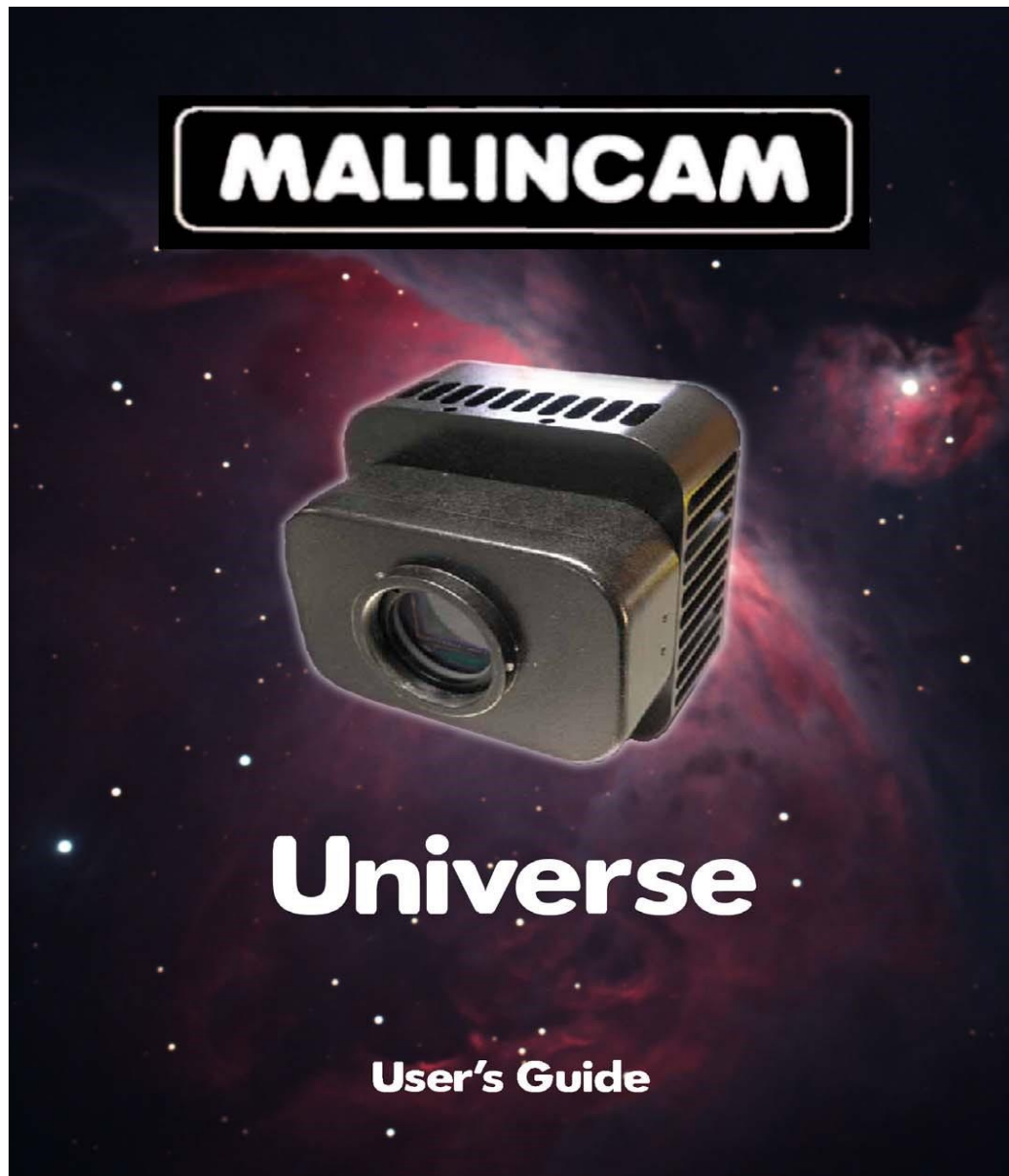# MALLINCAM UNIVERSE

[Version 1.0]
Michael Burns
Rock Mallin

[Mallincam Universe User Manual]

This document will quickly introduce you to the wonders of the MallinCam Universe Camera. It will include instructions on how to install the Software and Drivers and how connect the Universe to your computer along with explanations of the camera's major settings. The purpose of this guide is to quickly get you up and running with the Universe Camera so that you can image. This guide is based on the original user guide manual produced by Paul Klauninger.

Revision History

Version	Date	Revision Description
1.0	03/11/2017	Template Creation

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Contents

1. Introduction

The New MallinCam UNIVERSE is 100% USB 2.0 controlled, and the image is also transferred through the same USB connection. A Deep Cooling system with a Premium Argon Gas filled sealed sensor chamber allows cooling possible to reach as low as -45C continuous to ensure the lowest dark current possible; in most cases a dark frame is not generally required. A first in the industry. Taking magazine publication quality images is now possible and easier than ever with this new system. A constant live image is also displayed for those who wish to use the camera as a live observing system.

 At the heart of the Universe is a Class 0 scientific grade Sony ICX413AQ-S large APS-C class sensor, with a total size (diagonal) of 28.4 mm across and large 7.8 X 7.8 micron pixel size. The camera will excel in delivering live color images. Total pixels of the ccd sensor is 6.31 mega pixels. Horizontal size of the sensor is 25.10mm and Vertical size is 17.64mm. Active pixels deliver a total image size of 3032 X 2016 (active pixels are 6.11 MP).

The New MallinCam UNIVERSE can also be switched from color mode to black and white in the control software with a click of the mouse. A binning mode of 2x2, 3x3, 4x4 is also available in the control software to increase sensitivity and change resolution, allowing live focus on the fly in any image size with the crop feature not found on any other models of astronomy ccd camera. Live processing per frame is done with features such as full Histogram adjustment, Gamma Adjustment, Contrast adjustment, and Auto White Balance or manual RGB Color Balance. Works with WIN 7, WIN 8, WIN 10 in 32 or 64 bits.

The unique "Hyper Circuit" found on all other MallinCam systems has been introduced into this new design making the MallinCam UNIVERSE deliver a high variable gain, an ultra-high dynamic range, and a Signal-to-Noise ratio of 60+ dB. The MallinCam Universe comes complete with: a 5 meter USB cable, 2" threaded adapter, a 1.25" converter allowing the use of an optional 1.25" eyepiece adapter, 110 volts AC to 12 volts DC power supply, and driver and software on a USB key. An optional 0.5X focal reducer is available and an optional spacer is also available that screws directly to the camera body. The MallinCam Universe weighs just over 924 grams (2.1 pounds) and uses a 'T' mount system.

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

The Contents of the Universe - Package

Specifications:
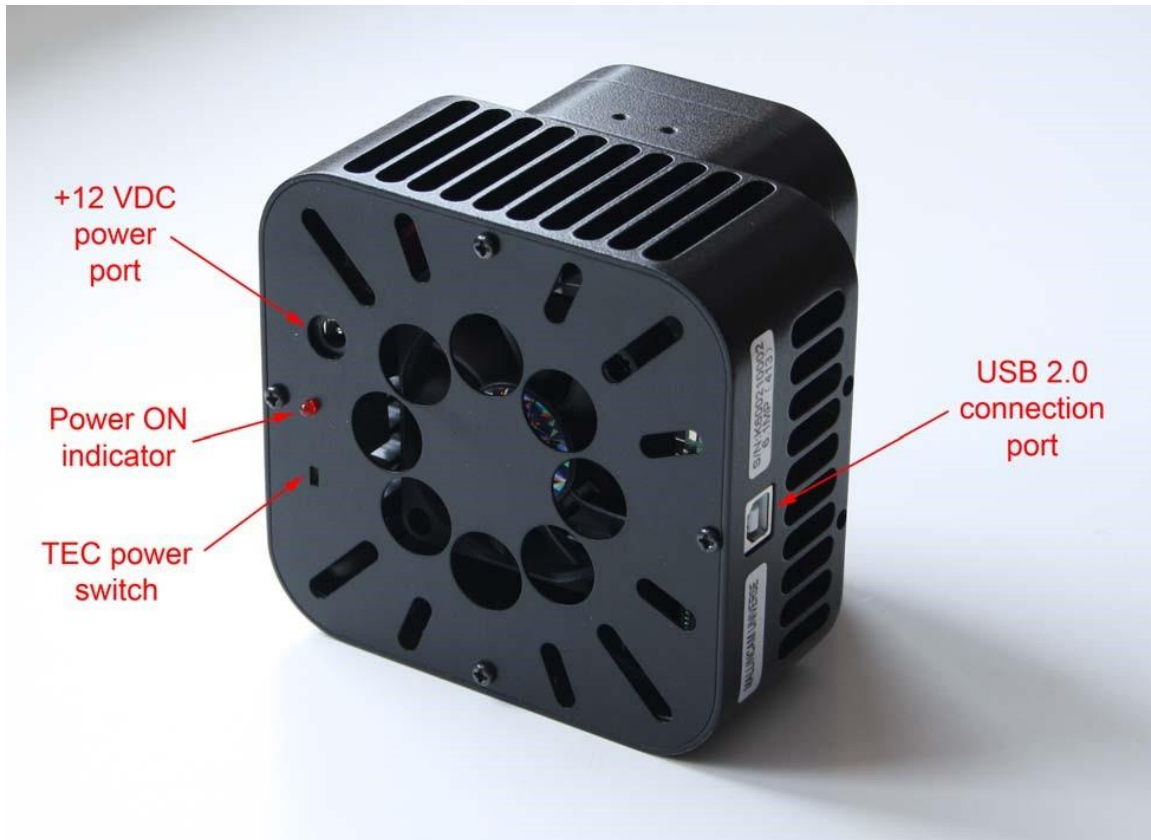
CCD sensor:	Sony SuperHAD ICX413AQ-S Color (scientific grade)
Sensor size:	25.10 x 17.64 mm
Active pixel array size:	3032 x 2018 (6.1 megapixels)
Pixel size:	7.8 x 7.8 microns
Analog-to-Digital conversion:	12-bit output written to a 16-bit data file
Total variable gain:	26.007 dB
Dynamic range:	80 dB
Signal-to-noise ratio:	60 dB
Exposure time range:	0.001 seconds to 55 minutes 59.999 seconds
Binning modes:	1x1, 2x2, 3x3, 4x4; all in full color
Filtering:	No filtering of the CCD sensor
Thermo-electric cooling:	-45°C below ambient temperature (maximum)
Weight:	32.5 oz. (924 gm)
Mounting interface:	T-thread or 2" nosepiece

Field-of-View reference

The following reference table provides a list of some common telescope focal lengths and the approximate angular field-of-view provided by the Universe when connected to these scopes. The measurements shown are in arc-minutes.

Focal length	Field-of-View	Field-of-View with optional 0.5X focal reducer
300 mm	270' x 180'	540' x 360'
400 mm	204' x 138'	408' x 276'
500 mm	162' x 108'	324' x 216'
750 mm	108' x 72'	216' x 144'
1000 mm	84' x 54'	168' x 108'
1500 mm	54' x 36'	108' x 72'
2000 mm	41' x 27'	82' x 54'
2500 mm	32.5' x 21.6'	65.0' x 43.2'
2800 mm	29.0' x 19.3'	58.0' x 38.6'
3000 mm	27.1' x 18.0'	54.2' x 36.0'
3500 mm	23.2' x 15.4'	46.4' x 30.8'
4000 mm 2	0.3' x 13.5'	40.6' x 27.0'

Included in Package:

① MallinCam Universe CCD imaging camera
② T-mount to 2" threaded camera nosepiece adapter
③ 1.25" eyepiece adapter converter
  ➤ This is part of the protective metal cap. Unscrew and remove the central plug to expose the converter threads required to mount the optional 1.25" eyepiece adapter.
④ AC-to-DC power supply (specific model supplied may vary)
⑤ 16-foot (5-meter) USB 2.0 data cable
⑥ Disc or flash drive containing software installation files and User's Guide

The following optional components are also available for your MallinCam Universe:

- 0.5X T-mount focal reducer
    - The optional 0.5X focal reducer is a recommended accessory when using the Universe on a telescope with a long focal length and/or a high F-ratio, such as F8 or greater. A long focal length yields a relatively small field-of-view. The 0.5X focal reducer essentially cuts the telescope's focal length in half and provides a field-of-view that is twice as large in both length and width. It also reduces the F-ratio by a factor of two. For example, it makes a relatively slow F10 optical system perform like a much faster F5 configuration. This cuts the exposure time down by a factor of four. A properly exposed 8-minute image taken through an F10 telescope would only require a 2-minute exposure to achieve the same level of brightness using the focal reducer! And the sky area covered in the image would be four times greater! A highly-recommended accessory to increase the near-live viewing experience!
- Focal reducer spacer
    - This is used to increase the focal reduction factor even further when using the 0.5X focal reducer. The degree of reduction varies with the telescope type.
- 1.25" eyepiece adapter
    - This adapter allows the camera to be attached to a 1.25 focuser. However, the camera's large chip requires a 2" focuser for full illumination. Using the camera on a 1.25" focuser will cause some vignetting in the images.

System Requirements:

- Equal to Intel Core2 2.8GHz or Higher
- Memory: 4GB or More
- USB port: USB 2.0 Port
- Display Monitor: 17" or Larger Recommended
- A video display capable of rendering 1024x768 resolution minimum; 1280x1024 or higher is recommended, and in 24-bit color
- One available fully-specified high-speed USB 2.0 port
- 120V AC Power for adapter, or 12V, 2.0A AC Source

2. Installing Driver and Software

System Requirements

PC running either Windows ® (32-bit & 64-bit) XP, Vista, 7, 8, 8.1, 10

Performance is not guaranteed if the following specification cannot be reached.

- DirectX 9.0 or later installed
- 2.8GHz processor (Recommend dual core 2.8GHz or more)
- USB 2.0 Port
- 4GB RAM (Recommend 4GB or more)
- 200MB Free HDD

Installing the Software

Step 1 Visit the Software Downloads Page in the Support Tab located on the website: www.mallincam.net
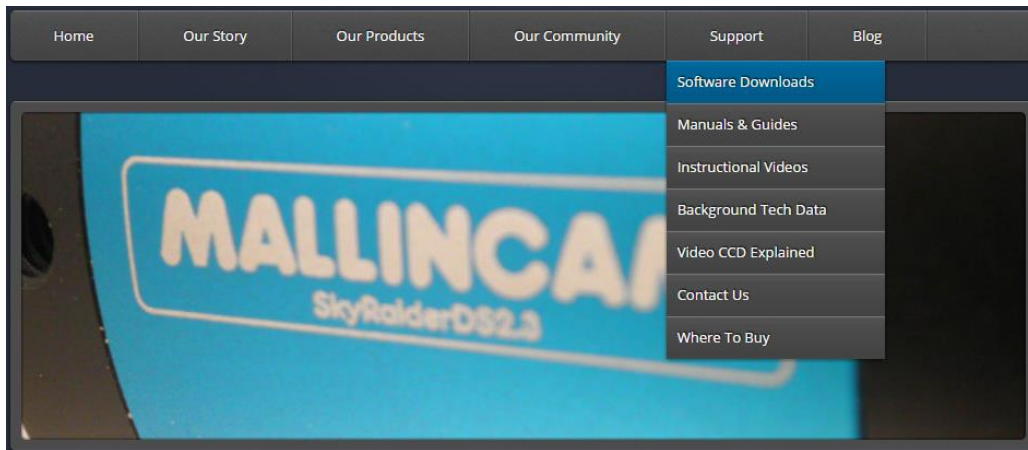
Step 2 Select the Blue **Download** Button to download the **Universe Driver** and the **Universe v4.9 Control Software**. There is a **Download** that contains a **ASCOM** drivers as well, but due to the large amount of data being passed by the Universe, the ASCOM is a use at your own risk.

After you have clicked on the Blue **DOWNLOAD** indicator, a zipped file will be downloaded onto your computer.

Note

*Make sure that the Universe is **not plugged** into the computer.*

We will install the Universe driver v5.0 first

Step 3

Place your mouse on the zipped driver file, **Right-Click** to pop-up an **Action Window**, and choose **Extract All …**

☑ 📁 mallincamdriverv5.0-20150527	2017-01-15 2:50 PM

A **Select Destination and Extract Files** Window will open-up. Just **Click** on the **Extract** button to accept destination location. The Destination Folder will now open-up the actual folder that contains the software to install.

☑ 📁 mallincamdriverv5.0-20150527	2017-01-15 2:51 PM	File folder
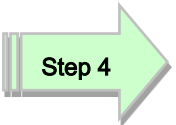
Step 4

Double-Click on the folder to open it up, revealing the **Mallincam Driver Setup** program it contains.

📄 MALLINCAM Driver Setup	2017-01-15 2:51 PM	Application	3,989 KB

We will now install the driver onto your Computer.

Step 5

Double-Click on the **Mallincam Driver Setup** File

Windows may display a warning asking for permission to run the program, if it does, select **YES.**
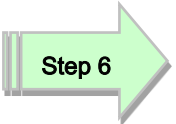
Step 6

The Following Set-Up Screen will appear
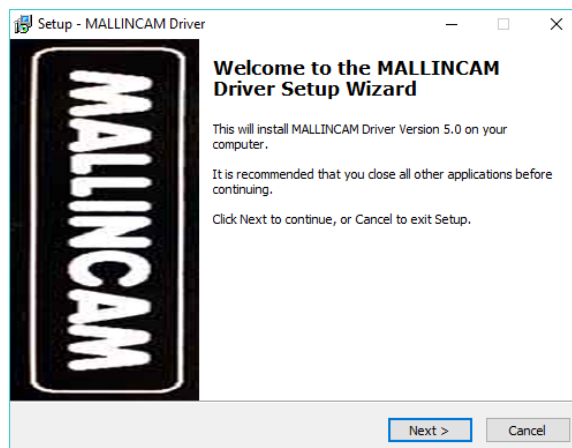
Step 7

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

The installation program will then install the drivers onto your computer, a green progress bar will indicate its process. Once completed, now wants to know where you would like to install the software. Either choose your own location, or select the **default**.
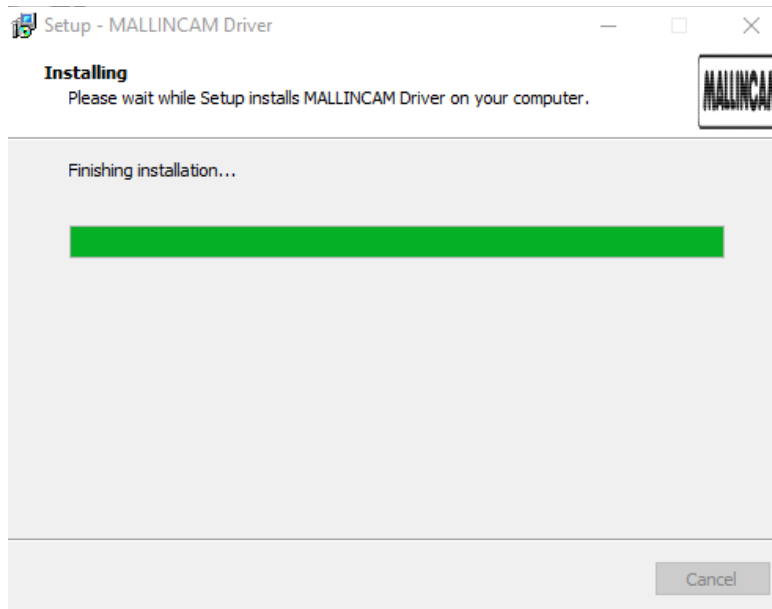
Depending upon the version on Windows you are using, you may need to provide Windows Security permission to install. Just click on the **Install** Button.

After all of the drivers have been installed onto your computer, the Setup program will pop-up a window asking you to **Click** on **Finish** to exit the installation process.

Step 8

Click on the **Finish** Button.
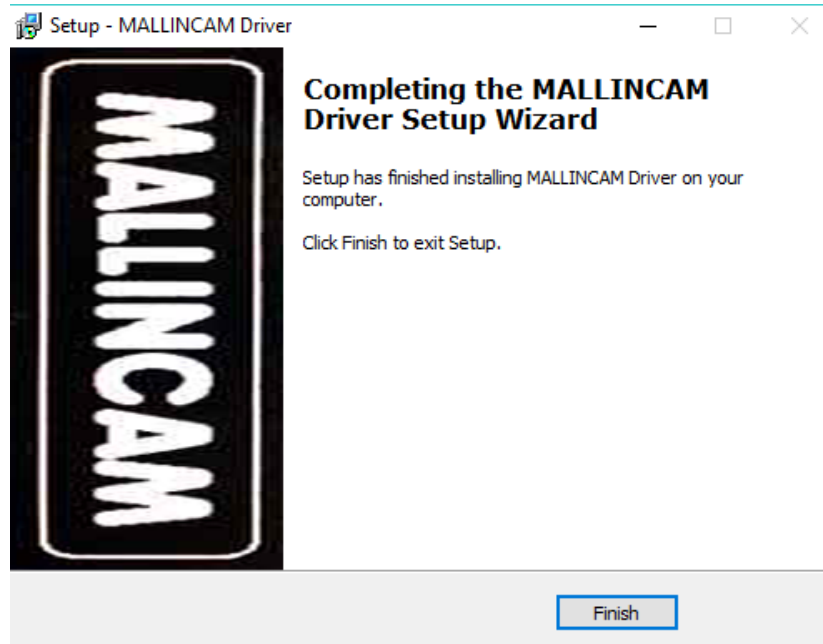
Now is the Time to Install the Universe Control Software onto your Computer.

Place your mouse on the zipped **mallincam_20univserv4.9** file, **Right-Click** to pop-up an **Action Window**, and choose **Extract All …**

☑ 🗜 mallincam_20universe_20v4.9-20160601	2017-01-15 2:41 PM

A **Select Destination and Extract Files** Window will open-up. Just **Click** on the **Extract** button to accept destination location. The Destination Folder will now open-up the actual folder that contains the software to install.

