	Status	Date modified	Type	Size
ASCOMMallincamSetup	✓	2022-08-18 9:56 AM	Application	5,121 KB
MALLINCAMDshowSetup	✓	2022-08-18 9:56 AM	Application	4,913 KB
MALLINCAMLITE.dmg	✓	2022-08-18 9:56 AM	DMG File	23,804 KB
MALLINCAMLITE.x64.tar.bz2	✓	2022-08-18 9:56 AM	BZ2 File	30,635 KB
MALLINCAMLITE.x86.tar.bz2	✓	2022-08-18 9:56 AM	BZ2 File	22,086 KB
MALLINCAMSKYSetup	✓	2022-08-18 9:56 AM	Application	38,331 KB
procomsdk.20220816	✓	2022-08-18 9:56 AM	Compressed (zipp...	62,803 KB

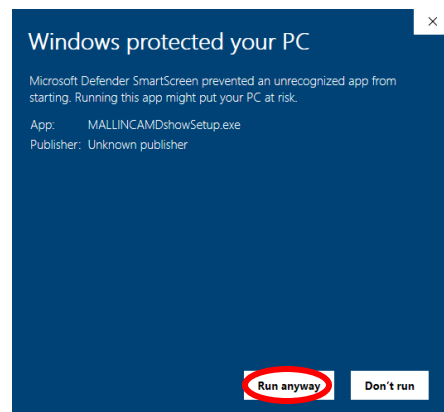
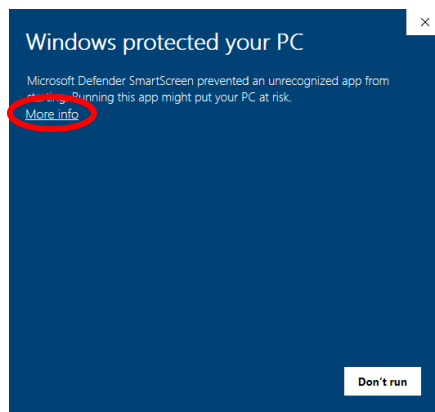
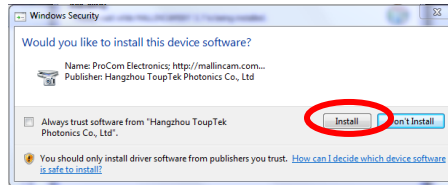
The **ASCOM DRIVER** contains the ASCOM Drivers for the camera  
 The **DIRECTSHOW DRIVER** contains the Direct Show Drivers for the camera  
 The **WINDOWS APPLICATION** contains the camera control software.

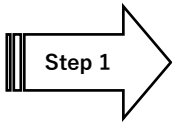


### Installing MallincamSky and its Driver



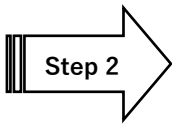
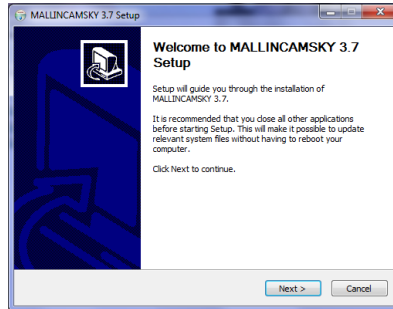
Depending upon the version of Windows, you may again be asked for permission for it to install **MallincamSky**, **DirectShow**, or **ASCOM**. Just accept **install**, or if a blue **Windows protected your PC** popup appears, then click on the **More info** text. Another **Windows protected your PC** screen will pop-up. Then select **Run anyway**





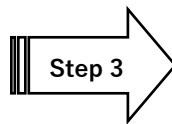
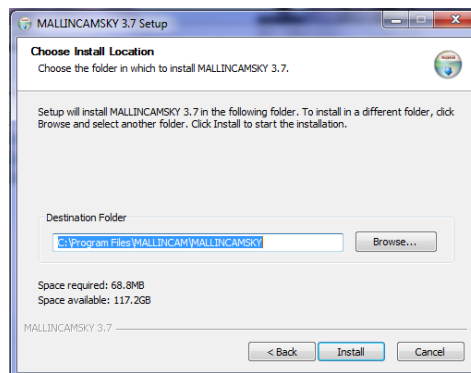
**Double-Click** on the **MALLINCAMSKYSetup** file and follow instructions to install the **MallincamSKy** software and drivers onto your computer:

The following **MallincamSky Setup Screen** will then appear:



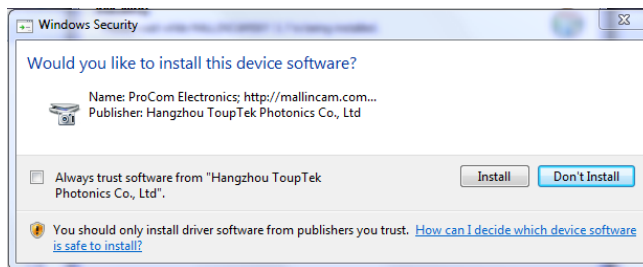
Click on **Next** to start the installation process.

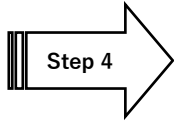
The installation program now wants to know where you would like to install the software. Either choose your own location or select the **default**.



Click on **Install** to proceed.

Windows may again ask for permission to install the device software.



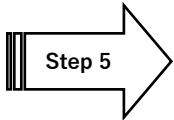
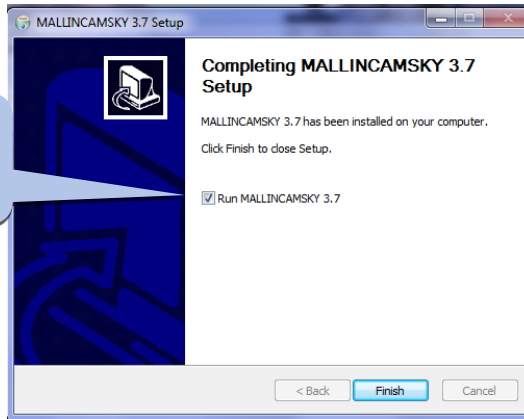


Step 4

Click on **Install** to accept.

The **MallincamSky Software** will take about a minute to be installed. When completed, the following screen will appear:

Uncheck the Run MALLINCAMSKY 3.7 checkbox



Step 5

Click on **Finish**, and the **MallincamSky** Icon will appear on your screen.



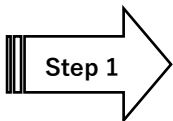
**MallincamSky** and its drivers are typically all you need to install to control the **DS432CTEC** camera, but if you would like to have other image programs control of the **DS432CTEC** then you can install two other optional drivers: ASCOM and DIRECTSHOW



### Installing DirectShow Driver



DirectShow drives provide an alternative way for third party software to control most (but not all) of the aspects of the SkyRaider camera. Look for the Mallincam name in the camera selection routines of those software packages.

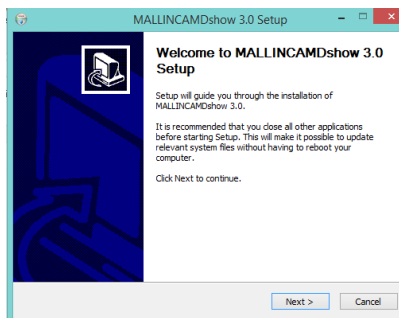


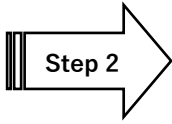
Step 1

Open the **DIRECTSHOW DRIVER** folder, then locate and **Double-Click** on the **MALLINCAMDshowSetup** File.

Windows may display a warning asking for permission to run the program, if it does, select **YES** to continue.

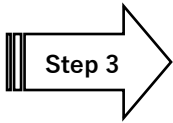
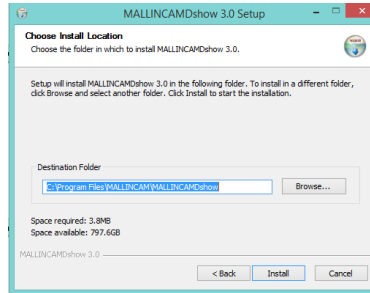
The following **MallincamSky Setup Screen** will appear:





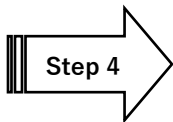
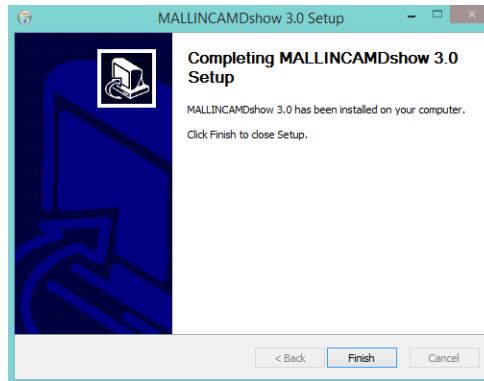
Click on **Next** to start the installation process.

The install **Location Window** will open, asking for the Destinations folder to install the drivers. We recommend using the default location.



Click on **Install** to start the installation process.

The final window will appear. This window just wants to inform, and have you acknowledged that the setup is completed.



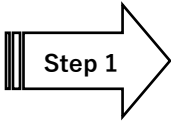
Click on **Finish** to close the process.



**Installing Mallincam ASCOM Driver**

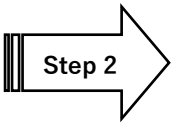
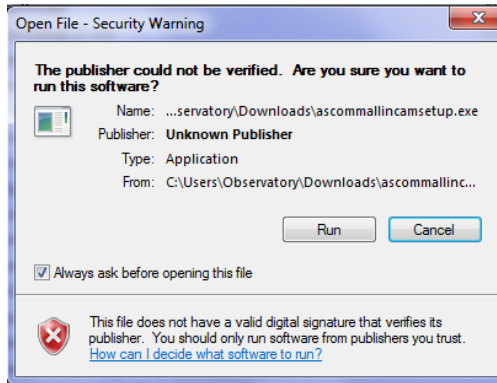


You must have already installed the latest **ASCOM Platform** on your computer ([www.ascom-standards.org](http://www.ascom-standards.org)).



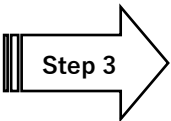
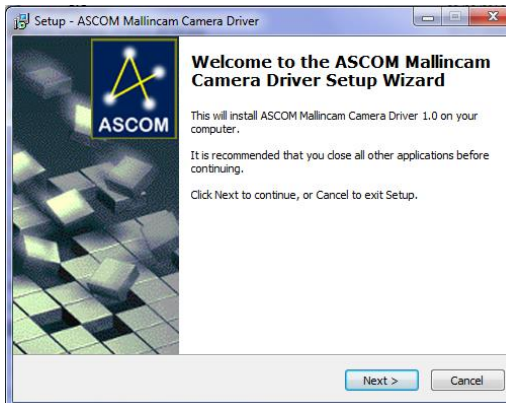
**Step 1**

**Double Click** on the **Driver** to install it onto your computer system (Windows). Depending upon the version of Windows, the following screen might appear.



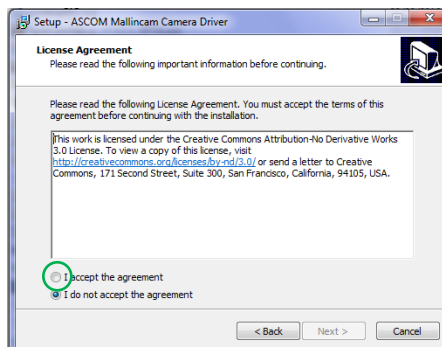
**Step 2**

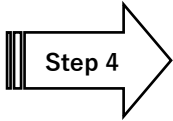
Click on the **Run Button**. The following Window should now Pop-Up.



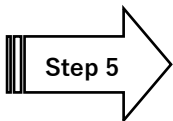
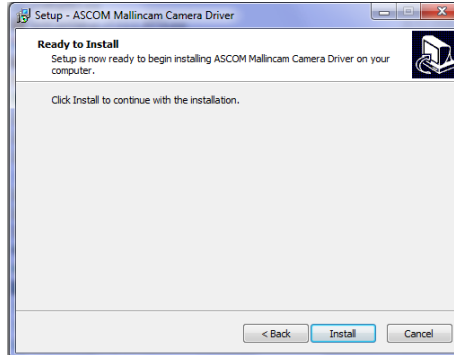
**Step 3**

Click on **Next** to Continue. The **License Agreement Window** should now appear.

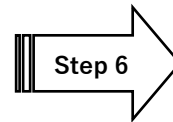
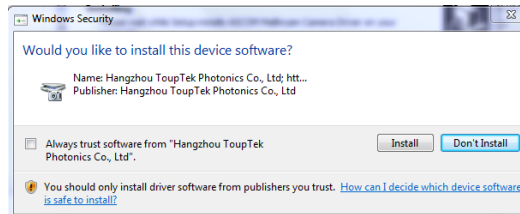




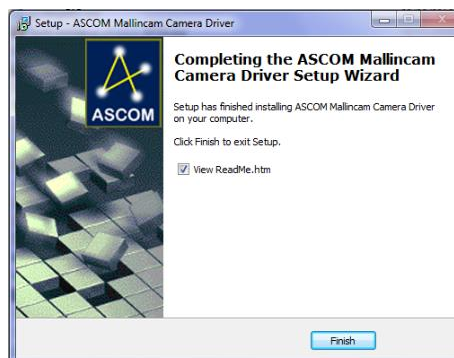
Click on the 'I accept the agreement' Radial Button, then Click on Next. The Ready to Install Window will appear.



Click on Install to install the ASCOM Driver. Depending upon the version of Windows, you may see the Following Pop-up. Install it.



The installation process will provide you with the final Pop-up window to inform you that the installation was successful. Click on the Finish Button to acknowledge.



## Chapter

## 6

## C6: Using Third Party Software



Keeping in mind that the SkyRaider **DS432CTEC** is a video imager rather than a dedicated single shot camera, we can control the camera with other 3<sup>rd</sup> party software products via the DirectShow driver or the ASCOM driver. This will provide you with alternative imaging processes when using the SkyRaider series of cameras.



### A Primer on Native Drivers versus SDK versus ASCOM

One of the most common questions that I receive is related to ASCOM vs MallincamSky or NINA versus MallincamSky or SharpCap versus MallincamSky. So, I put together this simple primer to help answer these questions. These questions are valid as the versatility of Rock's SkyRaider cameras, do provide so many options for you to experiment with. First, I would like to remind everybody that Rock's SkyRaider series was designed from the ground up for **Real-Time-Video-Imaging**. Every aspect of these cameras, from its built-in firmware (scientific quality components) to its control software (MallincamSky) was designed for **Real-Time-Video-Imaging**. But its versatility (and forethought) has allowed for other imaging techniques to be enjoyed, so let me explain how this can happen.



### Real-Time-video-Imaging

The **SkyRaider's** hardware (firmware) is directly accessed through the software **MallincamSky** using an **Operating System level Driver**. This communication level provides direct access to the SkyRaider's hardware routines and real-time-imaging and control processes. **MallincamSky** is specifically written to access the internal processes for each of the specific SkyRaider Cameras, that is why you choose the brand of SkyRaider from its camera List. Bottom line, **MallincamSky** provides the fastest possible and most efficient request/response throughput and thus the ultimate control of every process (notice the number of parameters you can adjust when using MallincamSky) that was designed and built into the SkyRaider camera. This is what the SkyRaider was designed to do, **Real-Time-Video-Imaging** with real-time tools such as Dark and Flat Field adjustments, video recording, and real-time Histogram adjustments. This process provides you, the user (and guests, both local and online), with almost immediate results when viewing objects from Deep Sky to local Planetary. This allows the SkyRaider series to be used for public star parties where results are presented in near real time and adjustment are seen as they happen. This is the design paradigm of Rock's SkyRaider series of cameras.

 **Astro-Imaging**

There is a class of Camera Assisted Astronomers who want to work with computer automated long exposure imaging. They most like will be using 3<sup>rd</sup> party software such as NINA, Voyager, SkyX, or SharpCap that will both control their camera, mount, and other attached accessories. The software may be able to schedule a whole evening of image, from capturing **Lights, Darks, Bias, Flats, Filter Wheel Control, Focus Control**, and automated target acquisition with **Mount Control** all while the user sleeps or is relaxing away from the system. These specialized pieces of software will incorporate and integrate many different manufacturers' hardware components into a seamless process. These 3<sup>rd</sup> part software packages will require access to the different hardware objects by interfacing with software layers that conform to (sometimes loosely enforced) Industry standards and protocols. Two of the currently major connection paradigms are using SDK and ASCOM (there are others coming down the pipeline). I will discuss and introduce both the SDK and ASCOM layers in the paragraphs below. Just a reminder, ROCK has provided both of these software layers in his SkyRaider cameras, so users have the option of using the MallinCams in this arena.

 **SDK**

This level (or layer) is a set of specific coded access routines (usually written in C++), these coded routines are typically referred to as SDK (**S**oftware **D**evelopment **K**it). These SDK routines are the layer of software that bridges the gap between 3<sup>rd</sup> party piece of software and the SkyRaider's OS-level device driver. By definition, an SDK is a software-kit that includes instructions that allow developers to create and develop proprietary software applications using this kit. The SDK usually relies on what we call **APIs (A**pplication **P**rogramming **I**nterface), which are purpose-built software routines for a specific use. When an SDK is used to create an application that must communicate to other applications, it includes a set of APIs for this functionality.

In this Astro-imaging environment, the 3<sup>rd</sup> party software as mentioned above represents software programs such as SKYX, NINA, and others who have written "**native Mallincam**" drivers that access the SDK which Rock has freely provided. The SDK provides access to the processes inside the camera (through the OS-Level driver), but each 3<sup>rd</sup> party software does not know exactly what each type of imaging camera can or cannot do, so These 3<sup>rd</sup> party software programs will control all of the expected processes that any imaging camera should perform. For example, if NINA or SKYX wants to adjust the **gain** of a camera, it will pass that request to the SDK for that camera, and the SDK for that camera will pass that request to the internal processes of the camera and the camera will perform that task. This is a win for the 3<sup>rd</sup> party software as it indirectly has access to the internal processes of the camera and provides immediate responses. The issue or limitation is that the 3<sup>rd</sup> party software may not include most of internal processes or capabilities that make a camera unique. For example, The SkyRaider has Dark and Flat Field internal processes, this this is unique and if the 3<sup>rd</sup> party software does not include that in their programming, then those unique processes are not utilized and thus not available from those 3<sup>rd</sup> party software packages.

To summarize these 3<sup>rd</sup> Party Software Applications, with their native drivers, can talk to Mallincam's SDK, they can call specific and expected camera related, functions such as "**set gamma**" or "**start exposure**". It is the SDK that turns those simple requests into a specific direct command that the SkyRaider understands. The SkyRaider may immediately respond or even return data back in response to that command. It is also the SDK that receives that



response and translates that back into something the specific Software Application can understand. But the 3<sup>rd</sup> Party Software Applications will/may not include all of the capabilities that the SkyRaider camera can perform (you may get a subset), just those that are required to access and control mainstream imaging procedures that is used by the 3<sup>rd</sup> party software. The bottom line, 3<sup>rd</sup> party software applications that utilize the SkyRaider SDK, get immediate control of the camera and its capabilities and thus complete throughput utilization of the built-in firmware, but for only those processes that the 3<sup>rd</sup> party software requires, not necessarily all of the capabilities of the camera.

### ASCOM

Now an ASCOM driver is another layer of sitting on top of the SDK. ASCOM is a control design layer that requires a structured and restricted list of commands and properties (guidelines) that an application must use to operate and adjust the camera, telescope, or filter wheel. A camera's designer, such as Rock and the SkyRaider series, will provide a ASCOM driver translates these functions and properties (as per the mandated ASCOM guidelines) into the appropriate calls to the SDK and, as explained above, the SDK in turn translates that and transmits that to the camera. What this means is that many application software companies can write a single procedure that can support any camera that provides an ASCOM driver without having to have specific knowledge of each and every one of those cameras. All that knowledge is hidden away by the ASCOM driver for that camera, which each vendor provides. The advantages are that a software program can access and control any camera (or other device) that provides an ASCOM driver. The disadvantage is that ASCOM has a restricted number of commands available for the software program, along with those commands are a required set protocols which must be followed. The protocols dictate how the controls must be adjusted and can significantly reduce the throughput effectiveness (how long it takes before an image appears) of the camera, along with a significant reduction of all of the capabilities of the camera. On a good note, the ASCOM layer is always being enhanced and over the years it has started to incorporate more and more camera capabilities as hardware technology improves.

To put this all together, the SDK and ASCOM layers provide access to the camera's major controls, with each of these being limited to either the enforced layer protocols or the actual software design of 3<sup>rd</sup> party applications. The result of these different layers is performance, since these limits do not exist in native drivers the dedicated software (**MallincamSky**) does not experience these issues (only hardware related restriction such as USB2 or USB3 bandwidth, or computer processing powers). From a throughput and control aspect, the order of layer's effectiveness from best to least are: Native (**MallincamSky**), SDK, and finally ASCOM. But as I have already mentioned. Rock has provided all three of these layers for you to use in your imaging journey.

### DirectShow

DirectShow is a multimedia framework and API produced by Microsoft for software developers to perform various operations with media files or streams. Based on the Microsoft Windows Component Object Model (COM) framework, DirectShow provides a common interface for media across various programming languages and Software applications. DirectShow is what allows software such as OBS, AMCAP, SplitCam, etc. to display and control (limited) the SkyRaider series of Cameras.



## Using the Mallincam with 3<sup>rd</sup> Party Software Applications

### ASCOM Note

When displaying images using a third-party software of a color camera using RAW, the image will not appear in color (it can appear checkered). This is because Image data from colour cameras in RAW format always needs to be 'debayered' to obtain a colour image.



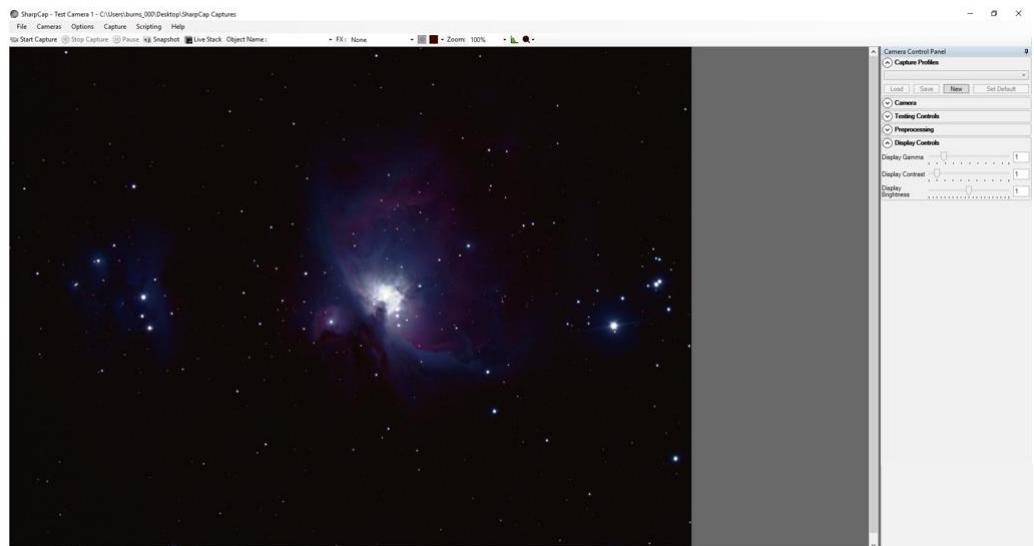
### Imaging in SharpCap

Now this is the first generation of DirectShow/ASCOM driver interaction with SharpCap and as such, not all the commands are perfected for user control.

SharpCap can be obtained at <http://www.sharpcap.co.uk/>

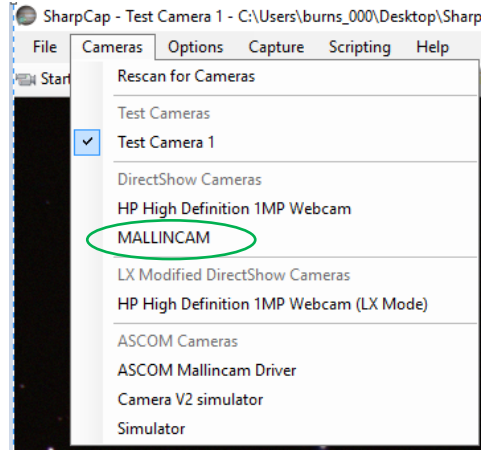


### Start SharpCap

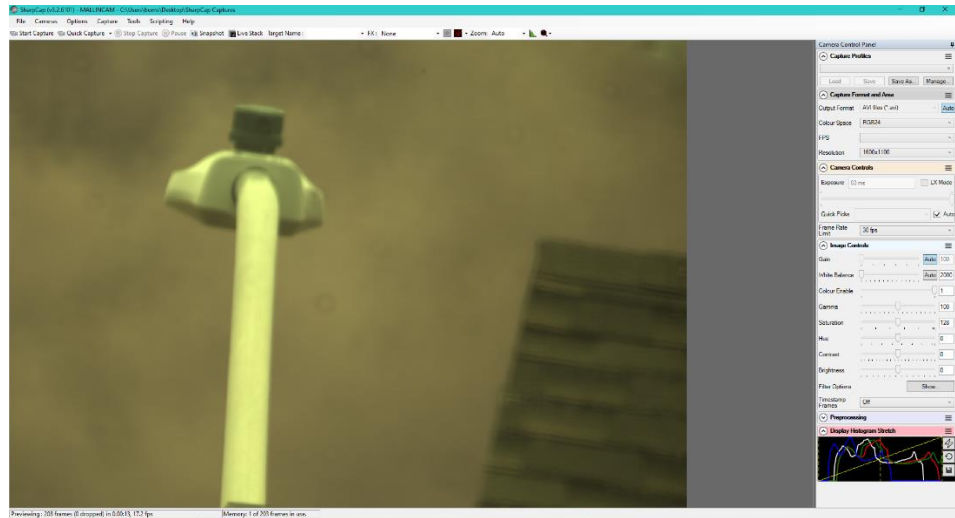


⇒ Choose Cameras (DirectShow)

From the Top Heading Tab, choose Cameras, then in the **DirectShow Cameras**, pick **MALLINCAM**.



Once you have selected, the **Mallincam Directshow Driver**, SharpCap will display what the SkyRaider is imaging.



The controls on the right of the screen (**Exposure, Gain, Gamma, ...**) allow you to change the settings of the SkyRaider.



If you cannot control the exposure from Sharpcap, use the Video capture Filter below to change the exposure.

It takes a bit of practice to become familiar with the settings as these are more generic controls, the majority of the controls have their own scales (the exposure does not indicate seconds, but has an equivalent range from 0 seconds to 5 seconds). You will need to record those numbers to assist you.

SharpCap recognizes that the **DS432CTEC** does have an **extended mode** for exposures that are over 5 seconds.

To turn on the **extended mode** (over 5 seconds), then enable the **LX Mode** in the **Options Tab** on the Top of the screen. This lets the exposure slider now provide exposures over 5 seconds (even though you do not actually see the time on the slider). **Disable LX mode** to return to the 5 second max exposure.

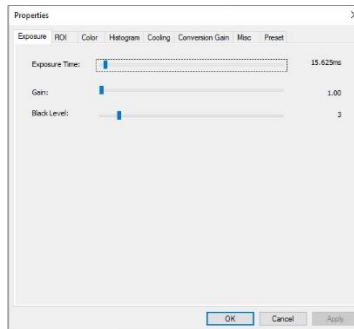
SharpCap will display the exposure you have set on the bottom of the SharpCap window after the first exposure is taken.



