

# Sequence Generator Pro

## Table of contents

---

About Sequence Generator Pro .....	5
Getting Started .....	6
Monochrome CCD Cameras .....	6
One Shot Color (OSC) and DSLR Cameras .....	20
Control Panel/Equipment .....	33
Supported Equipment .....	34
Cameras .....	35
SBIG Guider CCDs .....	43
Filter Wheels .....	43
Manual Filter Wheel .....	47
Focusers .....	47
Auto Guiders .....	50
Plate Solvers .....	52
Setting up Pinpoint .....	54
Setting up PlateSolve2 .....	55
Setting up ASTAP .....	56
Telescopes / Mounts .....	58
Using EQMOD with SGPro .....	61
Other Equipment .....	66
Flat Boxes .....	66
Manual Flat Box .....	69
Rotators .....	69
Manual Rotator .....	71
Observatories .....	71
Slave Settings .....	73
Safety Monitor .....	74
Environment Devices .....	76
Sequencing .....	77
Description .....	78
Sequence Options .....	79
How the Sequence Selects Work .....	80
Sequence Data / File Naming .....	82
Delay and Ordering Options .....	83
Sequence Status .....	84
Target Status .....	84
Big Status .....	84
Events .....	85
Automatic Camera Rotation .....	90
Automatic Target Centering .....	92
Automatic Meridian Flip .....	93
Starting, Pausing and Aborting .....	94
Automatic Frame Restart .....	95
Opening and Saving .....	95
Apply Profile to an Existing Sequence .....	97
Status Area .....	97
Data Stored in the FITS Header .....	98
Sequence Images .....	99

Sequence Recovery .....	100
Target Recovery .....	101
Sequence Recovery Mode .....	101
Restart Sequence on Safe .....	103
Capture Calibration Frames on Failure .....	104
Resetting the Sequence, Targets and Events .....	105
Target List and Settings .....	106
Profiles .....	111
Description .....	112
Understanding Profiles / FAQ .....	113
Equipment Profile Manager .....	114
New Sequence from Profile .....	116
Apply a Profile to an Existing Sequence .....	117
Save Sequence as Profile .....	118
User Profile Manager .....	119
Focusing .....	120
Frame and Focus .....	121
Using Subframes .....	121
Setting Focus and Target Positions .....	122
Manual Focusing Reminders .....	123
Auto Focus .....	123
Understanding Auto Focus .....	128
Auto Adjust Focus Per Filter .....	137
Temperature Compensation .....	138
Limiting Range .....	139
Framing .....	140
Frame and Focus with Nudge .....	140
Auto Center .....	140
Center Here .....	146
Using Goto Target .....	148
Sequence Notifications .....	149
SGPro Notification Center .....	149
Notification System .....	151
Images .....	154
Opening and Moving .....	154
Image Browsing .....	157
Closing Images .....	158
Menu Bar .....	159
Marking an Image Bad .....	159
Calculating HFR .....	160
Inverting .....	161
Crosshairs .....	162
Viewing FITS Headers .....	163
Saving Temporary Images .....	163
Zooming and Panning .....	164
Rotating .....	165
Stretching .....	165
Plate Solving .....	166
Center Here Action .....	168
Slew Here Action .....	168

Modules .....	169
Camera Temperature Control (TEC) .....	170
Environment Data .....	170
Filter Wheel .....	171
Flat Box .....	171
Focus Control .....	172
Target Markers .....	172
Frame and Focus .....	173
Histograms .....	174
Image Statistics .....	175
Observatory .....	176
Pan and Zoom .....	176
PHD2 Graph .....	176
Sequence .....	178
Scope Centering .....	178
Telescope .....	178
View Options .....	179
Image History .....	179
Helpers / Wizards .....	180
Flats Calibration Wizard .....	180
Flats Wizard .....	183
Planning Tools .....	184
Image Grader .....	186
Temperature Compensation Trainer .....	188
Meridian Flips .....	189
Framing and Mosaic Wizard .....	189
Target Imports .....	195
Image History .....	199
SGPro 2.5 Sequence Migration .....	201
Environment Options .....	202
General Options .....	203
Sequence Settings .....	204
External Apps .....	206
Keyboard Shortcuts .....	207
License Management .....	208
Management .....	208
Trouble Registering SGPro .....	210
API Documentation .....	212
JSON Example .....	214

## About Sequence Generator Pro

---

### About Sequence Generator Pro

Our goal is to provide a best-in-class image capture suite for astrophotography. Over the years we have been frustrated by a distinct lack of key features that make life easier under stars. You have a lot of equipment and sometimes it is difficult to get it all working together. We have written software that is capable of executing complex sequences of capture events which will allow you to spend more time looking up and less time fighting with your rig.

We also feel strongly about providing software at down to earth prices. Let's face it, astrophotography is expensive! You should be able to focus on the purchase of equipment without worrying about investing a fortune in software to control it.

### With Sequence Generator Pro you can:

- Use and save complex sequencing events (lights, darks, bias flats, filter wheels , binning, etc)
- Create and save equipment profiles to make generation of sequences fast and easy
- Create complex sequences for multiple targets in the same sequence
- Automatically move between targets
- Automate running auto focus routines according to user defined triggers (keeps you in focus as ambient temperature drops)
- Define sequence pause triggers for manual focus (time, intervals, etc)
- Dither between frames with your choice of three auto guiders (PHD, Astroart and MetaGuide)
- Center your ASCOM compliant telescope on any reference frame you can plate solve (even images from the Internet!)
- Center on your own images... makes framing for meridian flips and multi-night imaging sessions a snap!
- Center your ASCOM compliant telescope on any area of the image with a single click of a mouse!
- Easily perform frame and focus routines (with support for subframes high speed cameras)
- Feel at home with our highly customizable user interface (drag, dock and float small modules for almost any function)
- Over a dozen configurable UI modules (PHD graphing, Image Pan and Zoom, TEC control and more)
- User defined TEC cool down and warm up routines (to minimize thermal stress on your camera's sensitive components)
- Between frame temperature compensation (and integrated trainer)
- Easily create a "flats" sequences from your "lights" sequence
- Automatically calibrate your flats exposure lengths per filter
- Perform an automated meridian flip
- Detailed documentation and instructional videos
- Near immediate customer support via email or the Yahoo! group
- Hundreds of other features!

### Philosophy

When developing Sequence Generator Pro we adhered to a certain philosophy in order to keep a consistent "feel" and maximize usability.

- During sequence execution you should be able to adjust almost all parameters in real time.
- You should be able to create sequences "off-line". That is to say, you should not need to connect gear in order to create sequences for later use. This is sometimes difficult to execute... For ASCOM based

gear it is not possible to understand the capabilities of a piece of equipment until it is connected. Because of this we will often populate certain values with "supersets" of data (for instance we populate binning with 1x1 to 4x4 when no camera is connected). When your gear is connected we will check to see if your selected value is indeed supported. If it's not, we will "snap" these values to the closest supported value.

---

Created with the Standard Edition of HelpNDoc: [Free HTML Help documentation generator](#)

---

## Getting Started

---



---

Created with the Standard Edition of HelpNDoc: [Full-featured multi-format Help generator](#)

---

### Monochrome CCD Cameras

## Getting Started with Sequence Generator Pro and a Monochrome CCD Camera

Sequence Generator Pro is an extremely powerful image capture suite. It can perform many complex tasks in order to meet your imaging needs. That said, SGPro is also extremely intuitive and easy to use for beginners. In short, SGPro can be as powerful as you want it to be.

This tutorial will cover the basics to start up, create a sequence and run it. We assume that you will be using only a monochrome CCD camera and filter wheel. In addition, we cover some important in-sequence topics like dithering and histogram stretching. While we recommend using other equipment to automate your imaging sessions, we will reserve those tutorials for later.

In order to run through this tutorial in the comfort of your home, we will be using the ASCOM camera and color filter wheel simulators. These are installed when you install ASCOM. When connecting your own gear, you will need to ensure that all required ASCOM drivers are installed prior to starting SGPro.

If you are not familiar with ASCOM, it is an acronym for "Astronomy Common Object Model" and, with it, we are able to provide support for a broad spectrum of gear in a very short period of time. It is not critical that you understand the details of ASCOM, just that you are able to install it and that you can find ASCOM drivers (like any other driver) for your specific gear (QSI, FLI and SBIG being the exception to this rule).

Let's get started...

### Step 1:

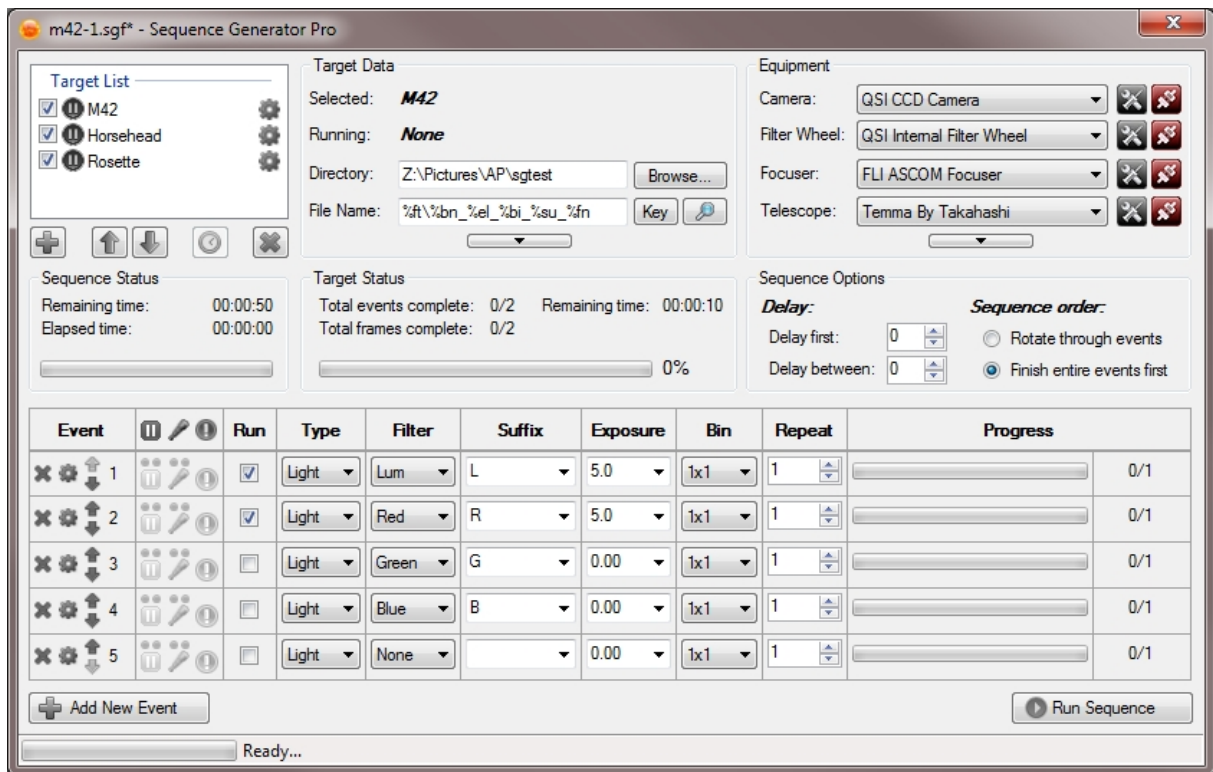
*Installing prerequisites:* Sequence Generator Pro is dependent on:

- ASCOM 6 or better. If you have not done so already please install ASCOM (<http://ascom-standards.org/Downloads/Index.htm>)
- Microsoft .NET 4 Framework (<http://www.microsoft.com/en-us/download/details.aspx?id=17851>). This should be installed automatically when SGPro is installed.
- While SGPro is not technically dependent on an auto guider, you will almost certainly use one. PHD2 is a free, open source, and community supported auto-guider: <http://openphdguiding.org/>

### Step 2:

*Open Sequence Generator Pro:* When you start, you will see a large window that contains several configurable modules on the left hand side. We will not discuss all of these modules in this tutorial, but will cover some that are essential to the image capture process. In the middle of the main window, you will see the "Sequencer" (pictured below). It is here that you will do most of the work when defining a sequence. The sequence window can be closed without fear of losing any of your sequence data.

When you close it, you can think of it more as “hiding”. If you close it and need to find it again you can either click the sequencer icon (to the right of the save icon) or hit Ctrl+W.



### Step 3:

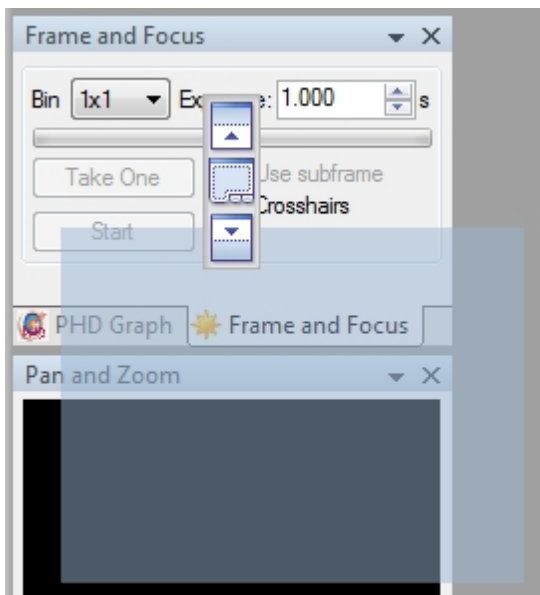
**Understanding the user interface:** Before we dive into things, we should take a moment to discuss the SGPro interface. The “main” window is where we display “modules” and image data. Modules are small windows that allow you to perform some type of common action. Examples of modules are the histogram module, image pan and zoom module and the frame and focus module. When you start SGPro for the first time, these modules will be docked to the left side of the screen. You can re-arrange modules to appear in any order you want (they can also be floating). To move a module, simply drag on its title bar and you will see positional arrows appear that will allow for placement above or under other modules. Modules can be docked on either the left or right side of SGPro. Lastly, you can “nest” modules with each other (on top of each other). This will help save some space and is a good option for modules you don’t use as much. To do this, drag a module and drop it on top of another existing module.

Your images will occupy the majority of the screen. Initially, when they appear, they will occupy the all remaining area on the screen (not occupied by modules). Performing actions that result in multiple images being open simultaneously will create a series of tabs across the top of the images (one for each image). By default, images taken with a camera will replace each other in the same image window. As with modules, you can float windows, nest them or place them side-by-side for comparison.

This is what docking a module to the left or right side looks like... The module will turn into a grey rectangle, just drop it onto the icon and it will snap into place:



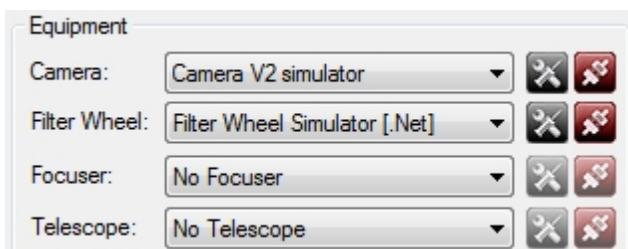
This is what rearranging a module looks like... To place this module above Frame and Focus, drop it on the "up icon", to place it below, drop it on the "down icon". Lastly, to "nest" it with Frame and Focus", drop it on the middle "tab" icon.



#### Step 4:

Connecting your gear: Before we start we need to select and connect to the ASCOM simulators...

To use these devices, you will need to select them from the upper right hand corner of the sequencer. Go ahead and select the simulators and attempt to connect (using the red connect button).



Choose these drivers:

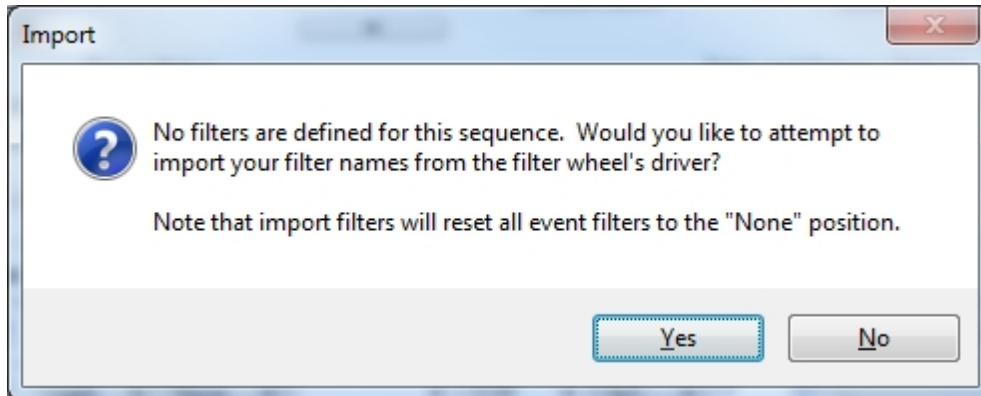
- "Camera V2 Simulator" for the camera
- "Filter Wheel Simulator [.NET]" for the filter wheel

Note: While we are using simulators, you can check now if your gear shows up on these drop down lists. If your gear does not appear here, you will need to install the appropriate ASCOM drivers and then restart SGPro.

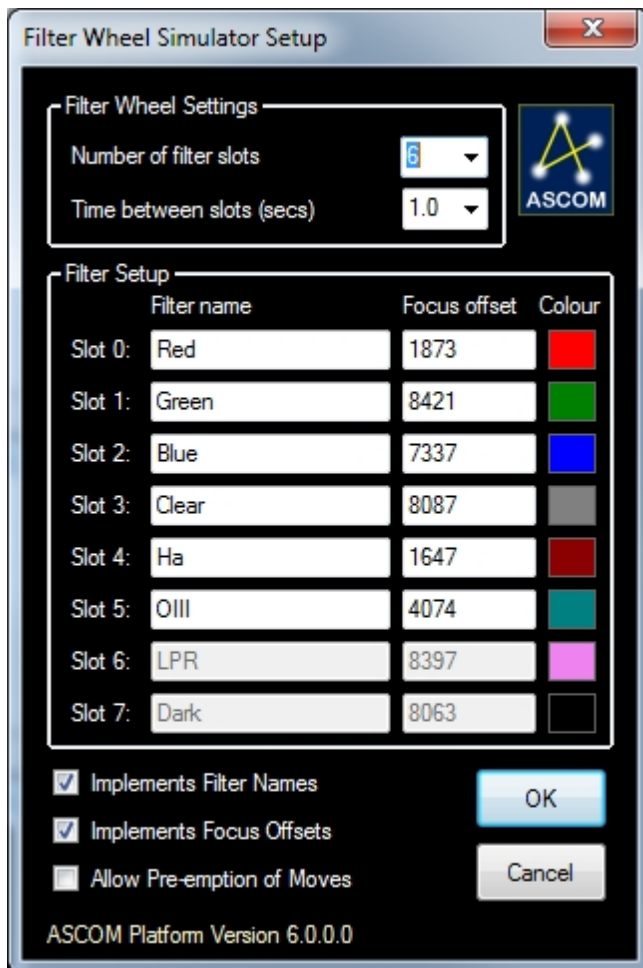


Now that you know how to connect gear, you need to specify the filter configuration for the color filter wheel (CFW). SGPro has only two ways of understanding the placement of filters in the carousel wheel. First you can use SGPro to specify this information or... if your CFW ASCOM driver supports it (and you have used your ASCOM driver to set this up before using SGPro), you can import filter data directly from the driver. When you select an ASCOM filter wheel and have no filters defined, you will be asked if you would like to attempt a filter import. Feel free to select "Yes" if you are set-up for this. If you are not set up for this or you don't know what this means, simply select "No" and follow the procedure below.

When you select the filter wheel, you will be prompted with this message:

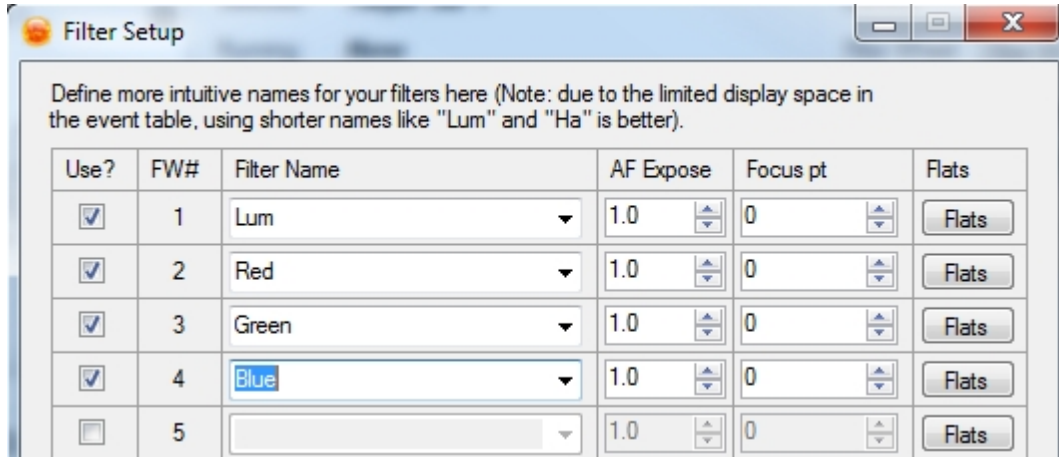


If you select "Yes", SGPro will import the filter information that is stored in the ASCOM driver. Specifically this (can be accessed by going to the simulator's settings):



If you select "No" (which you should probably do for this tutorial), you will need to add your filters

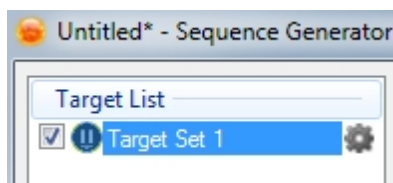
manually (one time). In order to do this, open the Control Panel (Camera Icon or Ctrl+E) and navigate to the "Filters" tab. Once here, click the "Define Filter List" button. The dialog presented contains entry rows for up to 12 filters. To add a filter, click the "Use?" checkbox and then enter name of the filter. There is a drop list of common filter names, but you can enter any name you would like (common names like R, RED and LUM are recommended since many astro-application can interpret this information and make your life easier). For this tutorial, go ahead and set up four filters... LUM, RED, GREEN and BLUE. Finally click OK. You will be presented with a warning that all event filters will be reset... we haven't set any events so just click "Yes" to proceed.



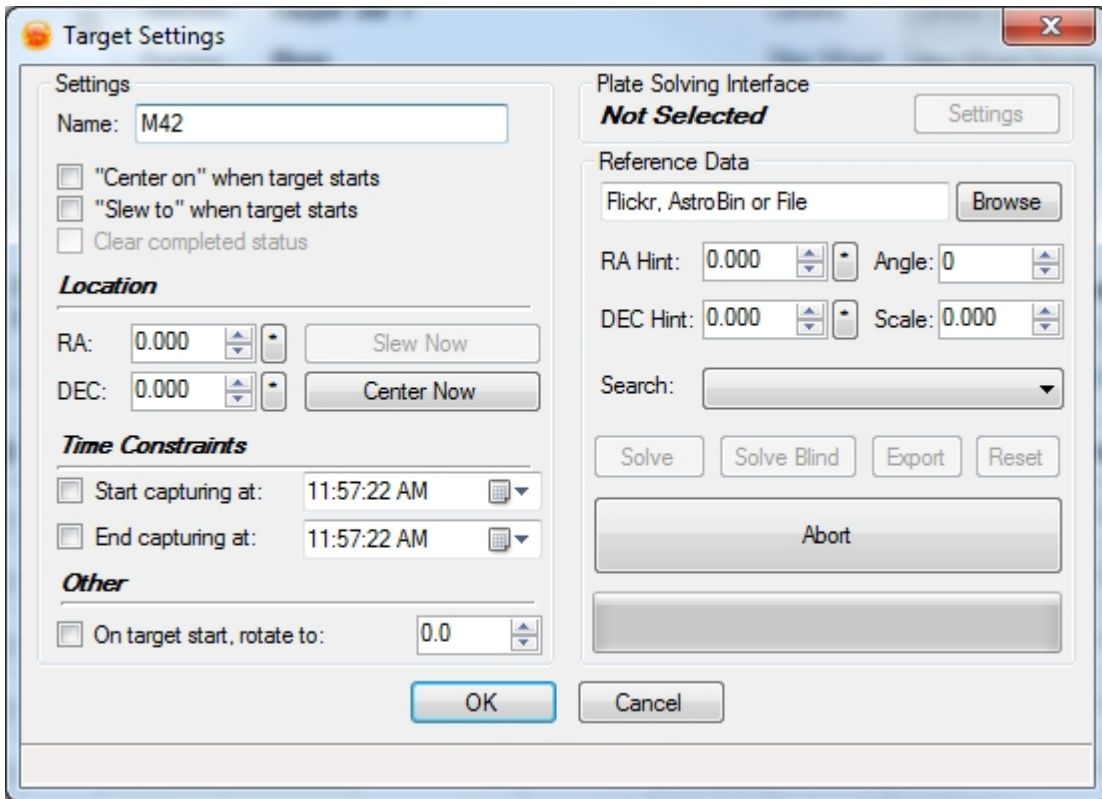
#### Step 5:

Creating the sequence: When a new sequence is created (a new one was automatically created when you opened SGPro), it will contain a default target in the upper left hand corner named "Target Set 1". It is named "Target Set", because it contains a "set" of events to execute (more on this in a moment). Most people will rename this to something more intuitive like "M42". To modify properties for your target, simply right click on it and select "Target Properties". There are many fields on this dialog but they are representative of more advanced topics. For this tutorial we will focus only on the "Name" field. Go ahead and enter the name of the target you would like to capture and click "OK" (any name is OK here). You will see now that the target name (in the sequencer's target list) has been updated to reflect the name of the target you chose.

Click the gear icon next to "Target Set 1" to open the settings dialog:










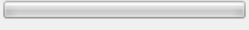





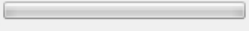




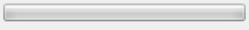




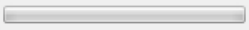




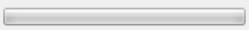
Target Settings:



So now you have a target... you're not ready to go yet. First we need to decide on and create events and frames for each target (in this case, just one). Occupying the entire bottom area of the sequencer you will find the event table. This is where you will apply all of the minutia that defines your sequence. For example, let's say, using LRGB filters, you want to capture 3 hours of LUM and 1.5 hours of each color. In addition, you would like to limit the exposure time of individual exposures to 10 minutes each. By default SGPro provides five empty events. You can add more by using the button in the lower left hand corner. In addition, SGPro will only execute events that have the "Run" option checked.

So... to get what we want here, go to event 1 (Run will already be checked). In the "Type" column, keep the event type as "Light". In the "Filter" column select the entry for your "Lum" filter. The "Suffix" field can be anything you want (including blank). When you select a filter, the suffix will auto update to the filter's name, but you can override this if desired. The suffix simply allows you to optionally provide some text that you would like to appear in file names for all images created by this event (described below). Next, set the "Exposure" time. You can use the drop down for a set of common intervals or you can enter the value in by hand. If you enter just a number by itself, this will be interpreted as seconds. The values 5, 600, and 0.01 all represent exposure times in seconds. Alternatively, you can use "m" after any number to force SGPro to interpret your entry as minutes. The value 10m is simply 10 minutes or 600 seconds. Go ahead and enter 10m or 600 here (for this simulation go ahead and substitute seconds for minutes... enter 10s instead of 10m or you will be watching the simulator do nothing all night). Next, choose your "Binning". SGPro, for most cameras, supports binning from 1x1 to 4x4 and values in-between. For our LUM event, go ahead and keep 1x1 selected. Lastly, fill in the value for repeat. We are after 3 hours of LUM data so we will enter 18 here. That's the gist of creating an event (this one has 18 frames). Go ahead and create three more events, one for each color filter (specify 2x2 binning to get a feel for that). Don't forget to check the "Run" column or these events will be ignored! When you are done you should have four active events (one for each of the LRGB sequence).

Here is what your event table should look like:

Event	  	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
   1	  	<input checked="" type="checkbox"/>	Light	Lum	L	10 s	1x1	18	 0/18
   2	  	<input checked="" type="checkbox"/>	Light	Red	R	5 s	2x2	9	 0/9
   3	  	<input checked="" type="checkbox"/>	Light	Green	G	5 s	2x2	9	 0/9
   4	  	<input checked="" type="checkbox"/>	Light	Blue	B	5 s	2x2	9	 0/9
   5	  	<input type="checkbox"/>	Light	None		0.00	1x1	1	 0/1

A few notes about the event table:

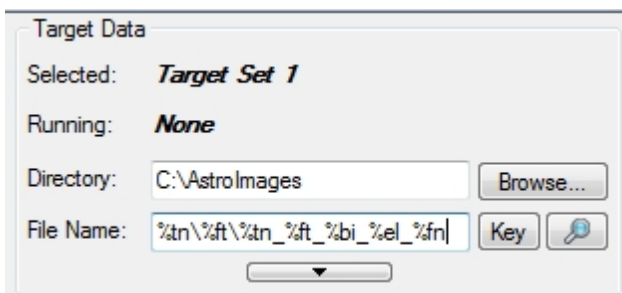
- You can move events by using the up and down arrows on the far left
- You can delete an event by clicking the “X” icon on the far left
- You can uncheck the “Run” option to prevent further execution of the event

### Step 6:

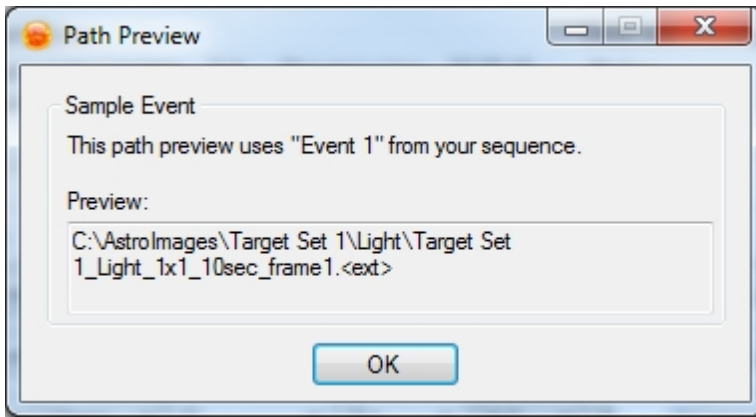
Specifying the location of your images: Now that your camera and color filter wheel (CFW) are connected, we will specify where and how to save your captured image files. To do so, we will set a few parameters in the upper middle area of the sequencer (the section labeled “Target Data”). First, locate the “Directory” field and then click “Browse”. This will allow you to select the base directory for all images taken by SGPro. Now you may be saying to yourself “That’s silly... I don’t want to save all of my SGPro images to the same directory”. You’re right. We don’t want to do that either. Because of this we have introduced a very powerful file naming system. In the “File Name” field directly below “Directory”, you can specify a custom file naming pattern using [quite a few options](#). For instance, if you want your file names to be named using the target name (the one you specified above), then the type (light, dark, etc...), then the binning, then the exposure length, then its frame (series) number, you would enter “%tn\_%ft\_%bi\_%el\_%fn” into the “File Name” field. Pretty easy... But what about the single directory issue, you mentioned above? This is also pretty easy... most folks simply modify their existing patterns by prepending “%tn\” to it. This will create a sub-directory under the base directory named after the target.

As an example, suppose you named your target “M42”. The full entry in the “File Name” field is: “%tn%tn\_%ft\_%bi\_%el\_%fn”. Using the LUM event as the basis for this example, the first frame will produce a file named “M42\_Light\_1x1\_600sec\_frame1.fit”. Where will it be created? Let’s assume directory you chose is “C:\AstroImages\” (in the directory field). In this case, because you specified “%tn\” as a prefix to your file name, the full path to your new images will be “C:\AstroImages\M42\”. You can also use this method to separate images by type. Instead, if you used “%tn%\%ft%\%tn\_%ft\_%bi\_%el\_%fn”, the path to your “Light” images would be “C:\AstroImages\M42\Light\”.

In SGPro, the example described above, would look like this:



Clicking the “magnifying glass” preview icon, you can see an example of how your data will be saved (using event 1):



Of course, you can create sub-directories using any of the provided pattern tokens. If you forget what [options are available](#) to you, just click the “Key” button next to the “File Name” field.

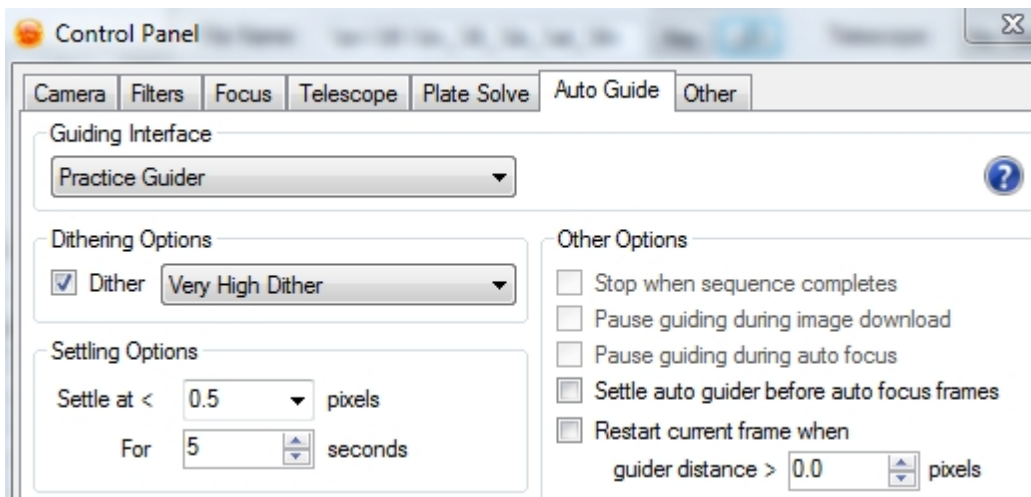
*Note:* To avoid setting these values every time you create a new sequence, you can set them in the Options dialog and they will be auto-populated for new sequences (Tools->Options menu item).

### Step 7:

Setting up the auto guider: SGPro currently supports three different autoguiders (PHD2, AstroArt and MetaGuide). As of now, SGPro does not have its own auto guider so when we say “supports” we mean that we are able to request that the external auto guider perform a dither operation between frames. Dithering is an important part of astrophotography and can help to remove unwanted artifacts when your sub-frames are stacked to form a master frame.

For the purposes of this tutorial, we will be using a special, non-functional auto guider called “Practice Guider”. Please remember not to use this guider outside of simulations like this one... its only purpose in life is to help you learn how to setup and run an auto guider up while indoors (PHD2 is not able to do this very well).

*Note:* Most folks using SGPro use PHD2 so, despite using the “Practice Guider”, we will discuss guiding like we are actually using PHD2.



To set your auto guider, open the Control Panel again and navigate to the “Auto Guide” tab. Use the Guiding Interface drop down to select “Practice Guider” (note that using this when not practicing, this is where you will pick your actual auto guider). Check the “Dither” option and then choose the dither amount. We use “PHD2 speak” for these terms, but in general, use “Very High Dither” or “Extreme Dither” for shorter focal lengths and the smaller dither options as you increase focal length. Finally you need to define the settling options. Settling options allow for the mount to settle after some kind of

disturbance. Typically this disturbance is invoked by SGPro in the form of a dither. This means that if PHD2 is not reporting that both RA and DEC values are below the settling value for a particular amount of time, SGPro will temporarily pause the sequence until guiding has recovered. The settling value is a whole number that defines the maximum allowable deviation (in pixels) from the center of your guide star. Short focal length scopes can generally get away with settle values of a half-pixel or more. Longer focal length scopes will sometimes require more precise guiding and use settle values of 0.2 pixels or lower. The “Practice Guider” will always return a value of 0 for distance from center so you will not get to see any real deviation while going through this tutorial.

At this point, go ahead and save your sequence. Sequence files in SGPro are saved as “.sgf” files. Click the “disk” icon in the upper left or go to “File->Save Sequence”.

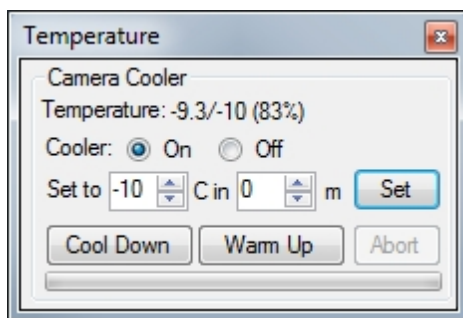
*Note:* Dithering will not work in PHD2 unless you enable the PHD2 server. To do this, open PHD2, go to the “Tools” menu and check “Enable Server”.

*Note:* SGpro contains a PHD2 module that will allow you to view the quality of your guiding without switching applications. To open the PHD2 module simply click the PHD2 icon. Furthermore, you can customize the color or scale of the graph to your taste. To adjust the colors, simply left click on the RA or DEC labels. To adjust the scale (zoom) simply right click on the graph. This module requires you to enable PHD2 logging or it will not function. To do so, open PHD2, go to the “Tools” menu and check “Enable Logging”.

### Step 8:

*Setting the camera's temperature:* Most monochrome CCD cameras allow for controllable temperatures. You will obviously want to set your camera's temperature to the desired value before you start capturing. Failure to do so will introduce large amounts of thermal noise and make your images very difficult to process. The easiest way to do this is to open the “[TEC Module](#)” by clicking the thermometer icon. This will open a small window named “Temperature”. In it, you can turn your camera's cooler on or off and easily set the temperature. Go ahead and do this for the simulator camera now. Click the “On” option to turn the cooler on and then enter the temperature you want to set. For instance, if you want to set the cooler to -10C, enter “-10” and click “Set”. There is a field next to the “Set to” field that will allow you to set the temperature of the CCD over time. Using this feature can help to reduce thermal shock to your camera's sensitive parts. If you want to set your camera's temperature to -10 C over a 5 minute period, simply change the “0m” to “5m” and click “Set”.

This is what the camera temperature module looks like:

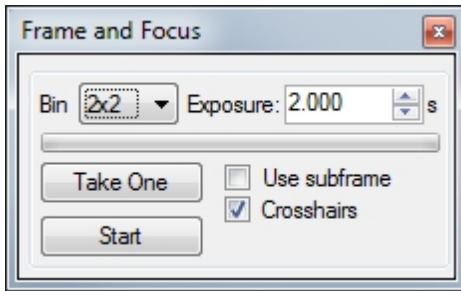


*Note:* You can have SGPro automatically cool and warm your camera for you. This is not discussed as part of this tutorial, but, if you are interested, more info can be found [here](#).

### Step 9:

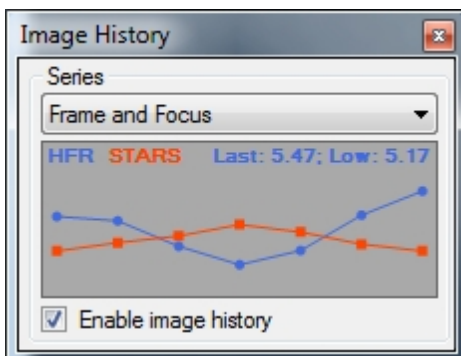
*Focusing your images:* This tutorial does not use a motorized focuser, and, as such, we cannot walk through how SGPro accomplishes “on-target” [auto focus](#) (it's actually quite easy and very powerful). Instead we will focus on two different methods that are available with a normal manual focuser. Both methods depend on use of the “[Frame and Focus](#)” module (click the gold star icon to open and

position).

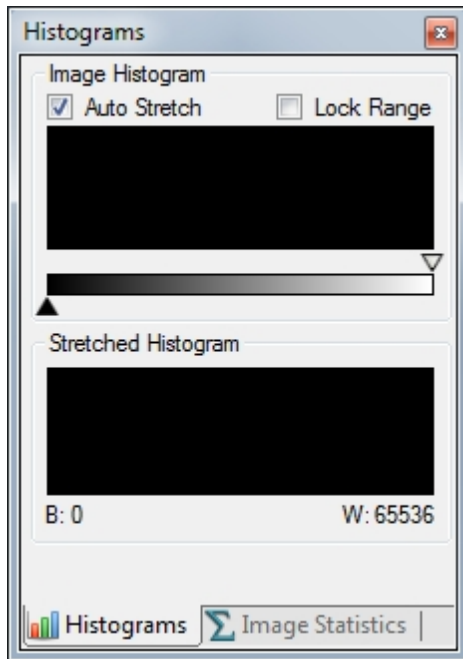


*Method 1:* This method will use a Bahtinov mask and a nearby (to your target) bright star. The object here is to obtain a uniform diffraction pattern (more on this here: [http://en.wikipedia.org/wiki/Bahtinov\\_mask](http://en.wikipedia.org/wiki/Bahtinov_mask)). While not unheard of, it is unlikely that your target will contain a star bright enough to produce this pattern in a reasonable amount of time (a few seconds). This means that you will have to perform off-target focus (moving the mount back and forth between the target and a bright star every time you want to focus). When performing initial focus, you will be using the “Frame and Focus” module. This can be opened by clicking the “Gold Star” icon. This will allow you to place the camera into state where it continually captures images for display purposes only. None of these images are saved to the disk. So... to get started, place the Bahtinov mask over the aperture of your scope (or pretend to since we are simulating... you get the point). Next, specify binning for these frames. In general, for frame and focus with a Bahtinov mask, you should specify the highest binning available (in most cases, this will be 4x4). This will help with both download times and sensitivity. For this simulation, leave binning at 1x1 because the simulator image is quite small already. Asking the simulator for a 4x4 image will work, but the image will be very tiny. Next, specify the exposure time... for this, a value between 1 and 5 seconds should be appropriate (depending on brightness of the star and binning). Finally, open the Histogram module (Colored Bars icon) and ensure that “Auto Stretch” is checked. If you don't do this, all of your images will just appear as empty black squares. That's it! Click “Start” and the camera will begin taking a continuous stream of images you can use to adjust your focuser. When you have achieved proper focus, click “Stop”.

*Method 2:* This method will use the built-in “Image History” module. This is arguably simpler, but may be a bit less precise depending on the star field you choose (typically the same as the target). The primary advantage of this method is that you don't need to move off your target to focus (huge time saver). To use this method, click the “Graph” icon to open the “Image History” module. Optionally, go to “Tools->Image History” to open a larger and more detailed representation of the module. Once this is done, start Frame and Focus (same as method 1). This time, in the Image History module, you will need to ensure that the “Enable image history” option is checked. Once enabled, the image history graphs will begin to plot “whole image half-flux radius (HFR)” (a focus metric) and star counts. A binning of 2x2 will normally work best here. Now adjust your focuser to get the lowest possible HFR value. Before you start paying attention to any numbers, make sure to obtain a rough focus (seeing any semblance of stars should be sufficient). The objective here is to spot a “V” pattern on the graph. The closer you move to focus, the lower your HFR value will be. As you move the focuser toward focus, the HFR value will decrease and then, at some point, start to increase. This is an indication that you have passed focus and should go back one increment. When you are done, click “Stop”.



*Note:* Before starting frame and focus, ensure that you open the “Histograms” module and check the “Auto Stretch” option. If you don't do this, all of your images will just appear as empty black squares. See the image below...



#### Step 10:

*Framing your target:* Pointing the scope in the exact center of your (intended) target can be a daunting task. In this tutorial, we did not connect an ASCOM compatible mount so our framing options are quite limited. Though it is beyond the scope of this tutorial, SGPro offers several, easy-to-use, [automatic centering options](#) that can get you within a few pixels of your target in under two minutes. Definitely worth checking out, but we want to stick to basics here...

In this example, we might use a spotting scope, finder or external planetary program to slew the mount near our target. Unless your mount's alignment (sync), polar alignment and gears are perfect, you will likely not be pointing where you want. To correct this, you will use the “Frame and Focus” module (as described in the “Focusing” section) to start streaming a series of temporary images. A binning of 4x4 is best for the framing process. Exposure time will vary depending on target brightness. To complete framing, click “Start” on frame and focus and then, using the hand controller for your mount, slowly move the telescope to the desired position and you're done. You may also be required to rotate the orientation of the camera (most CCD chips are not square). When you are done, click “Stop” on frame and focus.

*Note:* This process is pretty simple if you are imaging at short focal lengths, but grows increasingly more difficult as your focal length increases. At long focal lengths you will almost certainly need to move to more [advanced framing methods](#).

*Note:* Before starting the framing process, ensure that you open the “Histograms” module and check the “Auto Stretch” option. If you don't do this, all of your images will just appear as empty black squares.

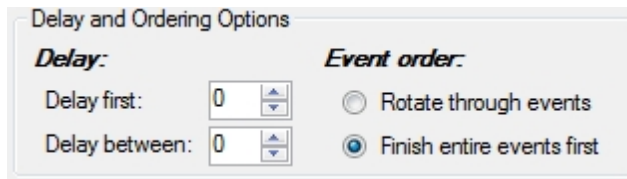
#### Step 11:

*Running the sequence:* OK... we've done a lot and it's time to review. So far we have found and connected the camera and filter wheel to SGPro, defined our filter list, created a target, defined events for that target, specified where and how to save images, set up your auto guider, learned a few methods for manual focus and finally learned how to manually frame your target. That's a lot of stuff and, at the end of this tutorial, we will talk briefly about how to [minimize the setup time](#) for future sequences.



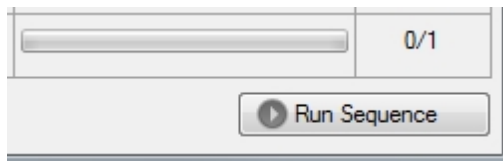
Next up, we need to consider the order of the sequence. On the sequencer window, below the equipment area, you will find several options that dictate the order in which the events you defined will be executed. For this tutorial, we will focus only on the “Finish event first” and “Rotate” options. When taking images with multiple filters, most imagers prefer to finish entire events first because it reduces the amount of time you need to wait for filter wheel changes. In our example, choosing this option will result in the capture of all LUM frames first (event 1), then each of the color filters will be captured as discrete events (events 2-4). A rotating capture is exactly what it seems. SGPro will capture one LUM frame (from event 1) and then move onto the next color filter (next event) and then onto the next and so on... This is a good option if you would like to get an even distribution of data over a given period of time.

For this tutorial, yours should look like this:



Lastly, ***you will be responsible for starting PHD2 guiding before you start the sequence.*** This means you need to connect your gear to PHD2, calibrate and start guiding while you are pointed at your target (obviously not necessary with the “Practice Guider”).

We're ready! Don't forget to save your sequence (sequences are saved as “.sgf” files). Click the big “Run Sequence” button in the lower right hand corner.

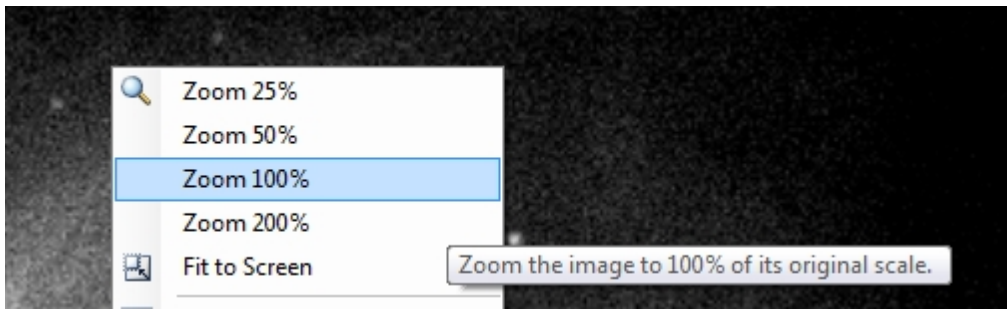


### Step 12:

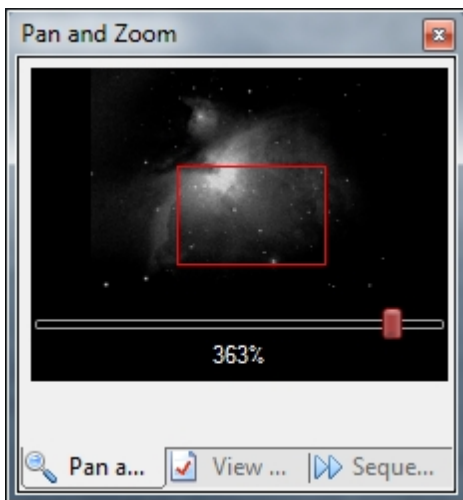
*Checking your images:* So now you are cranking out images and life is good. Many folks like to inspect their handiwork as the sequence progresses. First off, ensure that, using the “Histogram” module, you have the auto-stretch option checked so that you can actually see details in your images. You have several options for inspecting images...

In the currently displayed image you can zoom or pan to any location on the image. To zoom, right click on the image and then select the zoom factor. By default all images will be resized (for display purposes only) to fit in the image display area. You may want to zoom to 100% in order to check out the quality of your stars. Other ways to zoom an image include the “magnifying glass icons” on the image toolbar (located directly above each image) and the zoom drop down box to the right of the image toolbar buttons. Finally, you can use the “Pan and Zoom” module. On this module you will find a zoom slider that will let you adjust zoom up to 400%.

Here is a portion of the context menu (right click):



When an image is larger than the display area you can easily move to other areas of the image by dragging on the image and “pushing” it in the desired direction. Alternatively, you can use the “Pan and Zoom” module to drag the small red box to the area of interest. The main image display area will now be representative of this part of the image. Here is what the Pan and Zoom module looks like for images that are larger than the display area:



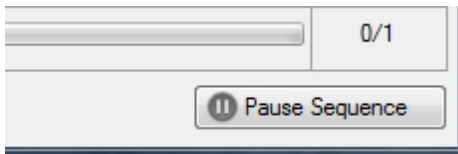
Lastly, SGPro, will by default, replace the current camera image window data with the latest data from the camera. This means that if you are taking 10 frames as part of an event and you are on event 9, only frame 8 will be shown. All other frames are on disk, but not displayed. If you haven't been out to check on your images for a while you may be interested in inspecting images that are no longer displayed. To help alleviate the user from having to go open older images through a file selection dialog, we use an “image browser”. The browser uses forward and back arrows just like an Internet browser. If you have frame 8 shown and want to see frame 6, simply click the back arrow twice. Alternatively, you can right-click on either the back or forward arrows and get a menu that shows the last 25 images.

### Step 13:

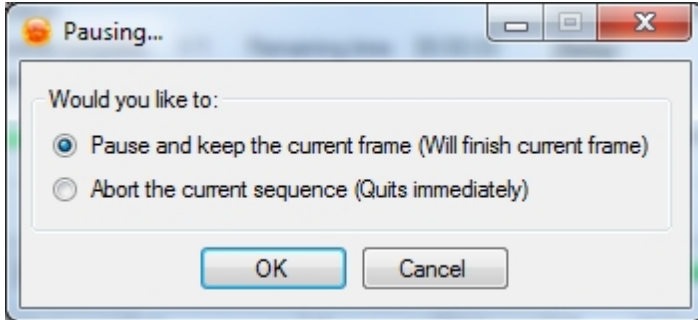
***Pausing and aborting:*** During the course of the sequence you may have need to pause or abort the sequence. There are any number of reasons to do this... you're done for the night, clouds roll in, pausing for emergency focus, hurricane, etc.

To pause the sequence, you simply click the same button you used to start it (located in the lower right hand corner). When the sequence is running, this button actually changes to read “Pause Sequence”. When you click it, you will be presented with another small dialog that allows you to choose how you want to pause the sequence. You can pause after the current frame is completed and downloaded or you can choose to abort immediately. If you choose to abort immediately, SGPro will not download data from the camera (it will be lost).

Here, you can see that the "Run Sequence" button has changed into a "Pause Sequence" button:



Clicking it presents you with these choices (as described above):



#### Step 14:

***Final thoughts:*** This tutorial does not cover many of the most powerful aspects of SGPro. It is intended as a primer to get you up and going quickly with just the basics. Below are some notes and thoughts that will help you figure out where to go from here (when you are comfortable moving on):

***Save as profile:*** You just spent a lot of time setting your gear up and tweaking settings. Almost any setting you make in a sequence can be saved to any number of [custom equipment profiles](#). Once you have a profile, you can create new sequences using them and all of your settings will be applied and ready to go with the click of a few buttons. All you need to do at this point is define your events and you'll be ready to go. More details on profiles can be found [here](#).

***Focusing reminders:*** This tutorial discusses a couple of options for manual focusing. If you are interested in pausing the sequence based on user defined triggers like time, temperature, frame count, etc, you can find more [here](#). Once this is set, and a trigger is hit, SGPro will automatically pause the sequence and inform you that it's time to focus. When you are done, simply resume the sequence.

***Playing around:*** Almost all equipment types have simulators. Hook them up and play around! You can try to use almost any feature in SGPro just with simulators (Auto meridian flips are one exception to this).

***Auto Focus:*** SGPro can provide you with ability to stay in focus all night. Temperature and gravity will try to destroy your images, but SGPro, simply by connecting an ASCOM compatible (absolute) focuser will be able to automatically focus based on a number of user defined triggers (time, frames, temperature, etc). More information on this can be found [here](#).

***Easier framing:*** In this tutorial we discussed a very manual and time intensive method for framing. One of the most powerful features found in SGPro is the ability to find your target and start imaging in minutes. In order to do this, you must install one of three [plate solvers](#) (Pinpoint, Elbrus or Astrometry.NET). Once this is done SGPro will interface with your plate solver in order to move the mount, with high accuracy, to your intended target. In addition to this, you can easily recenter on one of your images from a previous night or find an image on [astrobin.com](#) or [flickr.com](#) that you would like to use for framing your own image. More on this can be found [here](#).

#### Step 15:

***Getting more help:*** SGPro contains a fairly extensive help file (this document is also included in there). When in SGPro, you can get to the help file by going to "Help->Help File". SGPro also offers tooltips on almost every single button and control available. To access these, just ensure that you click on a

control and then hover over it with the mouse. Finally, feel free to post on our Yahoo! group (<http://groups.yahoo.com/group/mainsequencesoftware>)... we will be happy to see if we can help.

---

Created with the Standard Edition of HelpNDoc: [Free iPhone documentation generator](#)

---

## One Shot Color (OSC) and DSLR Cameras

### Getting Started with Sequence Generator Pro and a One Shot Color Camera (or DSLR)

Sequence Generator Pro is an extremely powerful image capture suite. It can perform many complex tasks in order to meet your imaging needs. That said, SGPro is also extremely intuitive and easy to use for beginners. In short, SGPro can be as powerful as you want it to be.

This tutorial will cover the basics to start up, create a sequence and run it. We assume that you will be using only a one shot color (OSC) or DSLR camera. In addition, we cover some important in-sequence topics like dithering and histogram stretching. While we recommend using other equipment to automate your imaging sessions, we will reserve those tutorials for later.

In order to run through this tutorial in the comfort of your home, we will be using the ASCOM camera and color filter wheel simulators. These are installed when you install ASCOM. When connecting your own gear, you will need to ensure that all required ASCOM drivers are installed prior to starting SGPro.

If you are not familiar with ASCOM, it is an acronym for "Astronomy Common Object Model" and, with it, we are able to provide support for a broad spectrum of gear in a very short period of time. It is not critical that you understand the details of ASCOM, just that you are able to install it and that you can find ASCOM drivers (like any other driver) for your specific gear (QSI, FLI and SBIG being the exception to this rule).

One note about this tutorial: This is a combined lesson on both One Shot Color (OSC) CCDs and DSLRs. The primary difference between these is that CCDs support "binning" (convincing to camera to consider a larger group as pixels as a single pixel) and DSLRs support ISO (sensitivity) values. We do our best to call these differences out, but you must keep in mind that there is no DSLR simulator. This means that even if you are using a DSLR camera, you will need to use the OSC simulator for this tutorial.

Let's get started...

#### **Step 1:**

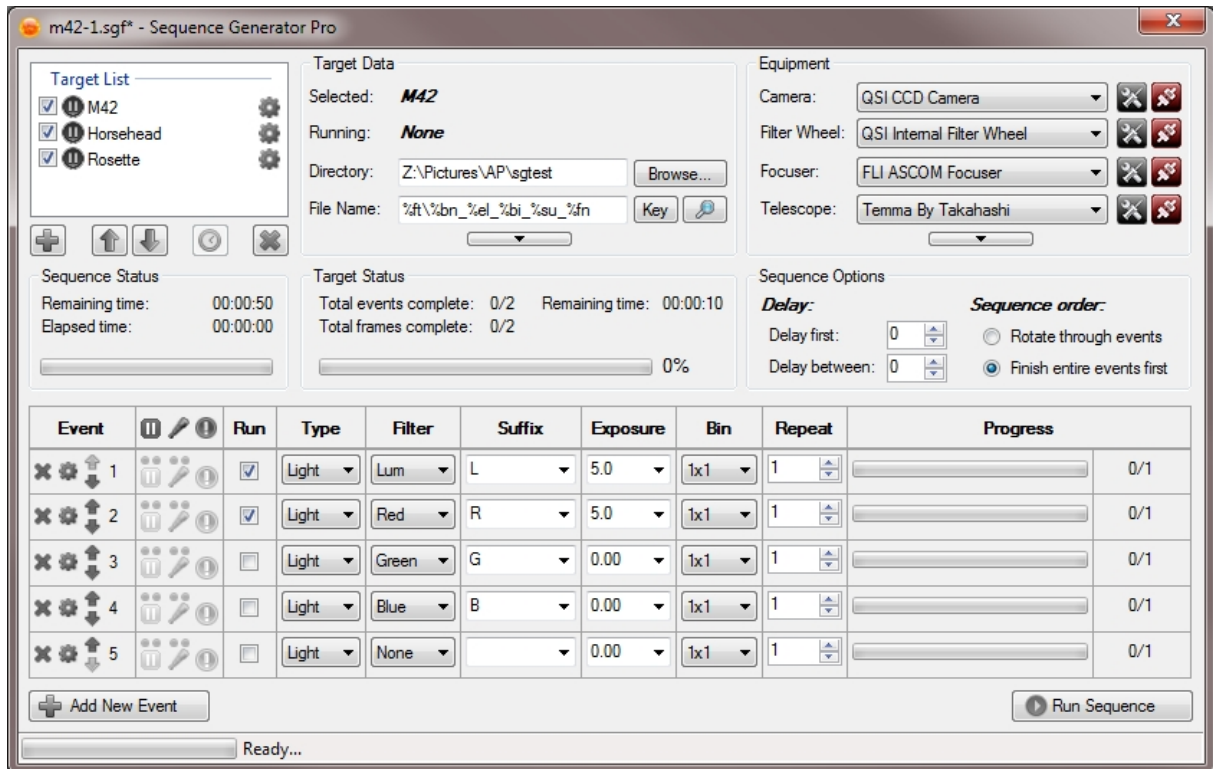
*Installing prerequisites:* Sequence Generator Pro is dependent on:

- ASCOM 6 or better. If you have not done so already please install ASCOM (<http://ascom-standards.org/Downloads/Index.htm>)
- Microsoft .NET 4 Framework (<http://www.microsoft.com/en-us/download/details.aspx?id=17851>). This should be installed automatically when SGPro is installed.
- While SGPro is not technically dependent on an auto guider, you will almost certainly use one. PHD2 is a free, open source, and community supported auto-guider: <http://openphdguiding.org/>

#### **Step 2:**

*Open Sequence Generator Pro:* When you start, you will see a large window that contains several configurable modules on the left hand side. We will not discuss all of these modules in this tutorial, but will cover some that are essential to the image capture process. In the middle of the main window, you will see the "Sequencer" (pictured below). It is here that you will do most of the work when defining a

sequence. The sequence window can be closed without fear of losing any of your sequence data. When you close it, you can think of it more as “hiding”. If you close it and need to find it again you can either click the sequencer icon (to the right of the save icon) or hit Ctrl+W.



### Step 3:

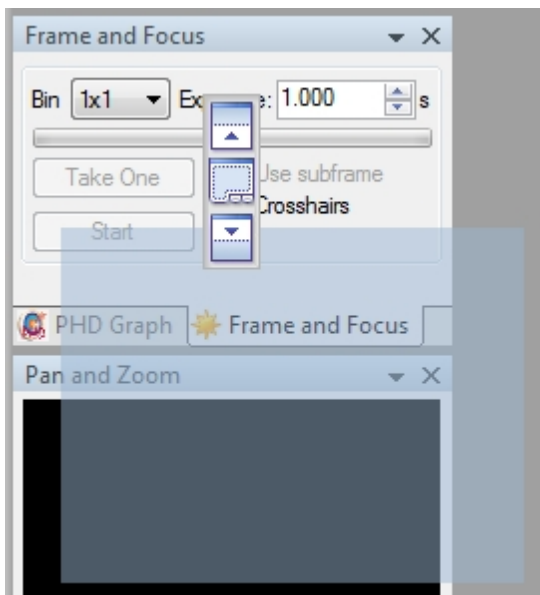
**Understanding the user interface:** Before we dive into things, we should take a moment to discuss the SGPro interface. The “main” window is where we display “modules” and image data. Modules are small windows that allow you to perform some type of common action. Examples of modules are the histogram module, image pan and zoom module and the frame and focus module. When you start SGPro for the first time, these modules will be docked to the left side of the screen. You can re-arrange modules to appear in any order you want (they can also be floating). To move a module, simply drag on its title bar and you will see positional arrows appear that will allow for placement above or under other modules. Modules can be docked on either the left or right side of SGPro. Lastly, you can “nest” modules with each other (on top of each other). This will help save some space and is a good option for modules you don't use as much. To do this, drag a module and drop it on top of another existing module.

Your images will occupy the majority of the screen. Initially, when they appear, they will occupy the all remaining area on the screen (not occupied by modules). Performing actions that result in multiple images being open simultaneously will create a series of tabs across the top of the images (one for each image). By default, images taken with a camera will replace each other in the same image window. As with modules, you can float windows, nest them or place them side-by-side for comparison.

This is what docking a module to the left or right side looks like... The module will turn into a grey rectangle, just drop it onto the icon and it will snap into place:



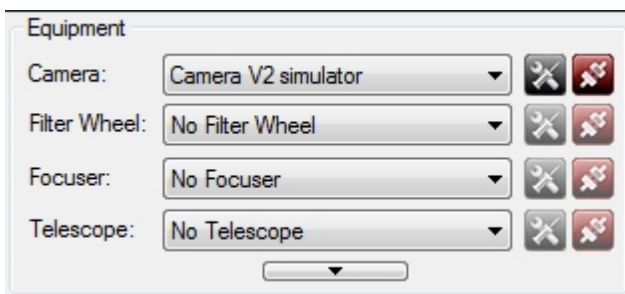
This is what rearranging a module looks like... To place this module above Frame and Focus, drop it on the "up icon", to place it below, drop it on the "down icon". Lastly, to "nest" it with Frame and Focus", drop it on the middle "tab" icon.



#### Step 4:

Connecting your gear: Before we start we need to select and connect to the ASCOM simulators...

To use these devices, you will need to select them from the upper right hand corner of the sequencer. Go ahead and select the camera simulator and attempt to connect (using the red connect button).



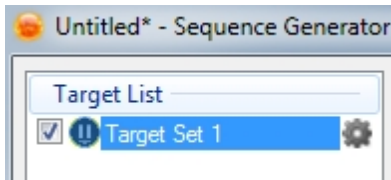
Note: While we are using simulators, you can check now if your gear shows up on these drop down lists. If your gear does not appear here, you will need to install the appropriate ASCOM drivers and then restart SGPro. If you are using a Canon or Nikon camera, there is no need to install ASCOM drivers.

#### Step 5:

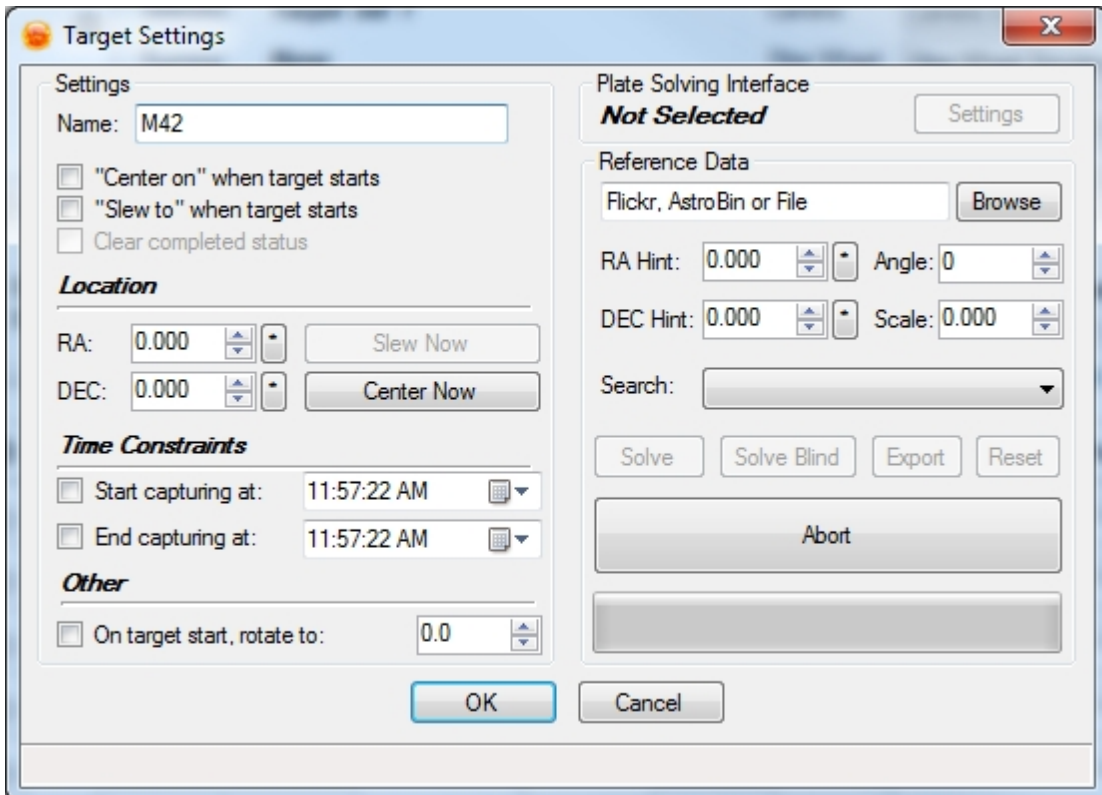
Creating the sequence: When a new sequence is created (a new one was automatically created when

you opened SGPro), it will contain a default target in the upper left hand corner named "Target Set 1". It is named "Target Set", because it contains a "set" of events to execute (more on this in a moment). Most people will rename this to something more intuitive like "M42". To modify properties for your target, simply right click on it and select "Target Properties". There are many fields on this dialog but they are representative of more advanced topics. For this tutorial we will focus only on the "Name" field. Go ahead and enter the name of the target you would like to capture and click "OK" (any name is OK here). You will see now that the target name (in the sequencer's target list) has been updated to reflect the name of the target you chose.

Click the gear icon next to "Target Set 1" to open the settings dialog:



Target Settings:



So now you have a target... you're not ready to go yet. First we need to decide on and create events and frames for each target (in this case, just one). Occupying the entire bottom area of the sequencer you will find the event table. This is where you will apply all of the minutia that defines your sequence. For example, let's say you want to capture 3 hours of data for your target. In addition, you would like to limit the exposure time of individual exposures to 10 minutes each. By default SGPro provides five empty events. You can add more by using the button in the lower left hand corner. In addition, SGPro will only execute events that have the "Run" option checked.

































So... to get what we want here, go to event 1 (Run will already be checked). In the "Type" column, keep the event type as "Light". In the "Filter" column, leave this a "None". The "Suffix" field can be anything you want (including blank). The suffix simply allows you to optionally provide some text that you would like to appear in file names for all images created by this event (described below). Next, set the "Exposure" time. You can use the drop down for a set of common intervals or you can enter the value in by hand. If you enter just a number by itself, this will be interpreted as seconds. The values 5, 600,

and 0.01 all represent exposure times in seconds. Alternatively, you can use “m” after any number to force SGPro to interpret your entry as minutes. The value 10m is simply 10 minutes or 600 seconds. Go ahead and enter 10m or 600 here (for this simulation go ahead and substitute seconds for minutes... enter 10s instead of 10m or you will be watching the simulators do nothing all night).

For OSC CCDs:

Next, choose your “Binning”. SGPro, for most cameras, supports binning from 1x1 to 4x4 and values in-between. For our event, go ahead and keep 1x1 selected. Lastly, fill in the value for repeat. We are after 3 hours of data so we will enter 18 here. That s the gist of creating an event (this one has 18 frames).


































Here is what your event table should look like:

Event	  	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress	
   1	  	<input checked="" type="checkbox"/>	Light	None		10 s	1x1	18	<div style="width: 100%;"></div>	0/18
   2	  	<input type="checkbox"/>	Light	None		0.00	1x1	1	<div style="width: 0%;"></div>	0/1
   3	  	<input type="checkbox"/>	Light	None		0.00	1x1	1	<div style="width: 0%;"></div>	0/1
   4	  	<input type="checkbox"/>	Light	None		0.00	1x1	1	<div style="width: 0%;"></div>	0/1
   5	  	<input type="checkbox"/>	Light	None		0.00	1x1	1	<div style="width: 0%;"></div>	0/1

For DSLRs:

Next, choose your “ISO”. SGPro, when it connects to your camera, will query it for available ISO values. For our event, go ahead and select an ISO value of 800. Lastly, fill in the value for repeat. We are after 3 hours of data so we will enter 18 here. That s the gist of creating an event (this one has 18 frames). Note, that there is currently no DSLR simulator, so you will need to proceed as though you are using an OSC CCD.

Here is what your event table should look like (use the one above for the rest of this tutorial though):

Event	  	Run	Type	Filter	Suffix	Exposure	ISO	Repeat	Progress	
   1	  	<input checked="" type="checkbox"/>	Light	None		10 s	800	18	<div style="width: 100%;"></div>	0/18
   2	  	<input type="checkbox"/>	Light	None		0.00	100	1	<div style="width: 0%;"></div>	0/1
   3	  	<input type="checkbox"/>	Light	None		0.00	100	1	<div style="width: 0%;"></div>	0/1
   4	  	<input type="checkbox"/>	Light	None		0.00	100	1	<div style="width: 0%;"></div>	0/1
   5	  	<input type="checkbox"/>	Light	None		0.00	100	1	<div style="width: 0%;"></div>	0/1

A few notes about the event table:

- You can move events by using the up and down arrows on the far left
- You can delete an event by clicking the “X” icon on the far left
- You can uncheck the “Run” option to prevent further execution of the event

## Step 6:

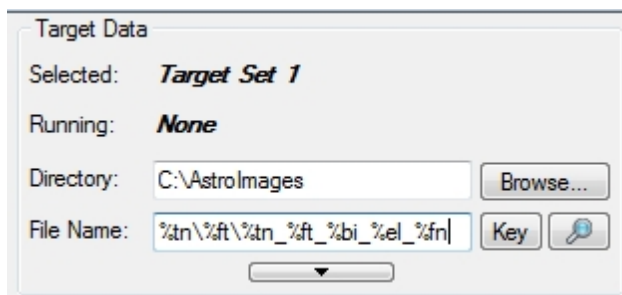
Specifying the location of your images: Now that your camera is connected, we will specify where and how to save your captured image files. To do so, we will set a few parameters in the upper middle area of the sequencer (the section labeled “Target Data”). First, locate the “Directory” field and then click “Browse”. This will allow you to select the base directory for all images taken by SGPro. Now you may be saying to yourself “That s silly... I don t want to save all of my SGPro images to the same directory”. You re right. We don t want to do that either. Because of this we have introduced a very powerful file



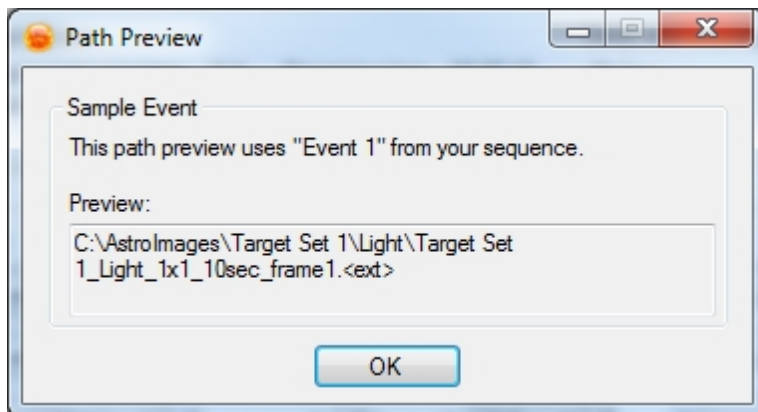
naming system. In the “File Name” field directly below “Directory”, you can specify a custom file naming pattern using [quite a few options](#). For instance, if you want your file names to be named using the target name (the one you specified above), then the type (light, dark, etc...), then the binning, then the exposure length, then its frame (series) number, you would enter “%tn\_%ft\_%bi\_%el\_%fn” into the “File Name” field. Pretty easy... But what about the single directory issue, you mentioned above? This is also pretty easy... most folks simply modify their existing patterns by prepending “%tn\” to it. This will create a sub-directory under the base directory named after the target.

As an example, suppose you named your target “M42”. The full entry in the “File Name” field is: “%tn%tn\_%ft\_%bi\_%el\_%fn”. Using the LUM event as the basis for this example, the first frame will produce a file named “M42\_Light\_1x1\_600sec\_frame1.fit”. Where will it be created? Let’s assume directory you chose is “C:\AstroImages\” (in the directory field). In this case, because you specified “%tn\” as a prefix to your file name, the full path to your new images will be “C:\AstroImages\M42\”. You can also use this method to separate images by type. Instead, if you used “%tn%\%ft%\%tn\_%ft\_%bi\_%el\_%fn”, the path to your “Light” images would be “C:\AstroImages\M42\Light\”.

In SGPro, the example described above, would look like this:



Clicking the “magnifying glass” preview icon, you can see an example of how your data will be saved (using event 1):



Of course, you can create sub-directories using any of the provided pattern tokens. If you forget what [options are available](#) to you, just click the “Key” button next to the “File Name” field.

*Note:* DSLR cameras that use ISO can insert this value into the file name using the “%is” token.

*Note:* To avoid setting these values every time you create a new sequence, you can set them in the Options dialog and they will be auto-populated for new sequences (Tools->Options menu item).

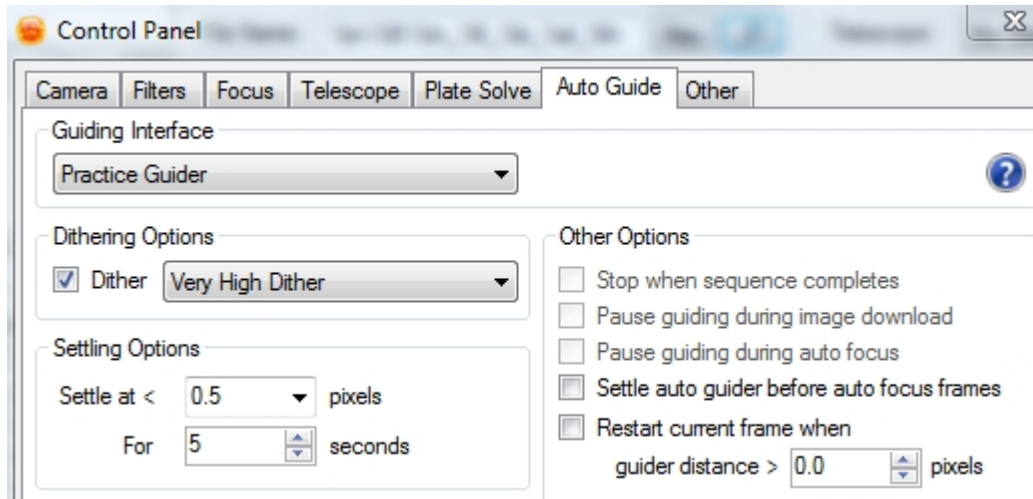
### Step 7:

Setting up the auto guider: SGPro currently supports three different autoguider (PHD2, AstroArt and MetaGuide). As of now, SGPro does not have its own auto guider so when we say “supports” we mean that we are able to request that the external autoguider perform a dither operation between frames.