☑ 📁 mallincam_20universe_20v4.9-20160601	2017-01-15 2:43 PM	File folder
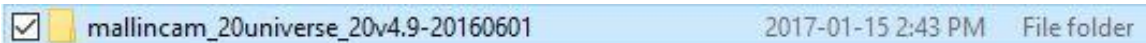
Step 9

Double-Click on the folder to open it up, revealing the **Mallincam Universe Setup** program it contains.

| 🎛 MallinCam Universe Setup	2017-01-15 2:43 PM	Application	2,945 KB

Step 10

Double-Click on the **Mallincam Universe Setup** File

Windows may display a warning asking for permission to run the program, if it does, select **YES.**

The following **Mallincam Universe Setup Screen** will then appear:
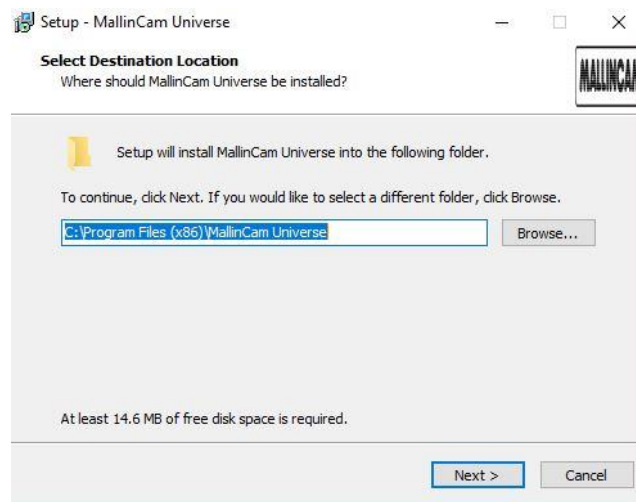
The installation program now wants to know where you would like to install the software. Either choose your own location, or select the **default**.

Step 11

Click on **Next** to start the installation.

The **Universe Software** will then install the Control Software. When completed, the following screen will appear:

Step 12

Click on **Finish** to complete the installation

The Software is now installed and ready to use. An program icon will be location on your desktop ready for you to start the application.

3.   Connecting the Universe

Connecting the Universe- to your Computer

Remove the rubber dust cover from the front of the Universe- camera (place it back in the box for safe keeping).

Screw in the optional 1.25" nose piece adapter or the provided 2" nose piece adapter to the front of the Universe.

There are 4 set screws located around the mounting collar of the camera body. Make sure that these are out far enough to allow the nose piece to fully seat in the camera. After the nose piece has been installed, you can tighten these 4 set screws for increase security. The use of the set screws is completely optional.

Insert the Universe (with adapter attached) into a 1.25" or 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).

Attach the 5 meter USB 2.0 Cable from the back of the Universe to a free USB 2.0 port on your computer.

Hint

The Universe has some strict power and thru-put requirements, and not all computers are created equal. If you find you are having difficulties with the following steps, it maybe the USB 2.0 port on your computer. If that is the case, one option to try is; connected a Powered USB 2.0 Hub to your USB 2.0 port on your computer. This simple step, can improve, both thru-put, power and distance between your computer and the Universe camera.

Check to ensure that the recessed thermo-electric cooler (TEC) switch is in the **ON** position. The TEC unit is on when the slider switch is closest to the red Power ON LED indicator.

Connect the +12 VDC lead from the AC-DC power supply to the camera's power port (next to the red Power LED.

Plug the AC-DC power supply into a power source to turn on the camera. The Power ON indicator will light. Allow a minute for full stabilization of the hardware. You should hear the fan operating on the Universe.

Note

If this is the first time connecting your Universe to the computer, Windows will then automatically load the correct **Universe Camera Driver** *onto your computer.*
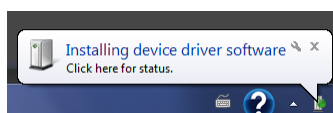
You are now ready to Start the Universe Control Software.

4. Using the Control Software

The Universe Window

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

① The **Top Menu Line** provides information about the current software

② The **Universe Video Window** will contain the display image from the **Universe Camera**. It is here that you will see the live video, or images.

③ The **Right SideBar** provides selection options adjusting the **exposure**, controlling the Universe camera's **Settings**, choosing **Folders**, and **Saving** images.

④ The **Shut Down Program Icon** will terminate the Universe Software, and will close the Program Window.

⑤ The **Panel Tabs** will indicate the current Tab (**Property** or **Picture**), that appears on the **Right Panel**.

Universe Quick Setup and Pictorial Work-Flow

A typical workflow when using the **Universe**.
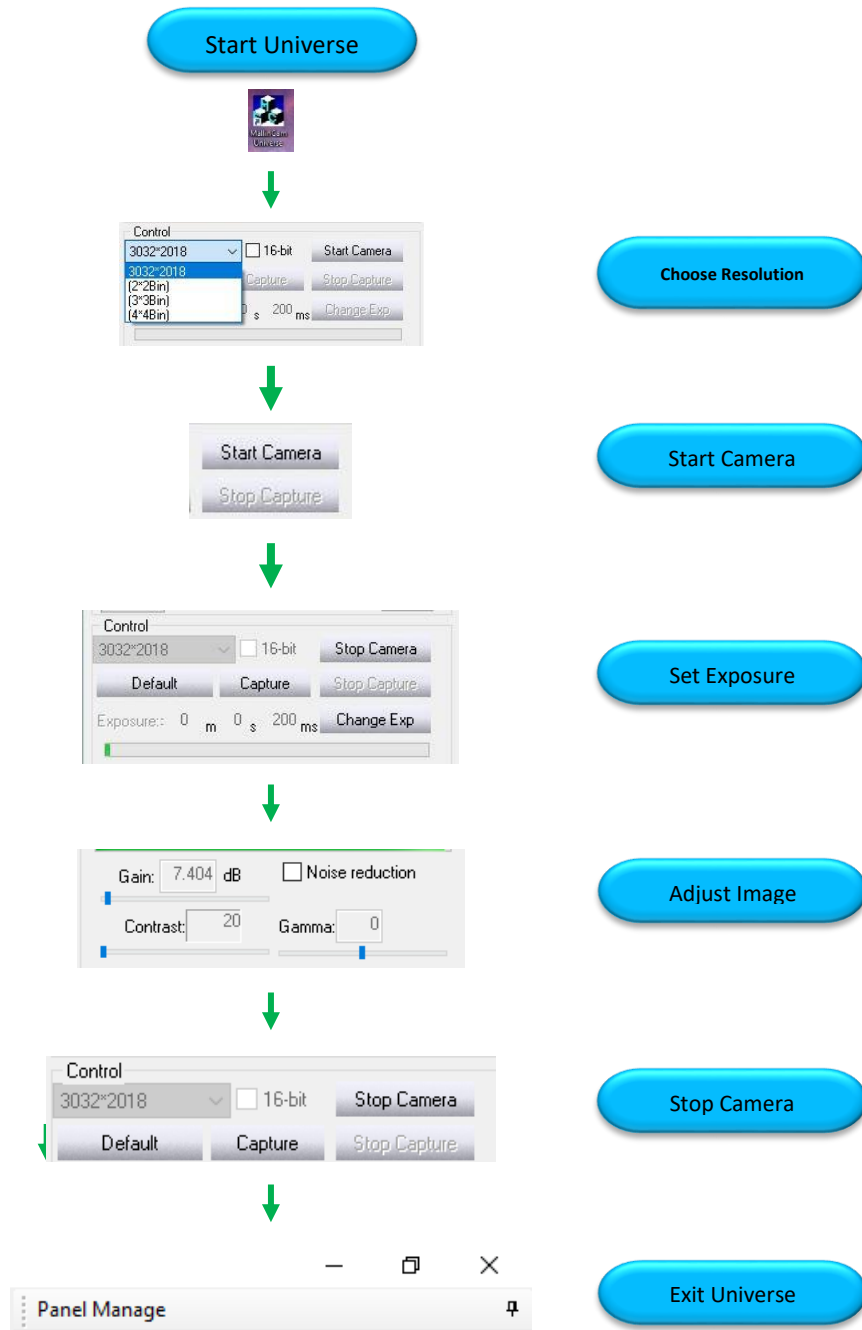
Dark Frame Subtraction Pictorial Work-Flow

A typical workflow when Using Dark Frame with **Universe**.
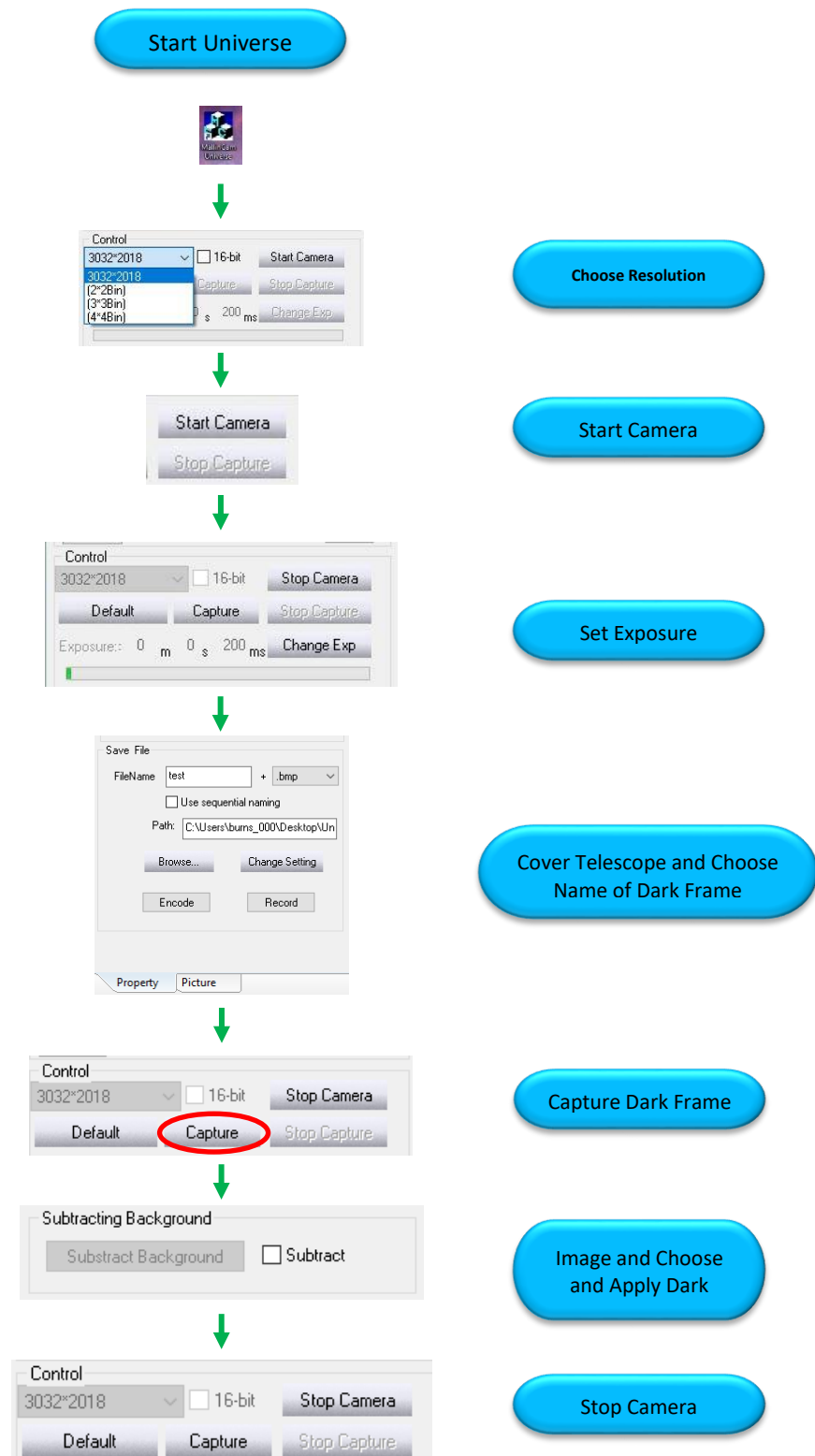
Saving Single Image Pictorial Work-Flow

A typical workflow when saving a Single Image with **Universe**.

Saving Multiple Images Pictorial Work-Flow

A typical workflow when Saving Multiple Images with **Universe**.

Start Universe

Choose Resolution

Start Camera
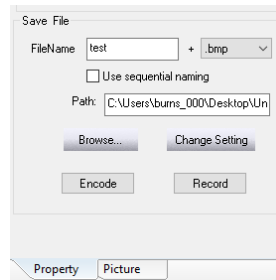
Choose location for Saved Image

Move into Picture Panel

Choose number of Images, and Delay between images and Start the capture process
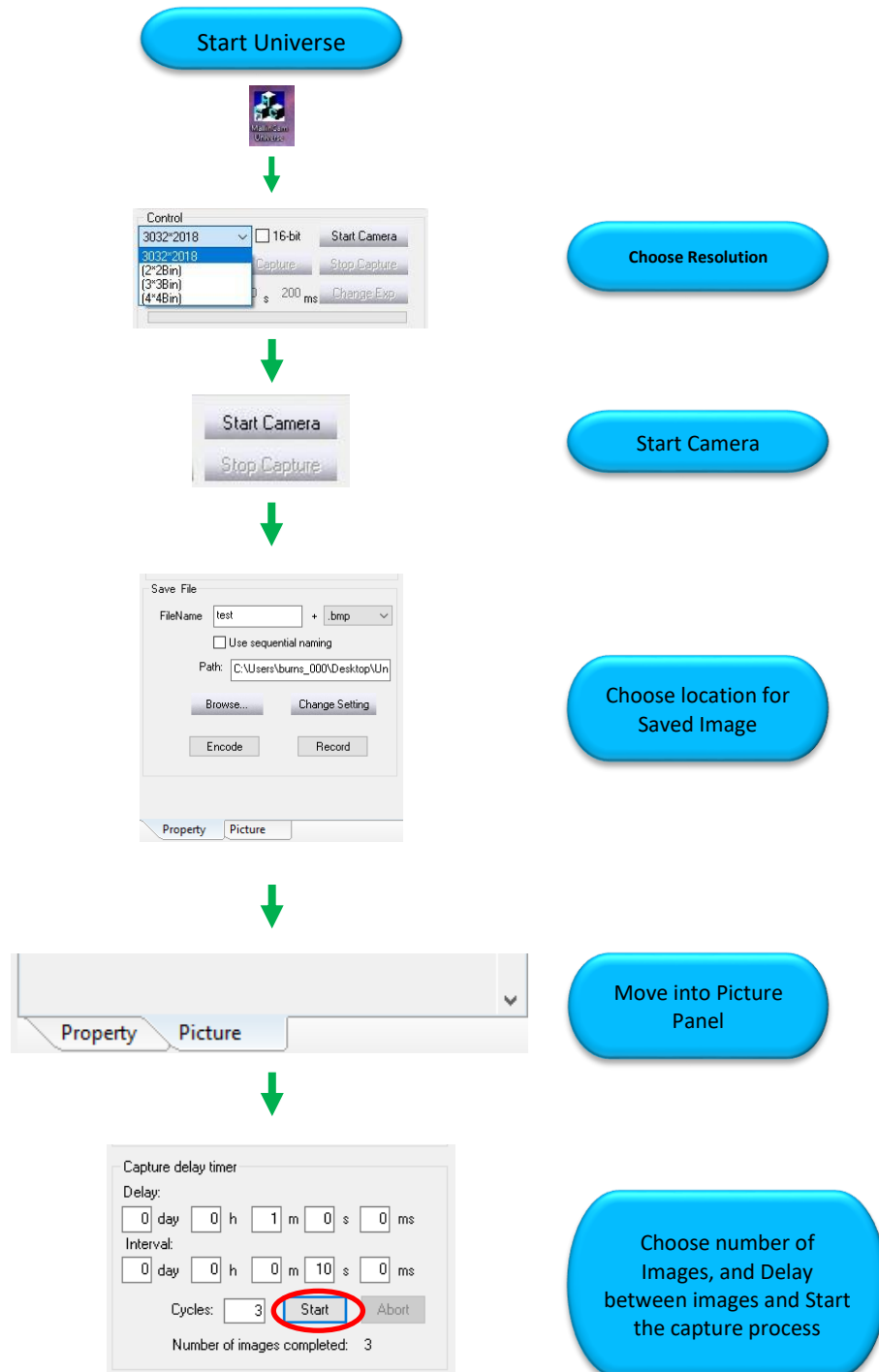
Record Video Pictorial Work-Flow

A typical workflow on how Record a Video with **Universe**.

when Saving Multiple Images with **Universe**.
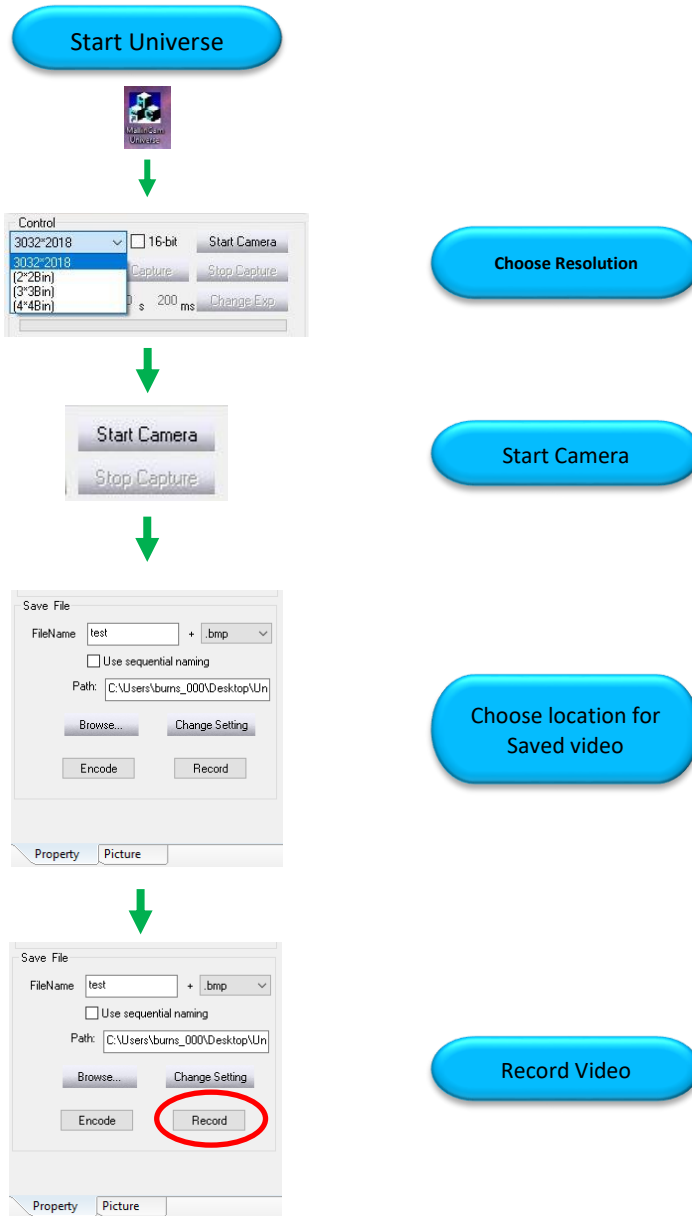
More Detailed Work-Flow Procedures

Quick Workflow for Mallincam Universe

Starting Mallincam Universe and Imaging

So, you don't 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 the **Imaging Workflow**, including hints and recommendations.

Step 1

Double Click on the **Mallincam Universe Icon** to start the program.

Note

*Before connecting the Universe Camera to the Control Software, you **must choose the resolution** that you would like to use for your imaging. So, ensure that you are in the **Property Panel** (if not sure, **Click** on the **Property Tab** located on the bottom right side of the Mallincam Universe Window).*

To reiterate, you can only adjust the resolution when the Universe Camera is stopped. But, the other controls can now be adjusted while the camera is continually exposing. This "on-the-fly" capability makes it much easier and quicker to adjust the settings to obtain the image you want.

Step 2

In the **Control** field, use the dropdown menu to select the image resolution. Use the default value of **3032 x 2018**. This is the camera's full, un-binned resolution.

Leave the 16-bit checkbox **unchecked** at this point. This will produce 8-bit files that will download and refresh more quickly than the 16-bit files.

Step 3

Click on the **Start Camera** button. The camera will then begin to capture images and display these in the preview window. Once the first image is displayed, the camera continues to capture images and show them sequentially.

Remember these are preview images that let you view what the camera sees through your telescope. They are not saved to your hard drive.

We are now going to adjust the exposure setting on the Universe so that you can obtain some level of detail in the image.

Step 4

Ensure that the **Auto checkbox** under the **Histogram panel** is **Not** enabled. If it does show a **checkmark**, then **Click** in the box to disable it.
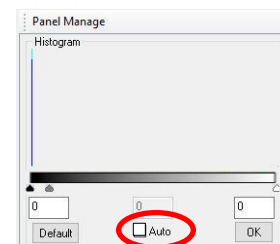
Step 5

Click the **Change Exp** button in the Control Panel. The **Exposure** fields now become active.

Step 6

Set the desired exposure length in the *m-s-ms* fields (minutes-seconds-milliseconds) and **Click** the **Max:56m0s0ms** button to accept. This exposure length will be used for both the preview images as well as any images you want to capture and save.

Note

If you have the exposure length currently set for a short interval (a few seconds or less) AND the histogram's Auto function is selected, you may notice that the m-s-ms fields keep resetting to the previous values as you're trying to change them. Deselect the histogram's Auto function to stop this behavior. You should then re-enable the Auto checkbox after changing the exposure length and Clicking the Max:56m0s0ms button.

Keep adjusting the exposure length until you start seeing some details or light variations in the preview image.

Step 7

You can now adjust the **Gain**, **Contrast**, and **Gamma** to improve your image's appearance using the controls just beneath the **Exposure** control.
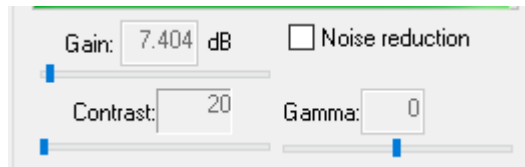
Saving an image onto your Computer

Step 1

Choose a **File Name**, **File Type** and **File location** using the controls in the **Save File Box** near the bottom of the **Property Panel**.
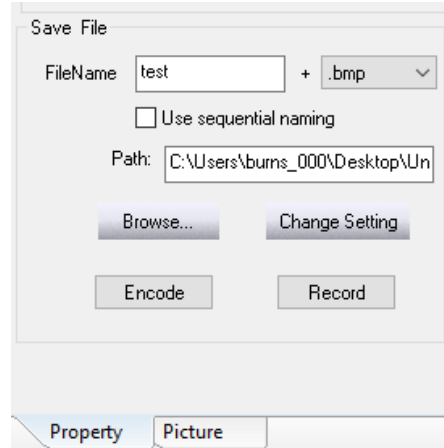
Step 2

Click on the **Change Setting** Button to accept.