SharpCap can Pop-Up the SkyRaider **Video Filter** (DirectShow control window). Click on the Show Button in the **Video Capture Control**



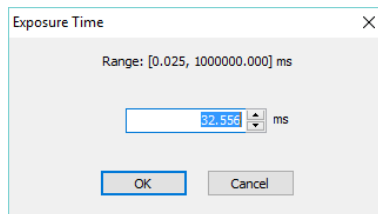
The Pop-Up Window gives you some familiarity with settings as it provides you with more comfortable units (exposure time in ms).



You can choose the **Exposure Tab** in the **Filter window** to slide the **Tab** to match the exposure time in **ms** (divide by 1000 to get seconds).

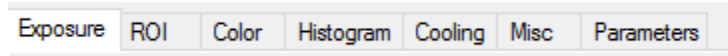


You can also **Click** on the **Time setting** on the right of the **Slider** to Pop-Up a window that allows you to directly enter in the time in **ms**.



You can also control the **Gain** in the window.

The other Tabs in the Window will also allow you to adjust other settings in the SkyRaider Camera.



Once you are comfortable with the settings, **Click** on the **OK** Button in the Properties window to close it.



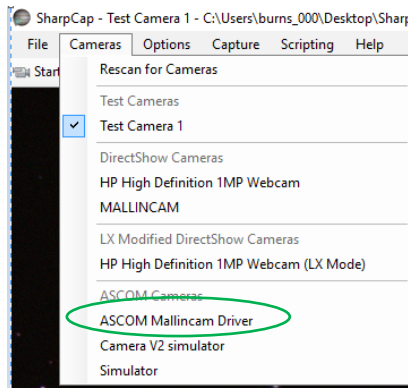
SharpCap will start the imaging process and will, on the bottom of the window, display information about the exposure and remaining time. You can watch the green status bar move to the right as the exposure is being taken.

6603 frames (0 dropped) in 0:26:55, current exposure 19.9s, last frame 0.0s (estimated)

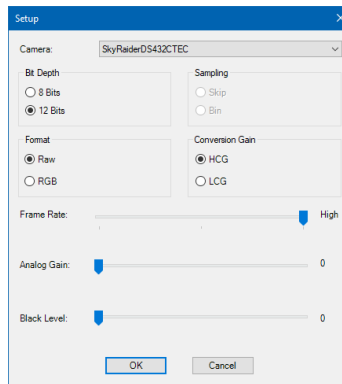
Frame:  00:02:00:18

⇒ **Choose Cameras (ASCOCM)**

From the Top Heading Tab, choose Cameras, then in ASCOCM Cameras, pick **ASCOCM Mallincam Driver**.



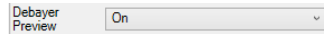
Once you have selected, the **Mallincam ASCOCM Driver**, SharpCap will open a setup window.



It is from here that you get to choose **Bit Depth** and **Format**.



**Raw Internal format:** you will need to select **Debayer Preview** to **On** to see image in color



The controls on the right of the screen (**Exposure, Gain, Gamma, ...**) allow you to change the settings of the SkyRaider.



If you cannot control the exposure from Sharpcap, use the Video capture Filter below to change the exposure.

It takes a bit of practice to become familiar with the settings as these are more generic controls, the majority of the controls have their own scales (the exposure does not indicate seconds, but has an equivalent range from 0 seconds to 5 seconds). You will need to record those numbers to assist you.

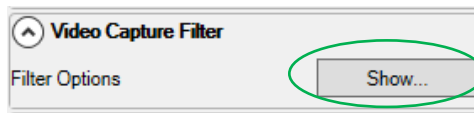
SharpCap recognizes that the **DS432CTEC** does have an **extended mode** for exposures that are over 5 seconds.

To turn on the **extended mode** (over 5 seconds), then enable the **LX Mode** in the **Options Tab** on the Top of the screen. This lets the exposure slider now provide exposures over 5 seconds (even though you do not actually see the time on the slider). **Disable LX mode** to return to the 5 second max exposure.

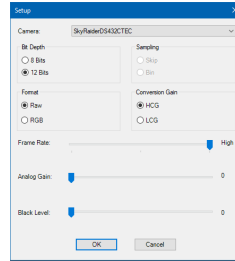
Sharpcap will display the exposure you have set on the bottom of the SharpCap window after the first exposure is taken.



SharpCap can Pop-Up the SkyRaider **Setup** (ASCOM control window). Click on the **Show Button** in the **Video Capture Control**



This window will allow you to change the **Format** and adjust the **Gain** and **Black Level**.



SharpCap will start the imaging process and will, on the bottom of the window, display information about the exposure and remaining time. You can watch the green status bar move to the right as the exposure is being taken.

6603 frames (0 dropped) in 0:26:55, current exposure 19.9s, last frame 0.0s (estimated)

Frame: 00:02/00:18

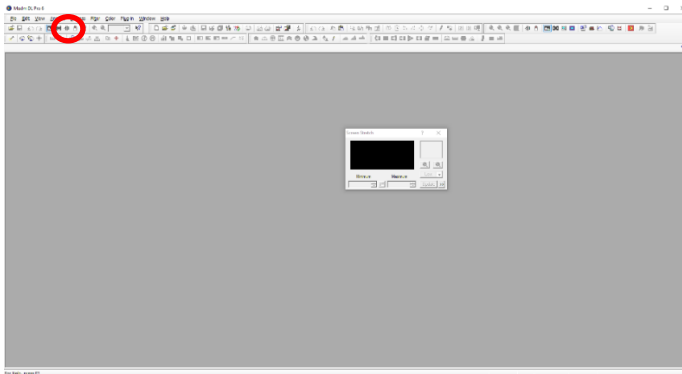


### Imaging in MaximDL

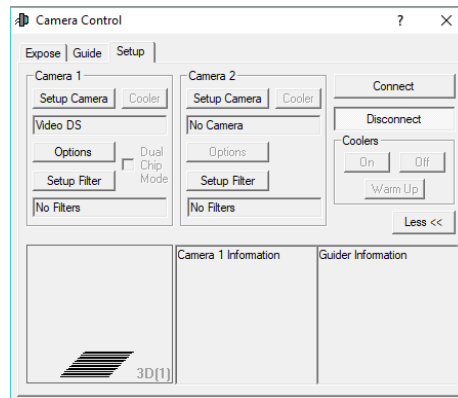
MaximDL is an image acquisition and composition software tool.



### Start MaximDL



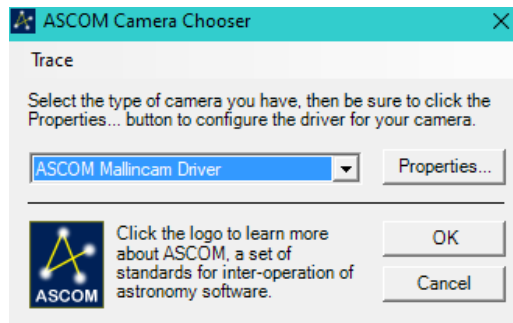
### Click on the Camera Control Icon



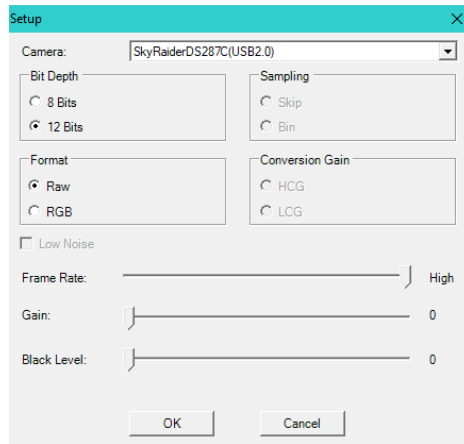
⇒ Select **ASCOM** from the **Setup Camera** button.



⇒ Now Click on the **Advanced** Button on the right-hand side and select **ASCOM Mallincam Driver** from the drop-down list.



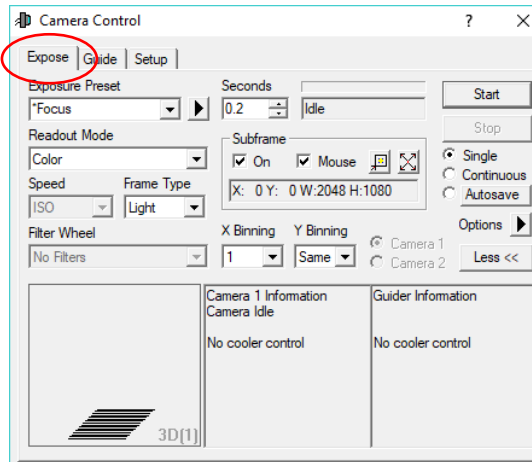
⇒ Now Click on the **Properties** button to open-up a Format and Bit Depth setup window.



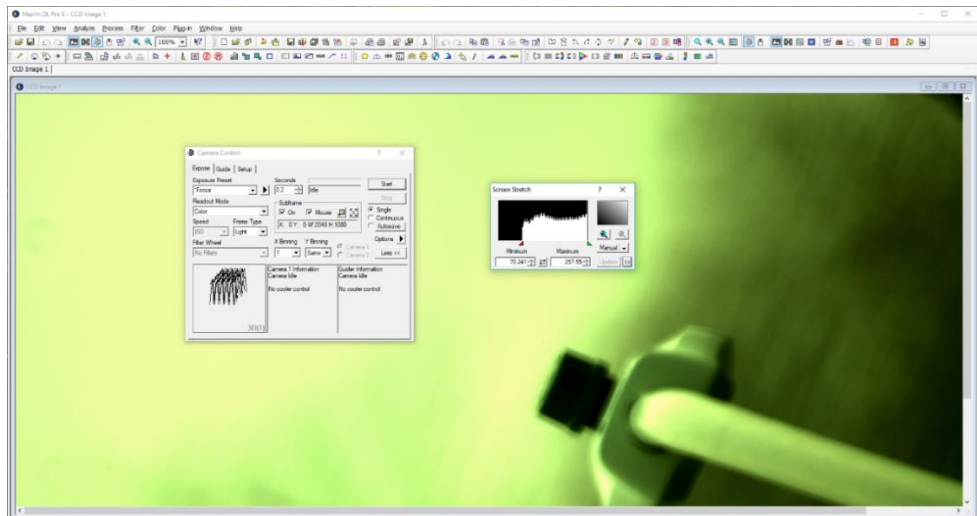
⇒ Choose your format and bit dept, then Click on **OK** to accept. Accept other Windows as well.



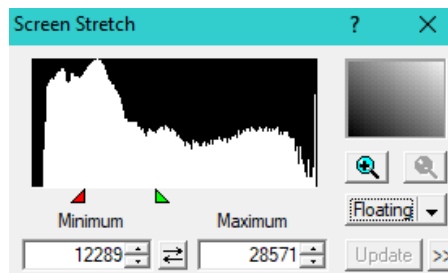
➡ Now Select the **Expose Tab** on the **Camera Control Window**.



➡ Enter your exposure parameters and **Click on the Start Button** to image.



☞ Don't forget to use the screen to stretch your image.



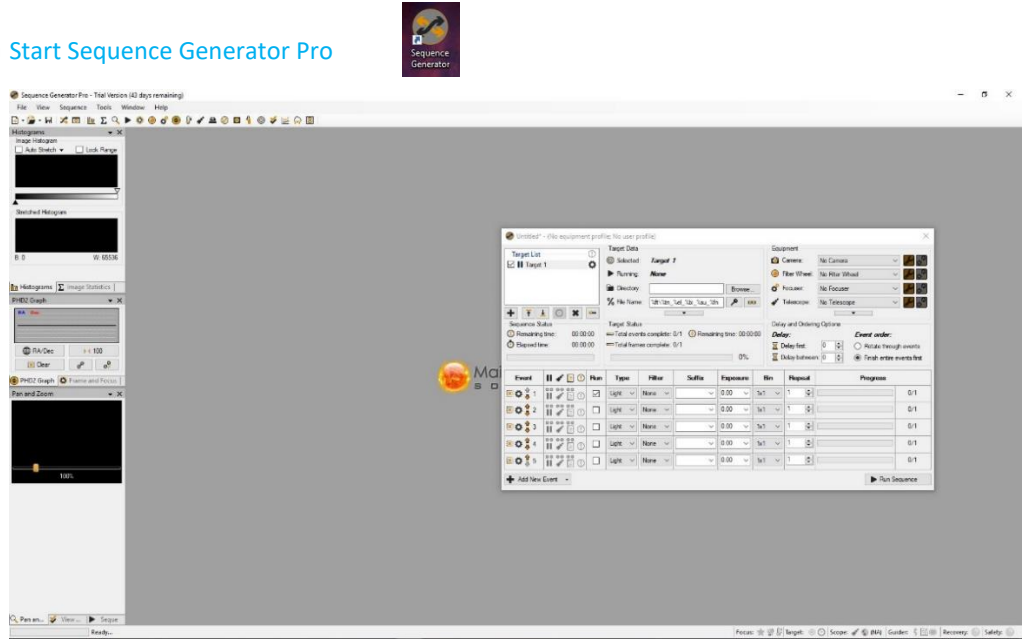
☞ Depending upon your Format choice, you may need to **debayer** the image.

➤ **Sequence Generator Pro and SkyRaider DS432CTEC**

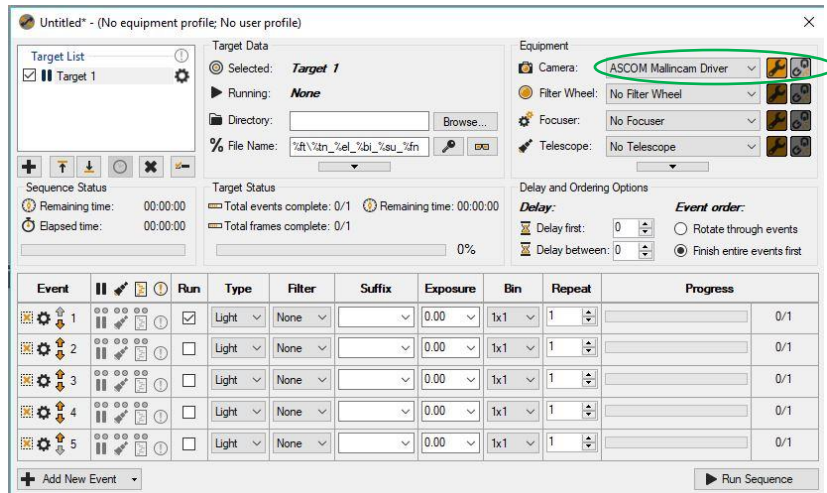
Sequence Generator Pro is a software package that can execute complex sequences of capture events which will allow you to spend more time using and less time fighting with your equipment. You have lots of hardware that is sometimes difficult to get it all working together. Sequence Generator pro work with ASCOM-based SkyRaider **DS432CTEC**.

Make sure you are using the latest version of ASCOM (both the **ASCOM core** and **ASCOM Mallincam Driver**).

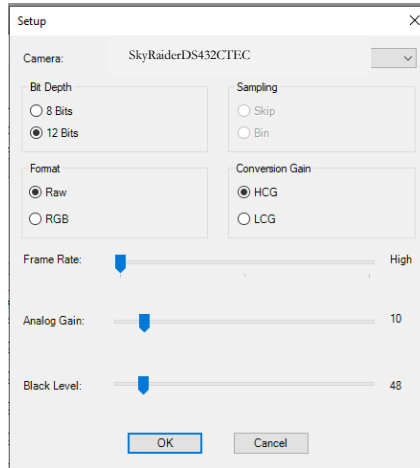
➤ **Start Sequence Generator Pro**



➤ Select **ASCOM Mallincam Driver** as the camera in equipment profile.

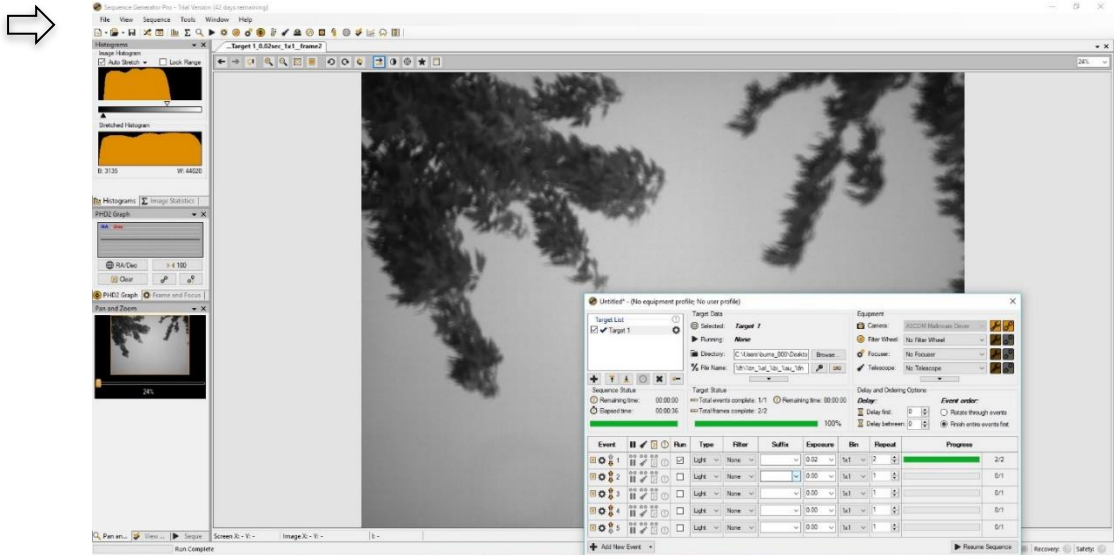


⇒ Select the required resolution and ensure that you are using **Raw** as the format.



☞ Your images will appear **Black and White** with a checkered look. This is normal if you are using a color camera since you will need your image processing software to debayer your saved images.

Start **Running Sequences** based on your needs.



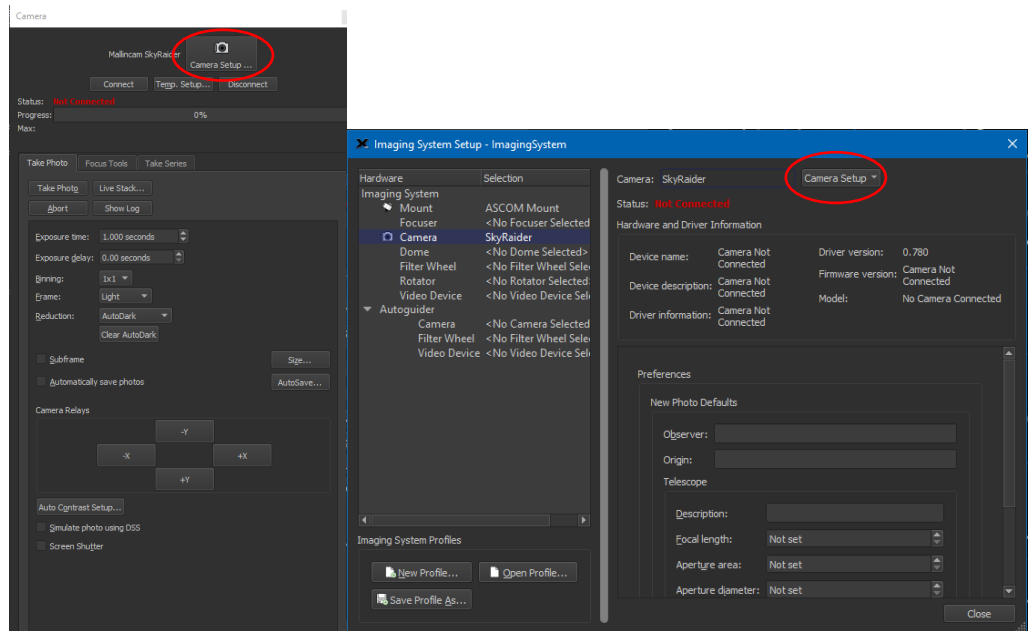
☞ If you are using Sequence Generator Pro then you will need to save **flats, biases, and darks** as you would with every other camera.

The SkyX and the SkyRaider DS432CTEC

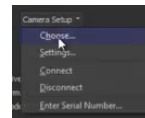
The SkyX is a telescope control software package, which can perform many tasks that are related to controlling a telescope. One of the capabilities is using a camera to assist in aligning (T-Point) and locking onto objects using a camera.

We can have The SkyX use the Mallincam DS432CTEC for this process (once camera is added).

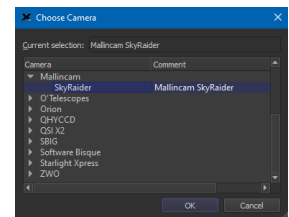
⇒ Click on **Camera Setup** from the Camera Tab in SkyX. This will open The **Imaging System Setup** Window. Click on **Camera Setup** drop down in this window.



⇒ Select **Choose** from the Drop-Down list.

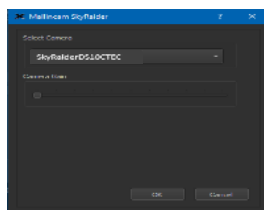


⇒ SkyX will open a list of supported cameras, choose **Mallincam SkyRaider** from the list. Hit the **OK** button.



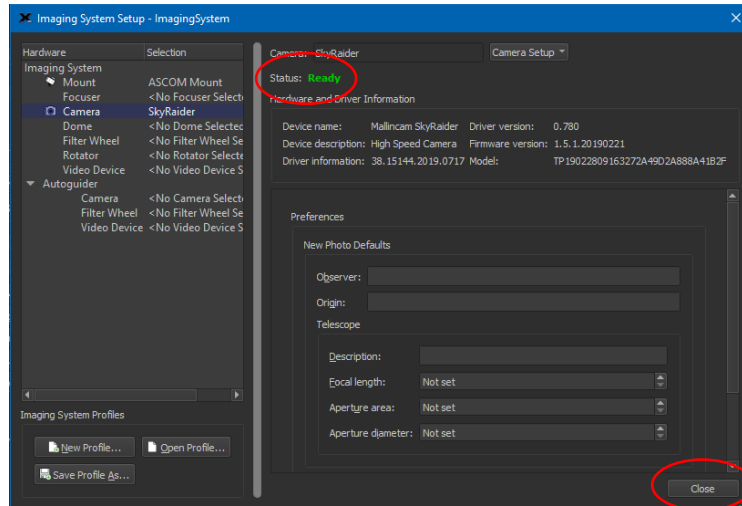
⇒ Select **Settings...** from the **Camera Setup** drop down list.

⇒ Select your Mallincam Camera from drop down list and hit **OK**.



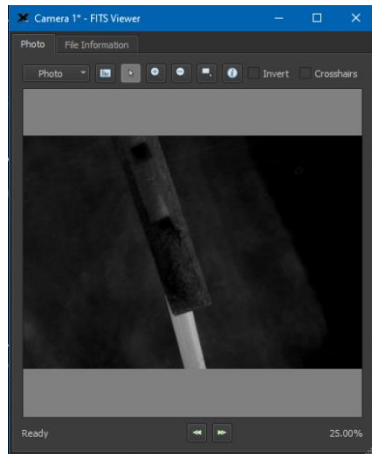
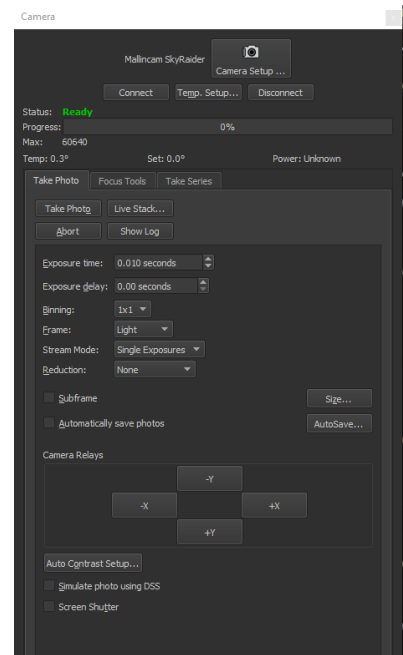
⇒ Select **Connect** from the **Camera Setup** drop down list (the fan on the camera should start).

The status should now say **Ready** as the **Status:** in the Setup Window. You can now close this window.



➡ Now from the **Camera** tab you can enter an exposure time, binning amount, stream type (single exposure), frame type (light), saving parameters.

➡ Once you have the settings selected, **Click on the Take Photo** button and SkyX will take a photo.



☞ A Quick frame viewer will popup displaying the FITS image for you. Recall that RAW FITS images are in Black and white and will need to be **debayered** to see color.

☞ The **LTI** version of SkyX automatically debayers the images.

### Using SKYX along with MallincamSky



Start **MallincamSky**, but DO NOT select the **DS432CTEC** camera to activate it



Connect the **DS432CTEC** to the SKYX **Camera control** and activate it by clicking on the **Connect** Button.



**SKYX** now controls the **DS432CTEC**.



Use SKYX to perform a **Closed Loop Slew** to an object (SKYX is using the **DS432CTEC** to take images)



Once telescope has object centred, disconnect the **DS432CTEC** from the Camera driver in SKYX by clicking on the **Disconnect Button**.



Now activate the **DS432CTEC** in **MallincamSky** by clicking on the **DS432CTEC** in the **Camera List**.



**MallincamSky** now controls the **DS432CTEC**.



Take your images with **MallincamSky**



When ready to slew to another object

- just **Right-Click** on the **Video [DS432CTEC]** window and choose **Close (MallincamSky** loses control of **DS432CTEC)**.
- Re-activate the camera in SKYX by click on **Connect button (SKYX** now controls the **DS432CTEC)**
- **Closed Loop Slew** to next object



Repeat as necessary.

## Nighttime Imaging 'N' Astronomy (N.I.N.A.)

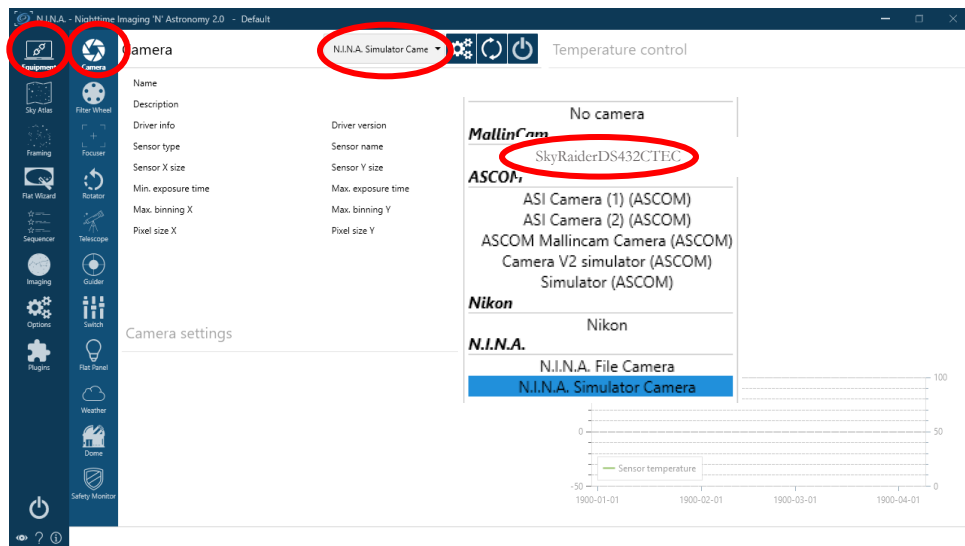
N.I.N.A. is a complete freeware complete system control software package, which can perform many tasks that are related to controlling a telescope, filter wheel, Camera, etc.



N.I.N.A. version 2.0 and higher include the Mallincam SDK routines, thus making it a powerful program to control the SkyRaider series of camera and providing more control options than using ASCOM.