Dithering is an important part of astrophotography and can help to remove unwanted artifacts when your sub-frames are stacked to form a master frame.

For the purposes of this tutorial, we will be using a special, non-functional auto guider called “Practice Guider”. Please remember not to use this guider outside of simulations like this one... its only purpose in life is to help you learn how to setup and run an autoguider up while indoors (PHD2 is not able to do this very well).

Note: Most folks using SGPro use PHD2 so, despite using the “Practice Guider”, we will discuss guiding like we are actually using PHD2.



To set your auto guider, open the Control Panel again and navigate to the “Auto Guide” tab. Use the Guiding Interface drop down to select “Practice Guider” (note that using this when not practicing, this is where you will pick your actual auto guider). Check the “Dither” option and then choose the dither amount. We use “PHD2 speak” for these terms, but in general, use “Very High Dither” or “Extreme Dither” for shorter focal lengths and the smaller dither options as you increase focal length. Finally you need to define the settling options. Settling options allow for the mount to settle after some kind of disturbance. Typically this disturbance is invoked by SGPro in the form of a dither. This means that if PHD2 is not reporting that both RA and DEC values are below the settling value for a particular amount of time, SGPro will temporarily pause the sequence until guiding has recovered. The settling value is a whole number that defines the maximum allowable deviation (in pixels) from the center of your guide star. Short focal length scopes can generally get away with settle values of a half-pixel or more. Longer focal length scopes will sometimes require more precise guiding and use settle values of 0.2 pixels or lower. The “Practice Guider” will always return a value of 0 for distance from center so you will not get to see any real deviation while going through this tutorial.

At this point, go ahead and save your sequence. Sequence files in SGPro are saved as “.sgf” files. Click the “disk” icon in the upper left or go to “File->Save Sequence”.

*Note:* Dithering will not work in PHD2 unless you enable the PHD2 server. To do this, open PHD2, go to the “Tools” menu and check “Enable Server”.

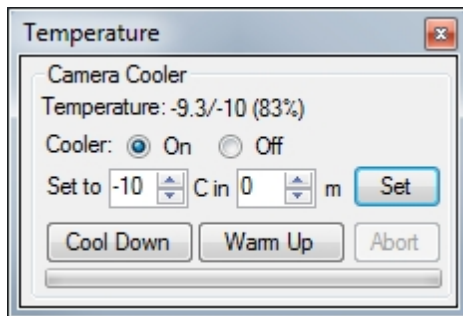
*Note:* SGpro contains a PHD2 module that will allow you to view the quality of your guiding without switching applications. To open the PHD2 module simply click the PHD2 icon. Furthermore, you can customize the color or scale of the graph to your taste. To adjust the colors, simply left click on the RA or DEC labels. To adjust the scale (zoom) simply right click on the graph. This module requires you to enable PHD2 logging or it will not function. To do so, open PHD2, go to the “Tools” menu and check “Enable Logging”.

### Step 8:

Setting the camera's temperature: Most CCD cameras allow for controllable temperatures. As of now,

there are no DSLR cameras will controllable coolers, so if you intend to use this type of camera, you can skip to next section. You will obviously want to set your camera s temperature to the desired value before you start capturing. Failure to do so will introduce large amounts of thermal noise and make your images very difficult to process. The easiest way to do this is to open the “[TEC Module](#)” by clicking the thermometer icon. This will open a small window named “Temperature”. In it, you can turn your camera s cooler on or off and easily set the temperature. Go ahead and do this for the simulator camera now. Click the “On” option to turn the cooler on and then enter the temperature you want to set. For instance, if you want to set the cooler to -10C, enter “-10” and click “Set”. There is a field next to the “Set to” field that will allow you to set the temperature of the CCD over time. Using this feature can help to reduce thermal shock to your camera s sensitive parts. If you want to set your camera s temperature to -10 C over a 5 minute period, simply change the “0m” to “5m” and click “Set”.

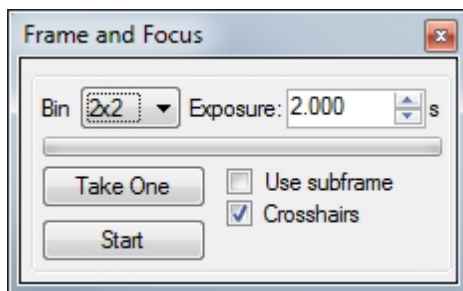
This is what the camera temperature module looks like:



*Note:* You can have SGPro automatically cool and warm your camera for you. This is not discussed as part of this tutorial, but, if you are interested, more info can be found [here](#).

### Step 9:

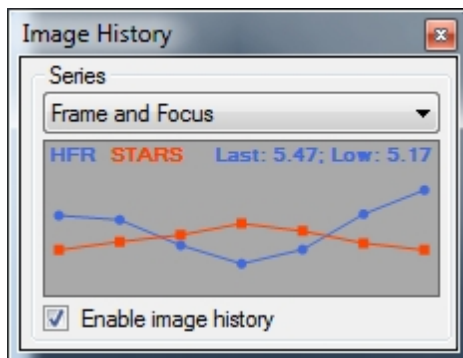
***Focusing your images:*** This tutorial does not use a motorized focuser, and, as such, we cannot walk through how SGPro accomplishes “on-target” [auto focus](#) (it s actually quite easy and very powerful). Instead we will focus on two different methods that are available with a normal manual focuser. Both methods depend on use of the “[Frame and Focus](#)” module (click the gold star icon to open and position).



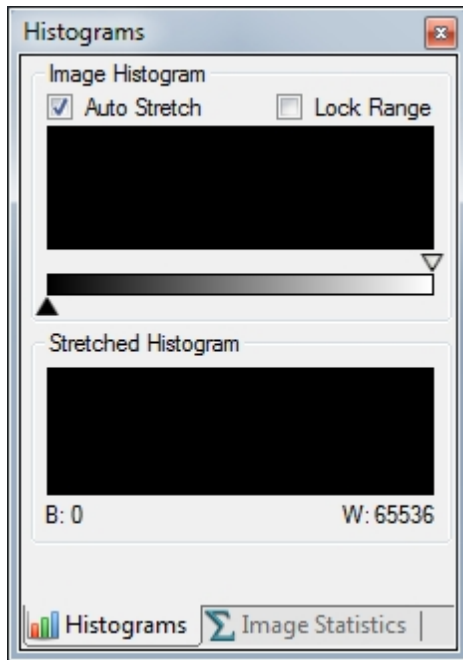
***Method 1:*** This method will use a Bahtinov mask and a nearby (to your target) bright star. The object here is to obtain a uniform diffraction pattern (more on this here: [http://en.wikipedia.org/wiki/Bahtinov\\_mask](http://en.wikipedia.org/wiki/Bahtinov_mask)). While not unheard of, it is unlikely that your target will contain a star bright enough to produce this pattern in a reasonable amount of time (a few seconds). This means that you will have to perform off-target focus (moving the mount back and forth between the target and a bright star every time you want to focus). When performing initial focus, you will be using the “Frame and Focus” module. This can be opened by clicking the “Gold Star” icon. This will allow you to place the camera into state where it continually captures images for display purposes only. None of these images are saved to the disk. So... to get started, place the Bahtinov mask over the aperture of your scope (or pretend to since we are simulating... you get the point). Next, specify binning for these frames. In general, for frame and focus with a Bahtinov mask, you should specify the highest binning available (in most cases, this will be 4x4; for DSLRs you will want to use a higher ISO... 800 or 1600 should be fine). This will help with both download times and sensitivity. For this

simulation, leave binning at 1x1 because the simulator image is quite small already. Asking the simulator for a 4x4 image will work, but the image will be very tiny. Next, specify the exposure time... for this, a value between 1 and 5 seconds should be appropriate (depending on brightness of the star and binning). Finally, open the Histogram module (Colored Bars icon) and ensure that "Auto Stretch" is checked. If you don't do this, all of your images will just appear as empty black squares. That's it! Click "Start" and the camera will begin taking a continuous stream of images you can use to adjust your focuser. When you have achieved proper focus, click "Stop".

*Method 2:* This method will use the built-in "Image History" module. This is arguably simpler, but may be a bit less precise depending on the star field you choose (typically the same as the target). The primary advantage of this method is that you don't need to move off your target to focus (huge time saver). To use this method, click the "Graph" icon to open the "Image History" module. Optionally, go to "Tools->Image History" to open a larger and more detailed representation of the module. Once this is done, start Frame and Focus (same as method 1). This time, in the Image History module, you will need to ensure that the "Enable image history" option is checked. Once enabled, the image history graphs will begin to plot "whole image half-flux radius (HFR)" (a focus metric) and star counts. A binning of 2x2 will normally work best here (again DSLRs can use an ISO value of 800 or 1600 here). Now adjust your focuser to get the lowest possible HFR value. Before you start paying attention to any numbers, make sure to obtain a rough focus (seeing any semblance of stars should be sufficient). The objective here is to spot a "V" pattern on the graph. The closer you move to focus, the lower your HFR value will be. As you move the focuser toward focus, the HFR value will decrease and then, at some point, start to increase. This is an indication that you have passed focus and should go back one increment. When you are done, click "Stop".



*Note:* Before starting frame and focus, ensure that you open the "Histograms" module and check the "Auto Stretch" option. If you don't do this, all of your images will just appear as empty black squares. See the image below...



### Step 10:

*Framing your target:* Pointing the scope in the exact center of your (intended) target can be a daunting task. In this tutorial, we did not connect an ASCOM compatible mount so our framing options are quite limited. Though it is beyond the scope of this tutorial, SGPro offers several, easy-to-use, [automatic centering options](#) that can get you within a few pixels of your target in under two minutes. Definitely worth checking out, but we want to stick to basics here...

In this example, we might use a spotting scope, finder or external planetary program to slew the mount near our target. Unless your mount's alignment (sync), polar alignment and gears are perfect, you will likely not be pointing where you want. To correct this, you will use the "Frame and Focus" module (as described in the "Focusing" section) to start streaming a series of temporary images. A binning of 4x4 is best for the framing process (again, higher ISO values for a DSLR will be better here). Exposure time will vary depending on target brightness. To complete framing, click "Start" on frame and focus and then, using the hand controller for your mount, slowly move the telescope to the desired position and you're done. You may also be required to rotate the orientation of the camera (most CCD chips are not square). When you are done, click "Stop" on frame and focus.

*Note:* This process is pretty simple if you are imaging at short focal lengths, but grows increasingly more difficult as your focal length increases. At long focal lengths you will almost certainly need to move to more [advanced framing methods](#).

*Note:* Before starting the framing process, ensure that you open the "Histograms" module and check the "Auto Stretch" option. If you don't do this, all of your images will just appear as empty black squares.

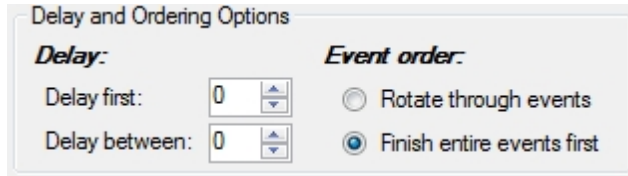
### Step 11:

*Running the sequence:* OK... we've done a lot and it's time to review. So far we have found and connected the camera, created a target, defined events for that target, specified where and how to save images, set up your auto guider, learned a few methods for manual focus and finally learned how to manually frame your target. That's a lot of stuff and, at the end of this tutorial, we will talk briefly about how to [minimize the setup time](#) for future sequences.

Next up, we need to consider the order of the sequence. On the sequencer window, below the equipment area, you will find several options that dictate the order in which the events you defined will be executed. For this tutorial, we will focus only on the "Finish event first" and "Rotate" options. Even

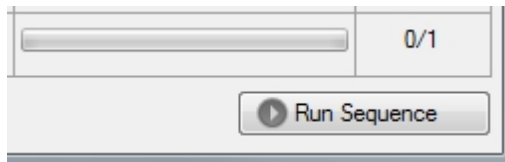
though we created only one event here, there are many scenarios in which you would create more. If we had created multiple events, choosing "Finish entire events first" will result in the capture of all frames for the first event (event 1), then each of the other events will be captured as discrete events. A rotating capture is exactly what it seems. SGPPro will capture one frame (from event 1) and then move onto the next next event and then onto the next and so on... This is a good option if you would like to get an even distribution of data over a given period of time.

For this tutorial, yours should look like this:



Lastly, **you will be responsible for starting PHD2 guiding before you start the sequence.** This means you need to connect your gear to PHD2, calibrate and start guiding while you are pointed at your target (obviously not necessary with the "Practice Guider").

We're ready! Don't forget to save your sequence (sequences are saved as ".sgf" files). Click the big "Run Sequence" button in the lower right hand corner.

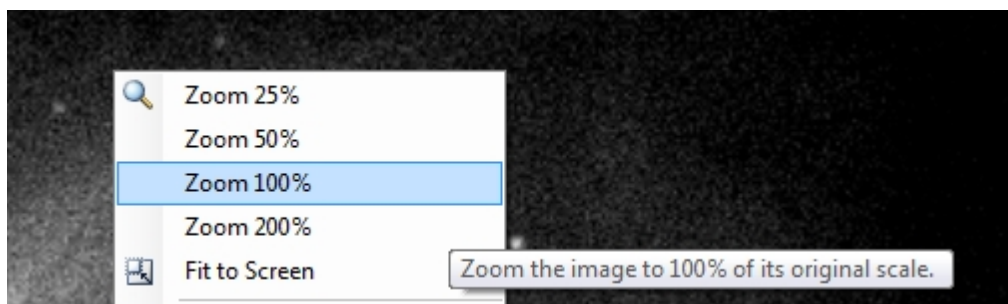


### Step 12:

Checking your images: So now you are cranking out images and life is good. Many folks like to inspect their handiwork as the sequence progresses. First off, ensure that, using the "Histogram" module, you have the auto-stretch option checked so that you can actually see details in your images. You have several options for inspecting images...

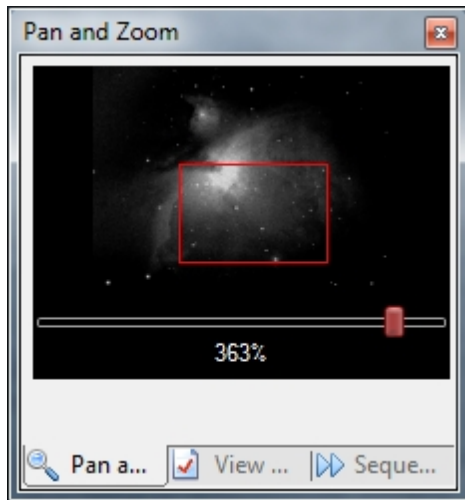
In the currently displayed image you can zoom or pan to any location on the image. To zoom, right click on the image and then select the zoom factor. By default all images will be resized (for display purposes only) to fit in the image display area. You may want to zoom to 100% in order to check out the quality of your stars. Other ways to zoom an image include the "magnifying glass icons" on the image toolbar (located directly above each image) and the zoom drop down box to the right of the image toolbar buttons. Finally, you can use the "Pan and Zoom" module. On this module you will find a zoom slider that will let you adjust zoom up to 400%.

Here is a portion of the context menu (right click):



When an image is larger than the display area you can easily move to other areas of the image by dragging on the image and "pushing" it in the desired direction. Alternatively, you can use the "Pan and

Zoom” module to drag the small red box to the area of interest. The main image display area will now be representative of this part of the image. Here is what the Pan and Zoom module looks like for images that are larger than the display area:



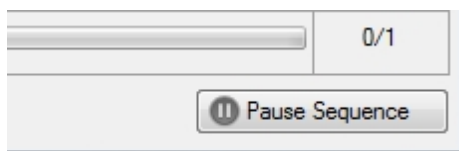
Lastly, SGPro, will by default, replace the current camera image window data with the latest data from the camera. This means that if you are taking 10 frames as part of an event and you are on event 9, only frame 8 will be shown. All other frames are on disk, but not displayed. If you haven't been out to check on your images for a while you may be interested in inspecting images that are no longer displayed. To help alleviate the user from having to go open older images through a file selection dialog, we use an "image browser". The browser uses forward and back arrows just like an Internet browser. If you have frame 8 shown and want to see frame 6, simply click the back arrow twice. Alternatively, you can right-click on either the back or forward arrows and get a menu that shows the last 25 images.

### Step 13:

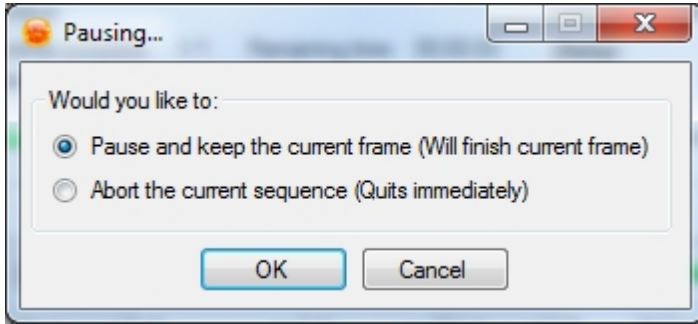
*Pausing and aborting:* During the course of the sequence you may have need to pause or abort the sequence. There are any number of reasons to do this... you're done for the night, clouds roll in, pausing for emergency focus, hurricane, etc.

To pause the sequence, you simply click the same button you used to start it (located in the lower right hand corner). When the sequence is running, this button actually changes to read "Pause Sequence". When you click it, you will be presented with another small dialog that allows you to choose how you want to pause the sequence. You can pause after the current frame is completed and downloaded or you can choose to abort immediately. If you choose to abort immediately, SGPro will not download data from the camera (it will be lost).

Here, you can see that the "Run Sequence" button has changed into a "Pause Sequence" button:



Clicking it presents you with these choices (as described above):

**Step 14:**

*Final thoughts:* This tutorial does not cover many of the most powerful aspects of SGPro. It is intended as a primer to get you up and going quickly with just the basics. Below are some notes and thoughts that will help you figure out where to go from here (when you are comfortable moving on):

*Save as profile:* You just spent a lot of time setting your gear up and tweaking settings. Almost any setting you make in a sequence can be saved to any number of [custom equipment profiles](#). Once you have a profile, you can create new sequences using them and all of your settings will be applied and ready to go with the click of a few buttons. All you need to do at this point is define your events and you'll be ready to go. More details on profiles can be found [here](#).

*Focusing reminders:* This tutorial discusses a couple of options for manual focusing. If you are interested in pausing the sequence based on user defined triggers like time, temperature, frame count, etc, you can find more [here](#). Once this is set, and a trigger is hit, SGPro will automatically pause the sequence and inform you that it's time to focus. When you are done, simply resume the sequence.

*Playing around:* Almost all equipment types have simulators. Hook them up and play around! You can try to use almost any feature in SGPro just with simulators (Auto meridian flips are one exception to this).

*Auto Focus:* SGPro can provide you with ability to stay in focus all night. Temperature and gravity will try to destroy your images, but SGPro, simply by connecting an ASCOM compatible (absolute) focuser will be able to automatically focus based on a number of user defined triggers (time, frames, temperature, etc). More information on this can be found [here](#).

*Easier framing:* In this tutorial we discussed a very manual and time intensive method for framing. One of the most powerful features found in SGPro is the ability to find your target and start imaging in minutes. In order to do this, you must install one of three [plate solvers](#) (Pinpoint, Elbrus or Astrometry.NET). Once this is done SGPro will interface with your plate solver in order to move the mount, with high accuracy, to your intended target. In addition to this, you can easily recenter on one of your images from a previous night or find an image on [astrobin.com](#) or [flickr.com](#) that you would like to use for framing your own image. More on this can be found [here](#).

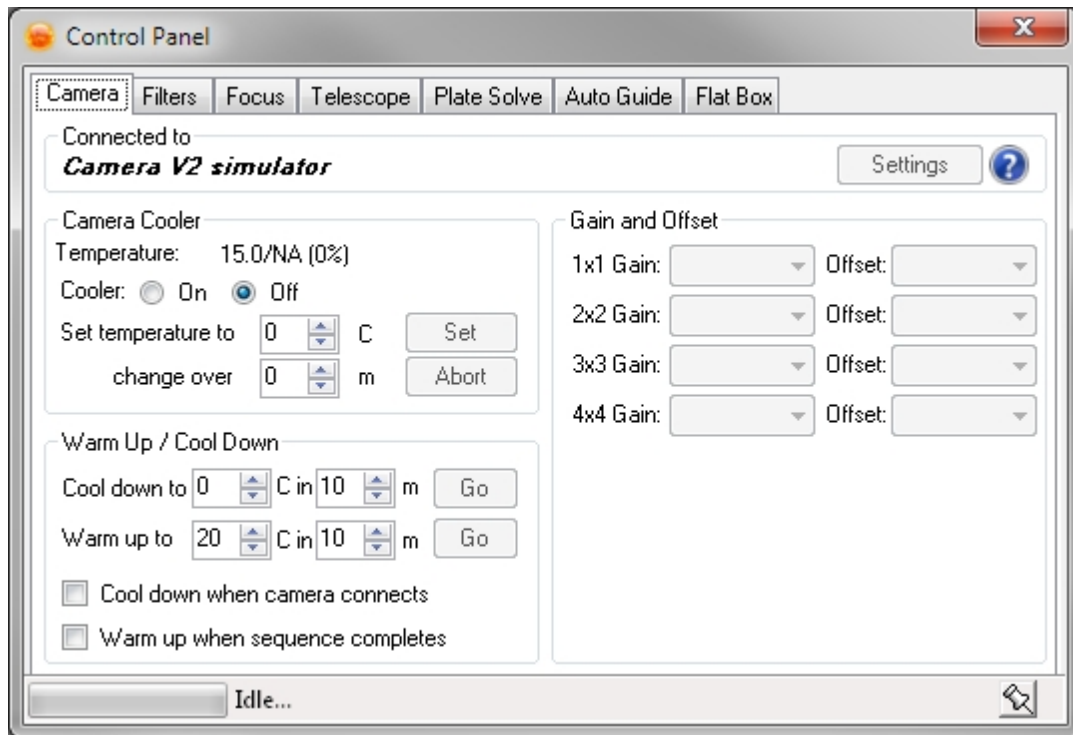
**Step 15:**

*Getting more help:* SGPro contains a fairly extensive help file (this document is also included in there). When in SGPro, you can get to the help file by going to "Help->Help File". SGPro also offers tooltips on almost every single button and control available. To access these, just ensure that you click on a control and then hover over it with the mouse. Finally, feel free to post on our Yahoo! group (<http://groups.yahoo.com/group/mainsequencesoftware>)... we will be happy to see if we can help.



## Control Panel/Equipment

Sequence Generator Pro supports a vast amount of hardware which is all controlled through the Control Panel



### Cameras

- ASCOM
- Canon EOS (Digid III and up)
- QSI
- SBIG
- FLI

### Filter Wheels

- ASCOM
- SBIG
- FLI

### Focusers

- ASCOM

### Telescopes

- ASCOM

### Plate Solvers

- Elbrus
- Pinpoint
- Astrometry.NET
- Local Astrometry.NET server (ANSVR)
- PlateSolve2 by PlaneWave

## **Auto Guiders**

- PHD2
- AstroArt
- MetaGuide

## **Flat Boxes**

- Alnitak Flat Box
- Manual Flat Box

---

Created with the Standard Edition of HelpNDoc: [Produce electronic books easily](#)

---

## **Supported Equipment**

### **Cameras**

- ASCOM Cameras (any camera that provides an ASCOM compliant driver).
- QSI Cameras. Sequence Generator Pro supports the full QSI line through the QSI600 series.
- SBIG Cameras. Sequence Generator Pro provides support for all SBIG cameras.
- FLI Cameras. Sequence Generator Pro provides support for all known FLI cameras.
- Canon EOS DSLR Cameras (Digic III and better).
- Nikon DSLR cameras (D7200, D7100, D7000, D5200, D5100, D5000, D800/D800E, D700, D600, D300S, D300, D90, D4, D3X, D3S, D3)

### **Filter Wheels**

- ASCOM Filter Wheels (any filter wheel that provides an ASCOM compliant driver).

### **Focusers**

- ASCOM Focusers (any focuser that provides an ASCOM compliant driver).

### **Telescopes / Mounts**

- ASCOM Telescopes (any telescope that provides an ASCOM compliant driver).

### **Rotators**

- ASCOM Rotators (any rotator that provides an ASCOM compliant driver).

### **Observatories**

- ASCOM Observatories (any observatory that provides an ASCOM compliant driver). We support both Dome and Roll Off Roof styles.

### **Flat Boxes**

- Alnitak Flat boxes

### **Safety Devices**

- ASCOM switch devices that allow SGPro to determine if it is safe to image

*Note:* Note that Sequence Generator Pro interacts with ASCOM devices as set forth in the official ASCOM developer documentation and we cannot vouch for the quality or level of conformance for individual drivers.

---


Created with the Standard Edition of HelpNDoc: [Easily create Help documents](#)

---

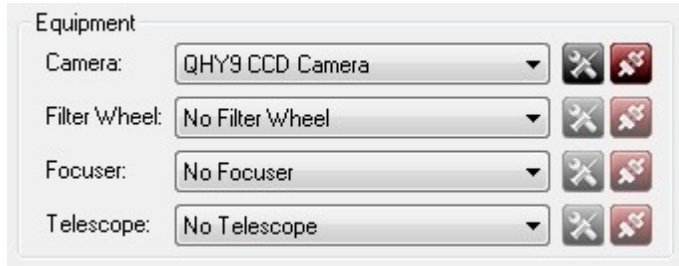
## Cameras









### Connecting and Setting Options:

Cameras are selected and connected on the [Sequence Window](#) in the equipment group box.

Options can be set when the camera is in a disconnected state by clicking the  icon.

These options will vary by manufacturer. For ASCOM cameras this will bring up the ASCOM properties dialog for the selected camera.



Equipment			
Camera:	QHY9 CCD Camera		
Filter Wheel:	No Filter Wheel		
Focuser:	No Focuser		
Telescope:	No Telescope		

To connect the camera click on the connection icon . Once connected the icon will change , click this icon to disconnect.

#### Hardware Specific Information

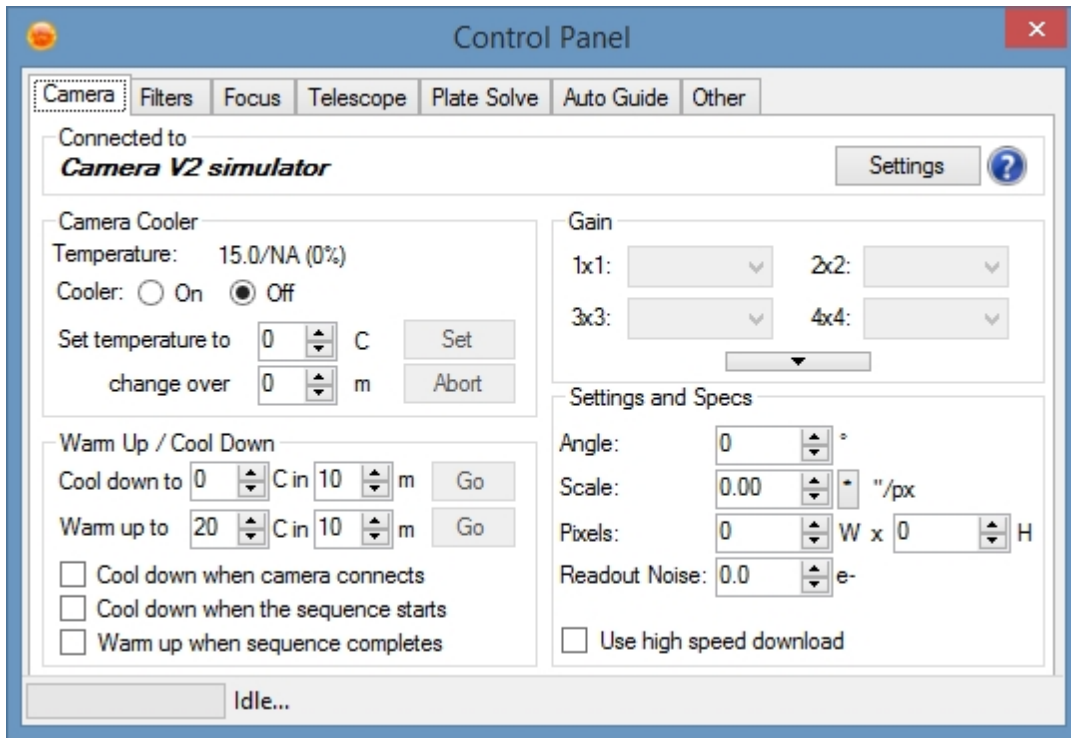
- [QSI Cameras](#)
- [SBIG Cameras](#)
- [FLI Cameras](#)
- [ZWO Cameras](#)
- [Canon EOS Cameras](#)
- [Nikon Cameras](#)

### Camera Control Panel:

*Description:* Sequence Generator Pro can use many cameras natively and any ASCOM supported camera. The camera is controlled through the Camera tab on the Control Panel. Depending on the hardware attributes of the camera different options will be available when connected. However there are two distinct types of cameras that can be connected which are CCDs and DSLRs.

### CCD Camera

*Description:* CCD (Charge-coupled Device) cameras are becoming increasingly popular for astro-photography. In general they are more sensitive than DSLRs and offer benefits such as deep cooling and the ability to take mono images (sharper images because there is no bayer matrix).



**Controls** (These values can also be preset by using a [profile](#) or by opening a [sequence](#).):

- Camera Cooler: If equipped, allows the cooler to be turned on and regulation temperature set. If no cooler is present these options will be grayed out. If a cooler is present, but does not provide temperature regulation then only the "on and off" controls will be enabled. These controls allow your cooler to be manually turned on:
  - *Cooler On/Off*: Turns the cooler on or off.
  - *Set Temperature to*: Sets the regulation temperature of the cooler. These values are not used in conjunction with "Warm Up / Cool Down".
  - *change over*: Allows you to specify a time period over which the temperature will be slowly dropped to the set temperature mentioned above.
  - *Set*: initiates the changes mentioned above.
  - *Abort*: stops the "Set" mentioned above. This button is also used to abort cooler warm up and cool down.
- Warm Up / Cool Down: These options control how and when the cooler is automatically turned on and off:
  - *Cool down to X in Y*: Similar to the controls above this will cool down the to the specified temperature in the specified amount of time. These values are used in conjunction with the "Cool down when camera connects" option.
  - *Warm up to X in Y*: This warms up the camera to the ambient Y temperature in the specified amount of time. (*Note*: The camera is not able to warm above ambient so this value should be fairly representative of the ambient temperature).
  - *Cool down when camera connects*: Checking this option will run the above "Cool down to X in Y" method to automatically start cooling down your camera when it is connected. This alleviates the need to remember to turn on your cooler when you first connect your camera.
  - *Cool down when sequence starts*: Checking this will keep the camera at ambient temperature until the sequence starts. This means that the camera will automatically cool and then start the sequence when the TEC is within 3 degrees of the target temperature. If your sequence has a delayed start, the camera will not cool until the expected start time has passed.
  - *Warm up when sequence completes*: When checked your camera will warm back up to the specified temperature (or ambient) within close to the specified amount of time. Unfortunately most camera drivers only allow the Temperature to be set and not the power, so without knowing the ambient temperature there is no way that warm up can be completely accurate.

Upon successful warm up the camera's TEC will be turned off.

- Gain: These controls allow you to change the Gain values of your camera for multiple binning levels. If your camera does not support these options these will be grayed out:
  - *Gain*: This sets the gain for the camera given the binning level.

By clicking the "arrow button", you can reveal an area designed to store the gain for your camera in terms of e-/ADU. These values are optional and can be used in conjunction with the "readout noise" value below to calculate ideal exposure time.

- Settings and Specs:
  - *Angle*: This field is used to tell SGPro the current angle of the camera. If a successful plate solve returns the camera angle this field will be updated with the actual angle of the camera.
  - *Scale*: This field is used to store the scale of the camera / telescope (arcsec / px @ 1x1 binning). If a successful plate solve returns the camera angle this field will be updated with the actual scale.
  - *Pixels*: Store the number of physical pixels for your camera here (i.e. pixels at 1x1 binning).
  - *Readout Noise*: This optional value, if present, will be used to calculate the [ideal exposure time](http://www.hiddenloft.com/notes/SubExposures.pdf) (<http://www.hiddenloft.com/notes/SubExposures.pdf>).
  - *Camera Gain*: These values are optional are also used to calculate the ideal exposure time (above). These value must come from the camera manufacturer and will likely vary by binning level.
  - *Download Times*: These values will help SGpro present more realistic "Time Remaining" estimates. Please note that, even with these fields filled out properly, SGPro is not able to estimate times for auto focus, meridian flips, plate solving, centering routines, etc.
  - *Use high speed download*: This option will allow your camera to use a high speed download for most temporary frames (frame and focus, auto focus and plate solve). Sequence and plate solve images **are not** affected by this setting (in order to reduce noise). **Note that if you check this and your camera or driver does not support it, it will be ignored.**

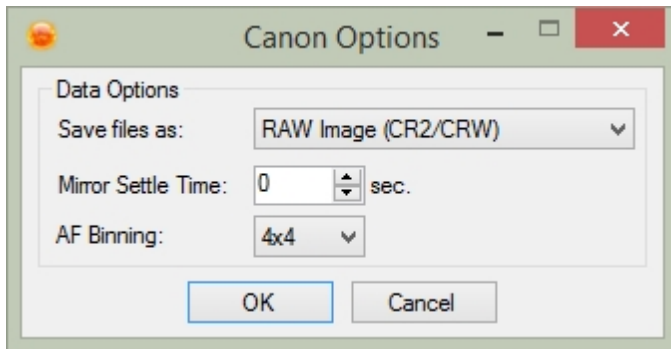
*Note: The current version of ASCOM 6SP2 does not implement Offset. Gain is available but VERY few cameras support setting Gain via ASCOM so for the time being all ASCOM cameras do not have access to these controls. For ASCOM cameras the gain and offset should be set via the cameras driver which can be accessed via the [Main Window](#) by using the settings button.*

## Canon EOS

*Description:* DSLR (Digital Single-Lens Reflex) cameras are an excellent avenue into astro-photography. Many people already own a DSLR so the cost of entry can be minimized in many cases.

*Options:* Sequence Generator Pro has the ability to save DLSR images in several different formats. No one

format is preferred as they all contain RAW data. These options are available in the camera setup dialog which can be accessed via the Camera Settings button mentioned above. When the settings are opened and "Canon EOS" is selected for the camera the following dialog will be shown:

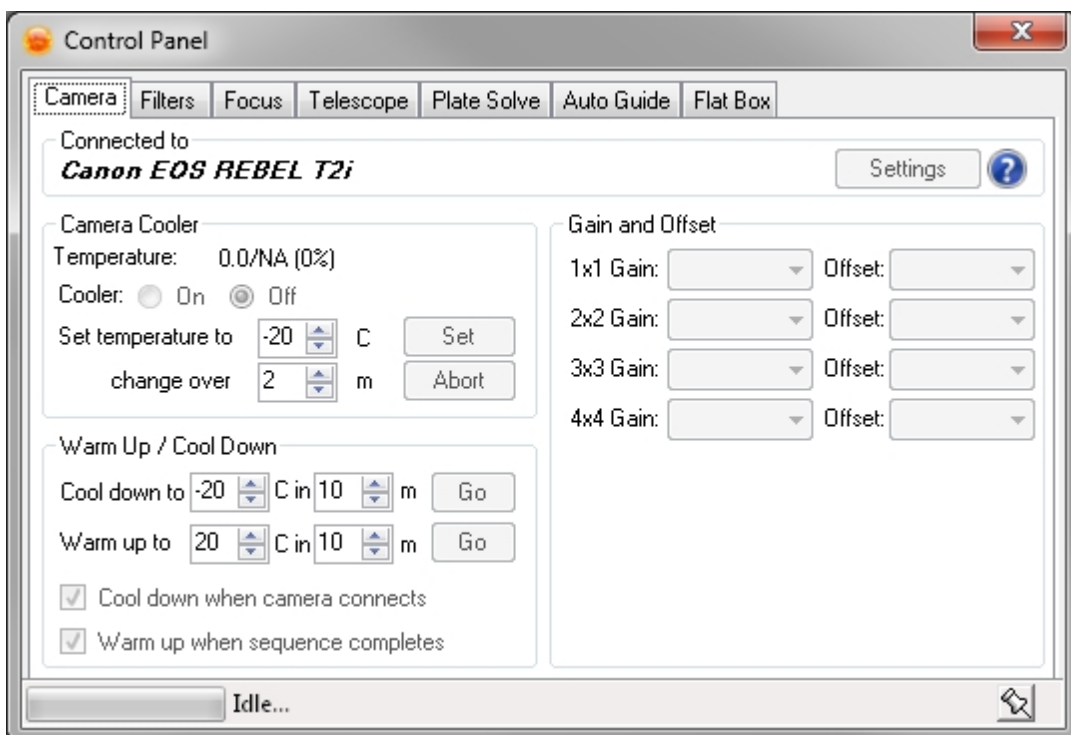


- **Save Formats:**
  - Single Image (CFA FITS): Stores the CFA (Canon Filter Array) data in a 2 dimension FITS file. The data remains Bayered.
  - RAW Image (CR2/CRW): Stores the native Canon Raw format
  - RAW + FITS: Stores both of the formats above
- **Mirror Settle Time:** Designates the amount of time (seconds) that will elapse between pulling the mirror up and opening the shutter. **This option must also be enabled in the camera.** Generally used to reduce vibration during shooting. To disable set to 0, to enable set to any non-zero value.
- **AF Binning:** DSLR cameras can sometimes have difficulty determining star centroid on AF frames (due to the bayer matrix). If you are having difficulty obtaining a "\V" curve with AF, try experimenting with different software binning levels.

*Note:* RAW Images will not contain meta data found in the FITS format.

Below is an image of the Control Panel with a DSLR connected.

*Note:* All of the controls are disabled.



- Canon Cameras - There are many features in Sequence Generator Pro that are unique to Canon

Cameras and require special consideration when using Sequence Generator Pro. Such as:

- LiveView - Cameras that support LiveView will have the option to turn on LiveView in the [Frame And Focus Module](#)
- Bulb vs Manual Mode - If your camera has a dedicated "Bulb" mode on the Mode Dial then you should use this mode for any exposure over 1 second. Also exposures under 1 second are not reliable when using Bulb mode so if you require reliably timed short exposures then you should switch the camera to Manual. For cameras that DO NOT have a Bulb option on the Mode Dial these options do not apply.
- If your camera supports "Auto Rotate", you should turn this **off** while you are using the camera for astro-imaging (the mount will hold the camera in all sorts of odd positions and possibly create images that are difficult to stack without manual manipulation):



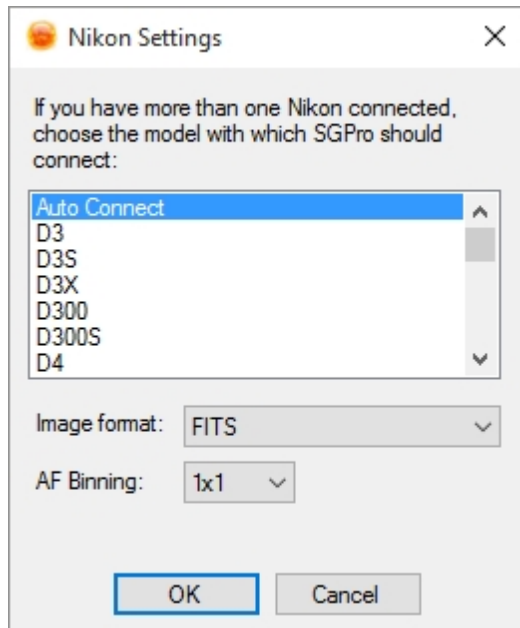
## Nikon Cameras

When connecting a Nikon camera, it is normally as simple as connecting the camera via USB and, if needed, with a Nikon shoestring adapter. When only one camera is connected you may simply click the "Connect" button on the sequence form. If multiple Nikon cameras are connected, use the options dialog (below) to tell SGPro to which camera you would like to connect.

Some Nikon cameras require a shoestring DSUSB adapter to exposures longer than 30 seconds. Other, newer, Nikon cameras can take long exposures without an adapter (via direct USB connection).

Long exposure ready (bulb mode) cameras: **D810, D810A, D800, D750, D800E, D7100, D7200, D5200, D600, D610, D5, D500, D5300, D5500, D4, D4S, Df**

**If your Nikon camera is not in the list above, you will require a DSUSB adapter.**

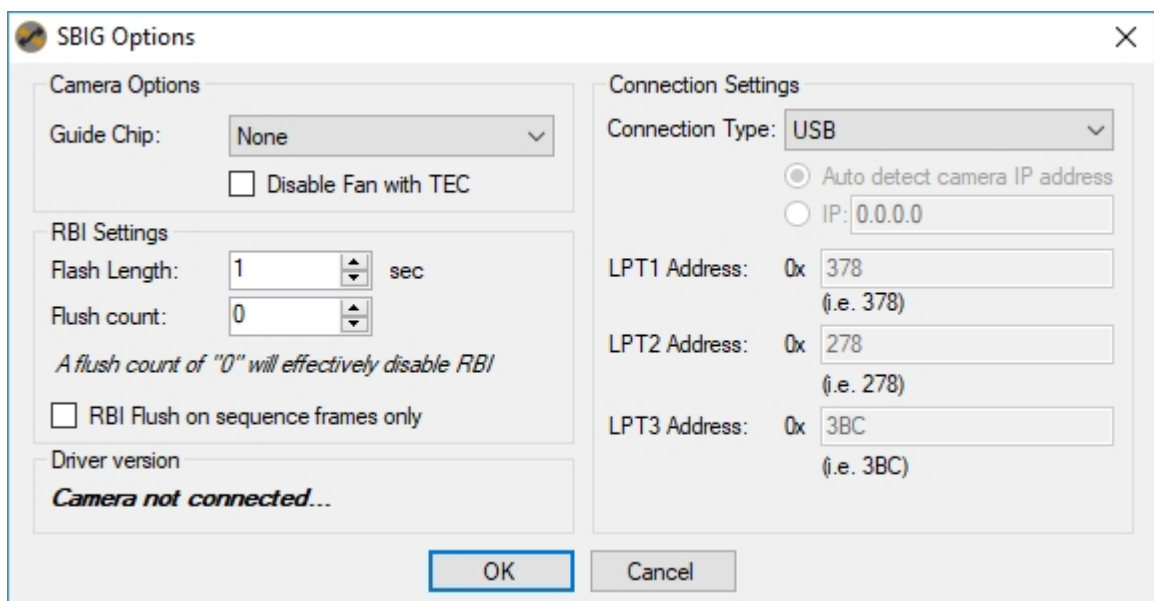


- **Image Data Formats:**
  - Single Image (CFA FITS): Stores the CFA (Nikon Filter Array) data in a 2 dimension FITS file. The data remains Bayered (mosaiced).
  - RAW Image (NEF): Stores the native Nikon Raw format
  - RAW + FITS: Stores both of the formats above
- **AF Binning:** DSLR cameras can sometimes have difficulty determining star centroid on AF frames (due to the bayer matrix). If you are having difficulty obtaining a "\V\" curve with AF, try experimenting with different software binning levels.

Note: RAW Images will not contain meta data found in the FITS format.

## SBIG Cameras:

- SBIG Cameras - SBIG's have their own Settings dialog for the connection type and can be changed between USB, Ethernet and LPT ports. This dialog is accessed when selecting an SBIG camera and clicking the Connect Icon (See [Connecting and Settings Options](#))



- Guide Chip: Used to select the guide chip that will be used in conjunction with the SGP API Guider Camera.



- Disable Fan with TEC: Turns the fan off when the TEC is turned off. Whenever the TEC is turned on the fan will always be turned on regardless of this setting.
- Connection type: SBIG Cameras can connect via USB, Ethernet or LPTs 1 through 3. If you connect via USB or Ethernet and multiple SBIG cameras are detected you will be presented with a dialog prompting you to choose the appropriate camera.
- RBI Settings: Force RBI on your SBIG camera (optionally on sequence frames only... other frames may be less critical that they are perfect)

## FLI Cameras:

- This dialog is accessed when selecting an FLI camera and clicking the Connect Icon (See [Connecting and Settings Options](#))

**FLI Camera Options**

**Camera Readout Speed**  
*Note: You must connect your camera in order to specify readout speeds. Once set, you will not need to set them again.*

Normal speed:  ▼  
*Used for all sequence frames (non-temporary data)*

High speed:  ▼  
*Used for all temporary frames (plate solves, etc)*

**Pre-Exposure Flush Control**  
*Note: These settings will not affect newer FLI cameras (2005 and later). For earlier cameras you will need to set these as appropriate.*

High quality flush count (slower):  ▲▼  
*Used for all sequence frames (non-temporary data)*

Low quality flush count (faster):  ▲▼  
*Used for all temporary frames (plate solves, etc)*

**RBI Mitigation**

None for  ▲▼ sec(s)

Flood & flush (normal) at  ▼ binning

Flood only

Flush only for  ▲▼ cycle(s)

**Library Information**  
**Software Development Library for Windows 1.104**

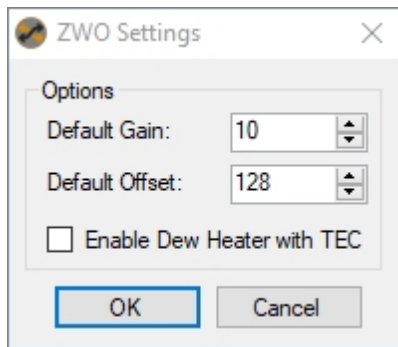
OK Cancel

- Readout Speed: Each FLI camera has unique readout speeds. SGPro only considers two... normal and fast. Your camera may have several more than this, but you will need to tell SGPro (one time) what speed you want to use for normal and fast readouts. Normal will be used for all collected data and auto-focus and high-speed readout will be used for frame and focus, plate solving and for other "throw-away" data. Please note that switching from fast speed to normal speed takes about 20 seconds **each time you do it..**
- High quality flush count: This setting has no effect for modern FLI cameras. For cameras manufactured prior to 2005, this setting is used to determine the pre-exposure buffer flush for sequence data (i.e. frames you would want to keep). This value should be at a nominal level (please contact FLI for appropriate settings here)
- Low quality flush count: This setting has no effect for modern FLI cameras. For cameras manufactured prior to 2005, this setting is used to determine the pre-exposure buffer flush for temporary data like plate solve frame focus frames. This can be a low value (1 or 2 is fine, the lower the better).
- RBI Mitigation: Some FLI cameras require RBI mitigation in order to avoid ghosting artifacts in your sub-frames. Unless you have a special reason, just use the "Flood & flush" method. The exact settings for your camera will vary. Please contact FLI to obtain settings best for your camera.
  - RBI Exposure length: Define the exposure length for the initial "Flood" exposure.
  - Binning: The horizontal binning will match that of the image you are about to capture, the vertical binning will be controlled by this setting

- Cycles: Define the number of "flush" reads you need to get rid of the RBI artifacts. Exposure length here will always be 0 seconds (bias frame)

## ZWO Cameras:

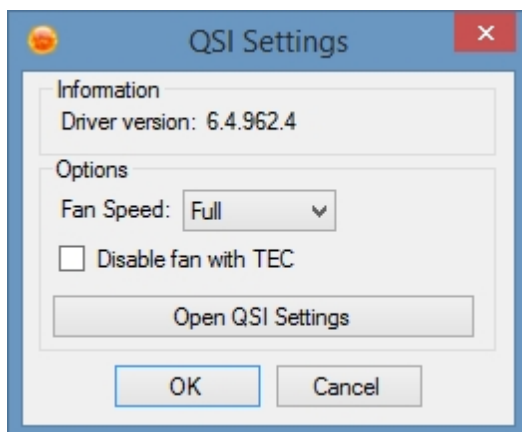
- This dialog is accessed when selecting an ZWO camera and clicking the Connect Icon (See [Connecting and Settings Options](#))



- Default Gain: The gain to be used when the Event Gain and Camera Gain (in the control panel) are both set to "Not Set"
- Default Offset: The offset to be used with the Event Offset is set to "Not Set"
- Enable Dew Heater with TEC: when checked the internal camera dew heater (if so equipped) will be turned on when the camera is cooling and turned off when the TEC is turned off.

## QSI Cameras:

- QSI Cameras - QSI camera have a special settings dialog that control behavior within SGPro. The main QSI settings dialog can also be accessed from here.



- Driver version: This will show the installed driver version. If no value is present in this field, the QSI drivers have not been installed in this machine.
- Fan Speed: QSI cameras support three different fan modes:
  - Full: Keeps the fan at full speed even when the camera is at the desired temperature
  - Quiet: Fan speed will vary based on need (i.e. can be at full speed when the camera is cooling)
  - Off: The fan can also be turned off, but this is not recommended
- Disable fan with TEC: Checking this option will turn the fan off when the TEC is turned off.

## SBIG Guider CCDs

Because the SBIG driver architecture only allows for one application to have control of the camera, we have created a special ASCOM driver that will allow any other guiding application that connects to an ASCOM driver to use the SBIG onboard guiding CCD **while SGPro is using the main CCD.**

This special ASCOM driver utilizes the SGPro API (Application Programming Interface... you don't need to be a developer to use this). It is made to be used in conjunction with cameras that provide an internal or external guider (most notably SBIG cameras). The main camera is connected to Sequence Generator Pro, then through the SGP API, a connection can be made to access the guide camera using the SGP API Guider ASCOM Camera.

To setup the communication you must follow these steps:

- **In Sequence Generator Pro**
  - Select the SBIG Camera from the camera list and click the "Settings" button
  - Select your guider connection method (Internal or Remote Guide Head)
  - Exit the settings dialog and connect to the camera
- In your guiding application (PHD2 will be used as an example)
  - Choose the "SGP API Guider" camera and click connect.
  - If all goes well you should be able to loop exposures.

You can turn on logging by going to the SGP API Guider ASCOM settings in your guiding application. The log is somewhat verbose and will grow fairly quickly. It is only recommended to be on for troubleshooting issues.


You may guide through Pulse Guiding by using an ASCOM connected mount in your guiding application, or by using a ST4 connection and choosing the "On Camera" option.

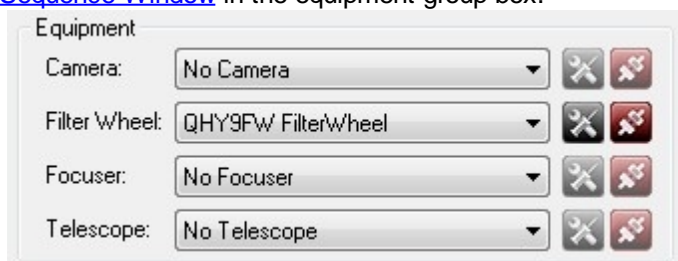
It should be noted that using the SGPro API Guider will result in some additional latency in guide corrections because of the round trip time from the camera to the autoguiding application. An additional time penalty will also be incurred if the correction is through ST4 as the correction will have to go back through the API. We highly recommend using subframes when guiding with the SGP Api Guider to decrease this latency as much as possible. This latency has been roughly measured at 0.6 second when using full frame images for guiding.


## Filter Wheels

### Connecting and Setting Options:

Filter wheels are selected and connected on the [Sequence Window](#) in the equipment group box.

Options can be set when the filter wheel is in a disconnected state by clicking the  icon. These options will vary by manufacturer. For ASCOM filter wheels this will bring up the ASCOM properties dialog for the selected filter wheel. This properties dialog is generally where the COM port is specified as well as other device dependent information.



To connect the filter wheel click on the connection icon . Once connected the icon will change ,

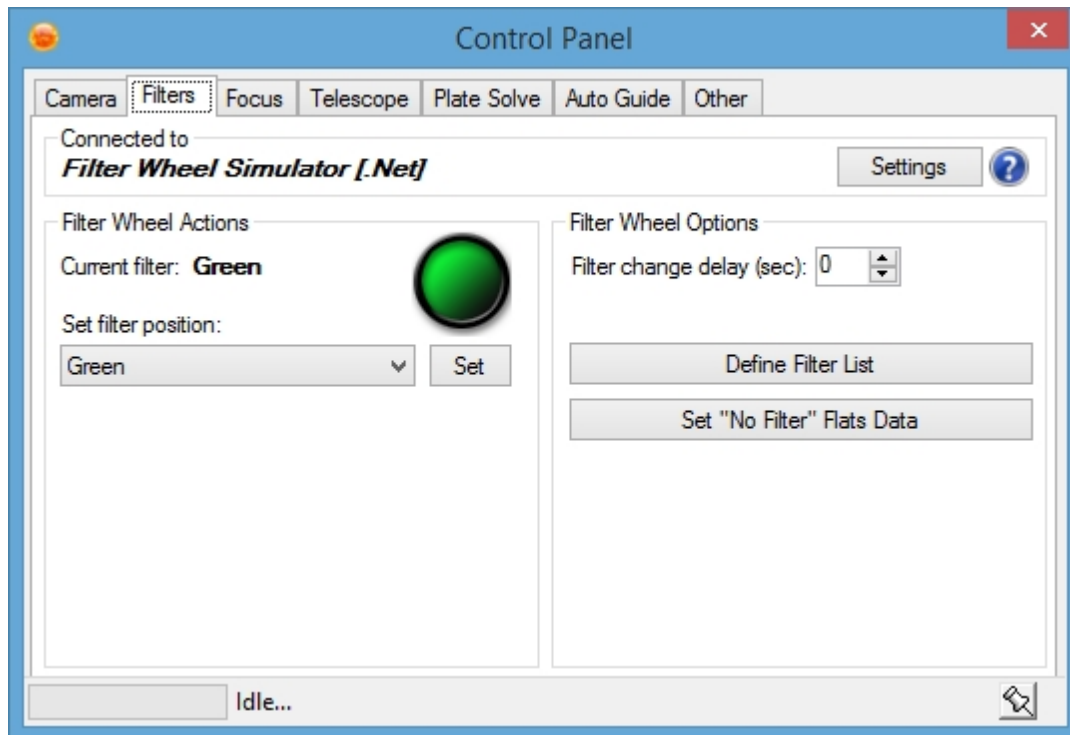
click this icon to disconnect.

Hardware Specific Information

- [SBIG Filter Wheel](#)

## Filter Wheel Control Panel:

*Description:* The Control Panel provides control of the Filter Wheel. Many of these controls are also duplicated in the [Filter Wheel Module](#). These values can also be preset by using a [profile](#) or by opening a [sequence](#).



The active (set) filter is displayed with bold text (and has a corresponding image of that filter for rapid identification)

Controls:

- *Set filter position:* Allows the filter position to be changed. However these filters must first be setup using the "Define Filter List" (if the filter list is empty or missing some filters).
- *Filter change delay:* Amount of additional time to wait after the filter wheel has indicated that it has completed changing the filter.
- *Define Filter List:* This will bring up the "Filter Setup" dialog where the filters and offsets can be specified.
- *Set "No filter" Flats Data:* Allows you to setup flats exposure and flat box settings when not using a filter wheel.

### Filter Setup Dialog

**Filter Setup**

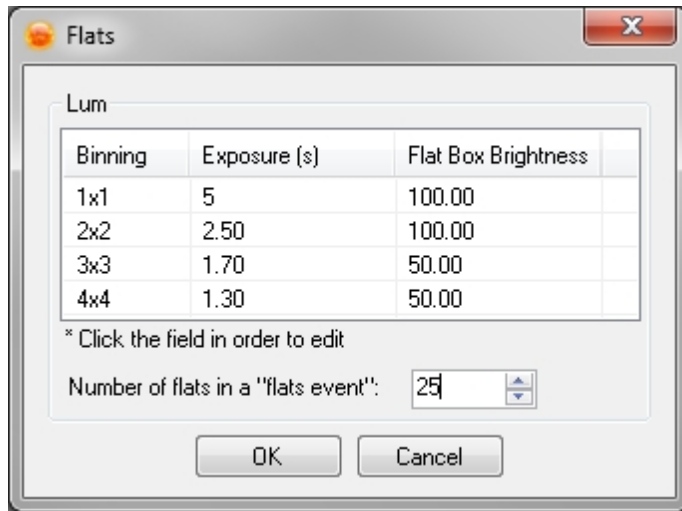
Define more intuitive names for your filters here (Note: due to the limited display space in the event table, using shorter names like "Lum" and "Ha" is better).

Use?	FW#	Filter Name	AF Expose	Focus with Filter	Focus pt	Flats
<input checked="" type="checkbox"/>	1	Red	1.0	Red	25000	Flats
<input checked="" type="checkbox"/>	2	Green	3.0	Green	25010	Flats
<input checked="" type="checkbox"/>	3	Blue	4.0	Blue	23000	Flats
<input checked="" type="checkbox"/>	4	Clear	5.0	Clear	24990	Flats
<input checked="" type="checkbox"/>	5	Ha	7.0	Clear	26000	Flats
<input checked="" type="checkbox"/>	6	OIII	3.0	Clear	25021	Flats
<input type="checkbox"/>	7		1.0	Default	0	Flats
<input type="checkbox"/>	8		1.0	Default	0	Flats
<input type="checkbox"/>	9		1.0	Default	0	Flats
<input type="checkbox"/>	10		1.0	Default	0	Flats
<input type="checkbox"/>	11		1.0	Default	0	Flats
<input type="checkbox"/>	12		1.0	Default	0	Flats

Import OK Cancel

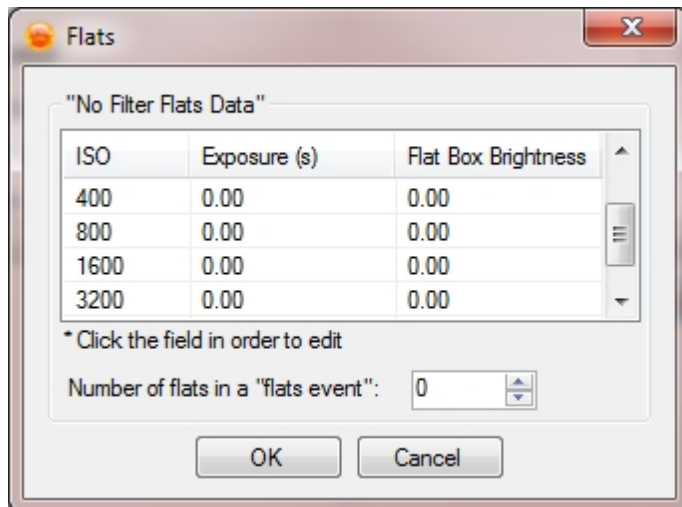
- *Use?*: Sets the filter position to on or off. Unchecked filters will not be available for use.
- *Filter Name*: Allows a meaningful name to be set for the filter, for example "Red" rather than "2".
- *AF Exposure*: The amount of exposure time that should be used for [auto focus](#) when the filter is set.
- *Focus with filter*: This option allows you to select a filter to use when the auto focus routine is performed while using this filter. In the example above, all of the broadband filters will focus using themselves, but the broadband filters will use the clear (LUM) filter in order to save time. There are two methods by which the focus filter can be overridden. This method, if set, has priority. If you leave this option set to "default", auto focus, when using this filter will either do nothing (if no [override filter is selected for the sequence](#)) or will use the [sequence's default override filter](#) (assuming one is set).
- *Focus pt*: Used to specify a starting point as well as to specify the offsets for adjusting [focus on filter](#) change when using an absolute [focuser](#) when [Auto adjust focus per filter](#) is enabled. Because of the way in which "focus on filter" works it is recommended that you set the focus position of your filters near the same ambient temperature.
- *Flats*: Brings up the Flats dialog which stores values for creating flats sequences for each filter. These values are used as part of the [Create Flats Sequence](#) tool.
- *Import*: If your filter wheel supports it, Sequence Generator Pro can import filter data (this will overwrite any existing data). This function will use the currently selected filter wheel (from the sequencing window). Note: If you are defining filters for a profile, the import will use the filter you have selected in the profile manager (not the sequencer).

## Flats Dialog



- *Exposure (s)*: sets the amount of time needed for a flat at the specified binning
- *Flat Box Brightness*: Sets the brightness to use for the flat box. When using an automatic flat box this value will be set when taking the flats. When using a [Manual Flat Box](#) you will be prompted with a dialog to set your flat box to this value.
- *Number of flats in a "flats event"*: Sets the number of flats to be used when creating a flats event with the specified filter.

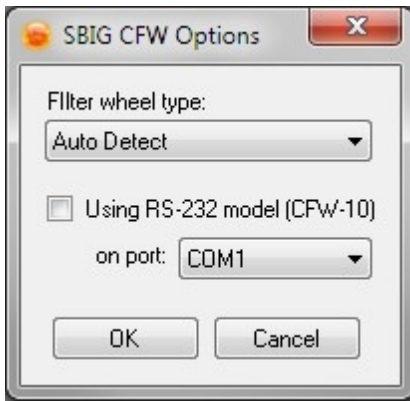
For Canon cameras this dialog will allow for entering exposure length and flat box brightness per ISO setting:



Note: You can automatically calculate and populate the exposure length data (per profile) here by using the [flats calibration wizard](#).

## Hardware Specific Information

- SBIG Filter Wheel - like the [SBIG Camera](#) there is a special dialog which is used to connect the SBIG Filter Wheel. This is accessed by selecting the "SBIG Filter Wheel" and clicking the settings button.



- *Filter wheel type*: specifies the filter wheel being connected to, generally using Auto Detect is adequate
- *Using RS-232 model*: selected if the filter wheel is connected through a COM port rather than through the camera.

---

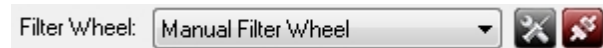
Created with the Standard Edition of HelpNDoc: [Full-featured EBook editor](#)

---

## Manual Filter Wheel

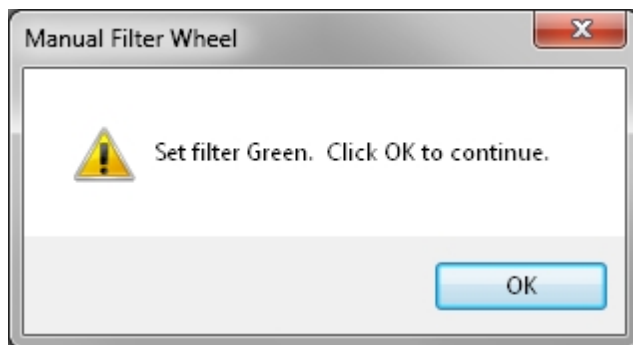
*Description*: The "Manual Filter Wheel" is used if you have a filter wheel that is not computer controlled, but still want to have the benefit of the sequencing, file naming, and FITs headers found within Sequence Generator Pro.

You can select the "Manual Filter Wheel" from the [Filter Wheel](#) drop down of the sequencing window.



You may setup the "Manual Filter Wheel" just like a normal filter wheel in the [Filter Setup](#) dialog.

Whenever a filter change is requested a dialog box will pop up asking you to manually set the filter:



This dialog will pause the sequence and any other actions currently taking place until "OK" has been clicked.

---


Created with the Standard Edition of HelpNDoc: [Write eBooks for the Kindle](#)

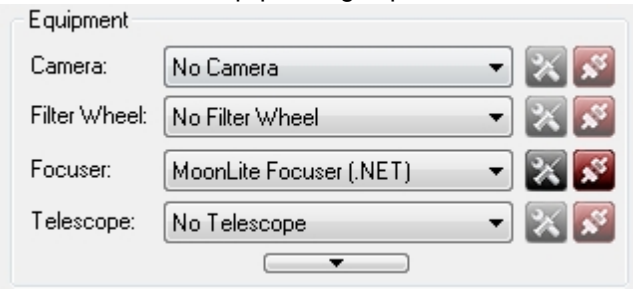
---

## Focusers

### Connecting and Setting Options:

Focusers are selected and connected on the [Sequence Window](#) in the equipment group box.

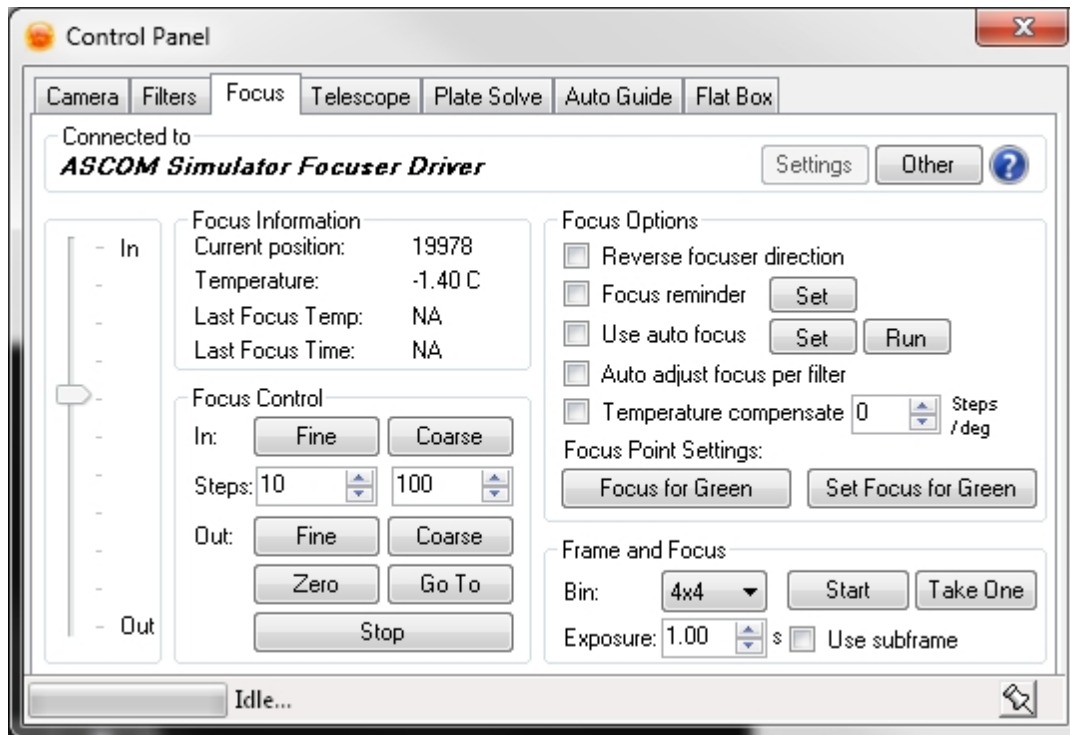
Options can be set when the focuser is in a disconnected state by clicking the  icon. These options will vary by manufacturer. For ASCOM focusers this will bring up the ASCOM properties dialog for the selected focuser. This properties dialog is generally where the COM port is specified as well as other device dependent information.



To connect the focuser click on the connection icon . Once connected the icon will change , click this icon to disconnect.

## Focuser Control Panel:

*Description:* The Control Panel provides control of the Focuser. Many of these controls are also duplicated in the [Focus Control Module](#). These values can also be preset by using a [profile](#) or by opening a [sequence](#).



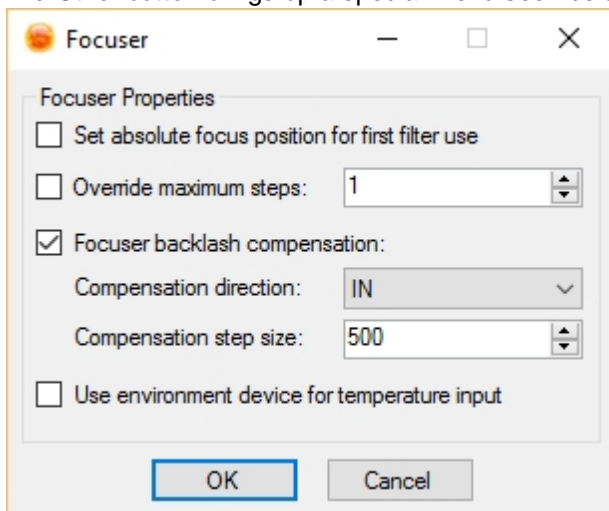
Controls:

- **Focus Travel (In / Out slider):** This is for display purposes only and shows where your focuser lies within it's range of travel.
- **Focus Information:** Displays information about the focuser
  - *Current position:* The position of the focuser in steps.
  - *Temperature:* The current temperature the focuser (NA if the focus controller is not equipped with a temperature sensor).
  - *Last Focus Temp:* The temperature at which the last focus run occurred.
  - *Last Focus Time:* The time at which the last focus run occurred.
- **Focus Control:** Contains options pertaining to manually moving the focuser.
  - *In (Fine/Course Buttons):* Allows the focuser to be moved inward by the number of steps specified below the button.
  - *Out (Fine/Course Buttons):* Allows the focuser to be moved outward by the number of steps specified above the button.
  - *Steps:* The number of steps that the In/Out buttons will move the focuser.



- *Zero*: Moves the focuser to the 0 position, you will be prompted to verify this move.
- *Go To*: Allows a position to be set and the focuser to be moved to that position.
- *Stop*: Stops any motion of the focuser.
- Focus Options:
  - *Reverse focuser direction*: Reverses what is considered In and Out movements
  - *Focus Reminder*: See [Manual Focusing Reminders](#)
  - *Use auto focus*: See [Auto Focus](#)
  - *Auto adjust focus per filter*: See [Auto Adjust Focus Per Filter](#)
  - *Temperature compensation*: See [Temperature Compensation](#)
  - *Focus Point Settings*:
    - *Focus*: Moves the focuser to the the specified focus point (per filter).
    - *Set Focus*: This will set the focus point of the currently active filter to the current position of the focuser. Alternatively, you can set focus points for filters in the [Filter Setup Dialog](#).
- Frame and Focus: Allows for taking a loop or a single image that is not saved. Useful when focusing or framing your target. This is also accessible via the [Frame and Focus Module](#). Also see [Manual Frame and Focus](#)
  - *Bin/ISO*: Sets the binning or ISO of the image.
  - *Exposure*: Sets the time in seconds for the image.
  - *Start*: Starts an imaging loop.
  - *Take One*: Takes a single frame.

The *Other* button brings up a special menu seen below:



Controls:

- *Set absolute focus position for first filter use*: Checking this option will cause the focuser to move to the absolute focus position set for that filter. The filter change can be for anything (the first event, AF override filter, Plate Solve override filter, etc.). Whatever filter is set first will cause the absolute position of that filter to be set. This is most often used with the "[adjust focus per filter](#)" option and it is important to note that the first (and only first) filter change will not behave in the way that all subsequent filter changes will behave. Normally, the focuser only moves by an amount equal to the difference between the old and new filters focus positions (the delta). Checking this option will not use any delta, but set an absolute position. This is useful if your first filter change will be for AF override and it will move the focuser to a point (regardless of temperature) where AF can succeed.
- *Override maximum step*: Allows the maximum step of your focuser to be set lower than the driver specifies. This is useful if you use the same controller on multiple motors and one has a lower range than the other. By setting the maximum step here you don't need to change it in the driver and the focus range appears correct.
- *Focuser backlash Compensation*: Allows you to specify a direction and number of steps for the focuser to end on. For instance if you specify "IN" and 100 then any move that is "OUT" will invoke the compensation which will move the focuser "OUT" by an additional 100 steps and then "IN" by 100 steps

to remove the backlash.

- *Compensation direction*: The direction that the backlash will be removed.
- *Compensation step size*: The number of steps to move to remove the backlash. This number does not need to be precise. If anything it needs to be larger than the total backlash in the focuser, so overshoot.
- Use environment device for temperature input: If you have an [Environment Device](#) device connected, you can use it to provide [focus trigger](#) input. If your connected focuser has a temperature probe, it will be ignored.

---

Created with the Standard Edition of HelpNDoc: [Easy CHM and documentation editor](#)

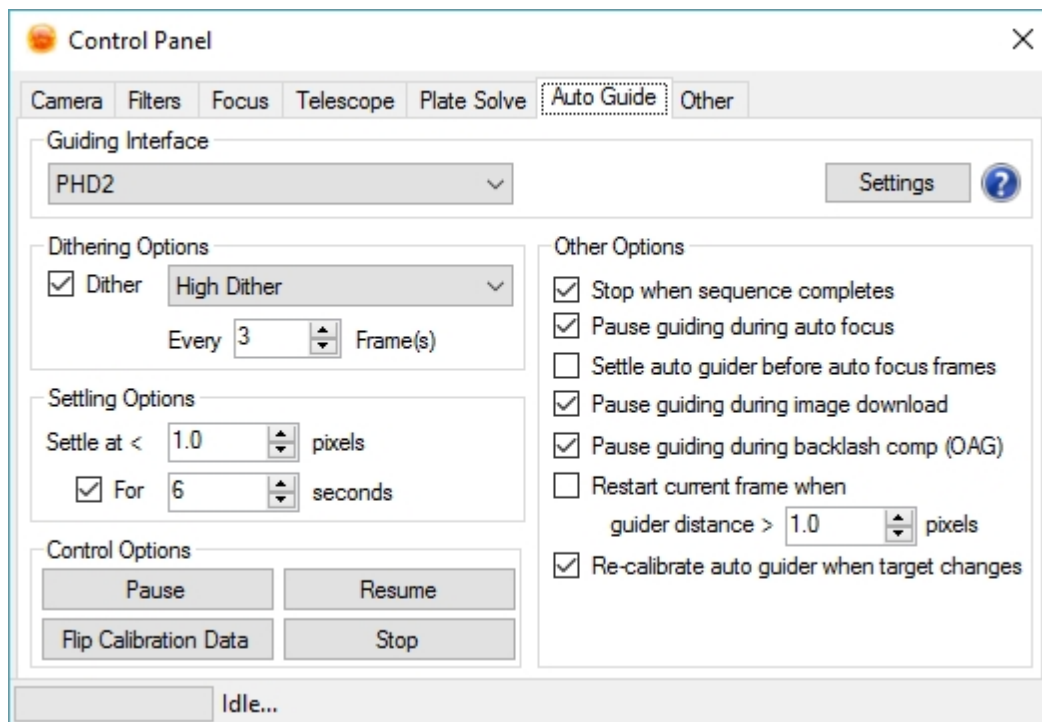
---

## Auto Guiders

*Description*: Auto guiders are used to keep the telescope centered on an object over a long period of time. The primary use of auto guiders in Sequence Generator Pro is for "dithering" between frames in order to give your software a better chance of removing camera defects like hot pixels and bad columns.