Now we will save the current image to our Computer

Step 3

Click on the **Capture** button located in the Control box and the software will save the image using the **location**, **name**, and **format** previously chosen.
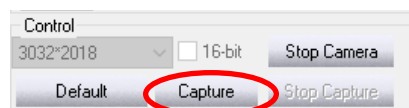
Shutting Down for the Night

Step 1   **Click** on the **Stop Camera** Button in the **Control Box** in the **Picture Tab**.
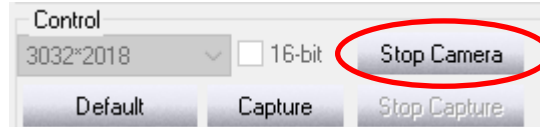
*Allow the **Universe** to finish its exposure.*

Step 2   **Click** on the **X** in the upper Right of the **Mallincam Universe Control Software** to shut down the Software.

Step 3   Remove the power from the **Universe Camera** to shut it down.

>>> **Detailed Workflow for Mallincam Universe**

> **Starting Mallincam Universe and Imaging**

The following procedures provide a step-by-step guide in imaging using the **Mallincam Universe Control Software** with the **Mallincam Universe Camera**. Please remember that every Telescope is different, and every sky condition will affect your results, so do not be afraid to adjust the values to produce an image you are satisfied with. So, have fun and experiment with the controls.

Later on in his User Guide you will find a section on describing what each control does in more detail, to assist you in experimenting with the controls.

Step 1 ➤ **Double Click** on the **Mallincam Universe Icon** on your desktop to start the software control program.

Note ⬡ *Before connecting the **Universe Camera** to the **Control Software**, you **must choose the resolution** that you would like to use for your imaging. So, ensure that you are in the **Property Panel** (if not sure, **Click** on the **Property Tab** located on the bottom right side of the Mallincam Universe Window).*

To reiterate, you can only adjust the resolution when the Universe Camera is stopped. But, the other controls can now be adjusted while the camera is continually exposing. This "on-the-fly" capability makes it much easier and quicker to adjust the settings to obtain the image you want.

Step 2 ➤ In the **Control** field, use the dropdown menu to select the image resolution. Use the default value of **3032 x 2018**. This is the camera's full, un-binned resolution.

Leave the 16-bit checkbox **unchecked** at this point. This will produce 8-bit files that will download and refresh more quickly than the 16-bit files.

Step 3

Click on the **Start Camera** button. The camera will then begin to capture images and display these in the preview window. Once the first image is displayed, the camera continues to capture images and show them sequentially.

Remember these are preview images that let you view what the camera sees through your telescope. They are not saved to your hard drive.

Focusing the Telescope

We are now going to adjust the exposure setting on the Universe so that you can achieve focus with your Telescope. We will use a short exposure time, so focusing adjustments will be readily reflected on the image window.

It is recommended that you focus on a bright object such as a bright star or bright planet. So, point your telescope on (or in the general direction) your selected focusing object. This procedure will be a lot simpler if your telescope is already aligned, and has go-to capabilities. If not, the following procedure will at least make the hunting for that bright object a lot easier. Don't worry, we all have spent many a time trying to get that bright star into the imaging window. It just takes a lot of patience and a nice cup of coffee (or other beverage of your choice).

Step 4

Ensure that the **Auto checkbox** under the **Histogram panel** is does show a **checkmark**, then **Click** in the box to disable it.
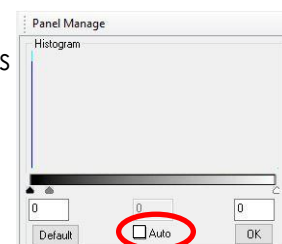
Step 5

Click the **Change Exp** button in the Control Panel. The **Exposure** fields now become active.
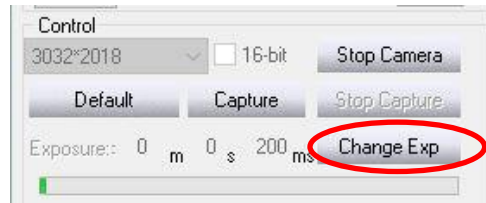
You must set the exposure length to obtain images that show some level of detail. If the current exposure time is too short, the image will appear black or very dark. If it is too long, the image will appear washed out or white.

You will need to set the exposure length for a fairly short interval, somewhere between 500 msec to 3 sec. This should be adequate for most telescope focal ratios F8 and less. High focal ratios (F10 and above) may require longer exposures. Using shorter exposure lengths will give you a quicker refresh rate on the live preview images. This allows for a near real-time approach to focusing the telescope, and will alleviate a lot of frustration.

Step 6

Set the desired exposure length in the *m-s-ms* fields (minutes-seconds-milliseconds) and **Click** the **Max:56m0s0ms** button to accept. This exposure length will be used for both the preview images as well as any images you want to capture and save.

Note

If you have the exposure length currently set for a short interval (a few seconds or less) AND the histogram's Auto function is selected, you may notice that the m-s-ms fields keep resetting to the previous values as you're trying to change them. Deselect the histogram's Auto function to stop this behavior. You should then re-enable the Auto checkbox after changing the exposure length and Clicking the Max:56m0s0ms button.

Keep adjusting the exposure length until you start seeing some details or light variations in the preview image.

If you find that the preview is very dark, try increasing the setting of the **Gain** slider, rather than increasing the exposure length. Set **Gain to maximum** and **Gamma to -20**. This will help to show brightness variations and defocused stars in the preview. If you're still having a problem seeing anything at all in the preview, you can try increasing the exposure length or even repositioning your telescope so that a bright star is near the center of the field of view. However, in most cases you shouldn't need to do this.
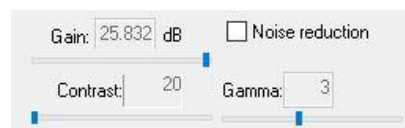
Step 7

Move your telescope's focuser in **one direction**. If the brightness variations become more diffuse or the defocused stars become larger and dimmer, then you're going the wrong way. Rack the focuser in the opposite direction so that the defocused stars become increasingly smaller and brighter. As you get closer to proper focus, you should begin to see an increasing number of fainter stars sharpening up in the field.

Step 8

When the stars are getting close to focus, place your mouse cursor near a brighter star, **Left-Click and Hold** the mouse button and draw a box around the star.
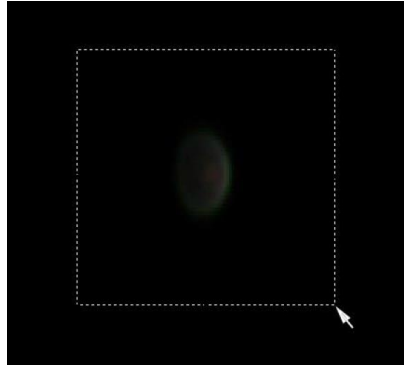
Step 9

Click the **Crop Area** button in the **Area Display** portion of the **Property** panel. The preview image will then only display the area you selected.

Step 10

Click the **Full Screen** checkbox in the **Area Display** box. The selected area is enlarged to fill the preview area. You now have a zoomed-in view of the defocused star. This makes seeing even the tiniest changes in your focusing much easier.
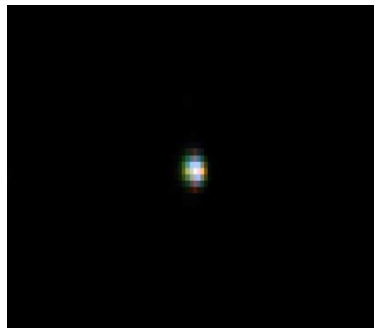
Continue adjusting the focus gradually until the star becomes as small and tight as possible. As the star image becomes smaller, it will also become brighter. When you cannot get it any smaller, you are in proper focus. If it starts to enlarge again, then you've gone too far. Reverse the focusing direction and make very small adjustments to tighten it up again.

Step 11

Once the telescope is focused to your satisfaction, **Click** on the **Restore** button in the **Area Display** box of the **Property** panel to return the Image Window display back to its original size.

Area Display
☑ Full Screen   Crop Area   *Restore*

Imaging a Deep Sky Object

You purchased the **Universe Camera** to image those amazing Deep Sky Objects, so let's get to work.

Since your telescope is focused, have it point to a Deep Sky Object of your choice.

Step 1

Click the **Change Exp** button in the Control Panel. The **Exposure** fields now become active.

Control
3032*2018   ☐ 16-bit   Stop Camera
Default   Capture   Stop Capture
Exposure:: 0 m 0 s 200 ms *Change Exp*
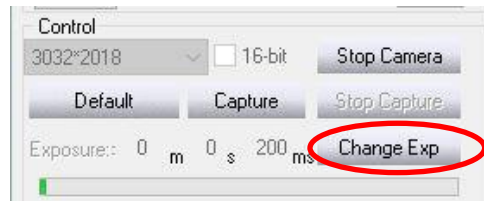
Note

You must set the exposure length to obtain images that show some level of detail. If the current exposure time is too short, the image will appear black or very dark. If it is too long, the image will appear washed out or white. You want to set an exposure time long enough so that you can verify that of Deep Sky Object in located somewhere in your image Window.

Step 2

Set the desired exposure length in the *m-s-ms* fields (minutes-seconds-milliseconds) and **Click** the **Max:56m0s0ms** button to accept. This exposure length will be used for both the preview images as well as any images you want to capture and save.

Exposure:: 0 m 0 s 200 ms *Max:56m0s0ms*

Note

Once you are seeing your object of interest, now is a great time to center the object in your Image Window using the telescope controls.

Step 2

Now adjust the **Gain**, **Contrast**, and **Gamma** sliders located just beneath the **Exposure** control to improve your image's appearance. Experiment with these controls in conjunction with the exposure to improve the image's detail.

Gain:	7.404 dB	☐ Noise reduction
Contrast:	20	Gamma: 0
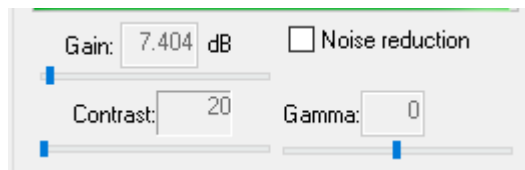
Step 3

Now adjust the **Contrast** by **Left-Click-Hold** and **Drag** the **Contrast slider** to a position that enhances your image.

Contrast is used to increase or decrease the differences in luminance to make objects in the image appear more or less distinguishable. This control should be adjusted in conjunction with altering the Exposure length, Gain, and Gamma settings to produce a satisfactory preview image.

Improve the Image Detail with the Histogram

*The purpose of changing the histogram values is to increase the data visible in your image. This is called **histogram stretching** or **dynamic range expansion**. This is an important function, especially in astronomical imaging, where the majority of pixels are often just capturing dark sky background.*

Until you become more comfortable with using the Histogram controls, the following guidelines will great ease you into the technique.

Step 1

Click the **Auto** checkbox located in the **Histogram** box.

Histogram

| 8 | ☑ Auto | OK | Default | 119 |
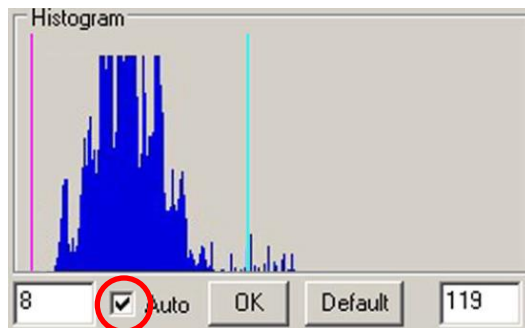
Step 2

Click the **OK** button located in the **Histogram** box to set the point values.

Note

*Using the **Auto** checkbox, then clicking on **OK**, let's the system determine an initial histogram stretch. This typically moves the black and white point values close to the leftmost and rightmost edges of where the blue columns first appear in the graph. The **Auto** function tries to maximize the dynamic range displayed onscreen in the preview image, and the image usually gets noticeably brighter.*

Step 3

Click on the **Auto** checkbox to **uncheck** it. This allows you to now tweak the black and white point values

Step 4

You have two methods of changing the black and white point values. The first is to **Left-Click-Hold and Drag** the **black**, **white**, or **grey** markers underneath the Histogram. The other method requires you to **enter-in** a value in the Black position box (left) and the White position box (right), then hit the **OK** button to accept.

Either technique will display a **Purple** vertical bar (Black point value) and a **Blue** vertical bar (White point value) at your chosen locations and the screens image will adjust accordingly.
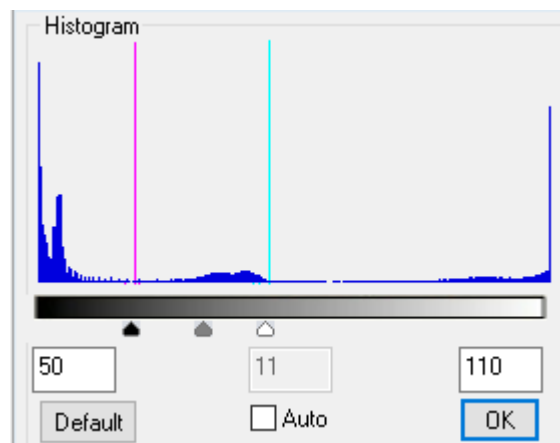
Note

The aim is generally to set the purple line (the black point) near the leftmost blue column of the graph and the blue line (the white point) near the rightmost blue column. Keep trying different values until you get these both into a location that displays the best image details. You'll see the effect of your changes on the current preview image, and these values will also be applied to the next preview image.

Amp Glow Reduction

If you take a long exposure with the **Gain** set high, you may notice a slight glow in the upper left corner of the image – that's amp glow. This results from the CCD chip's signal amplifier and is normal. The Universe Camera produces very little amp glow and so this is often not apparent. However, the amount of amp glow visible will actually depend on the particular combination of **exposure length**, **gain**, **contrast**, and **gamma settings**, as well as the degree of **histogram stretching** that you apply.

*The **Noise** reduction control reduces (and in many cases, eliminates) the amount of amp glow visible. It also reduces the visibility of any **hot pixels**.*

Step 1

To enable this control by **clicking** in the **Noise reduction** checkbox. Note that some of the faintest nebulosity visible in your image may also be reduced when you use this setting.

Gain: 7.053 dB   Noise reduction
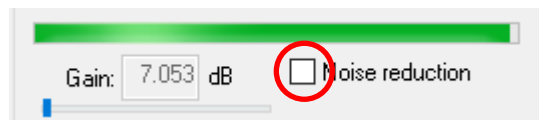
Color Controls

*Color balance (also referred to as **White Balance**) involves making adjustments to the intensities of the primary colors (**red**, **green**, and **blue**) in order to remove unrealistic color casts and achieve the proper rendition of all the colors in the image.*

*The **R gain**, **G gain**, and **B gain** sliders allow you to adjust the relative amounts of red, green, and blue in the image, respectively.*

Note

*Whenever you change the exposure time, the color balance will change. The recommended procedure to create a starting point is to **Click** on the **White Balance** button to automatically set the red, green, and blue values. These adjustments will appear during the next image refresh.*

Step 1

*Click on the **One Push WB** button located in the **Color** box.*

Color
R gain: One Push WB   0.84
G gain: 1.00
B gain: 1.00
Saturation: 51
☐ Adjust saturation   ☐ Monochrome
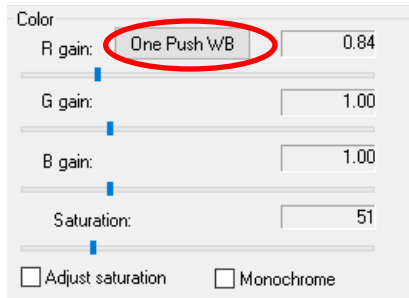
*If the colors are not meeting your requirements, then you can use **Step 2** to adjust them.*

Step 2

Left-Click-Hold and **Drag** each of the **R gain**, **G gain**, and **B gain** sliders to adjust the colors to your preference.

Sometimes the intensity of colors is too great for the brightness of the image, so we can adjust this with the Saturation control.

Step 3

Click on the **Adjust Saturation** checkbox to enable it.

☑ Adjust saturation   ☐ Monochrome
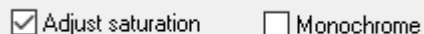
Step 4 — **Left-Click-Hold** and **Drag** the **Saturation** slider to a value that meets your color needs. The changes will appear during the next image refresh.

Note — *Sometimes you are looking for contrast details that display better in a monochrome image. If that is the case then **Click** on the **Monochrome** checkbox to activate it, and the next image refreshes will be in monochrome.*

☐ Adjust saturation   ☑ Monochrome

Saving Images onto your Computer

Once you have adjusted the camera's controls to your liking and focused the target in your telescope, you are ready to begin capturing images and saving them to the hard disk. The Universe Capture application provides a variety of ways to capture and save your images. You can save individual images one at a time, or you can instruct the application to save a sequence of images captured one after another. The sequence of images can all have the same exposure lengths, or each image in the sequence can be customized for a unique length. You can also configure the application to capture a number of images and stack them automatically to produce a higher quality image.

Save a Single Image

*Located near the bottom of the **Property** panel (you will need to use the scroll bar to display) is the **Save File Box**. It is in the box that you will set up the file **name**, **type**, and **location** for your saves image.*

Save File

FileName test   +   .bmp ∨

☐ Use sequential naming

Path: C:\Users\burns_000\Desktop\Un

Browse...   Change Setting

Encode   Record

Property   Picture

Note — *Ensure that the **Auto checkbox** is **NOT** selected in the **Histogram** box.*

Step 1 — **Click** in the **FileName** box and **enter a name** for the file (choose a logical name, such as M57).

FileName test

Step 2   **Click** on the **dropdown** box next to file name and choose an image format.

FileName second test   +   .tif

☐ Use sequential namir
.tif
.bmp
.jpg
.raw

Path: C:\Users\burns_000

Step 3   **Click** on the **Browse** button and use the popup window to choose a location (or create a new folder) to where you want the software to save the images.

Path: C:\Users\burns_000\Desktop\Un

Browse...   Change Setting

Step 4   **Click** on the **Change Setting** Button to accept all of these settings.

Note   *The software will remember the Path for the next time.*

Now we are ready to save the image to our computers.

Step 5   **Click** on the **Capture** button located in the Control box.

Control

3032×2018   ☐ 16-bit   Stop Camera

Default   Capture   Stop Capture
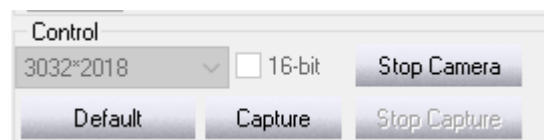
Note   *The Universe software will save the image using the **location**, **name**, and **format** previously chosen. It will even add a number behind the name to help distinguish it from other images with the same name.*

Save a Sequence of Images

*Located near the bottom of the **Property** panel (you will need to use the scroll bar to display) is the **Save File Box**. It is in the box that you will set up the file name, **type**, and **location** for your saves image.*

Save File	
FileName	test + .bmp
	☐ Use sequential naming
Path:	C:\Users\burns_000\Desktop\Un
Browse...	Change Setting
Encode	Record
Property	Picture

Note   *Ensure that the **Auto checkbox** is **NOT** selected in the **Histogram** box.*

Step 1   **Click** in the **FileName** box and **enter a name** for the file (choose a logical name, such as M57).

FileName   test

Step 2   **Click** on the **dropdown** box next to file name and choose an image format.

FileName   second test   +   .tif
☐ Use sequential namir   .tif
                          .bmp
Path: C:\Users\burns_000   .jpg
                              .raw

Step 3   **Click** on the **Browse** button and use the popup window to choose a location (or create a new folder) to where you want the software to save the images.

Path: C:\Users\burns_000\Desktop\Un
Browse...   Change Setting

Step 4   **Click** on the **Change Setting** Button to accept all of these settings.

Note   *The software will remember the Path for the next time.*

Now we are ready to save the images to our computer.

Step 5 **Click** on the **Picture** Tab, to open up the **Picture** pane controls.

Property   Picture
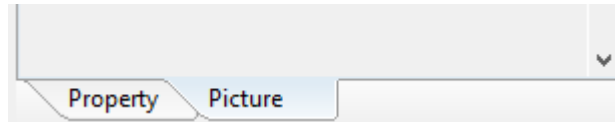
Step 6 Enter a number into the Cycles box that represents the number of images you would like to tale.

Capture delay timer
Delay:
0 day   0 h   0 m   0 s   0 ms
Interval:
0 day   0 h   0 m   0 s   0 ms

Cycles: 5   Start   Abort

Number of images completed: 0

Optionally, you can enter an interval that lets the software know how much time you would like to wait between each image.
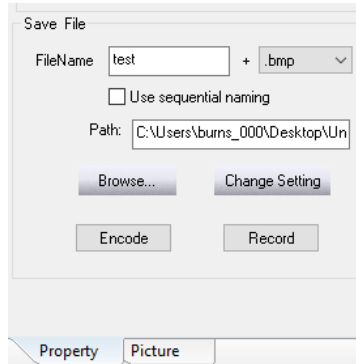
Optionally, you can enter a time that indicates how low the software should wait before taking the first image of the sequence.

Capture delay timer
Delay:
0 day   0 h   1 m   0 s   0 ms
Interval:
0 day   0 h   0 m   10 s   0 ms
Cycles: 3   Start   Abort
Number of images completed: 3
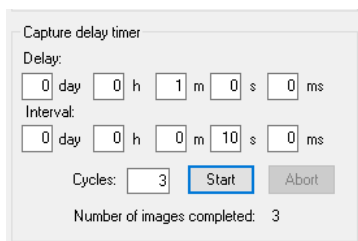
This will take **3 images**, with a **1 minute delay** before the sequence starts, and **10 seconds between** each subsequent image.