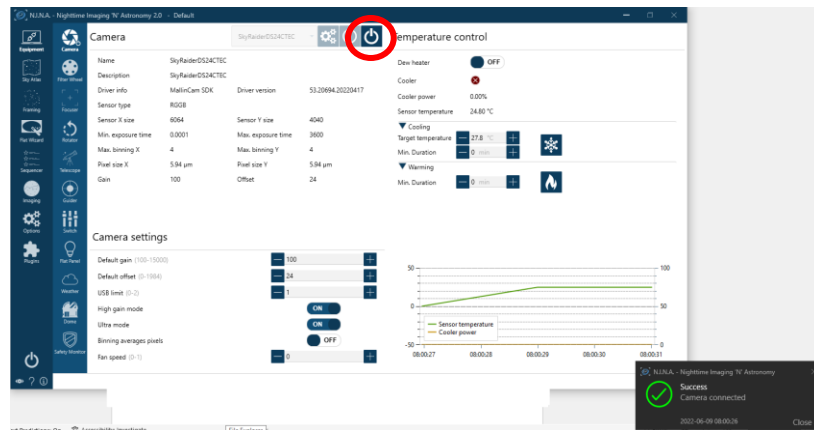
When started, choose **Equipment** and **Camera** and from the drop-down locate the **Mallincam** heading.



From the **Mallincam** Heading locate and select the **SkyRaiderDS24CTEC** camera.



Click on the **On** Button in N.I.N.A. to activate the camera. (You will be presented with the success connected screen.



➤ Make any camera setup adjustments, and heater/cooler activation you require.

### Camera settings

Default gain (100-15000)	— 100	+
Default offset (0-1984)	— 24	+
USB limit (0-2)	— 1	+
High gain mode	<input checked="" type="checkbox"/> ON	
Ultra mode	<input checked="" type="checkbox"/> ON	
Binning averages pixels	<input type="checkbox"/> OFF	
Fan speed (0-1)	— 0	+

➤ Set the exposure time and required binning in the imaging menu in N.I.N.A.

➤ Create a sequence in **sequencer** and start taking images.

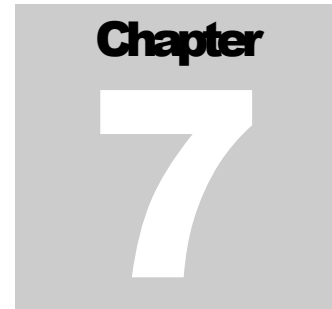
☞ Remember you can have N.I.N.A automatically **debayer** your images and you can choose the format in which you would like the images saved in.

☞ Don't forget to stretch the image when viewing its image. Otherwise, the image will appear too dark).





## C7: Upgrading, Explanations and Q&A



This chapter deals with issues and questions that you may have after using MallincamSky for a while or have encountered a problem that you do not know how to resolve.



### How do I



#### How do I get rid of the Green Exposure Rectangle?

First remember the **Green Exposure Rectangle** is only used for the **auto-exposure** process, but it can be annoying when you are imaging.

- The way to remove it from the Video Window is to **uncheck** the auto-exposure box.



If you require the **Exposure & Gain** Control to be expanded and auto-exposure turned on, but still do not want the **Green Rectangle** in the middle of your screen, try this.

- Choose **Fit to Window** from the **Zoom** Drop down Box (on the **Icon Tool Bar**). Now just drag the **Green Rectangle** (**Left-Click and Hold** technique) to the lower left of the window.
- Next grab one of the corners of the **Green Rectangle** and drag it to the matching corner of your **Video Window**. Next, grab the opposite corner of the **Green Rectangle** and drag it to the same location as the first corner. This will make a zero-size rectangle.



#### How do I Select a part of the Image and Zoom in?

- In **Video Mode**, expand the **ROI** control (a **Blue Rectangle** should appear around you image). Using the **Left-Click Hold and Drag** technique, maneuver, and size the **Blue Rectangle** so that it encloses the area in which you are interested. **Left-Click** on **Apply** and watch the part of the image in **Blue Rectangle**, be the whole image in the **Video Window**.
- Now, **Left-Click** in the **Blue Rectangle**, and use the scroll wheel on your mouse to enlarge or reduce the image (you can also use the **Fit to Window** control on the **Icon Tool Bar**).
- **Left-Click** on **Defaults** to get back to Full screen.
- See **ROI** section in Manual for creating an **ROI** in **Trigger Mode**.

**How do I automatically save 1 image every 30 seconds?**

- Choose the **Time-Lapse (Auto Capture)** from the **Capture Menu** on the **Top Menu Line**. Now determine your naming convention and location.
- Enter **30** in the **Time slot**
- Enter the total number of images you would like (or leave unchecked, and you will manually stop the process when you are ready).
- **Left-Click** on **OK**

At the bottom of the MallincamSky Window, a running count will be displayed.

- **Left-Click** on **Stop Time-lapse (Auto Capture)** to stop the process.

**How do I adjust the brightness in my monochrome SkyRaider?**

You will have noticed that the **Brightness** command in the **Color Adjustment** control is deactivated. You can use the **Gamma** command (moving it to the left will brighten the whole image, but the better control is the **Histogram** command in the **Side Bar**).

Moving the **Left Marker Line** or the **Right Marker Line** (or a combination of both) to the left will brighten up your image in a more controlled manner.

**How do I Broadcast my image onto LiveSkies?**

As a direct way is not yet available, you will need to use a third-party software to assist you.

Obtain one of the following: **KVYcam**, **OBS**, **SplitCam** (different opinions on which is the best, it becomes a personal preference). Each of these software programs will allow you to capture what is happening on your computer screen. The software packages also act as a webcam to LiveSkies.

Therefore, whatever screen image these software packages are capturing, will display on LiveSkies as a webcam image.

See **Setting up to Broadcast on LiveSkies** in the **Appendix** for more detailed instructions

**Can I Use MallincamSky with One SkyRaider and Auto-Guide with another?**

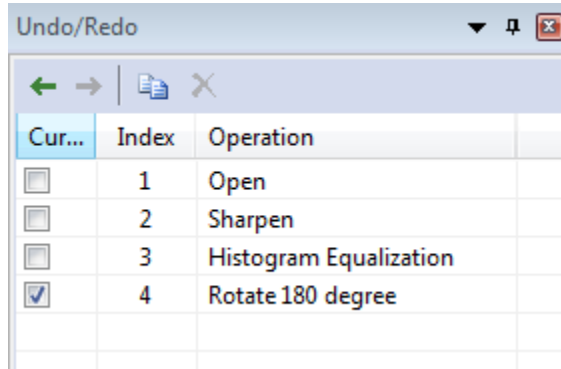
Yes, you can open multiple instances of MallincamSky, plus you use **DirectShow**, **WDM** or **ASCOM** with the second **SkyRaider**.

**How Do I Pause the Video?**

You can Pause or Resume the live video by either choose **Setup>Pause** from the **Top Menu Line**, or even easier, just press on the **pause key** on your keyboard.

➤ **How do I Undo an Operation?**

On the **SideBar**, there is an **Undo/Redo Tab**; Just **Left-Click** on the Tab and it will open with a list of all the operations you have performed on your Image (not Video, you cannot undo video operations such as contrast).



Just **Left-Click** on the location before the operation you would like to undo and **MallincamSky** will revert the image back to that step.

➤ **How do I make my ROI the whole Image Again?**

Just **Left-Click** on the **Defaults Button** in the **SideBar's ROI** control. Note, by changing the **ROI**, the **Dark Fields** will be removed from the **SkyRaider**.

➤ **How do I Turn Off Dark Field correction?**

Just **Left-Click** in the **Enable** box to remove the check mark in the **Dark Field** correction control on the **SideBar**. Place a checkmark back in the **Enable** box to reactivate Dark Field correction.

➤ **How Do I take Another Dark Field?**

Just retake the Dark Fields and it will overwrite the previous ones.

Note: If you save (export) the current Dark Fields, you will have the option of bringing them back in at a later date.

➤ **My ROI Window is Black?**

You must wait until the next exposure until the ROI Window gets filled. This can happen on longer exposure times.

➤ **What is the Storage Temperature for the Mallincam?**

All MallinCam cameras are of industrial design and use industrial components which makes them professional instruments in a sense.

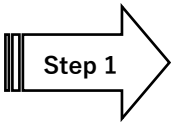
All MallinCam can be stored down to -35oF to +120oF (-37oC to 49oC)



## Upgrading my SkyRaider Camera Software

Rock has his software engineering team always looking at improving the software to make it work better for you. Once an update is made available, you will be notified on the Mallincam Groups website: <https://groups.io/g/MallinCam/topics>.

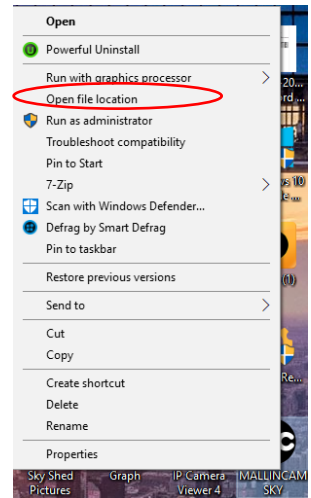
There are a variety of ways of updating the software, but the following method seems to have the best success rate when working with Windows if The **Windows Uninstall** routine fails.



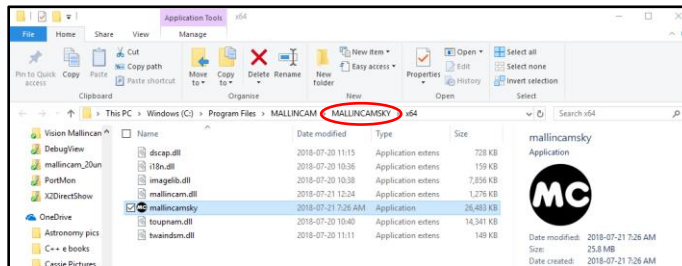
### Uninstall SkyRaider Software

You can use Windows **Uninstaller** process located in the **Control Panel** to uninstall both **MallincamSky** and **DirectShow**. But, if you are unsuccessful, then the following technique will also work.

- Unplug the SkyRaider Camera from your computer.
- Locate the MallincamSky **Icon** on your Desktop and **Right-Click** on the Icon to open-up a selection window.
- In this window select **Open file location**

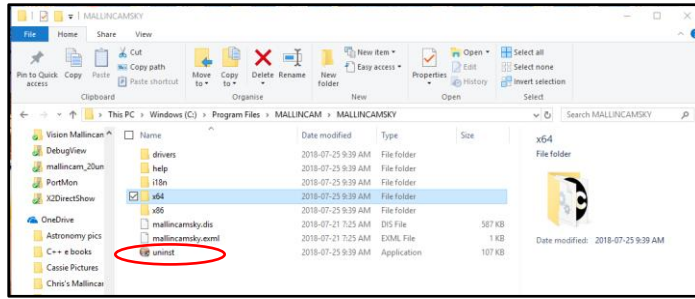


Windows will then open up the File folder that contains the software and drivers from MallincamSky.

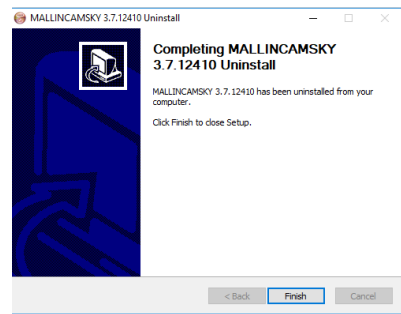
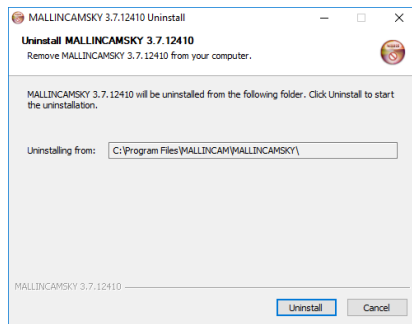


We want to jump back one folder (since this contains the **Uninstall** software for **MallincamSky**).

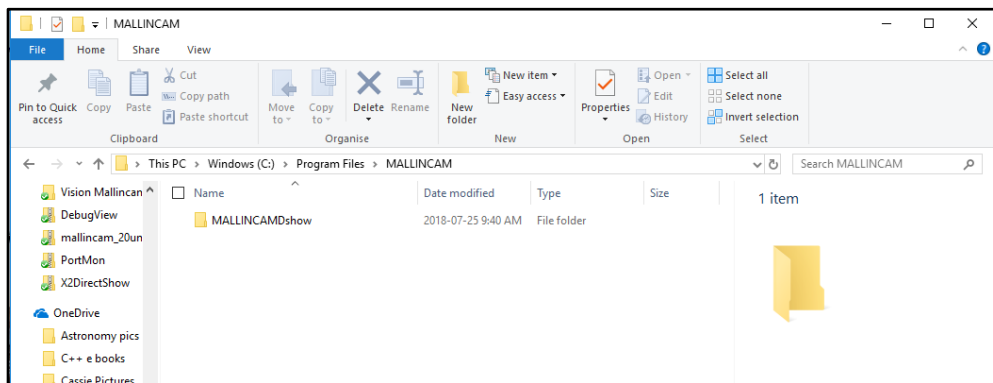
- With the folder still open, just **Click** on the word **MALLINCAMSKY** located in the folder address (see above image). This will take us back one folder.



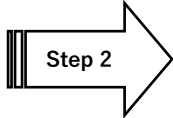
- We want to run the program **uninst**. So, **Double-Click** on the program name **uninst** and follow the instructions as Windows uninstalls MallincamSky.



Once MallincamSky is uninstalled, Windows will take you back to the **MALLINCAM** folder. This Folder may be empty, or if you have also installed the **Mallincam DirectShow** drivers you will see a folder named **MALLINCAMDshow** in the window.



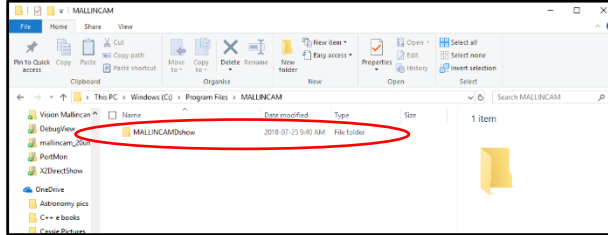
If you did not install the **DirectShow** drivers then jump to **Step 3**, else follow **Step 2** to uninstall the DirectShow drivers.



Step 2

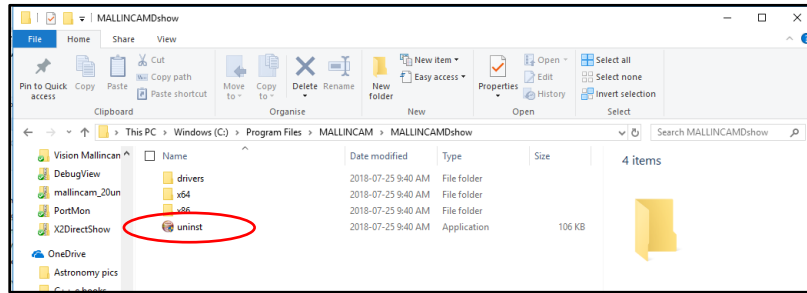
**Uninstall SkyRaider DirectShow Drivers**

Continuing from **Step 1**, you should have the **MALLINCAM** folder Windows open with the only file folder named **MALLINCAMDshow** displayed.

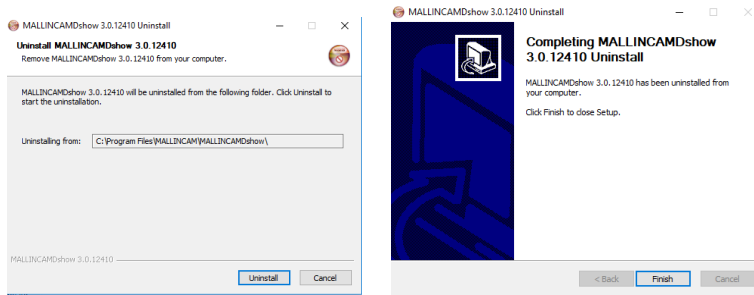


- **Double-Click** on the folder name to open it up.

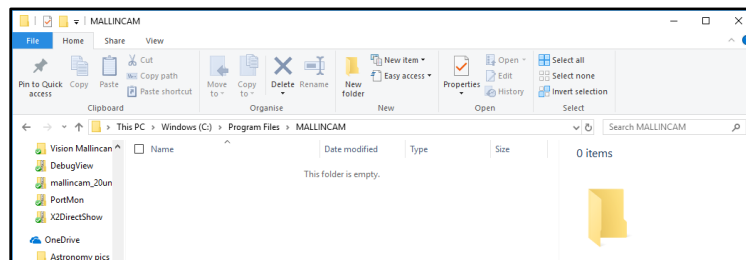
Window will then open-up the **MALLINCAMDshow** folder displaying its contents.



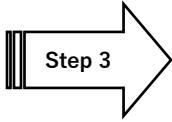
- Again, there is a program named **uninst**, **Double-Click** on the **uninst** program name and follow instructions to uninstall the DirectShow drivers.



Once the DirectShow drivers have been uninstalled, Windows will take you back to the **MALLINCAM** folder to show you that it is empty.

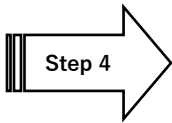
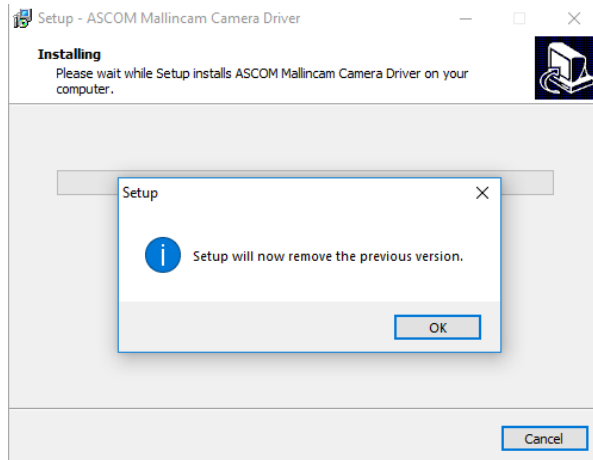


If you did not install the ASCOM drivers, then jump to **STEP 4**.



### Uninstall SkyRaider ASCOM Drivers

This step is extremely easy as **ASCOM** will automatically uninstall the previous drivers when it installs the latest drivers, so just follow the instructions above in **Section 7** of the User Manual on installing ASCOM drivers.



### Finish the Uninstalling Procedure

- This is an especially crucial step as it clears out the Windows registries. Reboot your computer via the **restart** option.

Now, if you haven't already done so, **download** and **install** the latest version of **MallincamSky**, the **DirectShow**, and the **ASCOM** drives at [www.mallincam.net](http://www.mallincam.net). (Note: you want the latest version)

• SkyRaider Series MALLINCAMSKY Software-Drivers, Windows, Mac (Lite), Linux, ASCOM package, DSHOW for All SkyRaider Cameras. Ver. 3.7.12128.20180614 [Click Here](#)



Do not forget to plug back in the SkyRaider camera after installing the software.



Hot-Keys available to MallincamSky

Command	Location	Function
<b>Ctrl-SCROLL WHEEL</b>	Main Window	Zoom IN/OUT
<b>Ctrl-A</b>	Main Window	Selects currently displayed Image
<b>Ctrl-B</b>	Main Window	Opens Browse Window
<b>Ctrl-C</b>	Main Window	Copies Selected image (see Ctrl-A or Image Select) to Windows Clipboard
<b>Ctrl-D</b>	Main Window	De-deselects currently displayed image (see Ctrl-A or Image Select)
<b>Ctrl-H</b>	Non-Live Image Window Tab	Opens Histogram Window
<b>Ctrl-I</b>	Main Window	Opens Image Folder
<b>Ctrl-O</b>	Main Window	Opens Image
<b>Ctrl-P</b>	Main Window	Opens Preference Window
<b>Ctrl-R</b>	Main Window	Opens Record Folder
<b>Ctrl-S</b>	Main Window	Opens Save As Window
<b>Ctrl-T</b>	Main Window	Opens Thumbnail Display Window
<b>Ctrl-V</b>	Other Software	Saves currently copied image (see Ctrl-C)
<b>Ctrl-W</b>	Main Window	Closes Current Window
<b>Ctrl-X</b>	Other Software	Removes currently copied image
<b>Ctrl-Num(*)</b>	Main Window	Image Size to Best Fit
<b>Ctrl-Num(/)</b>	Main Window	Image Size to Actual
<b>Ctrl-Num(-)</b>	Main Window	Decrease Image Size
<b>Ctrl-Num(+)</b>	Main Window	Increase Image Size
<b>Ctrl-Num(4)</b>	Main Window	Set Image Size to 25%
<b>Ctrl-Num(5)</b>	Main Window	Set Image Size to 20%
<b>Ctrl-Num(2)</b>	Main Window	Set Image Size to 50%
<b>Ctrl-Num(3)</b>	Main Window	Set image Size to 33%
<b>Ctrl-Num(0)</b>	Main Window	Set Image Size to Best Fit
<b>Ctrl-Shift-B</b>	Static Image Window	Set to Binary
<b>Ctrl-Shift-C</b>	Static Image Window	Crop Image after using Image Select
<b>Ctrl-Shift-I</b>	Static Image Window	Opens Image Enhancements Filters Window
<b>Ctrl-Shift-M</b>	Static Image Window	Opens (Hidden) Measurement Window
<b>Ctrl-Shift-Q</b>	Static Image Window	Opens (Hidden) Histogram Equalization Window
<b>Ctrl-Shift-R</b>	Static Image Window	Set Image Range
<b>Ctrl-shift-T</b>	Static Image Window	Starts/Stops Stitch Process
<b>F1</b>	Main Window	Opens up Generic Help Manual
<b>F5</b>	Browse Window	Refresh
<b>F6</b>	Main Window	Makes Video Window Active
<b>F7</b>	Main Window	Activates/Deactivates Auto Capture Sequence
<b>F8</b>	Main Window	Performs Image Capture
<b>F9</b>	Main Window	Starts/Stops Video Recording of Image
<b>F10</b>	Main Window	Starts/Stops Batch Record Function
<b>Esc</b>	Main Window	Enables/Disables Video image being Full Screen
<b>Delete</b>	Folders	Deletes Selected File
<b>Pause</b>	ST4 Test	Starts/Stops guiding process





## First Aid for the SkyRaider Series



### When I click on the SkyRaider camera from the Camera list, a message pops up saying Failed to Start: SkyRaider

There is an issue establishing full-time communications with the camera. This can occur for a variety of reasons but the most common one is the cable is too long for the USB port on that specific computer to establish the correct timing protocol. This is more so with USB 3.0 devices.

**Recommended solution:** if you need to use a longer length USB 3.0 cable for the DS432C TEC, then there are two options:

- Connect a **powered USB 3.0 hub** to the computer and connect the USB cable between the hub and the SkyRaider camera.
- Connect an active (not passive) USB 3.0 extension cable between the camera and the included USB 3.0 cable. Something along the lines of the Tripp-Lite USB 3.0 SuperSpeed Active Extension Repeater Cable



### When I try to connect I receive message “Catastrophic failure (Exception from HRESULT:0x8000FFF (E\_UNEXPECTED))”

This message indicates that something has blocked or overwritten the driver. Installing another driver or even a major Windows update has played havoc with the original SkyRaider Drivers.

**Recommended Solution:** Uninstall the current driver through the **Control Panel** (or if you cannot find it in the **Control Panel** check out the **c:/PROGRAM FILES/MALLINCAM/MALLINCAMSKY** folder, there is a program called **uninst**. **Double-Click** on **uninst** to uninstall MallincamSky and its drivers).

Once uninstalled, reboot your computer, then reinstall MallincamSky again. This should fix the issue.



### All I see is a White Image

**Recommended Solution:** Move **Gain** to the extreme Left (1). Ensure automatic exposure is off. Make sure you are in Video Mode. Move exposure to minimal value say 10 ms. Now slowly cover the telescope to see if image darkens up to black as you completely cover up the telescope. If this occurs, then SkyRaider is working properly so you need to check your telescope and focus setup.



### The computer keeps beeping when I plug in the USB 3.0 cable

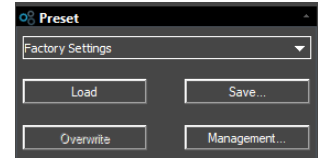
**Recommended Solution:** The computer is not providing enough power from the USB 3.0 port for the camera’s transmission. Inset a powered USB 3.0 hub between the computer and the camera.



**MallincamSky acts Strange After Update**

**Recommended Solution:** Reset Mallincam Sky to Default Factory Settings

Go to **Preset** and **Click** on the **Load** Button.



**How do I Optimize my Computer?**

**Recommended Solution:** Optimizing your windows computer sometime is a never-ending process but visit the website:

<https://www.youtube.com/watch?v=Hdb4iybN8gg>

for some great suggestions on how to optimize your computer.

To summarize as per the research done by **Doug Murphy**

**Add as much RAM as you can into your system.**

**Settings/System/Privacy Settings**

- General: all off
- Location: all off
- Camera: all off
- Microphone: yes (for messaging, voice recorder)
- Notifications: off
- Speech: ignore
- Account info: on
- Contacts: off
- Calendar: off
- Call history: off
- Email: on
- Tasks: off
- Messaging: off
- Radios: on (for Bluetooth)
- Feedback: basic/off/never

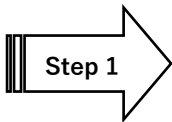
Background apps leave on alarms and clock, photos, settings, sticky notes, voice recorder (need for broadcasting)



**Stacking is going terribly slow or Stops completely?**

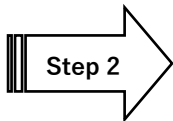
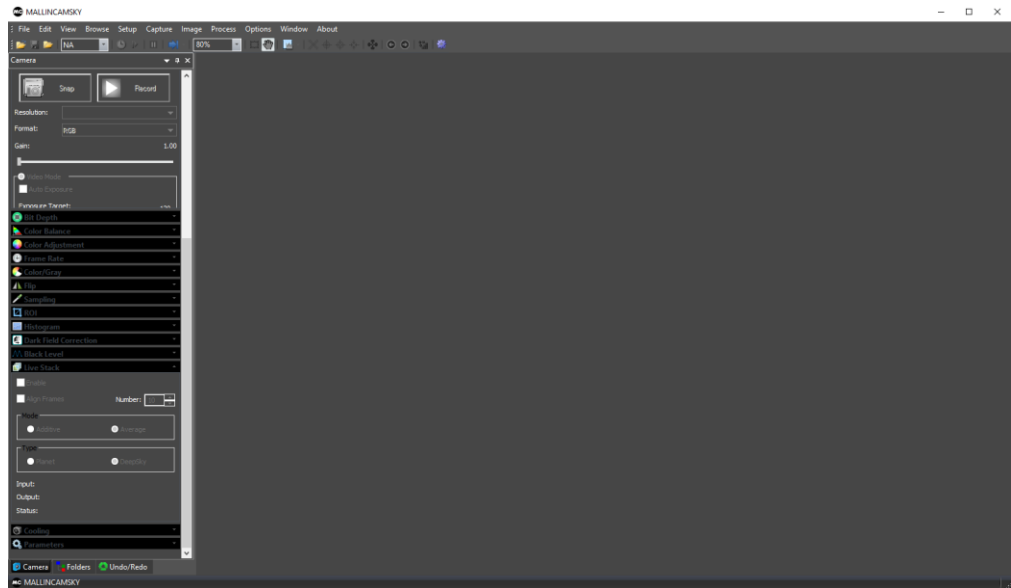
The reason for the slowing or freezing of the stacking process is not completely understood, but it is encountered by many processes that task the **usb** and **video processes** of computers. This problem is experienced by many video gamers and the solution that resolves this problem is to select only 1 or 2 of the CPUs running the program. The work around, is to tell MallincamSky to use only 1 processor rather than all of them.