Sequence Generator Pro does not have a built in auto guider. Rather it uses the following 3rd party auto guiding software

- AstroArt - [Website](#)
- MetaGuid - [Website](#)
- PHD2 (aka Open PHD Guiding) - [Website](#). PHD2 guiding graph is also available in the [PHD Graph Module](#)
- Practice - This is useful only when performing indoor simulations with the guider as part of your setup



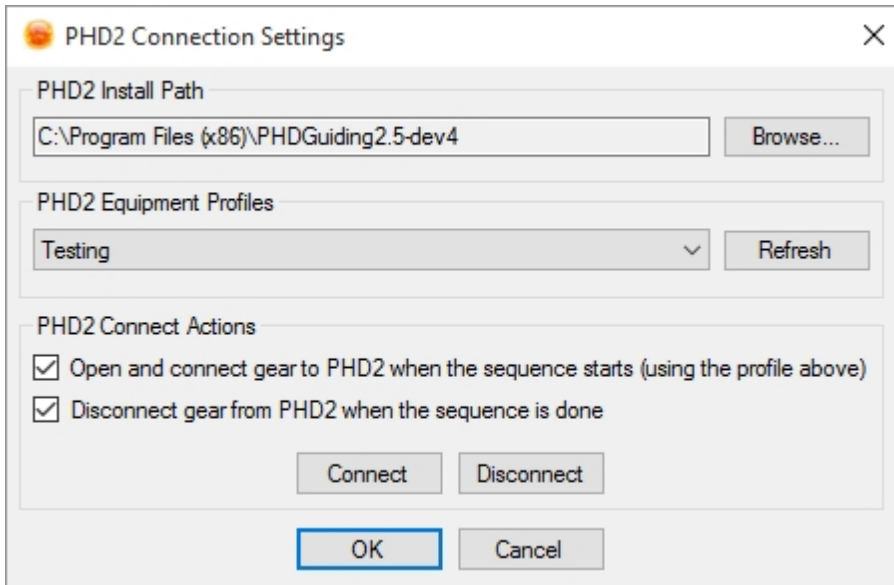
Controls:

- *Guiding Interface*: Where the guiding interface is chosen.
- *Dithering Options*: (Not available on all interfaces)
  - *Dither Checkbox*: Enables dithering between frames when checked.
  - *Every X Frames*: Dithers on a set interval rather than every single frame. The "count" is only reset on new sequences and when sequence reset is used. For instance if you set this value to "5" and had 2 targets each with 4 frames the first target would not dither, but the second target would dither after the first frame. The "frame count" is global.

- **Settling Options:**
  - *Settle at < X pixels For Y seconds (assuming the "For" checkbox is checked):* Guiding error amount in pixels that must be reached before a new image will be started. Once guiding is below the pixel amount, it must be maintained for Y seconds in order for the sequence to resume. This prevents the guiding from settling for a split second and then becoming unsettled. Settling will be run:
    - After a dithering operation
    - After guiding resumes from "pause guiding during auto focus"
  - If the "For" checkbox is not checked, the auto-guider will resume (considered "settled") as soon as the guider reports its error as under the user defined pixel tolerance above (even if the very next reading is above the error limit).
- **Control Options (Not available on all interfaces):**
  - *Pause:* Pauses auto guiding
  - *Resume:* Un-pauses auto guiding
  - *Flip Calibration Data:* Allows you to manually flip the calibration data of your auto guider. Generally used after a meridian flip.
  - *Stop:* Stops auto guiding
- **Other options (Not available on all interfaces):**
  - *Settings:* While it is possible for all auto guiders to have additional settings, this feature is currently only available for PHD2. See below for more details.
  - *Stop when sequence completes:* stops the auto guider when all events in a [sequence](#) have been completed.
  - *Pause guiding during image download:* Pauses auto-guiding between images. Useful if your guide camera data connection is "noisy" and causes issues with your imaging camera. This option is also pretty much mandatory if you are using an on-board SBIG guide chip. This option currently only works on SBIG cameras.
  - *Pause guiding during auto focus:* Pauses auto-guiding when auto focus is running. Useful if you use an OAG for guiding and running the [Auto Focus](#) routine (guide stars will be out of focus for a couple minutes).
  - *Pause guiding during backlash comp (OAG):* Use this option to pause guiding when your focuser is using backlash compensation. Backlash compensation can move far enough out that your guide camera's star will essentially disappear and cause PHD2 to send "star lost" messages. Using this option will help to prevent that.
  - *Settle auto guider before auto focus frames:* Check this box if you need to ensure guiding is stable during the autofocus routine (as the guide star changes position and shape). This is normally reserved for long focal length, OAG and SCT combinations. Those of you who use an SCT stock focuser (either with the Feathertouch/Microtouch combo, Robofocus or the Rigel Systems motor) have to deal with image shift when the focuser moves. Each time the focuser moves in for the next AF exposure, the guide star is nudged a few arc seconds off center because of SCT image shift. The guider will then pull it back in during each AF exposure - and the mirror also settles back into its "rest position" - but not always at the same speed. So this throws off the HFR calculations.
  - *Restart current frame when guider distance > X pixels:* Allows your current frame to be canceled and reattempted if you get a guiding error greater than X pixels. Note that you can turn this option off at any time, but turning when turning it on, the option will not take effect until the next light frame starts.
  - *Recalibrate auto guider when target changes:* This option should seldom be used. If you use an ASCOM connection from PHD2 to your mount, PHD2 will automatically adjust the current calibration to accommodate for changes in declination. If, for some reason, you are still using an ST-4 interface for guiding, this option may prove useful if switching targets causes a meridian flip or a large change in declination.

## PHD2 Settings

In an effort to become more tightly integrated with the PHD2 auto guider, SGPro implements some settings that are specific to this relationship. In order to access them, choose "PHD2" as the auto guider from the drop down list, then click the settings button. If this is the first time you have done this, a warning dialog will appear indicating that SGPro does not know where you have installed PHD2. To correct this, click the "Browse..." button and find your PHD2 install folder. Once chosen, you will not need to do so again. In addition to this, clicking the "Settings" button in the future will actually open PHD2 for you in order to complete the rest of the settings. The PHD2 settings dialog looks like this (note that you can set this for the current sequence via the control panel or you can set this per equipment profile via the [equipment profile manager](#)):



The install path (described above) is a global setting and applies to all sequences and profiles. The other settings here can be set per [equipment profile](#). SGPro will query PHD2 for a list of PHD2 profiles you have created. Here, you can match a PHD2 equipment profile with a particular set of gear (the gear in the corresponding SGPro profile).

- *Open and connect gear.* Checking this option will, when the sequence starts, open PHD2, connect the guider gear (as you defined in your PHD2 profile) and then start guiding.
- *Disconnect gear.* When the sequence finishes, the guider will be stopped and all gear disconnected.

It is also possible to connect / disconnect your PHD2 gear by clicking the "Connect" or "Disconnect" button. For convenience, these buttons are also located on the [PHD2 docking module](#).

---

Created with the Standard Edition of HelpNDoc: [Free Kindle producer](#)

---

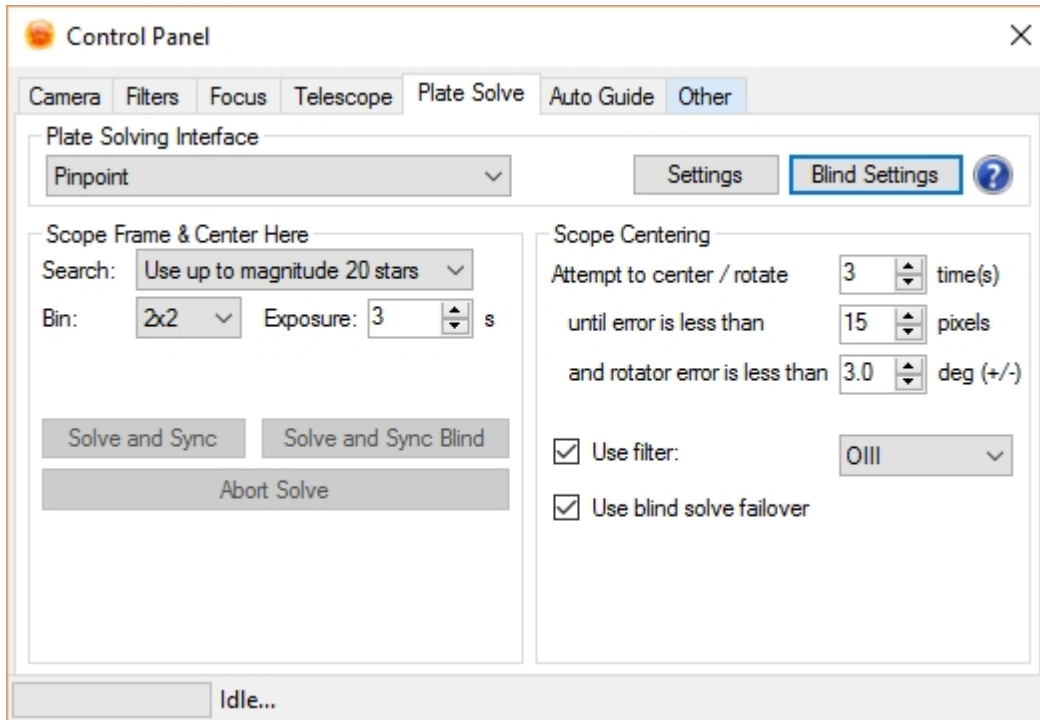
## Plate Solvers

*Description:* While not technically equipment, the Plate Solver is a fundamental piece of the Sequence Generator Pro experience. Plate solving adds the ability to find the exact center of your image (down to sub arcsecond accuracy). It also enables the [Center Here](#) and [Auto Center](#) features. The plate solving actions (not settings) are also available in the [Scope Centering Module](#).

In general, this tab is used to house settings and action that allow you to automatically center on a reference frame (see below). This comes in quite handy when you need to image the same target over multiple nights or when re-centering after a meridian flip. Once your plate solving setup is complete it is literally as simple as clicking a single button to get your target back in *near exact* position.

Sequence Generator Pro uses the following 3rd party software for plate solving:

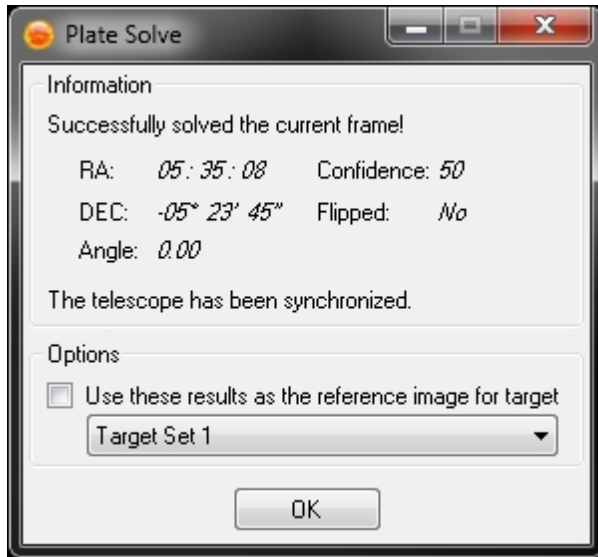
- *Elbrus*: See [Setting Up Elbrus - Manufacturer's Website](#)
- *Pinpoint*: See [Setting Up Pinpoint - Manufacturer's Website](#)
- *PlateSolve2*: See [Setting up PlateSolve2](#)
- Local Astrometry.NET Install ([ANSVR](#))
- *Astrometry.NET*: You can use either a local or remote instance of the Astrometry.NET plate solver as your primary plate solver.



Controls:

- *Plate Solving Interface*: see [Setting Up Elbrus](#) or [Setting Up Pinpoint](#) for more information.
  - *Blind Settings*: Brings up a settings dialog that will allow you to choose the remote (default) or local install ([ANSVR](#)) of Astrometry.NET. These settings will be used whenever you explicitly run a blind solve or when your primary solver fails and blind solve is invoke automatically (assuming you have the option below selected).
- *Scope Frame & Center Here*: this information is used to solve images captured with your camera. The data entered here is also used to populate FITS headers in saved images:
  - *Search*:
    - *Elbrus*: Specifies how large of a region should be used when attempting to plate solve. See [Elbrus Search Options](#) for more info.
    - *Pinpoint*: Specified the magnitude of the stars to use for plate solving. Magnitude 20 starts is the default and is sufficient for most applications. Extreme widefield setups will require the use of higher magnitude stars
    - *PlateSolve2*: Set the maximum number of regions to search before giving up.
  - *Bin/ISO*: Specifies the binning or ISO at which plate solve frames should be acquired.
  - *Exposure*: Time in seconds to expose the image at the designated binning.
  - *Solve And Sync*: Captures and then plate solves an image. If the solve is successful the telescope is synced to the solved location. The following confirmation dialog will show up asking if you would like to set the solved position as your reference for a given target. This is useful if you have your target framed exactly as you would like.
  - *Solve and Sync Blind*: Same as "Solve and Sync" above but uses the Astrometry.NET Web API to do a blind solve of your current position. This is useful to get your scope back on track for remote operation when you can't center a known star. However **this method does require Internet access**. Upon a successful solve the dialog box above will also appear and allow you

to set the coordinates for one of your targets if you would like.



- Scope Centering: This section contains options which relate to centering the telescope when using plate solving. Such activities include [Meridian Flip](#) and [Auto Center](#).
  - *Center on selected target reference*: Invokes [Auto Center](#) for the selected target.
  - *Attempt to center X times until error is less than Y pixels*: Setting the "times" and "pixel" values here specifies how the Auto Center and Meridian Flip behave when attempting to get the scope back on target. You can set a higher attempt count if your mount has some slack in the gears. Also depending on your setup you may want higher or lower accuracy and to change that you can set the "pixels" variable.
  - *Rotator error*: The [centering process](#) can also attempt to [rotate your camera](#) until a particular sky angle (east of north) is achieved. If you wish for your sky angle to be 90 degrees east of north, you can set a tolerance for rotational error here. If your specified error is 2 degrees SGPro will allow 88 - 92 degrees. If you wish to have the SGPro automatically rotate your camera, you will need a [mechanical rotator](#). Even if you don't have a mechanical rotator, you can still use the "[manual rotator](#)" to get your camera oriented the way you want. To make sure rotation occurs during centering, go to the [target settings](#) dialog and check the "Rotate to" option.
  - *Use Filter*: This will use the selected filter for each plate solve image that is acquired. If you want to use the current filter use this value unchecked.
  - *Blind Fallback*: This option will allow the Astrometry.NET blind solver to function as a backup plate solver to the primary solver (Pinpoint or Elbrus). Since the local (primary) solvers can fail under a variety of circumstances, it is ideal to have this option checked so you can keep a sequence on tack (especially if you rely on unattended meridian flips or auto centering routines). *You must have an Internet connection to use this feature!*

---

Created with the Standard Edition of HelpNDoc: [Easily create Web Help sites](#)

---

## Setting up Pinpoint

### Requirements

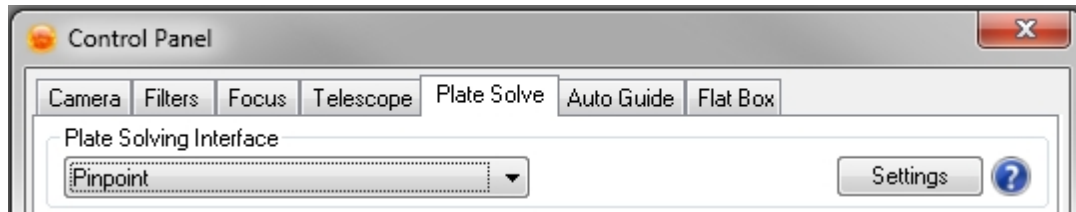
Pinpoint Setup is fairly straightforward, to use Pinpoint as your plate solver you will need:

- A fully licensed version of Pinpoint (not the LE version)
- One of the following catalogs:
  - GSC11
  - USNO A2.0

- o UCAC4

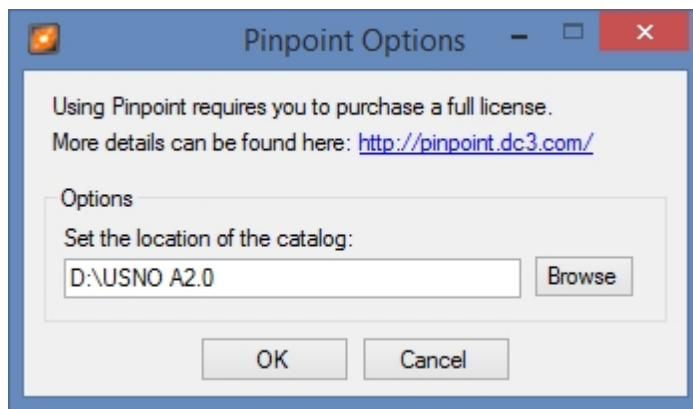
## Setup

Select "Pinpoint" as the Plate Solving Interface on the [Control Panel](#)



Click the "Settings" button.

When the "Pinpoint Options" dialog opens enter the location of your GSC catalog.



Click "OK". Pinpoint setup is complete.

---

Created with the Standard Edition of HelpNDoc: [Free PDF documentation generator](#)

---

## Setting up PlateSolve2

### Requirements

PlateSolve2 Setup is fairly straightforward, to use PlateSolve2 as your plate solver you will need one (or both) of the following catalogs:

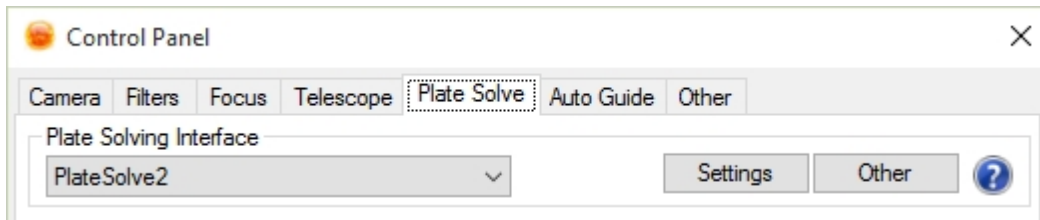
- o APM
- o UCAC3

You can download both of them from the PlaneWave website [here](#).

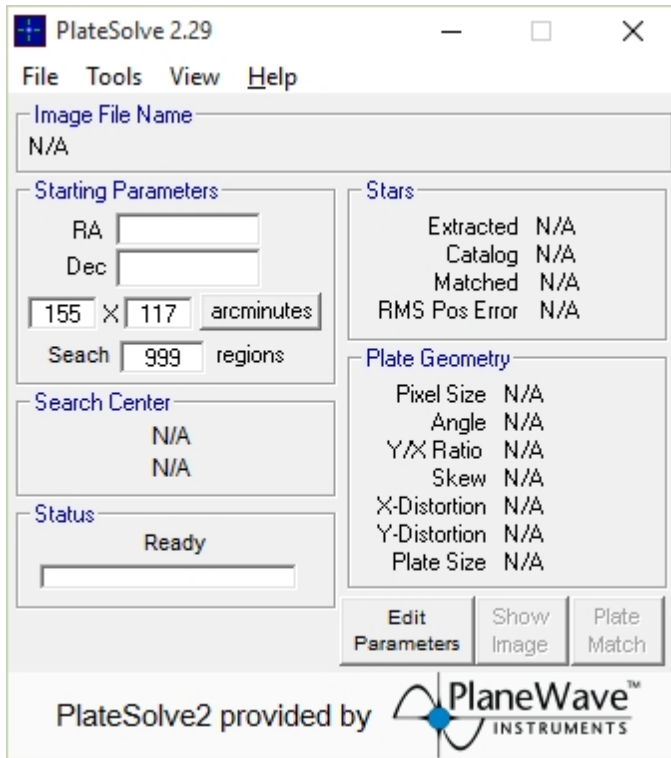
Once you have your catalog(s) installed, you will need to tell SGPro where they are.

Note: You should not install the actual PlateSolve2 software. SGPro distributes its own version... downloading your own copy for use outside of SGPro is possible, but keep in mind it will have a separate configuration than the one SGPro uses.

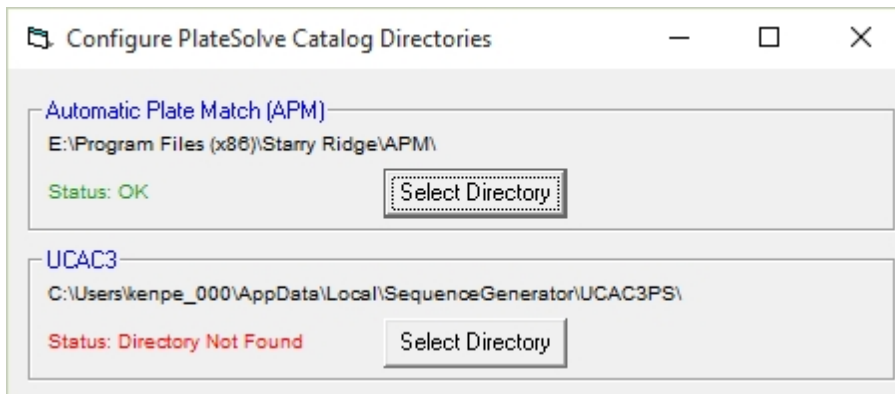
Select "PlateSolve2" as the Plate Solving Interface on the [Control Panel](#)



Click "Settings". You will be presented with the PlateSolve2 application:



Click "File"->"Configure Catalog Directories":



At least one catalog must be set in order to PlateSolve2 to function. That's all. Once configured, you should not need to do this again.

## Setting up ASTAP

ASTAP is a free Plate Solver by Han Kleijn. More information can be found at

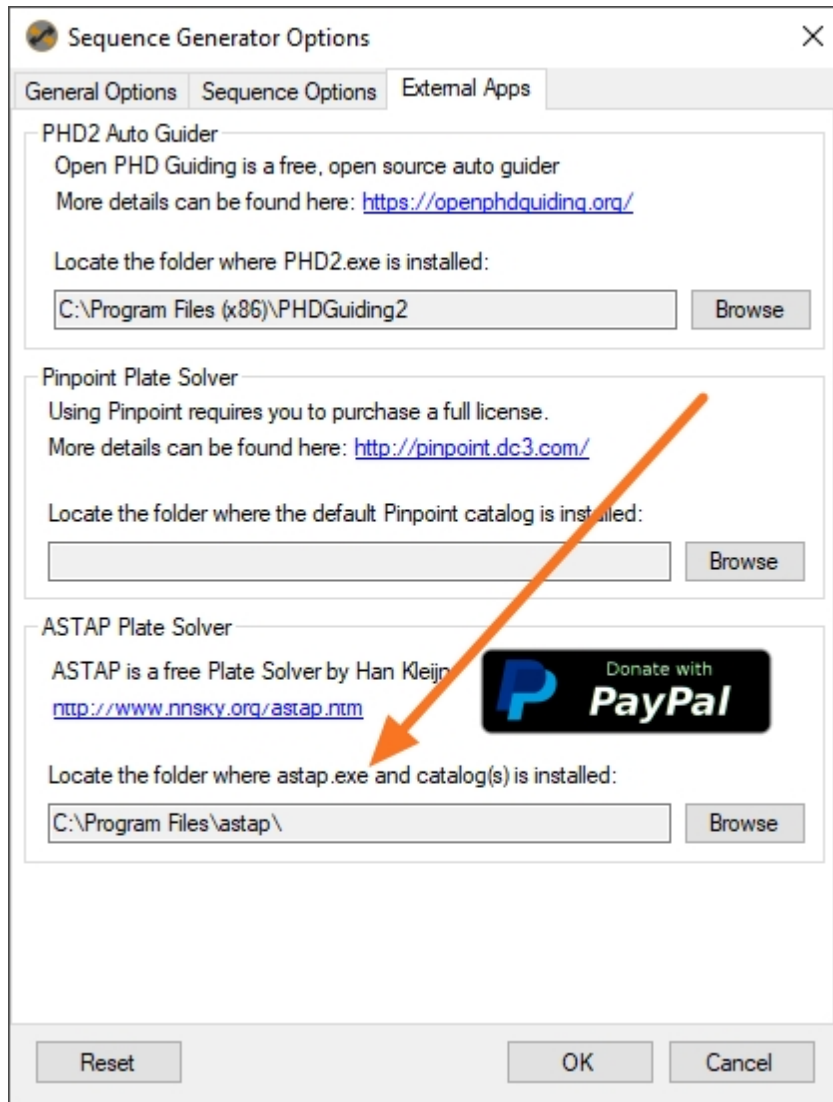


<http://www.hnsky.org/astap.htm>

If you'd like to use this solver during an SGPro sequence, you'll need to download it and set it up.

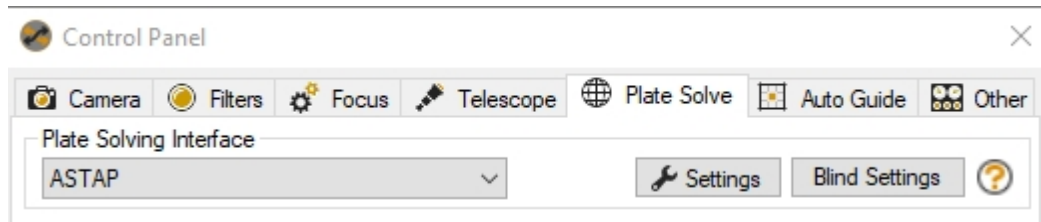
- Download ASTAP (64-bit): [https://sourceforge.net/projects/astap-program/files/windows\\_installer/astap\\_setup.exe/download](https://sourceforge.net/projects/astap-program/files/windows_installer/astap_setup.exe/download)
- Download ASTAP (32-bit): <http://www.hnsky.org/astapwin32.zip>
- Download the ASTAP star catalog: [https://sourceforge.net/projects/astap-program/files/star\\_databases/g17\\_star\\_database\\_mag17.exe/download](https://sourceforge.net/projects/astap-program/files/star_databases/g17_star_database_mag17.exe/download)

Now, you just need to tell SGPro where you installed ASTAP. Click the "Tools" menu item, the "Options". Then, at the top of this dialog, click the "External Apps" tab. Find where you installed ASTAP:



That's it! You're ready to go, just select it in a sequence (in the [Control Panel](#)) or in an equipment profile (in the [Profile Manager](#)).

Please [Donate to Han!](#)




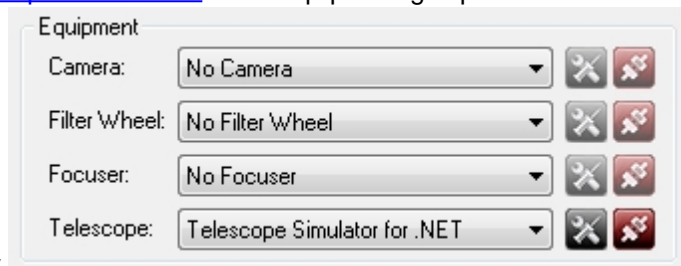
Created with the Standard Edition of HelpNDoc: [Full-featured Documentation generator](#)



## Telescopes / Mounts

### Connecting and Setting Options:

Telescopes are selected and connected on the [Sequence Window](#) in the equipment group box.

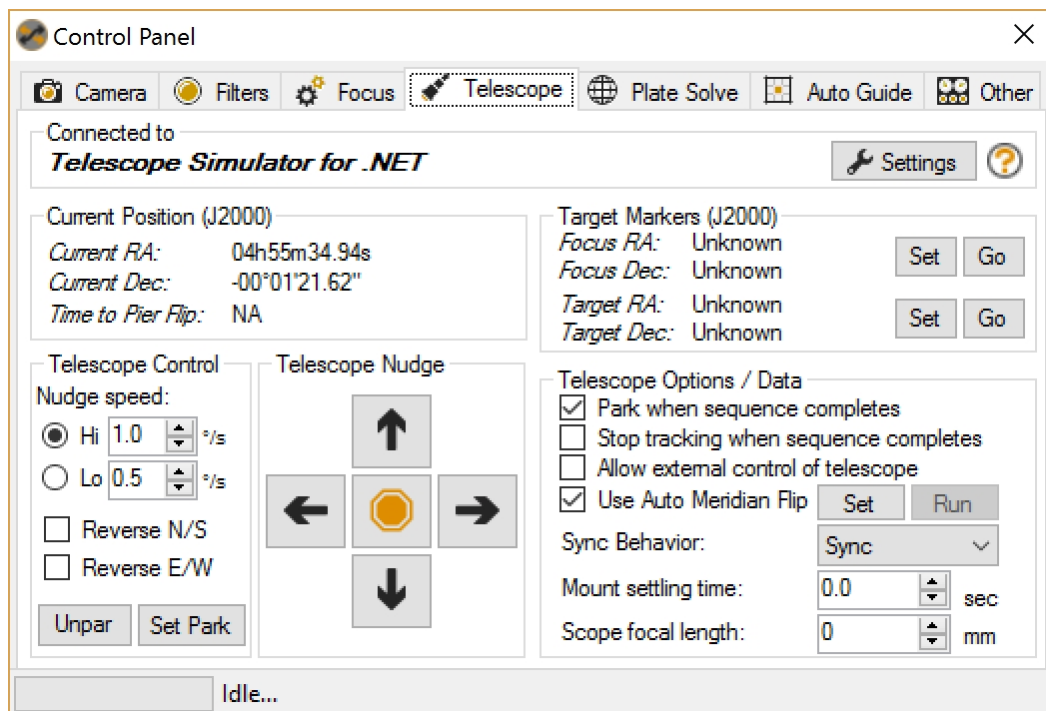
Options can be set when the telescope is in a disconnected state by clicking the  icon. These options will vary by manufacturer. For ASCOM telescopes this will bring up the ASCOM properties dialog for the selected telescope. This properties dialog is generally where the COM port is specified as well as other device dependent information.



To connect the telescope click on the connection icon . Once connected the icon will change , click this icon to disconnect.

### Telescope Control Panel:

*Description:* The Control Panel provides control of the Telescope / Mount. Many of these controls are also duplicated in the [Telescope Control Module](#) and the [Focus Target Module](#). These values can also be preset by using a [profile](#) or by opening a [sequence](#).



Controls:

- *Current Position*: Displays where the telescope is pointed in Right Ascension and Declination.
- *Time to* (this field will read "Meridian" if you are not using automatic pier flipping or "Pier Flip" if you are)
  - *Meridian*: displays amount of time until the scope will be at the meridian given the scopes current position.
  - *Pier Flip*: displays the amount of time until a pier flip will occur if using "Use Auto Meridian Flip". This is only given for the active target.
- *Telescope Nudge*: Allows the telescope to be moved in each axis. Vertical buttons are for Declination, Horizontal are for Right Ascension.
  - **Note: If the telescope is connected to SGPro and these buttons remain disabled, it is likely that your Telescope ASCOM driver does not support nudge outside of its own software (meaning it does not allow for 3rd party software like SGPro to nudge).**
  - **Note: Mounts only support a few ranges of movement speeds. If you ask for a selected rate and it appears to suddenly change to a new value, Sequence Generator is attempting to match your value with the closest value that your mount supports. If your mount is not connected when these values are set, then the rate match will occur when the mount connects.**
  - *Hi/Lo Speeds*: Changes the slew speed in degrees per second.
  - *Reverse N/S & Reverse E/W*: When enabled the N/S buttons will be changed to S/N. Same for East/West.
- *Telescope Park / Unpark*: Allows you to park or unpark the mount (depending on current state)
- *Set Park*: Clicking this button allows you to set the park position of the telescope to its current position (assuming it is supported by the driver). If a dome is connected, SGPro will optionally allow you to set the park for the dome at the same time.
- *Target Markers*: Used for manually focusing when the target frame doesn't contain a sufficient star for focusing use. Here you can define a focus target and your imaging target. Using the "Go" button, you can easily navigate between the two (think of them as bookmarks). See [Frame and Focus with Nudge](#) and [Setting Focus and Target Positions](#).
  - *Set Focus/Target Position*: Used to get the current position from the telescope and set that as the Focus or Target location. For instance to set the Focus position slew to the focus star and then click "Set". Now when you need to focus click "Go" to get back to that same location.
- *Telescope Options*
  - *Park when sequence completes*: When checked, this option will disable your autoguiding and send a park command to your mount when all events in the sequence are complete. Selecting this will de-select "Stop tracking when sequence completes".
  - *Stop tracking when sequence completes*: When checked, this option will stop the mount "in-place" when the sequence terminates. Selecting this will de-select "Park when sequence completes".
  - *Allow external control of telescope*: When checked, this option will allow for external control of the telescope via applications like SkySafari. See the section below for more information on how to use and configure Sky Safari.
  - *Use Auto Meridian Flip*: Checking this will allow you to perform a meridian flip during a sequence based on a set of criteria which can be found in the [Meridian Flip Options](#) dialog by clicking the "Set" button:

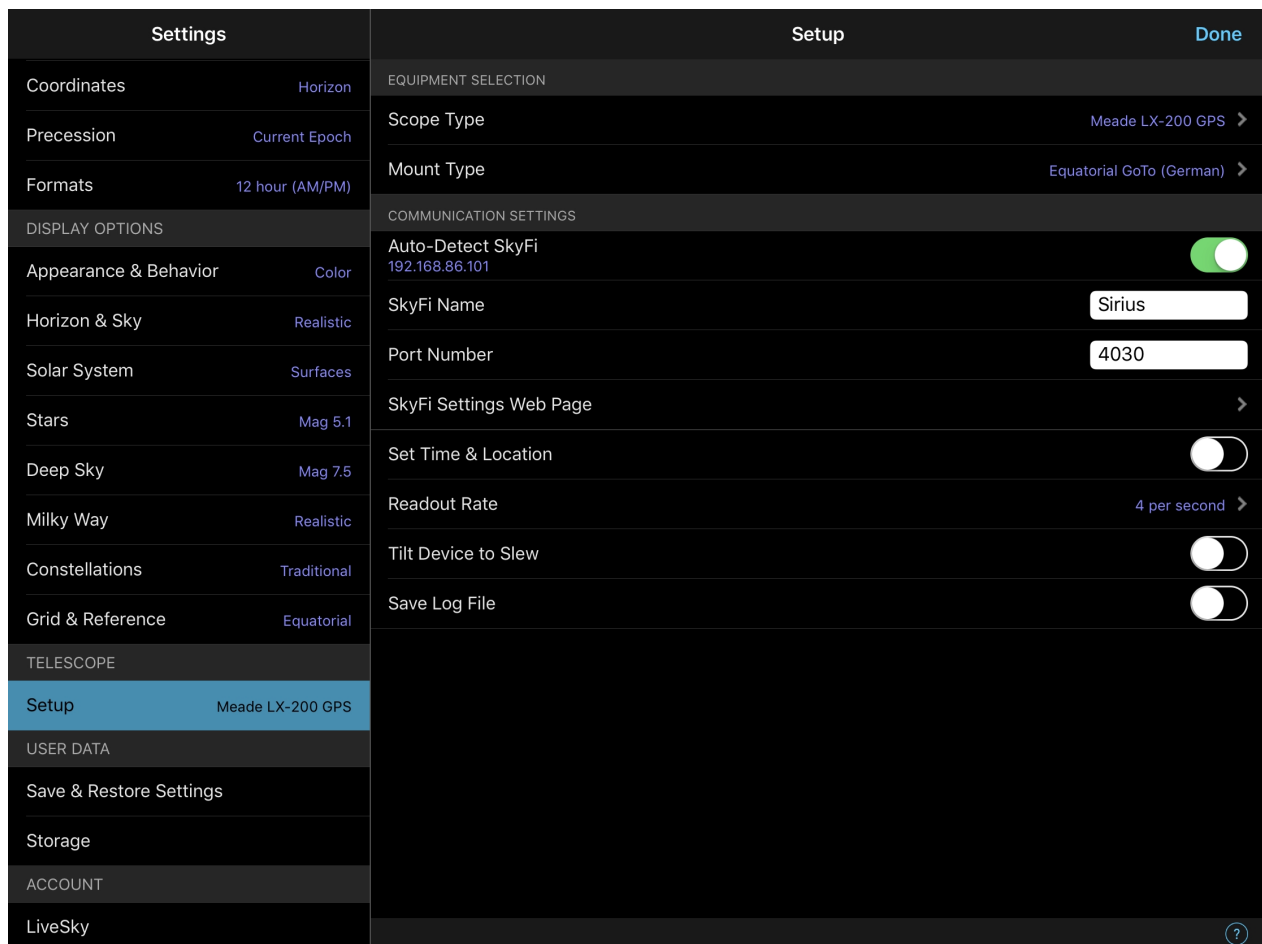


- *Mount settling time*: The time it takes your telescope to settle after a slew has completed. This value is currently only used during the "Auto Center" and "Center Here" processes (this will essentially be the delay between slewing and taking next image).
- *Scope Focal Length*: This is an optional field. If you enter a value here, the FITS header "FOCALLEN" will be written to your sequence images

## Using Sky Safari (for iPhone, iPod, iPad and Android):

In order to control a telescope connected to Sequence Generator Pro via Sky Safari, open telescope settings and enter the following configuration parameters (iPad pictured below):

- *Auto-Detect SkyFi*: This option will allow SkySafari to attempt to find the server in SGPro.
  - *SkyFi Name*: When using auto detect this should be set to your machine's hostname.
- *IP Address*: The IP address of you machine
- *Port Number*: The Port number for the listener
- *Set Time & Location*: Recommended to set to OFF. Setting this to ON will update your scopes time and coordinates what that of your device's. If you already have a pointing model setup this may cause it to reset or to be skewed.
- *Readout Rate*: Reduce this number if Sky Safari seems too sluggish when connected.
- *Scope Type*: **Regardless of the scope you are using, this should be set to "Meade LX-200 GPS"**



## Using EQMOD with SGPro

While SGPro can theoretically work with any ASCOM compliant mount. EQMOD, however, presents some

difficulties in terms of its own internal complexities. This section of the help file is intended to get users into a state where they can successfully use SGPro's automatic centering and flipping features with an EQMOD driven mount.

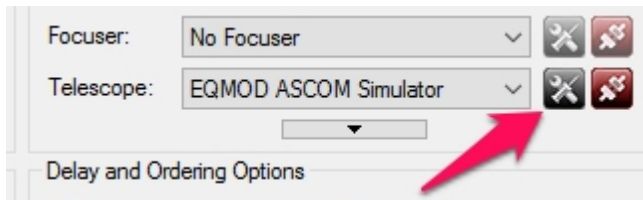
**Note:** As of this writing, the only version of EQMOD currently supported by SGPro is version **1.28m**. This version of EQMOD is not officially supported by the EQMOD group (still in a beta state) and must be downloaded in the files section of the Yahoo! group (you must be a member of the group).

**Note:** These screen shots and instructions are taken using the EQMOD simulator. While your experience will likely be nearly identical, you will need to choose the appropriate "non-simulator" option in the SGPro drop-down menu.

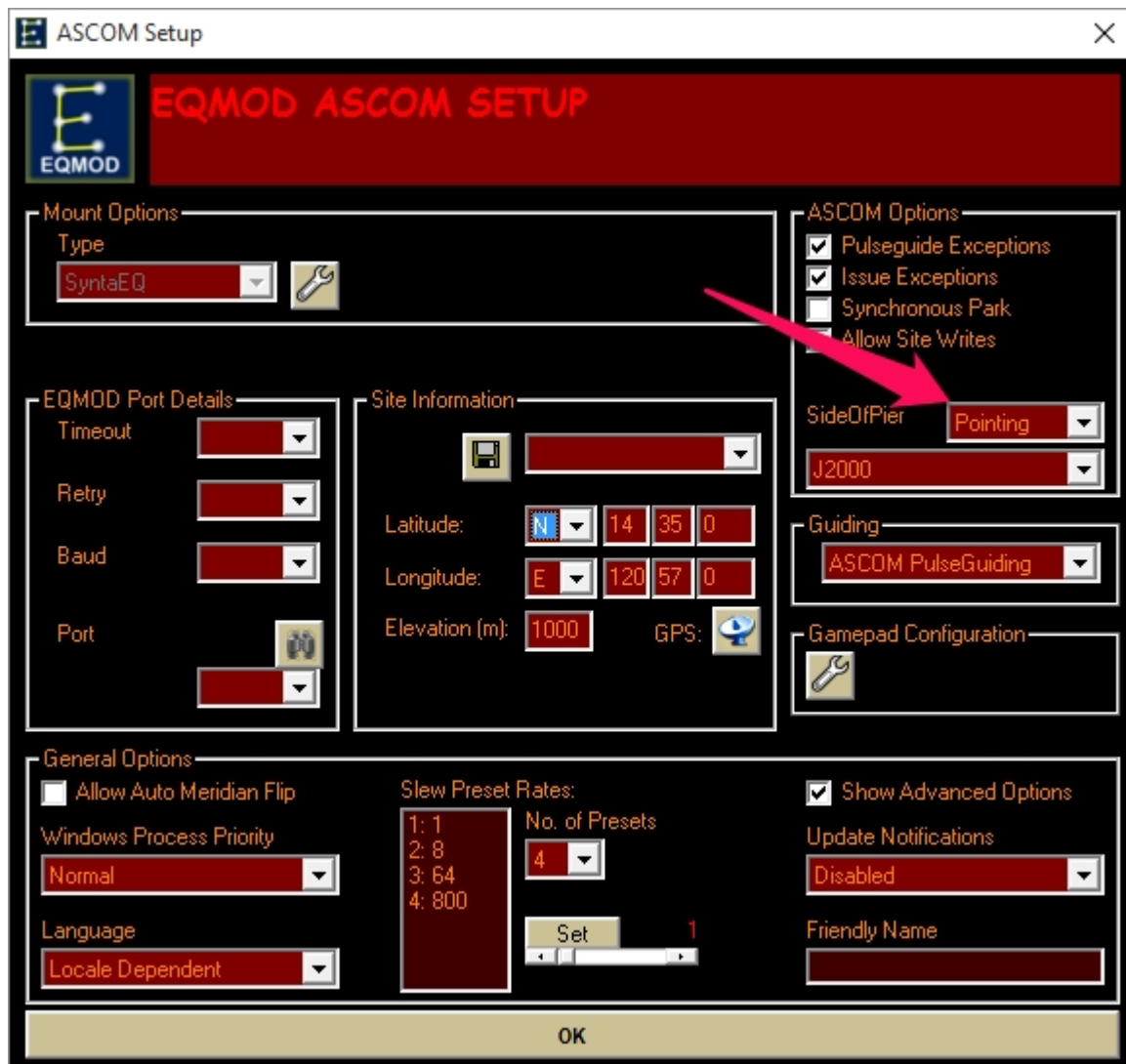
So... here are the steps...

### EQMOD setup:

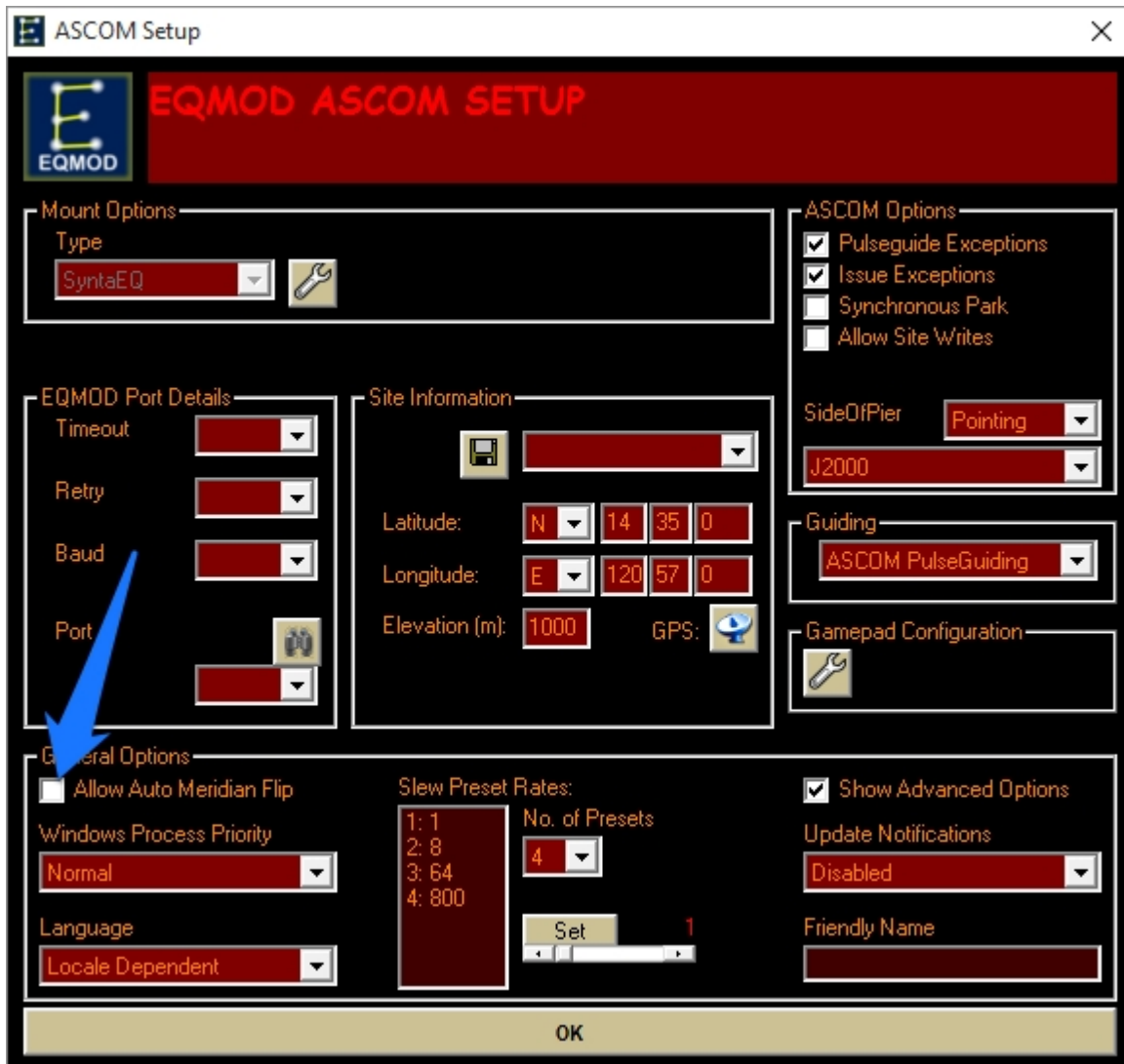
Prior to connecting, select EQMOD in the SGPro telescope drop down menu and then click the "settings" button next to it (Note, **do not** select the simulator... we have selected here for illustrative purposes only):



First, set "**SideOfPier**" to "**Pointing**":



In the "General Options" section, ensure that "Allow Auto Meridian Flip" is not checked.



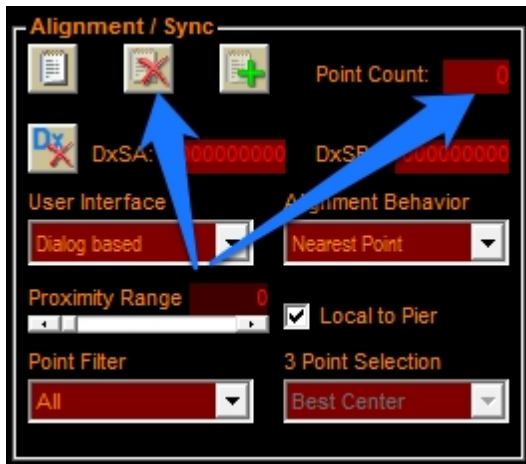
That's it for setup. Now go ahead and connect the mount by clicking the green connect button in SGPro.

When the EQMOD "connected" dialog appears, click the "wrench icon":

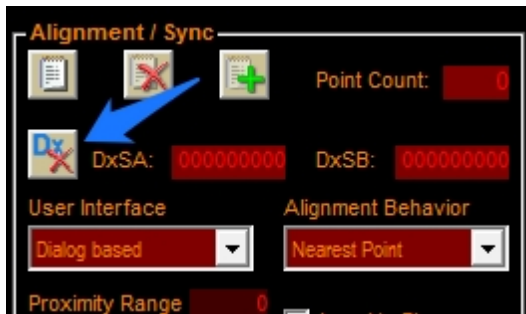


Next, clear / disable any pointing models:

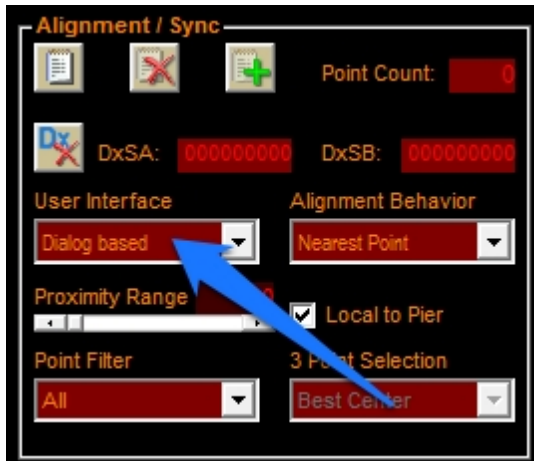




Clear out any point data the mount may have collected. To do this **click the button with the red "X"** on it and ensure the "Point Count" is "0". Last, clear any "Sync Data" by **clicking the "Dx" button with the "X"**:

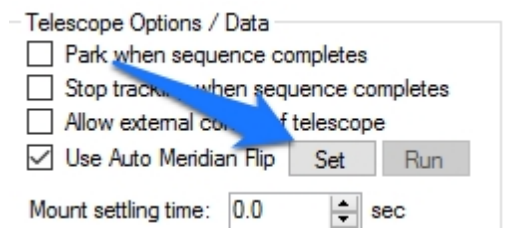


Next, set the User Interface to "Dialog Based":

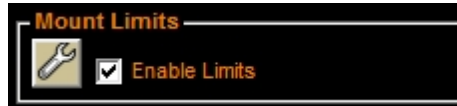


Now it's time to make your mount is safe, but still allows SGPro to perform a flip. In SGPro you will be setting your "Flip When" value to some value on the west side of the meridian. You will then need to make sure that EQMOD actually allows the mount to track that far (with some amount of error) AND also keep your gear safe (prevent it from colliding with a pier or tripod). In order to accomplish this:

In SGPro, go to to the Control Panel, then the Telescope tab. **Click the "Set" button**, next to "Use Auto Meridian Flip":



In the "**Minutes Past Meridian to Flip**" field, **enter a low positive value** (like 4 minutes for 1 degree or 8 minutes for 2 degrees past). Once this is set, it's time to make sure EQMOD will allow the mount to track to the SGPro trigger point. To do this, find the "Mount Limits" section, check the "Enable Limits" option, then click the "Wrench Icon".



Setting the new limits for EQMOD is a process of actually slewing the mount to the eastern and western limits (past the SGPro trigger). You will want to temporarily disable any EQMOD limits in order to do this, then remember to re-apply them. This video here does an excellent job of explaining how to set "extended limits" in EQMOD:

[EQASCOM Video detailing modification of mount limits](#)

It is good to watch the entire video. That said, the part that applies to this help file starts at 3:40 (3 minutes and 40 seconds into the video).

Once you are done with this, you should be in pretty good condition to attempt your first automated meridian flip. More information from the SGPro side is [here](#).

---

Created with the Standard Edition of HelpNDoc: [Single source CHM, PDF, DOC and HTML Help creation](#)

---

## Other Equipment

---

Created with the Standard Edition of HelpNDoc: [Easy EBook and documentation generator](#)


---



### Flat Boxes

## Connecting and Setting Options:

Flat Boxes are selected and connected on the [Sequence Window](#) in the equipment group box.

Flat Boxes are in the "Extended" equipment list and as such you will need to click the down arrow below the telescope to access the Flat Box connection settings.

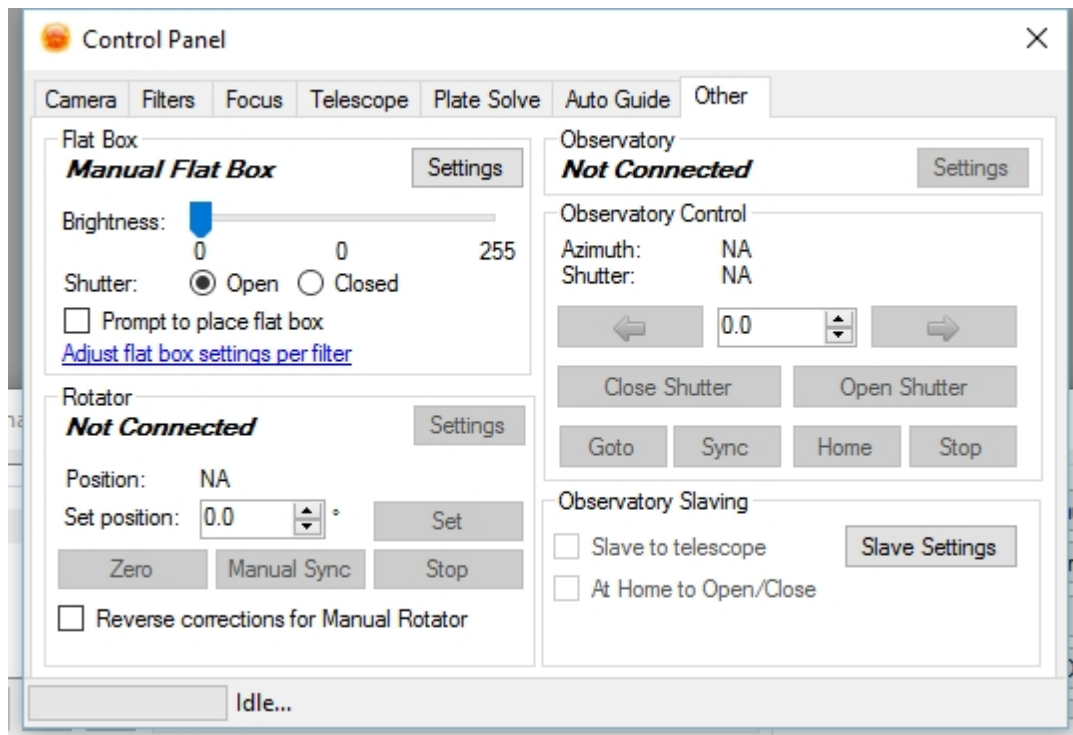
Options can be set when the flat box is in a disconnected state by clicking the  icon. These options will vary by manufacturer. This properties dialog is generally where the COM port is specified as well as other device dependent information.

To connect the flat box click on the connection icon . Once connected the icon will change , click this icon to disconnect.



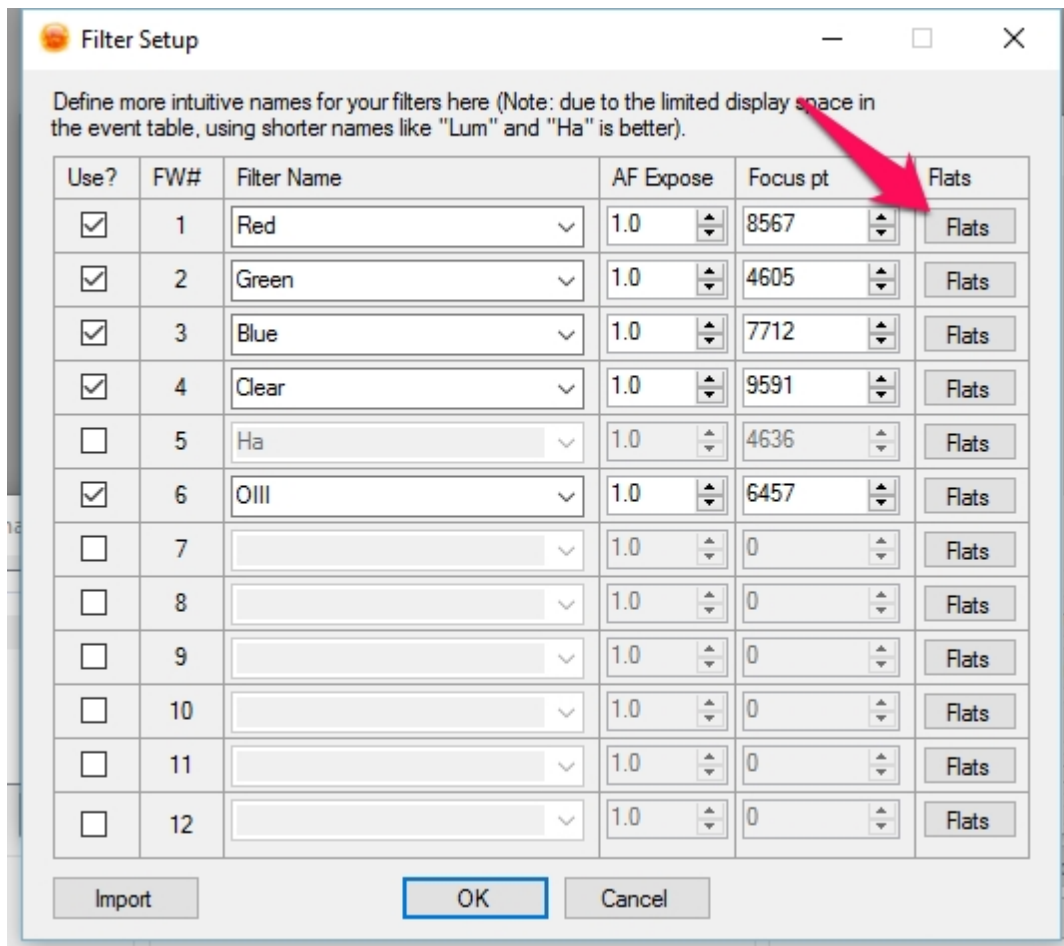
## Flat Box Control Panel:

*Description:* The Control Panel provides control of the Flat Box. These values can also be preset by using a [profile](#) or by opening a [sequence](#).

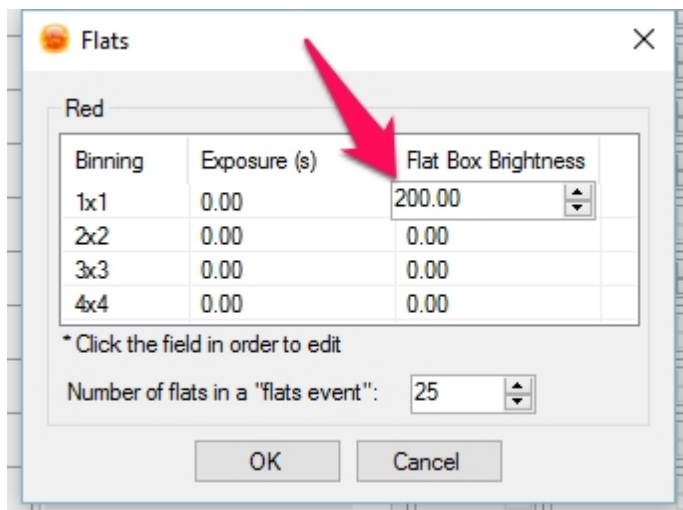


Controls:

- *Brightness Slider:* Allows you to manually set the brightness of the flat box
- *Shutter Control:* Allows you to manually open and close the flat box (on supported models)
- *Prompt to place flat box:* If this option is checked, SGPro will pause the sequence and prompt you to place your flatbox before commencing with flats.
- *Adjust flat box settings per filter:* This part of the control panel allows you to manually manipulate your flatbox settings. It does not adjust how your flatbox behaves during a sequence. In order to adjust those parameters, click this link. You will then be presented with the standard [filter wheel setup](#) dialog. Find the filter you would like to adjust and click the "Flats" button:



When you click the "Flats" button you will see a dialog like this:



From here, you can enter the flat box's brightness for that filter at a particular binning. These are the settings that will be used by the sequence when it is running. For example, if you are having the sequence capture flats for the red filter at 2x2, both the exposure length and flatbox brightness need to be set in this dialog for that filter. Keep in mind that once you have this data, you should save it into an equipment profile so that you do not continually need to fill these forms out prior to a sequence.

#### Other Information:

- For flat boxes that implement a shutter (i.e. the Alnitak Flip Flat) the flat box will be automatically

closed and powered on for sequences that contain flats and have been through the [Flats Calibration Wizard](#). In addition, these types of flatboxes will automatically close their shutter when a sequence ends.

- Selecting "Manual Flat Box" will prompt you to install/remove the flat box for sequences which contain flats. Also if you have previously used the [Flats Calibration Wizard](#) you can also store brightness values for your flat box.

---

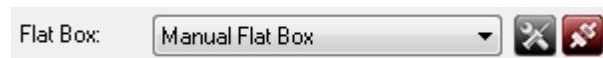
Created with the Standard Edition of HelpNDoc: [Write EPub books for the iPad](#)

---

## Manual Flat Box

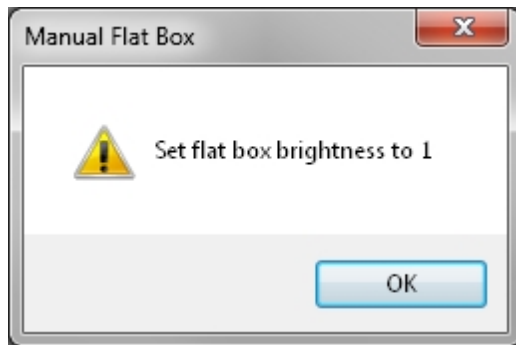
*Description:* The "Manual Flat Box" is used if you have a flat box that is not computer controlled, but still want to have the benefit of the sequencing, file naming, and FITs headers found within Sequence Generator Pro.

You can select the "Manual Flat Box" from the [Flat Box](#) drop down of the sequencing window.



You may setup the "Manual Flat Box" just like a normal flat box in the [Filter Setup](#) dialog.

Whenever a brightness change is requested a dialog box will pop up asking you to manually set the brightness the the value you've entered:



This dialog will pause the sequence and any other actions currently taking place until "OK" has been clicked.

---

Created with the Standard Edition of HelpNDoc: [Free help authoring tool](#)


---



## Rotators

### Connecting and Setting Options:

Rotators are selected and connected on the [Sequence Window](#) in the equipment group box.

Rotators are in the "Extended" equipment list and as such you will need to click the down arrow below the telescope to access the connection settings.

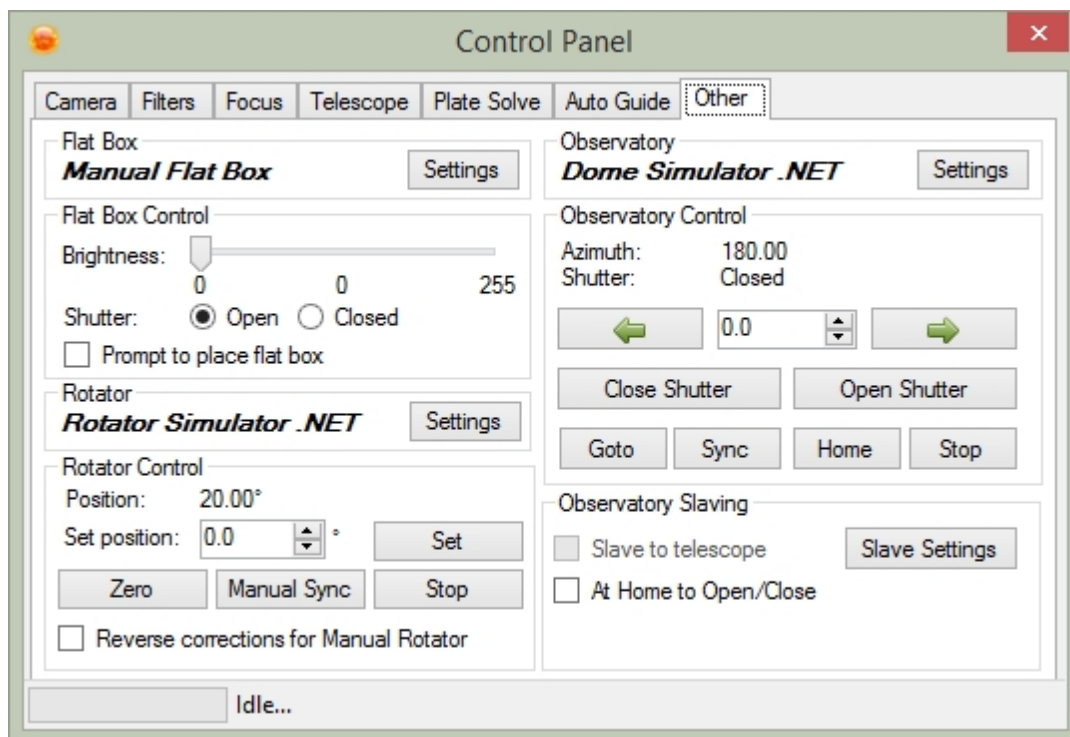
Options can be set when the rotator is in a disconnected state by clicking the  icon. These options will vary by manufacturer. This properties dialog is generally where the COM port is specified as well as other device dependent information.

To connect the rotator click on the connection icon . Once connected the icon will change , click this icon to disconnect.

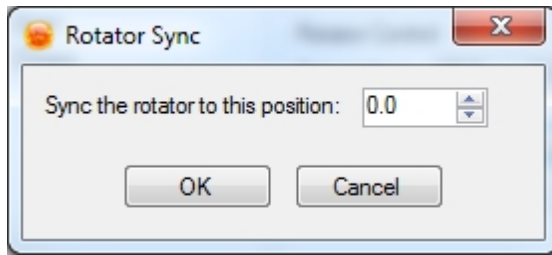


A camera rotator can be especially handy when using the [Framing & Mosaic Wizard](#). This add on can require your camera to be at almost any angle to get your image framed properly. In addition to actual mechanical camera rotators, you can use a [Manual Camera Rotator](#) which takes advantage of plate solvers and give you iterative adjustment instructions until your camera is properly positioned.

## Rotator Control Panel:



- Position: The angle (positional angle) of the rotator (Note that image angle in SGPro are standardized on east of north / counter-clockwise of north. Because angle can be given from any relative orientation in other apps, we recommend that you use angles only from plate solves conducted in SGPro).
- Set Position: Sets the position of the rotator (between 0 and 360)
- Zero: Returns the rotator to the "Zero" or "Home" position.
- Manual Sync: Override the reported position with an actual position:



- Stop: Will stop any current rotator movement.
- Reverse corrections for Manual Rotator: Checking this will reverse the direction the [Manual Rotator](#) asks to move your camera. This is required if your gear combination creates a "flipped" image.

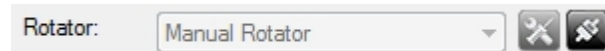
---

Created with the Standard Edition of HelpNDoc: [Single source CHM, PDF, DOC and HTML Help creation](#)

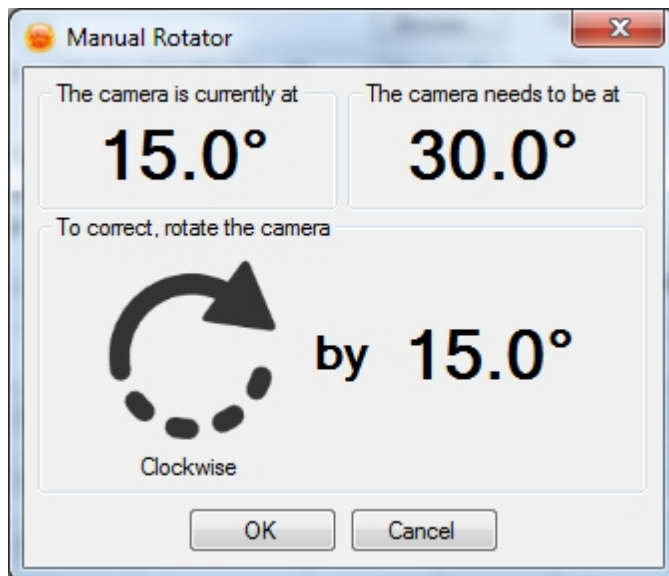
---

## Manual Rotator

Description: The manual rotator is used to ensure your camera is properly positioned before capturing data on a target. In the [target settings](#) dialog you can specify that a target's camera angle should be verified prior to starting. If this box is checked and you have selected the "Manual Rotator", you will receive a series of prompts that help you to properly position your camera. It should be noted that you must have a plate solver set up and in use for the Manual Rotator to function properly.



For instance, if your current camera angle is 15 degrees and your target requires 30 degrees, you will be prompted with a dialog similar to:



Note: If the direction you are prompted to move is opposite the actual movement required, be sure to check the "Reverse corrections for Manual Rotator" on the [Rotator Control Panel](#).

Note: For more information on how to use rotators with your sequence, see the [Automatic Camera Rotation](#) section.

---

Created with the Standard Edition of HelpNDoc: [Easy EPub and documentation editor](#)


---



## Observatories

### Connecting and Setting Options:

Observatories are selected and connected on the [Sequence Window](#) in the equipment group box.

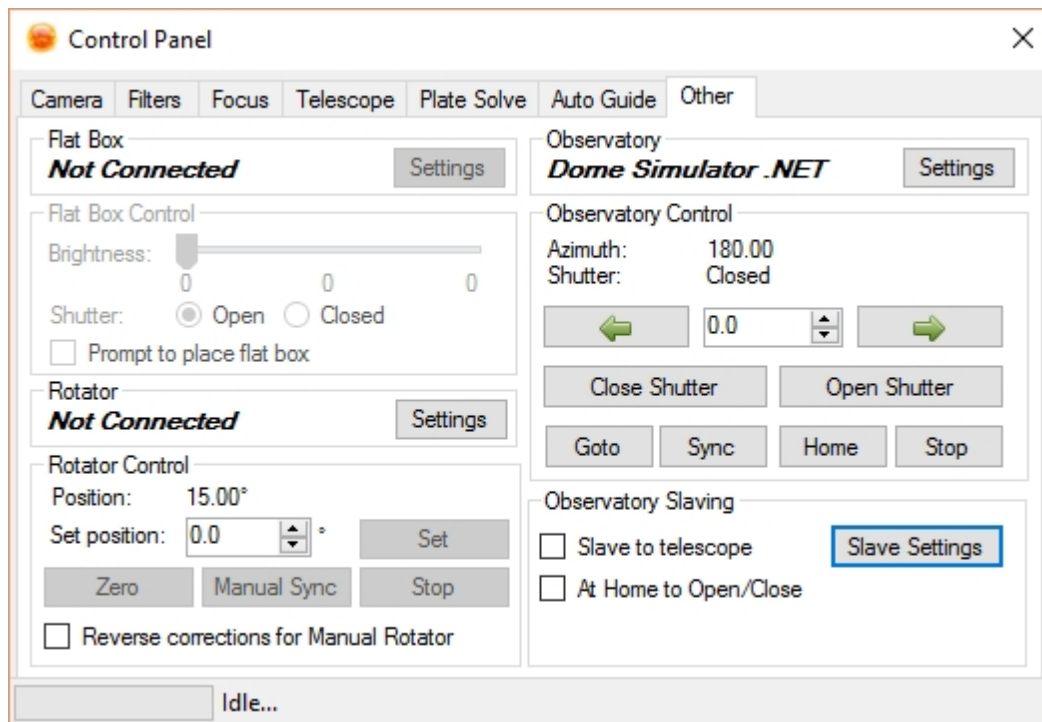
Observatories are in the "Extended" equipment list and as such you will need to click the down arrow below the telescope to access the connection settings.

Options can be set when the observatory is in a disconnected state by clicking the  icon. These options will vary by manufacturer. This properties dialog is generally where the COM port is specified as well as other device dependent information.

To connect the observatory click on the connection icon . Once connected the icon will change , click this icon to disconnect.

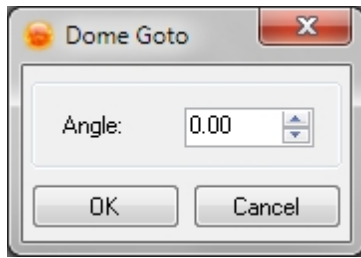


## Observatory Control Panel:

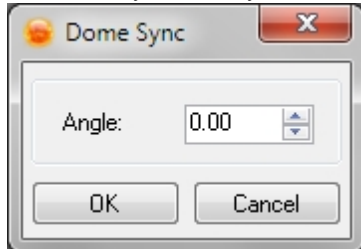


- **Azimuth:** The current azimuth that the dome shutter is located at. If your observatory is a roll off roof or does not provide the ability to slew in azimuth this value will be "NA"
- **Shutter:** The current state of the shutter or roof
- **Left & Right Arrows:** If your observatory can slew in azimuth these arrows will be available. The center number is the amount of degrees to slew in one click.
- **Close Shutter:** Closes the shutter or roof.
- **Open Shutter:** Opens the shutter or roof
- **Goto:** If your observatory can slew in azimuth this option will be enabled and will bring up the dialog below in which you can slew the azimuth to a specific angle:





- *Sync*: If your observatory can slew in azimuth this option will be enabled and will bring up the dialog below in which you can sync the dome azimuth to a specific angle:



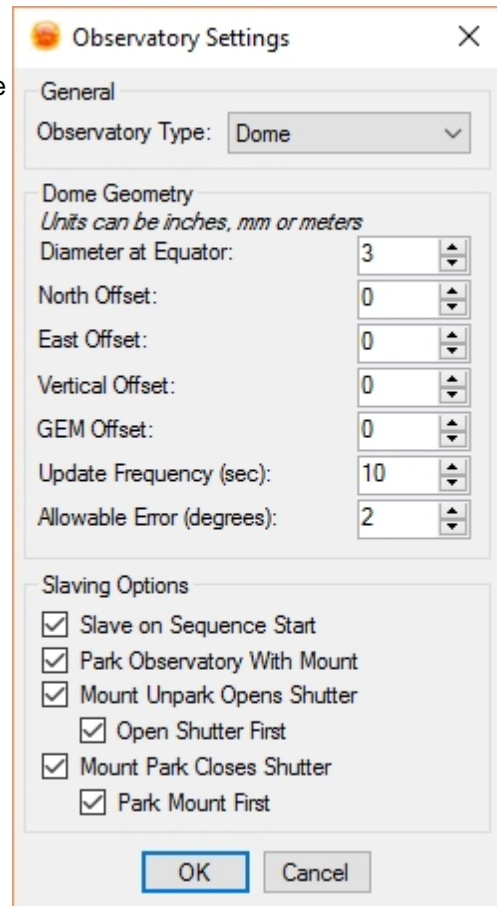
- *Stop*: Issues a command to the dome to stop all movement immediately. Depending on your dome's implementation this functionality may vary.
- *Slave to telescope*: When checked, the dome will be moved to keep the telescope looking through the slit of the dome. This needs to be setup using the Slave Settings dialog.
- *At Home to Open / Close*: Because some domes only provide power to the shutter while in the home position, the observatory can be instructed to attempt shutter open / close operations only while in this position.

Created with the Standard Edition of HelpNDoc: [Benefits of a Help Authoring Tool](#)

## Slave Settings

Description: The Observatory Settings (Slave Settings) dialog is used to define how the observatory will be slaved the the telescope position. It defines parking as well as settings to slave the dome slit to the telescope.