Step 7 **Click** on the **Start** Button in the **Capture Delay Timer** Box and the software will start taking the images using the **location**, **name**, and **format** previously chosen.

Cycles: 5   Start   Abort

Number of images completed: 0
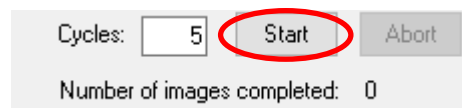
Save a Sequence of Images with each with Customized Time

This feature allows you to configure an automated sequence with various individual exposure times for up to 10 images. This can be very useful if you are shooting an object with a high dynamic range, such as the Orion Nebula. Taking a set of images with incrementing exposure times allows you to capture levels of details at different brightness levels by simply varying the exposure durations.

Located near the bottom of the **Property** panel (you will need to use the scroll bar to display) is the **Save File Box**. It is in the box that you will set up the file **name**, **type**, and **location** for your saves image.

Note   *Ensure that the **Auto checkbox** is **NOT** selected in the **Histogram** box.*
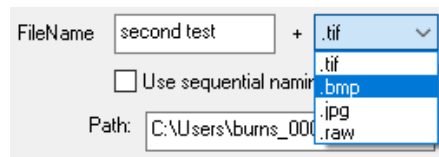
Step 1   **Click** in the **FileName** box and **enter a name** for the file (choose a logical name, such as M57).
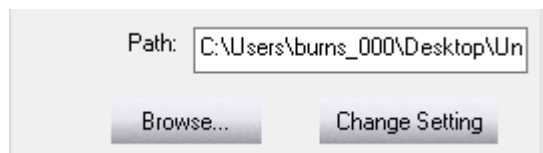
Step 2   **Click** on the **dropdown** box next to file name and choose an image format.

Step 3   **Click** on the **Browse** button and use the popup window to choose a location (or create a new folder) to where you want the software to save the images.

Step 4   **Click** on the **Change Setting** Button to accept all of these settings.

Note   *The software will remember the Path for the next time.*

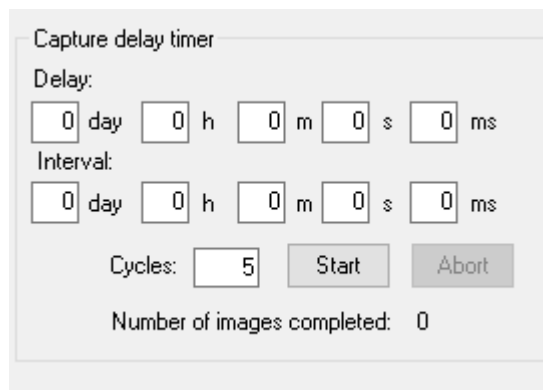*Now we are ready to save the images to our computer.*

Step 5   **Check** the **Customer Set** checkbox location in the **Custom Sequence Capture Mode** box in the **Property** panel.

Custom sequence capture mode

☑ Custom Set   Set times

Step 6   **Click** on the **Set time** button to open up its window.

Set exposure times

	Minute	Second	Millisecond
1	1	0	0
2	1	30	0
3	2	0	0
4	2	30	0
5	3	0	0
6	4	0	0
7	5	0	0
8	7	30	0
9	10	0	0
10	15	0	0

OK

Step 7   Enter the desired duration values in the **Minute-Second-Millisecond** fields for each image you would like to take.

Step 8 Once all durations have been entered, **Click** on the **OK** button to accept these times.

Note *Since you are capturing images of various exposure lengths here, you may want to leave the **Histogram's Auto** disabled off and set the histogram values manually before starting the sequence. In that way, the same histogram stretch will be used for all the images in the sequence. The only differences between images will be due to their varying exposure lengths. When the histogram's **Auto** function is enabled, the application will try to compensate for the different light levels and therefore apply a different stretch to each image.*

Step 9 **Click** the **Capture** button. The exposures begin and when they are done, the files are saved in the folder you selected.

Note *While the exposure sequence is running, the **Capture** button turns into a frame counter and indicates the number of the last frame in the sequence that was captured.*

Once the custom set of exposures has completed, the Universe resumes taking individual preview images. It uses the time of the last exposure in the custom set for these previews.

*If you want to go back to taking single images after shooting a custom set, you must click on the **Custom Set checkbox** again to **deselect** it. You can then change the exposure length of the individual preview images by clicking on the **Change Exp** button and setting the desired values in the **m-s-ms** fields (minutes-seconds-milliseconds), as usual. Then click **OK**.*

*The preview images will start to display using this new exposure setting. If you do not deselect the **Custom Set checkbox**, then the same custom exposure sequence you just completed will be started again whenever you next press the **Capture** button.*

Capturing images using the Capture delay timer

You can also set up a sequence of captures using the **Capture delay timer** section of the **Picture panel**.

This feature is an intervalometer that allows you to set a delay time before the beginning of your sequence, and an interval between exposures. You also use it to set up the number of captures you want. Use this function if you want to do a time-lapse sequence of an event such as the motion of Jupiter's moons, the movement of a comet against the background stars, the progression of an eclipse, and so on.

This feature works in conjunction with either the **Sequence capture mode** or the **Custom sequence capture mode**. The timer applies its delay and interval in cycles to either of those modes. Therefore, you must configure one of those modes before starting the timer. Examples are provided below.

The camera must be operating in the preview mode and actively generating preview images.

 Working with the Sequence capture mode

Step 1

*Configure all the camera settings properly, including the length of the exposure, on the **Property panel** so that you are satisfied with the preview image.*

Step 2

Perform one of the following:

a. If you want to capture a set of **single images** with a specific period of time between each image, then **Click** the **Change button** in the **Sequence capture mode panel**. Enter the number "**1**" in the **Frames box** and click **OK**.

b. If you want to capture groups of images with a specific period of time between each group, then click the **Change button** in the **Sequence capture mode panel**. Enter the number of images you want in each group in the **Frames box** and click **OK**.

Step 3

Locate the **Save File Box** near the bottom of the **Property Panel**.

Enter the name you want to assign to the captured images in the **FileName** field, for example: NGC891.

- The application will use this name and automatically add a number after the name for every shot in the sequence, for example: NGC891_1, NGC891_2, and so on.
- If you don't enter a name here, the application will automatically enter one for you. This will be in the form "TS_x", where x is an incrementing number, for example: TS_1, TS_2, and so on.

Step 4

Click the **Use sequential naming checkbox** if you want the application to automatically enter a name for each of the images in the timestamp format, as previously described in the capturing sections. This can be especially useful when using the intervalometer, since the name then indicates when the exposure was made.

Step 5

In the **+ extension box**, select a file format from the dropdown menu, as previously described in the capturing sections.

Step 6

Click the **Browse button** to select or create the folder you want to store the captured images in. You may want to create a new folder here to help organize your captures.

Step 7

Set the amount of **delay time** before the start of the exposures by using the **day-h-m-s-ms fields** in the **Delay section** of the **Capture delay timer** located in the **Picture Panel**. This delay will only be applied at the beginning of the first cycle. It is not repeated between cycles.

Step 8

Set the length of the time interval between cycles using the **day-h-m-s-ms fields** in the **Interval section** of the **Capture delay timer**. This amount of time will only be applied after a cycle is complete. It is not added to the delay you specify for the start of the sequence.

Step 9

Set the number of cycles in the **Cycles box**. As an example, enter the number "12" here.

a) If you entered the number "1" in the Frames field in **Step 2a**, you will have 12 images when the sequence is complete. The start of the first exposure is delayed by the amount of time you specified in **Step 7**. Each subsequent image will have the interval you specified in **Step 8** applied before the start of that exposure. This mode is useful if you just want to generate single images separated by a specific interval, as in a straightforward time-lapse sequence.

b) If you entered a number other than "1" in the **Frames box** in **Step 2b**, then the timer operates as follows. For example, let's say you entered the number "4". When you start the sequence, the timer will initially apply the delay you specified in **Step 7** and then a group of four images will be taken, one directly after another. This completes the first cycle. The timer will then apply the interval you specified in **Step 8** and the next group of four images will be taken, one directly after another. This completes the second cycle. This process continues until all the cycles are finished. In this example, you will end up with 48 images – 12 groups of 4 clustered images. This mode is useful if you want to generate multiple images within a group for stacking, and then have subsequent groups separated by a specific interval of time.

Step 10

Click the **Start button** to begin the capture sequence.

The Number of images completed counter shows you the total number of images that have been captured and written to the hard drive since you

pressed Start. For the example in step 9b, it would indicate "48" when the last cycle is complete and all images have been downloaded.

Note

*To **stop a capture** sequence before it is entirely completed, **Click** the **Abort button**.*

Working with the Custom Sequence capture mode

You can also use the Capture delay timer with the Custom sequence capture mode. This works in basically the same way as described above for the Sequence capture mode. The main difference is that you must set the customized exposure times in the Set exposure times form.

Proceed as follows:

Step 1

Perform **Step 1** through **Step 9** in the section **Save a Sequence of Images with each with Customized Time**

Step 2

Set the amount of delay time before the start of the exposures by using the **day-h-m-s-ms** fields in the **Delay** section of the **Capture delay timer**. This delay will only be applied at the beginning of the first cycle. It is not repeated between cycles.

Delay:
| 0 | day | 0 | h | 0 | m | 0 | s | 0 | ms |

Step 3

Set the length of the **time interval** between cycles using the **day-h-m-s-ms** fields in the **Interval section** of the **Capture delay timer**. This amount of time will only be applied after a cycle is complete. It is not added to the delay you specify for the start of the sequence.

Interval:
| 0 | day | 0 | h | 0 | m | 0 | s | 0 | ms |

Step 4

Set the number of cycles you want in the **Cycles field**.

Cycles: | 1 | Start   Abort

Step 5

Click the **Start button** to begin the custom capture sequence. The timer will apply the delay you specified in **Step 2** before beginning the first capture. The application will then capture each exposure you configured in the custom sequence, but with no delay between these shots. When the custom sequence is completed, the timer will then apply the interval you specified in **Step 3**. The cycle is then run again, with no delay between the shots. This process is repeated until all the cycles you specified in **Step 4** are finished.

As an example:

If you configured eight custom exposure times in the Custom sequence capture mode and you set the **Cycle**s field to "3", you will end up with 24 images when the last cycle is completed. Each group of eight images will be delayed from the previous group by the Interval length you specified for the timer. The start of the first image in the first group will be delayed from the time you pressed Start by the Delay length you specified for the timer.

The **Number of images** completed counter will show you the total number of images that have been captured and written to the hard drive since you pressed Start. For this example, it would indicate "24" when the last cycle is complete and all images have been downloaded.

Number of images completed: 0

Note

To **stop** a custom capture sequence before it is entirely completed, **Click** the **Abort** button.

To Exit for the Night

Click on the **Stop Camera** Button in the **Control Box** in the **Picture Tab**.

Allow the **Universe** *to finish its exposure.*

Step 2 **Click** on the **X** in the upper Right of the **Mallincam Universe Control Software** to shut down the Software.

| Panel Manage | 📌 |

Step 3 Remove the power from the **Universe Camera** to shut it down.

5.   The Universe Software Controls

This Chapter of the User Manual will describe in exact detail what each control on both the **Property Panel** and the **Picture Panel** 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.
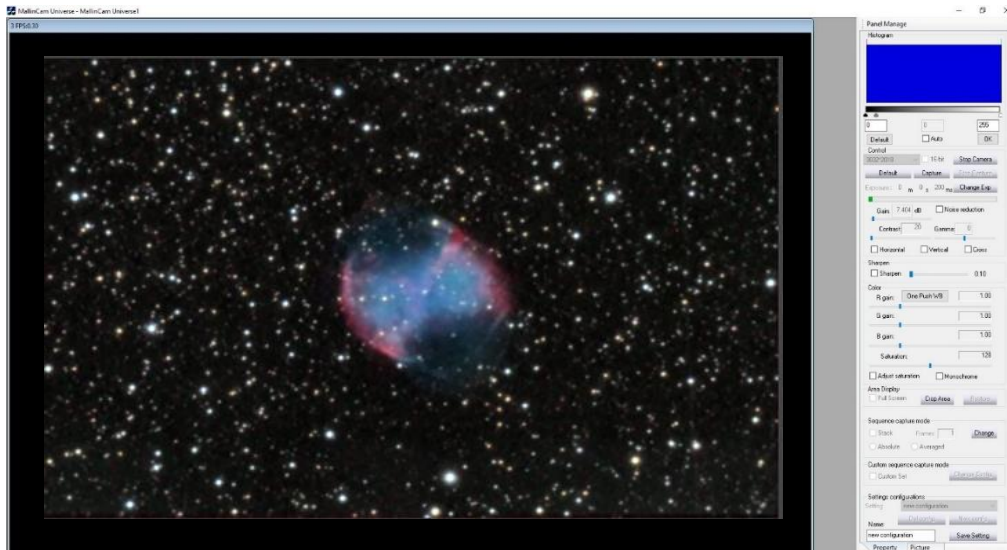
The Property Panel

Histogram

The histogram is a graphical view of the brightness range within the image. The horizontal axis represents the variation in brightness, with the darkest pixels to the left (pure black is "0" when the histogram is not stretched) and the lightest pixels to the right (pure white is "255" in an 8-bit image, or "4095" for 12-bit data (in a 16-bit file)).

The height of the dark blue columns in the vertical axis represents the relative number of pixels at a particular brightness value. The higher the column, the more numerous are the pixels at that brightness value.

The purpose of changing the histogram values is to increase the data visible in your image. This is called **histogram stretching** or **dynamic range expansion**.

This is an important function, especially in astronomical imaging, where the majority of pixels are often just capturing dark sky background.

As a result, the histogram curve tends to be towards the left side of the overall plot, indicating that darker and dimmer pixels are the most common.

The right side of the histogram plot tends to be sparsely populated, indicating only a relatively small number of bright pixels.
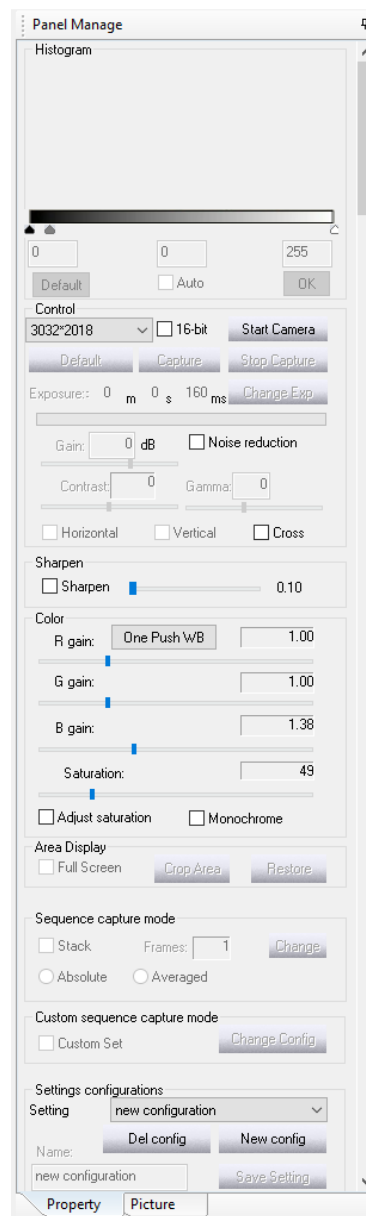
If the histogram is not stretched, then your computer will attempt to display the full range of brightness proportionately, resulting in a generally dark image. This is the histogram's initial Default full-range setting, and its effect is seen in the example below, on the left side.
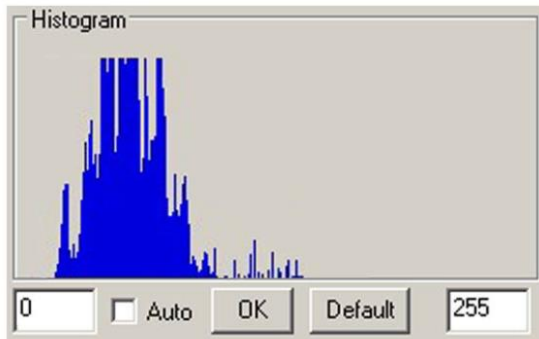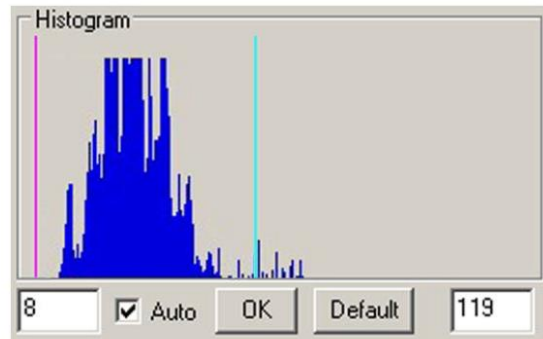
Unstretched histogram   Stretched histogram

When you use either the **Auto** function or the **manual** method to change the histogram, you are setting new values as the darkest (black) and lightest (white) points in the displayed image. The data between these new values is then stretched (expanded) to become the full display range of brightness. The result is shown in the example above, on the right side. These new values appear in the text boxes. The new black point is also indicated by a vertical **red line** on the graph, and the new white point is indicated by a **vertical blue** line.

Notice the differences between the two images. The stretched version shows a lot more dimmer detail at the outer portions of the nebula. However, some of the brighter details that are visible near the center of the unstretched image are now just shown as white in the stretched version. So generally, the narrower the range you set between the black and white points, the greater the contrast will become in your image. The bright colors become brighter and the dark colors become darker. In the example above, the range was decreased from 256 in the unstretched version (0 to 255) to 112 in the stretched version (8 to 119).

In addition, if you use the same range of 112 but at different points along the horizontal axis, for example, shifting it to the right at 20 to 131, the overall image will get darker. Likewise, shifting the same range to the left (say, 2 to 113) will make the overall image lighter. This demonstrates why you must carefully adjust the histogram to get the level of detail and brightness that you really want.

Alter the histogram by trying one or more of the following methods:

➢ **Click** the **Auto** checkbox, then **OK** to let the system determine an initial histogram stretch.

This typically moves the black and white point values close to the leftmost and rightmost edges of where the blue columns first appear in the graph.

The **Auto function** tries to maximize the dynamic range displayed onscreen in the preview image, and the image usually gets noticeably brighter. However, while Auto mode is recommended to get an initial approximation, it is not always the best choice for the final setting of your image. It can sometimes get "fooled" by the presence of a few too many bright or hot pixels, and therefore sets the white point too high. In such cases, go to manual mode and set the white point lower.

➢ In the **manual mode**, you can set the black and white points to any values in your image. With the **Auto mode unchecked**, you will drag the black or white marker triangle to change the location of the black and white point.
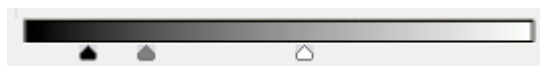
Place your cursor somewhere over the **black** triangle marker **right-click and drag** the marker to another location. You will see the **red vertical line** move to this location on the next image refresh. This sets the new black point.

Place your cursor somewhere over the **white** triangle marker **right-click and drag** the marker to another location. You will see the **blue vertical line** move to this location on the next image refresh. This sets the new white point.

Notice how the preview image changes after the next image refresh. Repeat as required until you get it the image stretched to your liking. as close as possible to the right side.
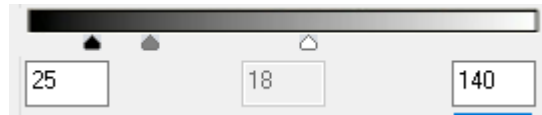
➢ For greater precision, use the text boxes below the display to enter specific black point and white point values, then click **OK**. The **Auto mode** must not be checked. The range for each field is 0 to 255 in 8-bit mode (or 0 to 4095 in 16-bit mode), with the left field to be set lower than the right. As with the manual mouse-click method, the goal is generally to set the **red line** (the black point) near the leftmost blue column of the graph and the **blue line** (the white point) near the rightmost blue column. Keep trying different values until you get these both as you want them. You'll see the effect of your changes on the current preview image, and these values will also be applied to the next preview image.

Note

*Note that you can always click the **Default button** to return to the full (unstretched) histogram range.*
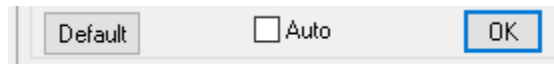
The **Auto checkbox** must **not** be checked when you do this.

The histogram can also help you to determine if you are exposing your image properly. If you only have a few blue columns clustered at the left side of the graph, then you are under-exposing. If the majority of the blue columns are towards the right side, then you are over-exposing. Adjust the exposure length for a greater spread of columns through the middle of the graph, if possible.

Resolution Control
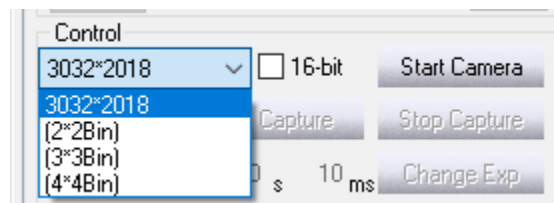
The **resolution control** is used to adjust the image size and thereby also the effective pixel resolution of your captured image. You can only set this control while the camera is stopped. In the upper-left corner of the **Control** box, use the dropdown menu to select the desired image size. The default value of 3032x2018 is displayed initially. This is the camera's full, unbinned resolution size. You can also choose to bin the image by factors of 2x2, 3x3, or 4x4.

Binning combines multiple pixels into fewer, but effectively larger, super-pixels. In 2x2 binning for example, a square of four adjacent unbinned pixels forms one large super-pixel. This increases sensitivity, since the binned super-pixel now delivers the combined signal of the four original unbinned pixels. But the trade off with binning is that since each super-pixel covers a larger physical area of the CCD imaging chip, it "sees" a larger area of the sky, and so the spatial resolution of each such pixel is decreased.

For example, if you select 2x2 Bin, the captured image size will now be only 1516x1008 pixels. It will still show the same total area of the sky as the unbinned 3032x2018 image, but will do so using only half as many pixels in both the vertical and horizontal dimensions. The actual file size of a saved 2x2 binned image will also be reduced to about one-quarter that of an unbinned image.