**Recommended Solution:**



Step 1

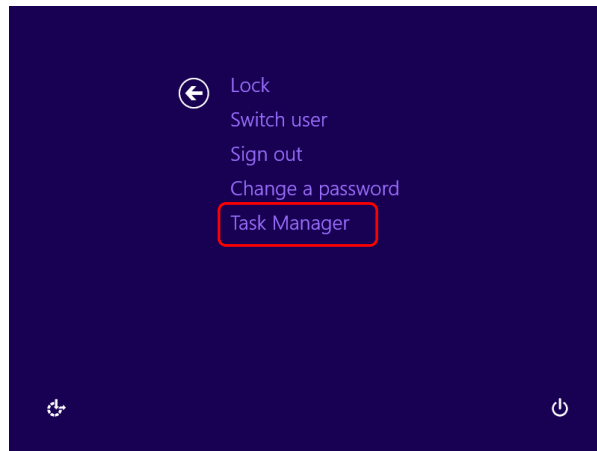
**Start MallincamSky**

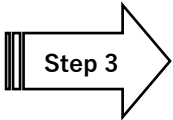


Step 2

In this Step we want to activate the **Task Manger**. There are a variety of ways to perform this task, but I find that the **CTRL-ALT-DEL** method is the fastest.

Press and Hold the **CTRL-ALT-DEL** buttons at the same time to pop-up the Control Window.



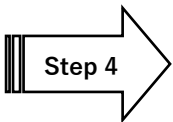


Step 3

Using your mouse, Choose **Task Manager** from the list.

This will open up the task **Manager Window**.

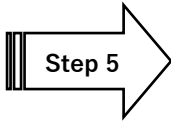
Name	Type	Status	PID	7% CPU	61% Memory
Service Host: Local System (Network Restricted) (19)	Windows process		500	2.2%	111.5 MB
Norton Security with Backup	Background process		4408	1.9%	40.9 MB
Windows Explorer	Windows process		65796	1.0%	33.0 MB
Desktop Window Manager	Windows process		33068	0.7%	41.7 MB
Uninstall Programs (32 bit)	Background process		60756	0.6%	1.0 MB
Task Manager	App		51176	0.6%	14.4 MB
Performance Monitor (32 bit)	Background process		67676	0.3%	7.3 MB
System	Windows process		4	0.2%	0.1 MB
Windows Audio Device Graph Isolation	Background process		18420	0.1%	4.7 MB
mallingcamsky	App		74868	0.1%	13.1 MB
Snipping Tool	App		72244	0.1%	2.9 MB
Google Chrome	App		73928	0%	106.3 MB
Service Host: Local Service (Peer Networking) (3)	Windows process		4184	0%	1.9 MB
UninstallerMonitor (32 bit)	Background process		67864	0%	1.8 MB
Touch Keyboard and Handwriting Panel	Background process		25344	0%	0.4 MB
Client Server Runtime Process	Windows process		56452	0%	1.3 MB
System interrupts	Windows process		-	0%	0 MB
Microsoft Word (32 bit)	App		43768	0%	56.7 MB
JIDhit.Malware.Finhtar.Service (32 bit)	Background process		1212	0%	4.4 MB



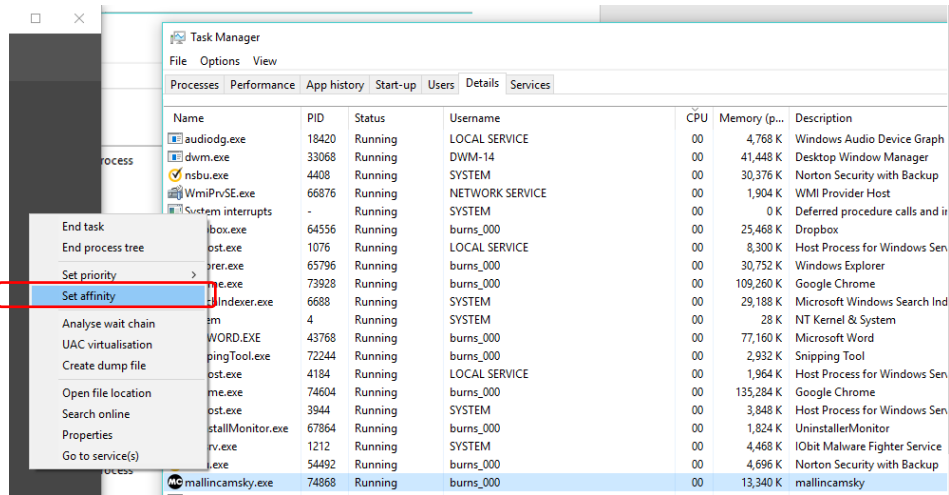
Step 4

Locate and **Right-Click** on **MallingcamSky** Process located in the **Task Manager**. This will open up a small Selection Window, **Click on Go to details** in that selection window. This selects the **Details Tab** in the **Task Manager**.

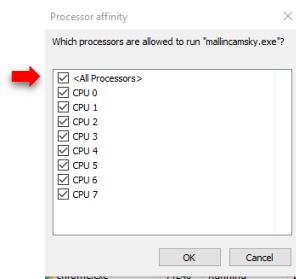
Name	Type	Status	PID	4% CPU	62% Memory
Advanced SystemCare Ultimate Service (32 bit)	Background process		1204	0%	1.6 MB
Snipping Tool	App		72244	0%	2.9 MB
Service Host: Remote Procedure Call (2)	Windows process		388	0%	6.6 MB
Advanced SystemCare Ultimate 10 (32 bit)	Background process		58540	0%	0.6 MB
Google Chrome	Background process		74604	0%	131.8 MB
HP My Display (32 bit)	Background process		66600	0%	1.2 MB
<b>mallingcamsky</b>	App		74868	0%	13.0 MB
Microsoft Word (32 bit)	Background process		6688	0%	28.5 MB
Host Process for Windows Explorer	Background process		67380	0%	1.3 MB
Service Host: Local Service (Network Restricted) (6)	Windows process		1524	0%	5.1 MB
Spooler Service	Background process		2348	0%	3.7 MB
NVIDIA Control Panel	Background process		4236	0%	2.0 MB
Local Security Authority	Windows process		884	0%	4.5 MB
Service Host: Local Service (Network Restricted) (6)	Windows process		1076	0%	8.0 MB
WMI Provider Host	Background process		3024	0%	3.0 MB



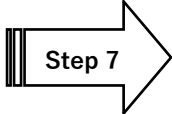
In the **Task Manager Window** locate and **Right-Click** on the **mallincamsky.exe** file and another selection window will appear, choose **Set affinity** from that list.



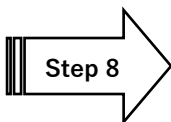
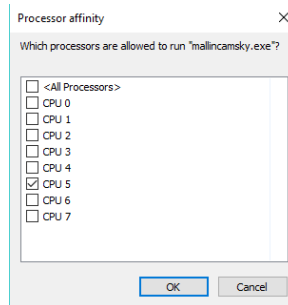
This will pop up the **Processor affinity** window.



Uncheck **<all Processors>**



Then **Check** a processor of choice (I usually select **CPU 5**), then Click **OK** to return to the task manager window.



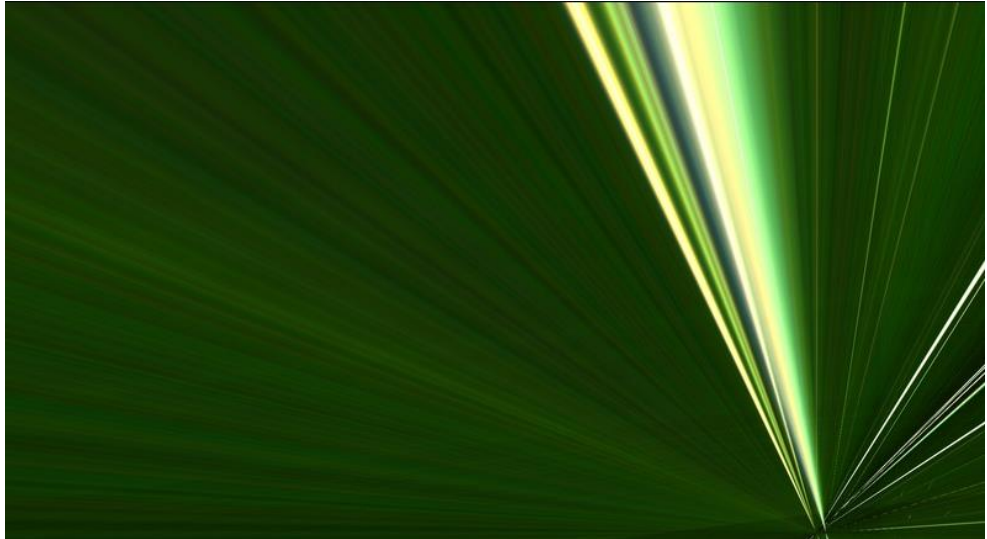
Close the **Task Manager Window**

**Note:** you will have to repeat this every time you restart MallincamSky, as windows does not remember you selecting 1 processor from the **Task Manager**.



### I see a Pink Floyd Kaleidoscope effect on my Screen

This effect has to do with star alignment difficulties when stacking images. You need bright stars to get a successful frame alignment. In other words, increase gain or increase exposure or re-adjust histogram to deliver a brighter image. Also, investigate adjusting the GAMMA and Contrast.



Some users have seen this occur when they use **DeepSky** to align and have had some success by choosing **Planet** rather than DeepSky in the Live Stack **Type** checkbox.



### I get the following message when using Dark: "Failed to import, mismatch"

The **binning** you used to save the **Dark Fields** does not match your **current binning** setting. Just ensure that are the same.



### The SkyRaider is listed as Westbridge or Driver will not Connect

When attempting to use **MallincamSky**, the camera is not available even though it is attached. When checking **Device Manager**, the camera is not listed under the camera section, but appears under **Other devices** as **WestBridge**. The camera is also not listed in the MallincamSky. The application displays a message to connect a device instead.



This issue occurs as a result of a failed USB configuration, typically due to shutting down your **SkyRaider** camera while the update is being applied in the background (unknown to you) or Windows thinks there is a Driver Signature issue. This issue occurs with many USB devices but is loves to occur with video cameras. There are three Steps you can try; each one goes deeper into Windows to help alleviate the issue. Just move through the steps until MallincamSky works with the driver.

#### The solution - Step 1:

- Hold your breath.
- Unplug the SkyRaider
- Uninstall MallincamSky, DirectShow (if installed), ASCOM (if installed).
- REBOOT your computer
- Reinstall MallincamSky (etc.).
- Plug back in your Camera.
- REBOOT your computer
- Check it out
- Breath

### The solution - Step 2:

If **Westbridge** still appears, then repeat, but after unplugging the SkyRaider, follow the following instruction.

Use Google and search “[Using Device Manager to Uninstall Devices and Driver Packages](#)” and following instructions on how to remove the USB device driver.

A good site with **step-by-step** instructions is:

<https://www.addictivetips.com/windows-tips/uninstall-a-usb-device-windows-10/>

### The solution - Step 3:

If removing the drivers did not help, there is an issue with Windows and the driver Signature (the internet is not sure why some computers have this issue and others do not, it may be related to the USB hardware ports used by that particular computer. Anyway, we are just going to tell Windows to not check for the Signature.

This is the most extreme fix and will require you to REBOOT your computer into a Windows configuration Mode, so you can set the Signature setting to ignore.

The following website provides **step-by-step** instructions for you to follow:

Permit Windows (10/11) to not check for driver signatures via:

<https://gearupwindows.com/how-to-disable-driver-signature-enforcement-on-windows-11-10/>





## Explanations on Terms used in MallincamSky



### Dark Field Explanation

The following is the best explanation of what **Dark Field** is, and it comes from the work of **Simon Hanmer**.



### Dark Frame Subtraction

First, take an image with the camera shutter closed or the camera/scope covered under the same conditions of exposure time and temperature as the light frames you are going to capture of your astronomical target. Many astronomers will take ten or more such **Dark Frames** and then combine them into a **Master Dark Frame**, principally for statistical reasons: the more sub-frames, the better quality of master frame.

This will give you a single (master) frame of hot and warm pixels generated in the imaging chip, electronically and thermally, including amplifier glow.

Second, subtract the **Dark Frame** from each of the light frames in order to remove hot and warm pixels and amplifier glow. However, other noise will remain and need to be removed with other manipulations and software. **Note:** a **Dark Frame** is an image file and can be examined.



### Dark Field Correction

**Dark Field** correction is another matter entirely. It does not refer to a single image and the recommended/default 10 frames captured to perform the **Dark Field** correction are not used to generate a master frame – nor are they simply subtracted from the light frames.

Instead, the 10 frames are first used to perform a **running stacking**, analogous to the stacking procedure applied in both the SSI software and the new Universe/SSI software.

**Running Stacking:** the first frame in the series of 10 is recorded in the camera as is. Then the first and second frames in the series of 10 are combined to form a new frame that is also recorded. Then the third frame is combined with the preceding 2 frames to form yet another combined frame that is also recorded ... and so on until you end up with 10 frames in a series that represent 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 combined frames, respectively.

Note that stacked and combined frame #10 represents information derived from all 10 frames.

But hold on ... we are not talking CCD imaging here – this is video. When a CCD chip is activated, it cranks at full blast and requires effective cooling to prevent it from rapidly heating up beyond a user-determined temperature. But video chips work differently: they heat up slowly and progressively. This means that the first frame of the series of 10 was taken at a lower chip temperature than the final one. Therefore, each of the 10 frames records different levels of thermal noise. In other words, when stored in the camera, these 10 combined frames represent a library of information that the camera and software can now choose from and use to CORRECT (note: not « **subtract from** ») the light image that we want to display on our computer screen.

Now, how does this work in practice – and why is it called a **Dark Field** correction?

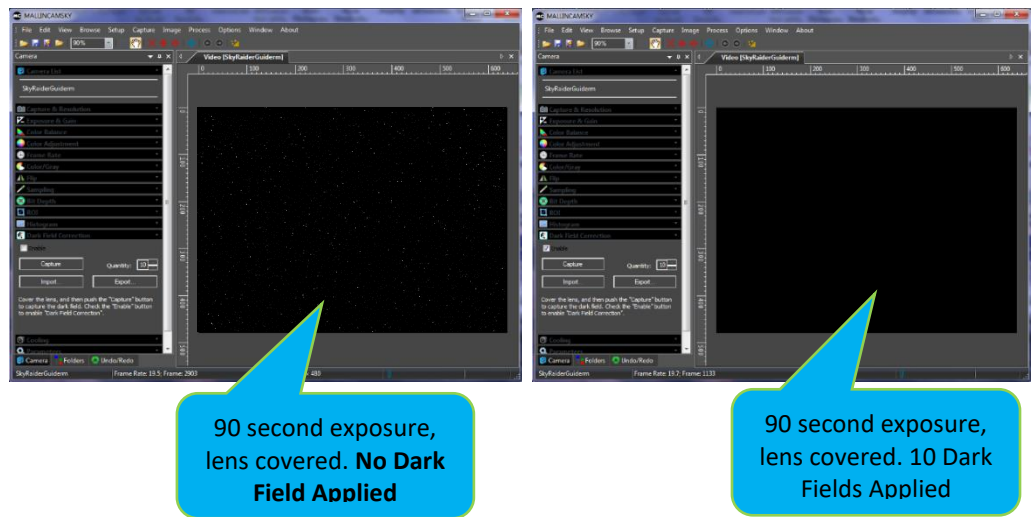
The **Dark Field** correction is prepared by the user at the beginning of an observing session by covering the camera or scope, pre-determining the exposure time and setting the software to automatically take up to 10 images. We all know our equipment and the skies we observe under (or we certainly will with a bit of practice). We also have an idea of what range of filters we might use that night and the effect they have with respect to exposure times. Take this into account when selecting your exposure time for your 10 dark images.

**But remember** this is NOT a **Dark Frame** subtraction – the exposures required for **Dark Frame** subtraction must be almost identical to those used for the light frames of our astro-targets. Not so for **Dark Field** correction. The camera and software in the latter case are not looking for a single FRAME to subtract based on exposure time. They are looking at the 10 combined frames to see which one has the noise level that most closely matches the noise level in the light frame itself. In other words, they are looking for a noise FIELD. The point here is that camera and software will select the appropriate **Dark Field** for the correction, for both shorter and longer light frame exposure times from the same « library ».

In addition, unlike the single frame of a CCD dark frame, the images used for **Dark Field** correction are interlaced combinations of odd and even scan lines. Apparently, this too factors into the fact that this correction removes ALL NOISE, not just hot and warm pixels.

The important point to retain here is that, because of the stacking and combining to form the library of images for the correction procedure, long light exposures do NOT require similarly long exposures for the **Dark Field** correction images. For example, a 2-minute light exposure using a narrow-band h-alpha filter may still only require the user to prepare ten 30 second dark images for the dark field correction. The precise numbers will vary with your equipment and conditions.

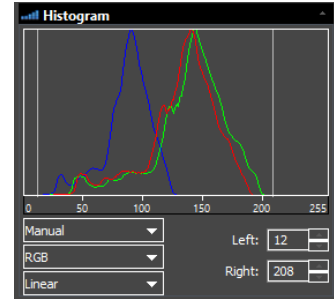
The two screen captures below demonstrate the difference that applying a Dark Field to an image can provide.





**Histogram Explanation**

A **histogram** is a graph that displays the distribution of brightness (luminosity) over the range from the darkest possible (left side) to the brightest possible pixel (right side). When we examine the histogram of a typical deep-sky image, we will notice that the intensity range (the bump) is both narrow and situated toward the left (dark) of the Histogram Window. This bump holds the bulk of the information about our deep-sky image, but there still are other details of the image that are in the Histogram that can be brought out. Our task is to stretch the pixels over a larger part of the graph to increase the dynamic range.

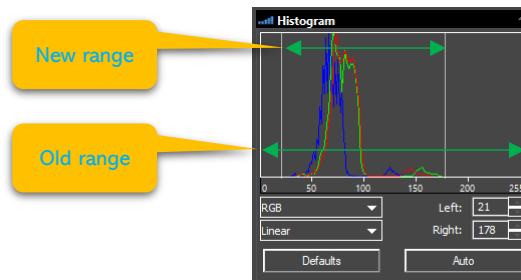


In **MallincamSky**, there are two vertical lines (as well as numerical indicators) that show the Dark (left side, 0 value) and Light (right side, 255 value). This range of 0 to 255 represents the whole window range you get to play with. In a daylight image, our bump may use most of that range, but with deep-sky objects, we will notice a narrower bump hanging at the left side of the Window. This is because we have very few bright pixels and a whole bunch of dark pixels (after all we are shooting at night).

What we want to do is stretch the bump by reducing the range where bright pixels lay, after all there are very few of them where the brightest ones in our image are just hanging to the right of our bump. So, if we tell the Histogram to forget about including the brightest possible values (which we have none of) and start displaying the Histogram at the brightness of about where the stars are. We can stretch the remaining data from the dark to the new bright marker.

That is what moving the Right slider or reducing the right value from 255 to a smaller number does. This will brighten up our image because we are removing the range of brightest possible pixels (which we have none of) and telling MallincamSky to display (stretch) our imaging to only include the new range.

Likewise, by moving the Left slider or increasing the left value from 0 to a larger number, will darken our image because we are removing the range of very dark pixels and displaying our new range (which still contains darks, but very few brights).



The Brighter our object the more to the right the bump will be located in our Histogram. So, if you increase the **gain**, **gamma**, or **exposure** the bump will also move to the right. This requires you to adjust the **Left** and **Right** markers to ensure you do not clip (remove), parts of the image that are outside the range.



So, what does this mean in English? As you adjust the **Left** and **Right** markers, you remove data that is not relevant to your image. The remaining data is then readjusted (stretched), to bring out more details of dimmer aspects of the image that was overridden by the previous settings. We have improved the dynamic range of our image, thus pulling out the fainter aspects of the Deep Sky Object.



Before Adjustments



After Adjustments



## Camera Assisted Astronomy vs Electronic Assisted Astronomy vs Live Video Imaging



### Electronic Assisted Astronomy

Camera Assisted Astronomy (CAA) has many definitions, but for the purpose of **Mallincammers**, it will be synonymous with Astrophotography using the Mallincam. In CAA, you will obtain the best image you can. You will create a set of Dark Frames (not Dark Fields), Flat Frames, Bias Frame, and even Dark Flats. All images will be saved in a non-compressed data format (such as FITS or TIFF). These images will then be combined (calibrated) using specialized software (MAXIM/DL, AstroArt, PixInsight, DeepSKy Stacker, etc, ...), and then finally enhanced, color adjusted, and tweaked, again using specialize software (Photoshop, etc.).



### Electronic Assisted Astronomy

Electronic Assisted Astronomy (EAA) has many definitions, but for the purpose of **Mallincammers**, it will be synonymous with using any electronics in the process of acquiring an object (does not require any camera). Using a mount with Goto capabilities with a scope and eyepieces is considered EAA.



### Live Video Imaging

This is when the video images and its adjustments, enhancements, stacking, Dark Fields, and Flat Fields, are all done live on the screen. The final image is live and can be saved, recorded, and broadcasted as needed. It is this process that the Mallincam SkyRaider cameras are designed for as their purpose, and Live Video Imaging is the objective of this User Guide.



### Can the Mallincam SkyRaider Camera do CAA

The answer is **yes**, but the process will be totally different than that of Live Video Imaging.

First, you will not be using **Dark Fields** or **Flat Fields** since you will be taking **Dark Frames** and **Flat Frames**. Images saved in RAW format will not include any of the **Dark Fields** or **Flat Fields** even if you have applied them to your image.



### Process



Take **Flats Frames** and save them in either RAW (which is a FITS format), or RGB (use FITS or TIFF) format. **Flat Frames** are actual images which you can examine.



Take **Bias Frames** and save them in the same format as the above Flats.



Take **Dark Frames** and save them in the same format as the above Flats.



Take your **Light Images** and save them in the same format as the above Flats.



Now, **calibrate** these images with your favorite astro-image processing software, then enhance using your astronomy enhancing software.

Most CAA imagers will be using monochrome cameras and will require color filters and the taking and organizing these filtered images is in the wheelhouse of specialized imaging software. MallincamSky can perform these tasks, but you will be in the driver’s seat every step of the way. Therefore, Mallincam SkyRaider cameras have an ASCOM driver so these specialized astro-imaging software packages can control the SkyRaider camera.

 Lossless File Formats used by MallincamSky

 **FITS (Flexible Image Transport System)**

FITS is an open standard defining a digital file format for astronomical images and contains a Metadata header. This Metadata header provides keyword information that includes particulars about the camera and its settings used in taking that image. Your favorite astro-imaging software can read and use this Metadata for its processing tasks. You may want to add a FILTER field in the Metadata to indicate what filter you used with this image.

```

image #1
SIMPLE = T / file does conform to FITS standard
BITPIX = 16 / number of bits per data pixel
NAXIS = 2 / number of data axes
NAXIS1 = 720 / length of data axis 1
NAXIS2 = 540 / length of data axis 2
EXTEND = T / FITS dataset may contain extensions
COMMENT FITS (Flexible Image Transport System) format is defined in 'Astronomy
COMMENT and Astrophysics', volume 376, page 359; bibcode: 2001AAS...376..359H
BZERO = 32768 / offset data range to that of unsigned short
BSCALE = 1 / default scaling factor
DATE-OBS= '2020-05-29T15:15:40' / date of the observation
DATE = '2020-05-29T15:15:40' / date of file creation
EXPTIME = 0.018594 / Exposure time in seconds
EXPOSURE= 0.018594 / Exposure time in seconds
GAIN = 100 / Analog Gain
XPINX2 = 6.9 / Pixel Width in microns
YPINX2 = 6.9 / Pixel Height in microns
XBINNING= 1 / Binning level along the X-axis
YBINNING= 1 / Binning level along the Y-axis
INSTRUME= 'SkyRaiderDS287C' / Camera Model
OBJECT = '1r filter' / name of observed object
CCD-TEMP= 32.2 / actual measured sensor temperature in degrees C
IMAGETYP= 'Light Frame' / type of image
CREATOR = 'MALLINCAMSKY V4.8.15988.20191124' / the name of the software task the
PROGRAM = 'MALLINCAMSKY V4.8.15988.20191124' / the name of the software task the
SMCREATE= 'MALLINCAMSKY V4.8.15988.20191124' / string indicating the software us
FILTER = '1r out '
COLORPR= 'RGB' / Bayer mosaic
    
```

FITS is in a bayered format for color cameras (so it will look like a checkered Black and White images), so think of it as one image hiding 3 or 4 other images inside itself, just waiting to be bebayered and combined to produce a color image (which is an art in itself).

 **TIFF (Tagged Image File Format)**

TIFF files are lossless (or lossy) formats that also contain header information (not as much detail as in FITS). Color images can be saved in TIFF format without being bayered.

```

SIMPLE = T
BITPIX = 16
NAXIS = 3
NAXIS1 = 720
NAXIS2 = 540
NAXIS3 = 3
COMMENT SkyRaiderDS287C
EXPOSURE= 0.050
COMMENT TP18071815544528E8F36358F24ACFD
DATE-OBS= '2020-05-29T17:21:32'
COMMENT C:\Users\burns\Desktop\test 1 rgb.tif
END
    
```

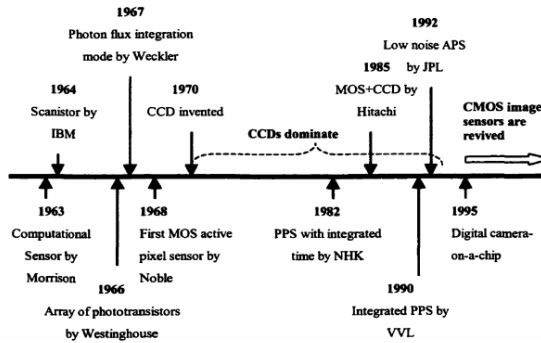


## An Introduction to the Stacking Algorithm



### Historic Review

In the 1970's a major breakthrough took place in the world of imaging, the CCD was invented. This technology started slowly to replace film as the medium for taking images of the night sky. CCDs are still the medium of choice in the professional field of astronomical imaging. But in the late 1990's advancements in CMOS technologies have started another revolution, CMOS optical sensors. Let the battle begin.



Simply both CMOS and CCD's do the same thing. They capture and convert photons (light) into an electrical signal that can be used by a computer. How they do it is what distinguished CCDs from CMOSs.

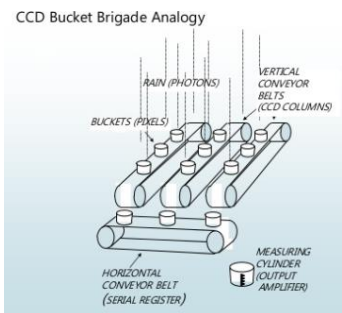


### CCD (Charge Coupled Device)

A CCD uses a thin silicon wafer, this wafer (or chip) is divided into thousands, or millions of tiny light sensitive squares (or rectangles) called photosites. Each of these photosites corresponds to an individual pixel in the final image.

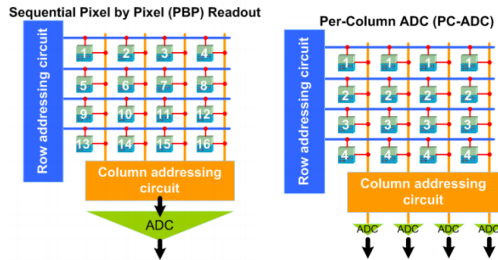
Think of the photosite (pixel) as a capacitor that converts the photons (light) into electric energy which it stores. When the CCD is finished collecting the photons, the charge is transferred downwards along the columns. Hence, during the CCD clocking operation, rows are transferred downwards to the final row (the readout register) which is used to transfer the charge in each pixel out of the CCD so it can be measured. In the Horizontal read-out register the charge is transferred in the horizontal direction, along the readout register. When a charge has been collected and is to be read-out it is transferred one charge packet at a time to an output amplifier where the charge is converted to a voltage.