- Observatory Type - Defines the type of observatory. Options are "Dome" and "Roll Off Roof". When "Roll Off Roof" is selected the "Dome Geometry" section will not be accessible.
- Dome Geometry - These settings are used to provide positional information when slaving the dome. The units are not important provided that all measurements use the same type of units
  - Diameter at Equator - The diameter of your dome at the equator. This should be measured from where your slit opening is. For example if your dome is skinned on the outside you would measure from the outside diameter. If it is skinned on the inside you would measure the inside diameter.
  - North Offset - The offset from the center of intersection of the Right Ascension and Declination axis to the center of the dome. If the RA/Dec intersection is north of the dome center this value is positive. If the RA/Dec intersection is south of this location the value should be negative.
  - East Offset - The offset from the center of the intersection of the Right Ascension and Declination



- axis to the center of the dome. If the RA/Dec intersection is east of the dome center this value is positive. If the RA/Dec intersection is west of this location the value should be negative.
- Vertical Offset - The offset from the center of the intersection of the Right Ascension and Declination axis to the center of the dome. If the RA/Dec intersection is above the dome center this value is positive. If the RA/Dec intersection is below this location the value should be negative.
  - GEM Offset - The distance from the center of the Right Ascension axis to the center of the telescope. This value can vary depending on how your scopes are setup on your mount. It is best to use some trial and error here. If the top of your scope is being eclipsed by your dome increase this value. If the bottom of your scope is being eclipsed decrease this value.
  - Update Frequency - Number of seconds to wait between slew commands. This also will depend on your Allowable Error (below).
  - Allowable Error - Number of degrees from where the dome azimuth can be from the calculated ideal position. This will depend on the width of your slit as well as position in the sky.
- Slaving Options - These options control special events with respect to parking and unparking of the mount.
    - Slave on Sequence Start - This will cause the dome to automatically slave itself to the telescope (follow the telescope) when the sequence starts. This is equivalent to clicking the "[Slave to telescope](#)" box in the control panel.
    - Park Observatory With Mount - This will cause the observatory to park and unpark when the mount parks and unparks. The Park and Unpark must come from Sequence Generator Pro to be captured. If the park status of the mount changes outside of Sequence Generator Pro the observatory park status will not be updated.
    - Mount Unpark Opens Shutter - When the mount is unparked the shutter or roof will be opened
      - Open Shutter First - This will cause the shutter/roof to open prior to unparking the telescope. Useful for Roll Off Roof designs where the telescope needs to be horizontal to allow for roof clearance. **WARNING - Using this option to open your roof prior to unparking your mount is very risky! It is highly recommended to have other fail safe mechanisms in place that will prevent your roof from coming into contact with your telescope. Main Sequence Software will not be held liable for any equipment damage.**
    - Mount Park Closes Shutter - When the mount is parked the shutter or roof will be opened
      - Park Mount First - This is used to park the mount before parking the observatory. **WARNING - Using this option to park your mount before closing your roof is very risky! It is highly recommended to have other fail safe mechanisms in place that will prevent your roof from coming into contact with your telescope. Main Sequence Software will not be held liable for any equipment damage.**

*It should be noted that when a slew is issued through Sequence Generator Pro that the slaving code will attempt to make an educated guess about what side of the meridian the scope will end up on. Unfortunately there is no way of knowing which side of the meridian the scope will actually end up on for items that are very close to the meridian. Sequence Generator Pro always assumes that the mount will end up on the opposite side of the pier from where it is pointing. For instance if the object is West of the meridian the scope will be assumed to be on the east of the meridian. However if this guess is incorrect the dome will be properly adjusted when the next update as it will use the side of pier obtained from the mount. For this reason it is beneficial to set your mount driver to disallow slewing to the same side of the meridian that the scope is currently on.*

---

Created with the Standard Edition of HelpNDoc: [Free Kindle producer](#)

---


## Safety Monitor

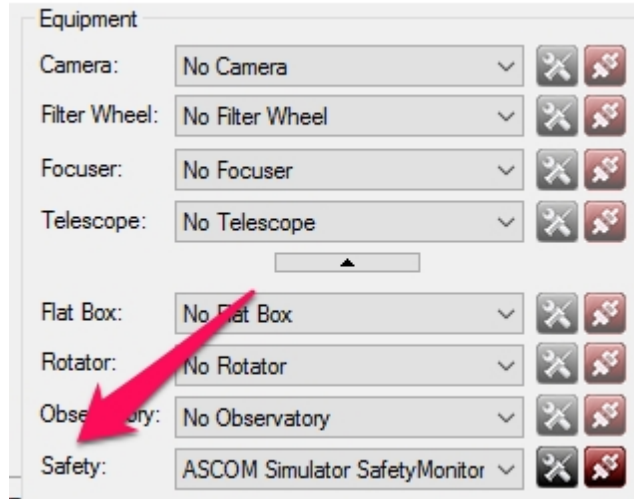
### Connecting and Setting Options:



Safety monitors are selected and connected on the [Sequence Window](#) in the equipment group box.

Most Safety Monitors give you an idea of imaging safety by continuously analyzing the weather. That said, a safety monitor can technically analyze anything (weather or other) and provide data to SGPro that indicates if it is unsafe to continue imaging.

Safety Monitors are in the "Extended" equipment list and as such you will need to click the down arrow below the telescope to access the connection settings.

Options can be set when the safety monitor is in a disconnected state by clicking the  icon. These options will vary by manufacturer. This properties dialog is generally where the COM port is specified as well as other device dependent information.



To connect the Safety Monitor click on the connection icon . Once connected the icon will change , click this icon to disconnect.

## Safe/Unsafe Status:

The current Safety Monitor implementation relies on the ASCOM "Safety Device" which supports a single status of Safe or Unsafe. When the device is reporting Safe everything operates as normal. When the device reports Unsafe the End of Sequence options are executed. **This is true even if the sequence is not running.**

The "End of Sequence" options are set on different devices. For instance when the sequence ends due to an unsafe condition you may want to:

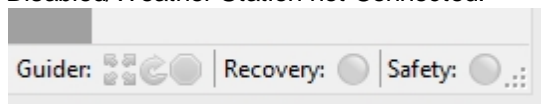
- Warm up your camera (turn off the TEC)
- Park your telescope
- Close your observatory.

These settings can be found in each of the device options in the Control Panel. **You should note that the observatory must be slaved to the mount to close as the observatory open/close is tied to the mount unpark/park event** and can be setup in the [Slave Settings](#) for the observatory. Likewise you must also select to have the mount [park when sequence completes.](#)

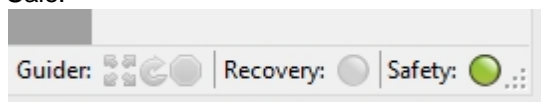
## Viewing Status:

The safety status can be seen in the bottom right notification area of Sequence Generator Pro.

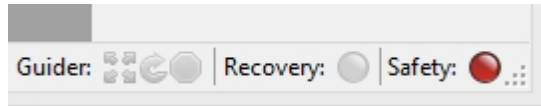
Disabled/Weather Station not Connected:



Safe:



Unsafe:



**Note:** The safety monitor will not truly be active until the first frame from the first target begins. If there is a period where SGPro is idle prior to sequence start, SGPro will ignore any unsafe events until the first target's start time passes.


---



Created with the Standard Edition of HelpNDoc: [Easily create iPhone documentation](#)

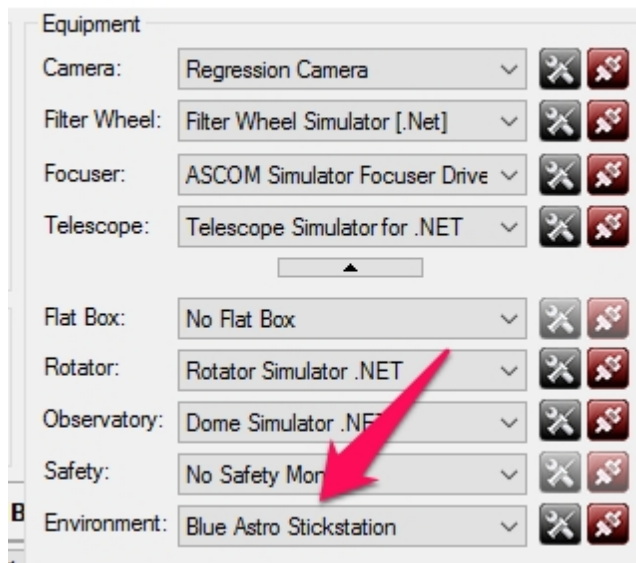
---

## Environment Devices

SGPro supports input from several environment monitoring devices (you can only use one at a time). The data collected from these devices is mostly used as direct input to the user (meaning that not much of the input will affect the way in which SGPro operates). To select a device in a sequence, you will need to extend the device area in the sequencing window and locate the drop down box labeled "Environment".

Options can be set when the environment device is in a disconnected state by clicking the  icon. These options will vary by manufacturer. For ASCOM devices, this will bring up the ASCOM properties dialog for the selected environment device.

To connect the device click on the connection icon . Once connected the icon will change , click this icon to disconnect.



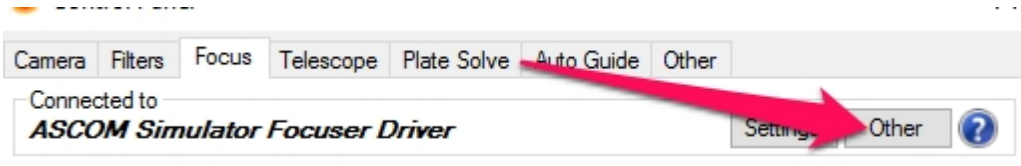
Currently, SGPro only supports ASCOM 6.2 "Observing Conditions" compliant devices. TEMPPerHUM, an exception to this statement, is also found in this drop down menu, but is **not officially supported** in any capacity.

When you select and connect to a device, you will be able to see data it reports on in the "Environment Data" docking module. You can [click the "cloud" icon](#) to view this docking window. More information can be [found here](#).

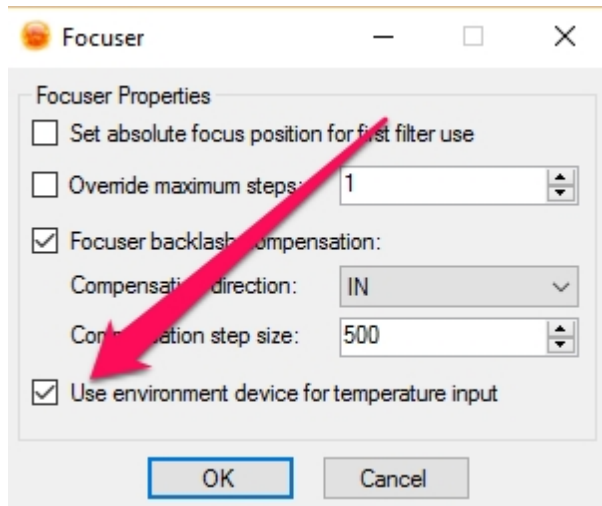
With respect to [auto focus](#), SGPro supports "[temperature based triggers](#)" (meaning you can choose to auto focus if the temperature drops by 1 degree). Many users simply use the temperature reported by their actual focus controller to control this trigger. Others do not have a focus controller that reports on temperature or simply wish to use input from the environment device because placement of their focus controller might affect its ability to report correctly on temperature change (like if it's stored in a warm power box or

something similar).

In order to use the environment device's temperature to control auto focus triggers, you need to open the control panel, navigate to the "Focus" tab and then click the "Other" button.



Then is the dialog presented, ensure the proper checkbox is selected:



Of course, this can all be setup in you equipment profiles so you don't need to worry about it for your new sequences.

Lastly, if you use the notification system, the environment device will alert you when (a sequence must be running or no notification will be issued):

- The temperature is within 4 degrees of freezing
- Dew is about to start forming (the dew point is within 6 degrees of the dew point with a downward trend or if you are within 2 degrees of the dew point, regardless of trend)

## Sequencing

---

Sequencing plays a large part in Sequence Generator Pro (it gets part of it's name from it!) The ability to quickly setup sequences using [profiles](#) and have all your stored settings right where you need them makes starting an imaging session extremely easy. Plus you can create sequences ahead of time and load them when you're under the stars and ready to begin your imaging for the night.

Regression24.sgf\*

Sequence Data

Running: **None**

Directory: C:\Users\kenpe\Desktop\T... Browse...

File Name: %ft%\bn\_%el\_%bi\_%fe\_%fn

User Profile: Ken-Home

Equipment

Camera: FLI USB Camera

Filter Wheel: Filter Wheel Simulator [.Net]

Focuser: ASCOM Simulator Focuser [

Telescope: Telescope Simulator for .NE

Rosette

Total events complete: 0/2 Remaining time: 00:00:35

Total frames complete: 0/7

0%

Delay and Ordering Options

Delay: Delay first: 0 Delay between: 0

Event order:  Rotate through events  Finish entire events first

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Light	Blue	B	5	1x1	4	0/4
2	<input checked="" type="checkbox"/>	Light	Red	C	5	1x1	3	0/3
3	<input type="checkbox"/>	Light	Green	C	5	1x1	4	0/4
4	<input type="checkbox"/>	Light	None		0	1x1	1	0/1
5	<input type="checkbox"/>	Light	None		0	1x1	1	0/1

+ Add New Event    Elapsed: 00:00:00    Remaining: 00:01:40    Run Sequence

Created with the Standard Edition of HelpNDoc: [Write eBooks for the Kindle](#)

## Description

Regression24.sgf\*

Sequence Data

Running: **None**

Directory: C:\Users\kenpe\Desktop\T... Browse...

File Name: %ft%\bn\_%el\_%bi\_%fe\_%fn

User Profile: Ken-Home

Equipment

Camera: FLI USB Camera

Filter Wheel: Filter Wheel Simulator [.Net]

Focuser: ASCOM Simulator Focuser [

Telescope: Telescope Simulator for .NE

Rosette

Total events complete: 0/2 Remaining time: 00:00:35

Total frames complete: 0/7

0%

Delay and Ordering Options

Delay: Delay first: 0 Delay between: 0

Event order:  Rotate through events  Finish entire events first

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Light	Blue	B	5	1x1	4	0/4
2	<input checked="" type="checkbox"/>	Light	Red	C	5	1x1	3	0/3
3	<input type="checkbox"/>	Light	Green	C	5	1x1	4	0/4
4	<input type="checkbox"/>	Light	None		0	1x1	1	0/1
5	<input type="checkbox"/>	Light	None		0	1x1	1	0/1

+ Add New Event    Elapsed: 00:00:00    Remaining: 00:01:40    Run Sequence

The sequencing of complex capture events is one of the most powerful aspects of Sequence Generator Pro. With it, you are capable of stringing together a variety of events ranging from capture of light frames all the way to "in-sequence" park events. Additionally you are able to save sequences for use later (meaning you can think about and create your capture events the night before and then when you are in the field, simply open your sequence and begin). Specifically the sequencer will allow you to:

- Save, open and edit sequence files
- Design complex file naming patterns to suit your needs
- Design a sequence for multiple targets
- Allow for pre-sequence or between frame delays
- Run events in a rotation or until they are complete
- Allow for the creation of image capture events (light, dark, bias, flats). You can specify:
  - Specify filter
  - Exposure count
  - Exposure duration
  - Naming suffix
  - Binning (or ISO)
- Additionally, you can define events that will perform in-sequence parking of the mount or pausing

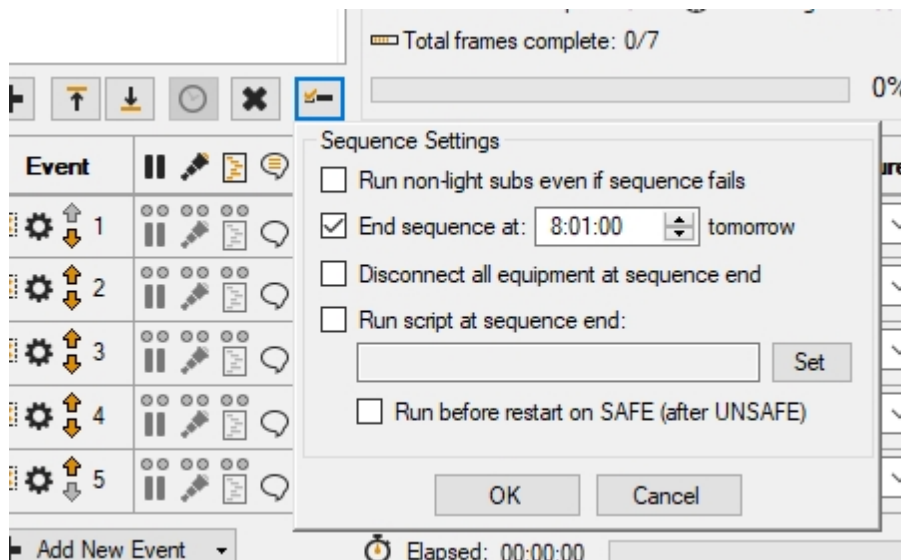
---

Created with the Standard Edition of HelpNDoc: [iPhone web sites made easy](#)

---

## Sequence Options

SGPro offers some sequence that are unique to the entire sequence (meaning they do not apply to a single target, event or frame). The options can usually be found in the options dialog, but for convenience, some can be found here:



- *Run non-light subs even if sequence fails*: This will capture flat, dark and bias frames even if the sequence fails to complete. More detail about this option [can be found here](#).
- *Global end sequence time*: If this option is checked it will force the sequence to end at that time. This end time takes precedence over any [start or end times set at the target level](#). No date is required for the end time. This means that you are not required to update the date when using the sequence over multiple nights. This also means that SGPro must infer a date based on the time you entered. The inference system is fairly simply... sequences run in what is referred to as a "sequence day"... a period of 24 hours that spans from 0900 to 0900. The dates attached to those time will either be yesterday and today or today and tomorrow. This decision is made based on when you click the "Run Sequence" button. The end time also has a helpful indicator after that time that will read either "yesterday, today or tomorrow". This is to be interpreted as: The sequence end time will be at 06:01 tomorrow if you click the "Run Sequence" button **right now**. Examples:
  - For a target that ends at 22:00, starting the sequence at 22:15 will skip this target, the sequence day will be 0900 today through 0900 tomorrow and the end time at 22:00 will be in the past. Conversely, starting at 21:45 would place the 22:00 end time in the future. Starting the sequence at this time will produce the same "sequence day".
  - For a target with an end time at 05:00, starting the sequence at 16:45 (more than 12 hours

- before the intended end time), the sequence day will be 0900 today to 0900 tomorrow and the end time of 05:00 will be in the future (this is the same example as above really... just illustrating that it still works when you are more than 12 hours away from the intended end time.
- For a target with an end time at 22:00, starting the sequence at 01:00 will create a "sequence day" from 0900 yesterday to 0900 today. The end time of 22:00 will be assigned to the only 22:00 that occurs in this sequence day (yesterday), and will be skipped.
  - *Disconnect all equipment at sequence end: Fairly self-explanatory:* When the sequence ends, SGPro will disconnect all your equipment. If you use camera warmup, disconnecting the camera will be delayed until it is complete.
  - Run script at sequence end: Run a custom vbs, cmd, bat or exe script BEFORE gear is disconnected.
    - Run before restart on SAFE: When a sequence is paused due to an UNSAFE event, the script above will NOT run unless this option is checked.

---

Created with the Standard Edition of HelpNDoc: [Qt Help documentation made easy](#)

---

## How the Sequence Selects Work

This section is intended to clarify how Sequence Generator Pro selects work during sequence execution:

### Parts of a Sequence

A sequence consists of three hierarchical components:

- *Targets:* These are at the highest level. A sequence may contain many targets.
- *Events:* Each target can contain many events. An event characterizes how a target is captured. An example of an event is "Light frame using the red filter at 2x2 binning".
- *Frames:* Each event can contain many frames. A frame is best characterized as an individual image that contains properties as set forth in its parent event.

### Selecting Work

Execution of a multi-target sequence can be straightforward if it remain static during data capture. When you decide you want to alter the ordering of targets or events in real time, you might observe unexpected behavior if you are not familiar with the sequencing rules.

#### *Basic Rules*

The simplest multi-target sequence will function as follows:

- Work is selected based on the order of the targets, from top to bottom (unchecked targets are considered inactive and will not be selected for work).
- A target consists of N events. Each event in the target will be executed in order (depending on event ordering options).
- When a target's events are completed, that target is marked as such (with a checkmark icon) and the sequencer will move to the next active target in the list. It is important to note that a target can be marked complete with remaining frames to capture... typically when a target reaches its [user defined end time](#). Once this happens, this target will never be selected to run until the sequence is reset or its ["completed" status is cleared](#).

This basic set of rules gets a bit more complex when you decide to alter the sequence in real-time. Here are some rules that are good to understand:

- *Moving targets:* In general, targets operate using the "sticky target" principle. This means that once a target starts, it will generally finish before moving on to another target. This includes targets that are moved above the currently running target. Suppose you have two targets (target 1 and target 2) and target 1 is running. If you then decide to alter the order of the targets and place target 2 above target 1, target 1 will continue to run until it is finished, then it will run target 2. If you wish to run target 2 immediately, you can either reset the sequence or uncheck target 1 (abort the sequence if you want to do this immediately). Unchecking target 1 will cause the sequence to look for other work and target 2



will be selected (it is now ahead of target 1).

- **Completed targets:** When a target completes all of events, it will be marked as completed. Being marked as completed is temporary and applies only to the current run. Completed targets may be modified, but will not be considered for work during this run. This means that if you add two new frames to a completed target, the sequence will be "complete" even though it has not attempted to capture the new frames. Completed targets have a checkmark icon to the left of the target name.

Typical use cases:

- A sequence with two targets: Simply add one additional target and use each target's settings to provide a unique name. Select each target and provide events as appropriate. When you run the sequence, the top-most event will run until completion. When it finishes, the next event will run and then the sequence will be complete.
- A sequence with two targets and an early end time for target 1: This is useful if target 1 sets early and, instead of figuring out in advance, how much time you have available, you can just ask the sequence to capture as much data as possible for that target until a specified [end time](#) (found in the target's settings). This is essentially the same process as described above, except that target 1 will use an [end time](#).
- A sequence with two targets and an early end time for target 1 and a delayed start for target 2: This is the same as the scenario directly above, except that when target 1 ends early, target 2 will delay start until the specified [start time](#).

Special use cases:

- Forcing a moved target to run immediately: As mentioned above, targets operate using the "sticky target" principle (see Moving Targets above). There may be times where you don't want the currently running target to finish before moving to the target you just re-ordered (above the currently running target). In order to do this, you can either reset the sequence or perform the following operations:
  - If you want to run the reordered target immediately, abort the sequence (otherwise skip this step and the new target will run after the current frame completes)
  - Move the desired target to the top of the list
  - Uncheck / deactivate the currently running target (now below the reordered target)
  - If you aborted the sequence, run it.
  - The sequence will now select new work from the top of the list.
  - After the new target is selected, you can optionally re-check the original target if you want the sequence to revisit that work later.

Example: A sequence contains targets for Horsehead, M42 and the Rosette nebula (in that order). You start the sequence and then realize you wanted to start with M42 first. Unfortunately, the Horsehead target has already started and, as a result of this, it is "sticky". This means that any attempt to simply re-order the targets (even if you pause and restart) will result in the Horsehead target running to completion. In order to force M42 to run, you will want to abort the sequence, move M42 above Horsehead, un-check Horsehead (this will remove the "sticky"), restart the sequence and then finally re-check Horsehead so it will be picked up after M42 completes. Of course, this is only an example to illustrate how to do this, if you haven't really gotten too far into a sequence, the best option would likely be to reset the sequence.

- Forcing modified completed targets to run: As mentioned above, completed targets are no longer considered for selecting work. There may be times where you want to modify a completed target and force it to run. It should be noted that resetting a sequence will automatically make any new work valid for selection. When faced with this situation, you can open the target's setting and check the box labeled "Clear completed status". After clicking ok, that target will no longer be in a completed status and will be eligible for work.

Example: A sequence contains targets for Horsehead, M42 and the Rosette nebula (in that order). Horsehead runs until completion and the sequence moves on to M42. During acquisition of M42, you

realize you want to capture some more frames for Horsehead. You move to the Horsehead target add a few more frames, but the target is still marked as complete. Under normal circumstances, you can't add more work to completed targets. But... if you really want to force the sequence to consider the new work for this target, you will need to open the settings for Horsehead and check the "Clear completed status" option. After clicking "OK", the target's icon will change from the completed check-mark icon to the pause icon. After M42 completes, the sequence will actually go back to Horsehead and finish your new frames (any target options like "center on when target starts" are applicable in this case).

When the sequence begins capture of a target it will continue its execution until it is done. That is to say that the sequencer will not select work between targets during execution. If you are using an event [rotation option](#) in a sequence that has multiple targets, the sequence will not rotate through all events in the sequence, but rather rotate through all events in the target and then move to the next target.

The sequencer selects works in a hierarchical manner. That is to say that it will always consider events on the target in the highest (top-most) position first. If you have defined multiple targets, the sequence will start executing events from the "top-most" target and finish with events in the "bottom-most" target. This logic will always remain true, even if you reorder the targets. For example, if you have three targets and run half of the events in the top-most target, pause, move target 2 to the top-most position, target 2 will start up when the sequence is resumed and the next available event for target 2 will begin to run. Targets can be re-ordered in real time and the same rules will apply (in this case the current event will always finish). If you pause and resume the sequence in such a way that does not cause the current / next target to change (i.e. run pause / resume with no target reordering), then the sequence will resume where it left off (i.e. same target, next event).

Targets and events that are not "checked" will not be considered for work.

### Resetting the Sequence

There are several ways you can alter the state and progress of a sequence. [See here for more details.](#)

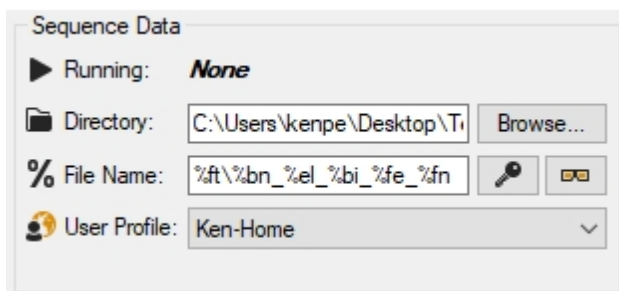
---

Created with the Standard Edition of HelpNDoc: [Produce Kindle eBooks easily](#)

---

## Sequence Data / File Naming

The data options block allows you to specify the way in which you expect your image data to be saved to disc.



*Running:* Indicates the running target. If the sequence is stopped, this will indicate "None"

*Directory:* Specify the location where you would like your data saved. The file pattern will be applied at this location.

*File Name:* This is a pattern based approach to naming files. The options (below) can be found by clicking the "Key" button and you can preview how your file names will look by clicking the magnifying glass icon.

*User Profile:* The user profile to use with this sequence. [User profiles](#) contain information about users and location and the sequence will, when saving images, ensure that this information is entered into the FITS header. A user profile is not required.

**Pattern Notes (see "File Name" above)**

When creating a pattern there are three important things to remember:

- You can use the "\" separator to create sub-directories under the specified Directory field (above). In the screen shot above, the "Frame Type" (%ft) is used to create a sub-directory like "Light" underneath "Z:\Pictures\AP\sghost".
- You can use any characters that are legal for naming files. This means that if you specify a string of characters that are not a valid pattern match then they will be included in every file name in a static way. For instance if you take the pattern specified in the screen shot and the string "\_TSP" to the end you image file names would appear as something like "M51\_600\_1x1\_L\_Frame1\_TSP.fit"
- The target name (%tn) is defined in the target options dialog.

### Key

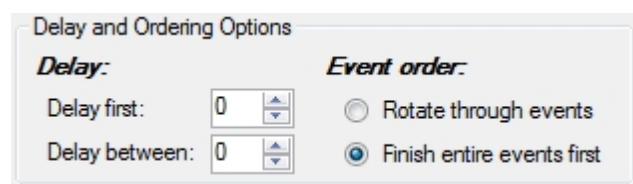
%tn = Target name (as is)  
 %ca = Camera Name (as is)  
 %ct = Camera temperature (inserted as ##.#C)  
 %ft = Frame type (Light, Dark, etc...)  
 %el = Exposure length (as NNNNsec)  
 %es = Exposure seconds (as NNNN)  
 %bi = Binning (as is, i.e. 1x1)  
 %is = ISO (as ISOXXX; DSLRs only)  
 %fl = Filter number (as filterN)  
 %en = Event number (eventN)  
 %fn = Frame number (as frameN)  
 %fz = Frame number (as frameNNNN, padded 0's)  
 %su = Suffix (as is)  
 %dt = Date (as MM-DD-YYYY)  
 %d2 = Date - 12 hrs (as MM-DD-YYYY)  
 %yy = Year (inserted as YYYY)  
 %mm = month (inserted as MM)  
 %dd = day (inserted as DD)  
 %dy = day - 12 hrs (inserted as DD)  
 %tm = time (inserted as HHMMSS)

Note: Directories can be inserted as part of the pattern (i.e. %ft%\%bn%\%bn\_%su\_%es\_%fn)

---

Created with the Standard Edition of HelpNDoc: [Easy to use tool to create HTML Help files and Help web sites](#)

## Delay and Ordering Options



Delay and Ordering Options

**Delay:**

Delay first:

Delay between:

**Event order:**

Rotate through events

Finish entire events first

These options apply individually to each target (i.e. each target can specify their own order or delay).

### Delay Options:

*Delay first:* Specify the delay, in seconds, prior to executing the first event in the target

*Delay between:* Specify the delay, in seconds, that should be honored between every frame in the running target

### Event order:

*Rotate through events:* Selecting this option means that the sequence will rotate through event until complete. If you have multiple targets, this option will rotate through events only in the current target.

(Example: Events 1, 2 and 3 are active and each requires 3 frames to complete. The frame order will be 1,2,3 - 1,2,3 - 1,2,3.)

*Finish entire events first:* Selecting this option means that the sequence will complete entire events prior to moving to the next.

(Example: Events 1, 2 and 3 are active and each requires 3 frames to complete. The frame order will be 1,1,1 - 2,2,2 - 3,3,3.)

Notes:

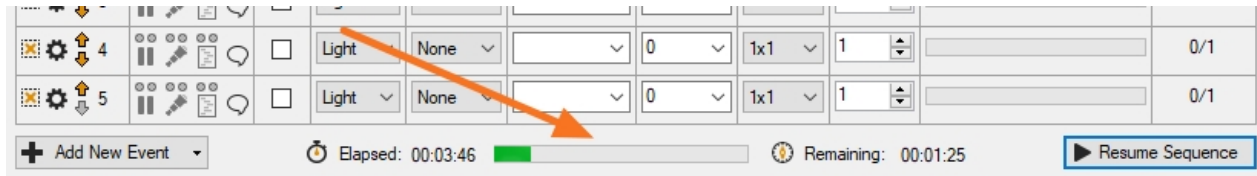
1. This ordering affects only events within a target. See [this section](#) on how Sequence Generator Pro selects work for more information.
2. This section applies to the sequence (i.e. different targets cannot have different ordering or delay options).

---

Created with the Standard Edition of HelpNDoc: [Full-featured Help generator](#)

---

## Sequence Status



The sequence status will provide insight into the total event progress across all targets. It provides:

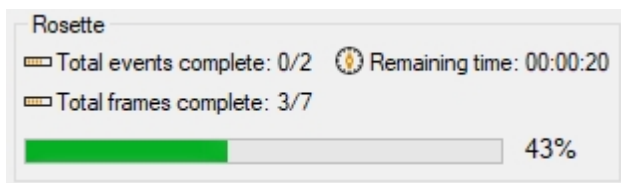
- *Remaining time:* This is an estimate of time remaining (It should be noted that this time does not account for overhead accrued by download time, pausing, running auto focus or any other activity that it outside the context of image integration time)
- *Elapsed time:* The time that elapsed since starting the sequence run

---

Created with the Standard Edition of HelpNDoc: [Easy EBook and documentation generator](#)

---

## Target Status



The target status will provide insight into the event progress for a given target. It provides:

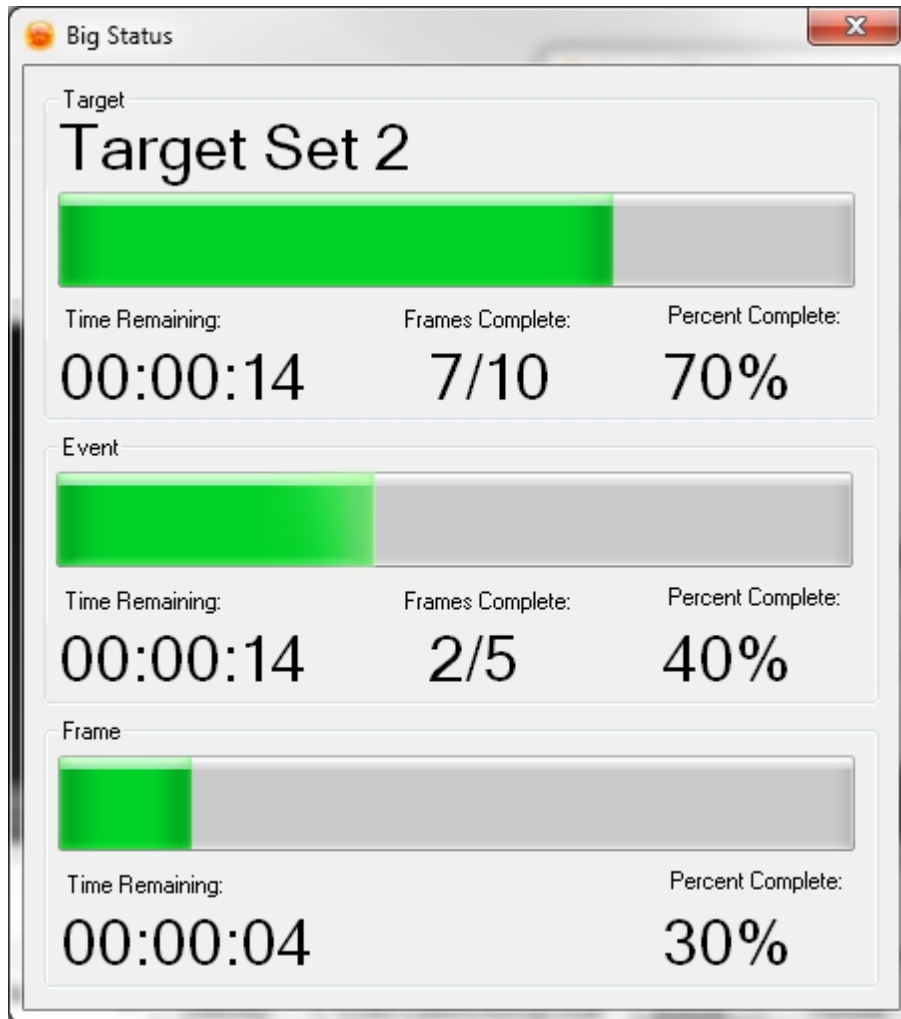
- *Total events complete:* Of the "active" events, what fraction have been completed
- *Total frames complete:* This is a sum of all frames from all "active" events and shows to total fraction completed
- *Remaining time:* This is an estimate of time remaining (It should be noted that this time does not account for overhead accrued by download time, pausing, running auto focus or any other activity that it outside the context of image integration time)

---

Created with the Standard Edition of HelpNDoc: [Free HTML Help documentation generator](#)

---

## Big Status



The "Big Status" does not provide any new or insightful information... it just makes it a lot bigger. Similar information is displayed in the [Sequence Status](#) and [Sequence Module](#).

Created with the Standard Edition of HelpNDoc: [Easily create HTML Help documents](#)

## Events

Events are the heart of Sequence Generator Pro. They define what type of frames you are after and many other attributes to fit your needs (explained below).

### Common Event Attributes

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
	<input checked="" type="checkbox"/>	Light	Green	G	10 m	1x1	6	0/6

- **Run:** If this box is checked, the sequencer will run the event, otherwise it will be ignored (the sequence will be considered complete without running it)
- **Type:** The event type (described below). All event types that are saved to disk will add the event type as a header. See [this section](#) for more details.
- **Filter:** The filter used in the event. (Note: If the filter list says only "None", it means that your filter list for this sequence has not been defined. Please [see this page](#) for help with that).
- **Suffix:** If defined as part of the [file naming pattern](#), this value will be added to the file's name when it is saved to disc. It is automatically populated when a filter is selected, but can be manually overridden.
- **Exposure:** The length, in seconds, of the exposure. Acceptable input is either a number like 600

(which will be interpreted as 600 seconds) or 10m which will be interpreted as the same.

- **Binning:** The binning level for the event (usually 1x1 through 4x4). It is possible that you can select a unsupported binning level when the camera is not connected and when the camera connects it will automatically select (and notify) that the closest available binning value has been selected.
- **ISO:** The ISO level for the image (For Canon camera only)
- **Repeat:** The number of time the event should be repeated (frames).

### Adding a New Event

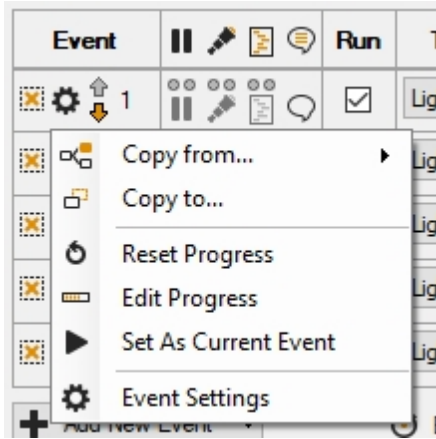


- To add a new event, navigate to the bottom left corner of the sequencer and click "Add New Event"
- Optionally, you can click the small arrow on the right and add a new event that is a copy of another existing event

### Event Icons and Actions



- **Delete Event ("X" Icon):** Clicking this button will permanently delete the event. You cannot delete an event that belongs to a target that is currently running.
- **Reorder Event (Arrow Icons):** Use these arrows to reorder events in a target (affects execution order). You cannot reorder an event that belongs to a target that is currently running.
- **Pause Indicator (Pause Icon):** This indicator will be "lit" if the event contains a pre or post pause instruction (see Event Setting below). The dots above the icon are representative of pre and post. If this icon is lit along with the left dot, it indicates a pre-event pause.
- **Park Indicator (Telescope Icon):** This indicator will be "lit" if the event contains a pre or post park instruction (see Event Setting below). The dots above the icon are representative of pre and post. If this icon is lit along with the left dot, it indicates a pre-event park.
- **Script indicator (Script Icons):** This indicator will be "lit" if the event contains a pre or post script instruction (see Event Setting below). The dots above the icon are representative of pre and post. If this icon is lit along with the left dot, it indicates a pre-event script.
- **Event Notifications (Spec Bubble Icon):** If the event contains any notifications, this icon will be "lit". These notifications normally contain some type of information indicative of an event error. See the section below labeled "Event Notifications" for more information.
- **Event Options (Gear Icon):** Clicking this button will show the event context menu (see section below for details).

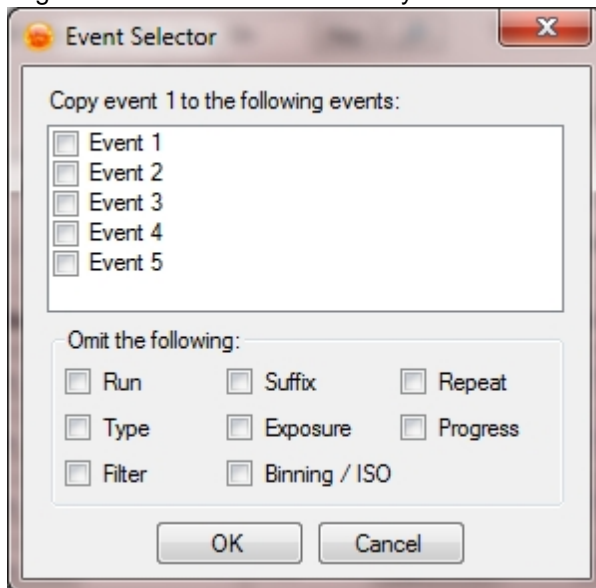


**Tip:** Double-clicking an event header will copy the value of event 1 into all of the other events.

### Copying Event Data

Using the context menu above, you can perform a variety of event copy operations:

- *Copy from:* Copy event settings from another event
- *Copy to:* Copy event settings from this event to one or more other events (place a check next to each target event and then select fields you want to omit from the copy operation):



- **Reset Progress:** This action will reset the progress of this event to zero.
- **Edit Progress:** Custom edit the number of frames captured (progress)
- **Set As Current Event:** This action will set the selected event as the current event. This means that when you start or resume a sequence, you are forcing it to start on this event. After start, the sequence will continue to select work normally. Setting of the current event can only be performed when a sequence is not running.

### Event Settings

The screenshot shows the 'Event 1' configuration dialog. It has two columns for 'Pre-Event Options' and 'Post-Event Options'. Each column contains:
 

- Park Telescope (with a telescope icon)
- Pause Sequence: (with a pause icon and a 'Message:' text box)
- Run Auto Focus on resume
- Manual Focus Reminder on resume
- Run script: (with a script icon and a 'Set' button)

 Below these is the 'Other Options' section with:
 

- Event Gain: 5 (dropdown)
- Event Offset: 10 (dropdown)

 At the bottom are 'Reset Progress', 'OK', and 'Cancel' buttons.

Every event has a set of associated options that can modify sequence behavior both before and after the event is started or completed.

*Park Telescope:* If this option is checked, the telescope will be parked when the event starts (pre) or ends (post).

*Pause Sequence:* If this option is checked, the sequence will be paused when the event starts (pre) or ends (post). When paused, a dialog containing the "Message" text will be displayed.

- *Run Auto Focus on resume:* If this option is checked, the sequence will force auto run when the user resumes.
- *Manual Focus Reminder on Resume:* If this option is checked, the sequence will force a manual focus reminder dialog when the user resumes.

*Run Script:* This will allow you to run a user created VBS or EXE script when the event starts (pre) or ends (post). Keep in mind that the sequence will not continue until the script complete. SGPro uses the Windows "cscript" VB engine. This means that you cannot use wscript interface elements (i.e. windows and dialogs). Everything in your script must be designed to run on the command line. Please see [Windows cscript documentation here](#). If your script hangs or never completes (closes), the sequence will hang with it...

*Event Gain:* If your camera supports gain, you may set per event gain here. If this is not set (and your camera supports gain), SGPro will use the default binning based gain defined in the [control panel](#).

*Event Offset:* If your camera supports offset, you may set per event offset here. If this is not set (and your camera supports offset), SGPro will use the offset provided in your camera driver.

*Reset Event:* This will reset the progress of the event (not its options or settings)

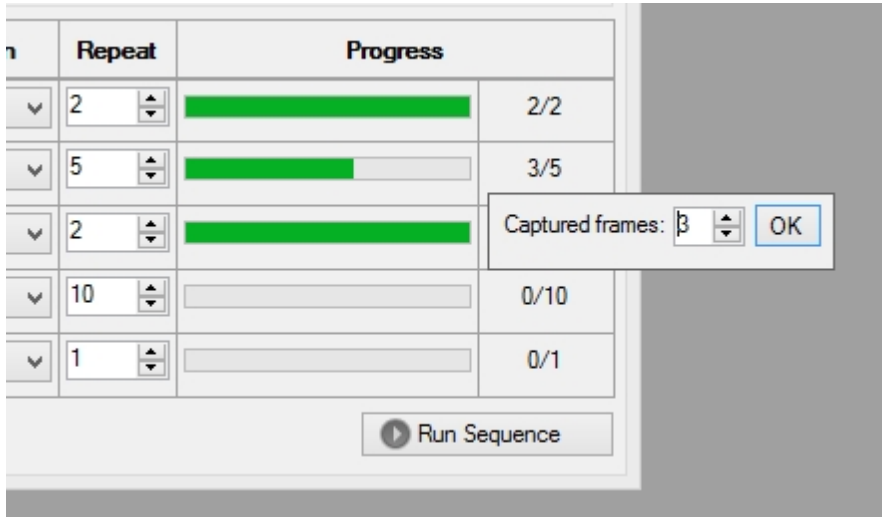
## Event Notifications

This section is used to convey critical information about the capture of frames in this sequence. If the event shows a "lit" speech bubble icon, there are notifications for that event. Clicking the icon open the [notification pane](#) and auto filter notifications only for that event. display window.

## Adjusting Capture History

It's unavoidable that you will capture some bad frames from time to time. In these cases, you may wish that the captured fraction no longer reflect the bad capture. This will help you to understand how much "good" data you have captured. To do this manually, simply double click the "fraction" or "progress bar" for the event you wish to alter:





From here, you can alter the number of frames you have actually captured for this event.

There are currently four different event types you can use in sequences. Each is described in detail below.

### Light Events

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Light	Lum	L	5.0	1x1	1	0/1

Light events are used to capture normal data representing your actual target.

### Dark Events

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Dark	None		5 m	1x1	1	0/1

Dark events are used to capture dark calibration frames. They don't require use of a filter, but need to be taken in an environment that does not allow light to hit the CCD (if you have light leaks, you can use foil to wrap around the nose). Furthermore, most dark frames are taken at the same exposure length and temperature as the corresponding light frames (some image processing applications can scale darks to any exposure length). It is acceptable to take these frames and build a library (such that you don't need to take them every imaging session).

### Bias Events

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Bias	None		0.00	1x1	1	0/1

Bias events are used to capture bias calibration frames. They don't require use of a filter, but need to be taken in an environment that does not allow light to hit the CCD (if you have light leaks, you can use foil to wrap around the nose). Furthermore, most bias frames are taken with the minimum allowable exposure time (set exposure time at 0). Some cameras (like the QHY8L) will require longer bias frame times. It is acceptable to take these frames and build a library (such that you don't need to take them every imaging session).

## Flat Events

Event	Run	Type	Filter	Suffix	Exposure	Bin	Repeat	Progress
1	<input checked="" type="checkbox"/>	Flat	Lum	L	2.00	1x1	1	0/1

Flat events are used to capture flat calibration frames. These frames should be taken during every imaging session because they depend on the alignment of the entire imaging train. Flat frames normally target a mean ADU of 22,000 to 25,000, but this will depend on camera and user preference. If your flats data is defined (per filter), selecting a flats event will automatically populate the saved exposure time (for the selected binning).

Created with the Standard Edition of HelpNDoc: [Produce Kindle eBooks easily](#)

## Automatic Camera Rotation

This topic is intended to convey the principles behind automatic camera rotation.

Camera rotation can occur either automatically with a mechanical rotator or manually using the "Manual Rotator". You can learn more about connecting and using rotators [here](#).

If you so desire, you can have Sequence Generator Pro automatically move the camera to any particular angle prior to starting data acquisition on a target. To do this, open that [target settings dialog](#).

**Note:** You must have a [plate solver](#) available in order to use automatic camera rotation.

In this dialog, on the left side near the bottom, you will see a check box labeled "On target start, rotate to":

**Target Settings**

Name:

**Location (J2000)**

RA:

DEC:

[Populate from link \(AstroBin, Telescopius or Flickr\)](#)

When target starts  SLEW to and then CENTER on location  
 SLEW to location  
 do not move to location

**Time Constraints**

Start at:   tomorrow

End at:   today

[Planning tools](#)

**Oth**

Rotate camera to:




camera will allow both 15.0° and 195.0°

If you check this box, the sequence will now require a rotator to be connected in order to run properly. When the sequence switches to this target, it will automatically invoke the rotator and move the camera to 15 degrees (Note that degrees in SGPro are standardized on east of north / counter-clockwise of north. Because angle can be given from any relative orientation in other apps, we recommend that you use angles only from plate solves conducted in SGPro).

**Important note:** The rotation value entered here is a *target value*. The actual value that is defined to be *acceptable* is defined by the angle defined above plus or minus some tolerance. The tolerance is user defined in the [plate solve settings dialog](#).

If you are familiar with the [Auto Centering](#) routine, Auto Rotating uses the same dialog to monitor status:

Center Scope and Rotate Camera for Rosette

Step 1	Action: <b>Determine Reference Frame Location</b>	RA: 6.527	Arcsec/pixel: 1.598
Status: <i>Completed! Reference frame solved.</i>		DEC: 5.020	Flipped: No
		Angle: 90.03	Confidence: 100

Step 2	Action: <b>Slew to Reference Frame / Rotate Camera</b>	Start RA: 0.000	End RA: 6.527
Status: <i>Completed!</i>		Start DEC: 0.000	End DEC: 5.020
		Rotator Start: 20.0°	Rotator End: 15.0°


Step 3	Action: <b>Validate</b>	RA Pixels: 0	RA Delta: 0.000
Status: <i>Running. Capturing new frame to validate location and camera angle (3s)...</i>		DEC Pixels: 0	Dec Delta: 0.000
		Rotator Delta: 0	


  

Location: **Total Error (1x1): 0 px (00:00:00.00)**  
 Rotation: **Total Error: 0 °**

Running attempt 1 (Max attempts: 3; Max Location Error: 15 px; Max Rotation Error: +/-3°)...

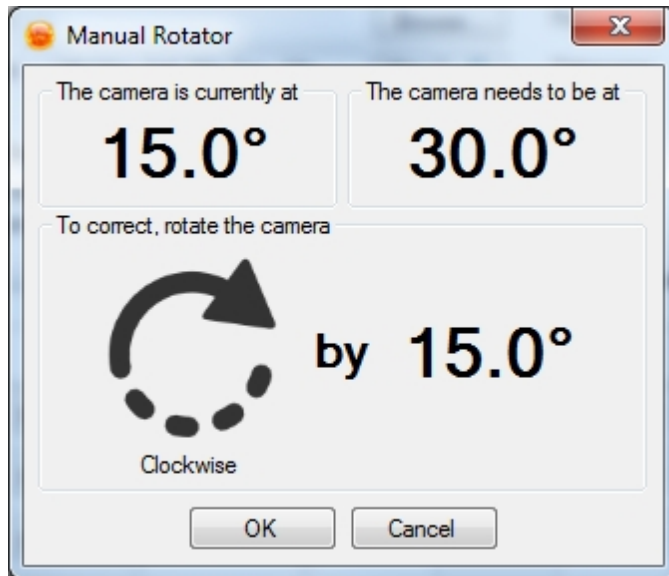
Attempt	Status	RA Error	DEC Error	Total Er...	Rot Error





Run Again
Abort

If you do not own a mechanical rotator, but you are interested in using Sequence Generator Pro to ensure that you camera is at the proper angle, you can still use the [Manual Rotator](#). When this rotator is connected, you still use the same exact process (as defined above), but instead of a rotator responding automatically you move the camera, you will be prompted with a series of dialogs that will help you find the correct positional angle manually. When the rotator attempts to move, you should see a dialog similar to this:



Follow these instructions and the camera rotation process will take care of the rest.

---

Created with the Standard Edition of HelpNDoc: [Easily create EPub books](#)

---

## Automatic Target Centering

This topic is intended to communicate how automatic centering is used within a sequence. For details on centering [go here](#).

The automatic centering routine will run during sequence execution when:

1. The target is set to [automatically center](#) when it begins
2. An [automatic meridian flip](#) is invoked

### Auto Centering as Part of the Target's Settings

**Target Settings**

Name:

**Location (J2000)**

RA:

DEC:

[Populate from link \(AstroBin, Telescopius or Flickr\)](#)

When target starts  SLEW to and then CENTER on location  
 SLEW to location  
 do not move to location

**Time Constraints**

Start at: °   tomorrow

End at: °   today

[Planning tools](#)

**Other**

Rotate camera to: °

camera will allow both 15.0° and 195.0°

As pictured above, when the "Center on" box is checked, the target will automatically invoke the center on the location data provided in the RA / DEC fields above.

### Auto Centering as Part of an Automatic Meridian Flip

Telescope Options

Park when sequence completes

Allow external control of telescope

Use Auto Meridian Flip

Mount settling time:  sec

When the "Use Auto Meridian Flip" box is checked, the routine will automatically invoke auto center after the mount has flipped (in order to correct mechanical inaccuracy introduced during the long slew).

Created with the Standard Edition of HelpNDoc: [Easily create iPhone documentation](#)

## Automatic Meridian Flip

### Automatic Meridian Flip

Automatic [Meridian Flip](#) allows your mount to automatically perform a meridian flip when set criteria are met.

These criteria can be found in the [Telescope Tab](#) of the [Control Panel](#). For more detailed information on how automatic meridian flips work, [go here](#).

Automatic Meridian Flip requires the following equipment:

- Telescope

- Camera
- Plate Solver
- PHD2 Autoguider

To use Automatic Meridian Flip connect the equipment mentioned above and select the "Use Auto Meridian Flip" Option in the Telescope control panel.

Telescope Options

Park when sequence completes

Allow external control of telescope

Use Auto Meridian Flip

Mount settling time:    sec

You may also manually invoke a meridian flip by clicking the "Run" button.

Clicking the "Set" button will open up the [Meridian Flip Options](#) dialog which will allow you to set options for how and when the automatic meridian flip will be executed.

---

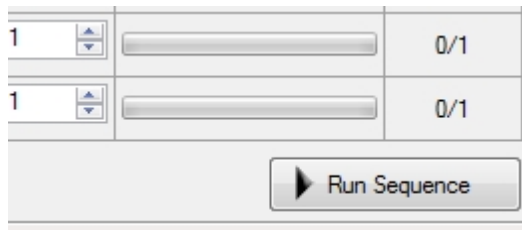
Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

## Starting, Pausing and Aborting

### Starting a Sequence

Starting a sequence is as easy as clicking a button (or pressing "F5"). Once all of the [events](#) are created and the [equipment](#) selected just click the "Run Sequence" button on the bottom left of the sequencer dialog.

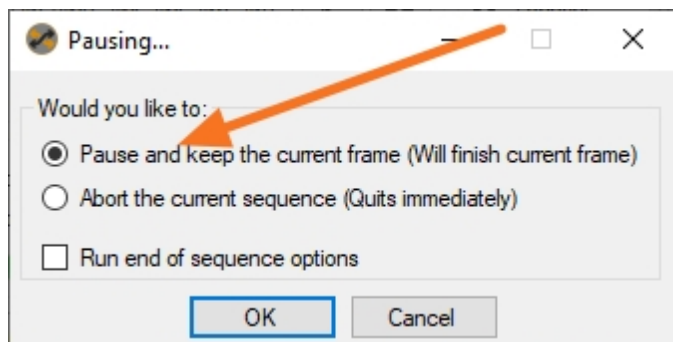


### Pausing a Sequence

When a sequence is running, that same button changes to "Pause Sequence". Clicking this button will present the following dialog that asks you to determine what type of pause you are after.

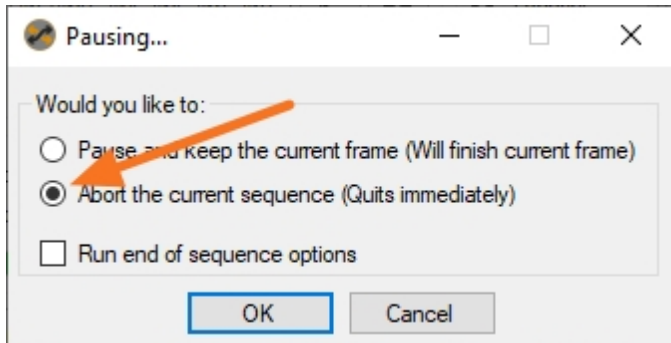
*Pause (no data loss):*

This option will allow the current activity (exposure) to continue. Once it is finished and saved to disk, the sequence will exit gracefully. Pausing a sequence will **not** run end of sequence options such as "[Park](#)", "[Warm up](#)" and "[Auto Guider Stop](#)".



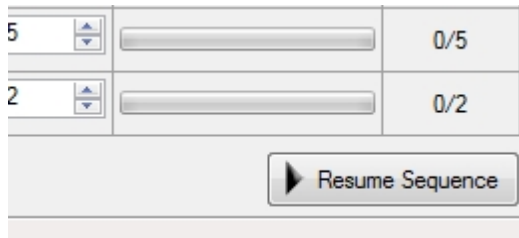
### Abort (data loss):

This option will abort the current activity (exposure) and quit immediately. Aborting a sequence will **not** run end of sequence options such as "[Park](#)", "[Warm up](#)" and "[Auto Guider Stop](#)".



## Resuming a Sequence

After pausing a sequence, resuming is as simple as clicking the "Resume Sequence" button (same button).




---

Created with the Standard Edition of HelpNDoc: [Free PDF documentation generator](#)

---

## Automatic Frame Restart

Sequence Generator Pro allows for automatic (in-sequence) restart of event frames that have errors in auto-guiding.

To use this feature, you must be using PHD2 auto guider.

Settings for this option can be found in the control panel in the [Auto Guider Tab](#).

Restart current frame when  
 guider distance >  pixels

If this option is checked, the frame will restart if the guider error is reported above the user defined value above. The frame will not restart until the guider error falls below the settling distance (also defined in the [Auto Guider Tab](#)).

When a frame restart occurs, an event notification will be generated that shows the relevant details (more information on event notifications [here](#)).

---

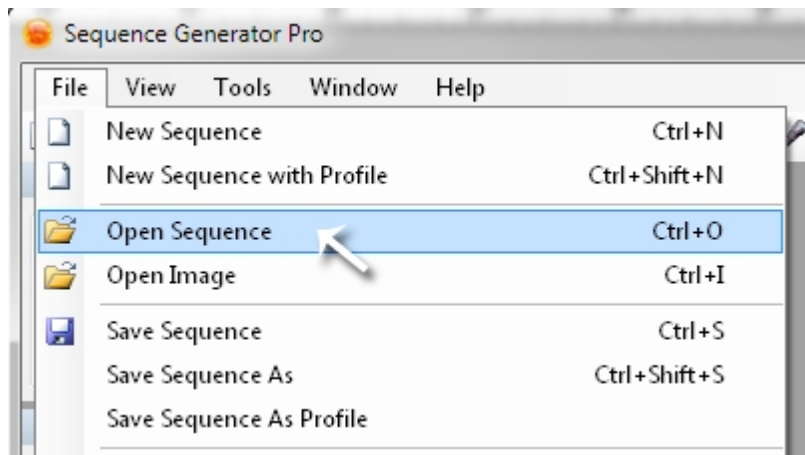
Created with the Standard Edition of HelpNDoc: [Create help files for the Qt Help Framework](#)

---

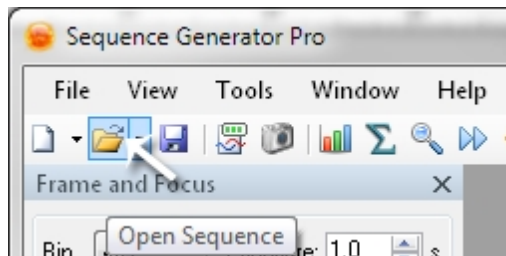
## Opening and Saving

### Opening

Sequences can be opened by going to the File Menu and selecting "Open Sequence".

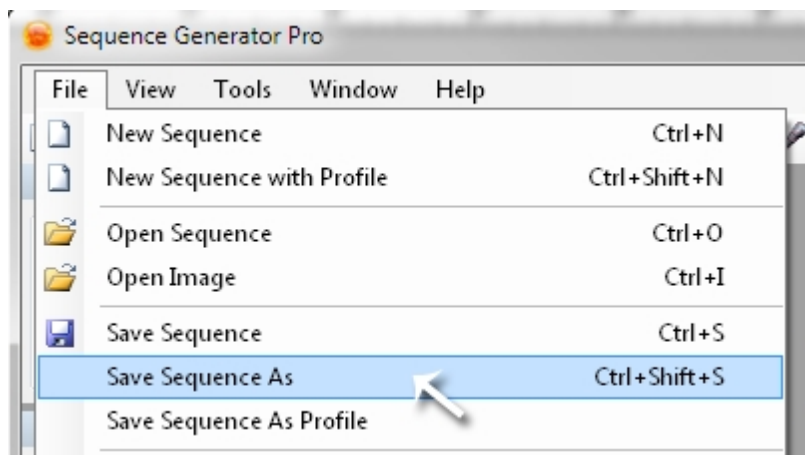


You can also click the "Open Sequence" icon on the Shortcut Bar or press Ctrl + O.



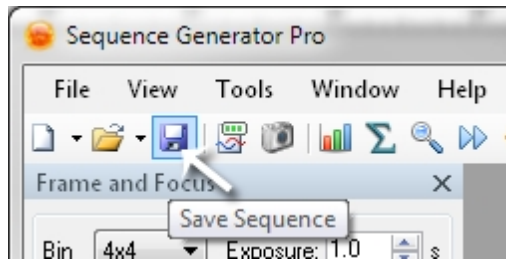
## Saving

Sequences can be saved by selecting "Save Sequence" or "Save Sequence As" from the File menu. A profile can also be created using the data from the Sequence. See [Save Sequence as Profile](#).



You can also save a Sequence by clicking the save icon.






---

Created with the Standard Edition of HelpNDoc: [Free EPub and documentation generator](#)

---

## Apply Profile to an Existing Sequence

### Applying a Profile to an Existing Sequence

In the case that you do not want to alter the actual [event data](#) and just want to apply a profile over the top of it, you can use the "Apply Profile to Sequence" option found in the "File" menu. This will not alter events, but will alter all other aspects of the sequence that are defined in the [profile](#).

Note: When performing this action, SGPro will do its best to map the filters of one profile (defined in events) to those of the new profile you are attempting to overlay. If a problem with the mapping is encountered, SGPro will produce a warning dialog letting you know that certain events need to have the filter reset manually.

---

Created with the Standard Edition of HelpNDoc: [Easily create Web Help sites](#)

---

## Status Area

In the bottom right hand corner of Sequence Generator Pro there is a status area that indicates what options are in use for a given sequence. When these are grayed out the options are inactive. For the most part, when you left click one of these icons it will enable or disable that feature. If you right click on it, it will open up settings for that particular feature.



### Focus:

- Star - [Auto focus](#) is in use
- Window - [Focus reminder](#) pop-up
- Thermometer - [Temperature Compensation](#)

### Target:

- Bulls Eye - [Auto Center](#)
- Clock - [Target start and end time](#)

### Scope:

- Telescope - [Park when sequence is complete](#)
- Globe - [Automatic Meridian flip](#)
- Time - this field will depend if "Automatic Meridian Flip" has been selected
  - If "Automatic Meridian Flip" is on then this will display the estimated time until the meridian flip. Or if it has already passed will display NA.
  - if "Automatic Meridian Flip" is off then this will display the time until the meridian is reached or the time past the meridian.

**Guider:**

- Arrows - Indicates [Dither](#) is active
- Loop Arrow - [Restart current frame](#) if auto guiding goes out of range.
- Stop Sign - Stop auto guider on sequence end.

**Recovery:**

- When the recovery light is green it is in the "on" position. It is gray when it is off. Please see the [automatic sequence recovery](#) section for more details.

**Safety:**

- When active, the sequence will abort when it receives an UNSAFE signal from the [safety monitor](#).

---

Created with the Standard Edition of HelpNDoc: [Full-featured multi-format Help generator](#)

---

## Data Stored in the FITS Header

Sequence Generator Pro will automatically record a variety of information in the FITS header (for sequence images). The text below is a comprehensive list of data that is conditionally stored in the FITS header. To view the FITS header for an image, see [this section](#).

*This data is always included in the FITS header:*

- **SIMPLE:** True (Conforms to FITS standards)
- **BITPIX:** 16 (16-bit image)
- **NAXIS:** 2 (Number of data axes)
- **NAXIS1:** Length of the X axis
- **NAXIS2:** Length of the Y axis
- **BZERO:** 32768 (Offset and data range of unsigned short)
- **BSCALE:** 1 (Default scaling factor)
- **OBJECT:** The name of the object (target)
- **DATE-LOC:** Local observation date (time image was written to disk)
- **DATE-OBS:** UTC observation date
- **IMAGETYP:** Type of frame (LIGHT, DARK, FLAT, BIAS)
- **CREATOR:** Capture software (Sequence Generator Pro / Lite)
- **INSTRUME:** Camera name
- **EXPOSURE:** Exposure time in seconds
- **XBINNING:** Camera X bin (always 1 for Canon cameras)
- **CCDXBIN:** Camera X bin (always 1 for Canon cameras)
- **YBINNING:** Camera Y bin (always 1 for Canon cameras)
- **CCDYBIN:** Camera Y bin (always 1 for Canon cameras)

*This data is included if you have a Canon camera connected:*

- **ISO:** The ISO level for this image

*This data is included if you have a temperature controlled camera attached:*

- **TEMPERAT:** Camera cooler temperature (recorded just prior to image download in case your camera turns off the cooler during this time)

*This data is included if you have a filter wheel attached (and the sequence is using it):*

- **FWHEEL:** Name of the connected filter wheel
- **FILTER:** Name of the current filter (the filter used to expose this image)

*This data is included if you have a focuser attached (and the sequence is using it):*

- **FOCUSER:** Name of the connected focuser
- **FOCPOS:** Absolute focuser position
- **TEMPCOMP:** Focuser temperature compensation (steps / deg) (only if you were using this option)
- **FOCTEMP:** Focuser temperature (not all focusers report temperature)

*This data is included if you have a telescope attached (and the sequence is using it):*

- **TELESCOP:** The name of the connected telescope
- **RA:** Object Right Ascension (as reported by the telescope at time of capture)
- **DEC:** Object Declination (as reported by the telescope at time of capture)
- **CRVAL1:** Object Right Ascension (as reported by the telescope at time of capture)
- **CRVAL2:** Object Declination (as reported by the telescope at time of capture)
- **OBJCTRA:** Object right ascension in HMS
- **OBJCTDEC:** Object declination in degrees
- **FOCALLEN:** The focal length of the current telescope
- **OBJCTALT:** The altitude of the object in degrees
- **AIRMASS:** The average airmass during the observation

*This data is included if you have performed a [solve and sync](#) prior to capturing the image:*

- **ANGLE:** The angle of the image (east of north)
- **SCALE:** The image's scale (arcsec / pixel)
- **PIXSCALE:** The image's scale (arcsec / pixel)

*This data is included if you have assigned a [user profile](#) to your sequence:*

- **OBSERVER:** Observer name
- **SITENAME:** Observatory / site name
- **SITEELEV:** Observatory / site elevation in meters
- **SITELAT:** Latitude of imaging site in degrees
- **SITELONG:** Longitude of the imaging site in degrees

---

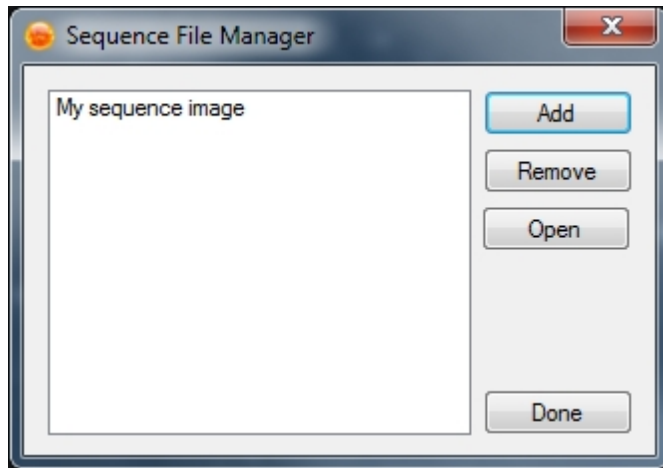
Created with the Standard Edition of HelpNDoc: [Free Kindle producer](#)

---

## Sequence Images

A Sequence Generator Pro sequence can associate external JPG images with the current sequences. These images, once associated, will be saved with the sequence file and, whenever the sequence is opened, the sequence images will be opened with it. This feature is useful if you want to store a reference image (like somebody else's image) in order to ensure the images you are taking resemble the reference. That said, a reference image can really be anything you want.

To use reference images, go to the "Sequence" menu and select "Manage Sequence Images". You will be presented a dialog that looks like this:



To add a sequence image, click "Add" and then select the appropriate JPG image. You will be required to give it a user friendly name. To remove this image from the sequence, simply click "Remove". Clicking open will allow you to re-open a sequence image if it was previously closed.

The feature integrates tightly with the Framing and Mosaic Wizard. When you create a sequence using this tool, you will be able to save the working canvas as a reference point. This will open up with your mosaic sequence so that you are able to remember what you were after when building it.

---

Created with the Standard Edition of HelpNDoc: [Full-featured Kindle eBooks generator](#)

---

## Sequence Recovery

### Sequence Recovery

Bad stuff happens... Sequence Generator Pro supports different kinds of recovery depending on your gear and situation.

#### Target Recovery

When SGPro encounters an error, the default behavior is to end the sequence and perform end of sequence options for your gear (park, CCD warm up, etc). Checking this option will provide basic recovery in that SGPro will only abort the current target and attempt to move to the next. This can be helpful if there is a chance that the view of the current target may have been obstructed, but the sky is still (mostly) clear. Click [here for more information](#).

#### Sequence Recovery Mode

This type of recovery is designed to resuscitate a sequence that has failed in some way... whether that be loss of a guide star or failure to make a precise pointing movement. Taking a minute to understand how this works can help prevent a loss of valuable imaging time due to a mishap early in the night. Click [here for more information](#).

#### Restart on Safe

This is exactly what it sounds like. If you have a safety monitor (weather monitor), SGPro will listen to it and shutdown your rig... park, warm up the CCD, etc. This recovery option will then restart the sequence and wait for your safety monitor to give the all clear. Click [here for more information](#).

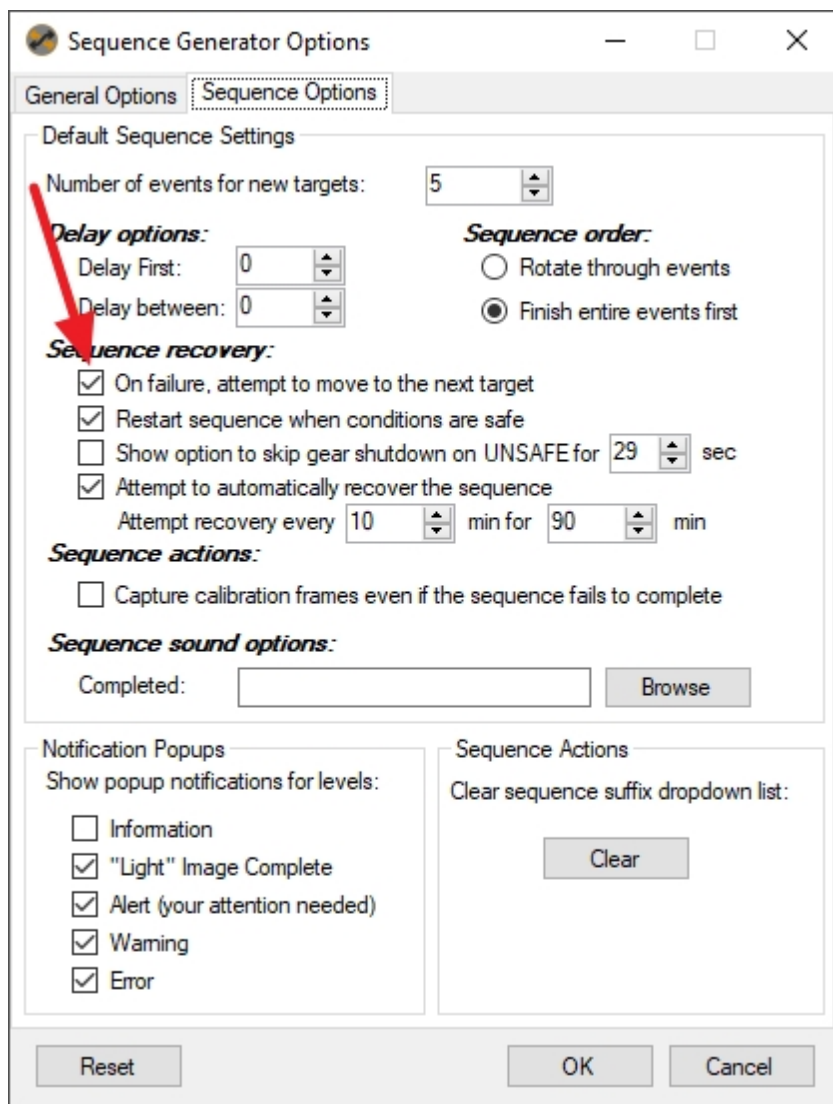
#### Capture Calibration Frames on Sequence Failure

If your luck has run, but you still have a bunch of calibration frames to grab, enable this option to grab everything it can before shutting down. Note that SGPro will park the mount and observatory and, for flats, enable your flat box. Click [here for more information](#).

## Target Recovery

### Target Recovery

When SGPro encounters an error, the default behavior is to end the sequence and perform end of sequence options for your gear (park, CCD warm up, etc). Checking this option will provide basic recovery in that SGPro will only abort the current target and attempt to move to the next. This can be helpful if there is a chance that the view of the current target may have been obstructed, but the sky is still (mostly) clear. To enable, turn it on in [Sequence Options](#).



## Sequence Recovery Mode

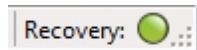
### Sequence Recovery Mode

Sometimes things go wrong...

In these cases, SGPro will attempt to be a bit more resilient, and, instead of simply aborting the sequence, it will try to recover itself. The failure might be due to loss of a guide star in PHD2 or passing clouds. This does not mean SGPro can magically repair catastrophic events like auto guider lockup or cable failure, but for situations where brute force repetition would work to manually repair a sequence's progress, the new recovery feature will also likely be helpful. Primarily, this recovery works well for things like passing clouds or loss of guide stars for any reason (like auto focus with an OAG). Here is a current set of events SGPro will now automatically attempt to recover from:

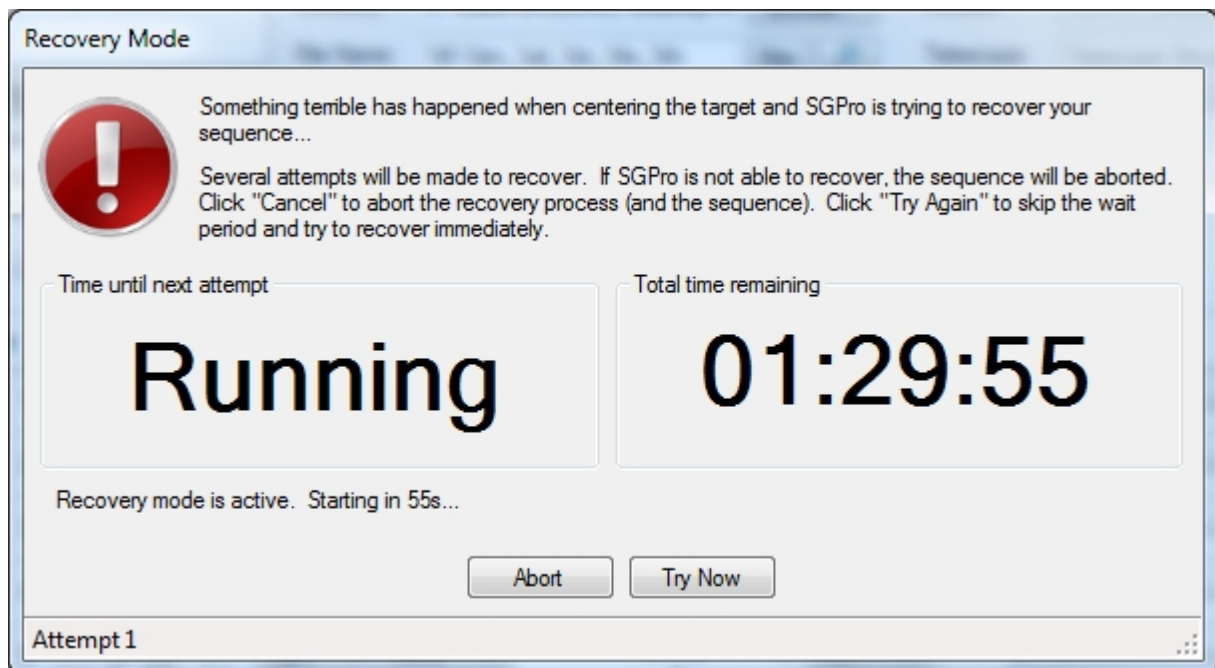
- Failure to settle the auto guider (PHD2) over a 5 minute period
- Failure in the centering routine on any step
- Failure on automatic meridian flip during solve and sync, auto center or resume guiding

If you have automatic sequence recovery enabled, you can ask SGPro to help you try and recover. This feature can be toggled on or off by going into the [options](#) dialog -> Sequence Options and then checking or un-checking the "Attempt to automatically recover the sequence" option. Alternatively, there is a "LED" light in the bottom right hand of the main SGPro window. If it is green, it indicates recovery is active. If it is gray, then recovery is not active. The options dialog will also allow you to set the frequency and duration of recovery attempts



The recovery mechanism will try to repair the sequence for 90 minutes with attempts at 10 minute intervals (by default... this can be altered in the options dialog).. If the sequence is not recovered after this time expires, it will abort. With this feature in place **it will be important to have tracking limits for your mount set that are external to SGPro** (like in your ASCOM driver). Auto recovery means that your end of sequence options like "park" may be delayed by up to 90 minutes. Alternatively, the recovery feature will honor your [target end times](#) and sequence end time so you can use those to protect your mount as well. As a final note, it is important to know that sequence recovery will also abort when the mount crosses the meridian (SGPro will do this for safety).