Since binning increases pixel sensitivity, objects such as faint nebulae will generally appear brighter and more prominent. However, some of the finer details will be lost due to the decreased spatial resolution. The higher the degree of binning, the greater the camera's sensitivity becomes.

The image sizes produced by the various binning options are as follows:

- 3032*2018 pixels: images are 3032 x 2018 pixels (full-resolution mode)
- 2x2: images are 1516 x 1008 pixels
- 3x3: images are 1008 x 672 pixels
- 4x4: images are 756 x 504 pixels

Regardless of the binning mode you choose, all images will still be in full color.

16-Bit
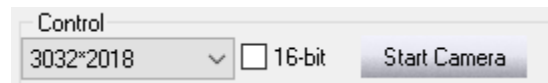
Used to set the bit resolution of captured **TIF** images. When this option is not selected, **TIF** files are saved as 8-bit versions (RGB 24-bit). When the option is selected, the **TIF** files are saved as 16-bit versions (RGB 48-bit) to capture the camera's full 12-bit data range. Although 16-bit is the recommended choice, some image processing applications cannot read this richer **TIF** format.

You can only set this control while the camera is stopped.

Exposure
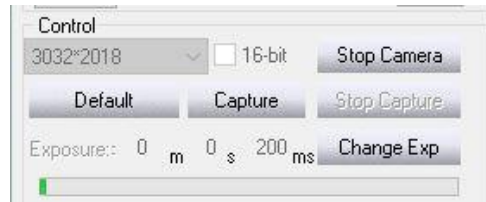
Used to adjust the length of an image exposure. You should set this control in conjunction with adjusting the **Gain**, **Contrast**, and **Gamma** parameters to produce a satisfactory preview image.

Click the **Change Exp** button and enter the desired values in the **m-s-ms** fields (minutes-seconds- milliseconds), then click on the **Max:56m0s0ms** Button. The next preview image will then begin. Once exposures are being taken, you should notice the green indicator bar moving across its box beneath the Exposure time,

*If you have the exposure length currently set for a short interval (a few seconds or less) AND the histogram's **Auto** function is selected, you may notice that the **m-s-ms** fields keep resetting to the previous values as you're trying to change them. Deselect the histogram's **Auto** function to stop this behavior. You can then re-enable the **Auto** checkbox after changing the exposure length and clicking **OK**.*

Gain
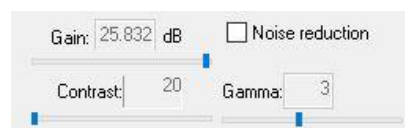
Used to set the camera's amplifier sensitivity. You should typically set the **Gain** as low as possible and adjust the **Exposure** time, **Contrast**, and **Gamma** parameters to produce a satisfactory preview image. Set the **Gain** higher if you need the additional boost in sensitivity, for instance, if you need to keep your exposures shorter. This can be beneficial if your telescope mount's tracking is not precise, or if you're imaging an event of short duration.

Select a value between **6.878 dB** to **26.007 dB** by **Left-Click-Hold-and-Drag** the blue slider to the required location. The higher the value, the more sensitive the camera will be. However, increasing the value of the **Gain** will also increase the relative amount of noise in the image.

Gain: 25.832 dB   ☐ Noise reduction

Used to reduce amp glow and hot pixel intensities for long exposures and high **Gain** settings. If you take a long exposure with the **Gain** set high, you may notice a slight glow in the upper left corner of the image – that's amp glow. This results from the CCD chip's signal amplifier and is normal. The Universe imager produces very little amp glow and so this is often not apparent. However, the amount of amp glow visible will actually depend on the particular combination of **Exposure** length, **Gain**, **Contrast**, and **Gamma** settings, as well as the degree of histogram stretching that you apply. Note the following:

- Shorter **Exposure** lengths produce less amp glow and fewer, less-intense hot pixels.
- Lower **Gain** settings produce less amp glow and fewer, less-intense hot pixels.
- Histogram stretching increases amp glow and hot pixel visibility. If you leave the histogram at its default (unstretched) setting, the amp glow will be at a minimum. However, this decreases all the visible data in your image, including your target, and so is usually not the setting you want. Whenever you use the histogram's **Auto** function (or set it manually) to get the best image, you may also increase the visibility of amp glow.

The **Noise reduction** control reduces (and in many cases, eliminates) the amount of amp glow visible. It also reduces the visibility of any hot pixels. Enable this control by **clicking** in the **checkbox**. Note that some of the faintest nebulosity visible in your image may also be reduced when you use this setting.

If you want to see the effect of amp glow, try the following tests. Cap the Universe camera so that no light reaches the sensor. The images you'll take here are called dark frames, with the only "light" showing in an image coming from the camera itself. Deselect the histogram's **Auto** checkbox and capture three 5-minute images with Noise reduction not selected: one with the **Gain** set to minimum (6.878 dB), the next with **Gain** around the mid-point (~16 dB), and the last, at maximum (26.007 dB). Now repeat those exposures with **Noise reduction** selected. Compare the images to see the effect of altering the **Gain**, with and without using **Noise reduction**. Try the same set of images, but this time, make them 10-minute long exposures. Note the differences between the two sets. Particularly, notice how a 10-minute exposure at mid-gain actually generates less amp glow than a 5-minute shot at maximum gain. Note also that the overall visible effect will increase on a real (uncapped) target, depending on how much you stretch the histogram. You'll get the idea once you try a few of these comparisons.

Tip

You can also reduce or eliminate amp glow in an image by using Dark Frame Subtraction, or by simply cropping your final image in an image processing application.

Contrast

Used to increase or decrease the differences in luminance to make objects in the image appear more or less distinguishable. This control should be adjusted in conjunction with altering the *Exposure length*, *Gain*, and *Gamma* settings to produce a satisfactory preview image.

➢ Select a value between **–20** to **+20**. Higher values increase the relative difference between light and dark areas of the image. You will see the effect on the current preview image.

The default value of **0** is a good starting point in setting the contrast. Higher values make bright colors become brighter and dark colors become darker. This has the effect of broadening (stretching out) the histogram curve, as seen in the comparison below.

Contrast set to -10   Contrast set to 0   Contrast set to +10
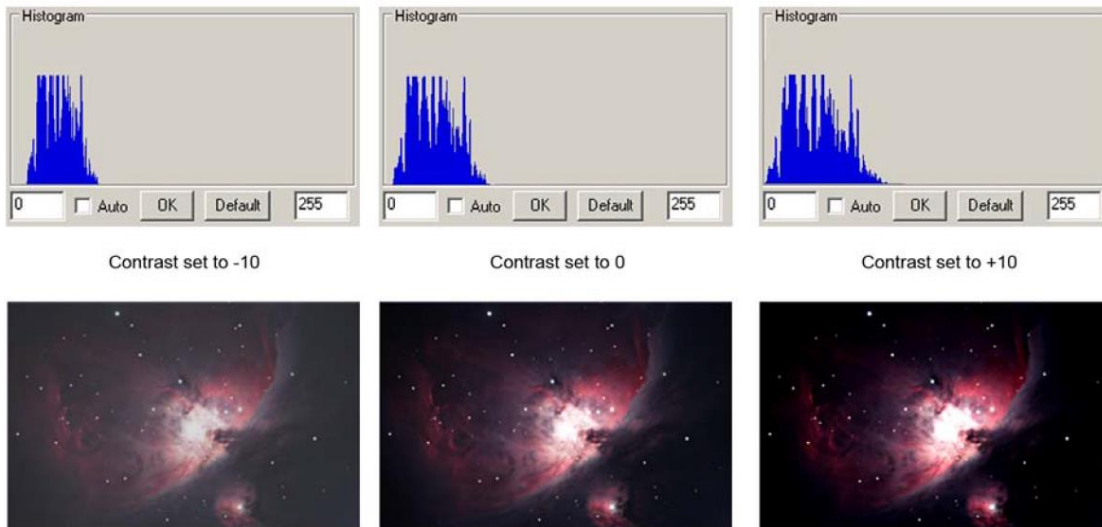
However, this can lead to a loss of data, especially if part of the broadened histogram is pushed off to beyond the left (black) edge of the plot. Excessively positive values can also make the image appear unnaturally harsh. Excessively negative values can make the image appear washed out. Lowering the **Contrast** is generally a better idea than raising it here, especially if you intend to do additional image processing in a photo-editing application. You can always boost the **Contrast** in such an application afterwards. However, if you set the contrast too high in your initial image capture, data can be lost that is not retrievable. You can see this in the core and peripheral regions of the M42 nebula above, as the **Contrast** is increased.

Tip

It is often best to set the Gamma value before adjusting Contrast. In this way, the histogram curve will usually begin in a more suitable position on the graph. This leaves you more room on both the right- and left-hand sides of the curve for proper contrast adjustments.

Gamma

Used to alter the relationship between a pixel's actual luminance and its assigned numerical value in an image, in order to compensate for how people perceive light and color. Adjusting the **Gamma** value essentially alters how image display bandwidth is allocated to light and dark tones.

Use this control in conjunction with adjusting the **Exposure length**, **Gain**, and **Contrast** settings.

> ➢ Select a value between **–20** to **+20**. The default value is **0**. Higher values make dark areas of the image appear darker, thereby emphasizing any bright details in the image. Lower values make dark areas lighter, thereby emphasizing fainter details. You will see the effect on the current preview image.

Setting the **Gamma** control in conjunction with proper adjustment of the **Exposure length**, **Gain**, and **Contrast** settings is especially crucial in obtaining a good image. The default **Gamma** setting of **0** often works well for brightly lit scenes, but usually requires adjustment for most dimmer deep sky scenes. The best way to see when this is needed is by examining the histogram.

Gamma set to 0   Gamma set to -10   Gamma set to -20
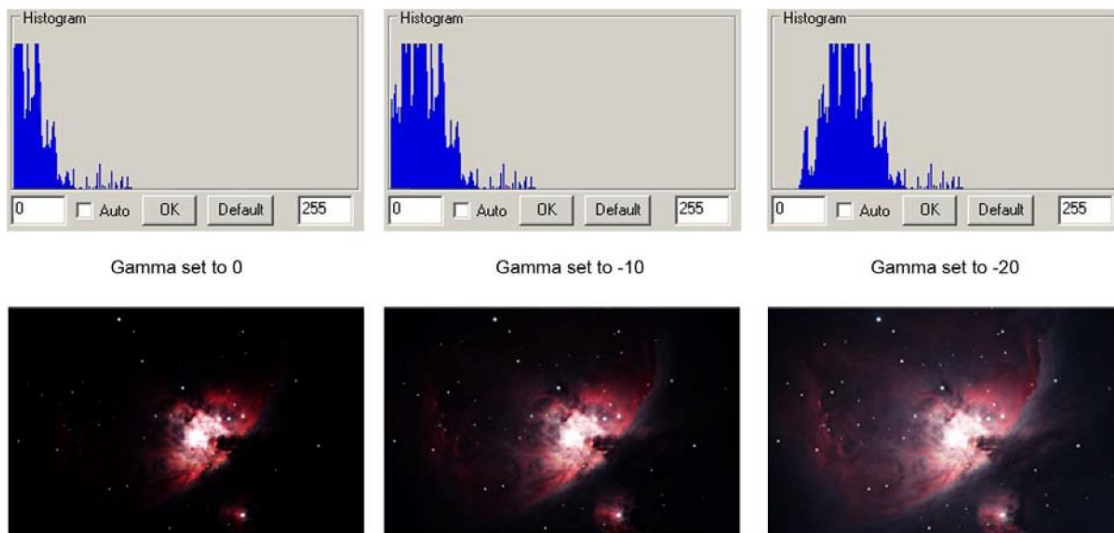
If the histogram curve is far to the left, as seen when **Gamma** is set to **0**, then data is being clipped. In this case, it is impossible to set a proper black point since many of the dimmer image areas are already being forced to a value of black. Adjust the **Gamma** value to increasingly negative values to shift the histogram curve to the right, as shown when it is set to **–20**.

Tip

*Setting **Gamma** to **–20** is often a good starting point for many deep sky objects. The key point to remember when setting your particular combination of **Exposure length**, **Gain**, **Contrast**, and **Gamma** controls is that the **left-and-right-hand** ends of the histogram curve should not be pushed beyond the sides of the graph. If that happens, you are losing portions of your image data and your image quality will be degraded.*

Horizontal and Vertical

These controls do exactly what you would expect them to, flipping the image **horizontally** and **vertically**. This can be useful in matching an image to a view in a star chart. You will see the effect on the next preview image.

☐ Horizontal   ☐ Vertical   ☐ Cross

Click the checkboxes to enable the image flips.

Cross

The **Cross** function displays a set of crosshairs on the preview image. This is useful for targeting and image positioning purposes. The crosshairs will not appear in a captured image.

Click on the **Cross checkbox** to activate the feature. The Color form is displayed.

☐ Horizontal   ☐ Vertical   ☐ Cross

Click one of the basic colors to choose the one you want to use for the crosshairs.

You can also specify a custom color by clicking the **Define Custom Colors** button. This expands the form to display a mixing palette. **Click** in the color field or enter numerical values to define the color you want to use. You can then also add your new color to the Custom Colors swatches on the form.

Click on the **OK** button when you're done to close the form and display the crosshairs. **Click** on the **Cross checkbox** again to deactivate the feature.

Sharpen

Sharpening provides more pronounced transitions between the brightness and color variations in an image. It does this by exaggerating differences along area boundaries and object edges.
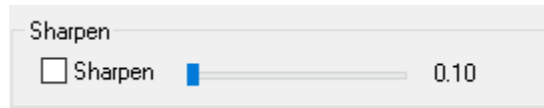
Enable the **Sharpen checkbox** and use the slider to set a value between **0.10** and **3.00**.

Note

Sharpening is a non-reversible process and alters the data in your captured image. If you intend to work on your image in a photo-editing application afterwards, you may want to leave any sharpening to that application, where it may be more finely controlled and even reversible. Real-time sharpening also requires more CPU processing and may slow your rate of image capturing.

Color Controls

Color balance (also referred to as white balance) involves making adjustments to the intensities of the primary colors (red, green, and blue) in order to remove unrealistic color casts and achieve the proper rendition of all the colors in the image. This is a complex topic, since the image captured by a CCD camera is different than the view acquired by the human eye and then processed and interpreted by the brain. In addition, ambient viewing conditions during the time of image acquisition always differ from the viewing conditions when displaying the image on a monitor later on.

Color adjustments are done to try to reconcile all of these differences.
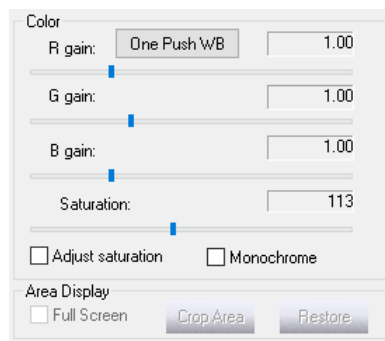
R Gain, G Gain, and B Gain

The **R gain**, **G gain**, and **B gain** sliders allow you to adjust the relative amounts of red, green, and blue in the image, respectively. The default values are **1.00** for each of these controls. You can adjust them independently to values in the range of **0.00** to **3.98**. You will see the effect on the current preview image.

White Balance

The MallinCam capture application also offers an automatic white balancing solution.

One Push WB

Click the One **Push WB** button to activate this feature. When you use this, the application performs an analysis of the current image. It then applies a mathematical algorithm to transform the data using the image's histogram and known characteristics of the sensor. The system then sets the individual co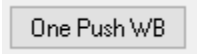lor slider values accordingly and you will see the effect on the current preview image. The next preview image is then started from the beginning and will use the new color slider values.

Refer later on in the Manual for more information on color balancing and the use of filters for your imaging. The use of a luminance filter is recommended for most deep sky imaging work.

Note   *The **White Balance** should be reset whenever you change the image exposure time.*

Saturation

Used to adjust the saturation of colors in the image. Saturation is the degree of intensity of a color relative to its own brightness.

Saturation: 113
☐ Adjust saturation   ☐ Monochrome
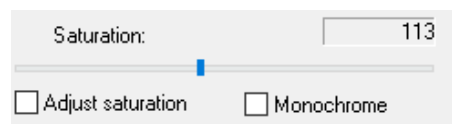
To change the degree of saturation, enable the **Adjust saturation** checkbox. Then set a value between **0** and **255**. The default value is at the midpoint of **128**. Higher values increase the degree of saturation, making colors more vivid. But too high a value will make the image look unnatural. Lower values make colors appear more muted. You will see the effect on the current preview image.

Monochrome

Click the **Monochrome checkbox** to produce a grayscale image instead of a color one. You will see the effect on the current preview image. **Click** the checkbox again to return to color images.

☐ Monochrome

Area Display

This tool is used to crop the display image. It can be helpful when you are trying to focus your telescope, but may also be used to save only a portion of the full image captured by the Universe. For some smaller targets (i.e. planets), you may not want to save the entire frame when you do a capture.

Crop the image to show only the area of interest and discard the rest. This also reduces the file size of your captured image. So, **Left-Click-Hold-and-Drag** to select a rectangular grid area over the part of the image you would like to keep.

Click on the **Crop Area** button to now make everything outside of the selected area cropped from the displayed image.

If you want to restore the image window to the original full image, just **Click** on the **Restore** button.

You can make the cropped image use the full size of the image window by **Checking** the **Full Screen** Check box.

Note

A full frame 16-bit TIF file is approximately 36 Mb in size. The file size of a cropped image is proportional to the amount you crop it by. For example, if you select only about a quarter of the image area to keep, the 16-bit TIF file size will be about 9 Mb.

Sequence Capture Mode
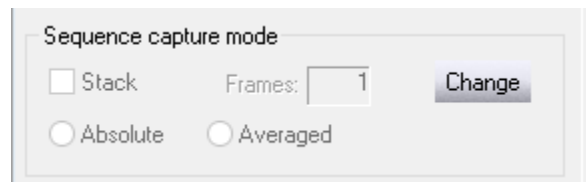
You have the ability to not only preview each image as it come off the Universe, you also have the capability to **stack** the images on top of each other (either absolutely or by averaging) to increase the signal to noise ratio.

The end result is to produce a more intense image that shows more detail.

You must have a great mount, with auto guiding enabled to ensure perfect alignment of stack images.

Step 1   **Click** on the **Change** Button to enable this mode (the changed button will change its name to **OK**.

Sequence capture mode
☑ Stack   Frames: 10   OK
◉ Absolute   ◯ Averaged
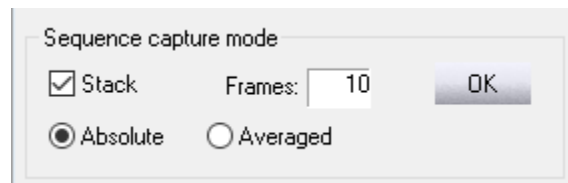
Step 2   **Check** the **Stack** checkbox to allow the process.

Step 3   Enter in the **number of frames** you would like stacked in the **Frames** box.

Step 4   Either select the **Absolute** (each new image is added to the previously stacked images) or the **Averaged** (each new image is averaged with the previous stacked images) radial button to choose stacking type.

Step 5   **Click** on the **OK** button to start the stacking process.

Note   *Once the number of images has been stacked, the software will display the final stack image on the screen. The process will automatically repeat the stacking with the next number of selected frames until you abort the process by again **Clicking** on the **Change** button and **unchecking** the **Stack** checkbox.*

If you are also saving the stacked imaged to your computer file by the **Capture Delay Timer** (see section Working with Sequence Capture Mode). The Delay Timer will capture **each** continuous stacked image until the final number of stacked imaged is taken.

For example, if you choose a stack of **4 images**, but chose **5 saving cycles** in the **Capture Delay Timer**, then you will obtain a total of **20** images. With **4 images** saved in each **cycle** (with each successive image having one more stack applied). The 4th image in each cycle (i.e. image number 4, 8, 12, 16, and 20 will be the stack of its previous images).

Custom Sequence Capture Mode

This feature allows you to configure an automated sequence with various individual exposure times for up to 10 images. This can be very useful if you are shooting an object with a high dynamic range, such as the Orion Nebula. Taking a set of images with incrementing exposure times allows you to capture levels of details at different brightness levels by simply varying the exposure durations.

Note

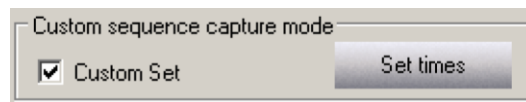*Ensure that the **Auto checkbox** is **NOT** selected in the **Histogram** box.*

Step 1

Check the **Customer Set** checkbox location in the **Custom Sequence Capture Mode** box in the **Property** panel.

Step 2

Click on the **Set time** button to open up its window.

Step 3

Enter the desired duration values in the **Minute-Second-Millisecond** fields for each image you would like to take.

Step 4

Once all durations have been entered, **Click** on the **OK** button to accept these times.

Note

*Since you are capturing images of various exposure lengths here, you may want to leave the **Histogram's Auto** disabled off and set the histogram values manually before starting the sequence. In that way, the same histogram stretch will be used for all the images in the sequence. The only differences between images will be due to their varying exposure lengths. When the histogram's **Auto** function is enabled, the application will try to compensate for the different light levels and therefore apply a different stretch to each image.*

If you are saving the images, make sure you have selected the File type and File location in the **Save File** Frame.

Step 5

Click the **Capture** button. The exposures begin and when they are done, the files are saved in the folder you selected.

Note

*While the exposure sequence is running, the **Capture** button turns into a frame counter and indicates the number of the last frame in the sequence that was captured.*

Once the custom set of exposures has completed, the Universe resumes taking individual preview images. It uses the time of the last exposure in the custom set for these previews.

*If you want to go back to taking single images after shooting a custom set, you must click on the **Custom Set checkbox** again to **deselect** it. You can then change the exposure length of the individual preview images by clicking on the **Change Exp** button and setting the desired values in the **m-s-ms** fields (minutes-seconds-milliseconds), as usual. Then click **OK**.*

*The preview images will start to display using this new exposure setting. If you do not deselect the **Custom Set checkbox**, then the same custom exposure sequence you just completed will be started again whenever you next press the **Capture** button.*

Saving and Loading the Universe Camera Settings

Once you have used the MallinCam capture application on a variety of targets (**deep sky**, **lunar**, **planetary**, and **solar**) you'll notice that the camera's control settings can vary widely to produce a properly exposed image. Use the **Settings configurations** commands to save the control settings at any time to a custom configuration that you can load and reuse in the future.