*See Bucket Brigade image below for a visualization of the process.*



⇒ CMOS (Complementary Metal Oxide Semiconductor)

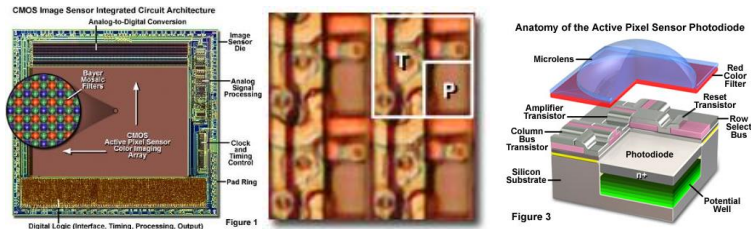
Unlike a CCD, a CMOS sensor's approach the converting of light photons into a voltage signal by having each pixel do its own charge to voltage conversion and amplification rather than shuffle the electrons off the sensor and perform the charge to voltage conversion and amplification there. Thus, the CMOS sensor, each pixel site is essentially a photodiode and three transistors, performing the functions of resetting or activating the pixel, amplification, and charge conversion (Analog to Digital Converter, ADC). This provides both high speed for CMOS sensors, but also low sensitivity (as well as high fixed-pattern noise due to fabrication inconsistencies in the multiple charge to voltage conversion circuits). CMOS sensors can be designed to read each pixel individually or read a whole column simultaneously.



In simple terms, the Photosites in a CCD are passive (they do not work) they just move the information along to a final Output Amplifier, while the photo-sites in a CMOS sensor are active (they do work), they amplify and can perform local processing.

⇒ CMOS Imaging

When the light hits the sensor of the Mallincam camera (remember the camera is configured as a Video camera) it is read and processed from each pixel (P). It sends all of the pixel's data (which we will call a FIELD (to distinguish it from an image FRAME) to another processing locations via the Transport System (T) where it is temporarily stored, and more logic and processing algorithms can be performed on the elements of the FIELD. This is where the proprietary work is performed by the Mallincam Camera including the ability to apply both analog and digital Gain before the FILED is sent to the computer. Note: it is these support circuit elements around the CMOS Pixel array that can cause AMP GLOW (see image below). Modern CMOS manufacturers are working on moving these support circuits away from the Pixel sensor array to reduce or eliminate Amp Glow noise.



To assist you understanding FIELDS and FRAMES. It takes a specific number (depending upon camera sensor) of FIELDS in 1/30th of a second to make up a FRAME. If the required number of FIELDS do not make it from the Camera to the computer software (either too much processing is being performed by the camera or computer, or FIELDS are being requested too fast by the USB port) then the FRAME will not be created. If the software fails to display an image (FRAME), then slow down the FIELD retrieval request rate of the USB by moving the



Frame Rate slider to the left (slows it down). It is this issue, of the computer software not having enough time to correctly process the information, that causes the **Pink Floyd** effect when Live Stacking.



### What is happening when you Live Stack



#### Average

When this control is activated from the software, the processing takes place on the FIELD data which is located in the Memory and Logic circuit on the CMOS chip. For example, for any given exposure time, many FIELDS of data are stored in the Memory and Logic Circuits of the Camera. Now if you enter 5 as the Number in Live Stack, then the Logic and Processing algorithms will continuously combine (average) 5 sets of FIELD data to create a MASTER FIELD in the Camera before sending this MASTER FIELD data to the computer software. The computer software will continuously incorporate (via a proprietary algorithm) these received MASTER FIELDS into the previous image FRAME's data (the required number of MASTER FIELDS must be met to create the FRAME) which will be displayed on the computer. The **Input**, **Output**, and **Status** indicators will indicate the process of the stacking. The averaging will be continuous with every new exposure incorporating a new MASTER FIELD. The initial output will provide a very noticeable increase of resolution as outliers and noise is averaged out. But, after many Outputs, the improvement return that you obtain in the image is diminished with the inclusion of more MASTER FIELDS (you may have incorporated 100's of previous MASTER FIELDS). If you do not see any more image improvement, it is time to take a Snapshot of the image.

First, you will notice a distinct delay after initially enabling **Live Stacking**, even after the camera has taken its user-determined exposure. In part, this delay reflects the fact that the camera circuitry is performing the compilation of the FIELDS (let us say 5 for our example). It must determine whether the data in the 5 FIELDS is of sufficient quality for the successful compilation of a MASTER FIELD. Remember, to analyze a group of fields, the CMOS sensor must evaluate the values at every location in every FIELD in the MASTER FIELD, it must even investigate every dark pixel, even if the pixel does not say anything particularly interesting about that location in the FIELD. Therefore, we want to keep the value in the Number box at a low value (e.g., 5) to minimize the amount of FIELD processing required by the camera.

When a MASTER FIELD has been successfully compiled within the camera and downloaded to the computer the **Input number** is incremented to 1. Note that the **Output number** is still 0, and the **Status** indicator remains blank. Note that the MASTER FIELD is also stored in the camera memory as a reference group for comparison with successive compiled groups of 5 fields during the ongoing Live Stacking run.

The MallincamSky software in the computer will attempt to incorporate the downloaded MASTER FIELD with the original noisy image that was visible on the computer's screen prior to enabling Live Stacking. Incorporating here means averaging and maybe aligning (if enabled) the MASTER FIELD with the original noisy image. Note, this involves processing FRAMES or images for display purposes. The alignment process does use stars (if Deep Sky is selected), or larger areas (if Planetary is selected) in the FRAME, which is quite different from the processing of FIELDS in the camera. This initial computer-based processing accounts for the other part of the initial delay perceived by the user at the beginning of Live Stacking. If MallincamSky determines that alignment and averaging was successful, it will now place the result in the Output Stack. This constitutes an output, and the **Output number** is incremented

from 0 to 1, and the **Status** indicator is set to **OK**. Sometimes the computer will reject the attempted first Output (maybe not enough good stars for an alignment) and will wait for the camera to download a fresh MASTER FIELD, hopefully with better quality data. In this case, the **Input Number** will continue to increment until the computer software accepts the first Output and sets the **Output Number** to 1. A new image that represents the processed Stack is then sent to the computer screen where the user will note a significant decrease in the random noise. This process is then repeated until you disable the Live Stacking.

The larger the value entered in the **Number Box**, the more processing that must be performed by the camera to create MASTER FIELDS. This can cause a processing overload as the camera and software are trying to work together to continuously create Live Video Frames (software continuously saying Feed me data (via USB frame rate setting), and the camera processing and dumping the data) that can be displayed on the screen. So, we recommend a small number between 4 and 10, so that both the computer and camera are happy. Since the incorporating of new MASTER FIELDS is continuous, you will average hundreds of MASTER FIELDS in your image and after a while achieve the same result of having entered a large value in the **Number Box**, but without the CPU overhead.

Note: If you are enabling alignment of Deep Sky Objects (which uses Stars in the alignment process), if there is too much bouncing around of the image (either due to mount stability, weather conditions, Sky conditions, or image rotation due to an Alt-Az setup), the computer algorithms may have difficulty aligning and you could obtain the **Pink Floyd** effect. You can observe this phenomenon, by tapping your mount while imaging in Deep Sky.



#### Additive

When this control is activated from the software, the processing takes place on the FIELD data which is located in the Memory and Logic circuit on the CMOS chip. For example, for any given exposure time, many FIELDS of data are stored in the Memory and Logic Circuits of the Camera. Now if you enter 5 as the Number in Live Stack, then the Logic and Processing algorithms will continuously combine (add) 5 sets of FIELD data to create a MASTER FIELD in the Camera before sending this MASTER FIELD data to the computer software. The computer software will continuously incorporate (via a proprietary algorithm) these received MASTER FIELDS into the previous image FRAME's data (the required number of MASTER FIELDS must be met to create the FRAME) which will be displayed on the computer. The **Input**, **Output**, and **Status** indicators will indicate the process of the stacking. The initial outputs will provide a very noticeable increase of brightness until the selected number in the Live Stack is reached (5 in this example). But, when the **Output Number** exceeds the Live Stack number, you will notice no increase in brightness (unless the brightness of the object changes during the rolling stacking process) so it's time to take a Snapshot of the image.

First, you will notice a distinct delay after initially enabling **Live Stacking**, even after the camera has taken its user-determined exposure. In part, this delay reflects the fact that the camera circuitry is performing the compilation of the FIELDS (let us say 5 for our example). It must determine whether the data in the 5 FIELDS is of sufficient quality for the successful compilation of a MASTER FIELD. Remember, to analyze a group of fields, the CMOS sensor must evaluate the values at every location in every FIELD in the MASTER FIELD, it must even investigate every dark pixel, even if the pixel doesn't say anything particularly interesting about that location in the FIELD. Therefore, we want to keep the value in the **Number box** at a low value (e.g., 5) to minimize the amount of FIELD processing required by the camera.

When a MASTER FIELD has been successfully compiled within the camera and download to the computer the **Input number** is incremented to 1. Note that the **Output number** is still 0, and the **Status** indicator remains blank. Note that the MASTER FIELD is also stored in the camera memory as a reference group for comparison with successive compiled groups of 5 fields during the ongoing Live Stacking run.

The MallincamSky software in the computer will attempt to incorporate the downloaded MASTER FIELD with the original image that was visible on the computer's screen prior to enabling **Live Stacking**. Incorporating here means adding and maybe aligning (if enabled) the MASTER FIELD with the original image. Note, this involves processing FRAMES or images for display purposes. The alignment process does use stars (if Deep Sky is selected), or larger areas (if Planetary is selected) in the FRAME, which is quite different from the processing of FIELDS in the camera. This initial computer-based processing accounts for the other part of the initial delay perceived by the user at the beginning of Live Stacking. If MallincamSky determines that alignment and adding was successful, it will now place the result in the Output Stack. This constitutes an output, and the **Output number** is incremented from 0 to 1, and the **Status** indicator is set to **OK**. Sometimes the computer will reject the attempted first Output (maybe not enough good stars for an alignment) and will wait for the camera to download a fresh MASTER FIELD, hopefully with better quality data. In this case, the **Input Number** will continue to increment until the computer software accepts the first Output and sets the Output Number to 1. A new image that represents the processed Stack is then sent to the computer screen where the user will note a significant increase in the brightness. This process is then repeated until you disable the Live Stacking.

The larger the value entered in the **Number Box**, the more processing that must be performed by the camera to create MASTER FIELDSs. This can cause a processing overload as the camera and software are trying to work together to continuously create Live Video Frames (software continuously saying Feed me data (via USB frame rate setting), and the camera processing and dumping the data) that can be displayed on the screen. So, we recommend a small number between 5 and 10, so that both the computer and camera are happy, plus the object that you are imaging does not become too over exposed. Since the incorporating of new MASTER FIELDS is a continuous rolling loop, you will continuously add the **Live Stack** number of MASTER FIELDS to create your image and after a while, achieve the same result as having entered a large value in the **Exposure Time** control.

Note: If you are enabling alignment of Deep Sky Objects (which uses Stars in the alignment process), if there is too much bouncing around of the image (either due to mount stability, weather conditions, Sky conditions, or image rotation due to an Alt-Az setup), the computer algorithms may have difficulty aligning and you could obtain the **Pink Floyd** effect. You can observe this phenomenon, by tapping your mount while imaging in Deep Sky.



## Setting up to Broadcast on LiveSkies



### Introduction

I found that when I first started connecting to **LiveSkies** things started happening too fast for me to keep track of everything at once. So, pre-planning was the most crucial step for me. I found that by doing test runs in the comfort of my house allowed me to develop my techniques that work for the equipment and software that I use. Below are the results and steps that I use to broadcast on LiveSkies, feel free to follow them and/or make modification as you deem as necessary.



Computer real estate will be your nemesis. So, depending upon the size of the monitor (laptop), the number of screens that you are using, then number of software programs that you are simultaneously using, will dictate how you will manage your windows. I will describe how I have organized my windows under a variety of situations (1 computer, 1 computer with 2 monitors, which software packages am I using, and what am I trying to do this session). Remember, it is all about having fun, and **time** and **patience** are your best friends (not to mention all the guys and gals, and the Google – MallinCam site:

<https://groups.io/g/MallinCam/topics>

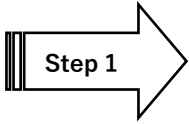
One of the most important decisions you will need to make with broadcasting the image of the SKYRAIDER is what Video capture software are you going to use. Some simple suggestions:

Currently MallincamSky is not capable of modifying the Video Image and having that Video Image be directly captured by LiveSkies. So, if you want to use all the features of the MallincamSky software and broadcast those results, as well as save screen shots and videos of your images, then we need another program to capture MallincamSky's output and have the output from that program directly linked to a Liveskies Channel.

You currently have many choices for that screen capture program: Splitcam, Manycam, WebcamMax, OBS Studio, StreamLabs OBS, .... All have about the same features, some of these have versions that will cost you, but all have a version that is free (reduced functions, advertisements, etc.). My current program of choice is Splitcam (Visit [www.mallincam.net](http://www.mallincam.net) software downloads for website address, or Google the software of choice). You will then use Splitcam/OBS along with MallincamSky Software to broadcast the images on NSN.

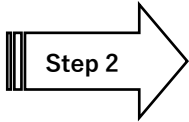
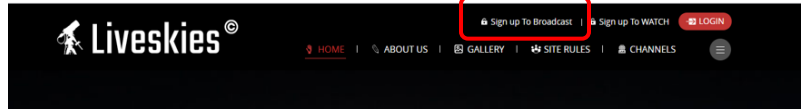
To Broadcast on LiveSkies, you will need to obtain a broadcast account from Rock. Once obtained, you will be able to broadcast, observe other broadcasting channels, and participate in real time discussions.

### Obtaining a Broadcast Account



Step 1

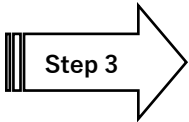
Visit <https://liveskies.org>



Step 2

Click on **Sign up To Broadcast** (located at top right of screen)

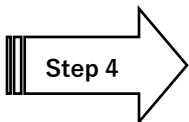
*Remember each channel name will have a unique email address.*



Step 3

Complete the Registration Form

*The Channel Name and Username should be the same with NO SPACES and SPECIAL CHARACTERS in the name*

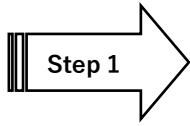


Step 4

Do not forget to check the **agreement Rules** checkbox and then Click on the red **Create Account** button.

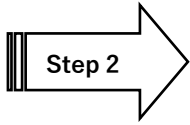
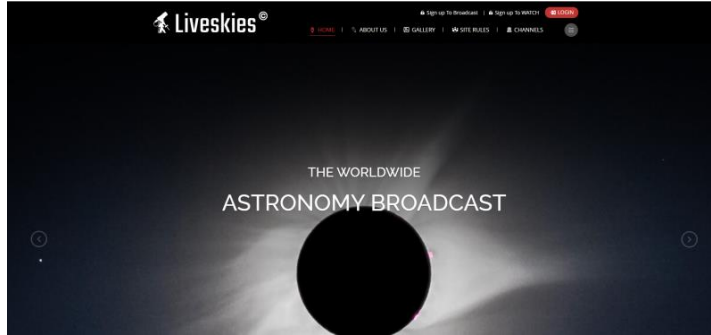
*In a couple of Days, Rock will approve your account. If you try to broadcast prior to approval, Liveskies will inform you that approval is still pending.*

### Logging into Liveskies



Step 1

Visit <https://liveskies.org>

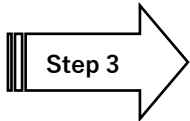
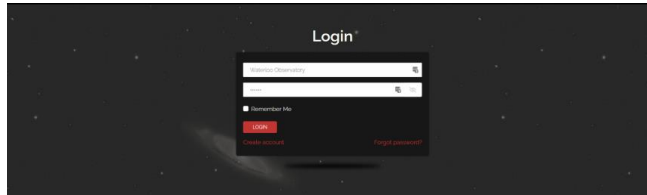


Step 2

Click on the red **Login** button on the upper right of the window.

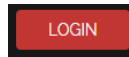


*A login window will pop up*

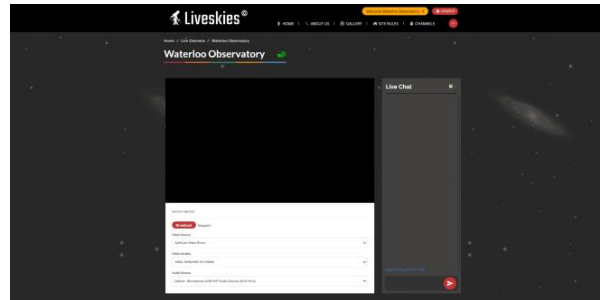


Step 3

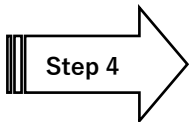
Enter both your **Username** and **Password** and click on the red **Login** button.



*You can have Liveskies remember your credentials.  
When you have successfully logged in, you will be presented with the  
main display and control window.*



*It is from here that you can select your Video source, Resolution, and  
Audio source. Liveskies tries to remember what you used last time  
and will automatically fill this information in for you if it can.*



Step 4

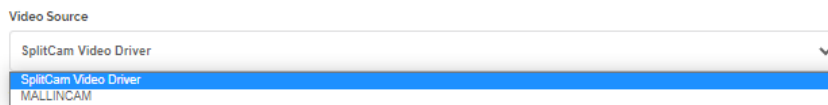
**Video Source**

At this point, determine how you would like to broadcast your live video of MallincamSky. I will go into more detail with two options **SplitCam** and **OBS** in the next section.

I am assuming that you have either **SplitCam** or **OBS** running and displaying the active MallincamSky Window. (See below on how to achieve this).



Clicking on the dropdown list will provide you with the current **DirectShow** options available to you on your computer (depending upon what software you have installed).

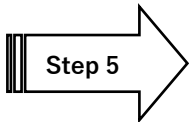


If you have installed the **DirectShow** drivers, then Mallincam will be added to the list.

*Note: In using **DirectShow**, you will see the image of what the camera is observing, but you will need Directshow software (such as **AMCap**) to control most aspects of the camera.*



If you have installed **Splitcam** (recommended), you will see **Splitcam Video Driver** in the List. Select your **Video Source** from the list.

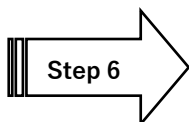
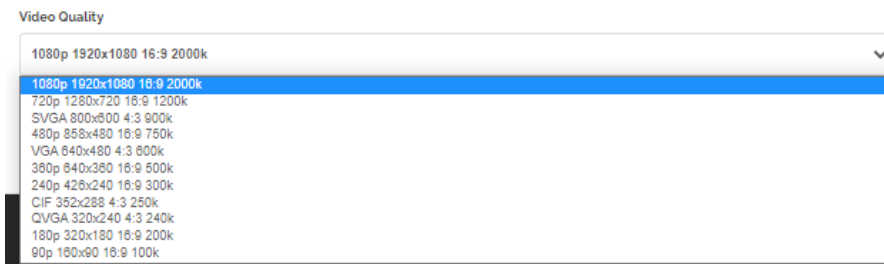


Step 5

**Video Quality**

From the drop-down list select the best resolution your system can handle.

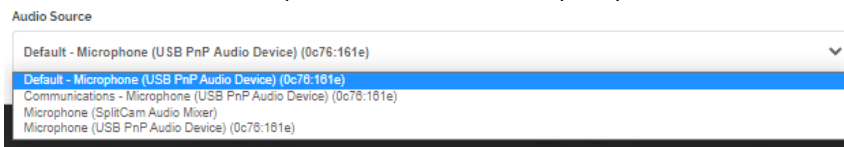
*Start with 1080p and see if you can broadcast with this resolution. If you find that your system (internet) cannot handle this level of resolution, just take the resolution down.*



Step 6

**Audio Source**

The drop-down list will indicate what current audio devices you have available on your computer. Choose the one which provides the best sound quality.



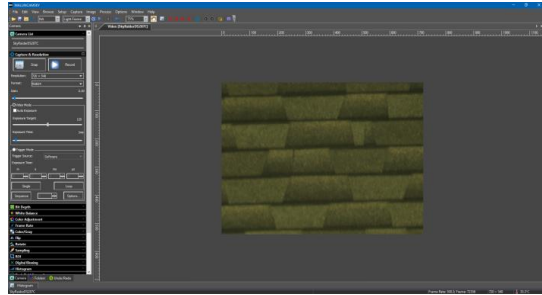
➔ **This section explains how to Capture and Broadcast Using either SplitCam or OBS**

You will want to stream the **MallincamSky** image to the Liveskies server. I will give procedure for two of many options. Once you have activated your option of choice, just bring the **MallincamSky** Window up front so you can control it. If you have multiple monitors, you can leave Liveskies and **MallincamSky** each on its own monitor, so they are available to control.

**Using SplitCam** (either visit [Mallincam.net](http://Mallincam.net) or [splitcam.com](http://splitcam.com) to download)

**Step 1**

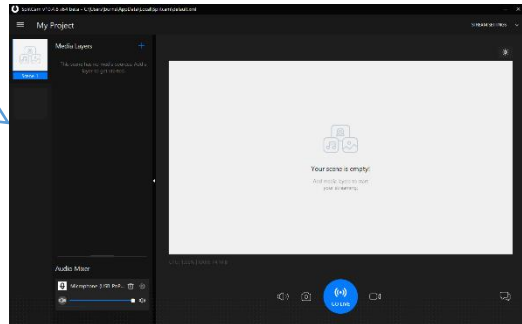
Start **MallincamSky** and connect to your camera. Ensure **MallincamSky** is active on your monitor and is not reduced.



**Step 2**

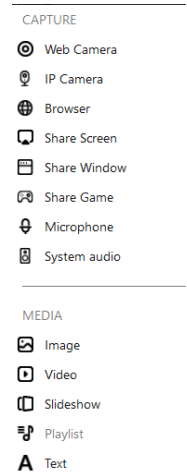
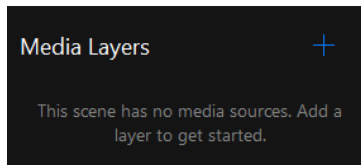
Start **Splitcam** (I will illustrate with the latest version)

*I recommend you have **SplitCam** appear on your task bar, so all you need to do is click on it, so it opens over the active **MallincamSky**.*



➔

Click on the blue **+** beside **Media Layers** to select what part of the screen you would like **SplitCam** to capture.

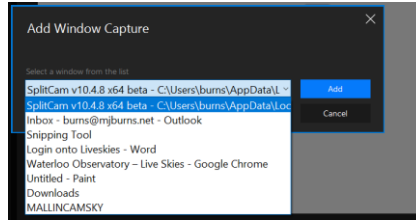


The new window will offer you many choices, but the two best choices will be either **Share Screen** or **Share Window**.

- **Share Screen** allows **SplitCam** to capture the whole screen.
- **Share Window** allows **SplitCam** to capture only a specifically running piece of software (such as **MallincamSky**). We recommend using **Share Window**.
  - You will not be able to annotate over **Share Window**.

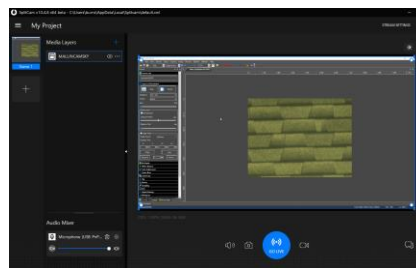


When **Share Window** is selected, a drop-down box will provide a list of currently running programs.

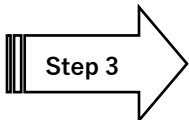


Choose **MALLINCAMSKY**

You will now have **SplitCam** displaying the **MallincamSky's** window in its display window.

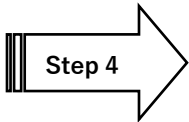


*I recommend setting the resolution to 1920 x 1080 in SplitCam's **General Settings** (the 3 horizontal lines beside **My Project** in the SplitCam screen.*



Step 3

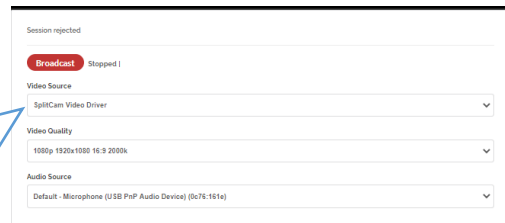
**Splitcam** will choose a default microphone for you, but you can delete it, and choose another microphone (or include system audio) by again clicking on the **+** in **Medial Layers** and selecting **microphone** or **system audio** and select your choice.



Step 4

On the **Liveskies** window, click on the red **Broadcast** button.

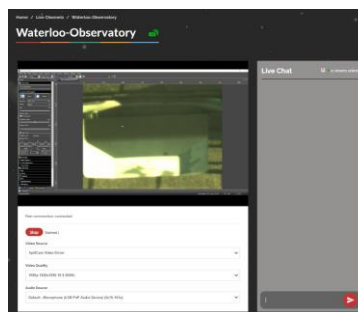
Select **Splitcam Video Driver** as the Video Source and either select your microphone directly or select **Splitcam Audio** to choose the microphone(s) you selected in **SplitCam**



CAPTURE

- Web Camera
- IP Camera
- Browser
- Share Screen
- Share Window
- Share Game
- Microphone
- System audio

If everything connects correctly, you will see **“peer connection connected”** at the top of the **Video source** window (the **Broadcast** button will change to a **Stop** button).



➔ **Live Chat**

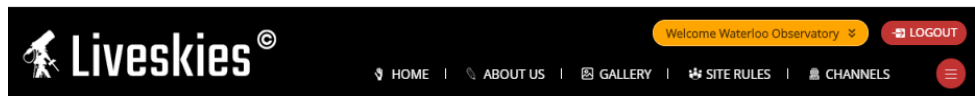
On the right-hand side of the Liveskies window you will see a Live Chat box. It is from here that you will be able to Chat and see responses from other viewers in real time. Just type in your message and hit the red button to the right of your message to send it.



➔ **Finished**



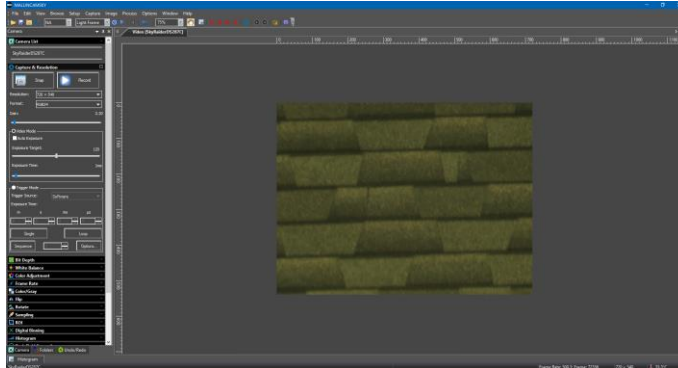
When you are finished with your session, just click on the red **LOGOUT** button at the top of the Liveskies screen, then shutdown **SplitCam** and **MallincamSky**.