If you see this screen, recovery mode is active:



As mentioned above, SGPro will attempt to recover (by default) every 10 minutes for 90 minutes. If you want to bypass the 10 minute interval between attempts, simply click "Try Now". If you want to exit from the

recovery process and abort the sequence, click "Abort". You can set custom recovery parameters in the "[Sequence Options](#)" dialog.

Attempt to automatically recover the sequence  
 Attempt recovery every 10 min for 90 min  
**Sequence actions:**  
 Custom calibration frames even if the sequence fails to complete

Note: The attempt to recover your sequence will end:

- After 90 minutes have elapsed...
- OR when the scope passes the meridian...
- OR when the "[end time](#)" for this target is reached

---

Created with the Standard Edition of HelpNDoc: [Create HTML Help, DOC, PDF and print manuals from 1 single source](#)

---

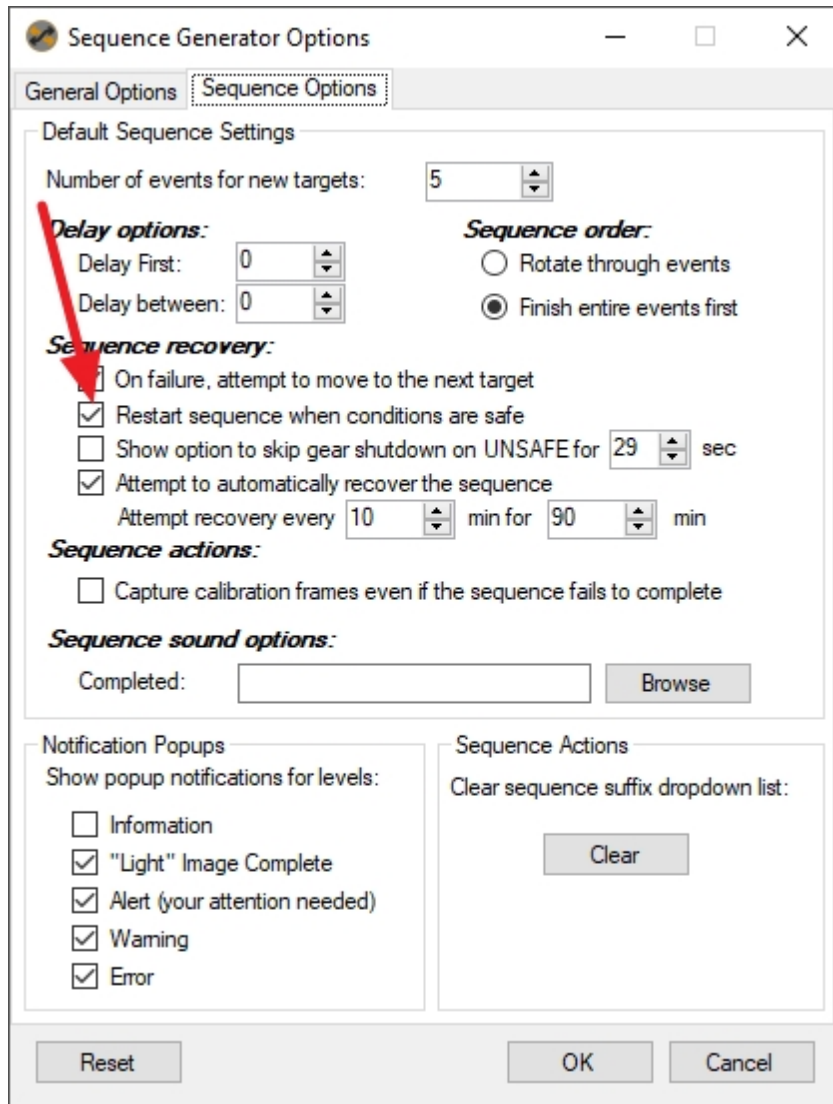
## Restart Sequence on Safe

### Restart Sequence on SAFE

SGPro is pretty good these days at providing you the ability to shut down the sequence and protect your gear when it detects an unsafe condition (assuming you have a safety monitor). This feature will allow for SGPro to automatically restart after an early termination.

This feature should only be used if you have SGPro and PHD2 setup such that you can load a sequence, connect all gear, do NOTHING ELSE, click "Run Sequence" and have success. If you require other manual operations to start your sequence, they will not happen during restart.

To enable Restart on Safe you will need to select the option in the Tools>>Options>>Sequence Options>>Restart Sequence when conditions are safe. You will also need a safety device connected.



When conditions are unsafe SGPro will run the “End of Sequence” options and then immediately restart the sequence and pause. This will almost certainly end up in a paused state where SGPro is waiting on the conditions to become safe. SGPro will wait indefinitely in this state and will require 5 continuous minutes (currently not editable) of safe conditions before it will restart (unpause) imaging. Because of this your “End of Sequence” options should be such that your equipment is in a safe position (mount parked, observatory closed, etc). If you fail to park or home your gear, it will continue to track while waiting for safe conditions.

When conditions become safe SGPro will perform a “Reset Sequence (Preserve Progress)”, select the target with appropriate start/end times and then run all of the normal “Run Sequence” events (cooling your camera, auto center, auto focus, starting guiding, etc).

---

Created with the Standard Edition of HelpNDoc: [Full-featured EBook editor](#)

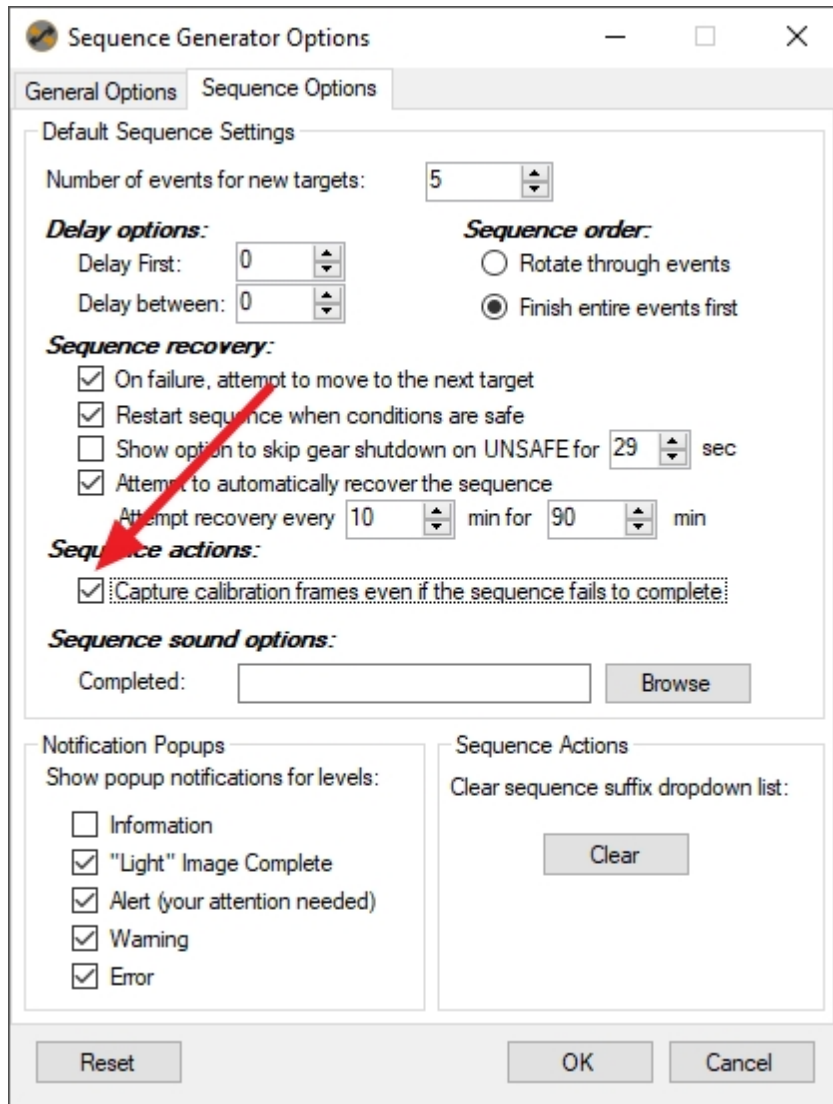
---

## Capture Calibration Frames on Failure

### Capture Calibration Frames on Sequence Failure

If your luck has run out, but you still have a bunch of calibration frames to grab, enable this option to grab everything you can before shutting down. Note that SGPro will park the mount and observatory and, for flats, enable your flat box. To enable it, check the box in [Sequence Options](#) as seen here:



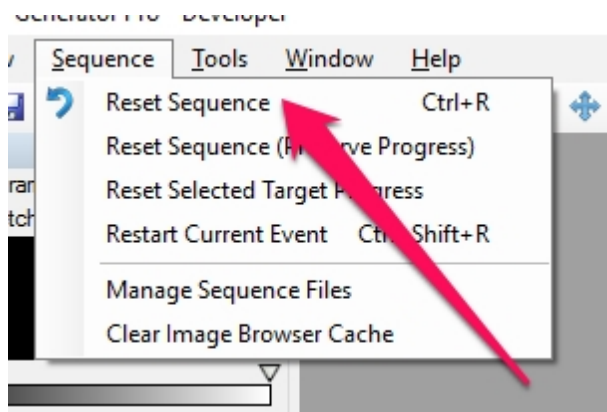


Created with the Standard Edition of HelpNDoc: [Free help authoring environment](#)

## Resetting the Sequence, Targets and Events

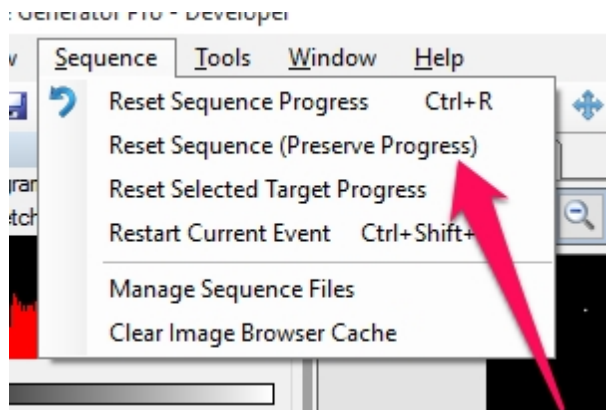
SGPro will let you reset the progress and state of a sequence at almost any level. You can reset the entire sequence, reset a single target or reset only a single event in a target.

At the sequence level, you have two different options:

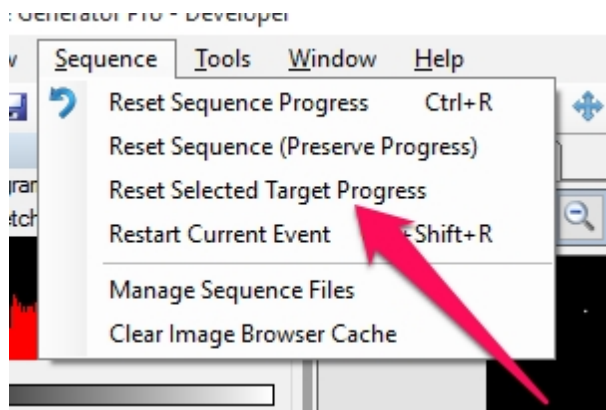


The first option will reset the sequence state **and** all of its progress. This is known as a full reset. Using this option clears any state the sequence was in:

- The sequence, when started will no longer be considered as "resuming", but rather starting. This can affect things like centering on the current target and auto focus.
- Elapsed sequence time
- The [auto focus](#) frame count (if using this as a trigger)
- The last focus temperature
- The last focus time
- [Average focus positions](#) for filters in this sequence
- If [event pre / post event actions](#) had been run, they will be cleared and marked as not run.
- All sequence and event progress



This option will reset the sequence's state (see above), but will not alter progress.



This will reset the state and progress of the selected target.

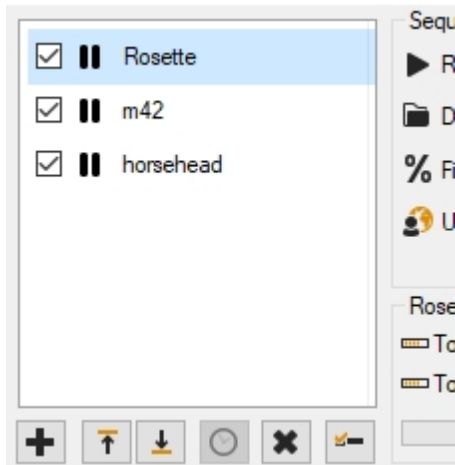
---

Created with the Standard Edition of HelpNDoc: [Qt Help documentation made easy](#)

---

## Target List and Settings

The Target List shows all targets for the current sequence (it will scroll when you have more than 5).



### Icons

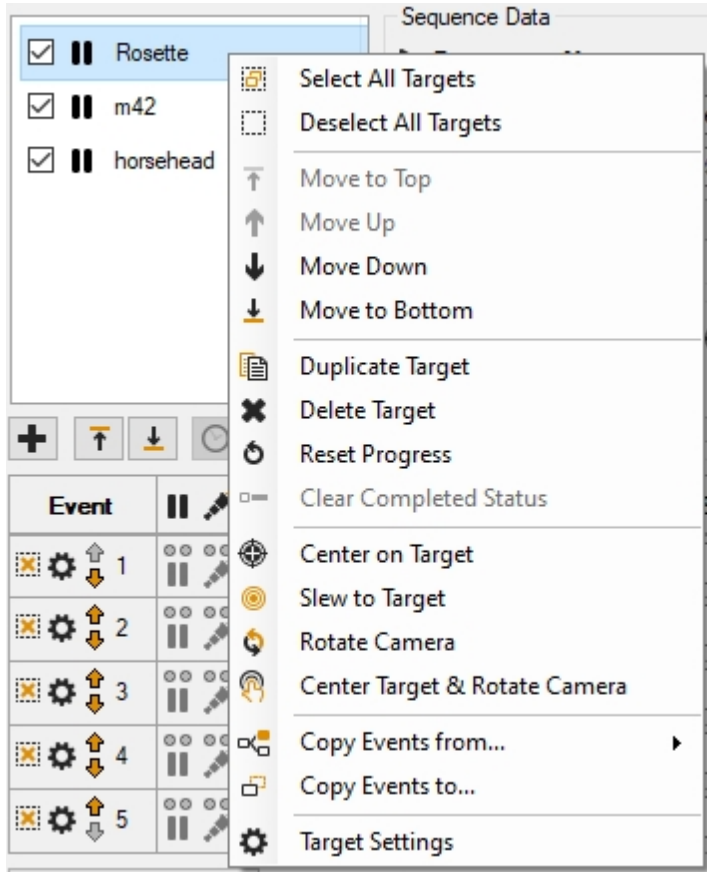
- *Pause Icon:* The target is not currently running, but has uncompleted work.
- *Play Icon:* The target is currently running.
- *Check Icon:* The target is complete.
- *Gear Icon:* Accesses the target's settings (see below).

### Action Buttons

- *Adding a New Target:* To add a new target simply click the "+" button and a new target will appear.
- *Moving a Target:* To Move a target, first select it and then click the up or down arrow.
- *Current Target:* Click the clock icon to select the target the sequence is currently running
- *Deleting a Target:* To delete a target, click on a target, then click the "x" button.
- *Settings:* To get to the target's settings, click the gear icon to the right of each target name.

### Target Actions

There are several actions that can be performed on targets by right clicking on them.



- *Select All Targets:* Checks (selects) all targets in the list.
- *Deselect All Targets:* Unchecks (deselects) all targets in the list.
- *Move Up / Down:* These actions are identical to the arrow buttons (Moving a Target) described above (they alter the target order).
- *Duplicate Target:* Create another target with settings and events identical to the selected target.
- *Delete Target:* This action is identical to the "X" button (Deleting a target) described above.
- *Reset Progress:* This will reset the progress of all events in the target and mark the target as incomplete (if it was previously complete).
- *Clear Completed Status:* WHEN a target stops (for any reason) and moves onto the next target, it is considered "done". If you want to add more events to a "done" target and then make it eligible for execution again, you will need to clear its "done" status. See sequencing for more information.
- *Center on Target:* This will perform a precision centering of the telescope on the target's location (see below). For more information on centering, [click here](#).
- *Slew to Target:* This will perform a low precision, standard telescope slew to the position defined in the location section.
- *Rotate camera:* This will rotate the camera to the angle specified in the "On start, rotate to" field (see below)
- *Center Target & Rotate Camera:* This will simultaneously perform these two operations (see above)
- *Copy Events From:* This will allow you to copy all of the events from another target to this target.
- *Copy Events To:* This will allow you to all of the events from this target to many other targets. This is very useful in situations where many targets have the same general composition of events (like when the [mosaic wizard](#) creates a sequence)

## Target Settings

Settings can be accessed by clicking the gear icon or by right clicking a target and then clicking "Target Settings". Note that the gear icon does not appear until you mouse over the targets list.

Each target has settings that will alter the behavior of the sequence. In addition, you will find several manual actions here (like slewing and centering).

- **Name:** This is the name of the target and is what will be displayed in the Target List. This is also the name that will be used when %tn is defined as part of the [target name](#). Note that, within a sequence, target names must be unique.
- **Location:** This is the exact location of the target's center. It is required if "Center On" or "Slew To" is checked. You can use the "[Solver](#)" tools to help populate this data (plate solving images, getting location data from the Internet, etc.). These fields are "free text" and will accept quite a large variety of formats (e.g. "20h58m54s +43°51'46" or "20:58:54 -43:51:46" or even decimal forms like 20.92). You can also paste text containing both RA and DEC into the RA field and it will properly populate both fields (most of the time... currently copying and pasting target data from Cartes du Ciel and Stellarium are known to be working, just copy the buffer into the "RA" field and SGPro will try to sort it out for you).
  - *Populate from web link:* Click this to auto populate the location fields with data from Astrobin or Flickr.
- **Slew Now:** This will perform a low precision, standard telescope slew to the position defined in the location section.
- **Center Now:** This will perform a precision centering of the telescope on the target's location. For more information on centering, [click here](#).
- **SLEW to and then CENTER on location:** If this option is checked, the sequence will automatically attempt to center the image on the defined location. In order to use this feature, you must have a plate solver and telescope connected. If you are guiding with PHD2, the sequence will attempt to stop and restart guiding automatically (on the new target). For more information on auto centering, [click here](#).
- **SLEW to location:** It is possible to simply slew to the target's location without going through a centering routine. Due to imprecise polar alignment, bad modeling data or mechanical imprecision, this will likely not get you pointing to where you want to be at for imaging. Using this can very easily yield a series of

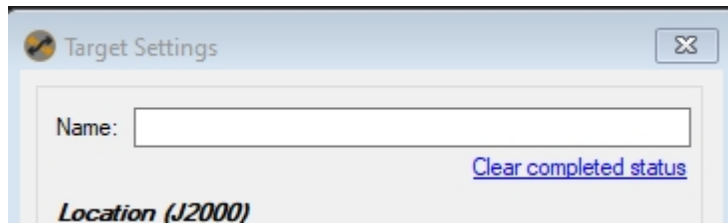
frames unsuitable for stacking.

- **Start at:** When this is checked, the target will not commence capture until the time / altitude constraint is met. This means that the sequence may sit idle for a bit (mount will still track). No date is required for the start time. This means that you are not required to update the date when using the sequence over multiple nights. This also means that SGPro must infer a date based on the time you entered. The inference system is fairly simply... sequences run in what is referred to as a "sequence day"... a period of 24 hours that spans from 0900 to 0900. The dates attached to those time will either be yesterday and today or today and tomorrow. This decision is made based on when you click the "Run Sequence" button. The start time also has a helpful indicator after that time that will read either "yesterday, today or tomorrow". This is to be interpreted as: The target start time will be at 07:24 today if you click the "Run Sequence" button **right now**. See the end sequence docs below for a couple examples of how time works within the bounds of a "sequence day".
- **End at:** When this is checked, the sequence will quit capturing frames for this target at the specified time (regardless of work remaining). At this point the next target in the sequence will run. No date is required for the end time. This means that you are not required to update the date when using the sequence over multiple nights. This also means that SGPro must infer a date based on the time you entered. The inference system is fairly simply... sequences run in what is referred to as a "sequence day"... a period of 24 hours that spans from 0900 to 0900. The dates attached to those time will either be yesterday and today or today and tomorrow. This decision is made based on when you click the "Run Sequence" button. The end time also has a helpful indicator after that time that will read either "yesterday, today or tomorrow". This is to be interpreted as: The target end time will be at 23:46 today if you click the "Run Sequence" button **right now**. Examples:
  - For a target that ends at 22:00, starting the sequence at 22:15 will skip this target, the sequence day will be 0900 today through 0900 tomorrow and the end time at 22:00 will be in the past. Conversely, starting at 21:45 would place the 22:00 end time in the future. Starting the sequence at this time will produce the same "sequence day".
  - For a target with an end time at 05:00, starting the sequence at 16:45 (more than 12 hours before the intended end time), the sequence day will be 0900 today to 0900 tomorrow and the end time of 05:00 will be in the future (this is the same example as above really... just illustrating that it still works when you are more than 12 hours away from the intended end time.
  - For a target with an end time at 22:00, starting the sequence at 01:00 will create a "sequence day" from 0900 yesterday to 0900 today. The end time of 22:00 will be assigned to the only 22:00 that occurs in this sequence day (yesterday), and will be skipped.
- **Altitude for start and end times:** Both **start at** and **end at** times have corresponding altitudes. The time and altitude, when possible, will always be in sync (meaning that if the target reaches the requested altitude, it will automatically fill in the time field). When they are in sync, they will contain a solid chain link icon between the altitude and time. When the time and altitude fields are not in sync, the chain icon will appear broken.
- **Locking altitude:** Either time or altitude must be fixed. By default the altitude field is not locked (fixed). This means that, unless overridden, time will be locked. When time is locked, it will not vary from night to night. If you end every night at 05:30 because of twilight, it is best to keep time locked. If you want to end when a target is at a certain altitude, regardless of time, click the lock next to the altitude control. When this is locked, it means altitude will not vary but the start or end time will. If you lock altitude, be sure that the altitude / time relationship is not broken (see above).
- **Planning tools:** Click the [Planning tools](#) link to open a visual planner for this target.
- **Automatic camera rotation:** This option will force the sequence to alter the angle of the camera prior to starting the target. More information on this can be found [here](#). A target angle can have two different meanings. The default is "+- 180 degrees". This means that if you enter 15 degrees for the target, either 15 or 195 degrees is OK. Switching sides of the meridian will also experience no change in camera rotation. This is just fine for most folks as processing software will take of the stacking and, even better, you will only need one set of flats. The other option is "Always". This means that the sequence will keep the camera angle at the angle you entered no matter what. So, if you flip, the camera will actually rotate 180 degrees to maintain that exact angle. This can be useful to keep the same guide star (OAG) in the CCD's FoV, but will require 2 sets of flats.

### Reset a Target's Completed Status

Once the sequence has moved on from a target, that target will no longer be eligible for starting (during this

sequence). When a target has been marked complete, a link reading "Clear completed status" will appear below the target name. Clicking this and clearing the completed status means that the target becomes eligible for selection when the current target is done.



Note: You can also clear a target's status by right clicking on it and clicking "Clear completed status".

Created with the Standard Edition of HelpNDoc: [Free PDF documentation generator](#)

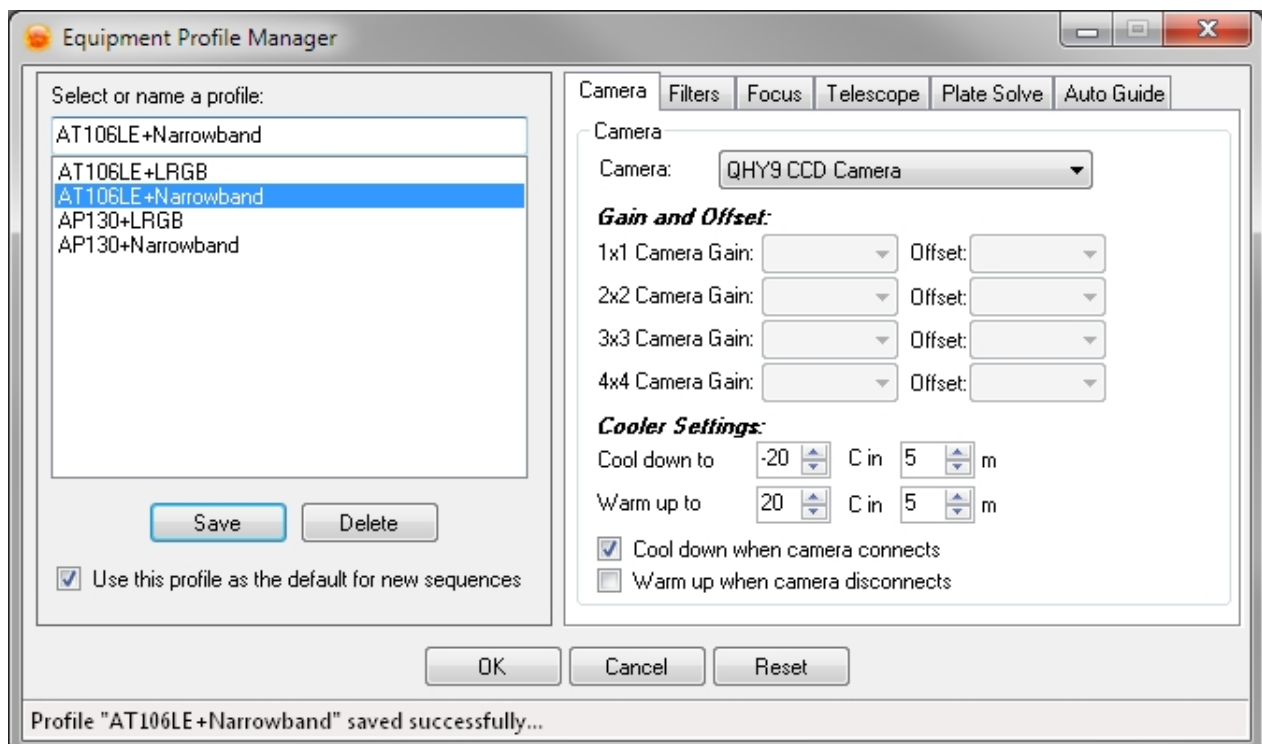
## Profiles

Profiles are one of the most important pieces of using Sequence Generator Pro. The profile system allows you to characterize your entire imaging system and even allows you to setup different profiles for different sets of gear or different settings that are needed when a single piece is swapped out. This can be a huge time saver and can prevent the introduction of errors if you have complex equipment interaction.

Sequence Generator Pro allows for the creation of two different types of profile, specifically [Equipment Profiles](#) and [User Profiles](#).

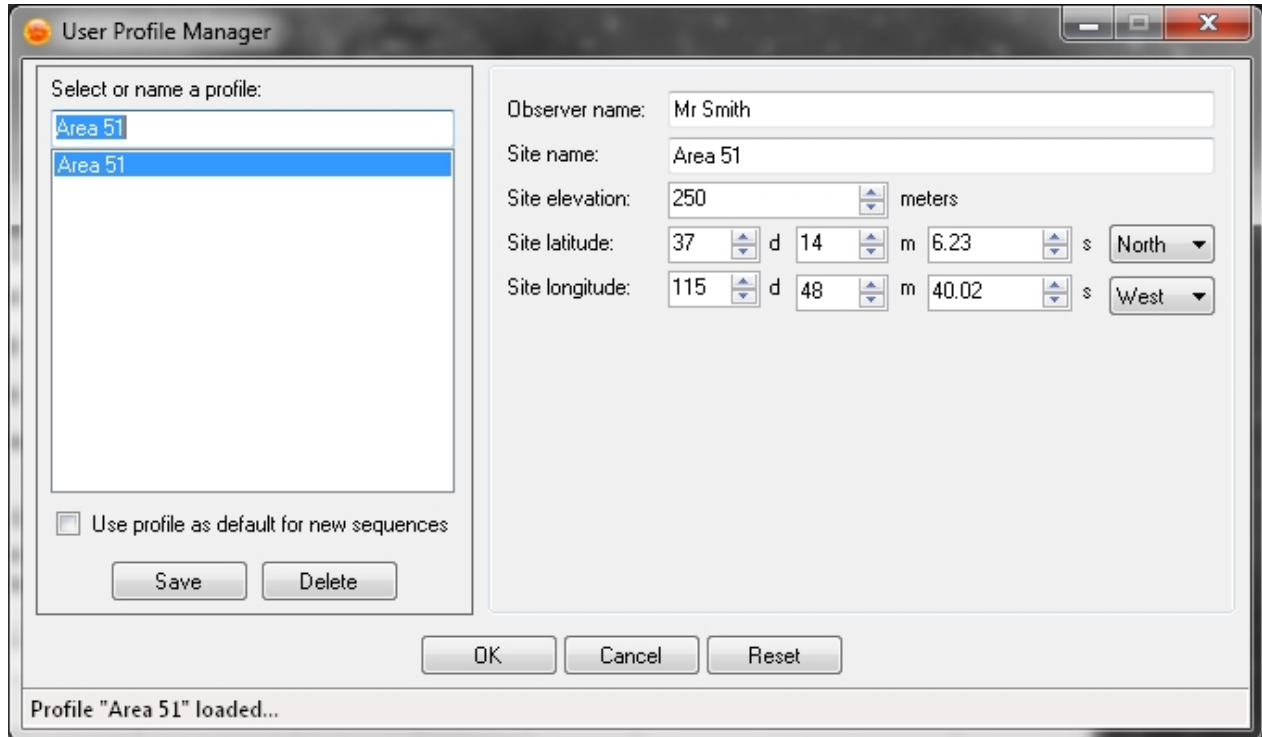
### Equipment Profiles:

These profiles are used to store settings for various permutations of gear. For instance, if you have a 5-position filter wheel and 7-filters, you will likely have a narrowband profile and a broadband profile. This makes creating new sequences a breeze (since you don't need to enter this information every time). Equipment profiles can be created in multiple ways but the most straightforward is to use the [Profile Manager](#). You can also use a [Sequence](#) to [Save the Sequence as a Profile](#).



**User Profiles:**

These profiles allow you to enter personal and location based data. When you [select a user profile as part of a sequence](#), this data will be stored in the FITS headers of every image saved to disk.



Created with the Standard Edition of HelpNDoc: [Create iPhone web-based documentation](#)

**Description**

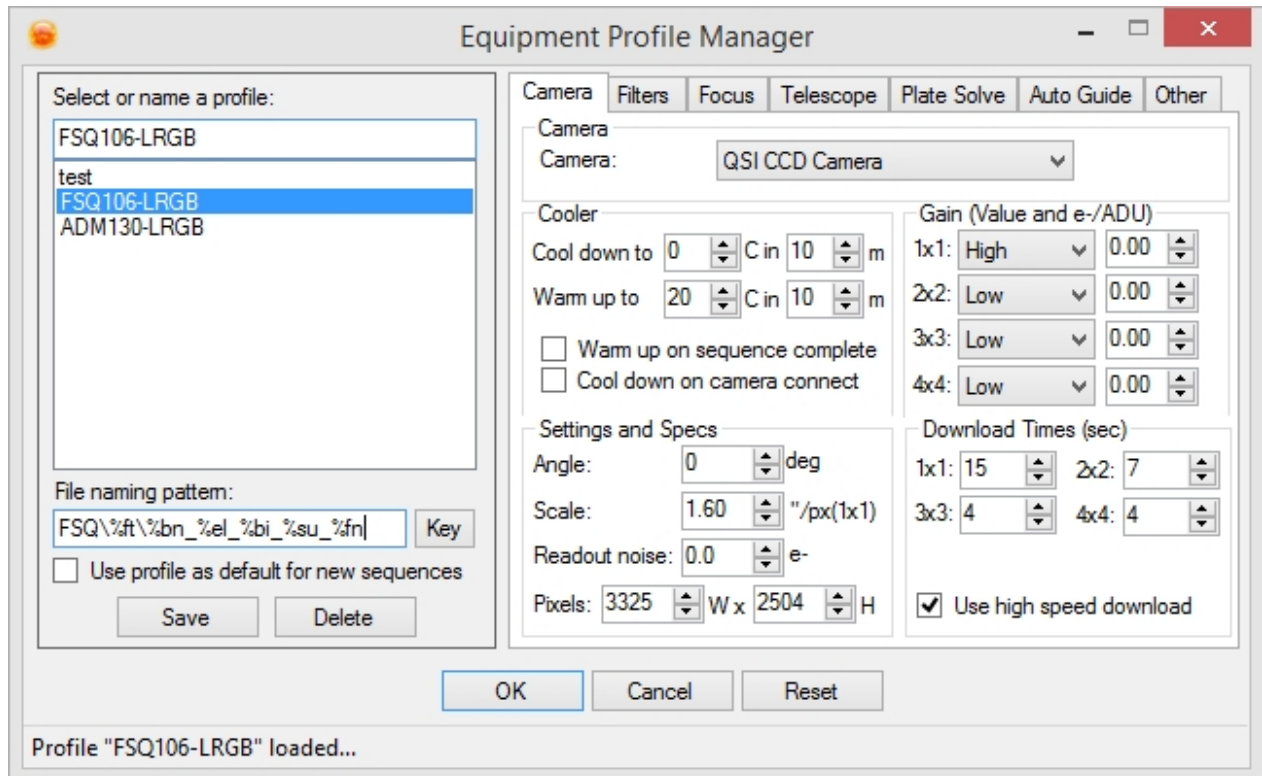
Profiles are one of the most important pieces of using Sequence Generator Pro. The profile system allows you to characterize your entire imaging system and even allows you to setup different profiles for different sets of gear or different settings that are needed when a single piece is swapped out. This can be a huge time saver and can prevent the introduction of errors if you have complex equipment interaction.

Sequence Generator Pro allows for the creation of two different types of profile, specifically [Equipment Profiles](#) and [User Profiles](#).

**Equipment Profiles:**

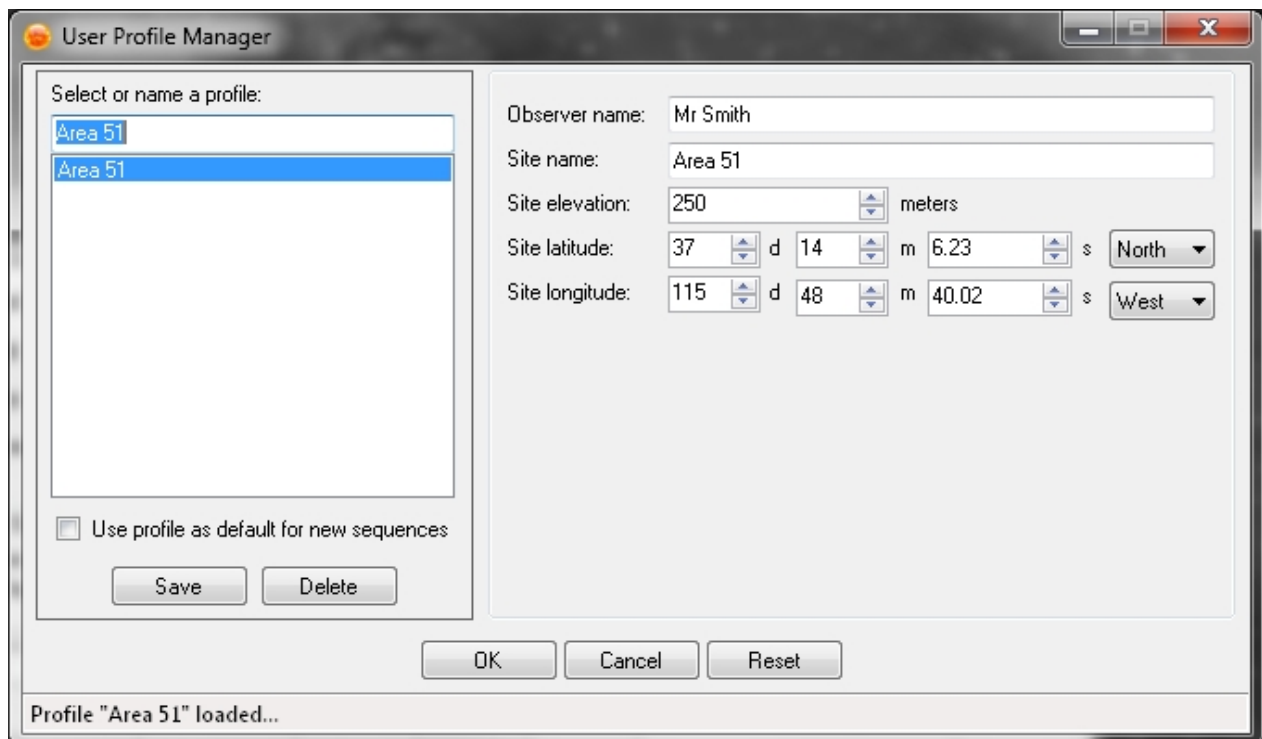
These profiles are used to store settings for various permutations of gear. For instance, if you have a 5-position filter wheel and 7-filters, you will likely have a narrowband profile and a broadband profile. This makes creating new sequences a breeze (since you don't need to enter this information every time). Equipment profiles can be created in multiple ways but the most straightforward is to use the [Profile Manager](#). You can also use a [Sequence](#) to [Save the Sequence as a Profile](#).





### User Profiles:

These profiles allow you to enter personal and location based data. When you [select a user profile as part of a sequence](#), this data will be stored in the FITS headers of every image saved to disk.



## Understanding Profiles / FAQ

### Understanding Profiles

Sometimes the equipment profile system can present a conceptual challenge to new users. It is not immediately clear how profiles work or what happens when you change one. This section will attempt to explain how one should go about using equipment / user profiles.

First, conceptually, you should view the profile system like you would view a template document for Microsoft Word. If you are not familiar with this concept, it basically allows you to load a Word template (like a form).

Then when you fill that form out it is saved as a separate Word document... it does not update the Word template. Also, when updating that Word template, it does not change the state of any documents that have been created using that template. So... to draw parallels, a profile in SGPro is like a Word Template. When you make a sequence with the profile (like making a Word document with a template), it will use all the profile's settings as a starting point. If you further modify settings on the sequence (change text in the Word template) and save it, this will have **no effect whatsoever** on the profile. Likewise if you alter a profile, it will have no effect on any sequences that were created using that profile as a starting point. Profiles and targets are loosely related, but are in no way connected to each other after the initial sequence is created from it.

## Profile FAQ

***If I have a sequence ready and I open the PM, change some setting, and save them (e.g. auto-focus settings) how does this affect the Sequence settings and the settings found on the Control Panel?***

At that point the PM does not change the sequence AT ALL. Think of the PM like a Word template. When you create a new Word document based on a template, that new document stands on it's own and will not be changed if you change the Word template. In the same way, when you create a new sequence based on a profile, the new sequence will stand on it's own. Changes made to the profile will not affect current sequences. Only NEW sequences based on a profile will include changes to the profile.

***If I change settings in the Control Panel (e.g. auto-focus settings), how does this affect the Equipment Profile settings and the Sequence settings?***

[/quote]

Changing something in the control panel only affects things in THAT sequence, it does not change anything in a profile.

***I have tried changing the settings (and saving them) in the Equipment Profile Manager, but these changes were not reflected in the Control Panel. Why? Are these changes taken into account by the Sequence?***

See answer to the first question. Also, if you make changes to an equipment profile, you can go to the file menu and choose to [apply \(or re-apply\) a profile to the current sequence](#).

***In the end, what manages/directs the Sequence? The settings in the Control Panel or the Equipment Profile Manager?***

A profile will never run a sequence... it just delivers settings to a sequence. Once a sequence has been created (from a profile), at that point it is just the settings in the control panel that matter.

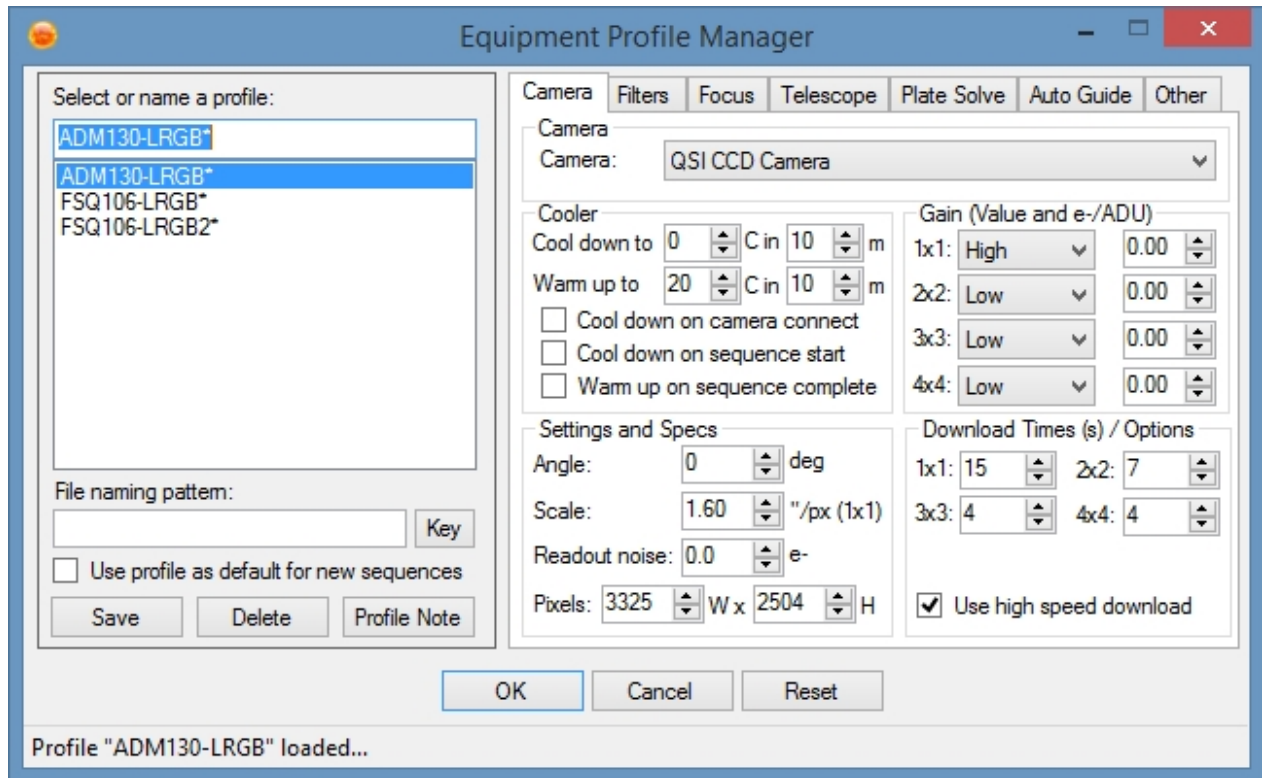
---

Created with the Standard Edition of HelpNDoc: [Qt Help documentation made easy](#)

---

## Equipment Profile Manager

*Description:* The Profile Manager is used to create, edit, delete and save profiles. A profile contains a description of hardware and settings that will later be used to create [sequences](#). A sequence created with a profile will automatically populate it with all the hardware and settings that were saved. The only reason Profiles exist is to create sequences with a set of equipment and options that are specific to your gear. Profiles without sequences are useless, with the exception of the default profile, which technically creates a new sequence when Sequence Generator Pro is first loaded (and when you create a "New" sequence).



The Profile manager is divided into 2 main parts. On the left is the Profile Selection area. On the right is the equipment area. Here the AT106LE+Narrowband is the active profile and any settings made on the equipment side will be saved to that profile when the save button is clicked.

#### You might create a new profile if (two simple examples):

- You have more than one imaging camera (like a CCD and a Canon)
- You have a single camera, but different filter sets (like broadband and narrowband)

#### Creating a New Profile

1. Using the provided tabs, select the options relevant to your setup.
2. When complete type a new profile name into the textbox below "Select or name a profile".
3. Click "Save"

#### Deleting a Profile

To delete a profile, simply highlight the profile and click the "Delete" button

#### File naming pattern

You can override the default file naming pattern for a particular profile by entering one here. If you just want to use the default naming pattern as specified in the [options dialog](#), you can leave this blank.

Each equipment tab (Camera, Filters, Focus...etc) in the Profile Manager is a near direct copy of the hardware **options** in the Control Panel. For this reason please see the sections in the control panel for a more detailed explanation of how these settings are used.

- [Camera](#)
- [Filters](#)
- [Focus](#)
- [Telescope](#)
- [Plate Solve](#)

- [Auto Guide](#)
- [Flat Box](#)
- [Rotators](#)
- [Observatories](#)

If you generally use the same equipment over and over again then you should select this profile and select to *Use this profile as the default for new sequences*. Each time you open Sequence Generator Pro your default profile data will be loaded into the [Sequencing](#) and [Control Panel](#) Windows

### Profile notes

If you'd like, you may add a set of notes to a profile... for instance if you have two very similar profiles and you can't quite remember when to use which, this might be very helpful. If a profile ends with an asterisk (\*) character, then that profile has a note you can view / edit by clicking the "Profile Note" button. Similarly, adding a new note to an existing profile can be created using the same button.

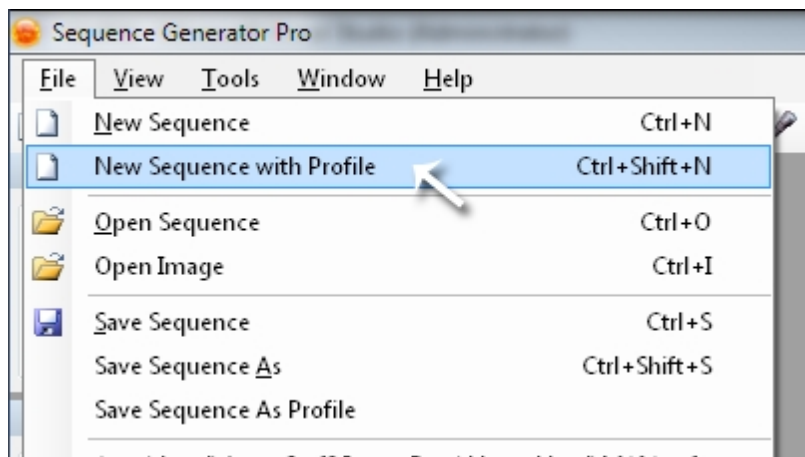
---

Created with the Standard Edition of HelpNDoc: [Easy EBook and documentation generator](#)

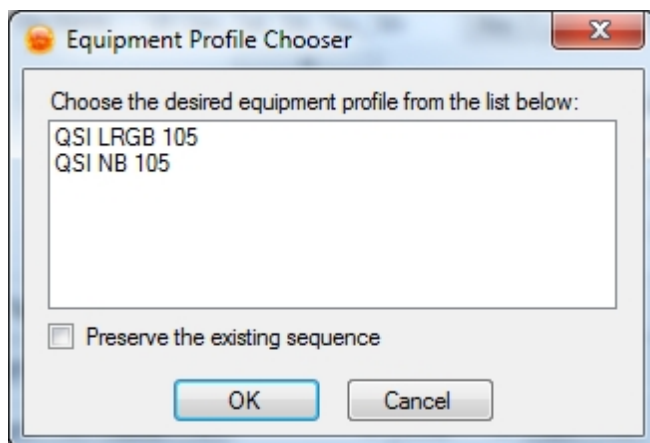
---

## New Sequence from Profile

*Description:* Once a profile has been created and saved you'll want to use that profile to create a Sequence. You can use your saved profiles by selecting "New Sequence with Profile" from the file menu or by pressing Ctrl+Shift+N.

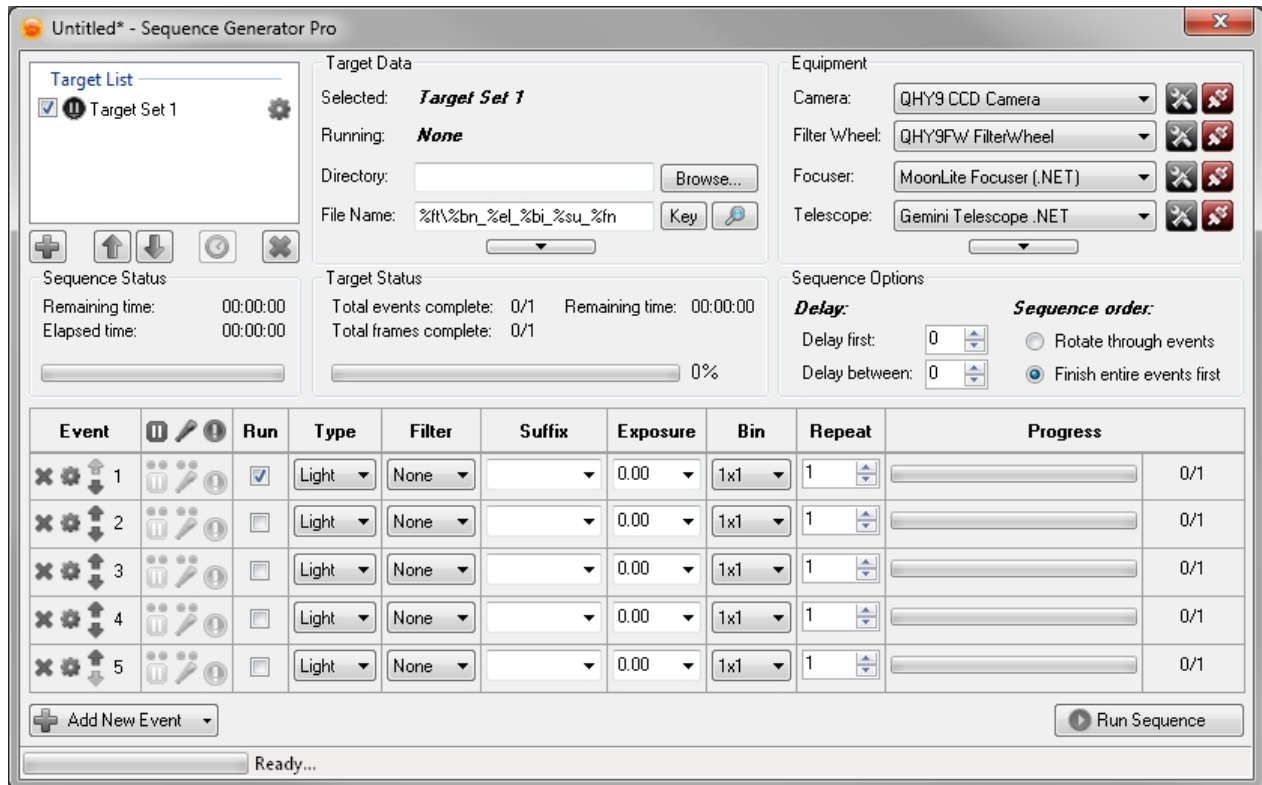


This will bring up the Equipment Profile Chooser Menu:



Select the profile you would like to use and click OK. Note that the "Preserve the existing sequence" option is not checked. This means that the new sequence will contain on the default target and one event.

Doing so will create a new unsaved Sequence with all your equipment data and settings populated. From here fill in the [sequence](#) specific information (such as [events](#)), connect your gear and you're ready to start imaging!



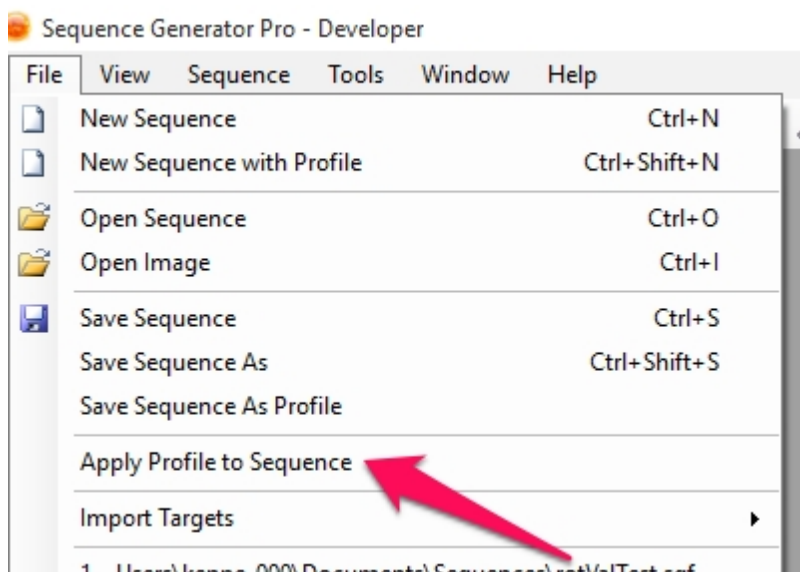
It is recommended to save your Sequences (especially if you have [auto save](#) turned off).

Created with the Standard Edition of HelpNDoc: [Produce online help for Qt applications](#)

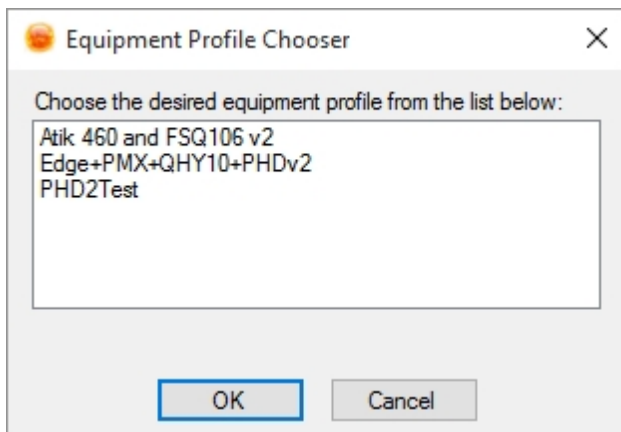
## Apply a Profile to an Existing Sequence

Applying a profile to an existing sequence (preserves target data and events) is very similar to [creating a new sequence from a profile...](#)

*Description:* Using an existing sequence (one with defined targets, events and frames), select "Apply Profile to Sequence" from the "File" menu.



This will bring up the Equipment Profile Chooser Menu:



Select the profile you would like to use and click OK.

Doing so will alter the equipment profile attributes of a sequence, but will not alter targets, events or frames. Keep in mind that the application of a new profile to an existing sequence could create some issues with filter settings. Because sequence events are not altered during this process, it is possible that it could be trying to use a filter that simply does not exist in the new profile. If this happens, SGPro will display a warning that you need to fix this event before running the sequence.

---

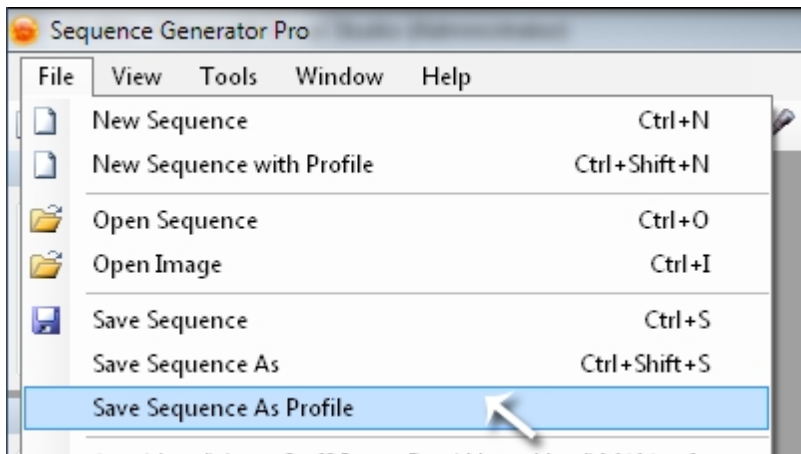
Created with the Standard Edition of HelpNDoc: [What is a Help Authoring tool?](#)

---

## Save Sequence as Profile

*Description:* In addition to creating profiles in the [Profile Manager](#) you can also create profiles from a [sequence](#). You can also use this method to update a profile which the sequence was made from.

To save a sequence as a profile select "Save Sequence As Profile" from the file menu:



If the sequence you're saving as a profile was created **with** a profile then that profile name will be pre-populated like below. Otherwise this field will be blank:



If you save over an existing profile all data in that profile will be replaced with the data in your sequence. This is useful if you created the profile when no equipment was hooked up and entered some incorrect information in the fields. If you don't want to override the profile you can enter a new name.

Once you've saved the profile it will show up in the [Profile Manager](#) and can be used to create sequences.

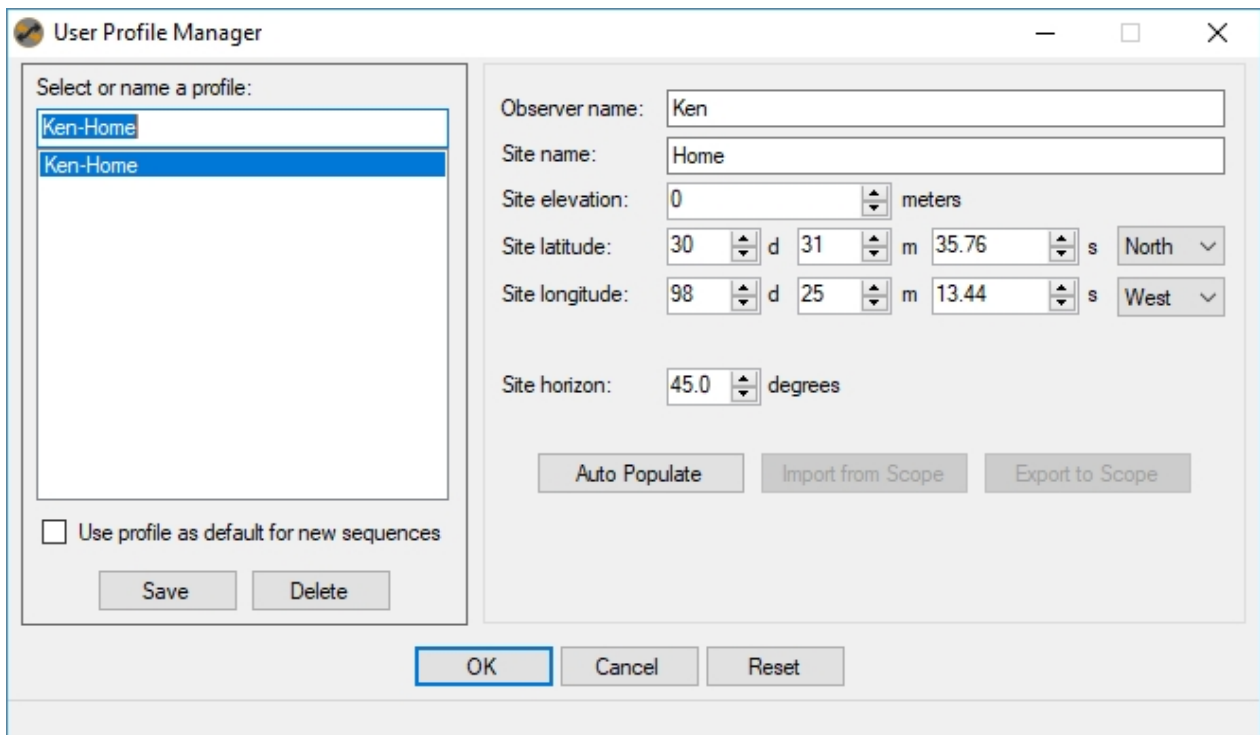
---

Created with the Standard Edition of HelpNDoc: [Free HTML Help documentation generator](#)

---

## User Profile Manager

User Profiles store site specific information. This information is then stored in the FITs header of your saved images. In general, this information is useful for astrometry measurement (or even for personal organization).



Selecting a profile as "default" means that all new sequences will automatically use this profile.

Auto Populate: If you have an Internet connection, you can attempt to auto locate your position. Please be careful with this... sometime internet geolocation is not so great.

Additionally, if you have a telescope (mount) connected, you can either:

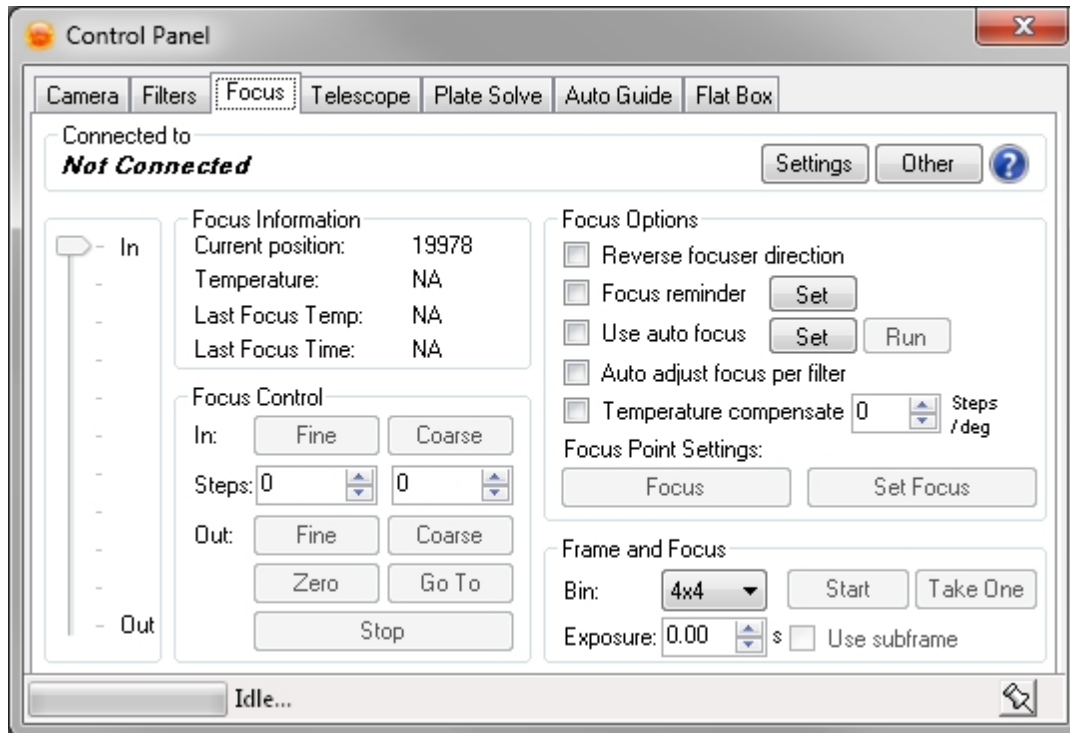
- Create a new user profile by clicking "Import to Scope" (this will query the scope for it's current latitude, longitude and elevation... must have been set by you in the past).
- Use an existing profile to set the current location of the telescope (this is very useful if you set up in

different locations). Proper latitude and longitude are import for determining time until meridian flip.

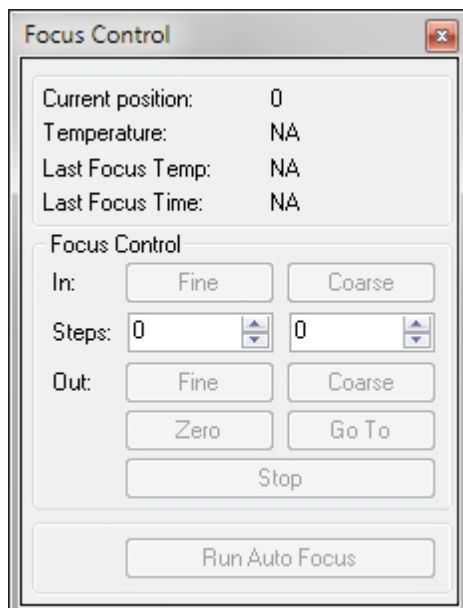
Created with the Standard Edition of HelpNDoc: [Create iPhone web-based documentation](#)

## Focusing

Focusing is very important and sometimes frustrating part of astrophotography. Sequence Generator Pro allows you to focus manually or automatically with multiple options and triggers for each type.



Above: [Focus control panel](#)



Above: [Focus Control Module](#)

Created with the Standard Edition of HelpNDoc: [Easily create Qt Help files](#)

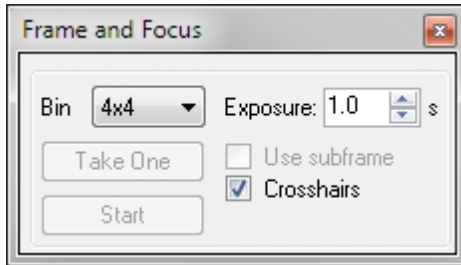


## Frame and Focus

*Description:* Frame and Focus can be run from the Focus tab in the Control Panel or the Focus Module. It allows for images to be taken in quick succession when using a Bahtinov mask or other focusing aid (for manual focus).



Above [Focus Control Panel](#)



Above [Frame and Focus Module](#)

To focus manually, connect your [camera](#) to Sequence Generator Pro:

- Find a bright star.
- Set your bin and Exposure settings to a reasonable value for the target you're focusing on (for broadband filters, typically 1 or 2 seconds is sufficient).
- Start a continuous capture loop by pressing "Start" on the Frame and Focus Module or on the Focus Control Panel (for [EOS](#) cameras you can also use Live View).
- Move your focuser towards the focus position by turning the focus knob or by controller the stepper motor through the [Focus Control Panel](#)
- Continue moving the focuser until you are in focus.

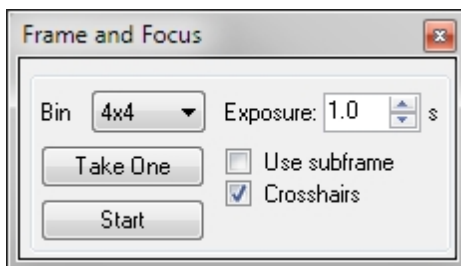
This procedure can be enhanced by setting up a [Target and Focus Position](#) in the telescope tab.

---

Created with the Standard Edition of HelpNDoc: [Generate EPub eBooks with ease](#)

---

## Using Subframes



1. Take a full image at any supported binning (with "Take One"). Make sure "Use subframe" in the frame and focus module is **not checked**.
2. Now, Check "Use subframe" in the frame and focus module.
3. Draw a rectangle onto the image you just took. This rectangle is now saved as the subframe area.
4. Now clicking "Take One" or "Start" (with "Use subframe" checked) will use the subframe. Unchecking "Use subframe" will begin full frame exposures again. While capturing subframes you can switch between binning modes without losing track of the area you selected.

Notes:

1. Taking a new frame and focus frame at a binning level different from the one at which the subframe area

- was selected, it will be removed. You will need to reselect the area using the new frame.
2. You are free to rotate images when using the subframe option.
  3. When "use subframe" is checked, you will only be able to draw subframe selection areas on "frame and focus" type frames (i.e. not on your light frame or others).

---

Created with the Standard Edition of HelpNDoc: [Free help authoring tool](#)

---

## Setting Focus and Target Positions

*Description:* Setting Focus and Target Positions helps to quickly slew to a focusing star and then get back on target quickly. If you're using [automated focusing](#) there is no need to setup the target and focus frames as Sequence Generator Pro will use your target position for computing focus.

To set the Focus and Target Positions you can use either the Control Panel or the Focus Target Module



Above: [Focus Control Panel](#)



Above: [Focus Target Module](#)

To setup the Focus and Target Positions first connect a [telescope/mount](#) to Sequence Generator Pro:

- Slew to the Focus Position
- Click the "Set Focus Position" (if using the module click "Focus Position")
- Slew to the Target Position
- Click the "Set Target Position" (if using the module click "Focus Position")

To use these settings:

- When you need to focus click "Goto Focus"
- Once you've finished focusing click "Goto Target"

When using this method, it can often be helpful to set [manual focus reminders](#). These will allow you to set triggers that pause the sequence and allow you to refocus prior to continuing.

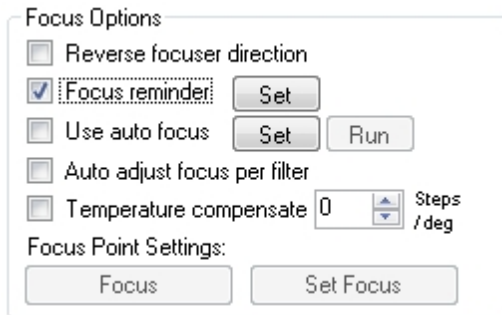
---

Created with the Standard Edition of HelpNDoc: [Free Web Help generator](#)

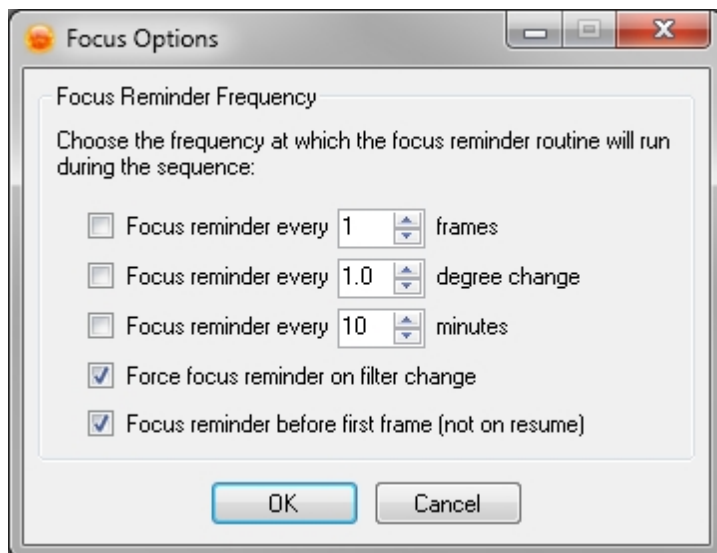
---

## Manual Focusing Reminders

*Description:* Manual focus reminders will pause the sequence and alert you when it's time to focus. You can find these options in the [Focus Control Panel](#) as well as the focus tab of the [Profile Manager](#).



To enable manual focus reminders click the "Focus reminder" check box. To set these options click the "Set" button which will bring up the following dialog where you can define when you want to be reminded to run focus:



### Options:

- *Focus reminder every X frames:* This will remind you to focus after X frames have been taken.
- *Focus reminder every X degree change:* This will remind you to focus after the temperature has changed by X degrees from the start of the sequence or from the last focus time. This requires that you have a focus controller that reports temperature.
- *Focus reminder every X minutes:* This will remind you to focus after the elapsed time has passed from either the start of the sequence or since the last focus time.
- *Force focus reminder on filter change:* When checked this will prompt you to focus when the filter is changed even if the criterion for the selected trigger has not been met.
- *Force reminder before first frame:* When checked this will prompt you to focus before the sequence starts (not applicable to "resuming a sequence"). The idea is that resuming a sequence will still depend on factors set previous to the pause and resume interval (like time or temperature).

---

Created with the Standard Edition of HelpNDoc: [Create help files for the Qt Help Framework](#)

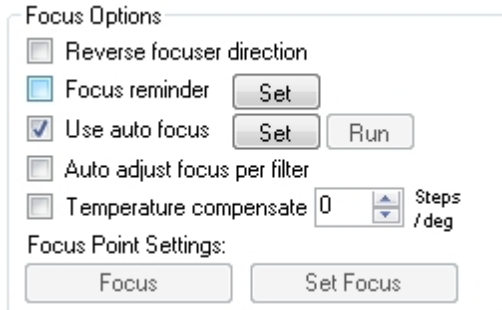
---

## Auto Focus

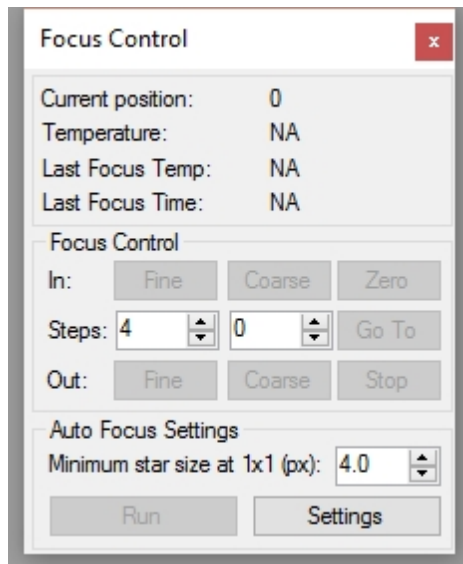
*Description:* Auto focus is an excellent step towards automated imaging. If setup correctly you can complete an entire imaging run with little to no interaction with your equipment once the "[Run Sequence](#)"

button is clicked. Auto focus assumes that you're already well focused with a Bahtinov Mask or some other focusing aide. The intent of auto focus is not to take you from completely out of focus to in focus, but to keep you in focus throughout the entire night. For more information on how auto focus works and how to best tune your setup to get the most out of auto focus please see [Understanding Auto Focus](#).