Saving your camera settings

Step 1

Adjust the camera control settings as required.

The state of the histogram's Auto function is not recorded when you save a new configuration. The Auto function should be deselected while you save your camera settings, otherwise it may interfere with the process.

Step 2

Click the **Stop Camera button**.

Step 3

Click the **New config** button in the **Settings** configurations section of the **Property panel**. An *Operation successful* message is displayed.
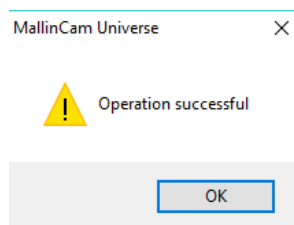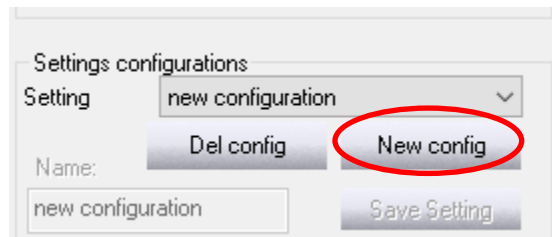
Step 4   **Click** on the **OK** button. The name "new configuration" is displayed in the **Setting** and **Name** boxes.
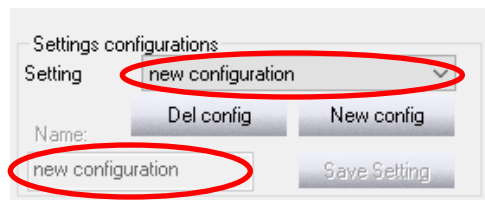
Step 5   **Click** the **Start Camera** button. The camera starts generating preview images again.
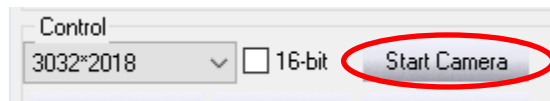
Step 6   Enter a name for your configuration in the **Name:** field and **Click** the **Save Setting** button. Your configuration is saved and its name appears in both the **Setting** and **Name** fields.
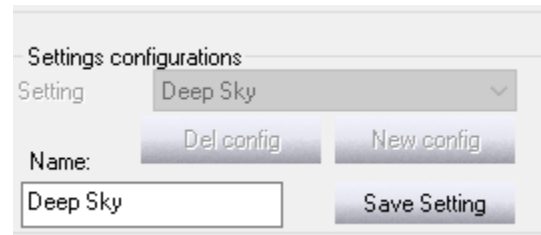
Loading a Saved Configuration

Step 1   **Click** the **Stop Camera** button.

Step 2   **Click** the dropdown arrow in the **Setting** field and select the desired configuration from the list. The camera settings are reset according to the chosen configuration and its name appears in both the **Setting and Name** fields.
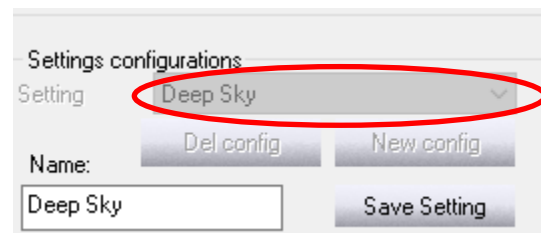
Step 3   **Click** the Start **Camera** button. The camera starts generating preview images again.
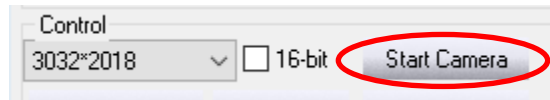
Deleting your camera settings

Step 1   **Click** the **Stop Camera** button.

Step 2   **Click** the dropdown arrow in the **Setting field** and select the configuration you want to delete from the list, if it's not the one you're currently using. The camera settings are reset according to the chosen configuration and its name appears in both the **Setting and Name** fields.

Step 3   **Click** the **Del config** button. The selected configuration is deleted.
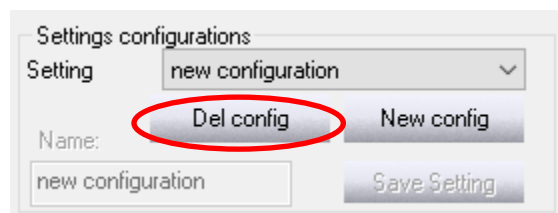
Step 4   **Click** the **dropdown** arrow in the **Setting** field again and select the configuration you want to use now from the list. The camera settings are reset according to the chosen configuration and its name appears in both the **Setting and Name** fields.

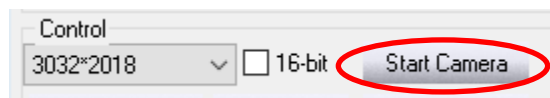**Step 5**   **Click** the **Start Camera** button. The camera starts generating preview images using the settings of the configuration you selected.

Subtracting Background
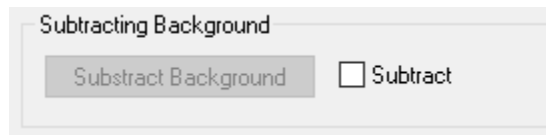
Subtracting Background

Substract Background   ☐ Subtract

Dark Frames are images that you take by capping your telescope to block all light coming into the camera. The only "light" that will appear in your image is electronic noise generated by the camera itself. This includes amplifier glow, dark current background noise, camera read noise, and any hot pixels.

You can use such dark frames to subtract this residual camera noise from your actual images. The MallinCam Universe is remarkably quiet in terms of the noise it generates. You often don't need to worry about dark frames to produce high-quality images. However, if you want to produce the best possible imagery, consider learning more about Dark Frames and their usage.

Preparing Dark Frame

You will first have to do some pre-planning before using this control. Determine the current exposure time and resolution that you are going to be imaging in so that the Dark Frames have about the same exposure times and conditions.

You will need to cover the Telescope to take Dark Frames or you may also cover the Universe's lens ahead of time a take Dark Frames. It is recommended that you use a variety of exposure times and situation settings (including Stacking) to create a data base of these Dark Frames. The goal is to obtain a Dark Frame image in which there is no external light that enters the Universe Camera.

For each Dark Frame you create; set an **Exposure Time**, **Exposure Resolution**, **File Type** and **File Location** that will match the same values in an image you want to apply a Dark Frame to. It is recommended that you create a Folder that contains all of your Dark Frames for the Universe Camera. Choose a name that is easy to locate its function and duration as a Dark Frame Time, such as: Dark_Frame_120s. Take and save the Dark Frame image.

Applying Dark Frames

Subtracting Background

Substract Background   ☐ Subtract
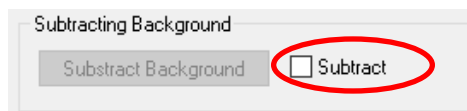
Step 1   **Click** on the **Subtract** checkbox to activate the Panel.

Subtracting Background

Substract Background   ☐ Subtract
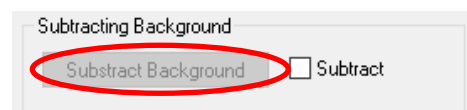
Step 2 **Click** on the **Subtract Background** button to open up a window so you can select your dark frame
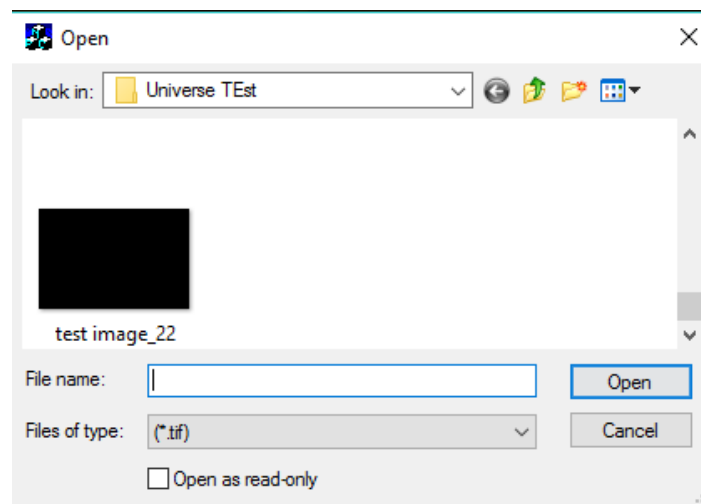
Step 3 **Click** on the **Dark Frame** Image that appears in the Window (Its name will now appear in the File Name: box)

Step 4 **Click** on the **Open Button** to have the Dark Frame automatically applied to the object currently being imaged. The next image refresh will appear with the Dark Frame Subtracted.

Note *The Dark Frame will now continuously be subtracted from the images being produced by the Universe Camera. To Abort the Dark Frame Subtracting, simply **uncheck** the **Subtract** Check box.*

Note *To reactive the Dark Frame Subtracting you need to repeat recheck the **Subtract** Check Box and again **Click** on the **Subtract Dark Frame** Button to choose a Dark Frame to subtract.*

Saving Files

Located near the bottom of the Property panel (you will need to use the scroll bar to display) is the Save File Box. It is in the box that you will set up the file name, type, and location for your saves image.

Note *Ensure that the Auto checkbox is NOT selected in the Histogram box.*

Step 1 **Click** in the **FileName** box and **enter a name** for the file (choose a logical name, such as M57).

Step 2 **Click** on the **dropdown** box next to file name and choose an image format.

Step 3 **Click** on the **Browse** button and use the popup window to choose a location (or create a new folder) to where you want the software to save the images.

Step 4 **Click** on the **Change Setting** Button to accept all of these settings.

Note *The software will remember the Path for the next time.*

Encode and Record

*You are now ready to save a **Video Stream** of the currently displayed image. These **avi** files can get very large very quickly, so use caution and preplanning if you are saving a video of the current session. First you need to decide if you require the Video image to be compressed or not by choosing the appropriate Codec.*

Step 1

Click on the **Encode Button** located in the **Save File** Panel to open up the **Video Compressor** Window that allows you to choose a Codec.
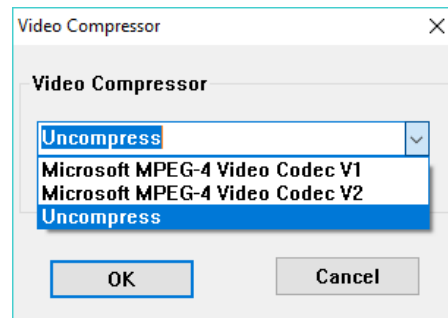
Choose the type of compression you will use (it is recommended that you choose **Uncompress**, so you will not lose any data due to compression).

Step 2

Click on the **OK Button** the accept your compression selection.

Now to start the Video Recording
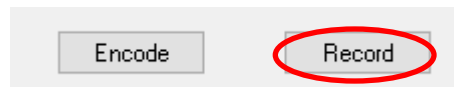
Step 3

Click on the **Record Button** in the Save File Panel to start the recording process.

Note

*The name on the button will now change to **Stop Record**.*

When you want to Stop the Recording,

Step 4

Click on the **Stop Record** Button.

The avi file is now stored in your pre-defined location on your computer.

The Picture Panel

Viewing your Captured Images

The MallinCam image capture application allows you to view the images you've captured in the current session.

There are two preview windows on the Picture panel. They are the **All images preview** and the **Sequence capture preview**.

All Images Preview

The **All images preview** window lets you view all the images you've captured and saved in the current session since you started the capture application, including all single and sequenced captures.

If there are other image files in the current path folder that were captured during a previous session, these will not be seen in this preview window.

To scroll through the current group of images, use the left (**<<**) and right (**>>**) buttons.

You can also click on the **Large** button to get a bigger view. **Click** on the **Large** button again to return to the normal view.
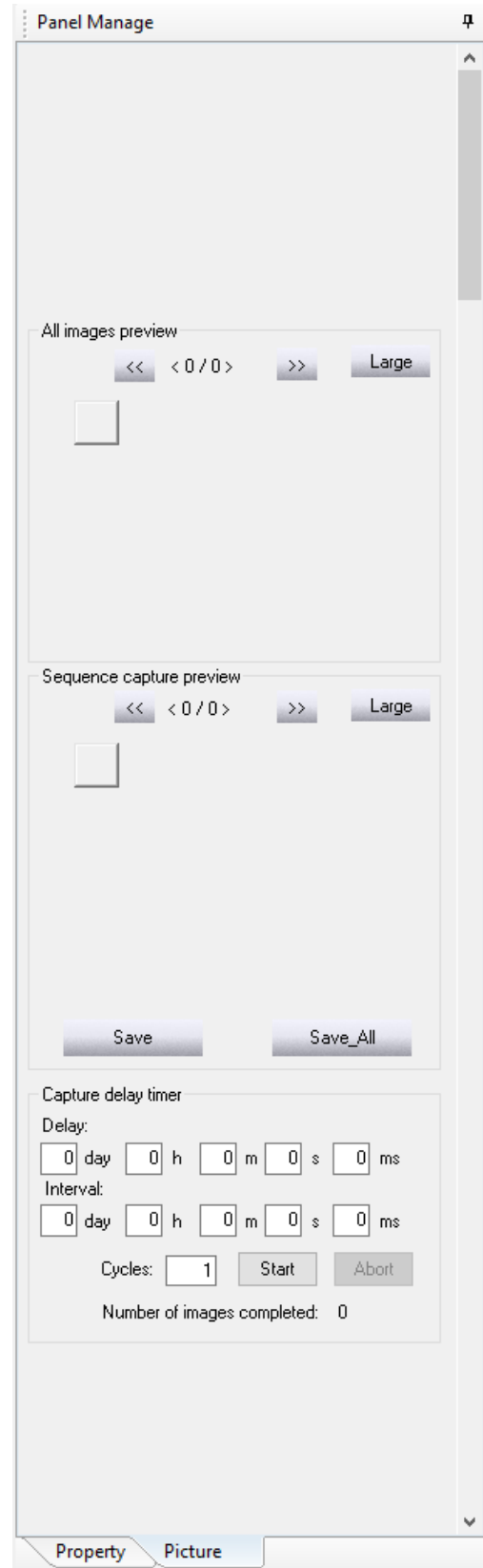
Sequence Capture Preview

The **Sequence capture** preview window lets you view the set of images you've captured and
saved in the current session using either the **Sequence capture mode** or the **Custom sequence capture mode** functions. It only shows the images of the last sequence you obtained by using either of these capture modes. If you've just been shooting single exposures, the window shows only the last such single capture.

If there are other image files in the current path folder that were captured earlier in this session or on a previous date, these will not be seen in this preview window.
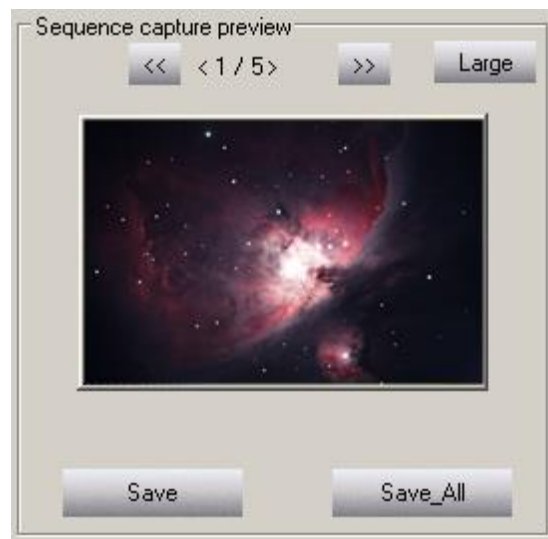
To scroll through the current group of images, use the left (**<<**) and right (**>>**) buttons. You can also **Click** on the **Large** button to get a bigger view.

Click on the **Large** button again to return to the normal view.

Note

*You can use the **Save All** button while previewing images in the **Sequence capture preview window** to save a duplicate copy of all the images in the current set. First enter the base name you want to assign to the duplicated images in the **FileName** field located in the **Save File** panel in the **Picture** Tab. For example: **M42**. The application will use this name and automatically add a number after the name for every shot in the sequence, for example: **M42_1**, **M42_2**, and so on. Then **Click** on the **Save All** button.*

If you use the **Save** button instead, you will save a duplicate copy of only the current image that is showing in the **Sequence capture preview window**. First enter the name you want to assign to the duplicate image in the **FileName** field located in the **Save File** Panel in the **Picture** Tab. Then **Click** on the **Save** button.

The **Save** and **Save All** buttons only apply to images in the **Sequence capture preview window**.

Tip

*You may want to browse for a different folder or create a new one to place your duplicate files into before using **Save** or **Save All**. This can help you sort through and organize the files later on.*

Capture Delay Timer

You can also set up a sequence of captures using the **Capture delay timer** section of the **Picture panel**.

This feature is an intervalometer that allows you to set a delay time before the beginning of your sequence, and an interval between exposures. You also use it to set up the number of captures you want. Use this function if you want to do a time-lapse sequence of an event such as the motion of Jupiter's moons, the movement of a comet against the background stars, the progression of an eclipse, and so on.

This feature works in conjunction with either the **Sequence capture mode** or the **Custom sequence capture mode**. The timer applies its delay and interval in cycles to either of those modes. Therefore, you must configure one of those modes before starting the timer. Examples are provided below.

The camera must be operating in the preview mode and actively generating preview images.

Working with the Sequence capture mode

Step 1   *Configure all the camera settings properly, including the length of the exposure, on the **Property panel** so that you are satisfied with the preview image.*

Step 2 Perform one of the following:

a. If you want to capture a set of **single images** with a specific period of time between each image, then **Click** the **Change button** in the **Sequence capture mode panel**. Enter the number "**1**" in the **Frames box** and click **OK**.

b. If you want to capture groups of images with a specific period of time between each group, then click the **Change button** in the **Sequence capture mode panel**. Enter the number of images you want in each group in the **Frames box** and click **OK**.

Step 3 Locate the **Save File Box** near the bottom of the **Property Panel**.

Enter the name you want to assign to the captured images in the **FileName** field, for example: NGC891.
- The application will use this name and automatically add a number after the name for every shot in the sequence, for example: NGC891_1, NGC891_2, and so on.
- If you don't enter a name here, the application will automatically enter one for you. This will be in the form "TS_x", where x is an incrementing number, for example: TS_1, TS_2, and so on.

Step 4 **Click** the **Use sequential naming checkbox** if you want the application to automatically enter a name for each of the images in the timestamp format, as previously described in the capturing sections. This can be especially useful when using the intervalometer, since the name then indicates when the exposure was made.

Step 5 In the **+ extension box**, select a file format from the dropdown menu, as previously described in the capturing sections.

Step 6 **Click** the **Browse button** to select or create the folder you want to store the captured images in. You may want to create a new folder here to help organize your captures.

Step 7

Set the amount of **delay time** before the start of the exposures by using the **day-h-m-s-ms fields** in the **Delay section** of the **Capture delay timer** located in the **Picture Panel**. This delay will only be applied at the beginning of the first cycle. It is not repeated between cycles.

Step 8

Set the length of the time interval between cycles using the **day-h-m-s-ms fields** in the **Interval section** of the **Capture delay timer**. This amount of time will only be applied after a cycle is complete. It is not added to the delay you specify for the start of the sequence.

Step 9

Set the number of cycles in the **Cycles box**. As an example, enter the number "12" here.

a) If you entered the number "1" in the Frames field in **Step 2a**, you will have 12 images when the sequence is complete. The start of the first exposure is delayed by the amount of time you specified in **Step 7**. Each subsequent image will have the interval you specified in **Step 8** applied before the start of that exposure. This mode is useful if you just want to generate single images separated by a specific interval, as in a straightforward time-lapse sequence.

b) If you entered a number other than "1" in the **Frames box** in **Step 2b**, then the timer operates as follows. For example, let's say you entered the number "4". When you start the sequence, the timer will initially apply the delay you specified in **Step 7** and then a group of four images will be taken, one directly after another. This completes the first cycle. The timer will then apply the interval you specified in **Step 8** and the next group of four images will be taken, one directly after another. This completes the second cycle. This process continues until all the cycles are finished. In this example, you will end up with 48 images – 12 groups of 4 clustered images. This mode is useful if you want to generate multiple images within a group for stacking, and then have subsequent groups separated by a specific interval of time.

Step 10

Click the **Start button** to begin the capture sequence.

The Number of images completed counter shows you the total number of images that have been captured and written to the hard drive since you pressed Start. For the example in step 9b, it would indicate "48" when the last cycle is complete and all images have been downloaded.

Note

*To **stop a capture** sequence before it is entirely completed, **Click** the **Abort button**.*

Working with the Custom Sequence capture mode

You can also use the Capture delay timer with the Custom sequence capture mode. This works in basically the same way as described above for the Sequence capture mode. The main difference is that you must set the customized exposure times in the Set exposure times form.

Proceed as follows:

Step 1

Perform **Step 1** through **Step 9** in the section **Save a Sequence of Images with each with Customized Time**

Step 2

Set the amount of delay time before the start of the exposures by using the **day-h-m-s-ms** fields in the **Delay** section of the **Capture delay timer**. This delay will only be applied at the beginning of the first cycle. It is not repeated between cycles.

Delay:
0 day   0 h   0 m   0 s   0 ms

Step 3

Set the length of the **time interval** between cycles using the **day-h-m-s-ms** fields in the **Interval section** of the **Capture delay timer**. This amount of time will only be applied after a cycle is complete. It is not added to the delay you specify for the start of the sequence.

Interval:
0 day   0 h   0 m   0 s   0 ms

Step 4

Set the number of cycles you want in the **Cycles field**.

Cycles: 1   Start   Abort

Step 5

Click the **Start button** to begin the custom capture sequence. The timer will apply the delay you specified in **Step 2** before beginning the first capture. The application will then capture each exposure you configured in the custom sequence, but with no delay between these shots. When the custom sequence is completed, the timer will then apply the interval you specified in **Step 3**. The

cycle is then run again, with no delay between the shots. This process is repeated until all the cycles you specified in **Step 4** are finished.

As an example:

If you configured eight custom exposure times in the Custom sequence capture mode and you set the **Cycle**s field to "3", you will end up with 24 images when the last cycle is completed. Each group of eight images will be delayed from the previous group by the Interval length you specified for the timer. The start of the first image in the first group will be delayed from the time you pressed Start by the Delay length you specified for the timer.