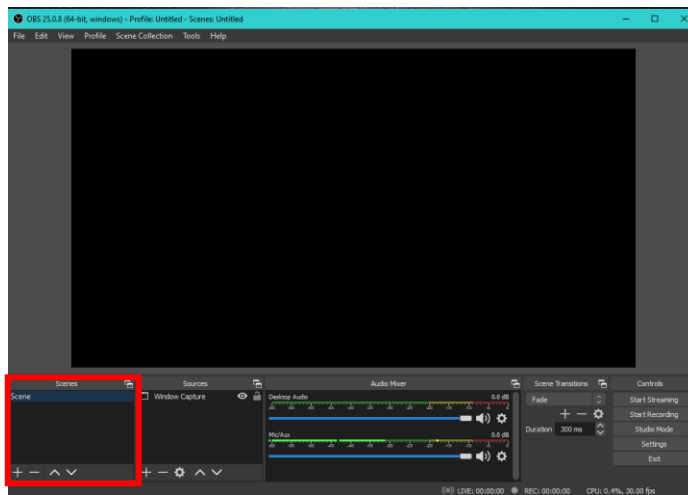
*To control **MallincamSky**, just bring it to the front. If you have a small sized monitor, you may want to reduce the size of the **MallincamSky** window so you can also view the **Liveskies** window and participate in the chat process.*

*Having multiple monitors gives options of placing the **Liveskies** window on one monitor while **MallincamSky** is on the other monitor.*

**Step 1** → **Using OBS (Open Broadcast Software)**  
 Start MallincamSky and connect to your camera.



**Step 2** → Start OBS

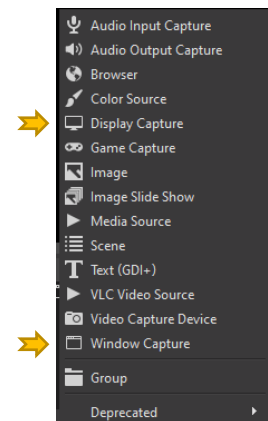


**Step 3** → Click on the **+** in the **Sources** box to select a source for **OBS**.

A new Window will open up where you can select from a list of possible sources.

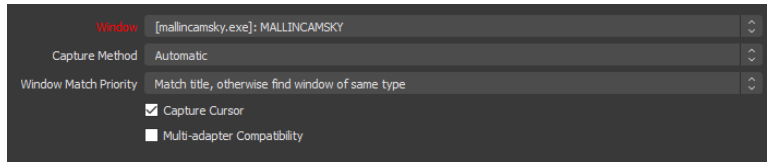
*Two two best choices are **Display Capture** and **Window Capture**.*

*We recommend **Window Capture**.*



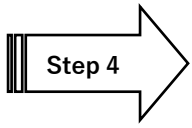
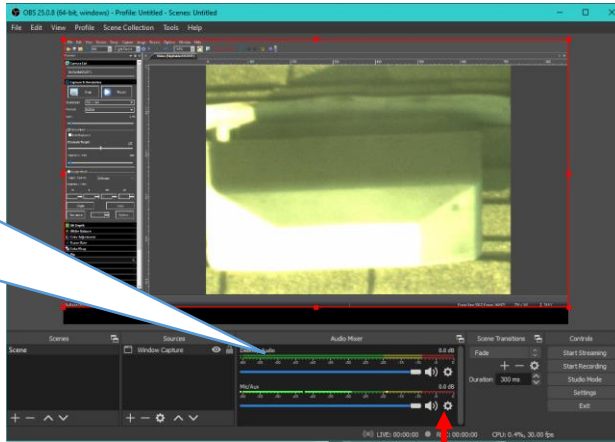


When the **Window Capture** selection appears, use the dropdown list to select **MallincamSky**.



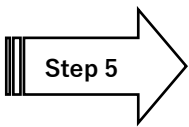
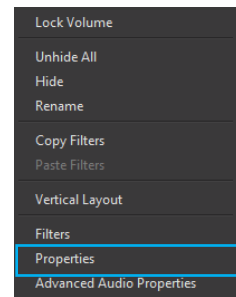
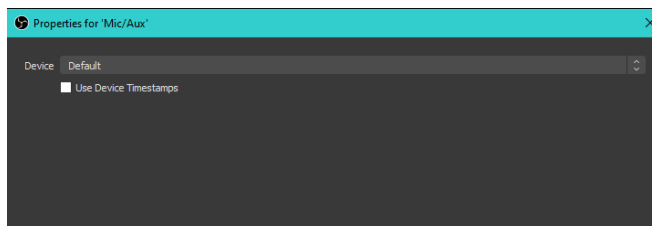
You will see the **MallincamSky** screen in **OBS's** display.

If you have the **Desktop Audio** setting too high, then you will catch your voice on that as well and this can lead to repeated echoing



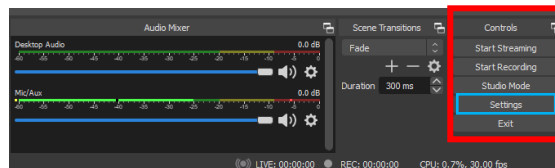
Step 4

Click on the **Gear** symbol in the **Mic/Aux** box and then select **Properties** to choose a microphone for broadcasting from the drop-down list. (You can test the microphone by speaking and watching the green level bar change)

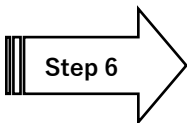
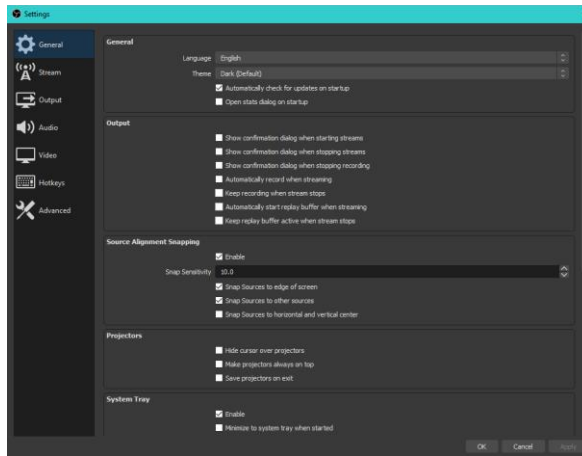


Step 5

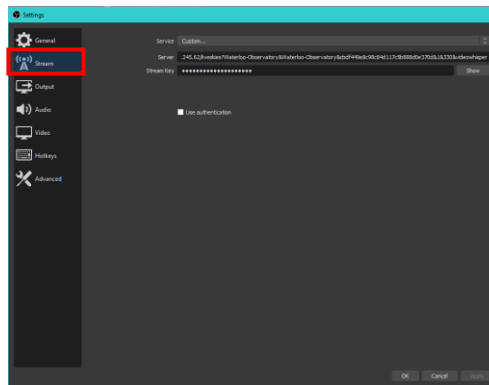
Now click on the **Settings** tab in the **Control** box.



| This will open-up the **settings selection** for OBS |



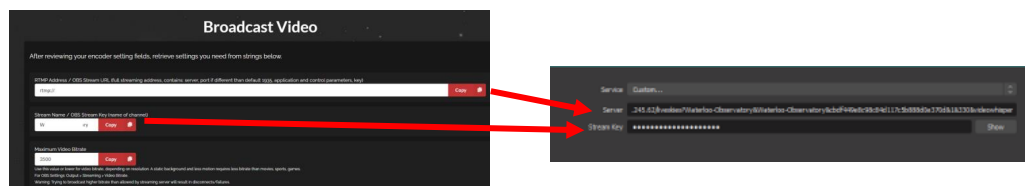
We want to **Stream** the MallincamSky Window, so select **Stream** from the selection on the left column.

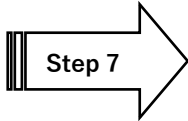


OBS will now require 3 pieces of information.

1. That the service is **Custom** (so select it from the drop-down list)
2. The server's **rtmp address**
3. The **Stream Key** name

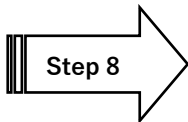
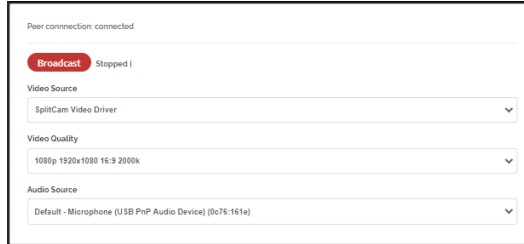
Both the **rtmp address** and **Stream Key** are located in **external encoders window on Liveskies**





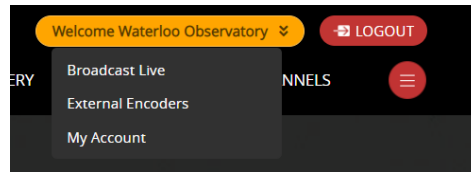
Step 7

Go back to **Liveskies** screen and make sure that you are not broadcasting (it will say Stopped! beside a red Broadcast button, do not worry about Video source)



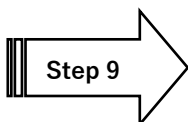
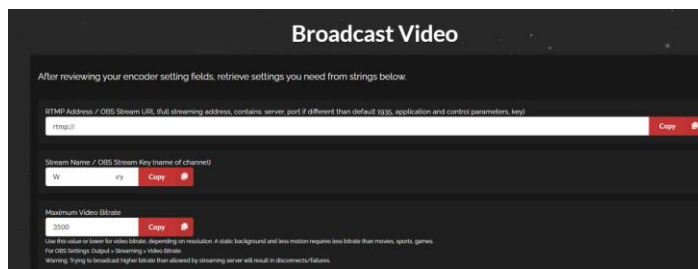
Step 8

We need to tell **OBS** (and give permission) where to send the **MallincamSky's** live video image. In the **Liveskies** window, place your mouse over the orange name of your channel. A pop-down list will appear.



Move the mouse to select **External Encoders** on **OBS Drop Down**

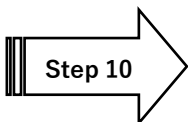
*The **Broadcast Video** window will appear that contains all of the data needed for broadcasting. Only the first two lines **RTMP Address** and **Stream Name** contains the information OBS needs. What we need to do is copy the information (one piece at a time) and give it to OBS.*



Step 9

Click on the red **Copy** button next to the **RTMP Address** box

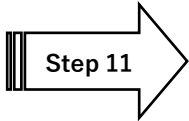
*This copies the **rtmp** address information.*



Step 10

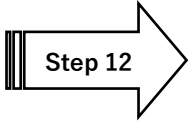
Go back to the **OBS** window and paste (Ctrl-c) the location into the **Server** box





Step 11

Go back to the **Liveskies Window** and click on the red **Copy** button for the **Stream Name**



Step 12

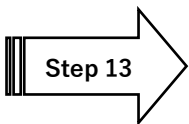
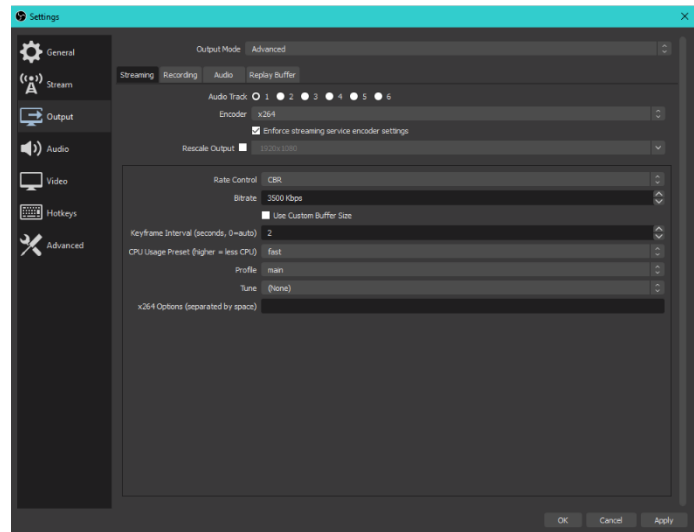
Go back to the **OBS** window and paste (Ctrl-c) the location into the **Stream Key** box



Now click on **Apply** to **OK** these address locations on **OBS**.

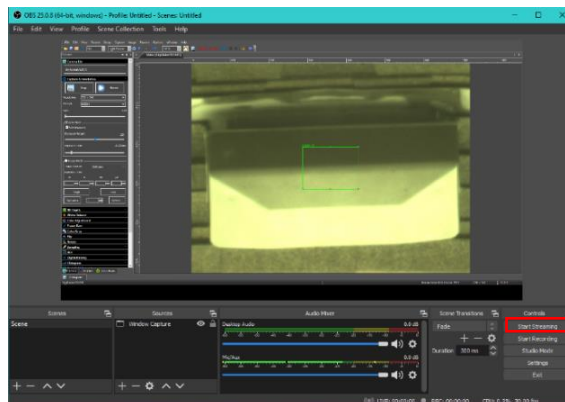
*Liveskies has a maximum video bandwidth of 3500, so you will want to ensure that you do not exceed that in **OBS** via the **Settings>Output** control. If your computer has a dedicated Video card, see if there is a hardware encoder in the **Encoder** dropdown box. If so try it to see if you get less cpu usage when using OBS. Visit youtube on advice for tweaking the settings on **OBS**.*

*In **Settings>Video** you can set the **Base** and **Output** resolution (1920 x 1080). Make sure they are both the same values.*



Step 13

To start streaming just click on the **Start Streaming** button in the **OBS** control box.



*If everything is working, you will see a green box appear on the bottom of the OBS window. ■*



To stop streaming, just click on the **Stop Streaming** button in the **OBS** control box.

### Comments about using OBS (or other streaming software)

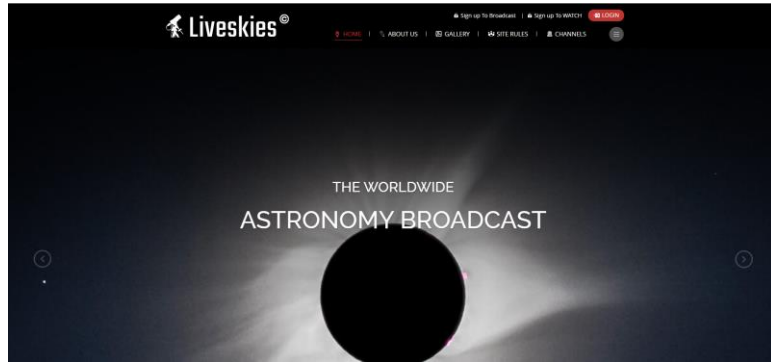
- There will be a delay (3 to 5 seconds) between your adjustment to the broadcast view. This has to do with the way **rtmp** works (encoding, buffering, ...).
- You do not need to be logged into your Liveskies account to use **OBS**, it will automatically stream to your channel (once you select **Start Streaming**). You can minimize **OBS** and use MallincamSky as you normally would. But, since you have not logged in, you will NOT be able to use the **Live Chat** (bummer). So, just log in to your Channel and then **view** your own channel to use **Live Chat** or Log in as **Guest** to view the channel. Some users use their phone to view the **Live Chat** and answer questions over the microphone in **OBS**.
- Once you have setup the settings on **OBS**, it remembers them. So, the next time you start **OBS**, all you need to do is click on **Start Streaming** and you are broadcasting.
- **SplitCam** (Version 10) also has the capabilities to broadcast on **rtmp** as well as **directshow**.



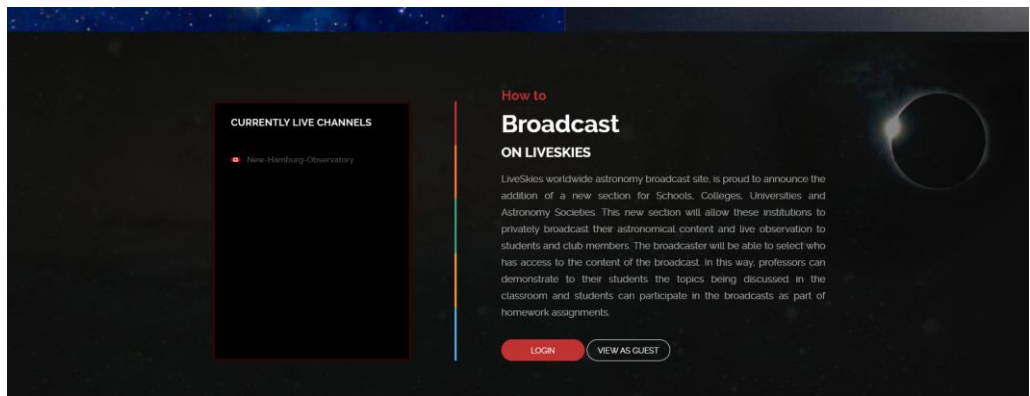
➔ **Viewing a Live Skies Channel**

**Logging into Liveskies**

➔ Visit <https://liveskies.org>



Below the main display window of **Liveskies** is a list of the currently broadcasting channels, or just click on the **CHANNELS** button on the top line to display currently broadcasting channels.



➔ If you just want to watch and not participate in the Live Chat, just click on the **Channels** Button to display available channels to watch. Then just click on the channel image and you will be presented with the live channel.

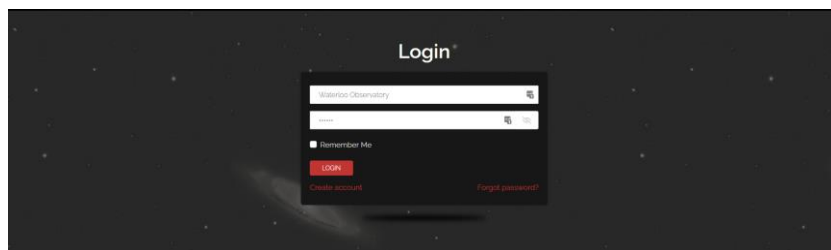
**If you want to participate in the Live Chat**

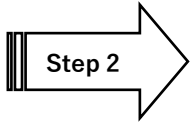
**Step 1** ➔

Click on the red **Login** button on the upper right of the window.



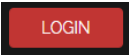
*A login window will pop up.*



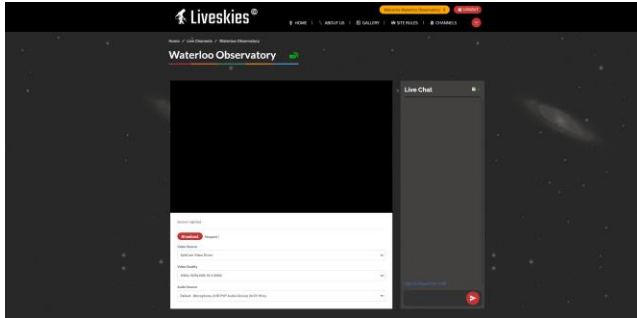


Step 2

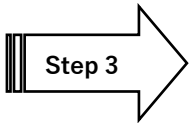
Enter both your **Username** and **Password** and click on the red **Login** button.



*You can have **Liveskies** remember your credentials.  
When you have successfully logged in, you will be presented with the  
main display and control window.*

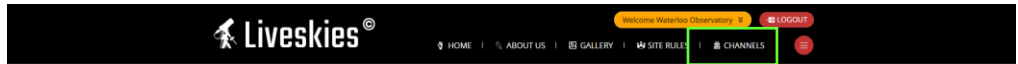


*If you have previously broadcasted, Liveskies may automatically  
activate your broadcast channel.*

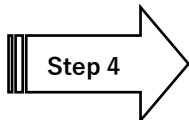
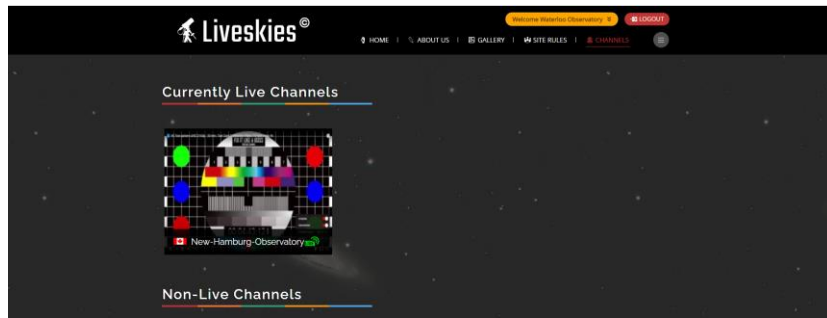


Step 3

Click on the **Channels** button at the top left of the Liveskies window.

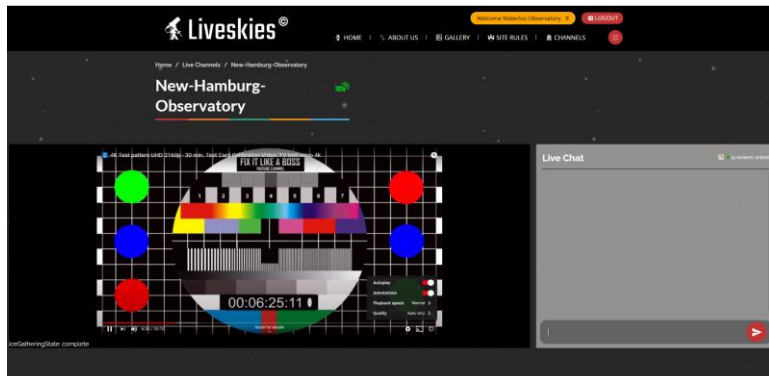



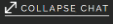
*A list of available channels will be displayed.*



Step 4

Just click on the Channel and you will be presented with the channel and the Live chat window



➤ You can make the Broadcast Video Window **full screen** by clicking on the  located on the bottom right side of the **Liveskies** video window (you will not be able to see the **Live Chat** Window), or simply by double clicking on the Video Window of the broadcast (double clicking on the full screen broadcast channel will return it to its original size). Clicking on the  button will also toggle on or off the **Live Chat** window (also increases the size of the Video Window).

*These are great ways to see the live broadcast in amazing detail, but you lose the Live Chat Window*

➤ If you are using Google Chrome (or similar), use the zoom feature (3 vertical dots on upper right of browser) to increase size. Experiment by increasing zoom factor.

*For my monitor zoom 150 gives me the best video and **Live Chat** arrangement, zoom 300 placed **Live Chat** underneath Video window.*

➤ You can pause the video stream by clicking on the 2 vertical bars on the lower left side of the Liveskies video window.

*When you resume the video, it jumps to the current live video stream, not where you left off*

#### To Live Chat

➤ Just type your text in the entry box at the bottom of the Live Chat window and click on the red **delivery** button to the right of the entry box.

*Your chat and other replies will display in the scrolling Live Chat window.*

Clicking on the **(Viewers Online)** opens a Viewers List containing your current viewers.

*Clicking on it again, closes the Views List.*

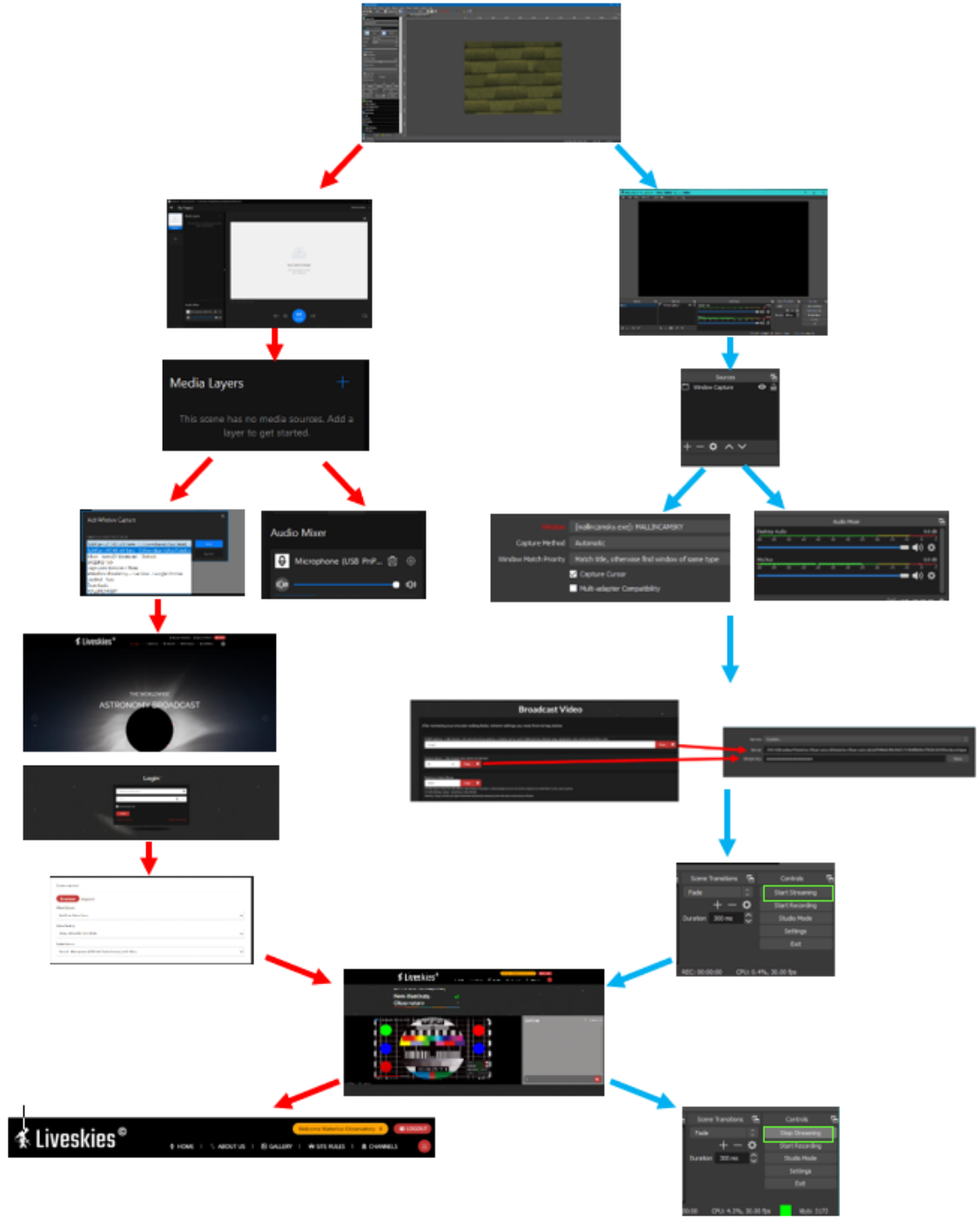
#### To exit

➤ All you need to do is Log-Out by clicking on the red **LOGOUT** button on the top of Liveskies Window.

*You can also click on the channels but change channel if you require.*



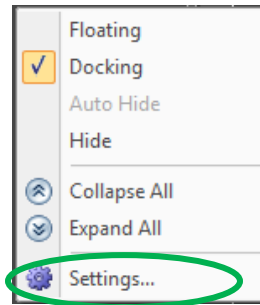
⇒ One Page Broadcast Summary



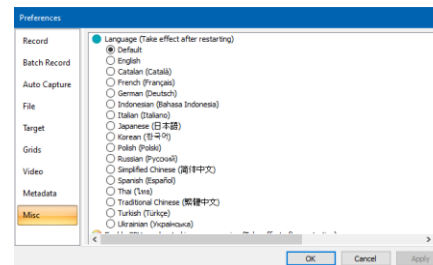
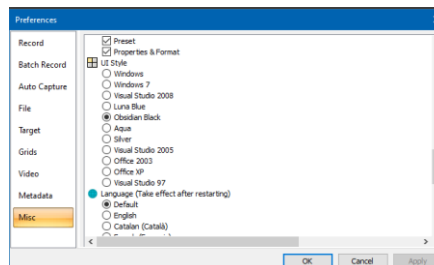
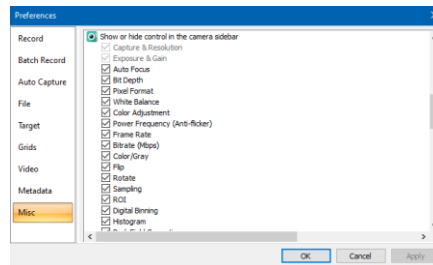
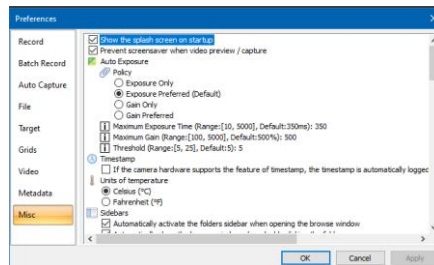


## Customizing the Screen

You can customize what controls (and the defaults for most of the controls) you want active, by **Left-Clicking** anywhere in the **Left Sidebar** then choose the **Settings** choice to open-up a **Preference Window** that allows you to make various setting changes.