Auto focus can be invoked by using the Focus Control Panel or the Focus Module:



Above: [Focus Control Panel](#)



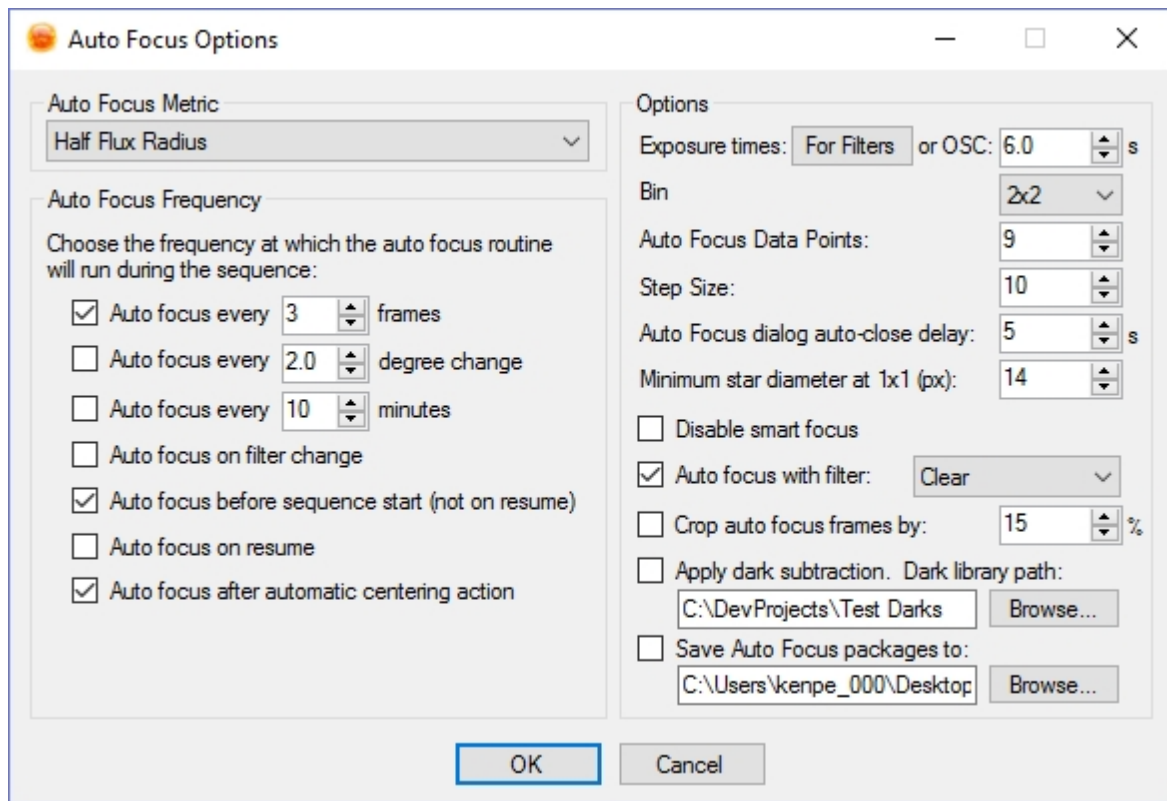
Above: [Focus Control Module](#)

## Setup

The majority of the auto focus options can be found in the [Profile Manager](#) under the Focus Tab, these options are also available at a sequence level in the [Control Panel](#). The illustrations below are from the Control Panel. Clicking the "Set" button next to the "Use auto focus" option will bring up the Focus Options Window.

The text below will describe what each fields represents, but will probably not leave you with a great feeling in terms of how to tune these setting for you rig. For that we have devised [this section](#) which, we hope, will help get you up and running with AF pretty quickly.

To use Auto Focus you will need to have a [camera](#) and a [focuser](#) which can return its absolute position.



## Options:

- Auto Focus Metric: Specifies the provider of the focus metric.
  - *Half Flux Radius*: Uses the Sequence Generator Pro "whole image" HFR (Half Flux Radius) metric for auto focus. Generally HFR is considered to be a more robust metric than FWHM.
  - *Full Width Half Max*: Uses the "whole image" FWHM (Full Width Half Maximum) focus metric. ***This metric requires that Pinpoint is installed!***
- Auto Focus Frequency: Specifies when Sequence Generator Pro should trigger an auto focus run
  - *Auto focus every X frames*: This will trigger auto focus after every X frames.
  - *Auto focus every X degree change*: This will trigger auto focus after every X change in degrees Celsius. This is probably one of the better methods to use as it best reflects why focus needs to happen (other than filter changes).
  - *Auto focus every X minutes*: This will trigger auto focus every X minutes during a sequence. It will not interrupt frames, but rather will wait until the current frame completes to run the auto focus routine.
  - *Force auto focus on filter change*: When checked, auto focus will run when the filter is changed even if the criterion for the selected trigger has not been met.
  - *Auto focus before first frame*: When checked this will auto focus before the sequence starts (not applicable to "resuming a sequence"). The idea is that resuming a sequence will still depend on factors set previous to the pause and resume interval (like time or temperature).
  - *Auto focus on resume*: will initiate Auto Focus if the sequence is paused and then resumed.
  - *Auto focus after automatic centering action*: Will initiate Auto Focus after performing an [automatic meridian flip](#) or an [automatic centering](#). This is useful if you are imaging with a mirror and the centering action causes an undesirable shift in the mirror due to gravity.
- Star Detection
  - *Minimum Pixel Size (at 1x1 binning)*: This is used to remove false stars from the HFR measurement. You can tell if you need to adjust this by visually inspecting the "AF boxes" overlay (tip: it is easier to adjust this from the focus floating module... adjusting it changes star detection in real time so you can quickly see how your results are affected). It is important to note that this setting is adjustable "per-target" and self-adjusts for binning. This means that if your 1x1 minimum diameter is 8 pixels, then 2x2 binning will have a minimum diameter of 4 pixels. This will prevent you from needing to adjust this if you change your auto focus binning mode.

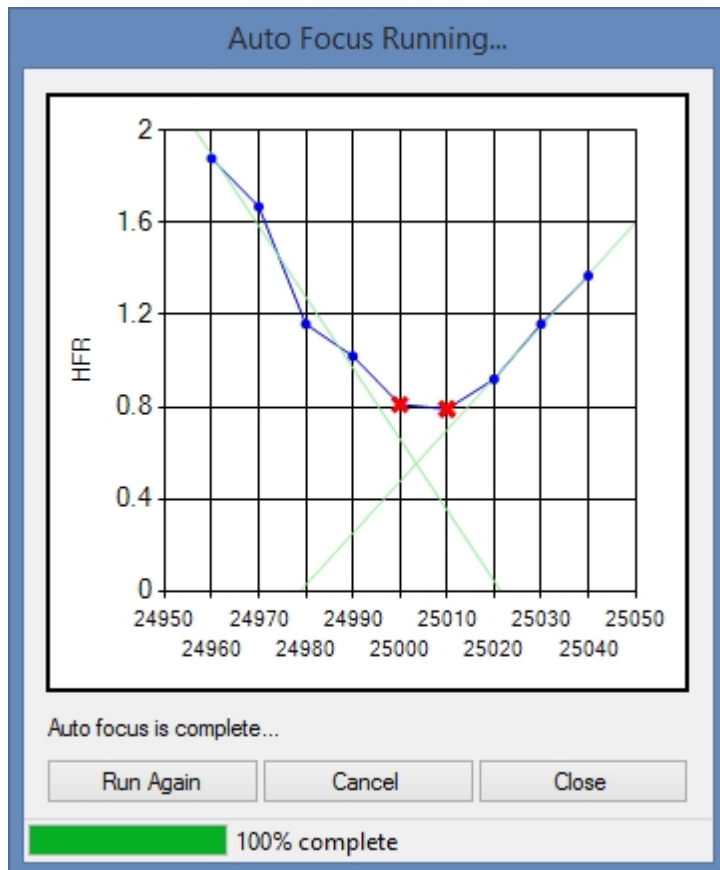
- **Important note for this field with respect to targets and equipment profiles!** This field is unique in that it is the only one in auto focus that can vary by target. In its current form it is not super-intuitive, so we will do our best to explain it here:
  - The value that shows up in this field when you open the auto focus setting dialog will be based on which target you have selected in the [sequencing window](#).
  - For equipment profiles, the value saved in the profile will be used for the creation of any new target. If you change that value (in the sequence file) for a target, it will have no effect on other targets in the sequence.
- Other options: These generally deal with the auto focus sampling (parameters used to complete an auto focus run). A more thorough explanation of these specific options can be found in [Understanding Auto Focus](#)
  - *Exposure times:*
    - *For Filters:* This button will take you to your filter setup ([Filter Setup Dialog](#)). From this dialog you can define the auto focus exposure time per filter.
    - *OSC:* *This exposure time is meant to be used when you are using a Once Shot Color camera and have no filters (of course, it would be used for monochrome cameras with no filter as well, but this is a less common setup).*
  - *Bin:* Specifies the binning at which auto focus should run.
  - *Auto Focus Data Points:* Specifies how many data points are used for auto focus. The minimum is 3, the **recommended value is 9**. A "data point" is used in conjunction with step size. For instance, if you set 7 data points with a step size of 10, auto focus will begin by moving the focuser out 30 steps, take a single exposure, calculate its focus metric, and then repeat this 6 more times, moving in by 10 steps each time.
  - *Step Size:* specifies the number of focus steps between the data points above. For example if you specify 3 data points, a step size of 10 and your current focuser position is at 1000 then the auto focus routine will take an exposure and calculate the focus metric at 990, 1000, and 1010 steps.
  - *Auto Focus dialog auto-close delay:* When auto focus is running the Auto Focus Dialog will appear. If auto focus is called during a sequence then this value specifies how long after auto focus completes that this dialog should be shown (prior to closing and continuing the sequence). It's important to note that while this dialog is on the screen that your sequence will not run. Set this to a non-zero value to leave the auto focus dialog up for a specified amount of time. If you're not interested in looking over the auto focus run then leave this value at 0.
  - *Disable smart focus:* Check this if you want to disable smart focus behavior (automatic continuation and expansion of the focus range in order to try and get adequate data). If your scope has a central obstruction you should most likely disable smart focus. If at all possible you should avoid using this option by using the [tuning method found here](#).
  - *Auto focus with filter:* Allows you to specify a filter to use for auto focus. This is generally not the best way to use auto focus as you will get better results performing auto focus on the filter that you intend to image with. However if you do decide to use this option it is highly recommended to use the "Auto adjust focus per filter" option as well as setting up your filter positions.
  - *Auto Focus Crop:* This is designed to help those who image with severe field curvature at the edges of the image and will prevent the auto focus algorithm from using "bad" edge stars to determine focus. This feature is specified as a percentage of the CCD's dimensions. For instance, if you specify a crop value of 5% and your CCD dimensions are 800x600, auto focus frames will not consider any stars within 20 pixels of the left and right edges (40 pixels total) and within 15 pixels of the top and bottom edges (30 total pixels).
  - *Apply dark subtraction:* Check this option to perform dark subtraction on your auto focus frames prior to analysis. This can be useful if your auto focus frames are noisy enough to produce false positives during star matching. The chosen directory must have dark frame in it for every variant of exposure (+/- 2 seconds). For instance, if you are taking 15s frames for one filter and 18s frames for another, you must have 15s (+/- 2s) and 18s (+/- 2s) dark frames in this directory. The naming convention for darks is as follows: <NNN>\_<name>.fit where NNN is the exposure length in sec (i.e. 15\_mydark.fit or 15\_mydark.cr2). If multiple images in your darks directory meet this criteria, the image closest to your exposure will be chosen.
  - *Save Auto Focus packages to:* Checking this option and setting the path will allow you to save your auto focus runs for further evaluation. In general this should not be needed unless you find

issues when running auto focus and need to submit an issue or ask for assistance on the Yahoo! Group.

Note: While not on this dialog, the auto focus routine can run using fast download speeds (assuming your camera supports it). This option can be found on the [Camera tab of the control panel](#). There is no harm in trying it... just a word of caution, that for some cameras, this might introduce enough noise or other unfortunate artifacts that the AF metrics are less than optimal.

## Manually Running:

You can manually invoke the Auto Focus routine either through the Focus Module or from the Focus Control Panel by clicking the "Run" button. This will bring up a window that resembles the window below:



- *Red Xs indicate points not used to compute focus*
- *Green lines indicate best fit for each side of the V (focus is the intersection of these lines)*
  - *Red lines indicate that a best fit was NOT found and focus will be computed by finding the lowest local average (this is the pre 2.3 method)*

If you are unhappy with the auto focus results (ie you don't get a good V curve or the V seems shifted dramatically to one side) you can invoke Auto Focus again by clicking "Run Again". This will center the Auto Focus run around the point that was last determined to have the best focus.

## The Validation Frame

After auto focus is complete and SGPro has determined the new focus position, it will move the focuser here and take a validation frame. Because of the way in which SGPro achieves auto focus, it has a pretty good idea what your ending HFR should be if you truly arrived the focus position. If the validation frame's HFR is not within 10% of the expected HFR, a temporary warning dialog will appear and let you know (if you purchased the notification add-on, a notification will also be sent). If this happens often, it might be due to backlash issues in the focus motor, underpowered focuser motor (heavy imaging chain fighting gravity near

meridian) or some sort of binding.

If you cancel the auto focus run after it has completed the focuser will be returned to the last focus position. For example:

- Auto focus starts and the focuser is at 2000
- Auto focus determines the focus position to be 1900
- Cancel is pressed
- Focuser is returned to 2000

However if "Run Again" has been used this will reset the start position. For example:

- Auto focus starts and the focuser is at 2000
- Auto focus determines the focus position to be 1900
- Run Again is pressed (1900 is now stored as the last focus position)
- Focus is determined to be at 1890
- Cancel is pressed
- The focuser is returned to 1900, not 2000.

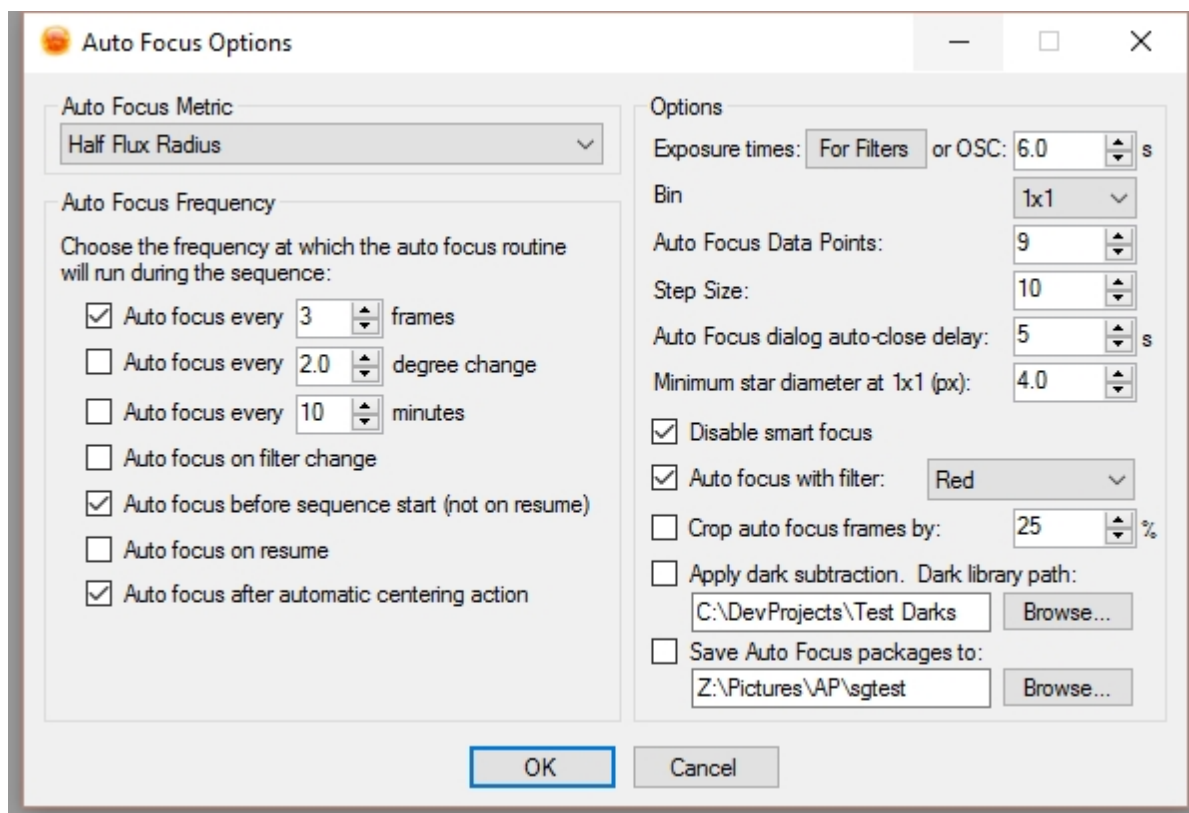
---

Created with the Standard Edition of HelpNDoc: [Free EBook and documentation generator](#)

---

## Understanding Auto Focus

*Description:* Auto focus is highly useful for keeping you in focus through the night; however, auto focus can often be difficult to understand what's going on "under the covers". This should help to demystify those issues. The purpose of the Auto Focus implementation in Sequence Generator Pro is to **maintain** focus through an imaging session. It is not designed to handle large focus swings. Because of this you will need to start out fairly well focused before you begin an imaging run with Auto Focus enabled.



## How Auto Focus Works

SGPro auto focus works off a notion of "whole image HFR". Under normal circumstances, this will allow



you to focus where you are imaging and avoid a costly move to a bright star and then back to target. When auto focus is triggered, it will begin by moving the focuser "out" by  $((\text{data points} * \text{step size}) / 2)$  steps. It will then begin taking AF frames, averaging HFR and then moving in by "step size" until the focus point is recognized. While "Data Points" is user defined it really only defines the number of steps used in the initial outward movement of the AF routine. SGPro is smart enough to recognize trends and automatically extend the number of points you need in order to find proper focus (when "smart focus" is not disabled).

In order to find the focus point SGPro will perform trend analysis (best fit lines) and use the intersection of those lines as the focus position. When SGPro receives data that cannot provide best fit lines, it will default to using the weighted average of the lowest 3 points (this will issue a warning if you are using the [notification system](#)).

## Auto Focus Variables

Unfortunately, SGPro does not have a "one size fits all" approach to auto focus and some targets will need to be tuned a bit before they can be let loose. Fortunately, SGPro's AF routine only requires a few settings to get working properly. The values that define auto focus are seen above and [defined here](#). The process by which one actually uses them to achieve focus is better described below.

## So... How do you set it up for your rig?

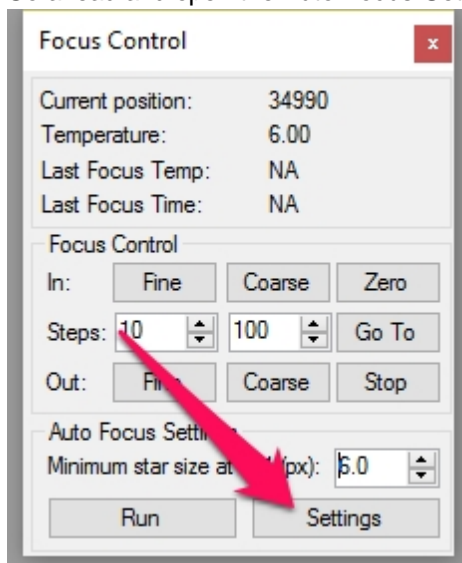
Setup and tuning of Auto Focus should not take a long time and, fortunately, once you are able to capture a few key parameters, future adjustments can come quickly. The first time, you use auto focus, however, all these things may seem a bit overwhelming. This small guide should add some clarity to the process and get you going.

The general process for starting out requires the following:

- About 20 minutes
- A camera (CCD or DSLR)
- For users of filter wheels, ensure that your [filter list](#) is set.
- A motorized focuser and controller
- A Bahtinov mask (or other means of finding focus without relying on SGPro)
- A little patience

Once you are setup and have your scope point at a bunch of stars, you are ready to go:

- Go ahead and open the Auto Focus Settings Dialog now and you can set a few parameters...



- This tutorial does not focus on auto focus triggers. Definition and use of these triggers can be [found here](#). For what you are doing, *stay on the right side of the settings dialog*.
- Set the auto focus exposure time. ***If you are not sure what to use, go ahead with eight seconds***.
  - If you use an OSC camera, just fill in the exposure length value right on this dialog.

Options

Exposure times:  or OSC:  s

Bin:

Auto Focus Data Points:

Step Size:

Auto Focus dialog auto-close delay:  s

Minimum star diameter at 1x1 (px):

Disable smart focus

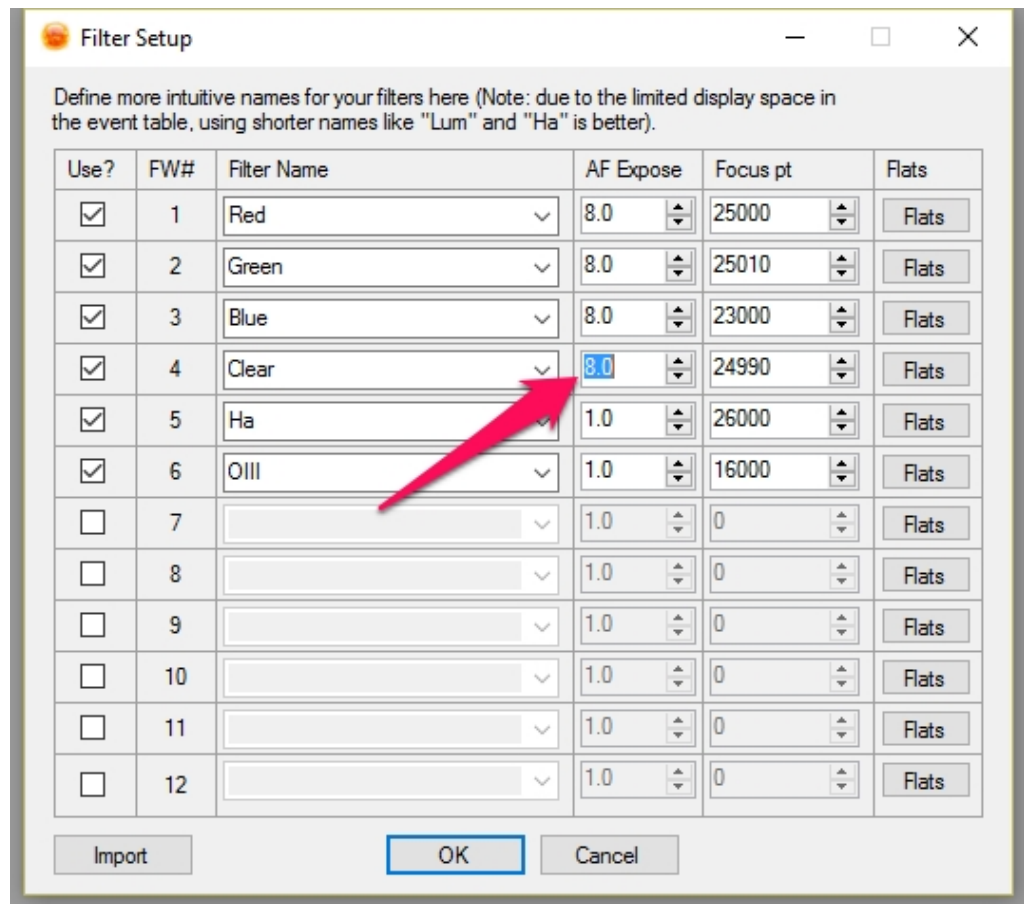
Auto focus with filter:

Crop auto focus frames by:  %

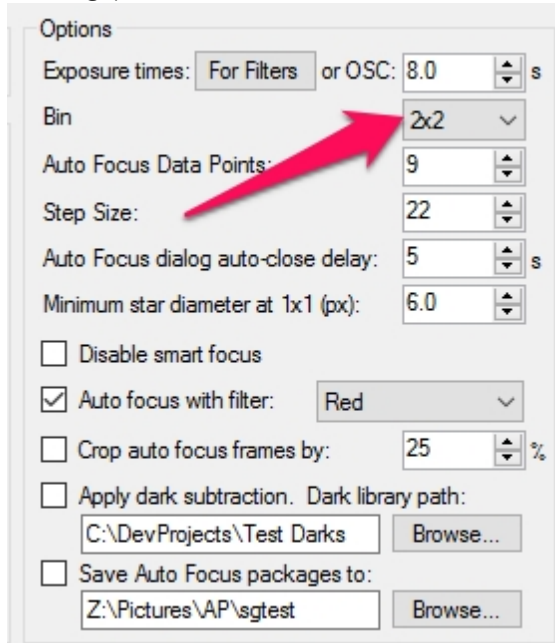
Apply dark subtraction. Dark library path:

Save Auto Focus packages to:

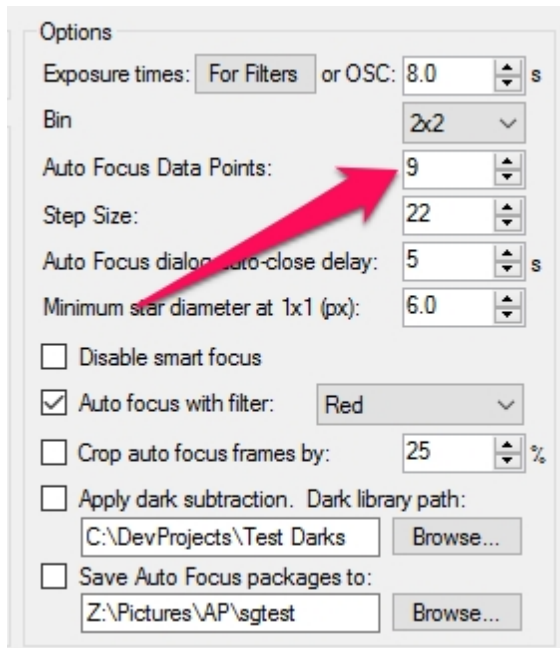
- If you use a filter wheel, you must set the auto focus exposure time per-filter. Go ahead and click the "For Filters" button and make the exposure length entries for the filters you will focus with. For this tutorial, you should pick a luminance or clear filter (you will likely always focus with this filter anyhow).



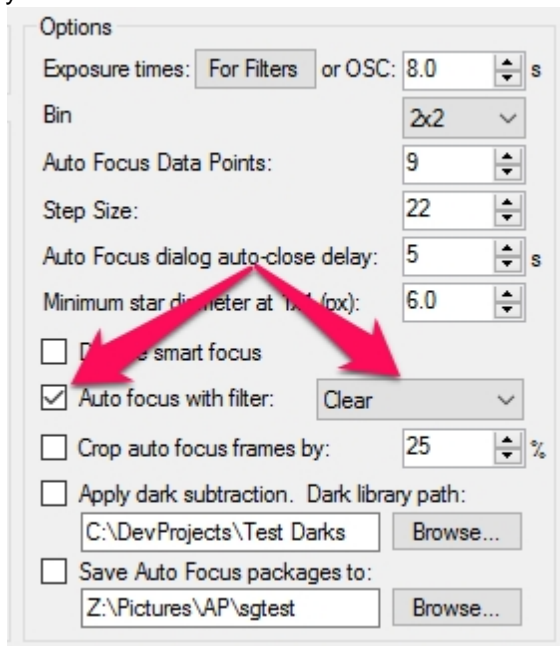
- Set the binning to use for auto focus frames. Unless you have a specific reason not to, **use 2x2 binning** (DSLR users can set their auto focus binning levels in the [DSLR's setting dialog](#)).



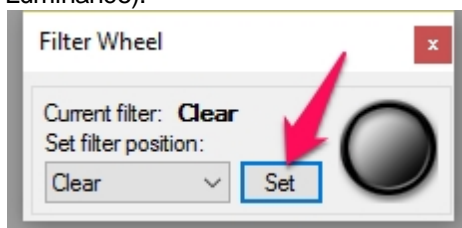
- Set the "Auto Focus Data Points" field to represent the number of samples you want auto focus to take during the run. If you choose a value of 9, perfect focus would show a "V" curve with four point outside of focus and four points inside of focus. **If you don't have a specific value in mind for your rig, choose nine points here.**



- If you are using a filter wheel, go ahead and check the "Auto focus with filter" option and choose your luminance or clear filter.

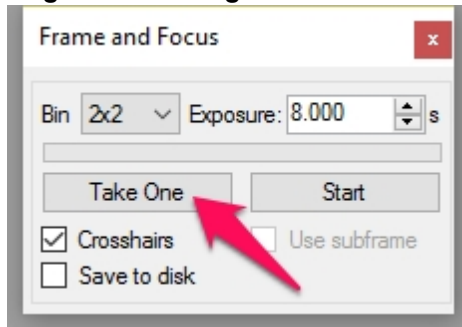


- Go ahead and close the auto focus settings dialog for now by clicking "OK".
- If you are using a filter wheel, change filters to the filter you will use for focus (normally Luminance).

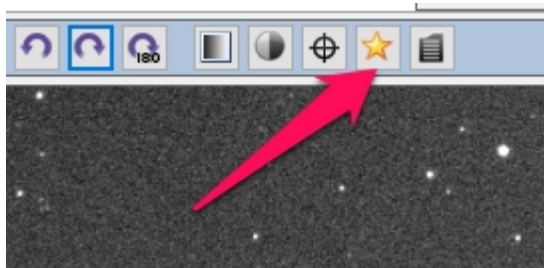


- Use SGPro's "Frame and Focus" module and a Bahtinov mask (or other) to [achieve focus](#). Exacting focus is not critical here.

- Now, use SGPro's "Frame and Focus" module to "Take One" image at the **same exposure length and binning as an auto focus frame** (the settings you just used above).



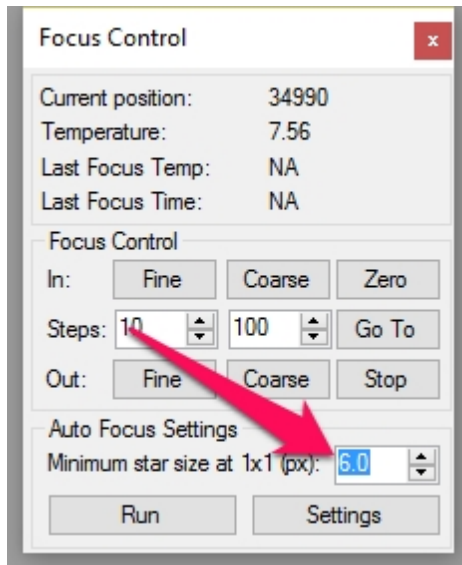
- Click on the "star" icon to start an HFR calculation of your test image.



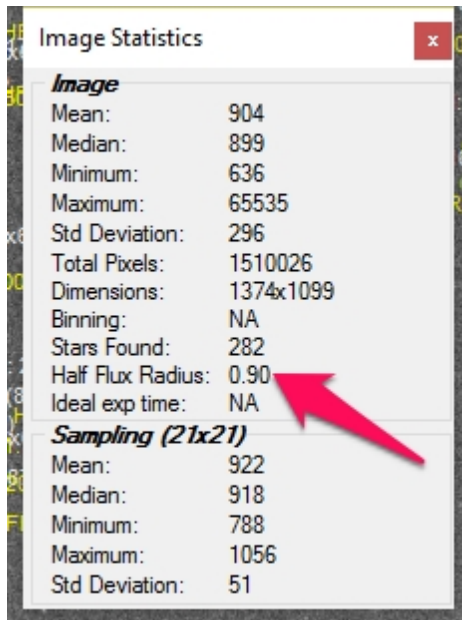
- You will probably see some stars with green circles around them when you click this button... if you don't, no need to panic... just needs a little adjustment.



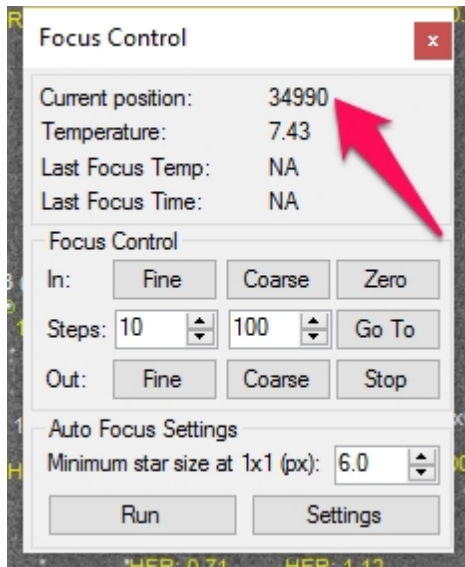
- Using the "Focus" docking module, adjust the "Minimum Star Size" field. This number is representative of the minimum diameter required in order to qualify as a star. If it's too low, you might pick up non-star objects... to high, you will miss a lot of valuable star data and also start picking up large parts of nebulae as false stars. Adjusting this value will adjust the number of stars detected in real time. Keep in mind that this value is representative of the minimum diameter (in pixels) at 1x1 binning and will auto-adjust when you use a binning that is not 1x1. For example, if you set this value to 10 pixels and take your AF frames at 2x2 binning, your minimum star size is automatically adjusted to be 5 pixels. **Adjust this value as low as you can without reducing the minimum diameter to less than 2 pixels after binning division occurs.** For instance, if you set this value to 2 pixels, the 2x2 value will be 1 pixel and will just be auto adjusted to back up to 2 pixels to avoid inclusion of noise and hot pixels. **If lots of diameters look good, go head and choose a "Minimum star size" (diameter) of six pixels.**



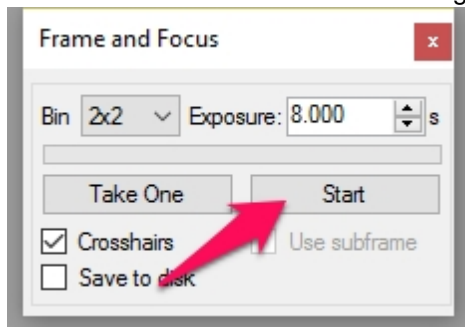
- Using the "Image Statistics" module, note your test frame's current "Half Flux Radius" value. Jot this down.



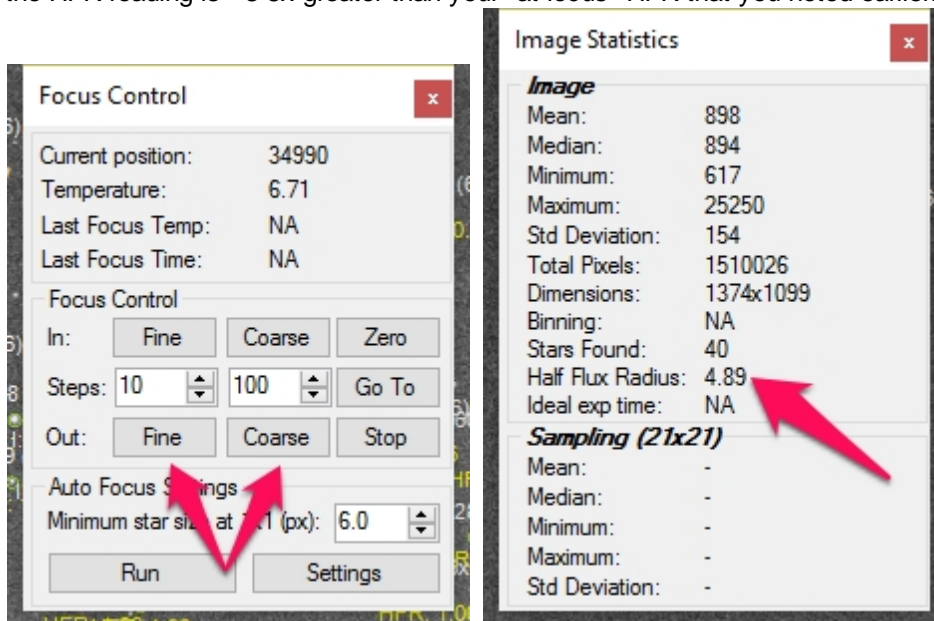
- Using the focus module, note the focuser's current absolute position.



- Using the "Frame and Focus" module, click on "Start" to begin capturing frames using the same auto focus setting you used for "Take One". The "star icon" should still be active and you should continue to see stars circled in green.



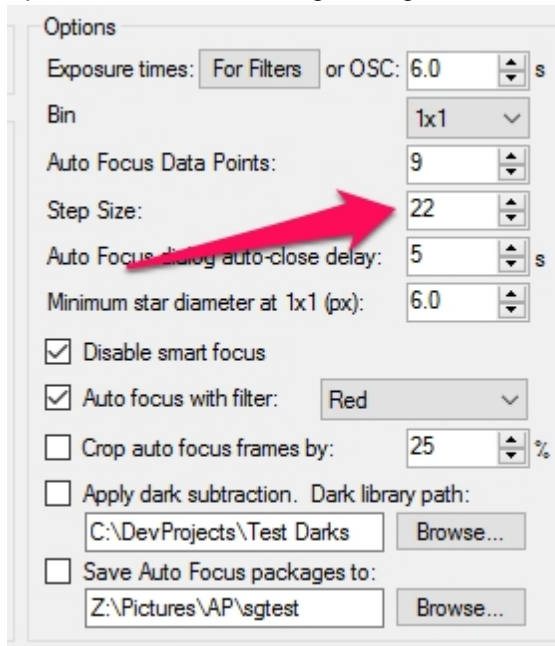
- While this is happening (looping frames are captured) begin to move your focuser outward until the HFR reading is ~3-5x greater than your "at-focus" HFR that you noted earlier.



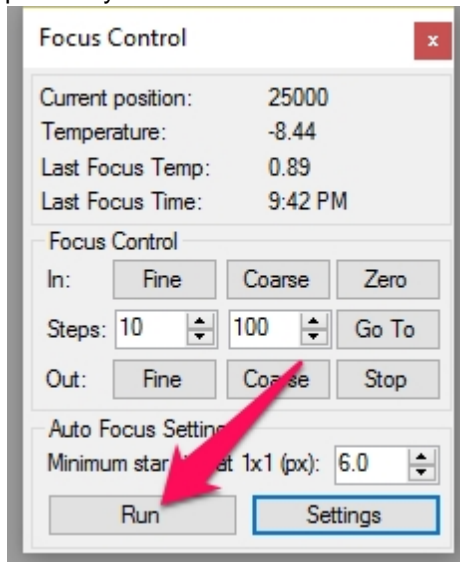
- Subtract the "in-focus" focuser position from the new (current) focuser position. Multiply this number by 2, divide it by the number of "Auto Focus Data Points" minus 1 and you now have a good "Step Size".

$$StepSize = \frac{((Pos_{3-5xhfr} - Pos_{infocus}) \cdot 2)}{Steps - 1}$$

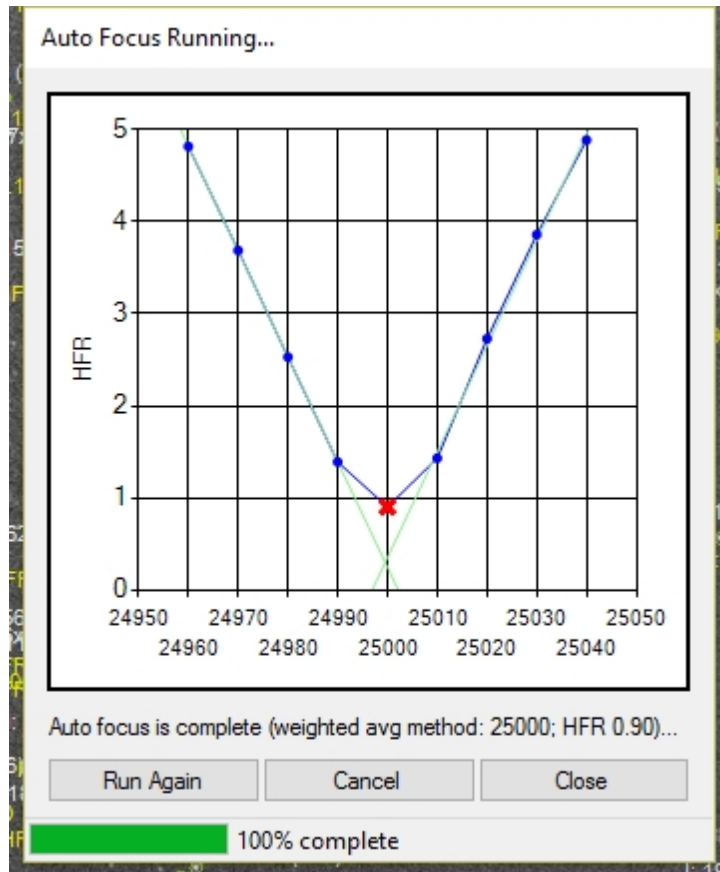
- o Open the auto focus settings dialog and enter this value into the "Step Size" field.



- o That's it! Let's kick the tires. Using the "Focus" module, go ahead and click the "Run" button. You should see a "V" and a focus point chosen that is very close to both the HFR and focuser position you noted above.







- Don't forget to save your hard work to both the sequence you are working on and to an [equipment profile](#) for later use... the idea is that you only need to perform this once per equipment profile.

Created with the Standard Edition of HelpNDoc: [Generate Kindle eBooks with ease](#)

## Auto Adjust Focus Per Filter

Using this option will attempt to adjust the position of the (motorized) focuser based on information of the newly requested filter position (and possibly the previous filter position). The observed behavior will vary in one of three ways depending on frame type.

Focus Options

Reverse focuser direction

Focus reminder

Use auto focus

Auto adjust focus per filter

Temperature compensate    Steps / deg

Focus Point Settings:

*Auto adjust focus per filter* can be turned on via the [Focus Control Panel](#), it can also be set within a profile using the [Profile Manager](#).

To use *Auto adjust focus per filter* you will need:

- A [camera](#), [focuser](#) and [filter wheel](#) connected to Sequence Generator Pro

## Light Frame Behavior

When operating on light frames, checking this option will auto-adjust focus per filter using the difference in [pre-recorded \(absolute\) positions](#).

In addition to the above requirements, you will need:

- Filters setup with their correct focus positions in the [Filter Setup Dialog](#)

### Explanation:

Focus tends to shift throughout the night so there's no possible way that the "Focus Pt", as specified in the Filter Setup Dialog, will be correct 100% of the time. These values have two purposes:

1. To give you a rough starting point of where your focus point lies.
2. To give you offsets relative to the other filters.

The *Auto adjust focus per filter* relies on the offsets relative to the other filters to adjust focus. To do this accurately the "Focus Pt" values all need to be setup around the same relative time span when the temperature is fairly constant. Ideally when setting these up you would run auto focus for each filter and set these values using the [Focus Point Settings](#) (then save the sequence as a profile or translate the values over to a profile). This will give you the most accurate offset positions relative to your filters. Alternatively, you can use a Bahtinov (or similar) mask and determine the focus point for each filter this way.

When a filter is changed, the "Focus pt" of your current filter is subtracted from the "Focus pt" of the target filter. This offset is then subtracted from your current position and the focuser is moved to that location before running an auto focus routine. Assuming that the "Focus pts" were setup correctly this should get the focus extremely close, if not dead on.

### Example:

Assume you have a focus point for a Red filter set to 7010 and a focus point for a Green filter set to 7030. You are imaging at a temperature much colder than the one used to set these focus points. You are currently at focus with your Red filter at 6940. If you are using this option and switch to your Green filter, your focuser will move out to 6960 (not 7030) to obtain focus. This is because, at the same temperature, the filters differ in focus position by 20 steps.

## Flat Frame Behavior

When operating on flat frames, checking this option will auto-adjust focus per filter using the mean focus position of that filter (focus position is recorded throughout the life of the sequence (**after successful auto focus**.. over days or however long it takes to run the sequence). If insufficient data exists to set the flat focus position, the focuser will not be adjusted. Critical focus is not necessary when collecting flat-frames and this method will will get you close enough to capture useful calibration data.

In addition to the above requirements, you will need:

- To periodically focus using SGPro's [auto focus](#) methodology. This is how focus data is collected for each of your filters.

### Note:

[Resetting the sequence](#) will clear a filter's focus data (the data collected during auto focus).

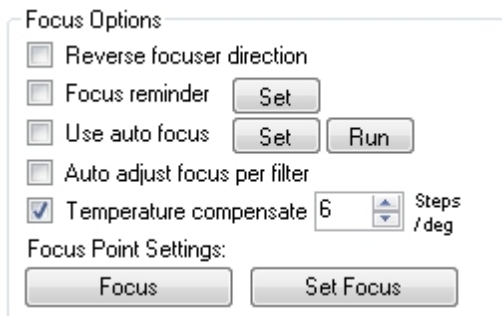
## Other Frame-Type Behavior

When operating on dark or bias frames, checking this option will do nothing.

## Temperature Compensation

*Description:* Temperature compensation allows you to train and adjust your focuser to react to temperature changes (between frames). If you're using auto focus triggers on the temp change this is not needed.

Temperature compensation can be turned on in the [Focus Control Panel](#) as seen below:



Before temperature compensation can be used it must first be trained. If you happen to know your temperature coefficient in Steps per Degrees Celsius, then you can enter this value directly into the Focus Control Panel. See [Temperature Compensation Trainer](#) for more information.

*Note:* Negative temperature compensation ratios indicate that your focuser will move INWARD as temperature drops.

*Note:* Changes less than 2 steps will not move the focuser until the required change exceeds 2 steps

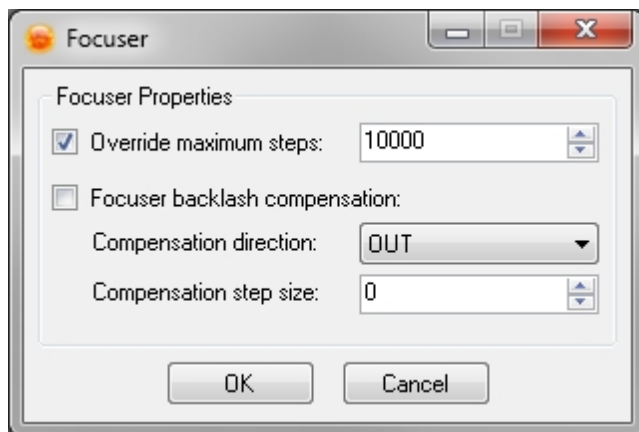
---

Created with the Standard Edition of HelpNDoc: [Create HTML Help, DOC, PDF and print manuals from 1 single source](#)

---

## Limiting Range

*Description:* Sequence Generator Pro has the ability to Override the maximum step value for a focuser with a smaller step value. This is useful you use more than one focuser with the same focus controller and they have different ranges or if the range of your focus controller exceeds the physical range of the actual focuser. For example, if your controller has a range of 50,000 units and at step 10,000 your focuser is fully racked out, setting the override value to 10,000 will give you a better visual representation of the focuser's position.



Override maximum step cannot increase the maximum steps of your focuser driver. For instance if your focuser driver is setup to allow a maximum range of 1000 steps Sequence Generator Pro cannot override this value with 2000 steps, it can however make this value less.

---

Created with the Standard Edition of HelpNDoc: [Create cross-platform Qt Help files](#)

---

## Framing

---

Sequence Generator Pro supports multiple methods to get your image framed quickly and repeatedly. The options range from manual framing to automated framing with multiple choices inbetween.

---

Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

### Frame and Focus with Nudge

*Description:* Running a [Frame and Focus](#) loop while manually moving the telescope via the [Telescope module](#) or [control panel](#) is the most manual method of framing your target.

To manually center your target you will need a camera and a telescope connected to Sequence Generator Pro.

- Start a [Frame and Focus](#) loop.
- Move the telescope using the direction pad on the Telescope Control Panel or Module (you can also move the telescope with its ASCOM driver or using the hand paddle).
- Once centered, stop moving the telescope and stop the Frame and Focus loop (if you intend on moving from this position in order to periodically obtain focus, it is recommended that you set this as the [Target Position](#)).

Manual framing is the most basic of framing routines. Sequence Generator Pro contains many advanced features that can make this process considerably faster when a [Plate Solver](#) is setup. [Center Here](#) and [Auto Center](#) are considerably faster than manually moving the mount and can ease the burden of multi-night imaging and meridian flips a great deal.

---

Created with the Standard Edition of HelpNDoc: [Full-featured EBook editor](#)

---

### Auto Center

*Description:* Once a [target's location](#) has been set (solved) you can then quickly center on that image using the Auto Center routine.

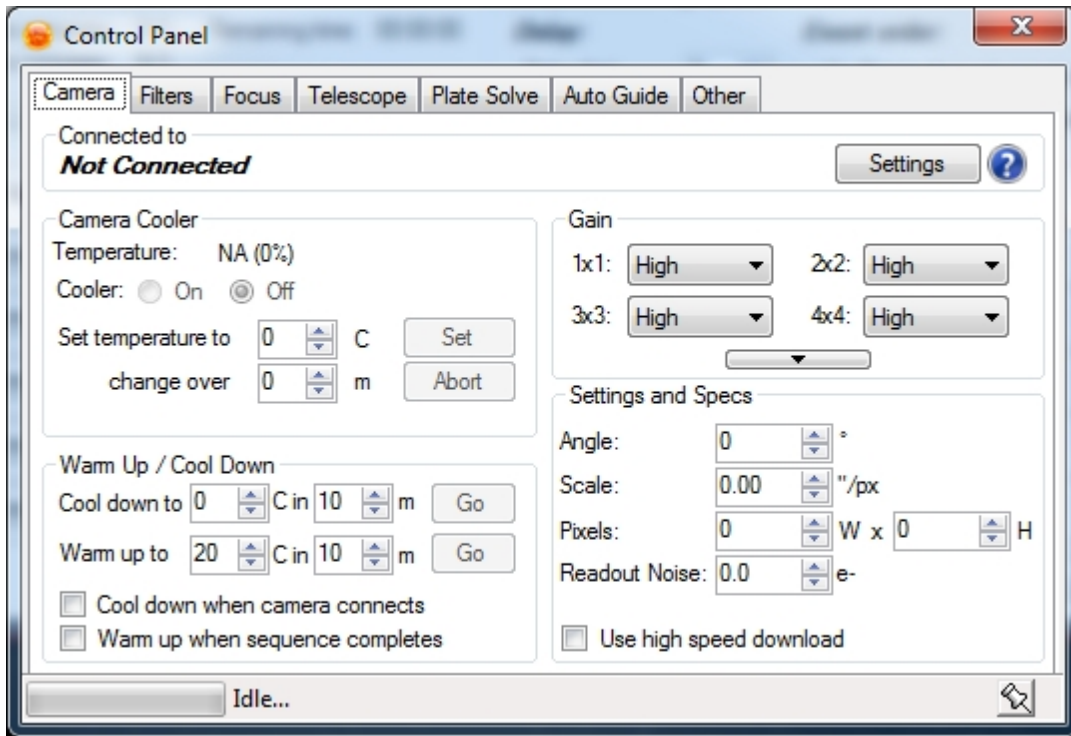
#### Auto Center Setup

To run auto center you will need to have the following setup and connected to Sequence Generator Pro:

- [Plate Solver](#)
- [Camera](#)
- [Telescope](#)

#### Setting Up the Plate Solver

Setting for proper plate solving of the scope are located in two areas. First, you must tell SGPro a few things about your current setup. This is done in the Control Panel in the [camera](#) tab. Here you must specify the camera's angle (for Elbrus only) and your gear's scale (for all plate solvers). While it is useful to fill out the remaining information, it is not necessary for plate solving.



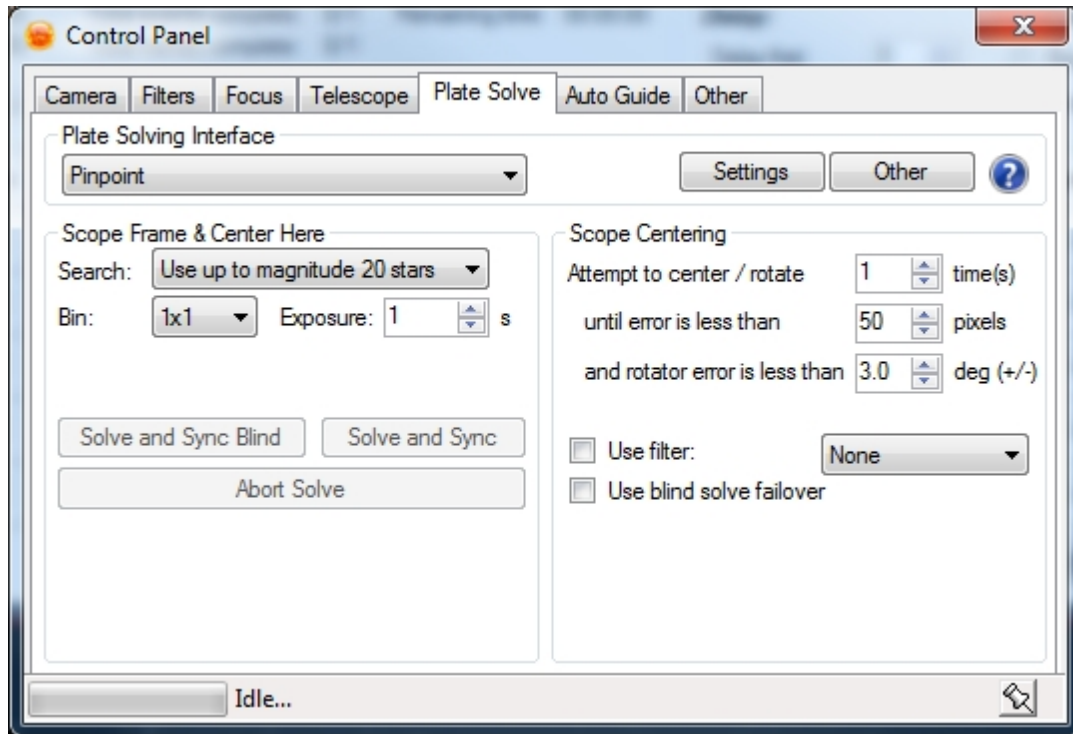
After this is complete, you will need to fill out a few things in the Control Panel in the [Plate Solve](#) tab. This assumes your plate solver of choice is installed, setup and ready to go. If not, please do this first ([Elbrus](#), [Pinpoint](#)). In this tab, you will need to:

- Choose your plate solver from the dropdown
- Choose your search method:
  - Elbrus should almost always use "5x5 dual angle" (use 2x2 at any angle if the camera angle is not known)
  - Pinpoint should almost always "Use up to magnitude 20 stars" (wide field imaging may require less)
- Choose the binning for the plate solve frames. A binning of 2x2 or less is recommended (more sensitivity and less download time)
- Choose an exposure time that is sufficient to capture solvable data (this will vary by filter, a good value for broadband filters is about 7-8 sec)

### Scope Centering Options

Use these options to ensure that SGPro centers your target according to acceptable tolerances. More detail on this is [here](#).

The Bin, Angle and Scale for the Scope Frame & Center Here options must be populated before attempting to use Auto Center. Refer to the [Plate Solve](#) area of the control panel for more information. You should save this information in a [profile](#) so you don't have to continually re-enter it.



## Running Auto Center

There are three ways to invoke the center here functionality (they all do the same thing... just conveniences depending on where you are operating). You can invoke auto center from:

The [Target Settings](#) dialog:

**Target Settings**

Name:

**Location (J2000)**

RA:

DEC:

[Populate from link \(AstroBin, Telescopius or Flickr\)](#)

When target starts  SLEW to and then CENTER on location  
 SLEW to location  
 do not move to location

**Time Constraints**

Start at: °  tomorrow

End at: °  tomorrow

[Planning tools](#)

**Other**

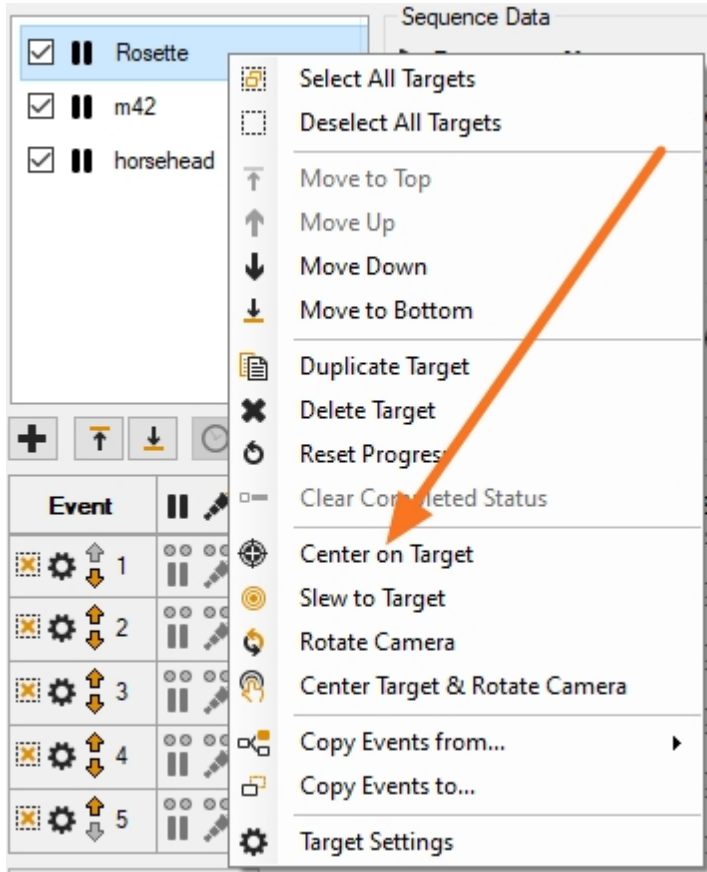
Rotate camera to: °

camera will allow both 15.0° and 195.0°

When running auto center, you have two different behaviors to choose from.

- **SLEW to and then CENTER on location:** This behavior will first slew the mount to the target's location. The slew is imprecise and will just get you in the general area of the target (unless you use external modeling software). Before the precision centering process starts, auto focus has an opportunity to run (on sequence start). After the optional auto focus, SGPro will enter an iterative, closed loop process to get you exactly on target (see below for related settings). This is particularly useful if you are starting the sequence from a parked position and would like to not run auto focus on the side of your house.
- **SLEW to location:** This behavior will slew the mount to the target's location. The slew is imprecise and will just get you in the general area of the target (unless you use external modeling software).

The [Target List](#) context menu:



Automatically during sequence execution:



Using the control panel will automatically center on the currently selected target. You can see the currently selected target in the sequencing dialog.

### Number of Attempts and Error Threshold

Anytime Auto Center is invoked, it will attempt to center itself in an iterative fashion. For instance in the screen shot above, the routine will attempt to center itself up to 3 times until the total error is less than 50 pixels. If after the 3rd attempt the error is still greater than 50 pixels, it will quit.

### Auto Center Filter

Because it takes much less time to expose a luminance frame (or any other broadband filter), it can be useful to specify a particular filter to use when running auto center. For instance, if you are imaging with an Ha filter and the sequence automatically invokes a centering routine, it will temporarily change to the luminance filter (or whatever you selected) and then switch back to Ha when the sequence resumes.


Once you have the equipment above connected and your plate solver successfully solving images open up the Plate Solve Control panel:

### What you will see during Auto Center

Once everything has been setup and is connected you're ready to begin the Auto Center process. Simply invoke Auto Center and Sequence Generator Pro will begin the process of Auto Centering on your reference frame; this is also accessible via the [Scope Centering Module](#).

You will see the following dialog:

Center Scope and Rotate Camera for Rosette




**Step 1**

Action: **Determine Reference Frame Location**

Status: *Completed! Reference frame solved.*

RA:	6.527	Arcsec/pixel:	1.598
DEC:	5.020	Flipped:	No
Angle:	90.03	Confidence:	100




**Step 2**

Action: **Slew to Reference Frame / Rotate Camera**

Status: *Completed!*

Start RA:	0.000	End RA:	6.527
Start DEC:	0.000	End DEC:	5.020
Rotator Start:	20.0°	Rotator End:	15.0°



**Step 3**

Action: **Validate**

Status: *Running. Capturing new frame to validate location and camera angle (3s)...*


RA Pixels:	0	RA Delta:	0.000
DEC Pixels:	0	Dec Delta:	0.000
Rotator Delta:	0		

Location: **Total Error (1x1): 0 px (00:00:00.00)**


Rotation: **Total Error: 0 °**

Running attempt 1 (Max attempts: 3; Max Location Error: 15 px; Max Rotation Error: +/-3°)...

Attempt	Status	RA Error	DEC Error	Total Er...	Rot Error



Run Again
Abort



This process is completely automated. The following steps are performed:

1. The reference data is solved (if it hasn't been previously solved... this will almost always be pre-solved).
2. An image is taken and then plate solved. The coordinates of this solve are then used to sync the telescope.
3. The telescope is slewed to the reference frame.
4. Another image is taken and then plate solved. The coordinates of this solve are used to compute the difference between the expected location and the actual location. The amount of error (in pixels and Degrees:Minutes:Seconds) is then shown.

If the error is too high (above your defined threshold), then the routine will automatically attempt to re-center until either the error is under the defined threshold or the maximum number of attempts has been exceeded.

Depending on your imaging setup and scale, different values are more or less permissive for the error amount and it will take some trial and error to find what you feel is acceptable. In general any error below 100 pixels is usually sufficient depending on focal length, target size and framing. The error is calculated along the hypotenuse of the RA and DEC error (which is why the total error does not add up to the sum of the two errors).

Created with the Standard Edition of HelpNDoc: [Easily create Web Help sites](#)

## Center Here

Description: Center Here is somewhat of a very advanced "[Nudge](#)". It allows you to click anywhere on a captured image and center the scope at the location the mouse was clicked.

To use Center Here you will need the following connected and setup within Sequence Generator Pro:

- [Plate Solver](#)

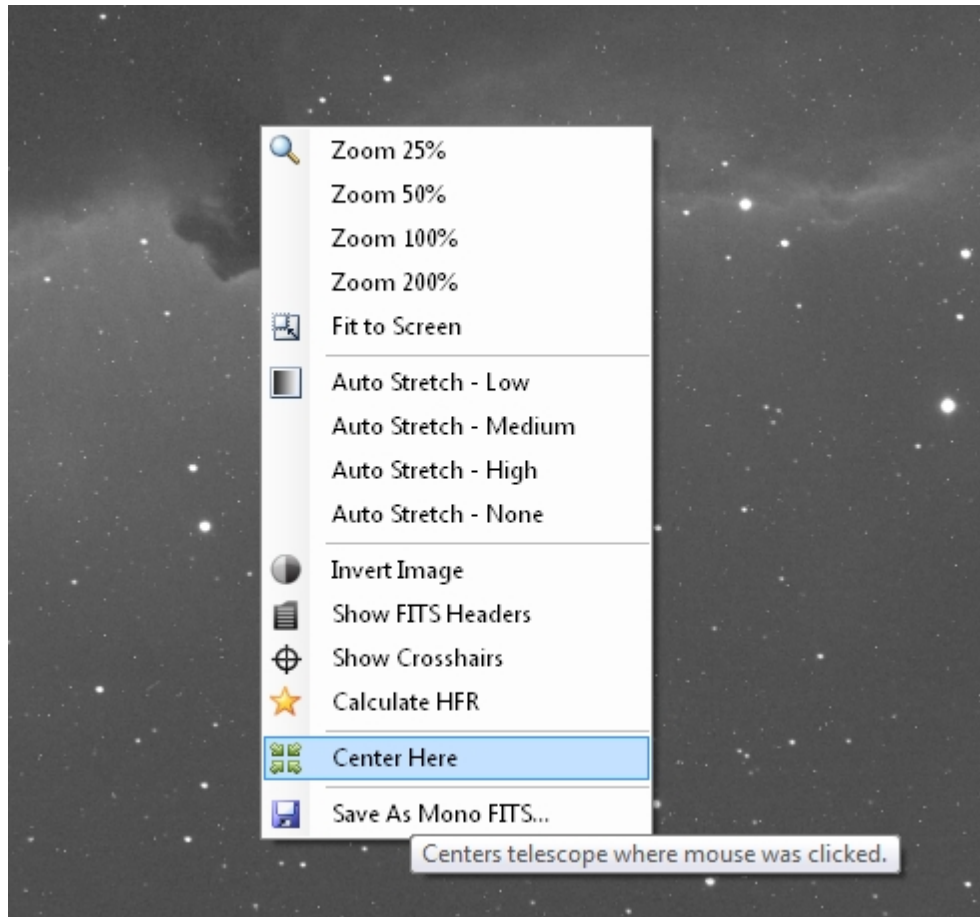
146 / 216

- [Camera](#)
- [Telescope](#)

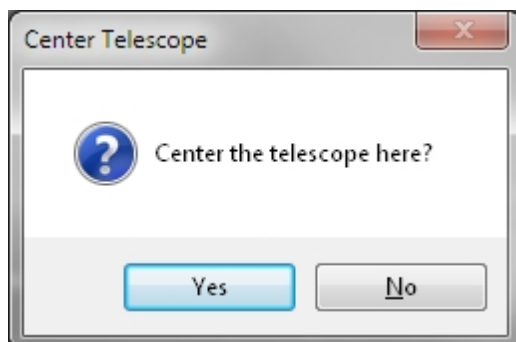
Center Here is available on any image that Sequence Generator Pro captures (with the exception of [Auto Focus](#) images).

Once the above equipment is connected and the plate solver is ready, capture a single image (for instance with, [Frame and Focus](#)).

Right click on the image and choose "Center Here"



The following confirmation dialog will appear:



Click "Yes" to center the scope where you right clicked on the image.

You will then see the following "Center Scope on Reference" Dialog:

Center Scope and Rotate Camera for Rosette

**Step 1**

Action: **Determine Reference Frame Location**

Status: *Completed! Reference frame solved.*

RA:	6.527	Arcsec/pixel:	1.598
DEC:	5.020	Flipped:	No
Angle:	90.03	Confidence:	100

**Step 2**

Action: **Slew to Reference Frame / Rotate Camera**

Status: *Completed!*

Start RA:	0.000	End RA:	6.527
Start DEC:	0.000	End DEC:	5.020
Rotator Start:	20.0°	Rotator End:	15.0°

**Step 3**

Action: **Validate**

Status: *Running. Capturing new frame to validate location and camera angle (3s)...*

RA Pixels:	0	RA Delta:	0.000
DEC Pixels:	0	Dec Delta:	0.000
Rotator Delta:	0		

Location: **Total Error (1x1): 0 px (00:00:00.00)**

Rotation: **Total Error: 0 °**

Running attempt 1 (Max attempts: 3; Max Location Error: 15 px; Max Rotation Error: +/-3°)...

Attempt	Status	RA Error	DEC Error	Total Er...	Rot Error

Run Again
Abort

This process is completely automated. The following steps are performed:

1. The reference data is loaded from your mouse click location.
2. An image is taken and then plate solved. The coordinates of this solve are then used to sync the telescope.
3. The telescope is slewed to the reference frame
4. Another image is taken and then plate solved. The coordinates of this solve are used to compute the difference between the expected location and the actual location. The amount of error in pixels and Degrees:Minutes:Seconds is then shown.

You cannot "Run Again" when using "Center Here", instead close this dialog and rerun the "Center Here" procedure by right clicking and selecting "Center Here".

Depending on your imaging setup and scale, different values are more or less permissive for the error amount and it will take some trial and error to find what you feel is acceptable. In general any error below 100 pixels is usually sufficient depending on focal length, target size and framing. The error is calculated along the hypotenuse of the RA and DEC error (which is why the total error does not add up to the sum of the two errors).

Created with the Standard Edition of HelpNDoc: [Write EPub books for the iPad](#)

## Using Goto Target

*Description:* Goto Target allows you to manually specify a target so that you can quickly get back to that target. It is highly recommended that you use the [Auto Center](#) with [Reference Data](#) rather than Goto Target as Auto center provides feedback and information about the error of your slew.

See [Setting Focus and Target Positions](#) for information on setting and using this feature.

## Sequence Notifications

### Sequence Notifications

Notifications are messages about something that has happened in the sequence. Examples would be things like, loss of the guide star, change of target, sequence end and auto focus complete. In SGPro, there are two basic categories of notifications:

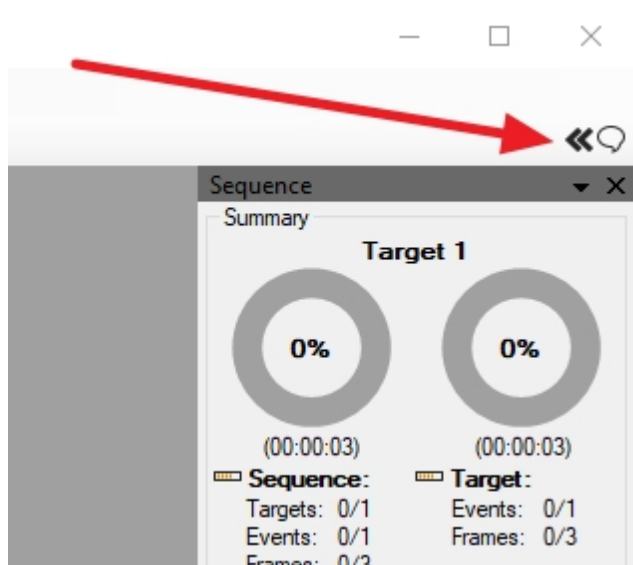
- [Internal notifications via the Notification Center](#): These notifications are emitted by SGPro and displayed to you within SGPro
- [External notifications](#): These notifications are emitted by SGPro and can be sent to Email addresses, SMS Text, a local file or Good Night System

## SGPro Notification Center

### Notification Center

In its current form, SGPro is great at telling you what's happening right now. If you watch your sequence like a hawk, this is probably good enough. For most though, you are inclined to leave SGPro unattended for long periods of time. When you come back and things don't seem right, it's hard to tell exactly what happened. Was it clouds? Failure to perform a meridian flip? A faulty USB hub? Having a consolidated Notification Center in SGPro can really help paint a concise picture of the evening's mishap. Even if there is no mishap, you can review a list of notifications and determine, quickly, if the sequence is running as you expected. Targets in the wrong order? Changing filters too often? Not running auto focus when you expect?

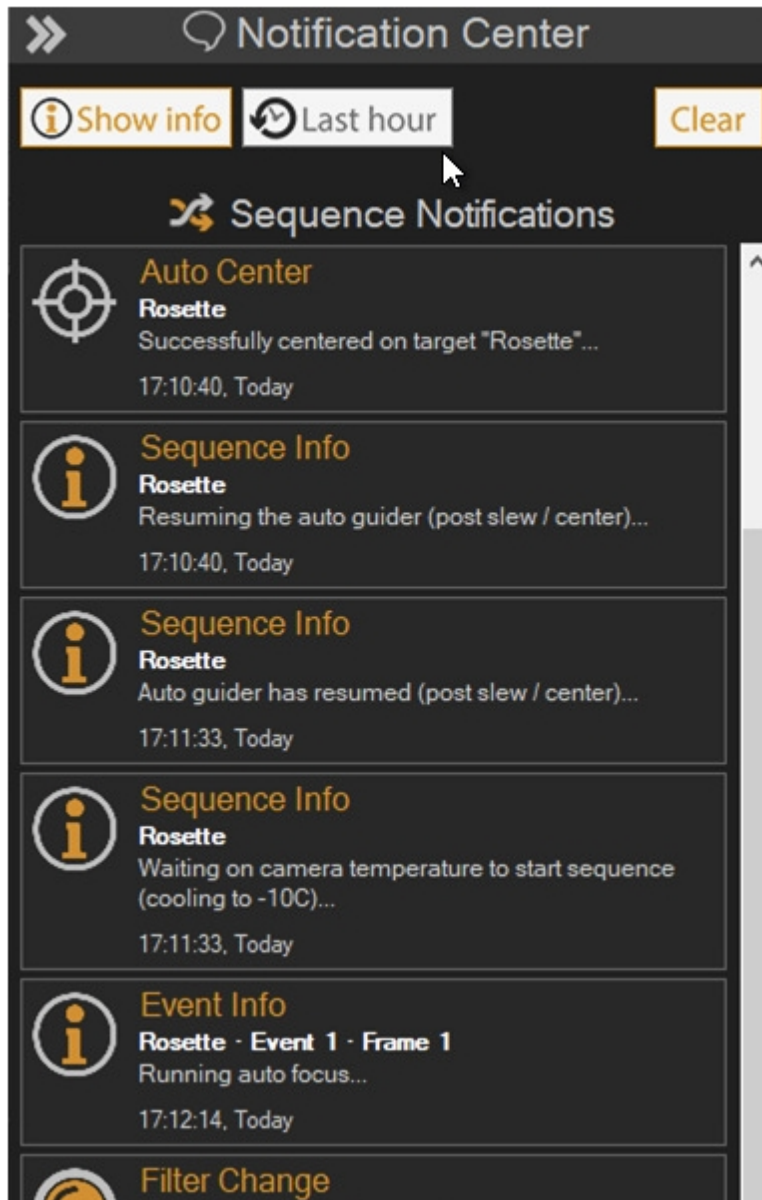
To open and view current notifications, click on the double arrows next to the speech bubble (located in the upper right corner of SGPro)



The consolidated Notification Center should look and feel a lot like the actual Windows 10 Notification Center. This is, of course, the point. SGPro notifications follow new Windows 10 guidelines for event messaging. A notification pane will open and attach itself to the right-hand

side of the main window. The Notification Center, when open will provide the ability to apply two different filters to the list of notifications:

1. Show or hide “Info” messages. Hiding these can give you quick access to more meaningful events in the sequence. Adding them back in can give you significantly more data around certain parts of the sequence.
2. Show notifications only from the last hour. Using this filter, you can more easily see things that have happened in the very recent past (especially helpful for errors that might occurred on a different day).



The notification tiles themselves are fairly general: Information, Warnings, Errors and Alerts (anything that requires your attention to continue). That said, we have created a set of special notifications, that, in general, are of greater interest to anyone engaged in reviewing the notifications for a sequence. Specifically, there will be different, easily identified icons for:

- Image complete (with a button to open that image inside SGPro)
- Filter change
- Auto focus (with HFR value)
- Target change (centering)

- Meridian flip
- Mount park
- Observatory park
- Any messages having to do with recovery of a sequence (recovery mode)

As you might have deduced, the Notification Center is not super useful when it's not visible. That said, some of the notifications are important enough to force their way on to the screen (regardless of the state of the notification pane). In these cases, the notification will appear by itself in the lower right corner. It will remain visible for 30 seconds and clicking it will open the notification pane. For information on setting up remote notifications so you can get messages to your phone or email, [see here](#).