The **Number of images** completed counter will show you the total number of images that have been captured and written to the hard drive since you pressed Start. For this example, it would indicate "24" when the last cycle is complete and all images have been downloaded.

Number of images completed: 0

Note

*To **stop** a custom capture sequence before it is entirely completed, **Click** the **Abort** button.*

Viewing the Preview Images

The Universe offers an additional display mode that is useful for viewing by groups, or if you just want to sit back and enjoy the scene. Once the telescope has been aimed and the camera configured for a proper exposure of the target, the preview image is constantly refreshed as each exposure is completed. This is the normal mode of operation.
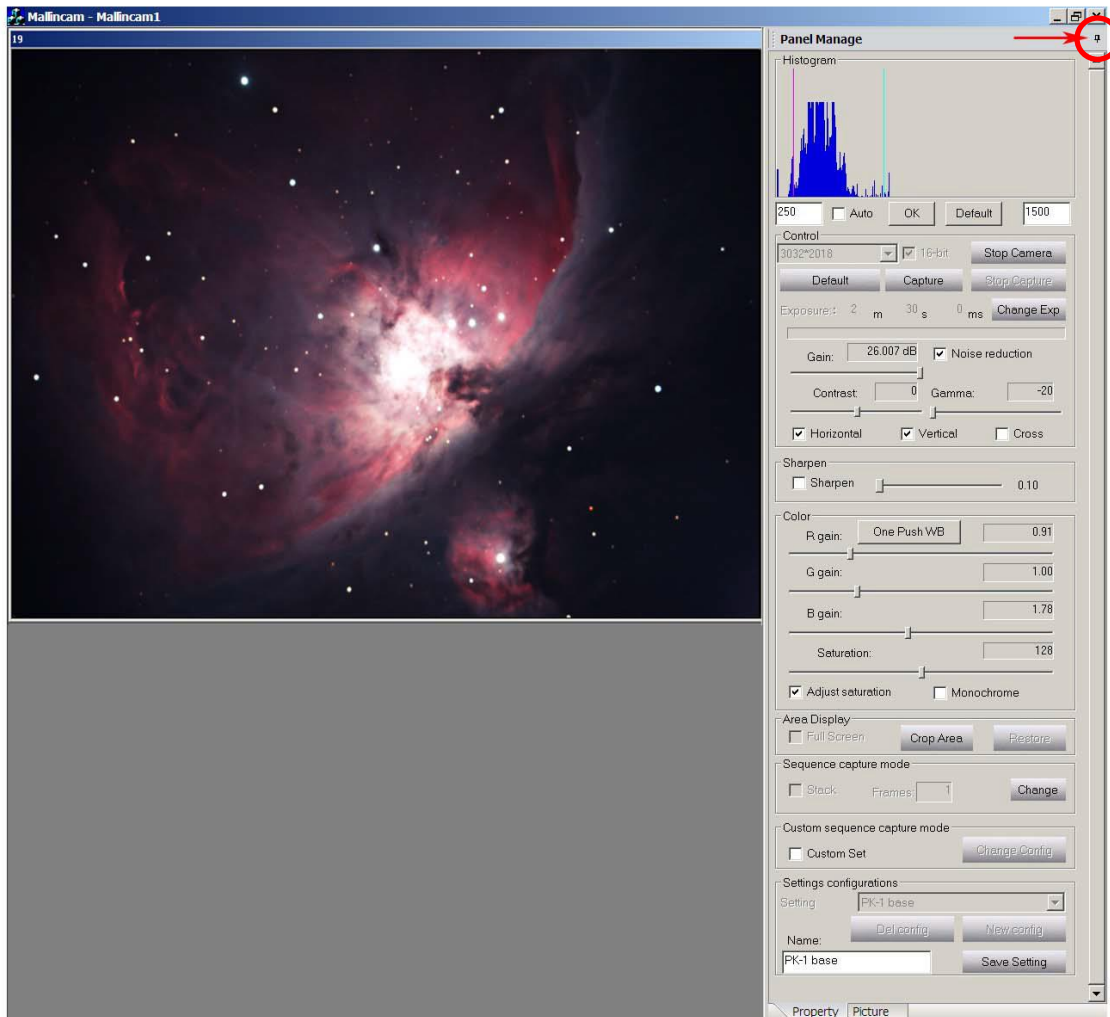
If you **Click** the **pin icon** at the upper right portion of either the Property or Picture panel, the panel is retracted. Now you can see the preview without the distraction of the controls visible. **Click and hold** on the image's title bar to drag and center it, if you prefer.

Note *You can also use this display mode while actually capturing a set of images.*
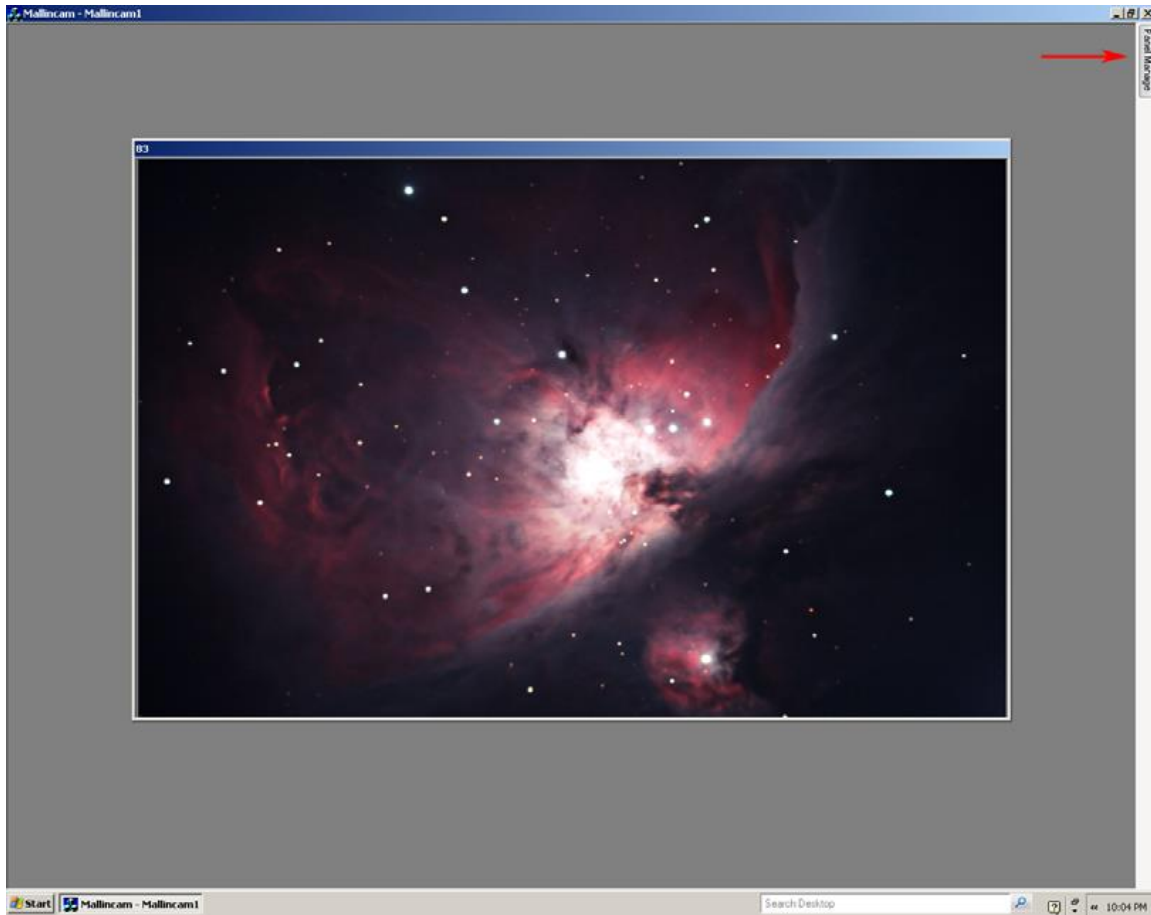
M42/M43: MallinCam Universe image courtesy of Paul Comision

To reinstate the Property or Picture panel, just **Click** the Panel Manage tab and then **Click** on the **pin icon** again.

For some targets, such as the Moon, planets, the Sun (with proper filtering), and brighter deep sky objects that require only short exposures, the constant preview image refresh can provide a near real-time viewing experience. The scene may be refreshed at a rate of up to once per second. The actual rate of preview refresh is dependent on a number of factors. If you are exposing a target that requires several seconds or minutes, the preview will refresh accordingly. So if you want to minimize the exposure time to increase the refresh rate, try one or more of the following:

➢ Bin the image to increase sensitivity. The greater the binning, the shorter the exposure needed.

➢ Boost the Gain setting. This shortens the exposure length but may increase visible image noise.

➢ Consider using the optional MallinCam 0.5X focal reducer. This cuts the exposure time by a factor of four, while providing four times the area of sky coverage.

➢ Use a "faster" telescope. An F5 configuration will produce the same level of brightness in your image as an F10, but in only one-quarter of the exposure time.

➢ Use the Crop Area tool for smaller images. While this doesn't affect the exposure length, the smaller images will download more quickly from the camera, increasing the refresh rate.

➢ Also, try deselecting the 16-bit setting. While this doesn't affect the exposure length either, the smaller 8-bit images will download more quickly from the camera, increasing the refresh rate.

Using Filters and Adjusting Color Balance

The CCD sensor on the MallinCam Universe is not filtered in any way. This allows you maximum freedom to filter an exposure in the way you want. For instance, you may want to experiment with a Hydrogen-alpha filter to capture the deep red light of many emission nebulae. Unlike stock DSLR cameras whose installed filters cut out much of the H-alpha emissions, the Universes captures this light unattenuated. As with most CCD imaging sensors, the Universe's chip responds strongly in the red portion of the spectrum, including into the infrared region. So proper filtering and color balancing are important considerations in obtaining a good image. For most imaging, we suggest at least the use of a 2" IR-cut or Luminance filter. These filters block the usually unwanted infrared and ultra-violet wavelengths, which can cause blurring, glare, and reduced contrast. They also help you obtain a proper color balance, which can minimize the amount of image processing you might otherwise need to do.

If you are imaging in an area where light pollution is an issue, we recommend that you use a light pollution reduction filter. These filters not only cut out unwanted IR and UV wavelengths, they also block many of the emissions from man-made sources such as sodium vapor street lamps. Also, note that these filters are available both for imaging use and visual observing. Make sure you use one designed for imaging. These and other filters are available from manufacturers such as Baader, Astronomik, Orion, Celestron, Lumicon, and so on. The 2" camera nosepiece adapter supplied with the Universe allows you to attach such a filter easily. Simply thread the filter into the front of the adapter.

As an example of the effect a simple luminance filter can have on your image, consider the following two images. A daytime terrestrial example is used here to

make the differences obvious. No post-processing was done, so the images are shown as they were captured. The capture application's One-Push WB function was used to try to obtain a good color balance.

This first image was captured with no filter installed. It shows trees and leaves. Some of the leaves are green, others are yellow-orange. Snow is seen through the branches in the distance.

The One-Push WB function set the color gain sliders to Red = 0.73, Green = 1.00, Blue = 1.48.

The next image was captured with a luminance filter installed. Note the difference in the overall color balance of the scene. This second image is quite a faithful reproduction of the actual view, again, with no post-processing involved.
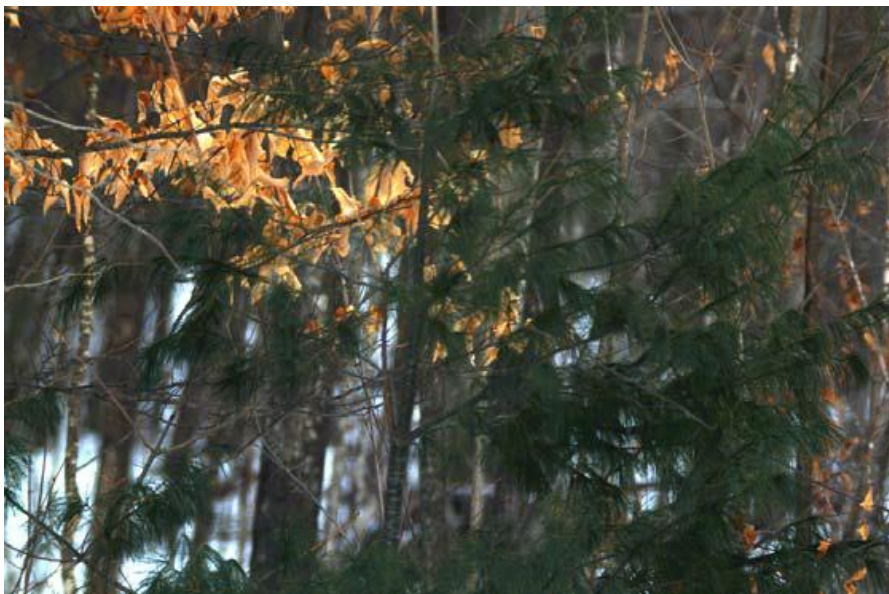
In both cases, the **One-Push WB** function adjusted the Red, Green, and Blue gain sliders in a similar fashion, though by different amounts, and with obvious differences in the end results. For the filtered image, the Red slider was decreased to only 0.97, the Green slider was left at the default value of 1.00, and the Blue slider was increased to 1.79.

Astronomical imaging is understandably different than terrestrial imaging. In terrestrial imaging, most of the light you deal with is reflected light, coming either from the sun or man-made sources. In astronomical imaging, the light is being emitted by your target of interest, such as a nebula, galaxy, or star cluster, along with a contribution from natural sky glow. In both cases, the color balance of the image needs to be adjusted for proper color rendition. You can correct the balance to a degree afterwards using an image processing application. But this may not yield very good results if the original captured color balance was considerably off to begin with.

With astronomical imaging, the One-Push WB function can provide an adequate starting point if your target is fairly large and bright. However, it may be limited in its analysis for lesser targets. As a suggestion, you may want to initially set the color sliders manually. If you're using a luminance or light pollution reduction filter, try Red ~ 0.77, Green = 1.00, and Blue ~ 1.66 as a starting point. Keep a record of your results. When you find a combination that works for you, try using it on various target types. You might even want to compare your images with the works of other experienced astro-imagers to use as a point of reference.

While these suggestions should help you get closer to a truer color balance, there are other factors at play that will be unique to your situation. The optimum color balance will be affected by the manufacturing specifics of any filter that you use, the exposure length you set, and by the optics of your telescope. A full discussion of attaining proper color balance is beyond the scope of this guide, but there are many good sources of information available on the Internet to help you out. One technique you might also consider is to take an image through your telescope of a standard photographic gray card, illuminated by a white light source. You can then adjust the color gain sliders to try and match the gray shade in your capture with the actual shade of the card. But note that such a comparison will be strongly influenced by the monitor you're viewing the image on. Color calibrating your monitor is highly recommended for this purpose.

Processing Astronomical Images

The MallinCam Universe is capable of producing high-quality astronomical images with little subsequent image processing required. However, image processing techniques can enhance your images even further, bringing out all the subtle details that the camera can capture. A full discussion of image processing is well beyond the scope of this guide, but there are a few suggestions we can make to help you along.

Using 16-bit TIF and RAW files

The MallinCam capture application offers two methods of saving an image with the maximum color resolution that the camera can deliver: the 16-bit TIF file and RAW files. In an 8-bit file format such as BMP, the data in each color channel (Red, Green, and Blue) is divided into 256 different levels of intensity. Such files are also referred to as 24-bit RGB files, since each color channel is 8-bits and there are three channels. However, the Universe can record a much finer level of color resolution than this. It does this by dividing each color channel into 4,096 levels. This is equivalent to further dividing a single level in an 8-bit file into 16 sublevels. This finer graduation of the color information allows for much more intensive image processing and the ability to bring out subtle details not possible when using only 8-bit files. To accommodate this greater amount of data, the application then packages it into a common format 16-bit TIF file. Such 16-bit files are also referred to as 48-bit RGB files, since each color channel can include up to 16-bits of data and again, there are three channels.

The 16-bit TIF file is the preferred format for processing images in programs such as Adobe PhotoshopTM. Select the 16-bit checkbox to produce 16-bit files. Note that some image processing applications cannot read this richer TIF format. But other programs, such as the very capable freeware GIMP application, are also available that can read the 16-bit files and convert them to 8-bit, if that's what you need.

Tip

It's better to save the 16-bit files, since you can always down convert them to 8-bit files, if required. You can't up convert an original 8-bit file to 16-bit at a later date, because that additional data was never recorded – it's lost. Keeping the original image that contains the full color channel data just makes good sense, though of course, it'll cost you some extra hard drive space.

The RAW format also contains the full channel color data. The MallinCam RAW files can be converted using the ImageJ program. ImageJ is a free, public domain, Java-based image processing program. It can read and process many different file formats at various bit depths and then convert them to other formats such as BMP, JPG, or even FITS files. The ImageJ program can be downloaded from: **http://rsbweb.nih.gov/ij/**

If you want to download a free plug-in for ImageJ that will convert your RAW files to the popular astronomical imaging FITS format, this can be found at: **http://www.umanitoba.ca/faculties/science/astronomy/jwest/plugins.html**

Using Dark Frames and Flat Fields

Dark frames are images that you take by capping your telescope to block all light coming into the camera. The only "light" that will appear in your image is electronic noise generated by the camera itself. This includes amplifier glow, dark current background noise, camera read noise, and any hot pixels. You can use such dark frames to subtract this residual camera noise from your actual images. The MallinCam Universe is remarkably quiet in terms of the noise it generates. You often don't need to worry about dark frames to produce high-quality images. However, if you want to produce the best possible imagery, consider learning more about dark frames and their usage. Many sources of such information are available on the Internet. Popular programs such as Adobe Photoshop, Nebulosity, MaxIm DL and freeware programs such as Registax and DeepSky Stacker all facilitate dark frame subtraction, but note that Realtime Dark Frame Subtraction is available through the Universe Software.

Flat fields are yet another aspect of image processing you may want to consider at some point. These are images taken through your telescope of a featureless, uniform light source such as a cloudless blue sky (best done after sunset or in the early morning), or using an artificial diffuse white light source (commercial kits are available). Flat fields record any unevenness in the illumination reaching your camera's CCD sensor. You can use these to calibrate your actual images to remove such unevenness caused by factors like vignetting, dust and other particles on optical surfaces, and various telescope artifacts.

Stacking your images

Stacking (also referred to as combining or integrating) your images is a technique used to increase the signal-to-noise ratio of your final processed image. It involves capturing a number of images of your target, all at the same camera settings, and then layering these "sub-frames" one on top of each other to mathematically combine them into one final version of the image. Since the "noise" in each of the individual sub-frames is random, it will get averaged out and therefore suppressed with respect to the signal – the object that you're trying to image. The object's light data is constant from frame to frame, so stacking numerous images serves to build up that signal. Popular programs such as Adobe Photoshop, Nebulosity, MaxIm DL and freeware programs such as Registax and DeepSky Stacker all allow you to stack images. This capability is also included in the MallinCam image capture application. You can set up the application to capture a sequence of images and automatically stack them for you. Refer to Procedure 5 to learn how to perform this function. Note that if you stack your images using the MallinCam capture application, your telescope's mount must be accurately polar-aligned and preferably autoguided.

This is required so that the image fields in each of the sub-frames will be identically positioned, otherwise drift will be obvious in the final combined image. One advantage of doing the stacking after your imaging session is that the programs mentioned above allow you to precisely shift the individual sub-frames

with respect to one another to bring them into perfect alignment. Another advantage is it allows you choose which images to use or discard. A few bad captures (caused by tracking glitches, passing clouds, aircraft and satellite tracks, car headlights, etc.) may spoil the final result if they are included in the stack automatically.

The result of stacking multiple images into one final combined image can be quite profound. Here's an example provided by Paul Comision of Ottawa, Canada from his first session with the MallinCam Universe. Five one-minute exposures of M27 were taken and then combined:
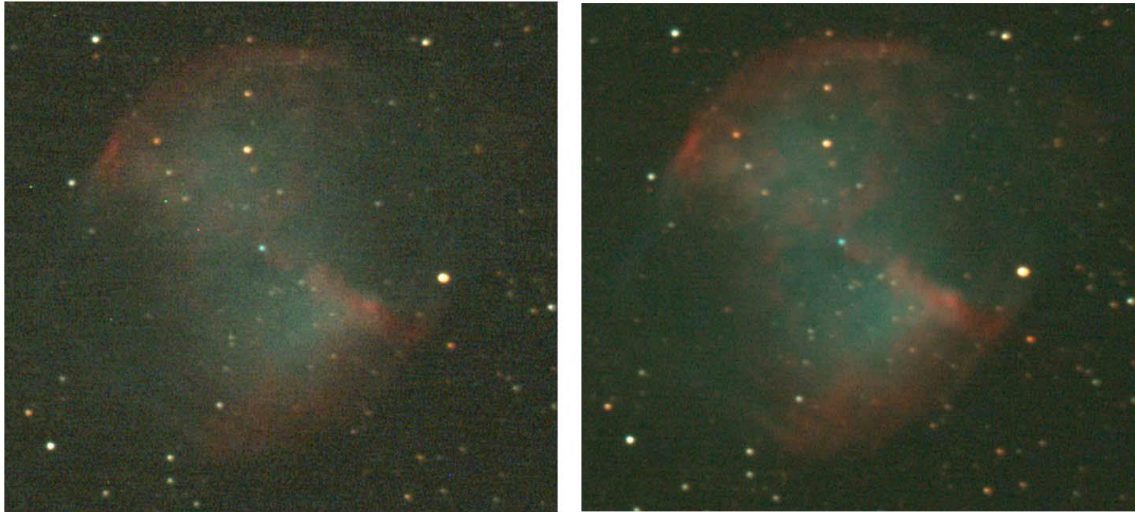
The image on the left is a single 60-second exposure, while the image on the right is a stack of five 60-second exposures, with no other processing done. Note the difference in the level of background noise and the degree of nebular detail visible between the two. Further image processing of the combined image yielded this final result:

Troubleshooting

Your computer doesn't recognize the camera once it is connected. This can occur for a number of reasons, including:

➢ USB 2.0 port: Make sure that you are using a fully-specified USB 2.0 high-speed port. Try switching to a different USB 2.0 port, if one is available. The camera will not operate if plugged into a USB 1.1 port.