Select **Misc** from the **Preference Tab** and then examine (or modify) all the controls and options available to you. You use the Preferences to activate (or deactivate) controls displayed on the left sidebar of MallincamSky, the colors of the commands in MallincamSky, or even the Language the controls are written in.





## Focal Reducers

### MFR-10 Focal Reducer

Because of the Large sensor size on the SkyRaider DS432C TEC, the best focal reducer to use is the MallinCam 2-inch version. The MallinCam MFR-10 (MallinCam Focal Reducer-10) is a breakthrough in optical performance only from MallinCam. You can now have a focal reducer for your larger size (up to 28.4mm diagonal) CCD or CMOS sensor astronomical camera. The large format focal reducer has a 2" (48mm) thread on either end and comes with a T-to-2" adapter to allow use with all T-mount type cameras. Reduction for a 17.5 mm back focus camera is 0.46X. The 3 element multi-coated system has a built-in field flattener crucial for RC type telescope and SCT as well. The MFR-10 will make your telescope F/ ratio faster when using a CCD or CMOS camera, cutting exposure time by up to 5X. Using this with a 10mm spacer provides the fastest system with the least amount of distortion effects.



### Universe .5X focal reducer

The Universe focal reducer and a 10 mm spacer is the best match for the DS432C camera. Designed and built for use with the large sensor in our Universe camera, this 0.5x focal reducer can also be used with other large sensor cameras such as our SkyRaider DS432, DS432C, DS432CTEC. The Focal Reducer has a T-mount thread on either end, allowing it to be securely attached between the camera and nosepiece. Three small set screws allow you to lock the T-mount threads after it is assembled.





### What do those Flashing LEDs indicate on the Back of the SkyRaider Camera?

There are a few different Models of SkyRaider cameras, but we will examine the two major styles.

#### One LED on the Back of the SkyRaider



When software has activated this camera (MallincamSky, ASCOM, or DirectShow). The **Blue LED** will flash to indicate that it is operating correctly. If the Camera has a Fan, it too will start.

#### Four LEDs on the Back of the SkyRaider



- When **12V** of power is provided: the **PWR LED** will be **ON**.
- When software has activated camera: the **SYS LED** will **FLASH** to indicate operating correctly.
- When **TEC** is turned **ON**: the **TEC LED** will be **ON**.
- When **FAN** is turned **ON**: the **FAN LED** will be **ON**.



## C8: Advanced Techniques

### Chapter

# 8

This chapter deals with detailed instructions on how to perform procedures to improve your image. This will be a chapter that grows as more users discover techniques that will be beneficial to others.

## How to Take Darks

As mentioned in the appropriate section in the User Manual, Applying Darks is a great way to remove noise generated by the Camera's environment. The following instructions will guide you in **Taking**, **Saving** and **Applying** Dark Fields.

Determine what exposure times, gain, Digital Binning you will be creating Darks Fields for. You will want to define a location on your computer where you would like to store your Darks. We will use a convention where you can grab the correct Darks for your current imaging requirements. For example, if you use **10s**, **20s**, **30s** and **40s** exposure rates, and switch between **Digital Binning 1** and **Digital Binning 2**, you will want to create a set of **8** Darks.

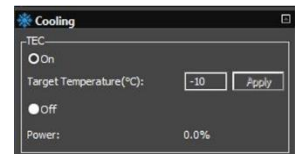


We will create a set of **20** second Darks using Digital Binning **2**. So, cover up your telescope objective and follow the ensuing recommended procedures.



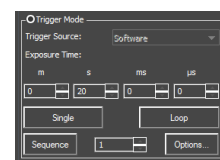
### Set your Camera's Temperature

Set the temperature of the camera to that which you will be using for. Most of us set it to **0°C**. Allow the camera to get in the range before you take Darks (examine the temperature value on the bottom right side of MallincamSky).



### Set your Exposure Value

Since we will be using 20 seconds as an example, set the exposure to 20s in Trigger **Mode** and start the camera **Looping**.

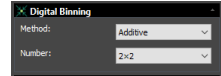






**Set your Digital Binning**

Since we will be using 2 x 2 Digital Binning as an example, set the Binning to **2 x 2** using **Additive**.



**Set the Gain**

Since we want to bring out more noise, it is recommended that to set the Gain as high as you can. So, we set it to **100** in this example.

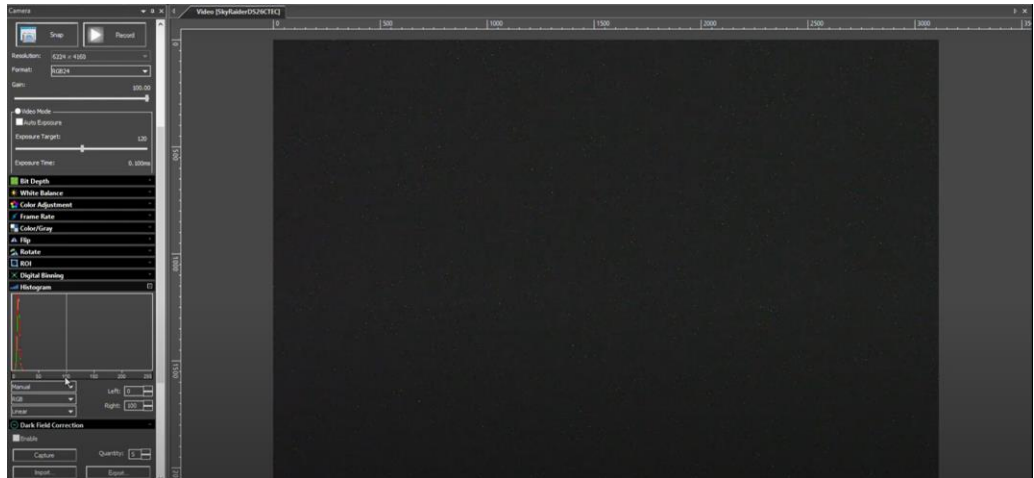


**Adjust the Histogram**

We want to bring out as much noise as we would imagine, so set the **Left to 0** and the **Right to 100**. This will emphasize the noise (red and green pixels).

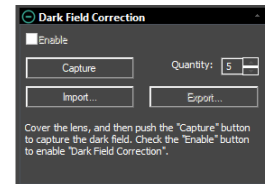


Your screen should look something like this:



**Set the Number of Dark Fields**

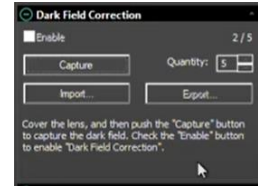
We want the system to incorporate several Dark Fields into its Master, so choose a number between **5** and **10**. Remember too high a number will take a while to produce the required Dark Fields. We will use **5** in this example. So, the Dark Field capture run of **5** Dark Fields of a **20** second exposures will take a total of **100** seconds.





### Capture Dark Fields

Click on the **Capture** button in the **Dark Field Correction** box to Start the capture process. There will be a running display that lets you know where the capture routine is at that moment. The image on the right shows us that it has so far captured 2 out of 5 Darks. This indicator number will disappear when the capture routine is complete.



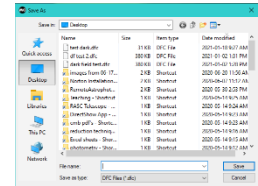
### Export the Captured Dark Fields

Click on the **Export** button in the **Dark Field Correction** box to Save the Master Dark Field.

Choose a Dark Field Folder: **Dark Fields**

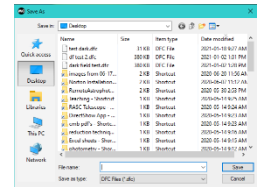
Choose a Sub Folder if you have multiple cameras: **DS432CTEC**

Use a naming standard the helps you find the correct Dark Field:  
**DS432\_20s\_DB2\_Gain100\_Meade10\_fr\_0.5**



### Import a Captured Dark Fields

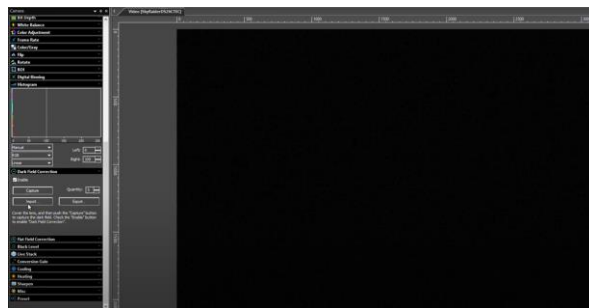
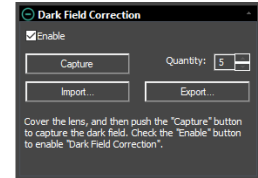
Click on the **Import** button in the **Dark Field Correction** box and select your previously saved Dark Master.



### Test the Captured Dark Fields

Click on the **Enable** check box in the **Dark Field Correction** box and examine your image.

Because MallincamSky is still capturing 20 second images with the lens cap on. When you apply the Darks, you should get a completely Black image (all of the colored pixels have been removed).



Now you can remove the lens cap from your Telescope and see how your images improve when you apply **Dark Field Corrections**.

## How to Take HDR Images

**High Dynamic Range** is basically just the difference between the lightest light and darkest dark you can capture in an image. If the object exceeds the SkyRaider's dynamic range, the highlights tend to wash out to white, or the darks simply become big black areas. It is extremely difficult to capture an image that retains both ends of this spectrum. But with modified imaging techniques and advanced post-processing software you can make it happen.

The following images of Orion demonstrate why we want to use HDR techniques.



The image on the Left provides the nebulosity of Orion, but the trapezium is blown out. While the image on the Right you can see the trapezium stars but have lost the detail in the nebulosity. What we want is an image that contains the best of both images.



What we want to do is obtain this style of image in MallincamSky using its built-in controls. We will call this process **Live High Dynamic Range (LHDR)** viewing, an acronym coined by Jim Meadows.

Now this is an incredibly challenging process, and you will start off with more failures than successes, but this is the pinnacle of imaging and people have spent over a year trying to master the technique, let alone in a **live imaging environment**.

The principle here is to combine (in real time), different exposures to produce an image that contains the faint detail of a long exposure, but the prominent feature of a short exposure.

**MallinCamSky** has of course two image presentation modes:

**Video Mode:** In Video Mode you can adjust both the exposure and the gain settings in real time, but you are limited to its exposure time (5 seconds).

**Trigger Mode:** In Trigger Mode, you must stop the looping, make exposure (or gain) adjustments, and then restart the looping.

We will use Trigger Mode in this process (it has its advantages and disadvantages).



**Jim Meadows** has provided a Blog in which he has some details of how he has accomplished HDT using Video Mode:

<https://remotevideoastronomy.com/blog/DS432c-live-hdr-averaging>

Now we always have had the opportunity to save our images and then utilize specialized HDR software to provide stunning HDR images. But remember, **MallinCamSky** and the **SkyRaider** cameras are designed for **Live Video** imaging, what we want to do is to incorporate some of its controls to produce the best **Live** HDR images we can.

I will discuss **two** approaches for HDR imaging:

- 1) Storing a sequence of exposures and gain values into MallinCamSky and having it automatically set and incorporate those values in the image stacking process. MallinCamSky will run the process for you.
- 2) You manually set up the exposure/gain (and other settings) for an image and you Click to add that image into the stacking process. You repeat this procedure for every new exposure you would like to incorporate into the Stack.

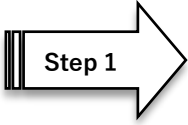
A comment for those who need exact control. Since we are using the **Live Stack** in **Average** Mode, it needs an original image to work with (to average). So, in reality the first image is actually averaged twice. This is usually not an issue since mostly you are using it to average the current image with a fixed exposure. But since we are **tricking** the **Live Stack** in to averaging multiple exposures, this ends up being the consequence.

That is, if you want to average a **2** second, **10** second, and **30** second exposure. The process will actually average **two** 2 seconds, **one** 10 second, and **one** 30 second as a final image.

The only workaround to obtain what you required exactly in terms of average would be for you to **double** the 10 second and 30 second exposures, to give you **two** of every exposure averaged.

 **Automated HDR**

Using this process, you will be able to adjust 3 values (**Exposure Time, Gain, Delay** time between exposures).

 **Step 1**

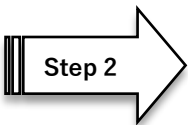
Plan your exposures. Write down how many exposures you are doing to use (more is not always better) and for each exposure what **Exposure** setting, **Gain** value, and **Delay** time between each shot you are going to use. This will help you get yourself organized and provides a history of what was incorporated in the HDR image. Remember one bad exposure can ruin the final image.

Let's assume you are going to incorporate 4 images to create a final HDR image.

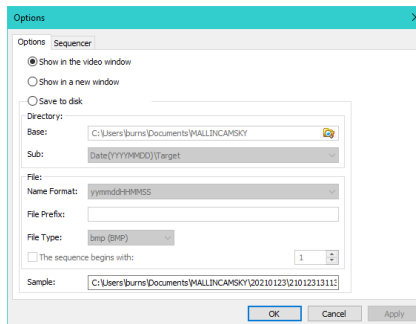
Image Number	Exposure Time	Gain	Time Between
1	2	3	15 s
2	10	1	15 s
3	16	1	15 s
4	30	2	15 s

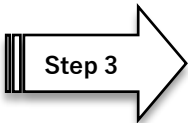
You can use the **Time Between** to make image setting tweaks (color Gamma, ...).

You will include all images EXCEPT the first into MallincamSky Sequencer. We will manually set up the first image parameters and take its image, so the sequencer can combine the remaining images into the first image.

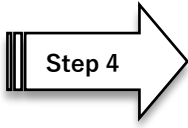
 **Step 2**

Select **Trigger Mode>Options** to open up the options Window.



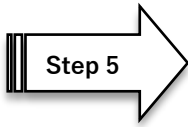
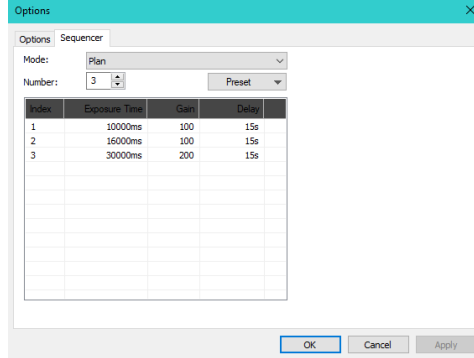
 **Step 3**

Select **Show in the video window** from the provided radial button options.



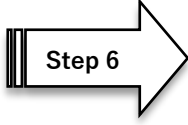
Step 4

Click on the **Sequencer** Tab at the top of the **Option** Window to display the Sequencer.



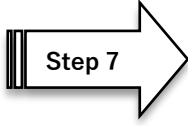
Step 5

Set **Mode** to **Plan**.



Step 6

Enter **1 less** than the **Number** of images you are going to incorporate (3 in this example).

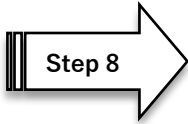


Step 7

Enter in the **Exposure Time**, **Gain** (enter in 100 time the value you require, i.e., a Gain of 1 is entered in in as **100**, a Gain of **2.3** is enter in as **230**), and the **Delay** time in each cell.

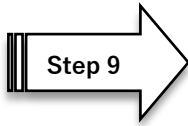


Recall, you **Double-Click** on the **cell** location to open up a window to enter in the value.



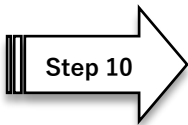
Step 8

Click on the Options' **OK** button to accept these settings and close the window.



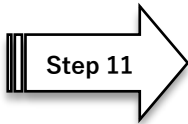
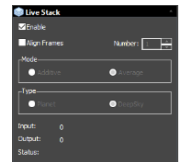
Step 9

Enter in the **exposure**, **gain**, and other values you need for your first image (**Exposure** of **2s** and a **Gain** of **3** in this example).



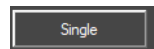
Step 10

Enable **Live Stacking** but ensure it has a value of **1** in the **Number** and it is set for **Average**.



Step 11

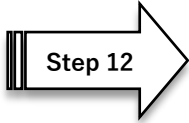
Click on **Single** to take the first image in **Trigger Mode**.





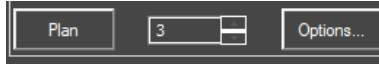
It may take up to about **20s** to register the image in **Live Stack**, you know you are successful when you see input at **2** and output at **1**. Live Stack is now pausing for you.

```
Input: 2
Output: 1
Status: OK
```



Step 12

Now **Click** on **Plan** in **Trigger mode** and watch MallincamSky take over **Live Stack**.

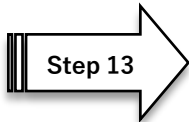


**Note:** during the **Delay** time, you can make other image adjustments. Every time an image form the **Plan** is added to **Live Stack** both **Input** and **Output** will increase by **1**.



Once completed, the **Output** number will match the total number of images average (4 in this example).

```
Input: 5
Output: 4
Status: OK
```



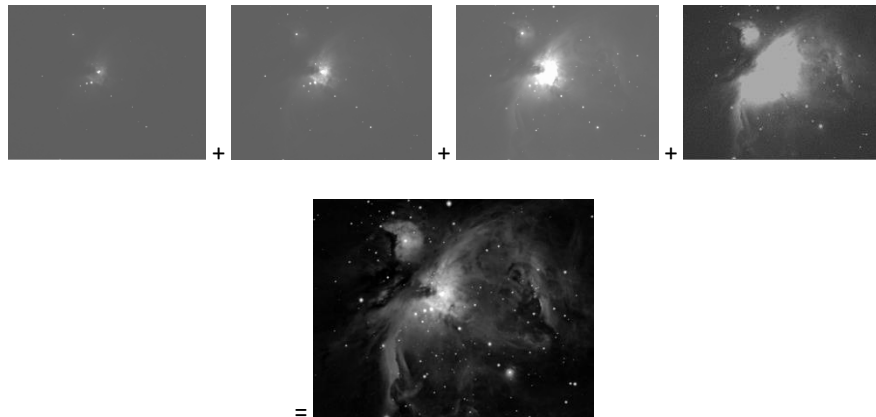
Step 13

Uncheck **enabled** on Live Stacking, for you are done.

Your **Live Video Window** will contain the **Average** of your images (4 in this example).

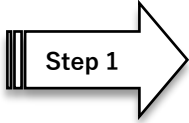
Do not be afraid to experiment with this procedure and use image controls to enhance the final image. Some users will repeat multiple exposures so that they average out to improve the overall image.

**For Example:** 5 exposures at 2s, 5 exposures at 10s, 5 exposures at 16s, 5 exposures at 30s



➤ **Manual HDR**

We are going to use **Trigger Mode** and **Live Stack** to Average Stack our images.

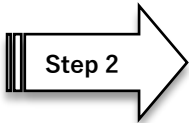


**Step 1**

Plan your exposures. Write down how many exposures you are doing to use (more is not always better) and for each exposure what **exposure** setting, **gain**, and other setting values you are going to use for each shot. This will help you get yourself organized and provides a history of what was incorporated in the HDR image. Remember one bad exposure can ruin the final image.

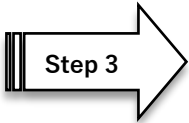
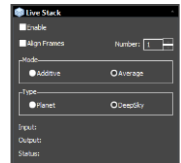
Let's assume you are going to incorporate 4 images to create a final HDR image.

Image Number	Exposure Time (s)	Gain
1	2	3
2	10	1
3	16	1
4	30	2



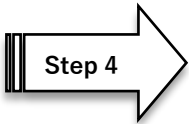
**Step 2**

Set up **Live Stack**, ensuring it is on **Average** and the number value is **1**. **Not enabled.**



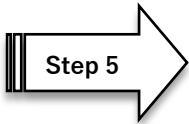
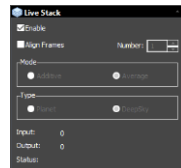
**Step 3**

Enter the **Exposure** and **Gain** value for the first image (**2s** and Gain of **3** in this example).



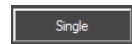
**Step 4**

**Enable Live Stack.**

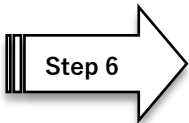
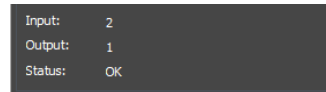


**Step 5**

Click on the **Single** button in **Trigger Mode** to take the first image.

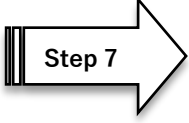


It may take up to about **20s** to register the image in **Live Stack**, you know you are successful when you see input at **2** and output at **1**. Live Stack is now pausing for you. Your image will appear in the Live Video Window.



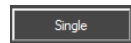
**Step 6**

Set up the **exposure** and **gain** for the next image in the sequence (**10s** and Gain of **1** in this example).



**Step 7**

Click on the **Single** button in **Trigger Mode** to take the second image.

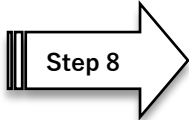






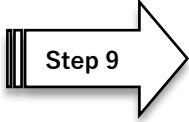
It may take up to about **20s** to register/average the second image with the first image in **Live Stack**, you know you are successful when you see **input** at **3** and **output** at **2**. **Live Stack** is now pausing for you. Your averaged image will appear in the Live Video Window.

```
Input: 3
Output: 2
Status: OK
```



Step 8

**Repeat** this process for each image in your sequence.



Step 9

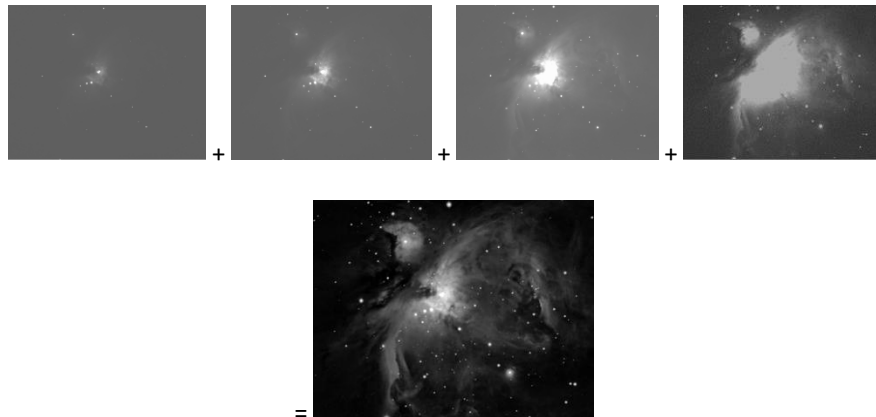
Uncheck **enabled** on **Live Stacking**, for you are done.



Your **Live Video Window** will contain the **Average** of your images (4 in this example).

Do not be afraid to experiment with this procedure and use image controls to enhance the final image. Some users will repeat multiple exposures so that they average out to improve the overall image.

**For Example:** 5 exposures at 2s, 5 exposures at 10s, 5 exposures at 16s, 5 exposures at 30s

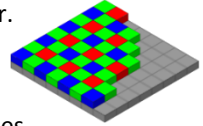


**Note:** we used the **Single** button to trigger the image capture, but if you want to capture many images at the same exposure settings, use the **Loop** command. You will have to **Stop** the Loop when you need to change the exposure.

# How to Debayer a RAW Image

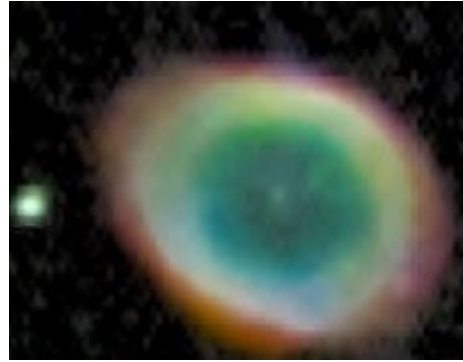
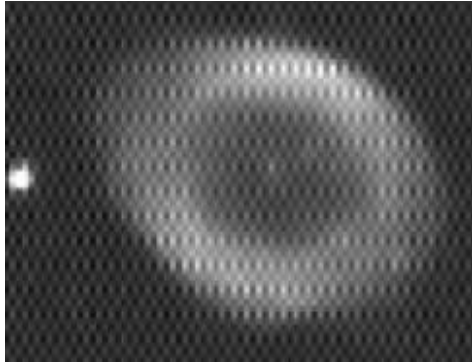
## Introduction to Bayer Pattern

A color camera contains a mosaic of color filters in front of the image sensor. This is also known as the Bayer filter. The Bayer has alternating red (R) and green (G) filters for odd rows and alternating green (G) and blue (B) filters for even rows. There are twice as many green filters as red or blue ones, catering to the human eye's higher sensitivity to green light.



Since each pixel of our sensor is behind a color filter, the output is an array of pixel values, each indicating a raw intensity of one of the three filter colors. Therefore, we need a process (algorithm) to estimate for each pixel the color levels for all color components, rather than a single component. This process is known as **debayering** or **demosaicing**.

When you save a color image in the RAW format, the image appears Black and White (with a checkered overlay). What we need is processing software that can debayer our image so that it is in color. Most professional astronomical imaging software can debayer, but you will have to indicate to the software the order of the colored pixels. You will then need to tweak the color and white balance to obtain an accurate color representation.

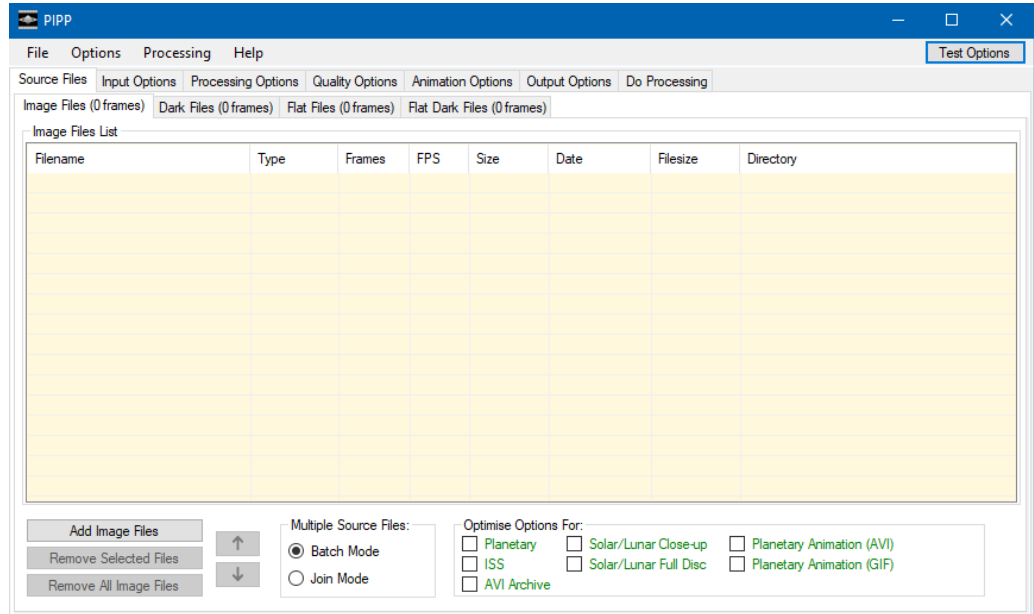


## Using PIPP

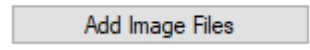
One free piece of software that can debayer your image for you, so you can then save it in another colored format (such as tiff) is **PIPP**.