---

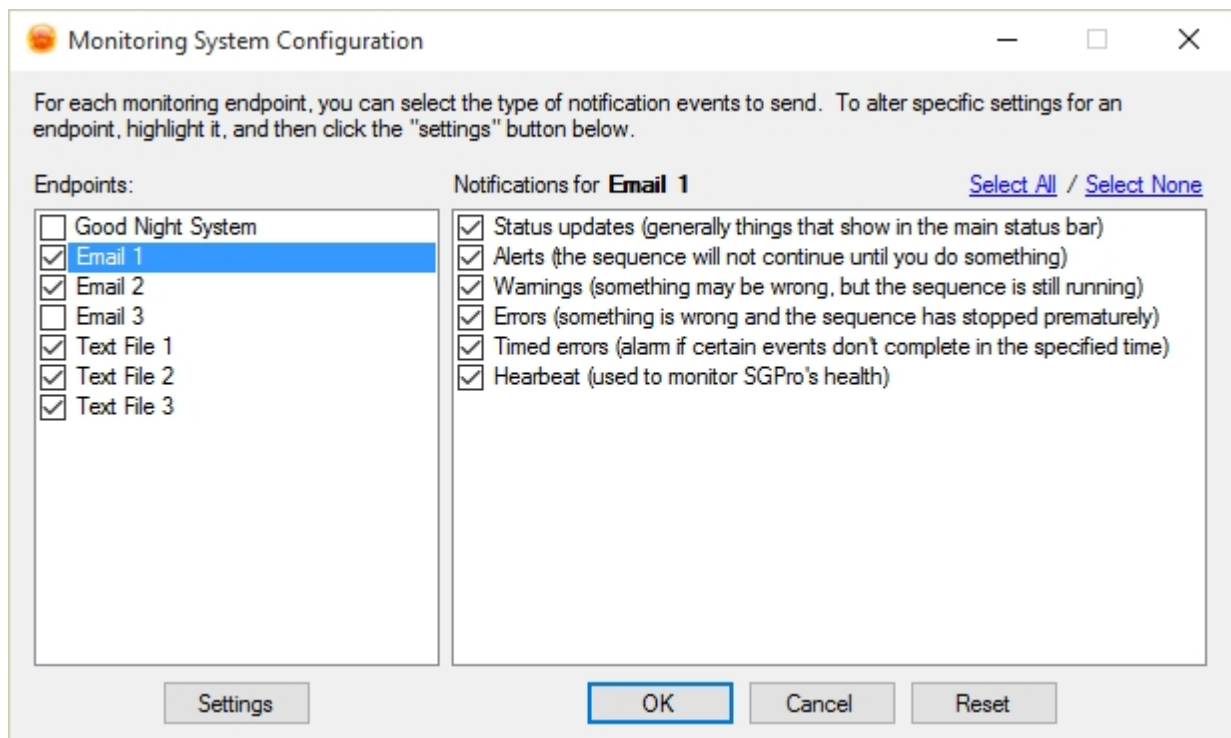
Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

## Notification System

The Notification System on SGPro is an [optional addon](#), but can be quite valuable if you don't sit outside to monitor the sequence and equipment responsible for its execution. With it, you can register for all sorts of sequence driven events and receive them via email, SMS (text message) or GNS ([Good Night System](#)).

In order to start configuring the way you receive notifications, open SGPro and click the "Tools->Notification" menu items. Upon doing so, you will be greeted with a settings window like this:



On the left, you will see "Endpoints". An Endpoint is meant to be the final destination of any notification. In its current form, SGPro supports the GNS and Email endpoints (most cell carriers allow you to specify an email for SMS relay as well).

On the right side you will see a list of notification categories. There are far too many notifications to list individually so we have divided all notifications in SGPro into six different categories:

- **Status:** These notifications are normal and pretty closely mimic the types of messages you would see

in SGPro's own notification area (on the bottom left corner of the main window).

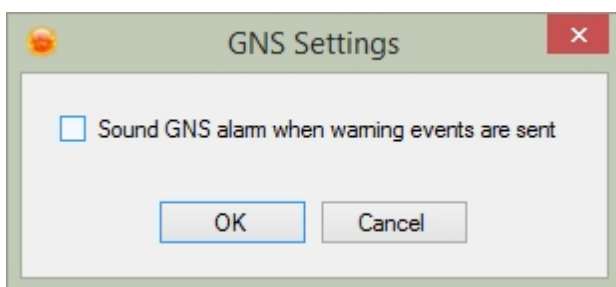
- **Alerts:** These notifications mean that SGPro is waiting on you to do something and will not continue until you provide some sort of input. Examples include pausing for [manual focus](#), [pause after meridian flip](#) and use of the [Manual Camera Rotator](#).
- **Warnings:** These notifications indicate something may be wrong, but that the sequence is still running. An example of a warning would be failure to achieve an auto focus value the way we intend to (best fit line intersection). Receiving a warning in this way, means that we defaulted capture of this value to an older method because the intended method did not function properly. When you receive a warning, it is probably a good idea to go check on things.
- **Errors:** These notifications mean something bad has happened and the sequence has stopped. An example of this would be failure to reacquire the target after a meridian flip. If you use [recovery mode](#) an error message will not be sent until recovery has also failed.
- **Timed Errors:** These notification errors are designed to alarm if certain events don't complete within a specified time period. An example of this is with sequence image capture... if SGPro is not in possession of an image within exposure time plus three minutes, this type of error notification will be sent. This can help to identify camera communication problems.
- **Heartbeat:** These notifications are for folks that want a great deal of visibility into the sequence. Sometimes SGPro can go long periods of time without any notifications... especially when taking long duration images. If you select this option, you will receive a notification once every 2 minutes indicating that SGPro is healthy. Failure to receive this message might indicate that SGPro or the Operating system has failed in some way.

## Endpoints

Each endpoint will require some amount of setup in order to be used. You can access an Endpoint's setting by highlighting it and then clicking the "Settings" button at the bottom.

### Good Night System Settings

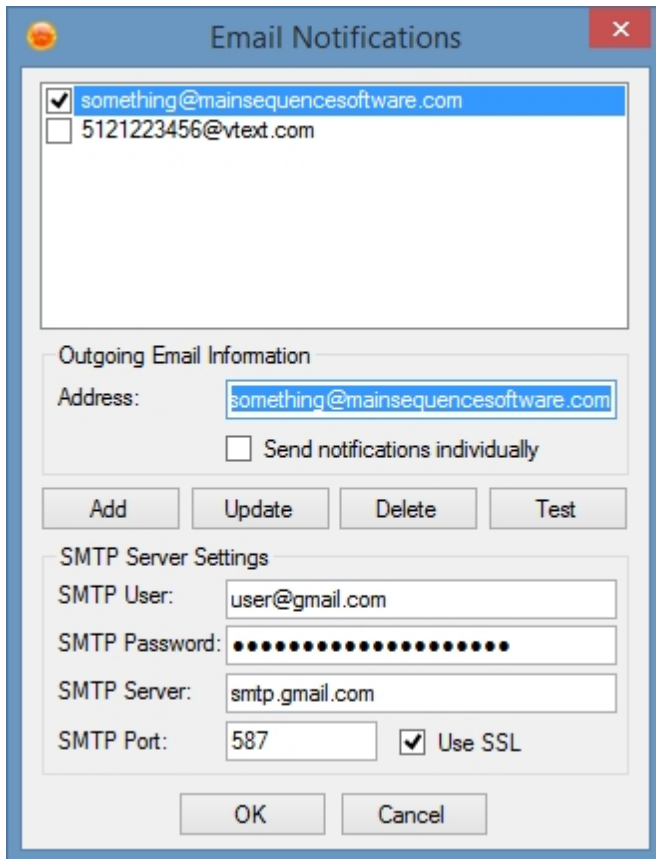
To use GNS, you **must** complete set up on the iOS or Android application using your mobile device. This endpoint also requires a GNS client for Windows. There is no need to download or install this as it is distributed with SGPro 2.4 and higher. Once you have downloaded the mobile application, go to the Windows Command Line (terminal) and type "**ipconfig**". Find the IP address under the heading **IPv4 Address** and enter this into the GNS mobile app "**Host**" setting. That should really be it... the rest of the settings are probably OK.



By default, the GNS endpoint will only sound an alarm on error messages (those that stop an event). If you would like the GNS alarm to sound when SGPro issues a warning notification (something might be wrong), make sure this option is checked.

### Email Settings





There are three different email endpoints. Each is identical to the next in terms of functionality, but you may wish to have different sets of filters for different addresses (for instance, you may want all events to go to your email account, but only warnings and errors to go to your SMS account).

Use this settings dialog to prepare for email and text based notifications. This is a one time setup used across all sequences.

*Outgoing Email Information:* This area contains information about the address the notifications are going **TO**. Enter the address you wish to receive your notifications at... you can enter multiple addresses if you'd like (one at a time though). The example above shows one normal email address and one Verizon based SMS email. Checking the "Send notifications immediately" button will send an email every time a notification is registered in SGPro. While sometimes useful, this may result in a lot of emails and, depending on your provider, you might be flagged as a spammer and shut down. Clearing this option will allow SGPro to aggregate notifications and send them out in 5 minute increments.

*SMTP Server Settings:* This area contains information that SGPro uses to send your notifications out. Normally it is permissible to use the same account you used in the Outgoing Email Information section. SGPro does its best to auto enter data for many ISPs (bases on the domain of the SMTP user field). If we know what it is, we will auto-populate the fields, if not, they will remain blank and you will need to find them.

- SMTP User: The account you will use to log into the SMTP server (mail server)
- SMTP Password: The password for the SMTP user account
- SMTP Server: The address of the SMTP server
- SMTP Port: The port used by the SMTP server
- Use SSL: Check this is your SMTP server requires SSL communication (most do)

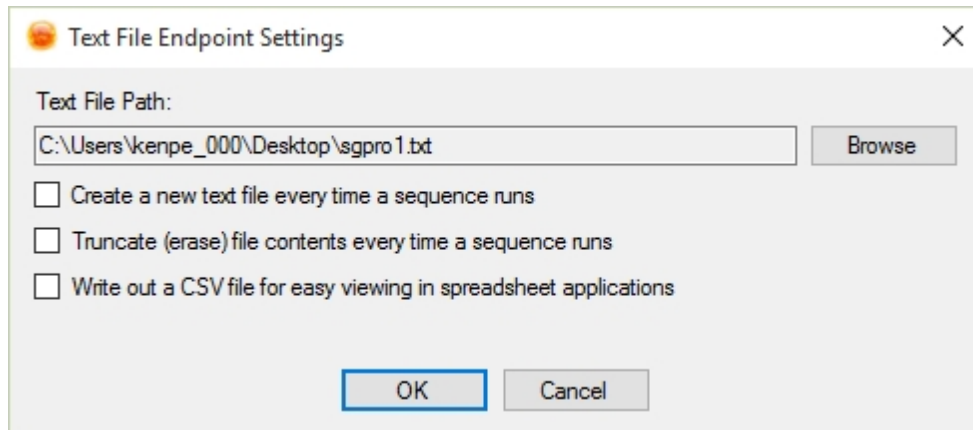
When done, click the "Add" button and then click the "Test" button to ensure the settings are correct. You should receive a test email from the SMTP user (be sure to check your SPAM folder if SGPro indicates success but you still don't see a message).

In order to update these settings, highlight the address you want to change, make changes in the fields provided and then click the "Update" button.

Note for GMail users: SGPro can sometimes be flagged as a "less secure application". In order to use gmail with SGPro, you might need to go here and allow less secure applications access to your address: <https://www.google.com/settings/security/lesssecureapps>

### Text File Settings

There are three different text file endpoints. Each is identical to the next in terms of functionality, but you may wish to have different sets of filters for different files (for instance, you may want all events to go to one file, but only warnings and errors to go to another).



- Text File Path: The absolute path of the file to use (write to). It must be either a txt or csv file.
- Create a new text file every time a sequence runs: This will create a new (unique file) based on the file name you supplied. A new file will be created every time a new sequence is started.
- Truncate (erase) file contents every time a sequence runs: Use this option to truncate the contents of the file every time you start a sequence.
- Write out a CSV file: Use this option if you prefer to view these files as a spreadsheet (better filtering, etc).

---

Created with the Standard Edition of HelpNDoc: [Free iPhone documentation generator](#)

---

## Images

---

The display of images in Sequence Generator Pro is handled through "Image Containers". An "Image Container" is really just a window that can be docked (tabbed), nested in other windows or popped out to float above other windows.

The idea is to provide a highly flexible and useful environment in which to display and view images. For example, you can keep all of your windows tabbed or you can display two images side by side for comparison.

We call these windows "Image Containers" because they retain their own set of properties (like stretching values, inversion crosshairs, etc). If a new image is swapped out in the same container it will inherit all of the container's properties.

---

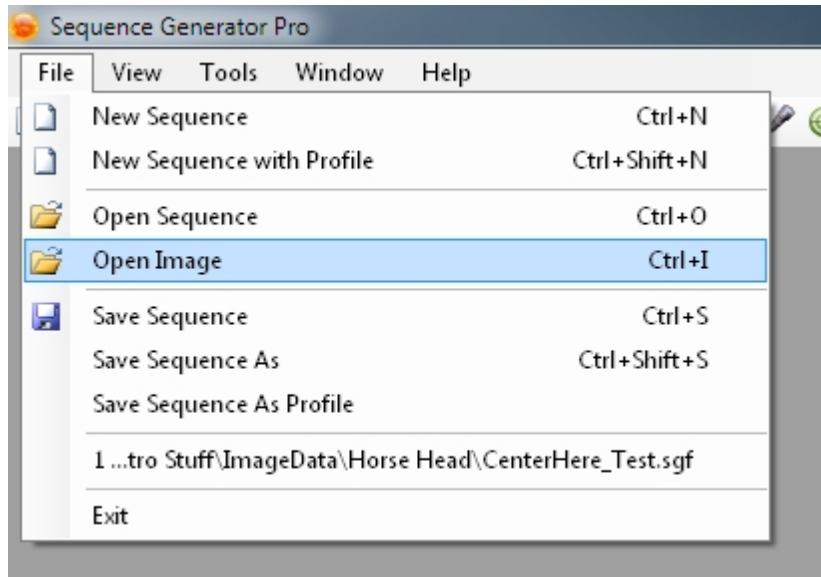
Created with the Standard Edition of HelpNDoc: [Generate EPub eBooks with ease](#)

---

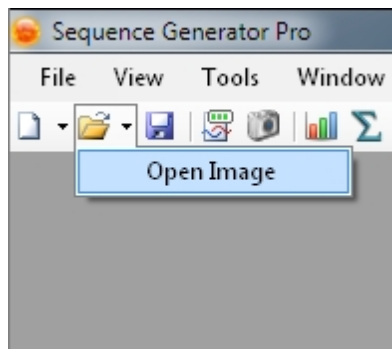
## Opening and Moving

## Opening Images

Images can be opened from the File Menu by selecting "Open Image":



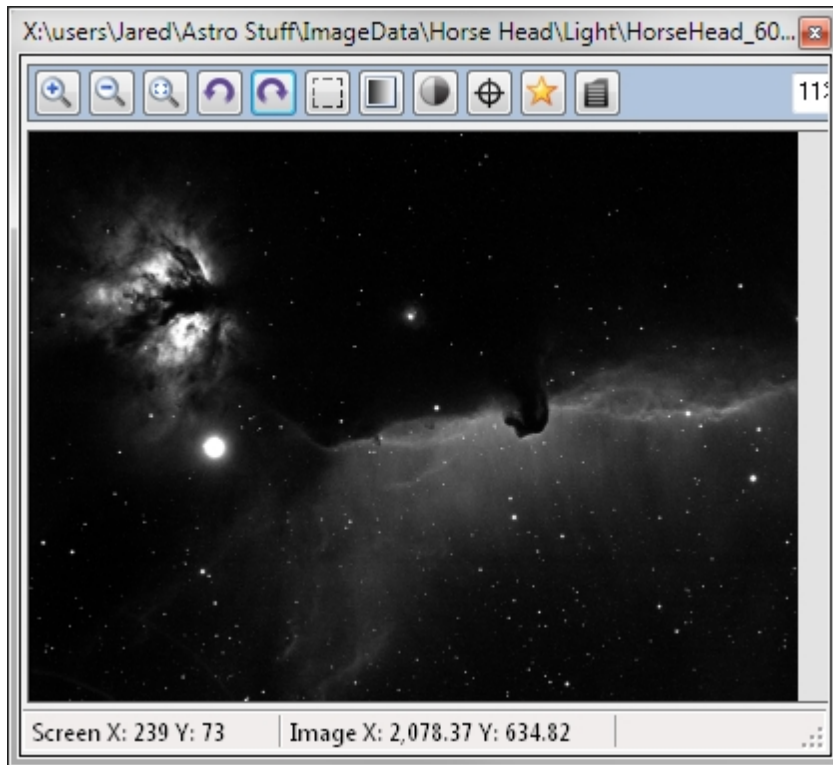
Images can also be opened by clicking the drop down button on the Open button and selecting "Open Image"



You can also open images by dragging them into the Sequence Generator Pro window.

## Moving

Like [Modules](#), image windows can be manipulated and docked within the Sequence Generator Pro interface.



Above: an Opened image display window that is "floating"

There are 3 kinds of image displays:

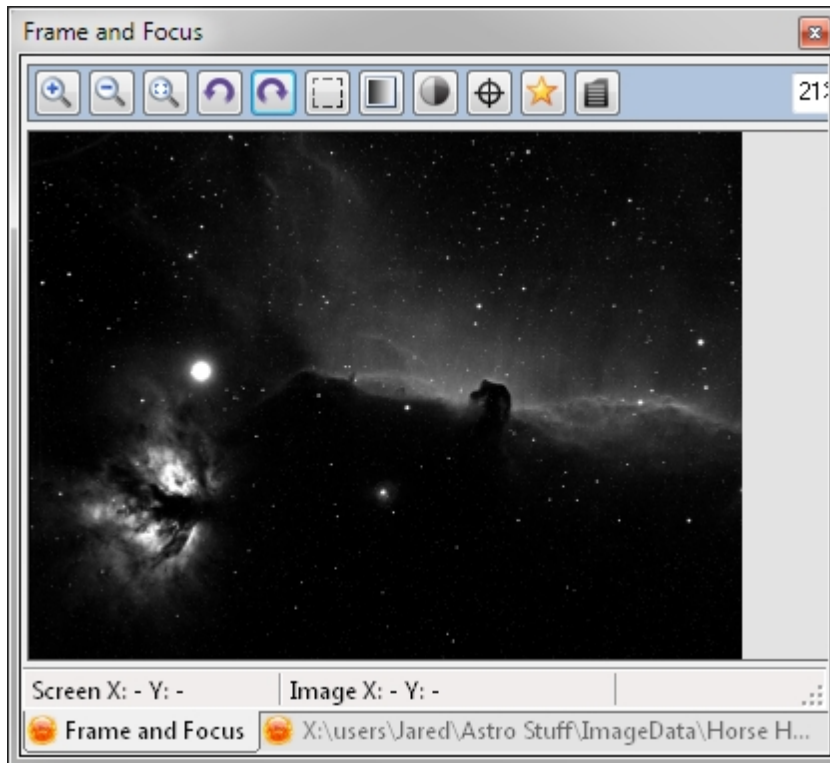
- *Opened images*: These are images that you have manually opened in Sequence Generator Pro, these image displays will never be reused by any running sequence.
- *Sequence Images*: These are images captured as part of a sequence (flats, darks, bias, etc), this image display will potentially be reused by new images of the same type depending on how you have your [View Options](#) setup.
- *Temporary Images*: These are images captured as part of a process (plate solving, auto focus, frame and focus), this image display will always be reused for new temporary images.

Any type of image display can interact with the other 2 types. The only thing that makes the image displays unique is the type of frame they hold.

Image displays can have 3 states:

- *Docked*: The image display is docked to the top, bottom or center of the main Sequence Generator Pro window and will move with that window.
- *Floating*: The image display is not locked to the Sequence Generator Pro window and can move freely around the desktop.
- *Nested*: Windows can be nested within one another. Simply drag a window over another open window and, using the nesting grid, select the desired position.

Image display windows can also be nested with one another (top, bottom, left, right, tabbed).



Above: a [Frame and Focus](#) image display nested (tabbed) with an Opened image display.

---

Created with the Standard Edition of HelpNDoc: [Easily create Web Help sites](#)

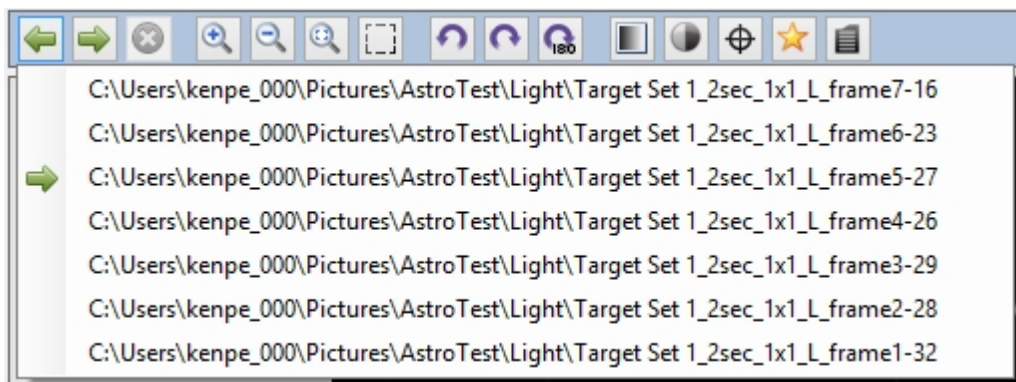
---

## Image Browsing

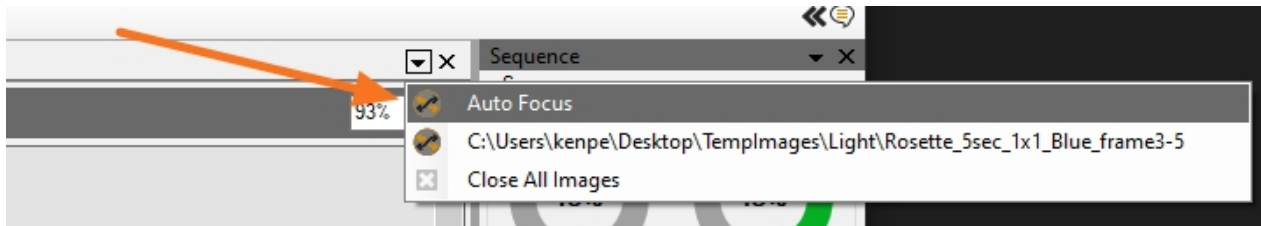
### Navigating and Browsing Images



The image browsing functionality works much in the same way as an Internet browser. If you want to see images taken in the recent past (without going to the file menu), simply click the back button (green arrow buttons on the far left). In addition to this you can right click either arrow button to show a list of recent images. The arrow in the left margin shows which image is currently displayed. Clicking on one of these images will open it in the current image window.



Additionally, you can click the small down-arrow at the upper right corner of the image display area:



Created with the Standard Edition of HelpNDoc: [Benefits of a Help Authoring Tool](#)

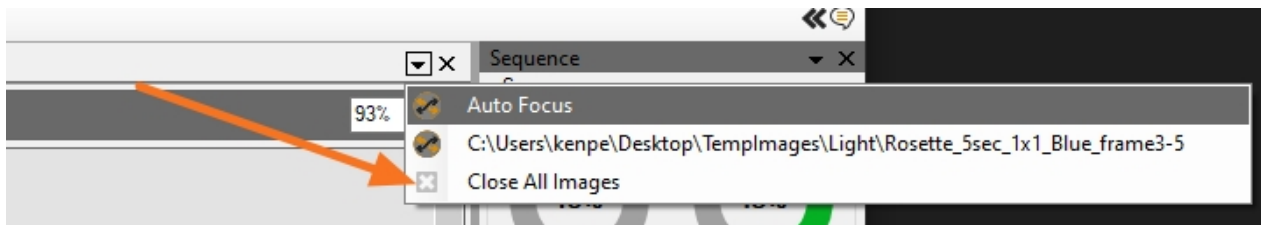
## Closing Images

### Closing Images

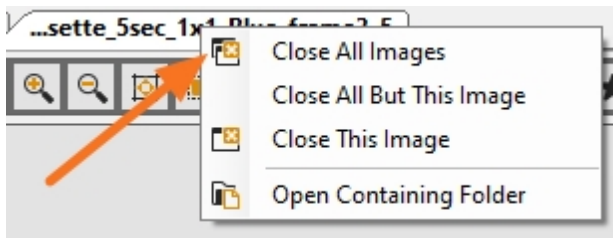
Images can be closed in several different ways:

#### Close All Images

Close all images via the down-arrow button at the upper right of the image display area:

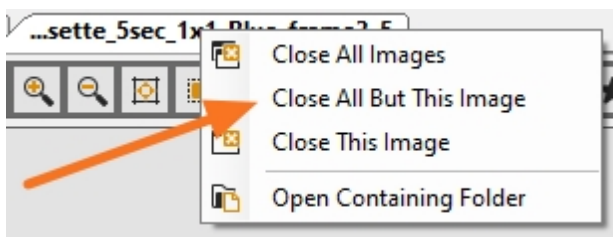


You can also right click on any image tab and select "Close All Images":



#### Close All But This Image

Right click on any image tab and select "Close All But This Image":

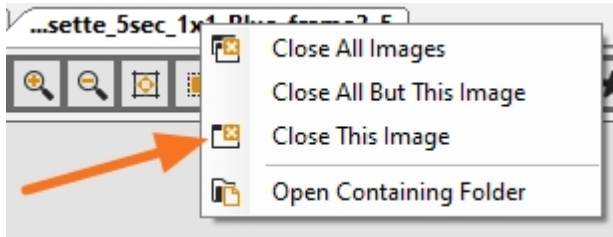


#### Close the Active Image

Close the current image by clicking on the "X" at the upper right of the image display area:



You can also right click on any image tab and select "Close This Image":



Created with the Standard Edition of HelpNDoc: [Create blue help files for the Qt Help Framework](#)

## Menu Bar



Every image in SGPro will have this menu bar attached to it. From it you can perform a variety of options. The bar has several distinct groupings in it... specifically from left to right:

- Image browsing tools
- Image zooming tools
- Image rotation tools
- Miscellaneous tools

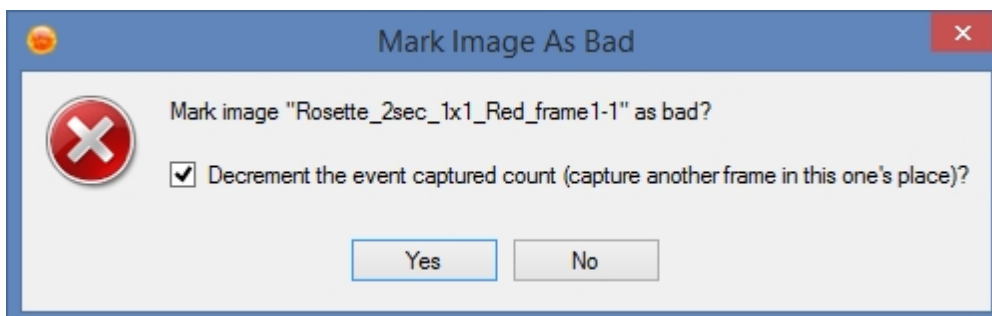
Created with the Standard Edition of HelpNDoc: [Full-featured Help generator](#)

## Marking an Image Bad



To mark an image bad, simply click the red "X" button. Marking an image bad will rename the image by prepending "BAD" to the front of the image (easily separated from your other images).

When you mark an image as bad, you may wish for it to be removed from the total number of frames you have already captured (so that this number reflects only "good" data). To perform this operation, simply ensure that the "Decrement" check box is selected:

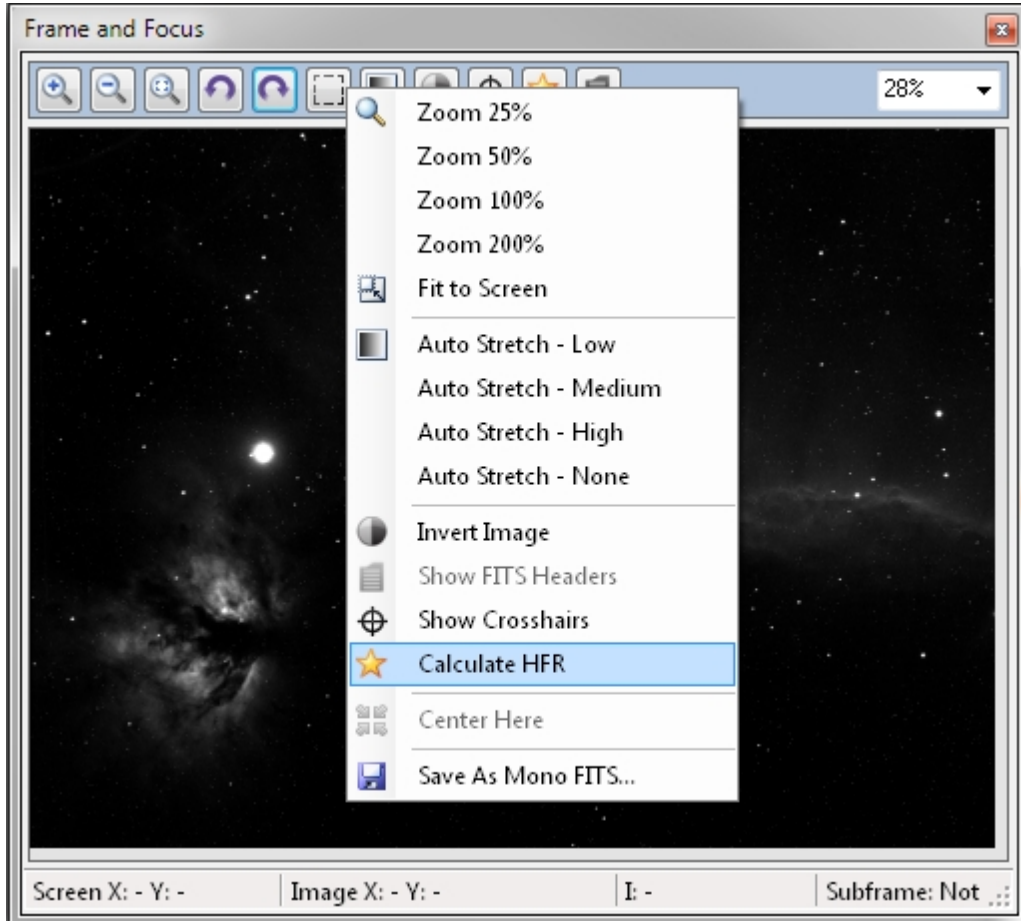


Created with the Standard Edition of HelpNDoc: [Create HTML Help, DOC, PDF and print manuals from 1 single source](#)

## Calculating HFR

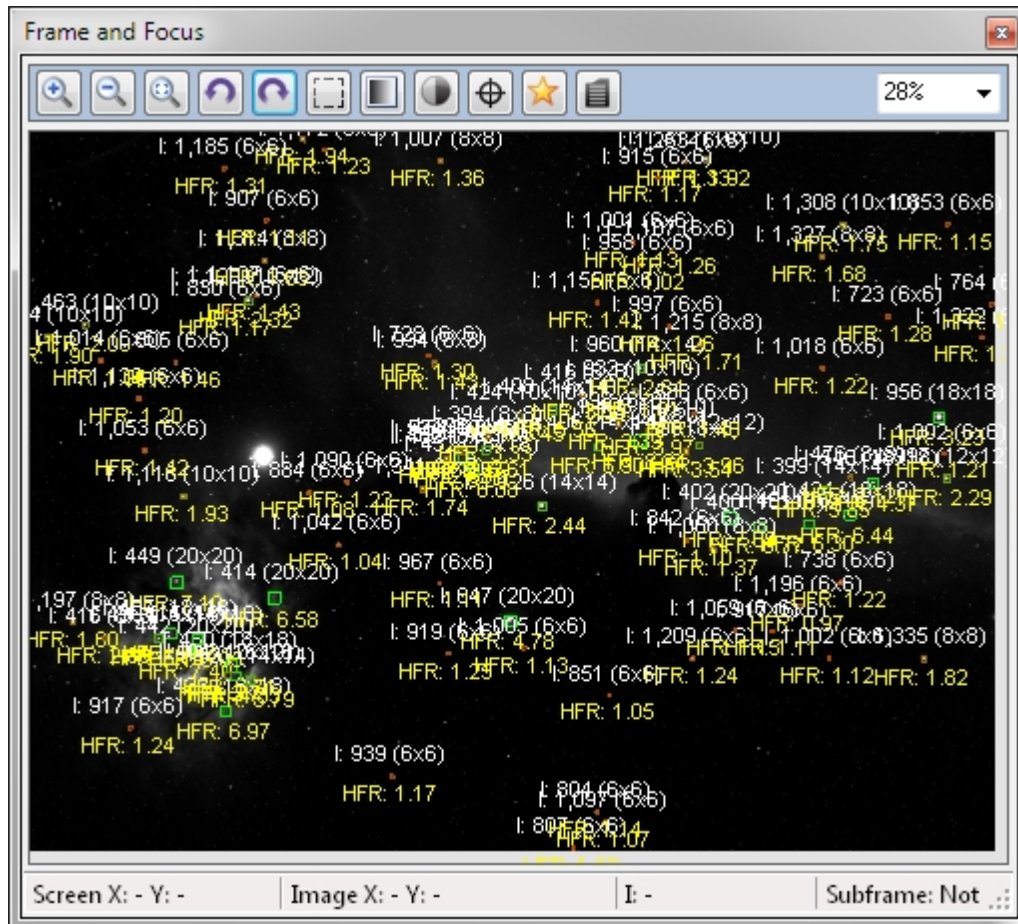
*Description:* HFR (Half Flux Radius) is a useful metric for determining your telescope's focus. It's important to note that HFR is only relative to other images of the same object through the same imaging train.

To calculate HFR, Right Click on an image within the Sequence Generator Pro display and select "Calculate HFR" (alternatively you can click on the "star" icon in the toolbar).

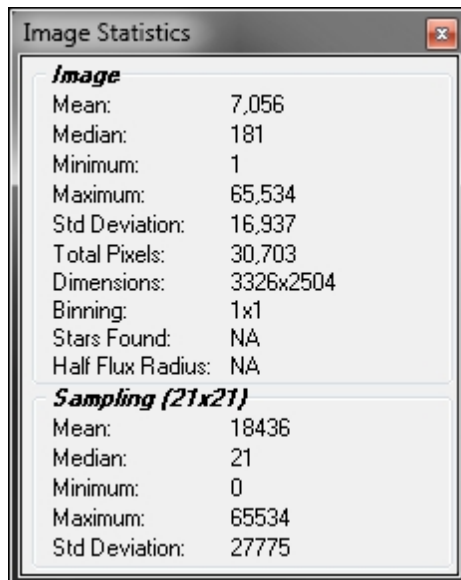


The image will then have an overlay of some of the stars used for the HFR calculation.





To view the HFR of the entire image use the [Image Statistics Module](#):

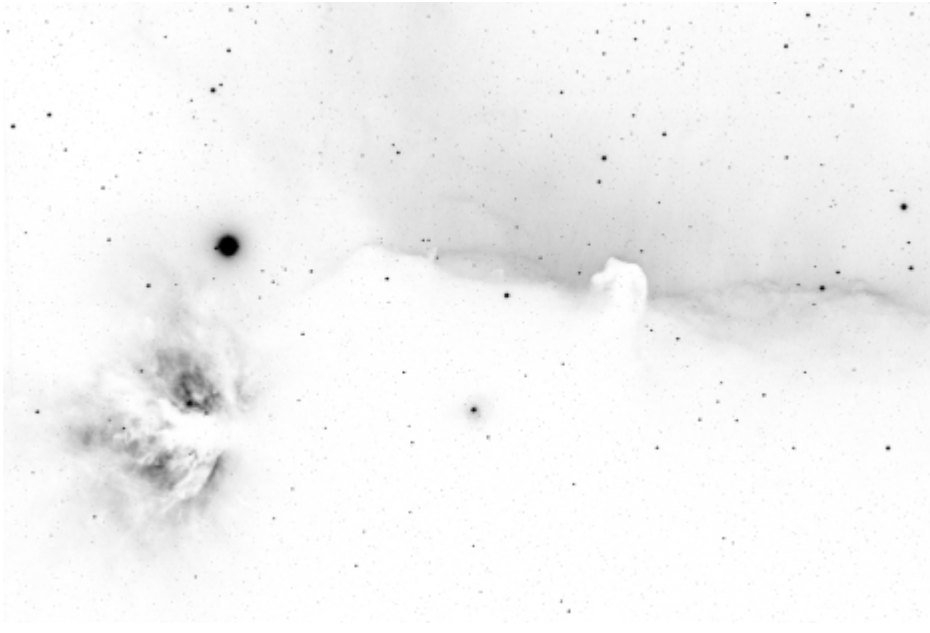


Created with the Standard Edition of HelpNDoc: [Create help files for the Qt Help Framework](#)

## Inverting

The black and white point of the image can be inverted by clicking the Invert Image button (black and white circle). This can be useful for detecting very faint objects in your image.

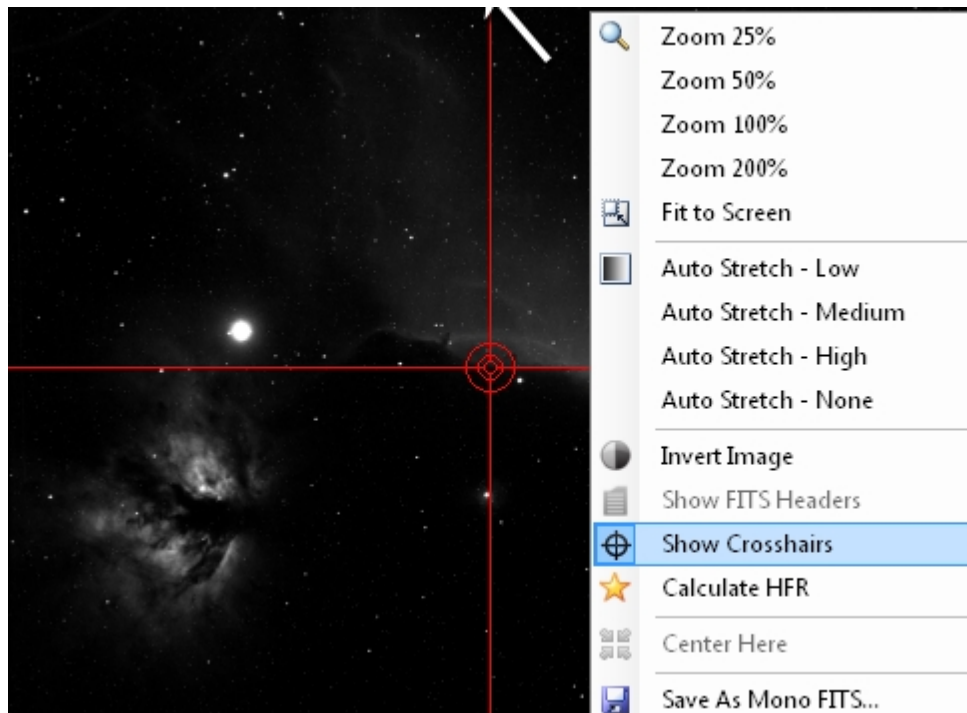




Created with the Standard Edition of HelpNDoc: [Qt Help documentation made easy](#)

## Crosshairs

Crosshairs can be toggled by Right Clicking on the image and selecting "Show Crosshairs" or by clicking the "Show Crosshairs" icon (reticle). Clicking the "Show crosshairs" checkbox for [frame and focus](#) will not toggle crosshairs for the current image (it is only used to decide whether or not to apply crosshairs to new [frame and focus](#) images).



Created with the Standard Edition of HelpNDoc: [Easy EBook and documentation generator](#)

## Viewing FITS Headers

FITS Headers can be displayed by clicking the "FITS Headers" icon (black document with white lines) on the image display:



This will bring up the following dialog:

Type	Key	Value	Comment
Logical	SIMPLE	T	file does conform to FITS standard
Int	BITPIX	16	number of bits per data pixel
Int	NAXIS	2	number of data axes
Int	NAXIS1	3348	length of data axis 1
Int	NAXIS2	2496	length of data axis 2
Int	EXPOSURE	600	Exposure time in seconds
Float	DEC	-2.248888888888889	Object Declination
Float	TEMPERAT	-19.9179071760555	Camera cooler temperature
Float	SCALE	2.025	Image scale (arcsec / pixel)
Float	CRVAL1	5.680833333333333	RA at image center
String	FILTER	Ha	Filter name
String	TELESCOP	Gemini Telescope .NET: ASCOM.GeminiTel...	Telescope n
Float	RA	5.680833333333333	Object Right Ascension
Float	YPIXSZ	5.4	pixel size in microns
Float	CRVAL2	-2.248888888888889	DEC at image center
Float	XPIXSZ	5.4	pixel size in microns
Int	PCOUNT	33004	Number of pixels in image

For multi-plane images you will see additional tabs for each pane (i.e. HDU2, HDU3, etc.).

You can see FITS header data stored in SGPro images [here](#).

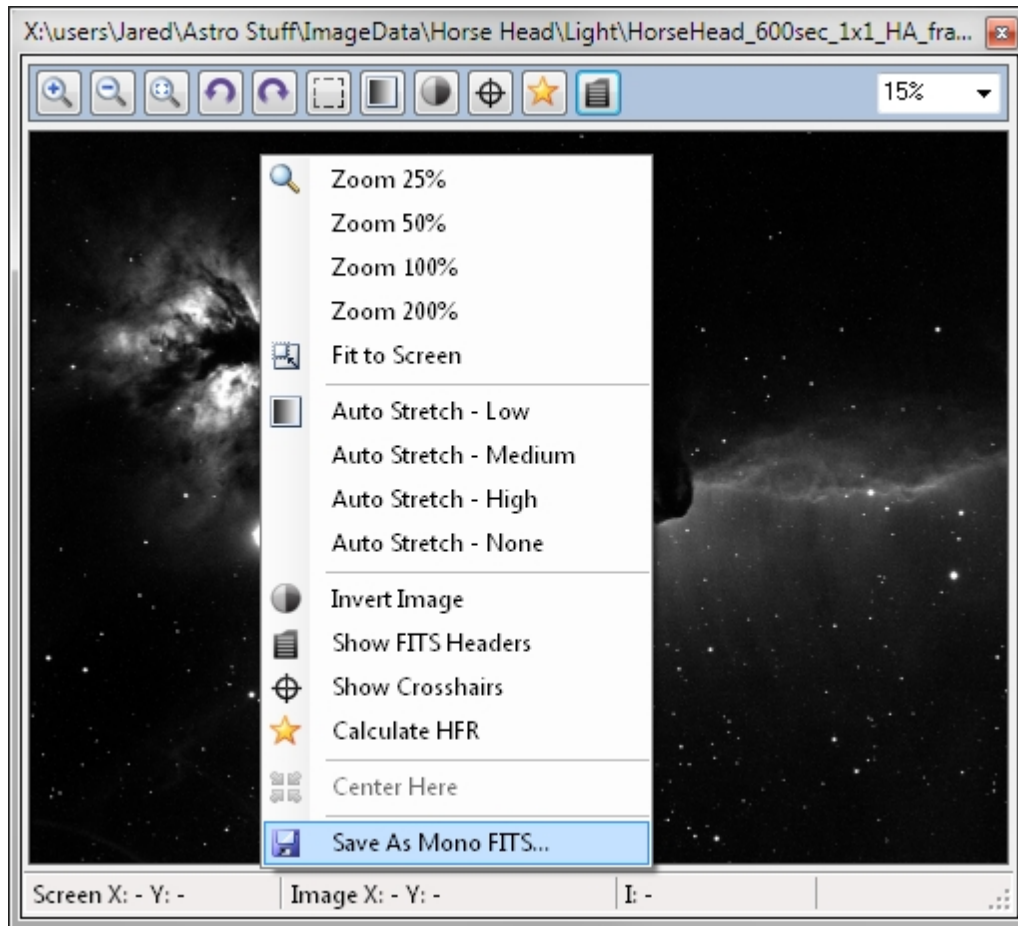
---

Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

## Saving Temporary Images

You can save temporary images ([plate solve frames](#), [auto focus frames](#) and [frame and focus frames](#)) by right clicking on the image and selecting "Save As Mono FITS..."



Created with the Standard Edition of HelpNDoc: [Free help authoring environment](#)

## Zooming and Panning

### Zooming



The zooming tool group is the second group from the left:



- Images can be zoomed in and out by using the Zoom In and Zoom Out buttons on the Image display (magnifying glasses with + and - symbols), you may also zoom in and out by using the Up and Down directional arrows on the keyboard.
- You can quickly zoom the image so it matches the size of the display window by clicking the "Fit To Screen" Button (Magnifying glass with dashed square).
- You can also select an area in which to zoom. In order to do this, click the "dashed rectangle" button and then select a rectangle around the area you want to zoom (Note: when the "zoom on selection" button is clicked, the mouse no longer pans the image when dragging (see below). Simply click this button again to return to "panning mode").

### Panning

To pan, click and hold on an image and then drag the image to where you would like to view. Note that this feature is not functional when the "zoom on selection" mode is active (see above).

For more information on zooming and panning see the [Pan and Zoom Module](#).

---

Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

## Rotating



Images can be rotated by clicking the "Rotate -90 Degree", "Rotate 90 Degree" or the "Rotate 180 degrees" buttons on the image display. The rotation group is located third from the left:




---

Created with the Standard Edition of HelpNDoc: [Easy to use tool to create HTML Help files and Help web sites](#)

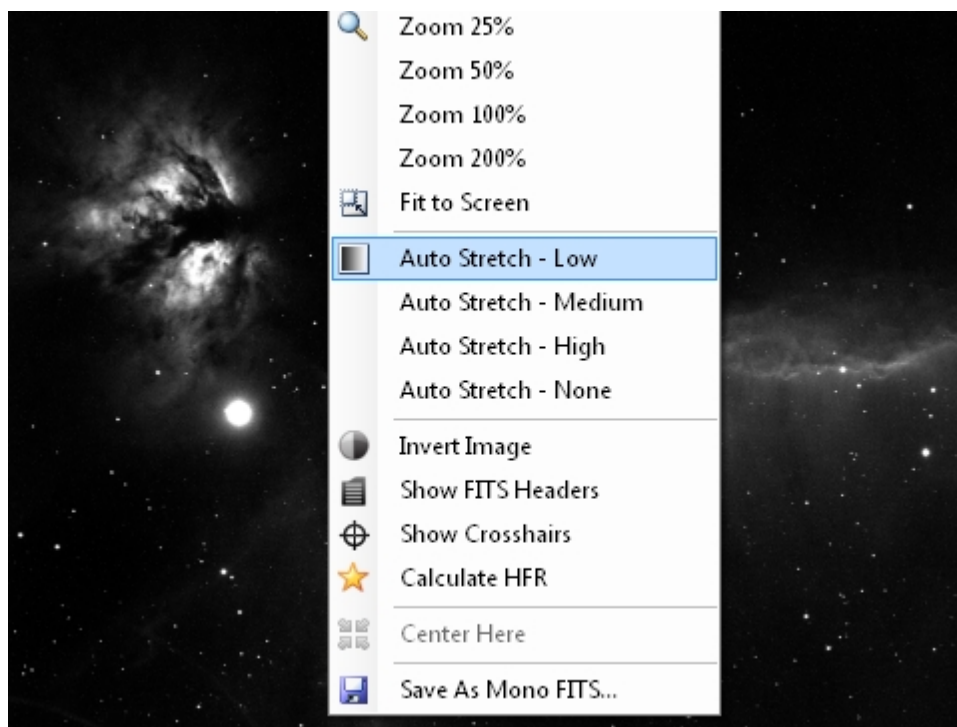
---

## Stretching

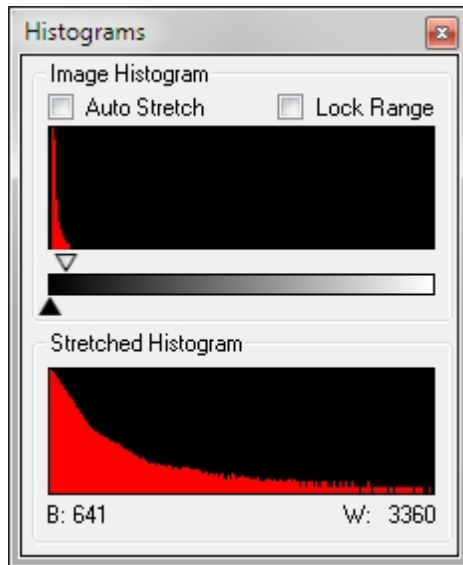


Stretching can be accomplished manually through the [Histogram Module](#) or automatically through the preset stretches.

To use one of the preset stretches right click on the image and select the "Auto Stretch" to be applied to the image. From the menu bar, simply click the "black and white gradient button".



To manually stretch the image drag the black and white points in the histogram module. The lower histogram displays the stretch as it is applied to the image.



You can also select "Auto Stretch" which will apply a low stretch to any newly captured images.

Stretching images can be accomplished in a variety of ways at different precision:

- *Baseline*: Use auto stretch as described above. The aggressiveness of auto stretch can be set in the [general options dialog](#).
- *Coarse Movement*: Use the mouse to drag the black and white point on the [histogram](#).
- *Fine Movement*: Use the mouse wheel or track pad scroll. This will move the black or white point by 100 ADU for each increment. You must set your mouse to control stretching [here](#).
- *Precision Movement*: Use the [left and right arrow keys](#) to make precise movements (10 ADU per click).

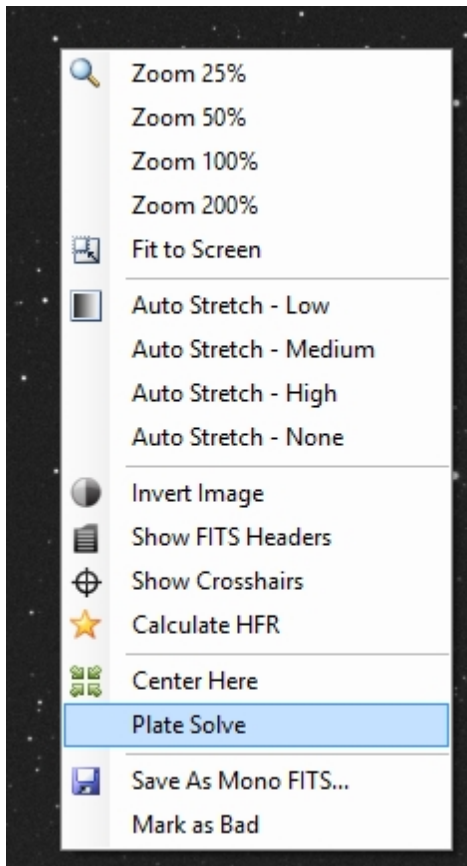
---

Created with the Standard Edition of HelpNDoc: [Create HTML Help, DOC, PDF and print manuals from 1 single source](#)

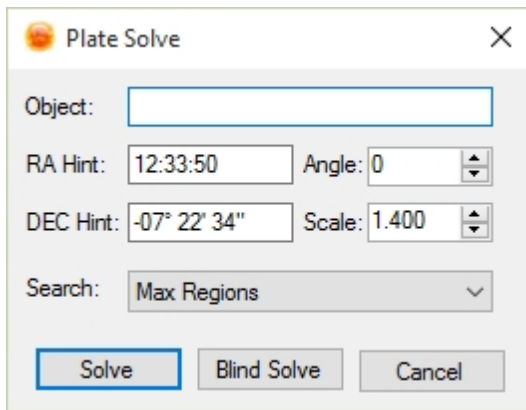
---

## Plate Solving

Almost any image displayed in SGPro can be plate solved by right clicking it and selecting the "Plate Solve" option:



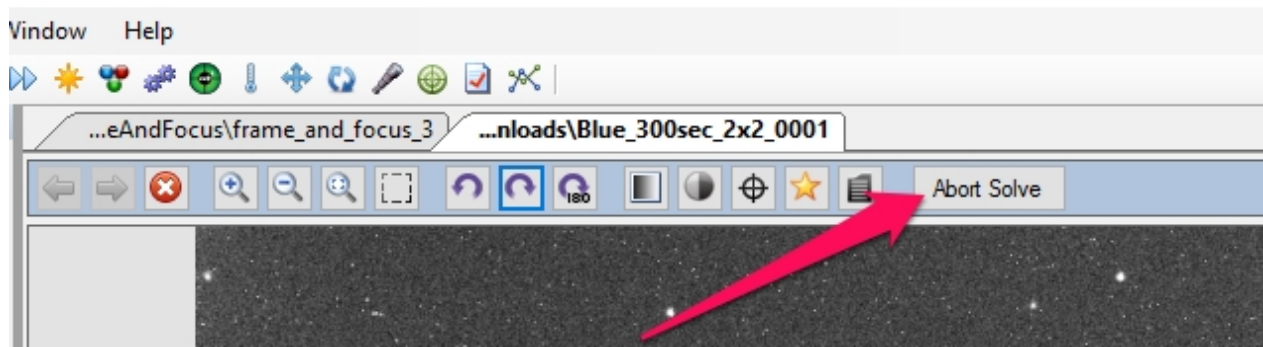
This will show you a small dialog box that prompts you for the hints required to solve. If possible, SGPro will auto populate these boxes for you. Also, if your blind solver is set up, you can skip all of the hints and click the "Blind Solve" button:



To solve with a "non-blind" solver you must enter some hints. Both Pinpoint and Elbrus require RA, DEC and scale hints. Only Elbrus requires an angle hint (assuming that you are not using the 2x2 at any angle search option). The RA and DEC fields are "free text" and will accept quite a large variety of formats (e.g. "20h58m54s +43°51'46" or "20:58:54 -43:51:46" or even decimal forms like 20.92). You can also paste text containing both RA and DEC into the RA field and it will properly populate both fields (most of the time). If you do not want to supply RA and DEC location information, you can simply supply the object catalog name closest to the center of the image. This will auto-populate the RA and DEC for you.

#### Long Running Plate Solves

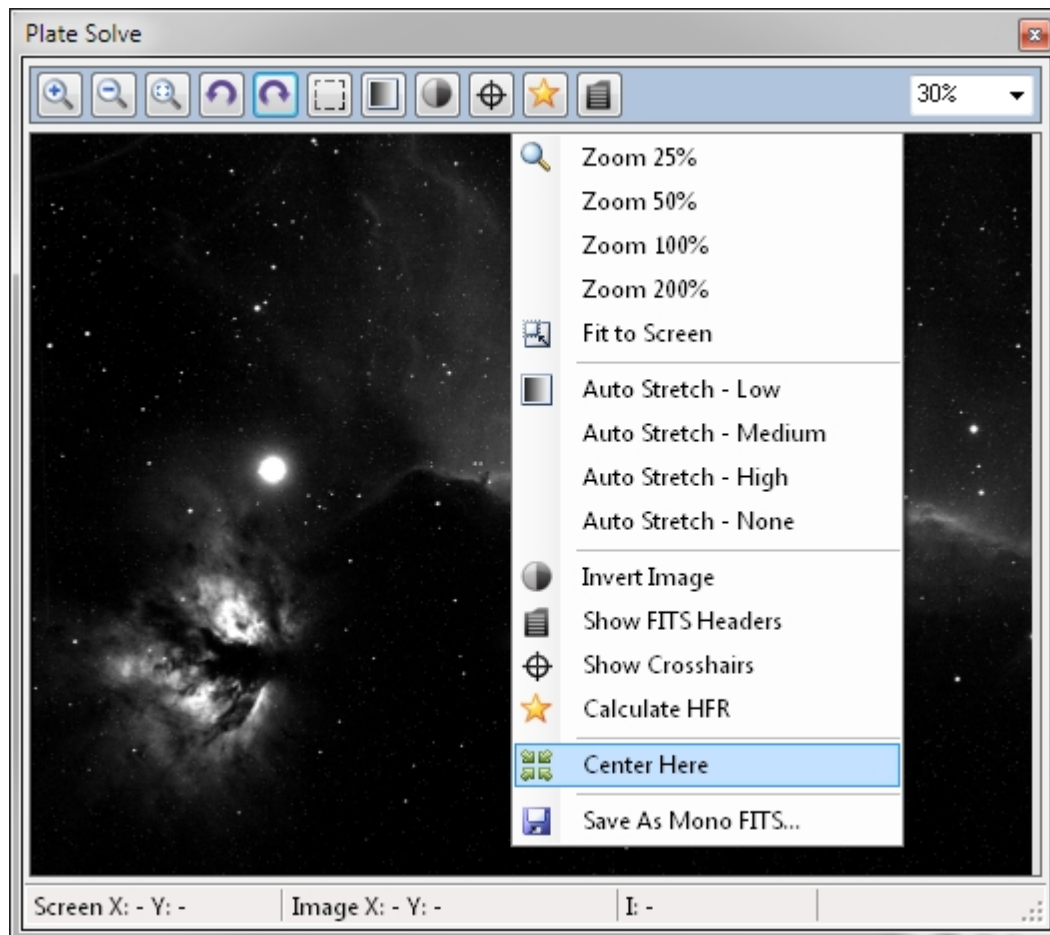
Some plate solves, depending on a variety of parameters, can take a long time to solve. Because they try many, many methodologies to solve the image, they can also take a long time to fail. If after some period of time, you come to the realization that your solve will never succeed and want to terminate it early, you can do so from the image tool bar:



Created with the Standard Edition of HelpNDoc: [Produce electronic books easily](#)

## Center Here Action

"Center Here" allows the mount to be pointed where the mouse was right clicked in the image. For more information see [Center Here](#) in the framing section.



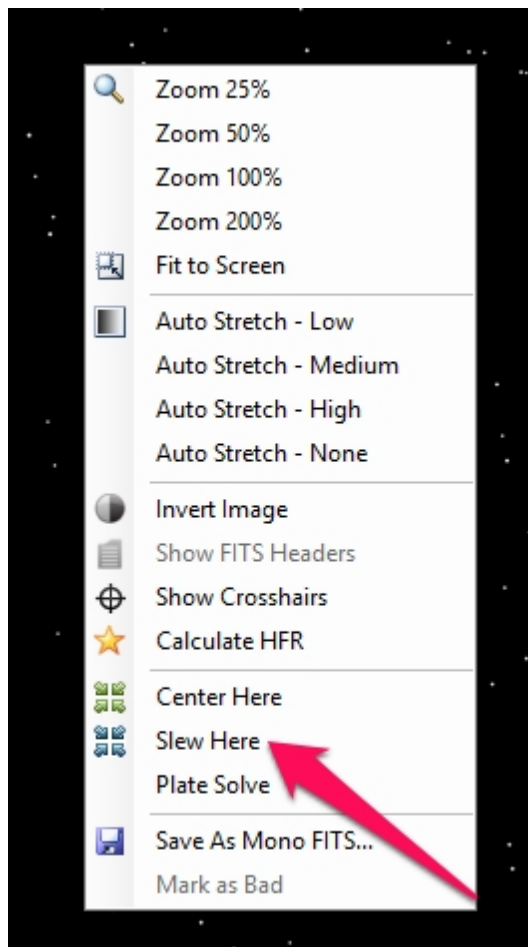
Created with the Standard Edition of HelpNDoc: [What is a Help Authoring tool?](#)

## Slew Here Action

This will use data about a previous solve to provide rapid, low overhead movements (without the need for a full centering process). This means that, unless some type of action that performs a plate solve of the scope's current position ([solve and sync](#), [auto centering](#) or [center here](#)) has been performed, this option will not be available. Once it becomes available, you can use it in a much more expedient manner because it



does not require the full centering process with solving and subsequence verification. The validity of this action is highly dependent on your mount's polar alignment and ability to slew in a precise manner.




---

Created with the Standard Edition of HelpNDoc: [Full-featured EBook editor](#)

---

## Modules

---

Sequence Generator Pro has a highly customizable user interface. At the heart of this flexibility are the Modules and the [Image Display](#) Windows.

The following modules are available for use:

- [Temperature Control \(Camera TEC\)](#)
- [Filter Wheel](#)
- [Focus Control](#)
- [Focus Target](#)
- [Frame and Focus](#)
- [Histograms](#)
- [Image Statistics](#)
- [Pan and Zoom](#)
- [PHD2 Graph](#)
- [Sequence](#)
- [Scope Centering](#)
- [Telescope](#)
- [View Options](#)
- [Image History](#)

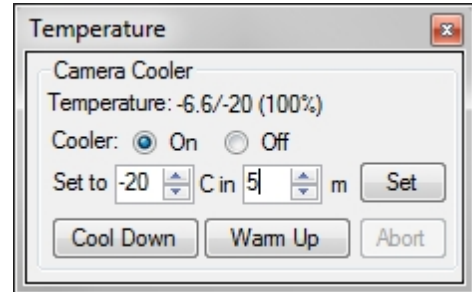
## Camera Temperature Control (TEC)

*Description:* Allows setting and controlling the CCD cooler for cameras that are equipped with a TEC. All values are in degrees Celsius. For more information see the [camera](#).

*Note:* If your camera has a cooler but it is not regulated then the only options available will be "On" and "Off". If your camera does not have a cooler at all all these options will not be available.

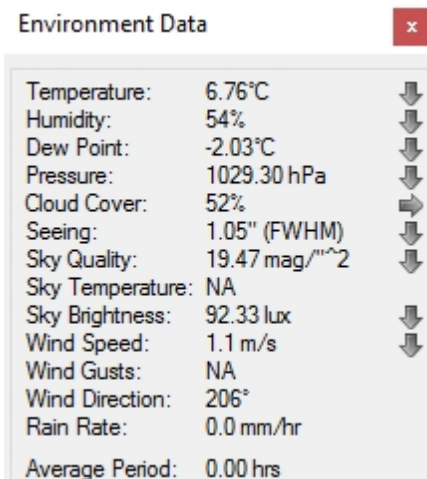
### Controls:

- *Temperature Display:* Displays the following information:  
Current CCD Temperature / Current Set Temperature (Current Power Level of TEC)
- *Cooler:* Allows for turning the cooler on and off.
- *Set To X in Y:* Allows setting the regulated temperature to X degrees Celsius. The CCD will be cooled to that temperature in Y minutes. If the time is set to 0 then the TEC will attempt to reach the set temperature in the shortest time span possible. Cooling down and warming up over a larger window of time allows for less thermal shock on the CCD and can help to increase the life of your camera.
- *Cool Down:* Will start the camera cool down process as defined in the [control panel](#).
- *Warm Up:* Will start the camera warm up process as defined in the [control panel](#). (*Note:* The camera is not able to warm above ambient so this value should be fairly representative of the ambient temperature).
- *Abort:* Stops the current Cool Down or Warm Up process.



## Environment Data

The Environment Data module provides the user with a variety of information about the local environment. Lots of different data types are supported, but it is doubtful any one device (as of the time of the writing) supports all of them. To access this module, simply [connect an "Environment Device"](#), and then click on the "cloud" icon on the tool bar.



In this module, you have access to:

- Temperature (C)
- Humidity (%)
- Dew Point (C)

- Pressure (hPa)
- Cloud Cover (%)
- Seeing (FWHM)
- Sky Quality (mag/"^2)
- Sky Temperature (C)
- Sky Brightness (lux)
- Wind Speed (meters/sec)
- Wind Gusts (meters/sec)
- Wind Direction (compass degrees)
- Rain Rate (mm/hr)

You will also have access to the period of time this data is averaged on the device before it is reported to SGPro. This is identified as the "Average Period". If the average period is 30 seconds, then all of the data presented is representative of the device's reading of that data over a 30 second period.

In addition to this data, given enough time, SGPro will also start to report on trends for available metrics. A trend is identified simply by an "up arrow", "down arrow" or "right arrow". Respectively, this means that SGPro believes this metric is increasing, decreasing or stabilized. The longer SGPro is able to collect this data, the more accurate the trend prediction will be.

---

Created with the Standard Edition of HelpNDoc: [Write EPub books for the iPad](#)

---

## Filter Wheel

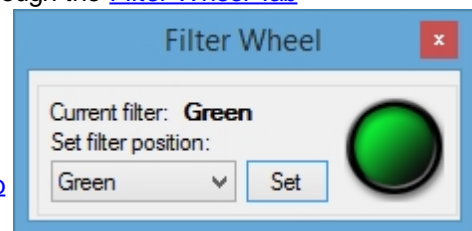
*Description:* Allows direct access to setting filters without going through the [Filter Wheel Tab](#)

The active (set) filter is displayed with bold text (and has a corresponding image of that filter for rapid identification)

### Controls:

*Set filter position:* selects the filter to be set. Also see [Filter Setup Dialog](#).

*Set:* Moves the filter wheel to the selected position (filter).



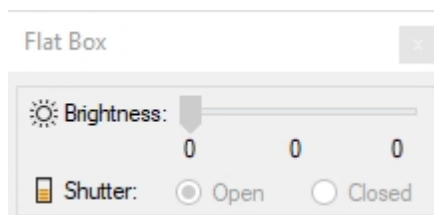
(Note: If the filter list is empty, it means that your filter list for this sequence has not been defined. Please [see this page](#) for help with that).

---

Created with the Standard Edition of HelpNDoc: [Produce Kindle eBooks easily](#)

---

## Flat Box



*Description:* Allows direct access to flat box control without going through the [Flat Box Control in the Control Panel](#).

### Controls & Indicators:

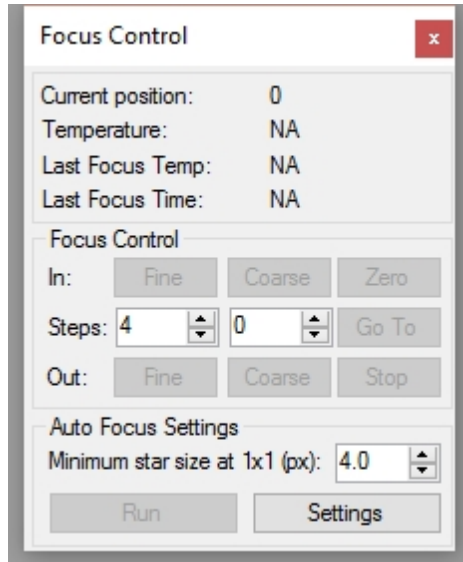
*Brightness:* Selects and displays the current brightness of the flat box.

*Shutter:* Some flat boxes can position themselves automatically when flat frames are required. This capability is referred to as a "Flat Box with Shutter". The "Open" indicator refers to the position of the flat box when it is not in place for flat frames. The "Closed" indicator refers to the position of the flat box when engaged in taking or prepping for flat frame capture.

## Focus Control

*Description:* Displays current information about the focuser as well as allowing control of the focuser.

*Note:* Currently Sequence Generator only supports absolute positioning focusers.



### Controls:

- *Current position:* displays the current position, generally in steps, of the focuser.
- *Temperature:* displays the current temperature of the focuser (if available).
- *Last Focus Temp:* displays the temperature at which the last focus run occurred.
- *Last Focus Time:* displays the time at which the last focus run occurred.
- *Focus Control:* Allows control of the focuser without going to the Control Panel. See [Focusers](#) for more information.
- *Minimum Star Size:* Adjust the minimum diameter of a star (pixels). More information about this in the section detailing [Auto Focus](#). Keep in mind that this is a per-target setting.
- *Run:* Initializes an [auto focus](#) run.
- *Settings:* Opens [auto focus settings](#).

Also See:

[Manual Focus](#)  
[Focus Reminders](#)

## Target Markers

*Description:* Useful for manual focus with a Bahtinov mask or other focusing aid. Allows you to set a focus target as well as an imaging target. This is generally useful for [Manual Focusing](#) but not needed for [Auto Focus](#).

**Controls:**

*Focus Target / Image Target:* Displays the coordinates of the Focus or Image target

*Set Focus / Target Position:* Sets the current telescope coordinates as the position for the focus or the target

*Goto Focus / Target:* Slews to the defined coordinates (as set above).

*Abort Slew:* Stops the current slew.

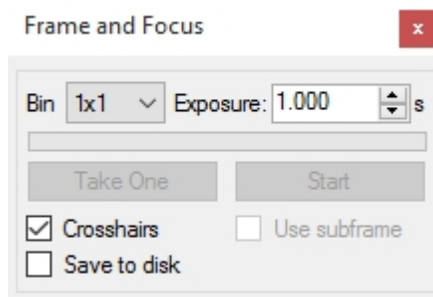


Created with the Standard Edition of HelpNDoc: [Free CHM Help documentation generator](#)

## Frame and Focus

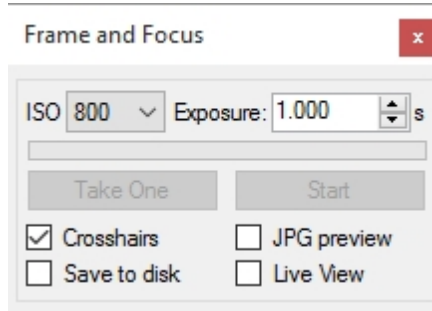
*Description:* Allows you to take temporary frames to manually adjust your [focus](#) or to verify [framing](#).

CCD Frame and Focus Module:

**Controls:**

- *Bin:* Changes the binning of the image.
- *Exposure:* Sets the exposure time of the image in seconds.
- *Start:* Starts a continuous frame and focus loop. Changes to the Bin, Exposure and Crosshairs options will be present upon the completion of the next frame (these options do not alter the appearance of the currently displayed frame). When looping the "Start" button will be changed to "Stop".
- *Take One:* Takes a single frame using the current Bin, Exposure and Crosshairs settings.
- *Use Subframe:* Toggles sub frames on and off. When selected you can use the mouse to create a [subframe](#) on a non-subframed image.
- *Crosshairs:* Toggles whether or not new images will show crosshairs. Crosshairs can also be toggled for a single image via the [image context menu](#)
- *Save to disk:* Allows for images to be saved to disk (for third party applications that perform directory monitoring). You are currently responsible for toggling this during the execution of SGPro (it can consume lots of disk space). It will never be checked on SGPro start (this is not a bug... it will never be saved in the checked state). Images will be saved to the sequence's data directory into a sub-folder named "FrameAndFocus". This is where you should point any application interested in this data. At least for now, you will also be responsible for the cleanliness of this temporary data (we might try and auto delete it sometime in the future).

DSLR Frame and Focus Module:



### Controls:

- *ISO*: Changes the ISO setting of the camera.
- *Exposure*: Sets the exposure time of the image in seconds.
- *Start*: Starts a continuous frame and focus loop. Changes to the ISO, Exposure and Crosshairs options will be present upon the completion of the next frame (these options do not alter the appearance of the currently displayed frame). When looping the "Start" button will be changed to "Stop".
- *Take One*: Takes a single frame using the current ISO, Exposure and Crosshairs settings
- *Crosshairs*: Toggles whether or not new images will show crosshairs. Crosshairs can also be toggled for a single image via the [image context menu](#)
- *Live View*: When enabled, will use the Live View on the camera when "Start" is clicked. Live View has a much faster image rate, but sacrifices some sensitivity.
- *Save to disk*: Allows for images to be saved to disk (for third party applications that perform directory monitoring). You are currently responsible for toggling this during the execution of SGPro (it can consume lots of disk space). It will never be checked on SGPro start (this is not a bug... it will never be saved in the checked state). Images will be saved to the sequences's data directory into a sub-folder named "FrameAndFocus". This is where you should point any application interested in this data. At least for now, you will also be responsible for the cleanliness of this temporary data (we might try and auto delete it sometime in the future).

Created with the Standard Edition of HelpNDoc: [Benefits of a Help Authoring Tool](#)

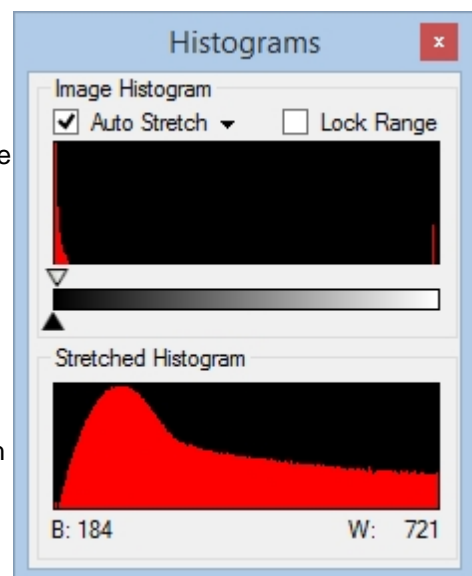
## Histograms

### Description:

The histogram module visually displays the pixel intensity information for the selected image. The top histogram shows the un-stretched image data from 0 - 65535. The bottom histogram displays the image data based upon the black and white point sliders. By adjusting the black and white arrows, the stretch on the selected image is changed. This is displayed on the Stretched Histogram as well stretching the on screen display of the image. It's important to note that performing a histogram stretch in this fashion does not alter the original image in any way. This is only for display purposes.

### Options:

- *Auto Stretch*: Checking this option will automatically perform a stretch on all newly opened images (does not affect the stretch value of the currently displayed image). For more information about stretching please see [Stretching](#). Auto stretch can be set to low, medium and high levels by clicking the small down arrow next to the "Auto Stretch" label.
- *Lock Range*: Checking this option will apply the current stretch to all new images.



Created with the Standard Edition of HelpNDoc: [Easily create EPub books](#)

## Image Statistics

*Description:* The Image Statistics Module displays pixel statistics for the selected image.

### Image

*This area displays information about the entire image*

- *Mean:* Displays the mean value (average) of all the pixel values within the image (ADU).
- *Median:* Displays the median (middle) pixel value of the entire range. The median is halfway between the brightest and darkest pixel (ADU).
- *Minimum:* Displays the minimum pixel value (ADU).
- *Maximum:* Displays the maximum pixel value (ADU).
- *Std Deviation:* Displays the value of one standard deviation of the image (ADU).
- *Total Pixels:* Displays the total number of pixels in the image.
- *Dimensions:* Displays the pixel dimensions of the image (Width x Height)
- *Binning:* If appropriate data is available, the binning of the image will be displayed here
- *Stars Found:* Displays the total number of stars used for the Half Flux Radius calculation. If the frame is not an [Auto Focus](#) frame or "[Calculate HFR](#)" has not been run on this image then "N/A" will be displayed.
- *Half Flux Radius:* Displays the Half Flux Radius of the entire image. The Half Flux Radius is a way to measure the relative size of a star. This metric is useful for determining when an image is focused, the lower the value of this metric the better the focus.
- *Ideal Exp Time:* This metric is designed to display ideal exposure time for your current environment (camera and other atmospheric conditions). In order to calculate this metric, you are required to enter data describing gain and readout characteristics of your camera). This metric is based on the following study (<http://www.hiddenloft.com/notes/SubExposures.pdf>).

Image Statistics	
<b>Image</b>	
Mean:	427
Median:	418
Minimum:	226
Maximum:	64,000
Std Deviation:	335
Total Pixels:	8,328,304
Dimensions:	3326x2504
Binning:	1x1
Stars Found:	300
Half Flux Radius:	1.53
Ideal exp time:	NA
<b>Sampling (21x21)</b>	
Mean:	321
Median:	318
Minimum:	263
Maximum:	422
Std Deviation:	22

### Notes on Ideal Exposure Time:

This value will be provided only for images that come directly off of the camera (it will not work for images opened off the disk) and requires 5 parameters to be of any use:

- Integration time (automatic input from SGPro for the current camera image)
- Mean background ADU (automatic input from SGPro for the current camera image)
- Gain for the binning used in e-/ADU (user input from the [camera tab in the control panel](#))
- Readout noise in e- (user input from the [camera tab in the control panel](#))
- Percent contribution of read noise to total noise (assumed no more than 5%)

### Sampling(21x21)

*This area displays information about a 21x21 pixel sample centered at the cursor location*

- *Mean:* Displays the mean value (average) of all the pixel values within the sample (ADU).
- *Median:* Displays the median (middle) pixel value of the sample. The median is halfway between the brightest and darkest pixel (ADU).
- *Minimum:* Displays the minimum pixel value (ADU) of the sample.
- *Maximum:* Displays the maximum pixel value (ADU) of the sample.
- *Std Deviation:* Displays the value of one standard deviation of the sample area (ADU).

## Observatory

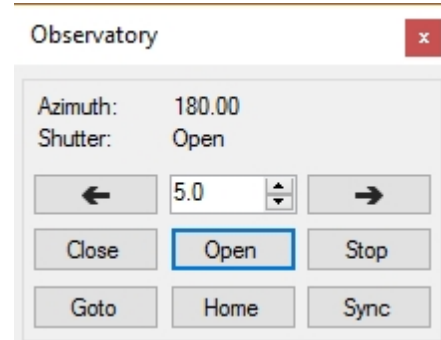
*Description:* Allows direct access to observatory actions without needing to go through the [observatory controls](#) located in the control panel.