➢ Power supply: Check that the camera's power supply is securely connected and that the Power ON LED is lit.

➢ USB cable: Older USB 1.1 cables will not work properly. Use the supplied high-speed USB 2.0 cable. If the cable has been damaged, that might not be apparent from a visual inspection. Try using a known good cable.

➢ Ensure that your computer meets the specifications stated in Section 2.

➢ Check that the camera driver has been properly installed. Open the Windows Device Manager and look for an entry under Imaging devices that is named "TM-6 USB Camera". If this is not listed or a conflict is indicated, then the driver has not been properly installed. Try uninstalling and then re-installing the driver again, as described in Chapter 2.

The camera and drivers seem to install, but Windows issues a message stating that: "The device might not work properly".

➢ There may be a conflict with another USB device connected to your computer. Remove any other unnecessary devices, reboot the computer, and try connecting the camera again.

➢ Your USB cable may be too long. If you are using a cable longer than the originally supplied one, the data stream through the cable may be getting degraded. Only use a high-quality active (repeater) USB 2.0 cable if you need to extend the length beyond the originally supplied cable.

The optical window above the CCD sensor is fogged.

➢ Under severe conditions of humidity, dew might accumulate on the glass above the sensor due to the cooling provided by the TEC. Try shutting off the TEC by moving the recessed slider switch (use a ballpoint pen tip) to the position furthest away from the Power ON indicator. Refer to the Universe picture in The Contents of the Universe Package Section in thus User Manual to locate the switch.

➢ Apply gentle or gradual heating (no hair dryers!) to remove the dew, if required.

The downloaded images appear very noisy.

➢ Certain devices such as power supplies and even cell phones can cause interference with the image data as it is downloading from the camera to the computer. If there are any such devices near your USB cable, try positioning them further away. Also, if you are using active USB extension cables, keep the total cable length to a maximum of 80 feet (25 meters).

➢ Your Gain setting may be too high. Try decreasing the gain and increasing the exposure length instead.

The preview image appears scrambled.

➢ On certain computer systems, the preview image may sometimes appear scrambled when you are imaging in 16-bit mode. This only seems to occur with certain combinations of operating systems and graphics hardware. When it does occur, it usually happens when you are refreshing the preview by adjusting parameters such as Contrast or Gamma, or when manually setting black or white points in the histogram from other than the default (full values). The histogram curve may also look somewhat odd, since it is plotting this distorted image preview. In such cases, your display may appear similar to this example:
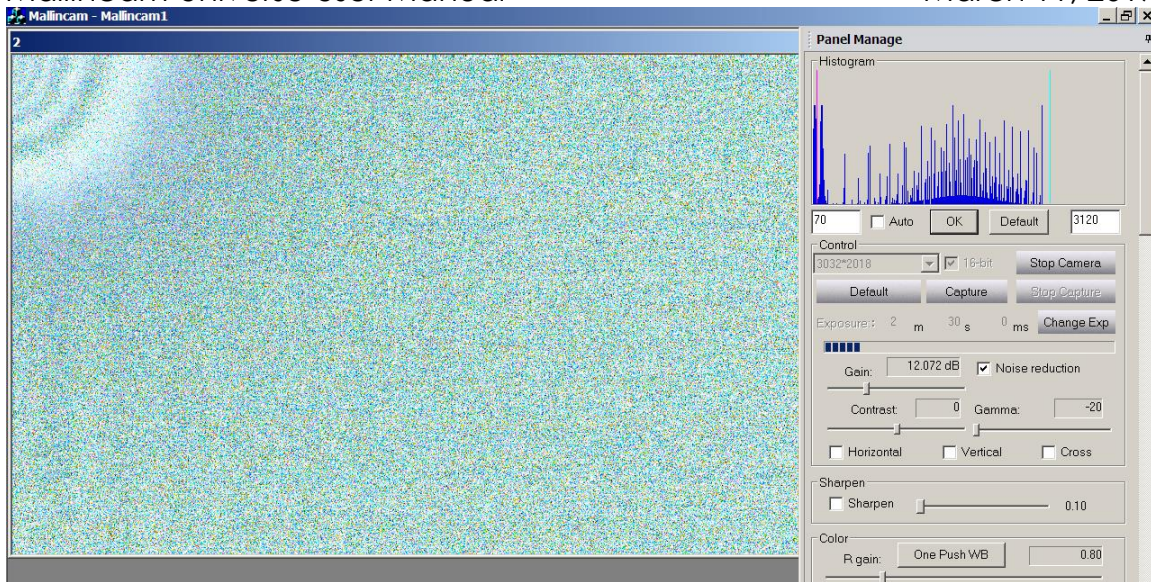
> ➢ In most cases this image preview distortion can be removed by pressing the **OK** button in the histogram display. You may need to press it more than once if the scrambled preview does not return to normal operation after the first attempt.

> ➢ This issue seems to resolve itself without any intervention when a new image is downloaded from the camera. Therefore, images that are being saved to the hard drive do not appear to be affected. But the issue may re-occur in the preview whenever you adjust a new image's parameters.

6.   Appendix

Installing Universe ASCOM Driver

Step 1

Visit www.Mallincam.net

Select the Support Tab, Go into Software Downloads

Near the bottom of the page under is **the Mallincam Universe DRIVER** link

Step 2

Download the **UNIVERSE ASCOM** driver (ascom_universe_setup.exe)

Note

• **MallinCam Universe**

- Universe v4.9 New Control Software with stacking (Latest) DOWNLOAD
- Universe driver v5.0. DOWNLOAD
- Universe ascom (use at own risk) DOWNLOAD

You must have already installed the latest **ASCOM Platform** on your computer (www.ascom-standards.org).
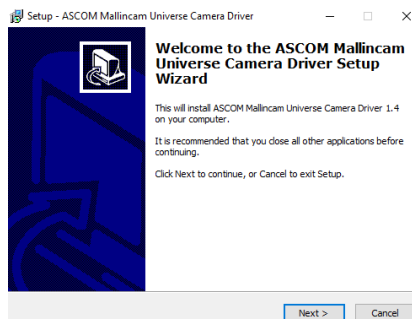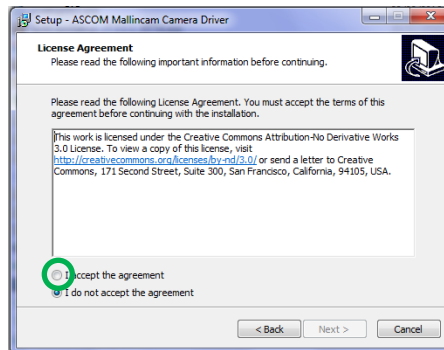
Step 3

Double Click on the **Driver** to install it onto your computer system (Windows). Depending upon the version of Windows, the following screen might appear.
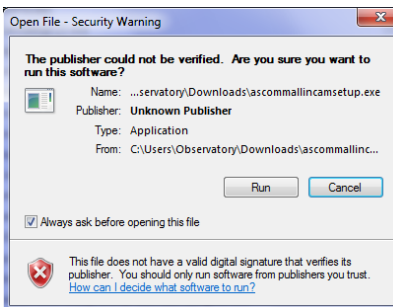
Step 4

Click on the **Run Button**. The following Window should now Pop-Up.

Step 5   **Click** on **Next** to Continue. The **License Agreement Window** should now appear.

Step 6   **Click** in the '**I accept the agreement**' Radial Button, then **Click** on **Next**. The **Ready to Install** Window will appear.
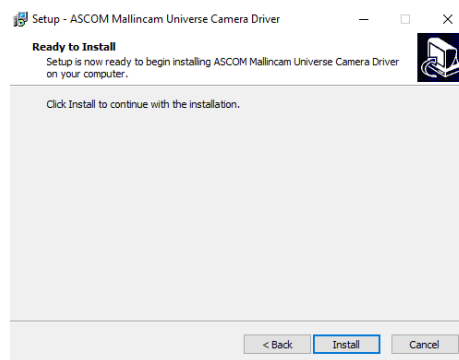
Step 7   **Click** on Install to install the ASCOM Driver.

That's 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.
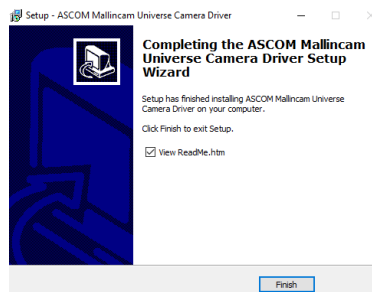
Step 8   **Click** on the **Finish** button to acknowledge the installation and close the Window.

Setting up to Broadcast on Night Skies Network

Introduction

I found that when I first started connecting tonight Skies Network (NSN), things started happening too fast for me to keep track of everything at once. So, pre-planning was the most 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 NSN, feel free to follow them and/or made modification as you deem as necessary.

Note | *Computer real-estate will be your nemesis. So, depending upon the size of the monitor (laptop), then number of screens that you are using, then number of software programs that using are simultaneously are 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's all about having fun, and **time** and **patience** are your best friends (not to mention all the guys and gals, and the Yahoo – MallinCam site:*

http://tech.groups.yahoo.com/group/mallincam/messages

One of the most important decisions you will need to make with broadcasting the image of the UNIVERSE is what Video capture software are you going to use. Some simple suggestions:

Currently Universe is not capable of modifying the Video Image and having that Video Image be directly captured by NSN Flash. So if you want to use all the features of the Universe software and broadcast those results, as well as save screen shots and videos of your images, then we need another program to capture Universes's output and have the output from that program linked to NSN's Flash grabber.

You currently have three choices for that other program: Splitcam, Manycam, WebcamMax. All three 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 (I can live with the Advertisements). You will then use Manycam/Splitcam/Webcam Max along with Universe Software to broadcast the images on NSN.

Step 1 *Plug in the UNIVERSE camera into an USB port on your computer.*

Note | *Always use the same port for your connected devices. I even mark on my laptop which USB port is for which device.*

Step 2 *Start Universe Software*

Get the image of your object on the Image Window of the Universe Software, adjust the settings on the software for your planned object and size the window so you have room for other software on your monitor real-estate. If you have a dual Monitor system, move the Universe Window to the second monitor.

Note

*During your initial **NSN** experience, you will find it easier to even get the object of interest onto the Universe Software window. This allows you to spend some time playing and adjusting the settings prior to connecting to NSN. As you become more comfortable, you will not worry about that and will adjust while connected to NSN (with the whole universe watching you live).*

Step 3

Start Manycam/Splitcam/WebcamMax

Note

Size the Manycam/Splitcam/WebcamMax window so that is beside the Univere Window and you can see both with little overlap. If you have a dual monitor system, you can slide both the Universe Software Window and the Manycam/Splitcam/WebcamMax window to the second monitor.

Step 4

Have Manycam/ Splitcam/Webcam Max grab the window image

Note

All of these packages have the ability to get a desktop image. Choose this option and overlay the sizing window on top of your Universe Software Image Window. You may need to play with the sizes until you obtain the ideal combination of both the fit in your screen. You want to ensure that you get a good image of whatever the Universe Software is looking at inside the Manycam/ Splitcam/ Webcam Max window.
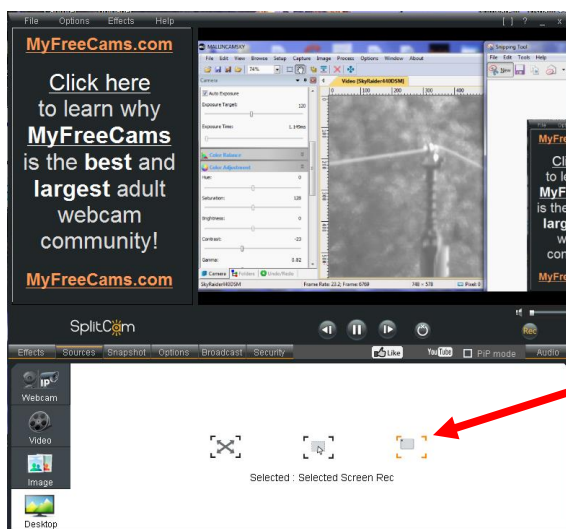
This allows you to select the size and location of the desktop that you want on the SplitCam. Just slide and adjust the overlay on top of your Universe's Software image.

Step 5   *Adjust the Resolution and frames/second (fps) value on Manycam/Splitcam/WebcamMax*

Note

This will be trial and error; it all depends upon resolution, bandwidth, and what over members on NSN experience from your broadcasted image. You will end up adjusting both on the Manycam/Splitcam/Webcam Max side as well and on the NSN side to get the best image. A helpful hint: I slide over the Manycam/ Splitcam/Webcam Max window so that some of the text appears in the Manycam/Splitcam/Webcam Max window. Can the members on NSN read the words? If not, adjust. Remember, this may take a couple of sessions until you obtain the ideal resolutions for your particular setup. For me I have set both Manycam /Splitcam at 640 x 480 at 15 fps.

Step 6   *Minimize the Manycam/Splitcam/WebcamMax software window*

Click on the little underscore on the top right side of the Manycam/Splitcam/Webcam Max window. This will eliminate the Manycam/Splitcam/Webcam Max window from your desktop (it should now appear on the bottom of your desktop monitor), but note that the software is still running and still has hold of your desktop (Universe) Image location.

Note

Do not move the Universe Window around your desktop when broadcasting, since Manycam /Splitcam/WebcamMax is just grabbing the real-estate location that currently your Universe Software image is situated at. If you move the Universe Software Window, then Manycam /Splitcam/ Webcam Max will still grab the desktop location, but may not grab the whole Universe Video Image. Don't be afraid to practice moving the Universe Software window when not broadcasting to learn how it affects the displayed Manycam/ Splitcam/ WebcamMax Window. If you need to, you can again use the Manycam/ Splitcam/ WebcamMax desktop select icon and select or change the location or size of the window for it to grab.

If you have a dual monitor, you can leave the Manycam/Splitcam/WebcamMax window open on the second monitor since real-estate will not be an issue in the situation. In fact with Splitcam, you have an option to view the displayed image in full screen mode by clicking on the "[ ]" symbol in the upper right side of the screen (the escape key returns you back to normal size).

Step 7   *Start your Web Browser of Choice*

You may have to play with a number of Browsers to see which one works well with your particular computer setup. I have had success with many browsers: *Chrome*, *Internet Explorer*, *Firefox,* and *Maxthon*.

Step 8

Log into Night Skies Network (NSN)

Have your Web Brower go to the location: http://www.nightskiesnetwork.ca/ . Locate and click on the ***BROADCASTERS AND MEMBERS SIGN IN*** button. The next ***Login*** screen will ask you to enter your ***username*** and ***password***.   You will next be presented with the ***Channel Line Up*** screen for Night Skies network. Click on the ***Login*** selection on the upper right hand side of the screen.
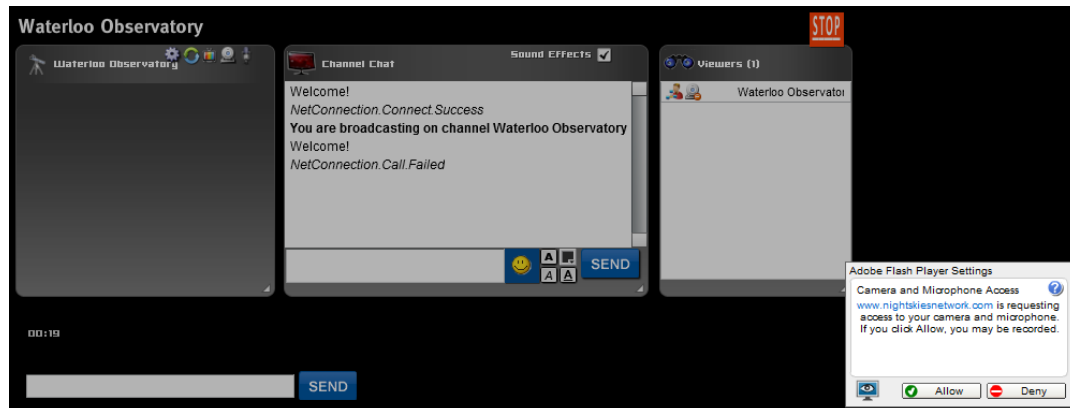

You will be presented with the ***Channel Launch Sign In*** screen for NSN. Again enter your ***Username*** and ***Password*** and click on ***Publish Channel*** button.


Step 9

Allow Adobe Flash to use your Manycam/Splitcam/WebcamMax

The ***Adobe Flash Player Settings*** window will pop up on your screen asking you for permission to use your camera and your microphone. Select ***Allow***.

Step 10

Turn off your Microphone

Until you have your microphone figured out, it is best to initially turn it off. If you do not, the viewers on NSN may hear an extreme loud buzzing (feedback noise). Later on we will look at using the microphone, but until then I recommend *CLICKING* on the little *microphone symbol* on the upper right corner of the NSN video display window to disable the microphone.
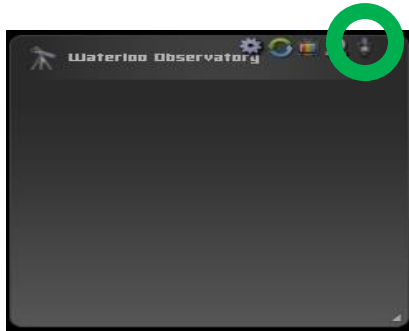
Step 11

Set a message for the NSN observers

It is a good idea to display a message above the NSN display window, so that the other NSN views understand what you are doing. When initially setting up (which usually takes longer when you are learning), I usually type the message "*Setting Up the Camera*" then *CLICK* on the *SEND* button to have it displayed.

Note

When you are us and running and everything is working as it should, you will change the message to indicate, what telescope, mount, and camera you are using. For that is the most frequently asked question from the NSN viewers.
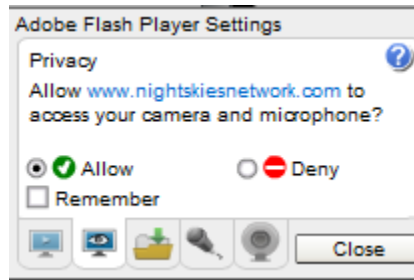
Step 12

Select the Camera

Now is the time to activate the camera, or in our case have NSN driver point to our Manycam/Splitcam/Webcam Max output.

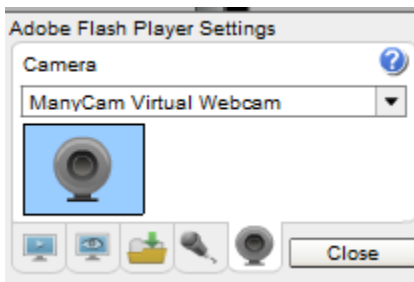➢ *RIGHT CLICK* inside the NSN Video window to bring up a *Settings Window*

> ➢ **CLICK** on the **Settings** choice and you will be presented with the *Adobe Flash Player Settings Window.*

> ➢ **CLICK** on the **Camera Icon** and you will be presented with a *pull down menu* to select your camera.

> ➢ **CLICK** on the **Pull Down** list to select your camera of choice.


> ➢ **CLICK** on **CLOSE** to Continue.

NSN will remember what camera you chose from the last visit. So usually you only have to go through this process whenever you want to change what camera device you would like the *NSN flash driver* to use.

Step 13   *Choose your Camera Settings*

We will now select the settings for our camera. We have the option of changing: The *Bandwidth*, *Picture*, *Resolution*, *Framerate*, and even the *microphone rate* (when you are ready). The changes will **not be activated** until you **CLICK** on the Green **OK** symbol in the window.

> ➢ **LEFT CLICK** inside the NSN video Window to bring up the *Camera Settings Window*.
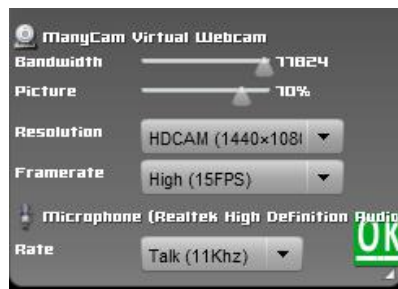
> ➢ **Use the sliders** for **Band Width** and **Picture** values. I usually have both of my sliders way on the right. Over time you will find the sweet spot for your system.

> ➢ Select your **Resolution** from the **Pull Down Menu**. Select a starting value of **(640 x 480**) for the system. Again, play with these to see what settings the NSN viewers say is the best.

> ➢ Select your **Frame Rate**. From its **Pull Down Menu**. I usually leave it at 15 fps, but I have used 30 fps at times. Again trial and error for your system.

> ➢ **CLICK** on the green **OK** symbol to accept these settings.

That's it, you are done. If everything is working well and the Window's gods are in a good mood, you should be broadcasting whatever object the **Universe** is capturing. You should now enter another Message and **SEND** it out to indicate what system you are using and what object you are viewing.

Note
There is a time delay on what you say (if you have your microphone activated) and do on your computer as compared to what others see (and hear) on the NSN broadcast.

Note
You will freeze (and I don't mean like what Chris does when he broadcasts in winter till 3am), I mean from time to time your NSN connection will freeze for no apparent reason. It happens to us all. When this happens, you can simply terminate the Web browser program (Ctrl –Alt-Del). Then restart your browser and Log back into NSN. This usual is a very quick process. But, sometime we all have to restart our computer (this takes longer for we need to power down hardware and software) and reactivate everything before login back in. Don't worry, the NSN viewers sense what is happening and will keep the conversations going while waiting for you to come back on.

Don't be afraid to ask for advice by typing in on the Video chat window, as we are all learning and are willing to assist whenever we can.

When ready, try activating the microphone (click on the microphone symbol). Other will let you know if they can hear you, or if there is noise. Remember there are settings for the microphone in the camera settings window.

Note
*When you are finished with your session, you simply say your good nights to the crowd of NSN viewers to let them know that your session is ending. **CLICK** on the red **STOP** button on your NSN Window and NSN will shut down your channel and you can power down your system and call it an evening (It won't force the NSN viewers off the channel and some viewers will continue chatting long after you have gone to bed).*

User Notes