Visit <https://sites.google.com/site/astropipp/> to download PIPP (and to look at instructions)

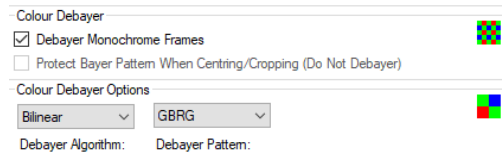
A summary of the PIPP process is as follows:



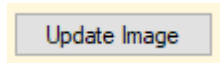
Load your image into PIPP from the **Source Files** tab (**Add Image Files** from PIPP button, it will display image in an **Image Window**).



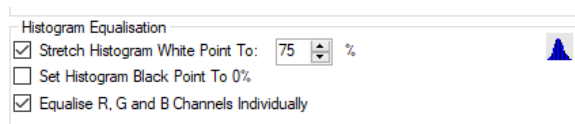
On **Input options** tab select **Debayer Monochrome Frames** with a Debayer pattern checked.



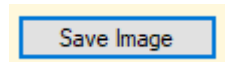
Click **Update Image** on **Image Window** to see if color is correct (if not choose a different Bayer pattern from Colour Debayer Options and **Update Image** again).

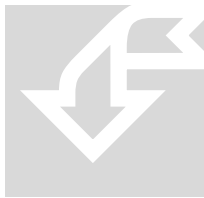


From the **Processing Options** tab, check **Stretch the Histogram White Point** and **Equalize R, G, and B channels Individually** (again click on **Update Image** to see the change).



From **Image Window**, select **Save Image** and choose your required color format (TIFF)





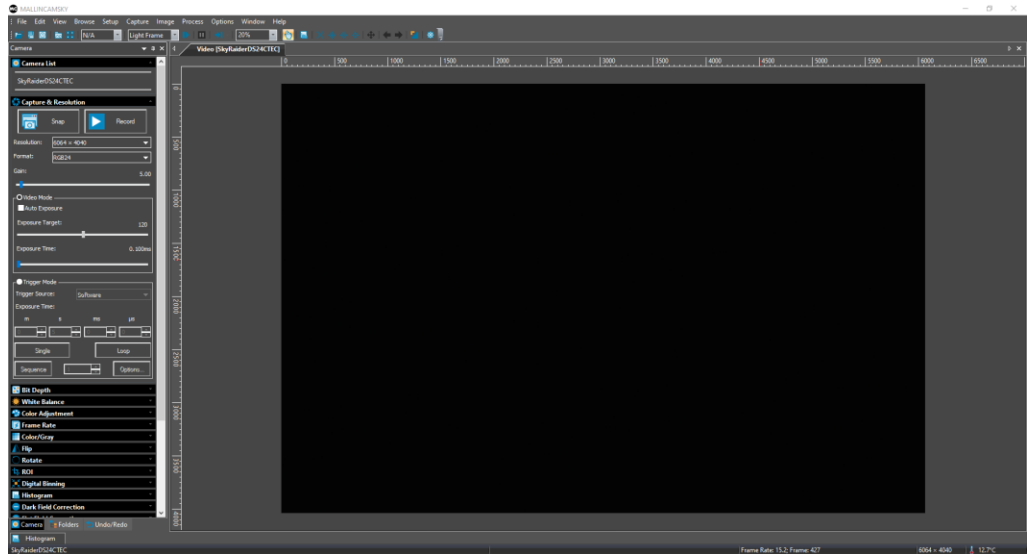
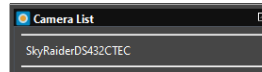
## C9: Pictorial Workflows

Connect the DS432CTEC to your computer.

The following pictorial diagrams demonstrate the steps necessary to perform the required procedure.

### Starting MallincamSky

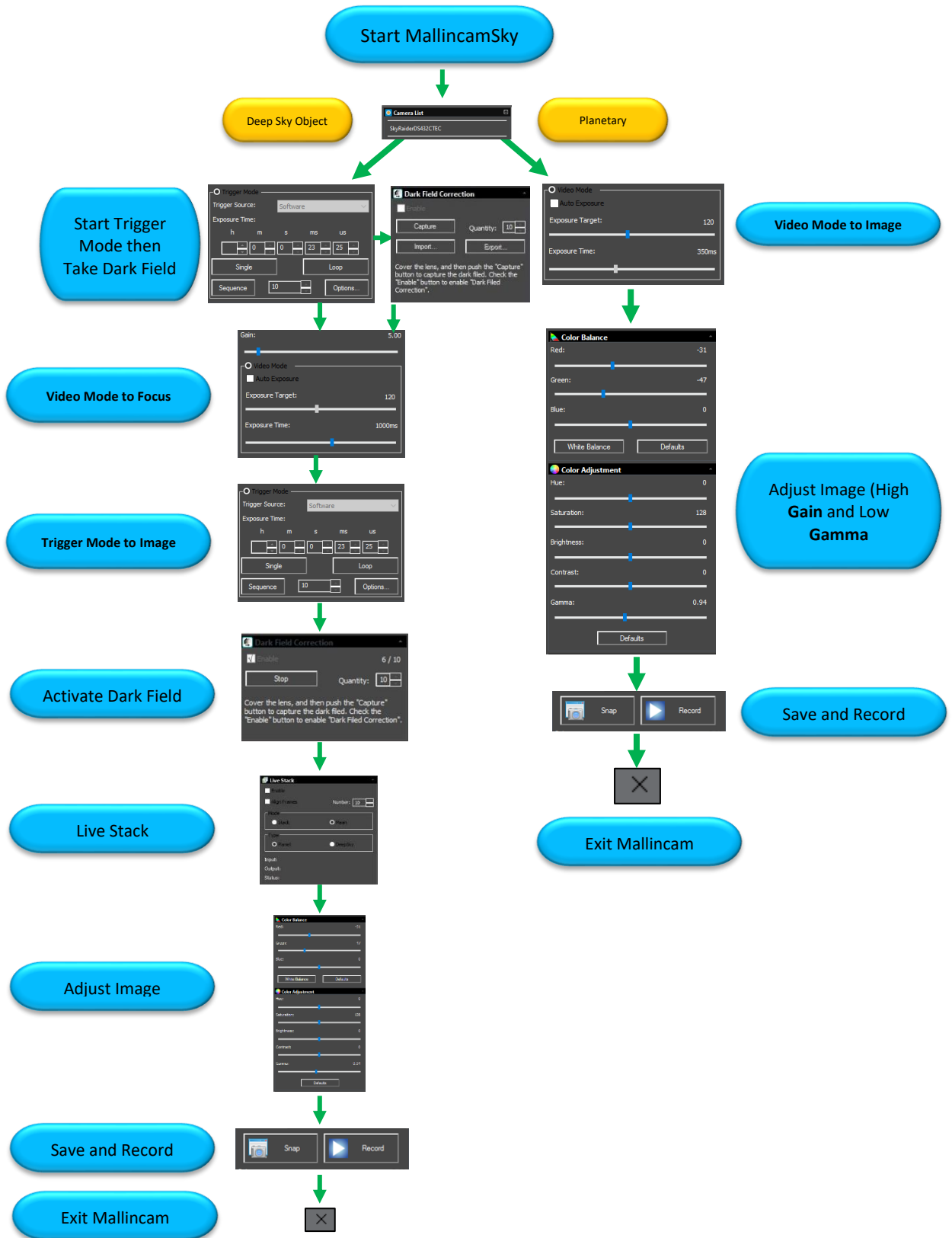
Start MallincamSky



Exit MallincamSky

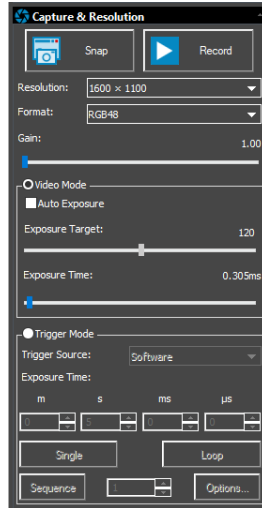


Typical Session in MallincamSky

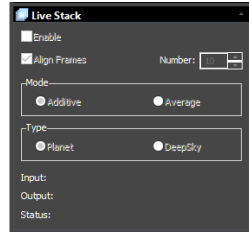


Live Stack Workflow

Expose Object

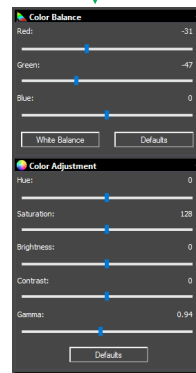


Choose and Activate Video Mode or Trigger Mode

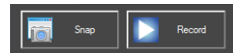


Live Stack

Choose Mode and Type of Stacking, Then Align and Enable.



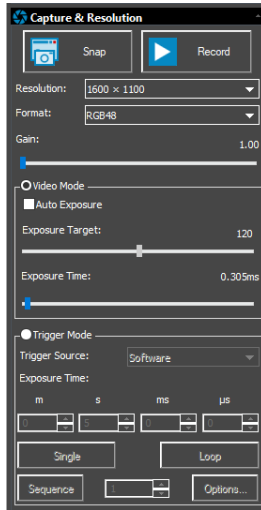
Adjust Image



Save and Record

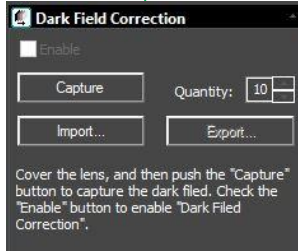
**Dark Field Workflow**

Determine Maximum Exposure



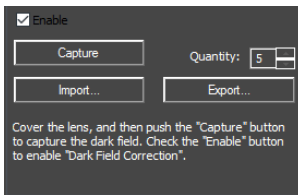
Set Exposure

Choose and Activate Video Mode or Trigger Mode with Maximum Exposure expected



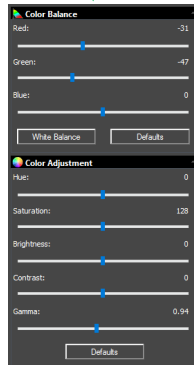
Take Dark Field

Choose Quantity and Click Capture to Take Dark Fields



Enable Dark Field

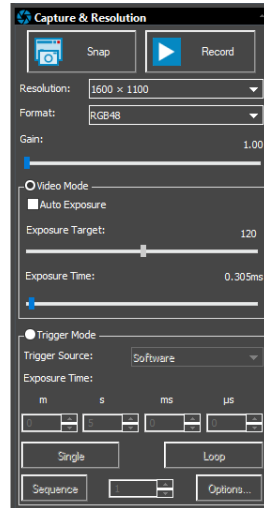
Check Enable Box



Adjust Image

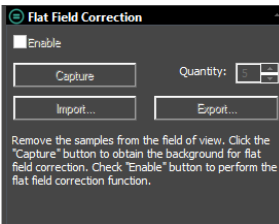
**Flat Field Workflow**

Determine Flat Field Exposure



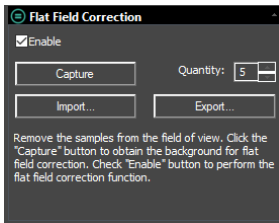
Set Exposure

Choose and Activate Video Mode or Trigger Mode with Maximum Exposure Required. Click on Loop



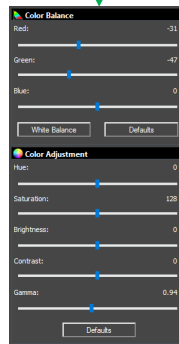
Prepare Telescope for Flat Field

Choose Quantity and Click on Capture to take Flats



Apply Flat Field

Check Enable Box

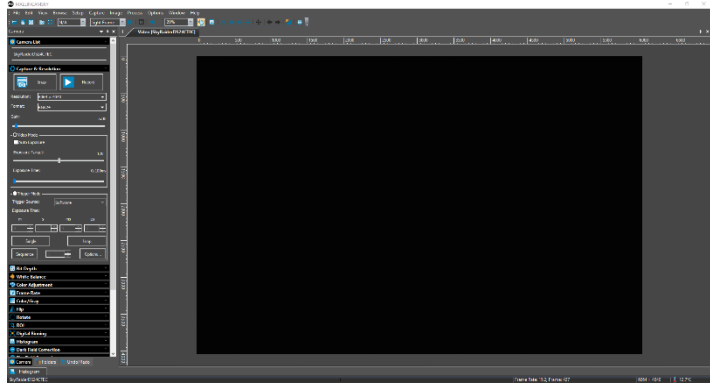


Adjust Image

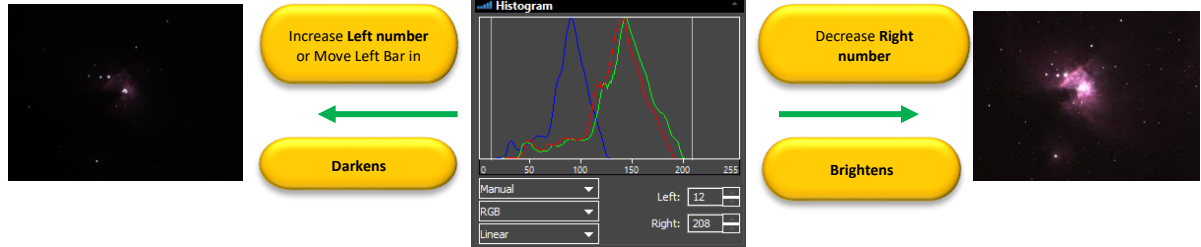


### Histogram Workflow

Expose Object



Select Histogram

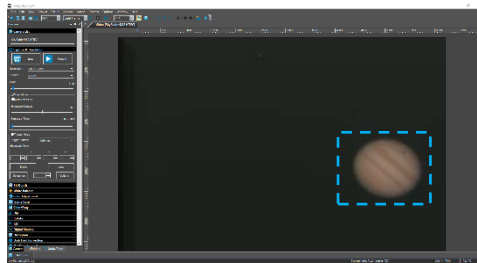
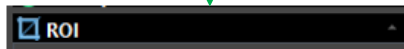
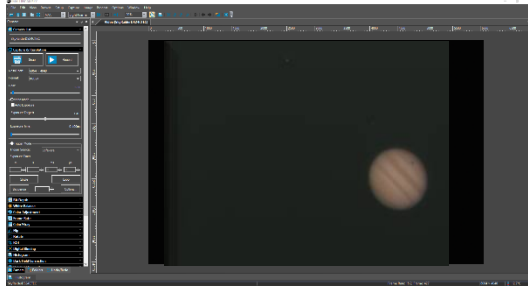


Select Exposure



ROI Workflow

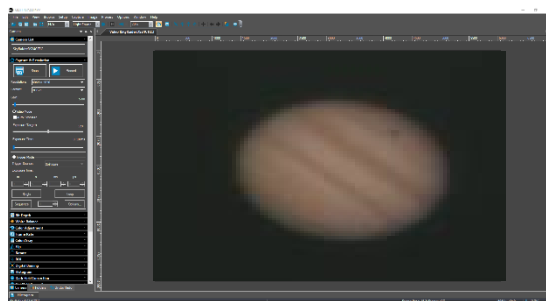
Expose Object



Video Mode



Video Mode



Trigger Mode

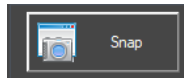
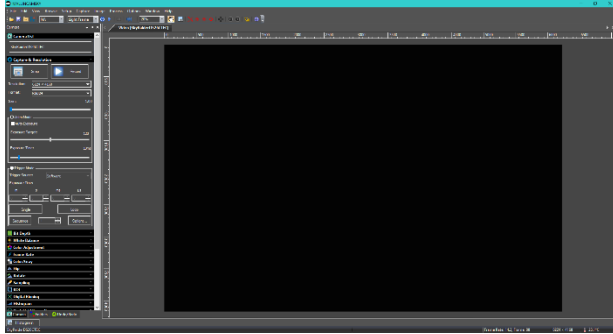
Stop

Trigger Mode

Loop

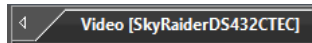
Save a Snapshot Image Workflow

Expose Object



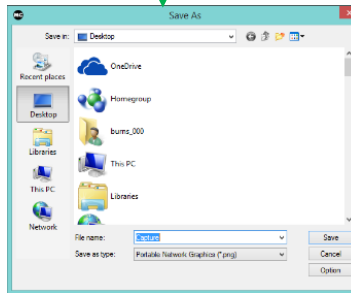
Take Picture

Select Image



Press Save Icon

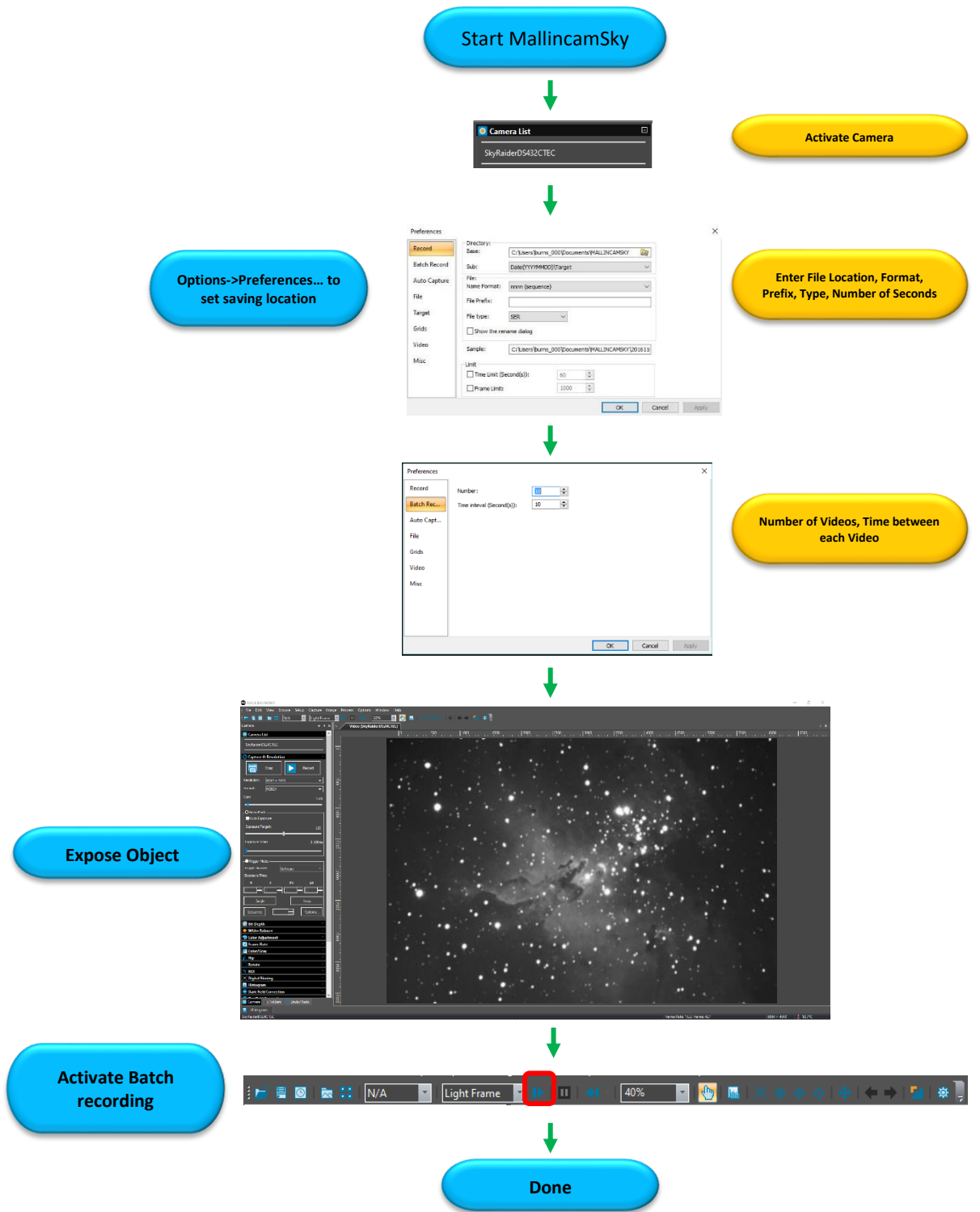
Select Location and Name



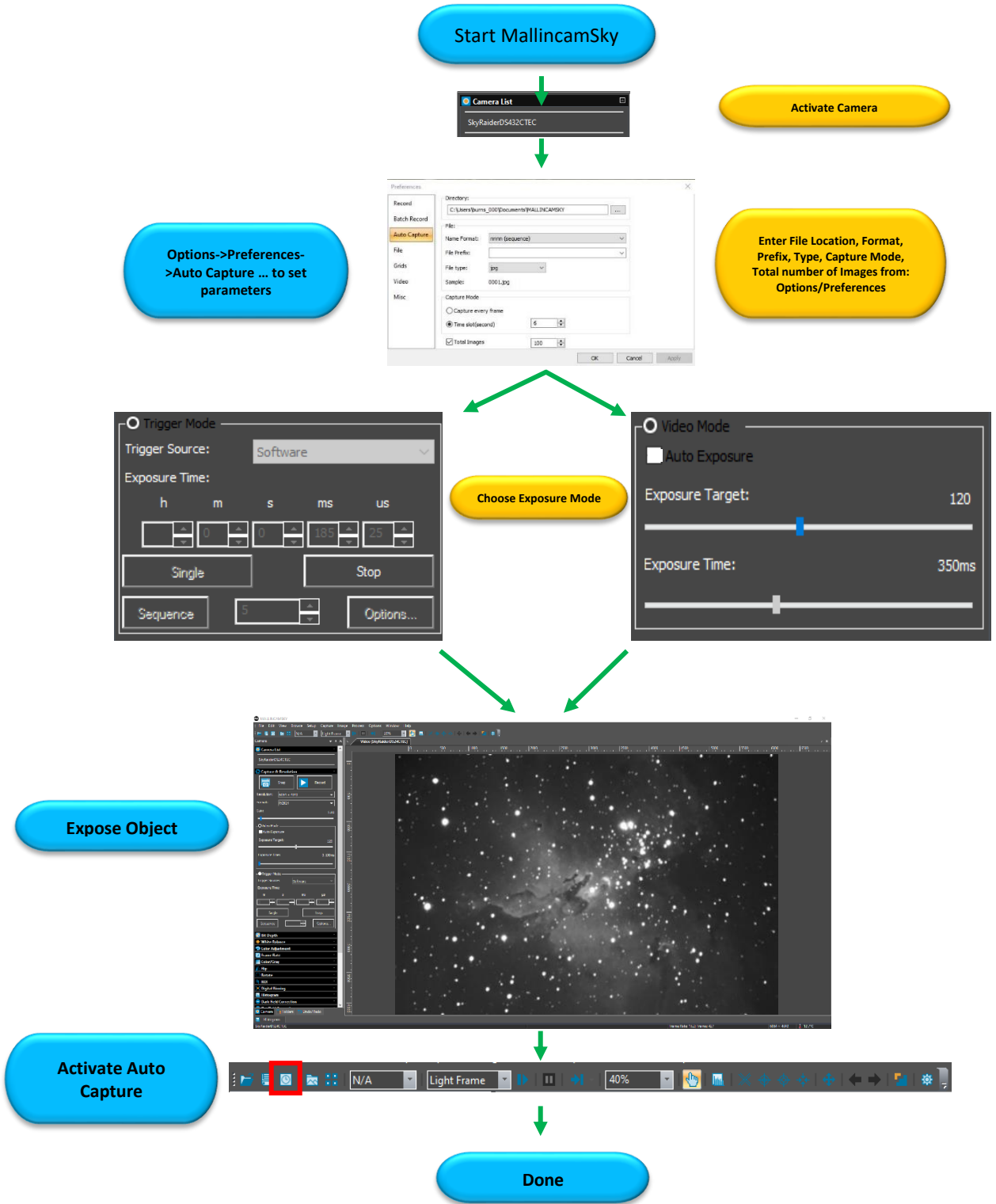
Record Video Workflow



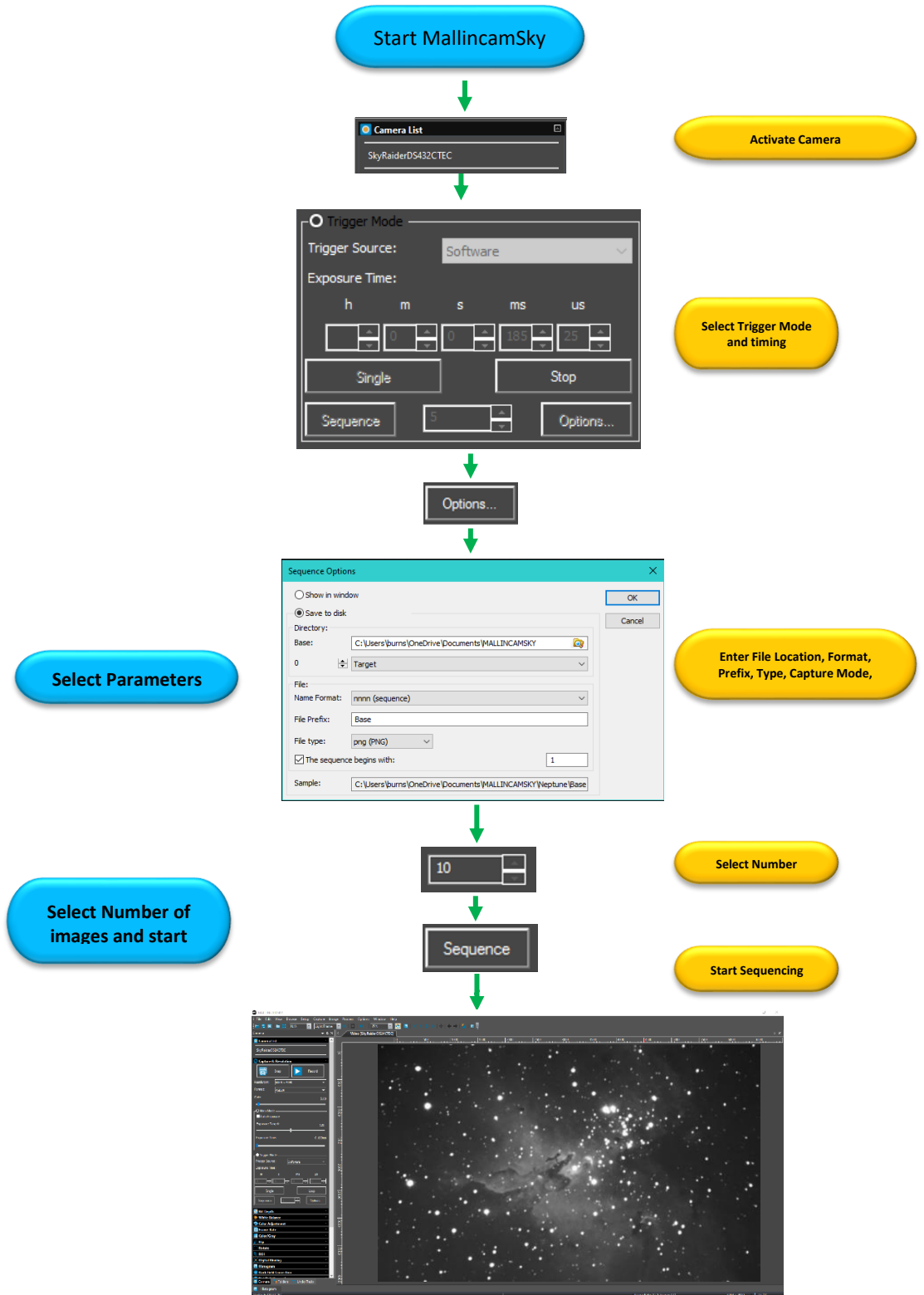
Batch Record Videos Workflow



Auto Capture Images Workflow



Save Sequence of Images Workflow (Trigger Mode)



Digital Binning Workflow