The observatory's azimuth and shutter status are displayed at the top for convenience.

### Controls:

- *Move left:* Rotates the observatory to the left by the number of degrees in the field directly between the arrow buttons.
- *Move right:* Rotates the observatory to the right by the number of degrees in the field directly between the arrow buttons.
- *Close:* Closes the observatory shutter.
- *Open:* Opens the observatory shutter.
- *Stop:* Stops all movement in the observatory.
- *Goto:* Summons a dialog asking for an absolute position (in degrees) in which to slew.
- *Sync:* Sync the dome azimuth to a specific angle.
- *Home:* Slew the observatory to user defined home position.

Also see [observatory settings](#) in the control panel.

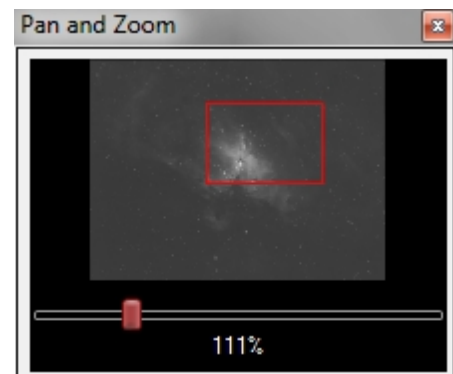


## Pan and Zoom

*Description:* Displays the current zoom level percentage as allows you to change the currently displayed portion of the selected image.

### Controls:

- *Image Zoom Window* - Displays a thumbnail of the entire image. Clicking on the image will allow you to quickly pan to a specific area of the image. The red highlighted area shows the currently displayed area of the selected image.
- *Zoom Slider* - Moving this slider to the left will decrease the zoom level, moving the slider to the right will increase the zoom of the selected image. The percentage of the zoom is displayed below the slider. This slider allows a zoom range between 25 and 400%.



## PHD2 Graph

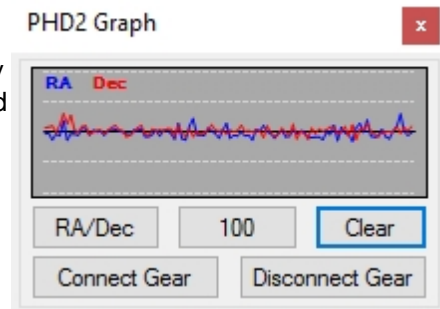


*Description:* Displays information from the PHD2 log in order to visualize guiding accuracy.

*Note:* Logging must be ENABLED in PHD2 Guiding for the PHD2 Graph display to work. If logging is not enabled a Red box will display over the graph. To enable logging in PHD2 go to the "Tools" menu and verify that "Enable Logging" is checked.

#### Controls:

- *RA/Dec:* Changes the current display of the graph between RA/Dec and dX/dY.
- *100:* Changes the number of sample points displayed on the graph. Options are 50, 100, 250, 500.
- *Clear:* Removes all the points from the current graph. New sample points will be displayed starting on the left hand side as they arrive from PHD2.
- *Left Clicking the Graph:* Changes the Y axis range. The displayed above shows a range of -4 to 4 pixels. The options are -4 to 4, -2 to 2 and -1 to 1.

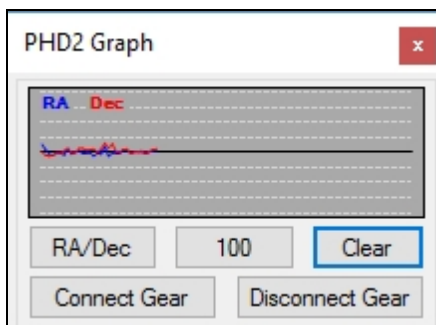


*Graph color customization:* All of the graph colors can be changed by using the color change dialog seen here.



- To change the background color Right Click on the Graph
- To change the RA/dX Color, left click on the Ra or dX label on the top left of the graph.
- To change the Dec/dY Color, left click on the Dec or dY label on the top left of the graph.

#### Connecting / Disconnecting Guider Equipment



Clicking the "Connect" or "Disconnect" buttons will connect / disconnect PHD2 gear as defined by the sequence's chosen PHD2 profile. For more details on how to set your sequence's PHD2 profile, [go here](#).

Created with the Standard Edition of HelpNDoc: [Single source CHM, PDF, DOC and HTML Help creation](#)

## Sequence

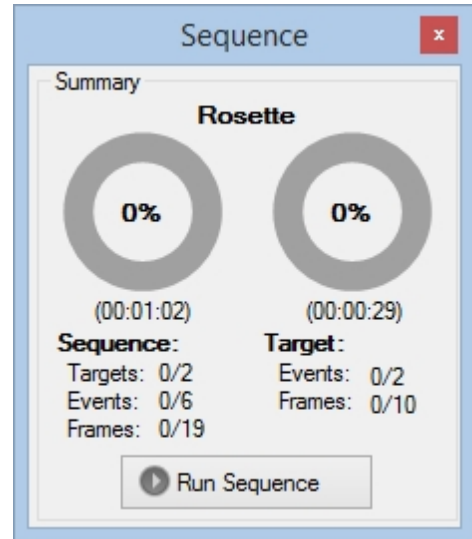
*Description:* Displays real time information about the state of the sequence as allows the sequence to be started and paused.

This module operates differently depending on whether or not the sequence is running.

If no sequence is running, the module displays information about the currently selected target. If a sequence is running, it will always display information about the currently running target.

The first (top) line of this module displays the name of the currently selected or currently running target. Below that are two donut progress graphs that represent the sequence and target progress (respectively). At the bottom of the graph on the left side, the number of completed targets, events and frames for the sequence are displayed. On the right side, the number of events and frames for the selected or currently running target are displayed.

*Run Sequence/Pause Sequence:* Allows the sequence to be started or paused (aborted) depending on the current state of the sequence.



Created with the Standard Edition of HelpNDoc: [Produce Kindle eBooks easily](#)

## Scope Centering

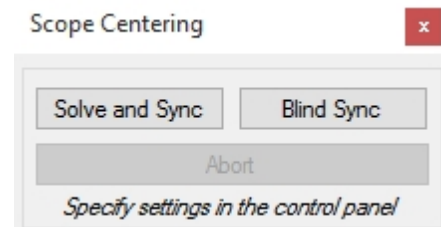
*Description:* Allows direct access to the Solve and Sync and Auto Center options in the [Plate Solve Tab](#)

### Controls:

*Solve and Sync:* Captures an image and then syncs the telescope to that location .

*Blind Sync:* Performs a Solve and Sync using the Astrometry.NET blind web solver (Internet connection required).

*Abort:* Stops the Solve and Sync or Blind Sync process.



Note: The buttons are only to provide a convenient way to access these actions. The actual settings are only available in the [control panel](#). These will need to be checked and set prior to using this module.

Created with the Standard Edition of HelpNDoc: [Create cross-platform Qt Help files](#)

## Telescope

*Description:* Displays the current position of the telescope and allows the scope to be nudged ( to aid in

centering).

#### Controls:

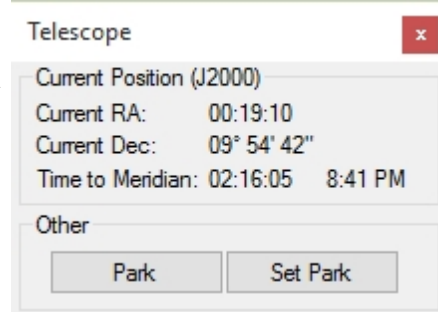
*Current Position:* Displays the current position of the telescope in RA and Dec.

*Time to Meridian/Pier Flip:* Displays the time to the meridian or the time until a pier flip will be invoked if [Auto Meridian Flip](#) is in use.

Negative values will be displayed if the meridian has been passed or the Pier Flip has already occurred.

*Park:* Runs the Park command for the telescope (mount) and dome (if a dome is connected).

*Set Park:* Sets the park position for the telescope to its current position (also gives you the option to set the dome park position to its current position)



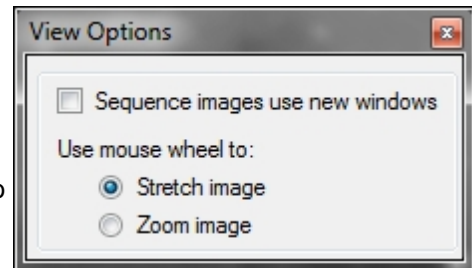
Created with the Standard Edition of HelpNDoc: [Easy EPub and documentation editor](#)

## View Options

*Description:* With respect to the currently active image, determines how the mouse wheel functions and changes options that govern how new [images](#) behave.

#### Controls:

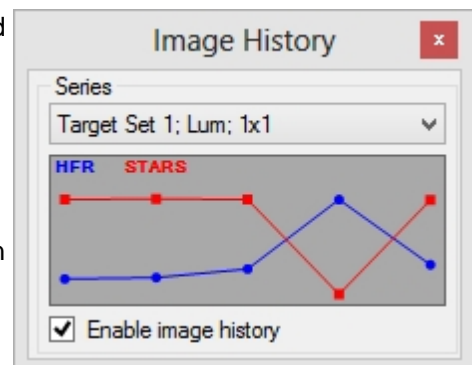
- *Sequence images use new windows:* When checked, new images (taken as part of a sequence) will use new display windows rather than reusing the current image display window. Note that this option does not apply to temporary frames (auto focus, frame and focus, plate solve) which always use the same window for display. If this option is not selected, sequence images will replace one another in the same window frame.
- Use mouse wheel to:
  - Stretch Image: Selecting this option, the mouse wheel will [stretch](#) the currently selected image's white point (holding the ALT key while moving the mouse wheel will move the black point).
  - Zoom Image: Selecting this option, the mouse wheel will [zoom](#) the currently selected image.



Created with the Standard Edition of HelpNDoc: [Easily create PDF Help documents](#)

## Image History

*Description:* This module will record and show a history of HFR and Star count data for all camera images. This will help you understand, at a glance, if recent images are likely bad (poor guiding, clouds, etc.). Both the HFR and Star count series should be representative of fairly straight lines. If you see a deviation in these lines where HFR increases and star value decreases, then you will want to inspect the image to verify if it is bad. To inspect the image, simply hover the mouse over either of the bad points (on the graph) and click. The image in question will open for inspection. If you want even more details, right click on a point (or click the down arrow on the title bar) and select "Show series details". This will open a [larger representation](#) of the module that includes a text based table used to display HFR and star count for all images. More information on the expanded version can be found [here](#).



A more detailed description (including how data is grouped) of this data can be found by reviewing the documentation for the [Image History Tool](#).

#### Controls:

- Enable image history: Checking this will start the collection of data
- Right click to:
  - Open an image for inspection
  - Clear all image history data
  - Clear just a single series
  - Mark an image as bad
  - View details for a particular series
- Click the HFR and STARS labels to change colors

---

Created with the Standard Edition of HelpNDoc: [Full-featured Help generator](#)

---

## Helpers / Wizards

---

Here you will find information about the various wizards and helpers that Sequence Generator Pro offers.

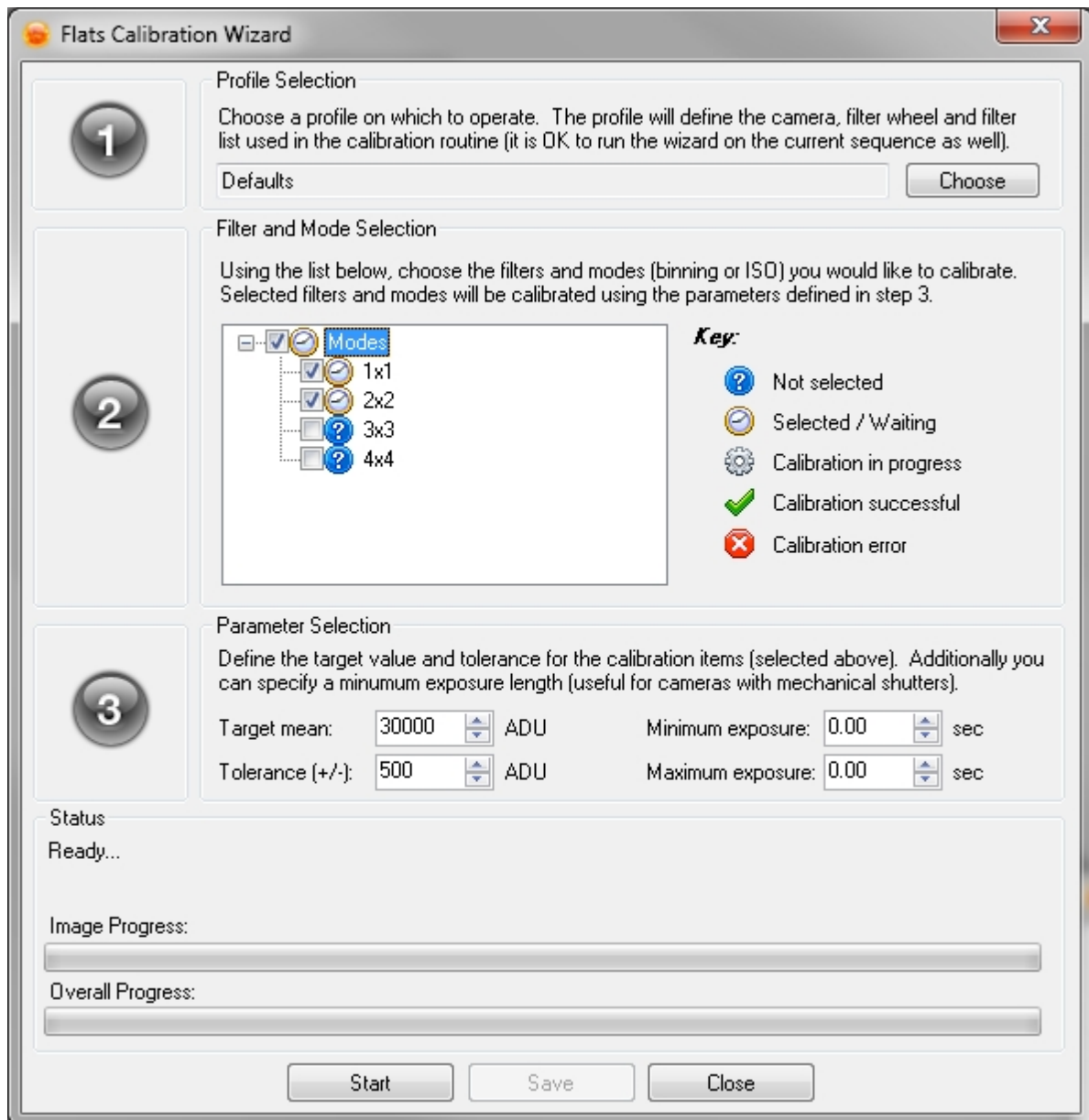
---

Created with the Standard Edition of HelpNDoc: [News and information about help authoring tools and software](#)

---

### Flats Calibration Wizard

*Description:* The Flats Calibration Wizard is used to automatically find the exposure time needed when taking flats. In general this wizard only needs to be ran once for each equipment configuration. Once the Flats Calibration Wizard is complete the exposure lengths are stored in the "Flats" section of the [Filter Setup](#).

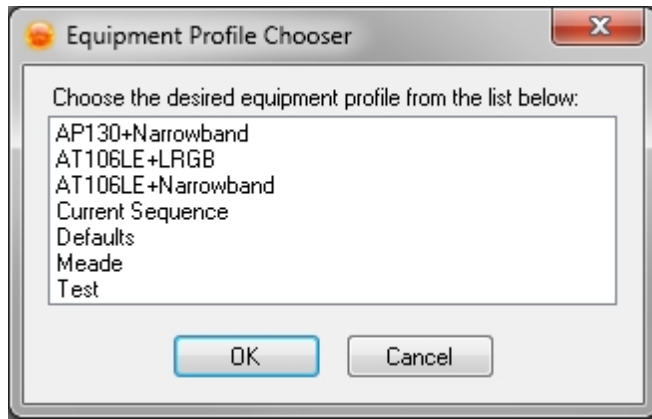


## Running The Flats Calibration Wizard:

Before you run the Flats Calibration Wizard you should ensure that:

- Your [Flat Box](#) or flat source is setup and ready to use
- Your camera is connected
- If needed your filter wheel is connected.
- If using a Flat Box with controllable brightness you have setup the brightness values to be used for the filters using the [Filter Setup](#) dialog.

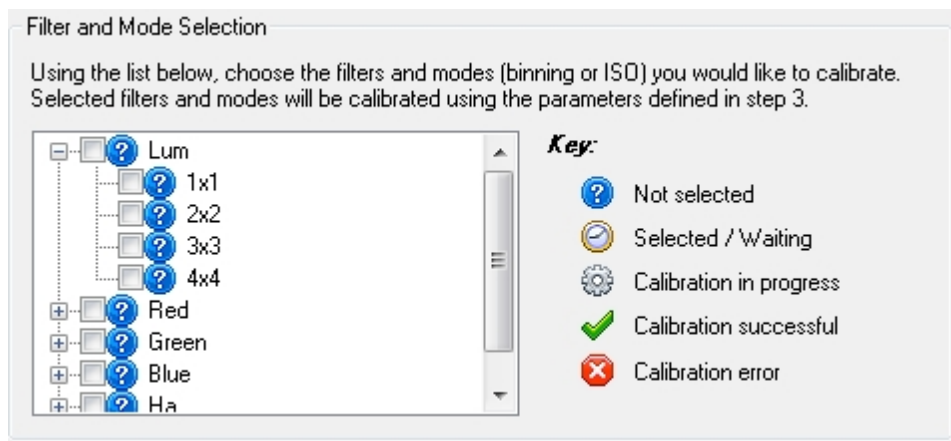
Once the above are ready you can begin the wizard by selecting the profile that you would like to run calibration for by clicking the *Choose* button. The following dialog will appear:



If you select "Current Sequence" the equipment and data from the current sequence will be use. However if you fail to save the sequence or you do not save the sequence as a profile then all the flats data will be lost. The preferred method is to run the Flats Calibration Wizard against a profile so that the profile gets updated with the flat exposure information.

Select the Profile you would like to use and click "OK".

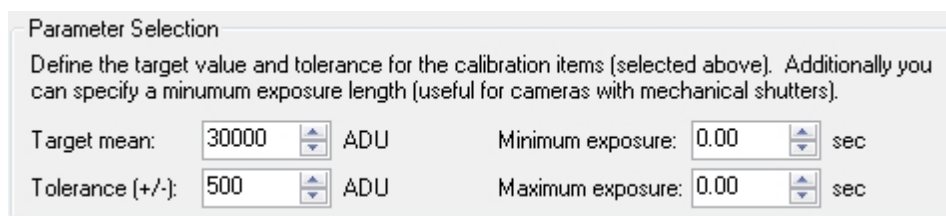
If you're using a CCD with a filter wheel then your "Modes" window should look something like the following:



However if you're using a DSLR the binning values will be replaced with ISO Values. Also if you're not using a filter wheel then you will just see the options to set the binning or ISO values.

Select the Binning or ISO values for which you would like to run the calibration.

Next you'll need to enter some parameters to characterize your flats in the *Parameter Selection*.



- **Target mean:** This indicates the ADU that you would like to obtain for your flats. For CCDs this value is generally between 20,000 and 40,000. Ideally you want to your flat data to fall in the area where your CCD behaves in a linear manner. You man need to consult your CCD manufacturer to obtain this information, but typically CCDs behave linearly under 40,000 ADU.
- **Tolerance:** How close must the Flats Calibration Wizard come to your *Target mean* ADU value before calling the exposure time good. Generally for CCDs this value can be a couple hundred ADU. However

for DSLRs this value generally needs to be higher because they are not temperature regulated and don't have as linear as a response as a CCD.

- *Minimum exposure:* The minimum exposure time that is acceptable for your flats. Again this will depend on your camera. If you have a non-uniform shutter (Qhy9) this value will likely need to be higher than if you have a uniform shutter (SBIG 8300).
- *Maximum exposure:* The maximum exposure time that is acceptable for your flats. This will depend on your light source and the filter you're using. This is mainly just to give Sequence Generator Pro a stopping point when finding the exposure time so that it doesn't continuously adjust the exposure. Setting this to 0 does indicate no maximum, so use accordingly.

Once you have the above values filled in with reasonable values click the "Start" button to run the wizard. The "Modes" will then display what binning/ISO is currently being calibrated and the status of any previously attempted runs. Refer to the "Key" section of the Filter and Mode Selection for information about what specific symbols mean.

## Saving and Using the Calibration Data

When the calibration routine completes, you will need to save the data for future use. If your calibration source (step 1) was a profile, this data will be saved to the profile. If your source data was the current sequence, this data will be saved as part of the sequence.

Once saved, this data can be used in one of two ways:

1. From the [flats wizard](#): Using this tool, you can use existing light sequences to automatically create a variety of flats events (that use this data).
2. By selecting an [event](#) type of "flat": Selecting this type will automatically populate events with the appropriate exposure length (as determined by the calibration routine) and count.

---

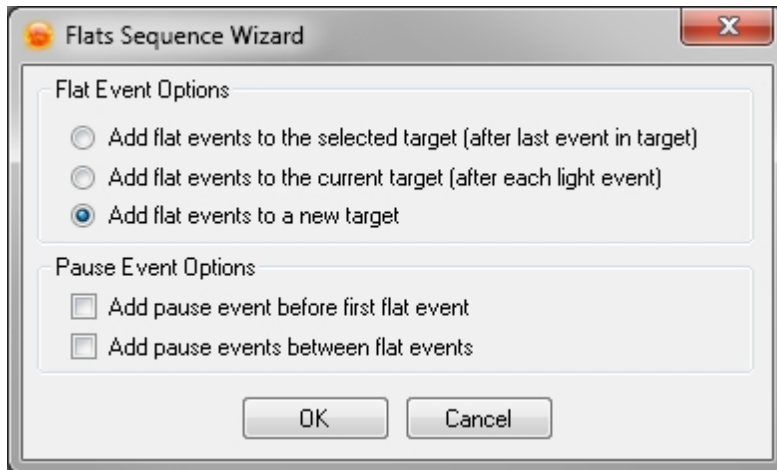
Created with the Standard Edition of HelpNDoc: [Generate EPub eBooks with ease](#)

---

## Flats Wizard

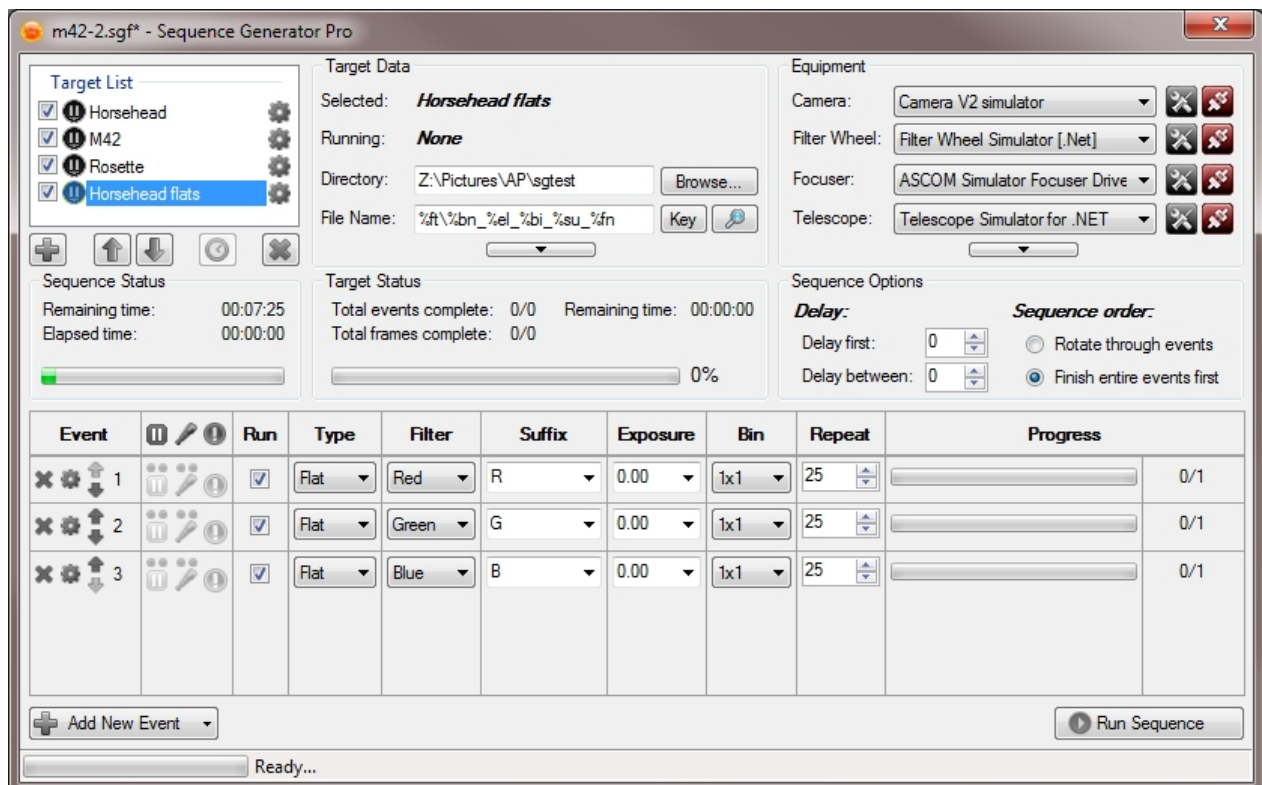
Sequence Generator Pro has the ability to easily create a "flats" sequence using only your "lights" sequence as input. Taking the time to collect information about how your equipment needs to capture flats can be a big time saver when capturing flats in the field. The following is a step by step tutorial on using this tool:

1. Make sure that your filter data is set up correctly and that each filter has valid flats data specified. [Click here](#) for more information about how to create and use a filter set.
2. Open a "lights" sequence (that uses filters). This might already be open if you take flats after capturing your lights data.
3. Go to the "Tools" menu and click "Flats Wizard". You will be prompted with the dialog below. The flats data will also use the ["Auto adjust focus per filter"](#) option. This means that the focuser, prior to capturing flats data, will move to the focus position defined for that filter.



4. You will need to specify some options about how your flats will get created such as:
  1. Flat Event Options
  2. Pause Event Options
5. Once you've selected the options from above click "OK" and the events will be added to your current target or to a new target depending on your selections.

This tool will, in the end, create a sequence that resembles the following ("Horsehead flats" was created from "Horsehead" using the option to "Add flat events to a new target"):



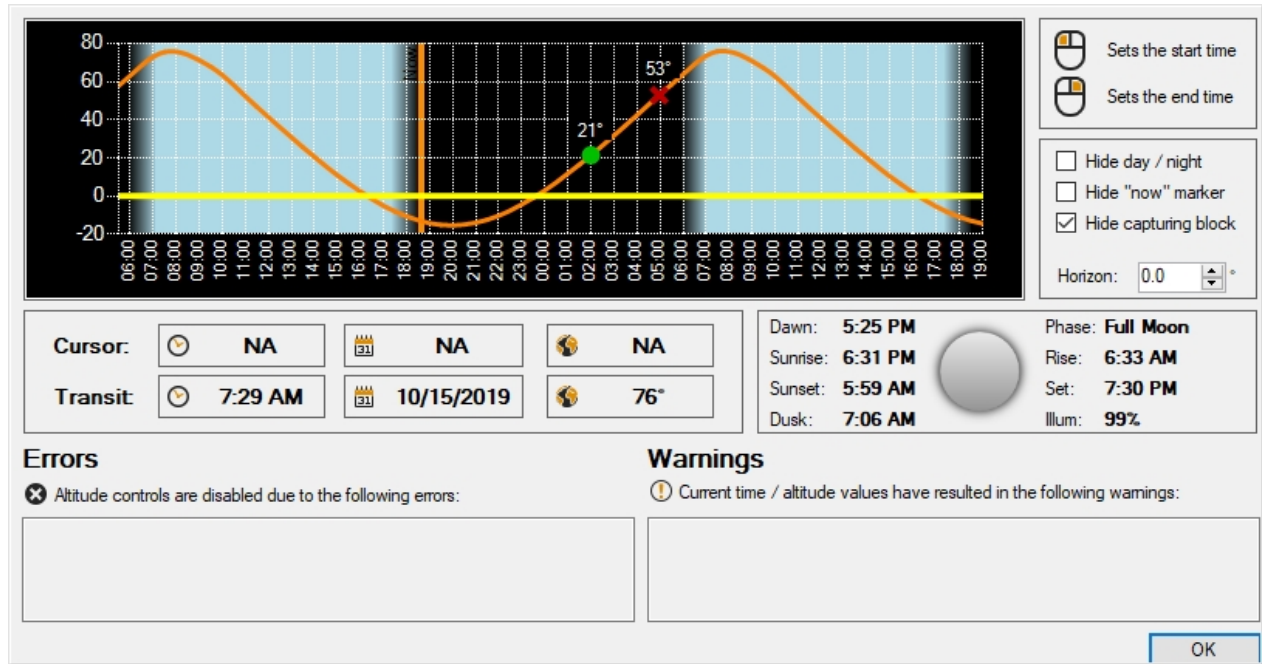
The data it used to populate "Exposure" and "Repeat" are pulled from the [filter set data](#) you defined. All other fields are essentially a direct copy of those values found in the "lights" sequence.

Created with the Standard Edition of HelpNDoc: [Full-featured Kindle eBooks generator](#)

## Planning Tools

Planning tools are designed to assist the user with decisions around start and stop times for a specific target.





## Reading the graph

**Day and night.** Any bluish area represents daylight and any blue to black gradient represents twilight. The black area is always suitable for imaging. Twilight is rendered using "Amateur Astronomical Twilight" (-15 degrees).

**Altitude.** The orange series represents a target's altitude over time (for the current night). This sample shows a target that is only at 20 degrees when twilight is over... not a suitable target.

**Horizon.** The horizon is a user defined value that represents your (artificial) horizon. The initial value here will be derived from the horizon value found in the [user profile](#) you are using. This value can help you visually identify appropriate start and end times. If you change the value here, it will only be saved as part of the current sequence and will not change the value found in the user profile. The sample above shows an artificial horizon at 45 degrees.

## Using the graph

When you hover the mouse over the graph, it will show a vertical red line that is indicative of the position (time). If you left click anywhere there, it will set the target start time to the value shown in the "Cursor" time field (indicated by a green dot). Right clicking will do the same for the target's end time (indicated by a red X). **Note: This functionality does not work unless the "Start at" and "End at" checkboxes are actually checked (in [target settings](#)).**

## Other

**Transit.** Below the "Cursor" information, information for the target's nearest transit is displayed. This indicates when the target will start to decrease its altitude and head toward the horizon.

**Solar / lunar data.** Next to the "Cursor" and "Transit" information area, there will be general information about the sun and moon for the current night. Dawn and dusk are calculated using "Amateur Astronomical Twilight" (-15 degrees).

**Errors.** If SGPro has detected errors in the values you have chosen or is unable to render parts of the graph, it will tell you why here (Note, the most common issue encountered is that the planning tools do not

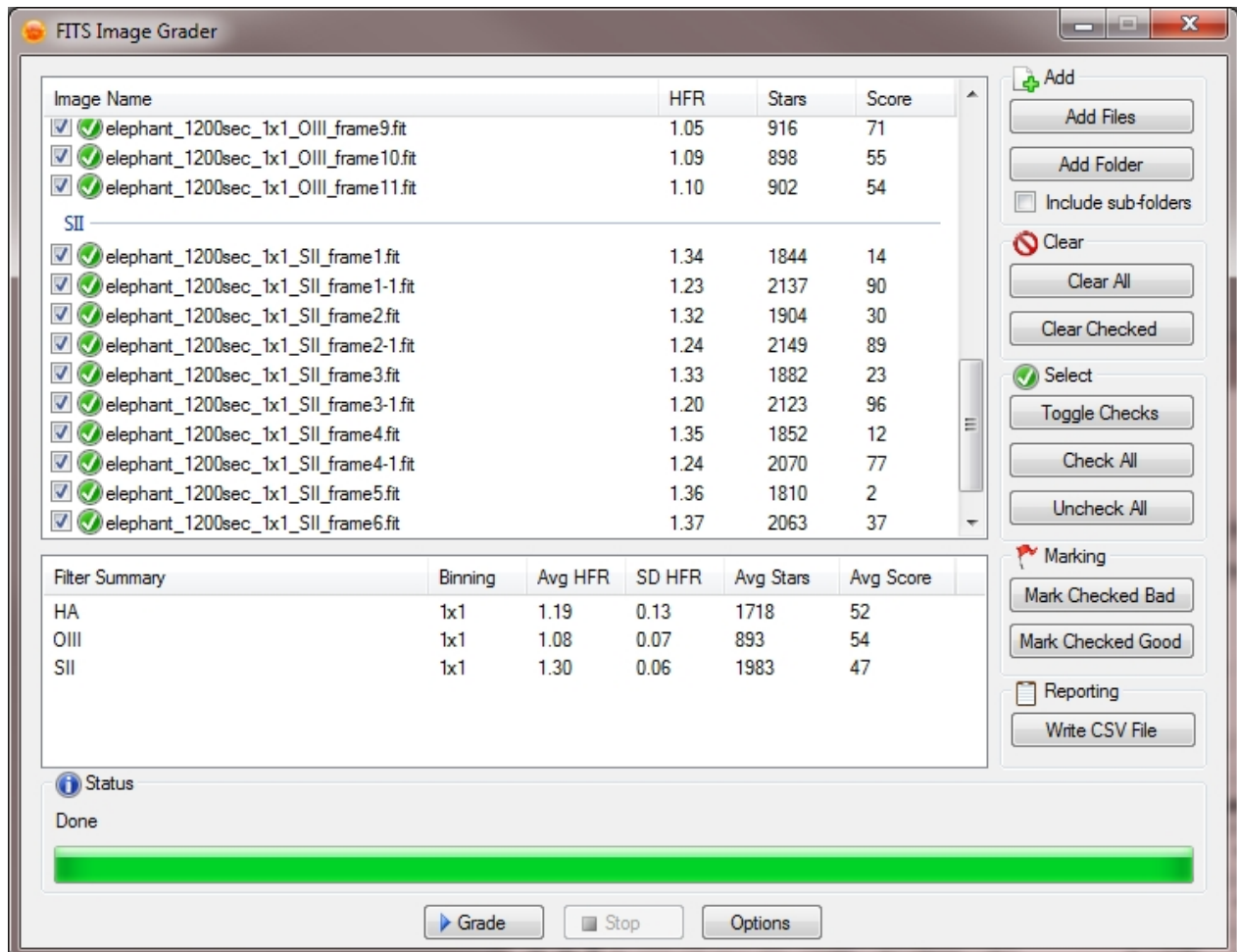
render anything because they do not know your location on earth... click the link at the bottom of the planning tools to correct).

**Warning:** Much like errors, except SGPro is not certain if you meant to do that or not.

Created with the Standard Edition of HelpNDoc: [Produce Kindle eBooks easily](#)

## Image Grader

The FITS Image Grader is a handy utility designed to perform a focus quality analysis and assign relative grading metrics to your sub-frames. Simply select the FITS files you want to grade, click "Grade" and FITS Image Grader will calculate "whole-image" Half Flux Radius (HFR) in order to determine the image's relative focus (lower values are better), Number of Stars found and finally a proprietary "Score" that takes both HFR and Number of Stars into account to provide a single metric (higher is better).



### What FITS Image Grader is not...

The image grader tool is not an absolute measure of the quality of your images... it grades images relative to one another. This means that if all of your images are consistently and badly out of focus then your images will all likely have around the same HFR and bad images will have good scores (which is less than helpful). You will need at least one image that is of decent quality in order for images of lesser quality to stand out.

### Why use star count?

HFR is a fairly resilient metric and as a result, it is normally capable of providing accurate measurement in poor seeing and even through a thin film of clouds. Using star count gives you another point of reference in

terms of image quality. While an image with thin cloud cover might have a very similar HFR to a "good" image, the star count is likely to be reduced.

### ***How the final score is calculated***

The final score is nothing complex. It is a number between 0-100 (higher is better) that reflects the average of an image's HFR and Star Count scores. The score is RELATIVE and will often give a value of "0" to PERFECTLY GOOD IMAGES. A very low score indicates that an image was of lesser quality than similar images in the set... and that's all. You should always visually inspect low score images.

### ***How images are grouped***

When you add images to the grader (use either "Add Files" or "Add Folders"), it will automatically attempt to categorize the images by filter type and binning mode. It will first inspect the file name for certain patterns and then if that fails, it will open the FITS file and inspect the headers for this information. Only images of similar type are scored against one another (e.g. HA images at 1x1 binning).

*Note:* Checking include sub-folders will add all files in the selected directory and all files found in its sub-directories.

### ***Renaming images***

FITS Image Grader provides several options to rename images as they are graded (see options below). You can choose from several patterns and select from using score, HFR or both as part of the new file names. Additionally, you can copy the file before renaming (see options below).

### ***Reporting and Marking***

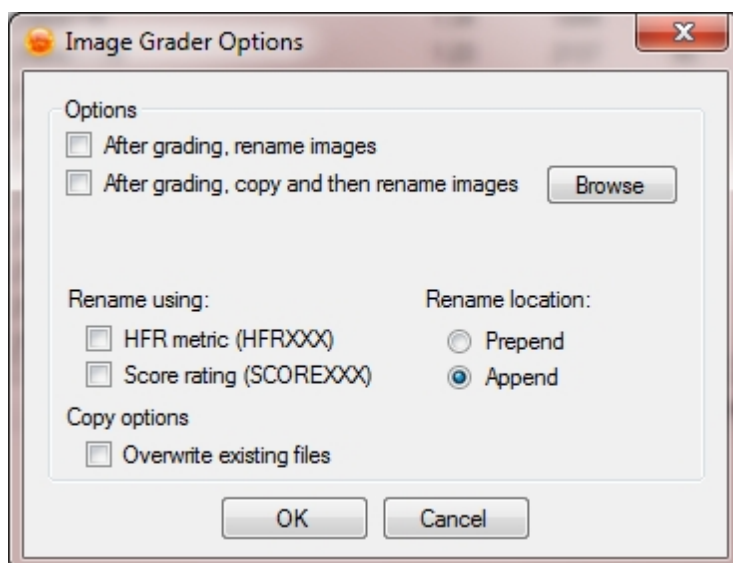
After a grading session is complete, you can choose to mark images as good or bad (renames files). Either right click on individual images or select them using the check boxes on the left and click either "Mark Checked Good" or "Mark Checked Bad". Additionally, you can create a CSV (for Excel or Google docs) report of the grading run for later viewing.

### ***Notes***

FITS Image grader will currently operate on all known variants of the 16-bit FITS format (mono and color). It is optimized to run analysis on well integrated sub-frames from about 2 minutes to 30 minutes in length.

### ***Options***

These options control how images are renamed during the grading process.



- *Rename images*: Check this to rename images (in-place) during the grading process. See the rename using section below for more details.
- *Copy and then Rename Images*: Check this to copy the image and then rename images during the grading process. Images will be copied to the selected directory (browse button). See the rename using section below for more details.
- *Rename using*: Rename the files using the calculated HFR, final score or both.
- *Rename location*: Add the data selected in "rename using" to the beginning or end of the file name.
- *Overwrite existing*: Check this to allow overwrite of existing files during the grading process.

---

Created with the Standard Edition of HelpNDoc: [Create help files for the Qt Help Framework](#)

---

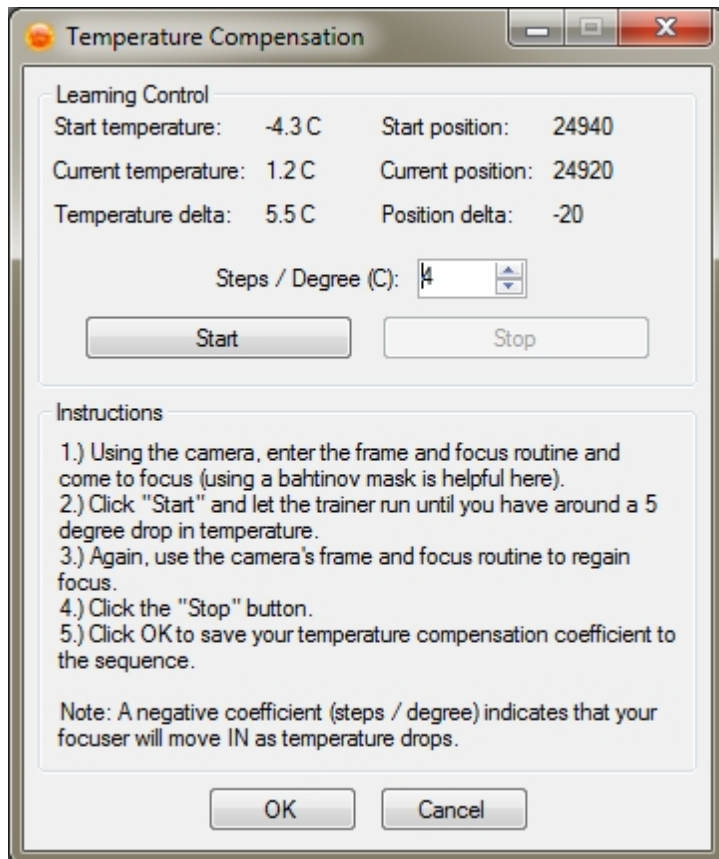
## Temperature Compensation Trainer

### Training Temperature Compensation

Temperature compensation can help to keep you close to focus as the ambient temperature drops. Checking [this option](#) in the control panel will allow the focuser to automatically move by an amount relative to the temperature change between successive frames. In order to do this though, you will need to determine your gear's temperature compensation ratio (steps / degree change).

**Follow the steps outlined below to find your temperature compensation ratio:**

Access the Temperature Compensation Trainer through the "Tools" menu. Ensure that both a [camera](#) and [focuser](#) are connected.



- 1.) Using the camera, enter the frame and focus routine and come to focus (using a bahtinov mask is helpful here).
- 2.) Click "Start" and let the trainer run until you have around a **5 degree** drop in temperature.
- 3.) Again, use the camera's frame and focus routine to regain focus.

- 4.) Click the "Stop" button.
- 5.) Click OK to save your temperature compensation coefficient to the sequence.

*Note:* A negative coefficient (steps / degree) indicates that your focuser will move IN as temperature drops.

---

Created with the Standard Edition of HelpNDoc: [Free PDF documentation generator](#)

---

## Meridian Flips

Sequence Generator Pro, when used with PHD2 or better can provide you the ability to perform an automated meridian flip. This function can be run manually, by clicking a single button or you can let the sequence decide if it needs to run a flip based on settings you provide.

### A Brief Summary of Automatic Meridian Flips

1. Take an image, solve it and then sync the telescope
2. Stop auto guiding: Simply sends a command to PHD2 requesting a stop.
3. Flip the mount: Send a signal to the mount to flip sides. This is based on input that provides the number of degrees past or before (negative values) the meridian to invoke a meridian flip during a sequence. Not all telescopes allow for setting of SideOfPier. For these telescopes it is best to always use a positive value. For details take a look at the [telescope control panel](#) page.
4. Perform [auto centering](#) (optionally): Performs a precision centering to ensure that your target is still centered on the other side of the mount.
5. Restart guiding: Send a command to PHD2 to automatically select a guide star and resume guiding.

### The Meridian Flip Status Window

---

Created with the Standard Edition of HelpNDoc: [Free PDF documentation generator](#)

---

## Framing and Mosaic Wizard

### Framing and Mosaic Wizard

#### Instructions for use:

- Select "Framing and Mosaic Wizard" from the tools menu
- You will be presented with a "longish" dialog with 4 distinct steps.
- In order to fetch your "canvas" (area of the sky to capture), you must be connected to the Internet

#### Menu options:

- Profile: Using this option will present a list of equipment profiles. Selecting one will overwrite Scale and Camera Dimensions with those in your profile.
- Other
  - Fetch location from mount: While you can provide data in the form of object name, another image or custom RA and Dec in order to fetch your working canvas, you can also choose to have the RA and DEC locations populated using your telescope's current location (by clicking this option). This will fetch RA and DEC and then populate those boxes on the form. You will still need to click "Fetch" when ready.

The steps below, in general correspond to the black circular numbers found on the mosaic dialog:

- **Step 1:** Choose the area of the sky that you want to capture. This area should contain more data than you want to actually capture. To get your "mosaic canvas", identify a name (like M42 or NGC6144) and define a field of view in degrees. Clicking fetch will resolve the name into J2000 RA and DEC coordinates and then download the canvas from the DSS. Keep in mind that asking for very large fields might take a bit of time (typically 8 degrees takes about 30 seconds and this will scale almost linearly). Fear not though, once you download an image we will cache it so you can refine your mosaics later without re-downloading. Optionally, you can bypass the name lookup completely, click the "RA/DEC" radio button and enter the J2000 location manually. Note: You can also specify URLs AstrobIn or Flickr images that have been solved. Some plates have different background levels than others and you will need to use normal [stretching](#) routines to make the image more clearly visible (finding nebulosity, etc)
  - You can also use an existing FITS image (taken from SGPro). This will create an image canvas centered on the image you provide. A blue rectangle will be drawn around the area captured in the image you provide. In this way you can extend existing images by drawing frames that overlap your existing frame.

Framing & Mosaic Wizard
✕

---

**Profile**

Fetch the Target Area (J2000)

1 Define an area of the sky and click "Fetch" to display it as an image window.

Object:

Image:

RA:  Dec:

FoV:  degrees

---

Define the Camera Data

2 Define the camera data and desired frame overlap area.

Scale:  "/px    Overlap:  %

Pixels:  px(w) X  px(h)

---

Define the Target

3 Drag onto the image to define the target area, then use the controls below to refine.

Mouse:

Draw the target rectangle

Move the target rectangle

Pan the image

Rotate selection:

Show:  Composite tiles  Entire field

---

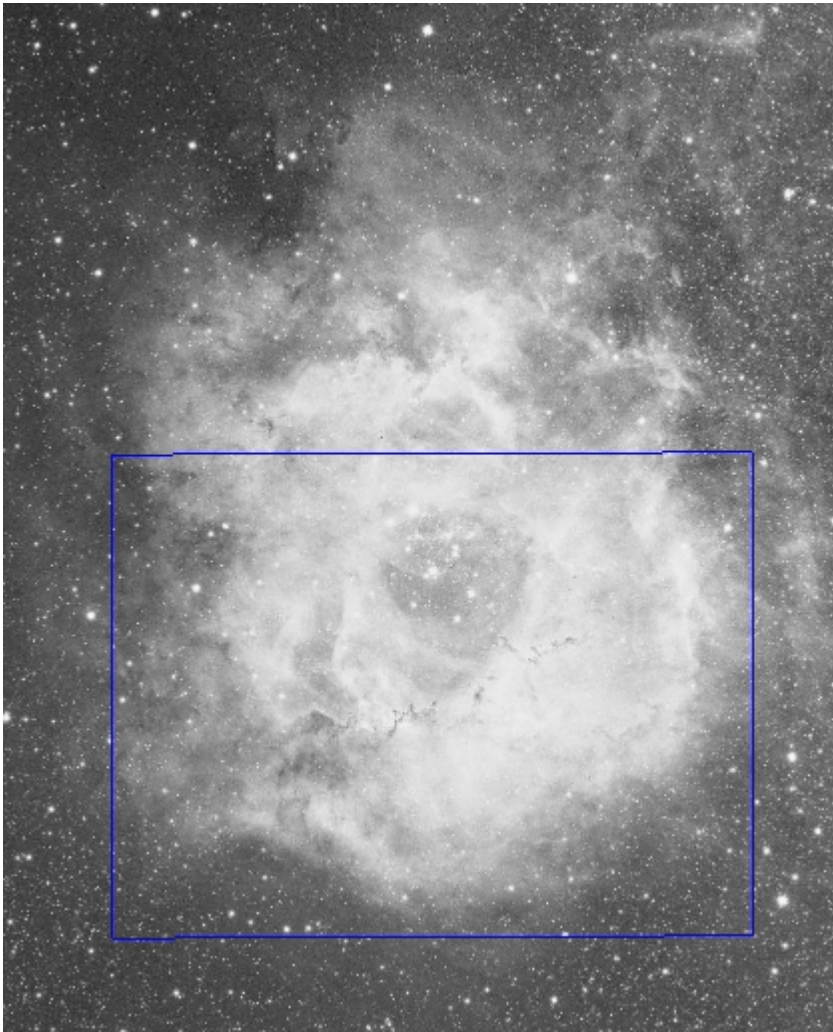
Create the Sequence

4 Validate the data below and click "Create Sequence" to finish.

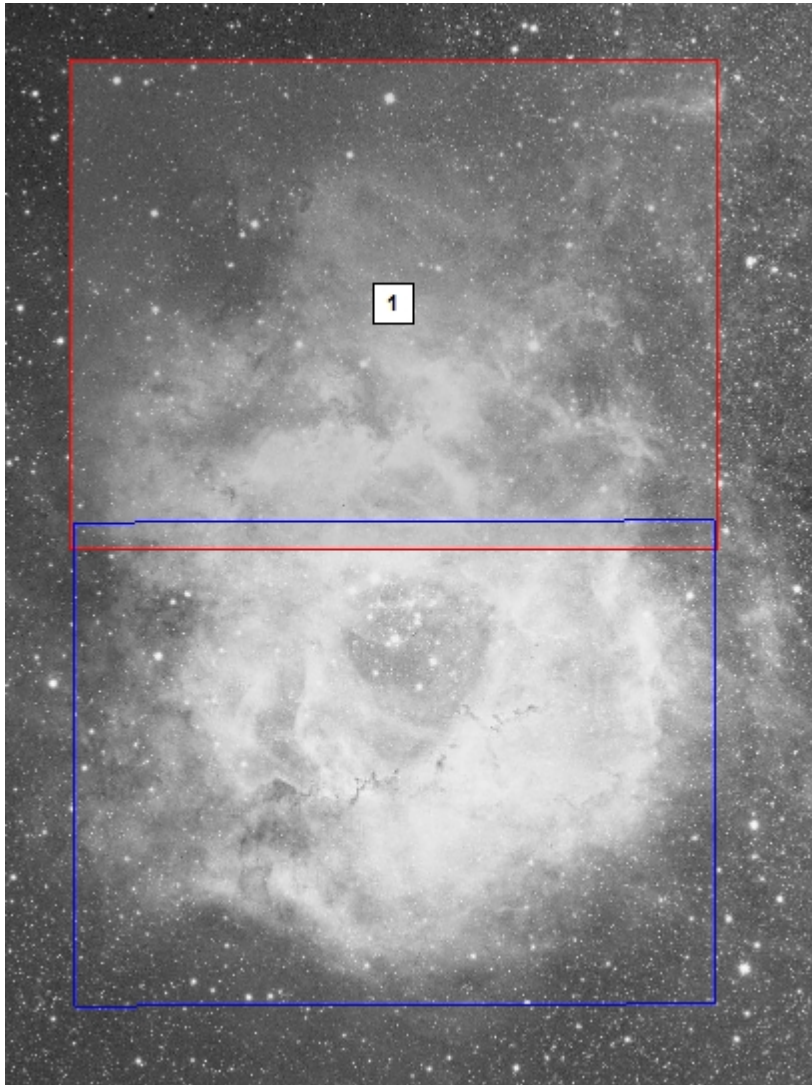
Camera tiles:  x  (4 tiles)

Field of view: 2.78° x 2.09°

Size: 6251 x 4708 px

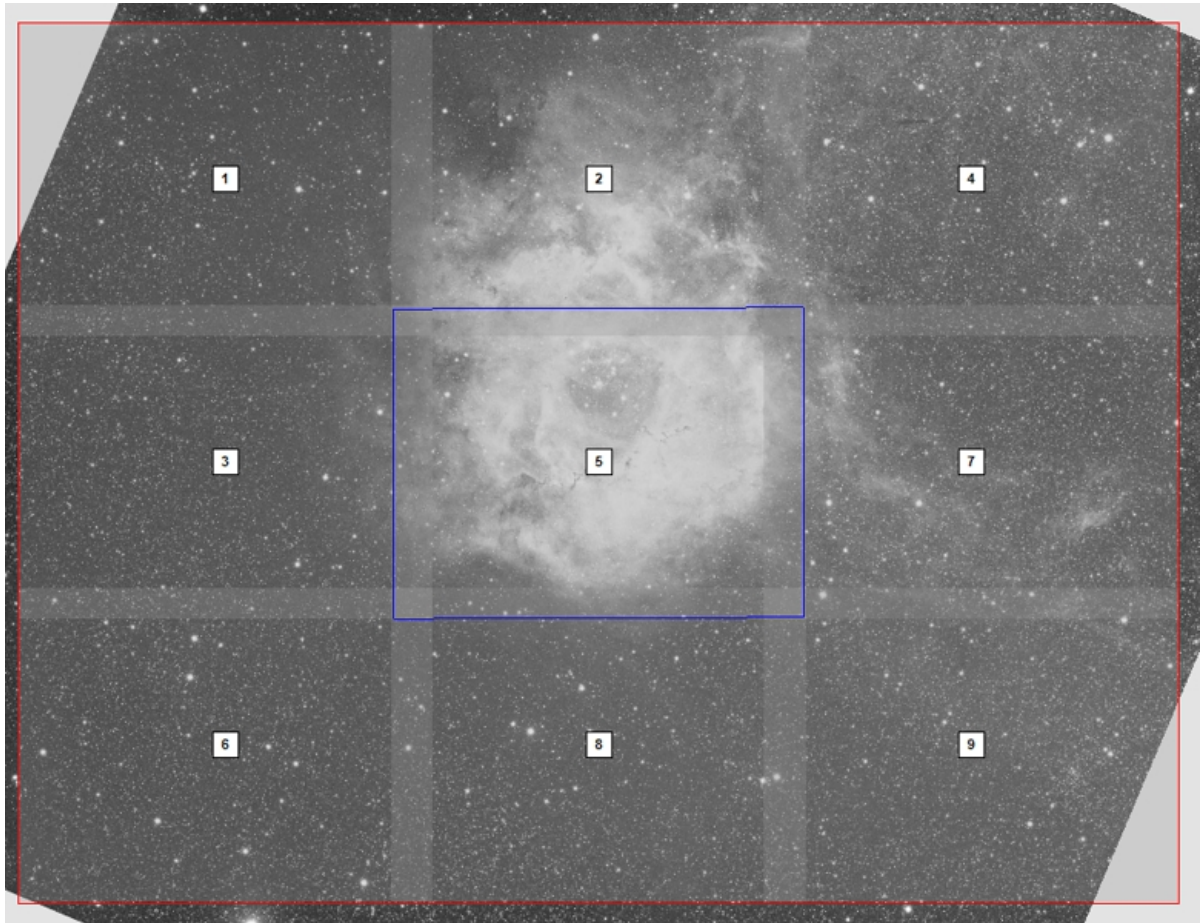


Here the blue rectangle represents the area that your existing image occupies. You can then figure out how you would like to extend it by drawing the normal red rectangles over this area. Here are a couple examples:



Or more complex...

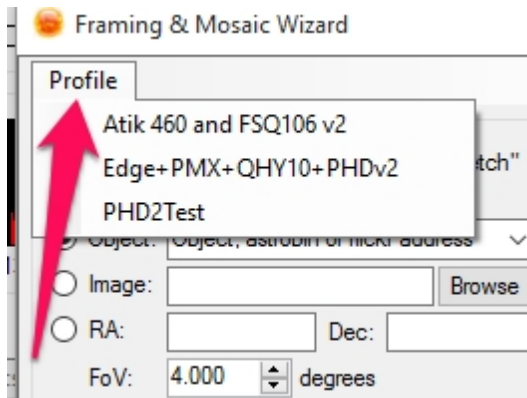




In this case, you would likely delete target 5 after the mosaic sequence was created.

- Step 2:** Define your camera data. This is pretty straight forward... define your image scale at 1x1 binning and the number of physical pixels on your CCD. These values are part of [equipment profiles](#) and will be automatically populated using that data. Finally define the desired overlap between tiles here. If you are unsure of your scale, a calculator has been provided (click the "\*" button next to scale).

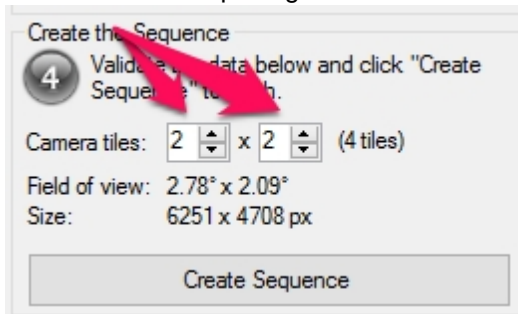
The mosaics and framing wizard will allow you to populate the scale and camera pixel values from any equipment profile you have available. To switch profiles (if you want to draw a mosaic with a different set of gear), find the "Profiles" menu at the top of the tool and select the profile you want to use.



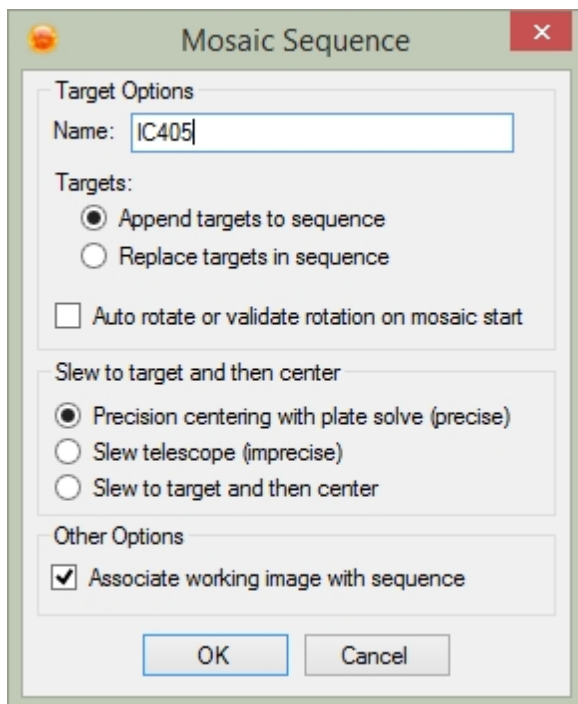
- Step 3:** Define the area you want to capture. Using the mouse, drag a rectangle over the area you are interested in capturing. The wizard will automatically calculate the number of tiles in your mosaic and number them according to capture order. You can toggle the tile grid on and off using the "Show tiles" checkbox. You may notice that the size of your capture area will expand after it is defined. This is

because the wizard will snap to the minimum number of camera tiles required to cover the area of interest. After drawing the capture box, you can then use the mouse to move it around (by dragging). Finally, rotate the canvas to either match your camera angle or to find the angle your camera will need to be at when you start capture. **The rotation angle is indicative of the angle your camera needs to be at to capture your target!**

- **Note:** After drawing the initial rectangle on the canvas, you can adjust the number of horizontal and vertical tiles by hand simply by entering them into the step 4 area. This will automatically adjust the size of the capture area without having to continually redraw in order to achieve the desired size.
- Tip: Camera angle is extremely important when capturing mosaic tiles! If you don't have a mechanical camera rotator, you can use the [SGPro manual rotator tool](#) to make sure you are all set before capturing.



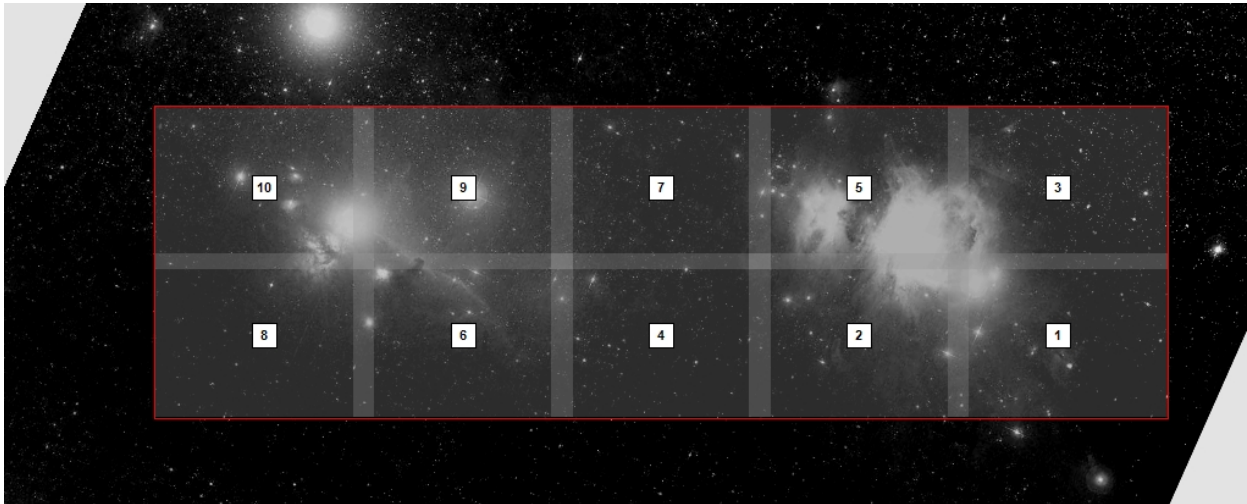
- **Step 4:** Create the sequence. After all of this is defined to your satisfaction, simply click the "Create Sequence" button. You will be presented with a small dialog that asks you for the mosaic name, whether or not you want to append targets or replace targets and finally whether or not you want to save the working canvas with the new mosaic sequence (as a reference... see Sequence Images below).



- **Name:** This is the base name of the target set that will be created. If you use "M42" and have 4 mosaic tiles, your sequence will contain targets M42-1, M42-2, M42-3 and M42-4.
- **Targets:** Append to or replace the current target set.
- **Auto rotate:** Check this box if
  - You have a [rotator](#) and would like the sequence to automatically rotate to the required angle
  - You would like to use the [manual rotator](#) (which will verify your camera's angle and

- provide instructions on how to correct)
- Working Image: Check this if you would like to save an image of your working canvas for later reference
- When you complete step 4, you will have a sequence that contains a target for each mosaic tile. Each mosaic will have the "Center On" checkbox marked and the appropriate centering location populated. None of these targets will have any events populated. The best way to populate events (since most of the panels will have the same or similar event composition) is to create events for the first target and then using the new "Copy event to..." function (right click target), copy the events to all the other targets.

### Sample Canvas:



**Note:** You can easily refine the center position of your mosaic canvas by right clicking on an existing canvas and choosing "Center Here". This will download a new canvas with the specified field of view where you clicked.

---

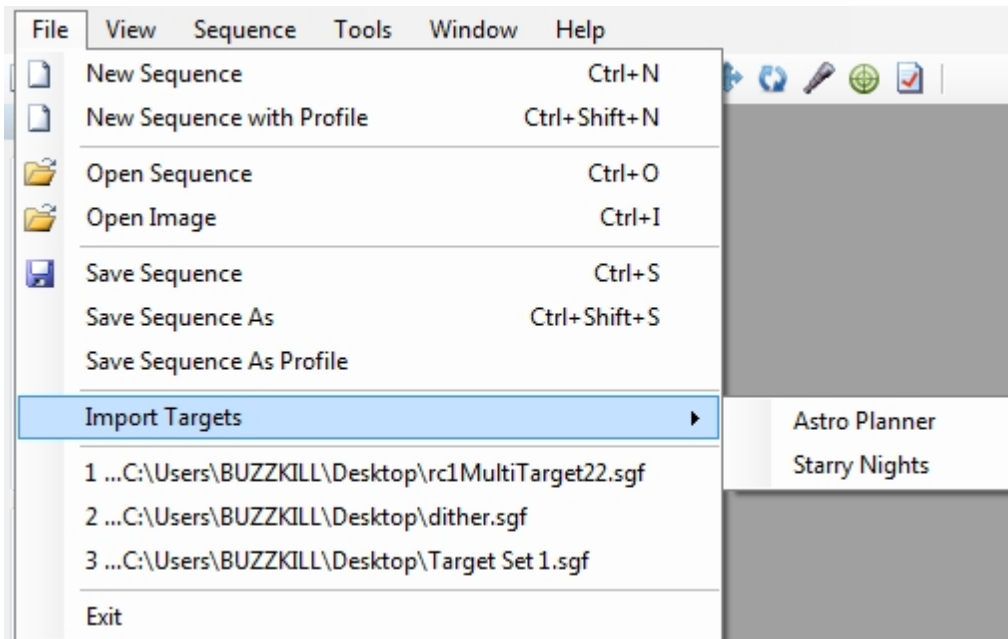
Created with the Standard Edition of HelpNDoc: [Benefits of a Help Authoring Tool](#)

---

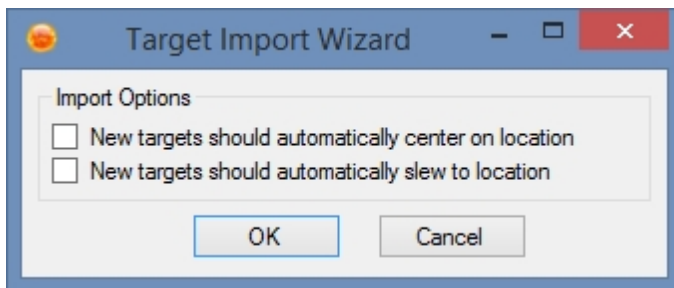
## Target Imports

Sequence Generator Pro can import target sets (lists of targets) from both AstroPlanner and Starry Nights. When a target is imported into Sequence Generator Pro it will appear in the "Target List" box of the sequencer. Inspecting its properties will show that it also imports the location specific to that target.

To do this, click in the File menu, then on the "Import Targets" menu. Finally, select the application from which you would like to import:

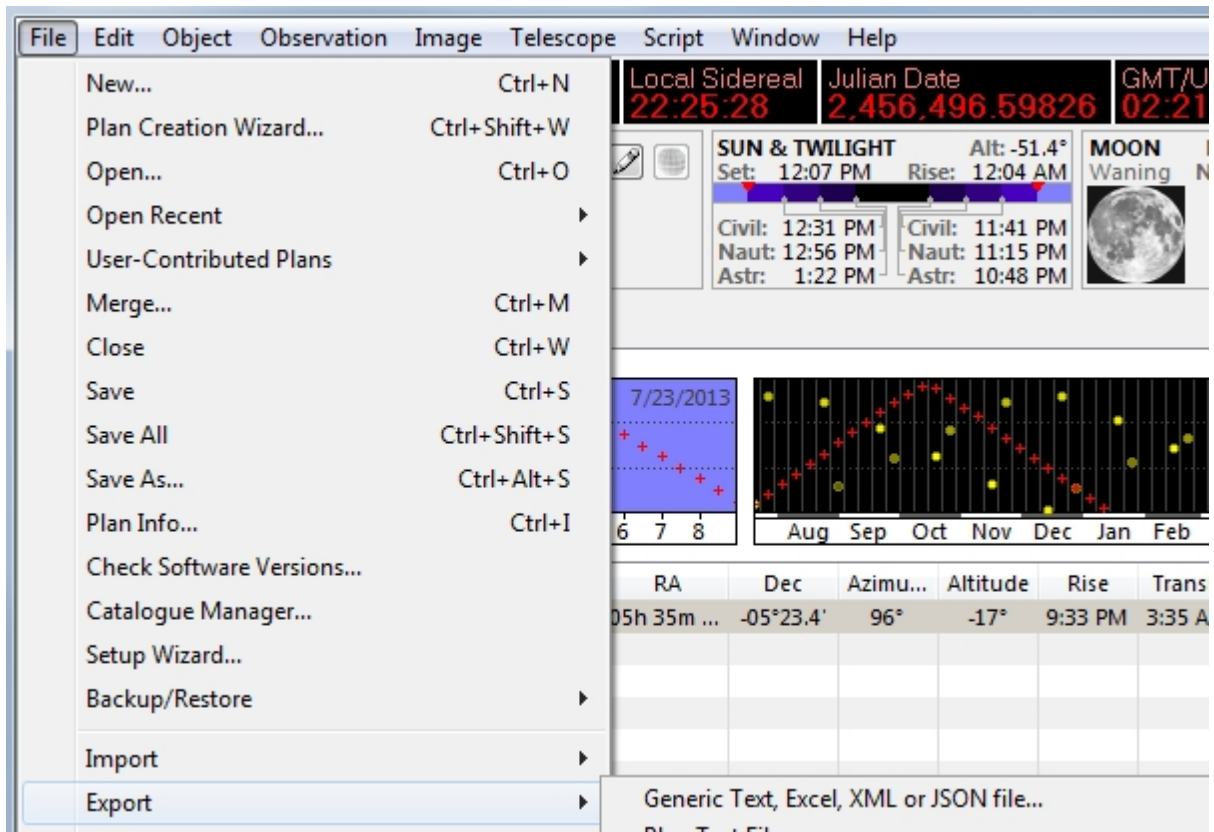


After selecting a file for import, you will be presented with a dialog that will allow for imported targets to be created with centering or slewing options checked by default (otherwise SGPro will assume that will do this manually). Obviously, these options should only be used if you are importing location data (in J2000).

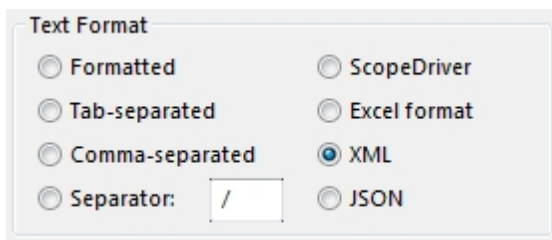


### AstroPlanner

AstroPlanner requires that you export in the XML format. To do this, create your AstroPlanner list, then click on the File menu, "Export" and then "Generic Text, Excel, XML or JSON file..."



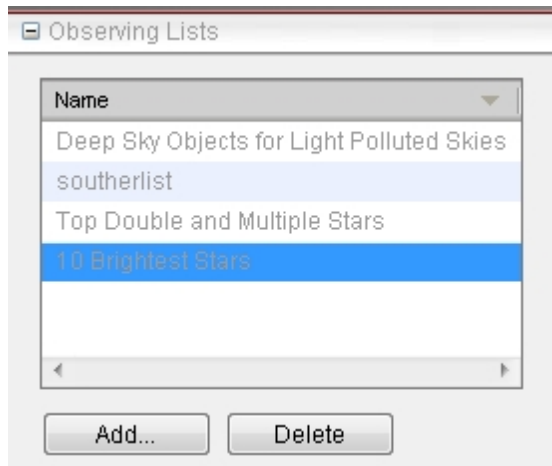
In the export dialog, you will need to select XML for the "Text Format" options:



The rest of the settings should be OK to leave as is. Click "Export" and you should be done. This is the file you will want to import into SGPro.

### Starry Nights

Starry Nights requires that you create an "Observing List" and then export this as a simple text file. To do this, first click on the "Lists" tab (on the left side). Once this tab is open you either need to select or create a new Observing list:



Finally, after selecting the list of interest, there will be an "Export" button at the bottom of the tab pane (below all the targets in that list):

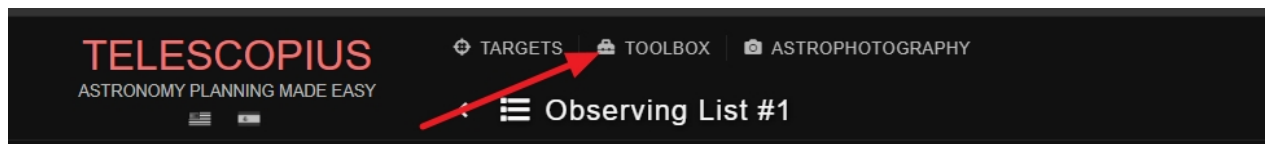


Click export and save the file to disk. This is the file you will want to import into SGPro.

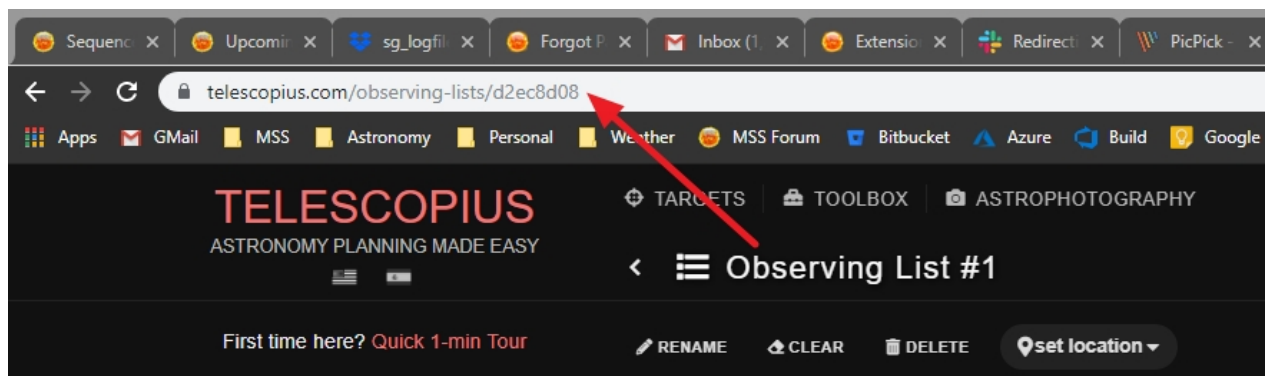
## Telescopius

Unlike the other types of imports, this option does not require ingestion of a file. Instead, you will use the website address of your [Telescopius](#) observing list.

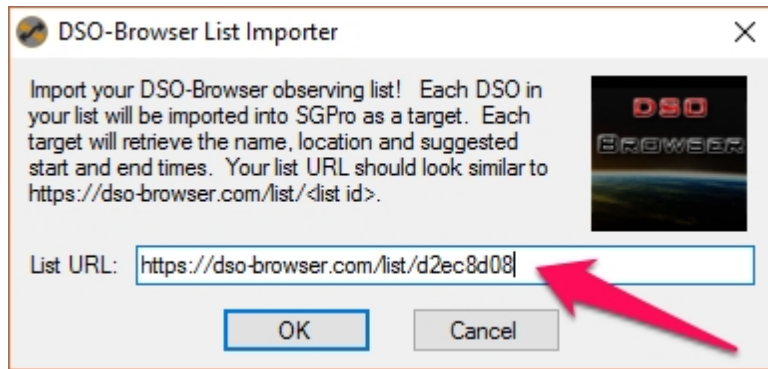
When you arrive at the [Telescopius website](#) and log in using your Telescopius account, you will see a navigation bar at the top. Choose the "My Observing List" option.



When you click this menu item, you will be presented with your [Telescopius](#) observing list. If it's your first time here, it will be empty. Follow local instructions to populate your list. What SGPro needs in order to produce viable targets from your list is the URL. At this point, you can just copy it from your browser's address bar:



Then in SGPro, simply paste it into the target import dialog:



Click OK and you're done!

*Note:* The Telescopius list import will populate **suggested** start and end-times based on visibility at your location. You will need to review these times before running the sequence.

---

Created with the Standard Edition of HelpNDoc: [What is a Help Authoring tool?](#)

---

## Image History

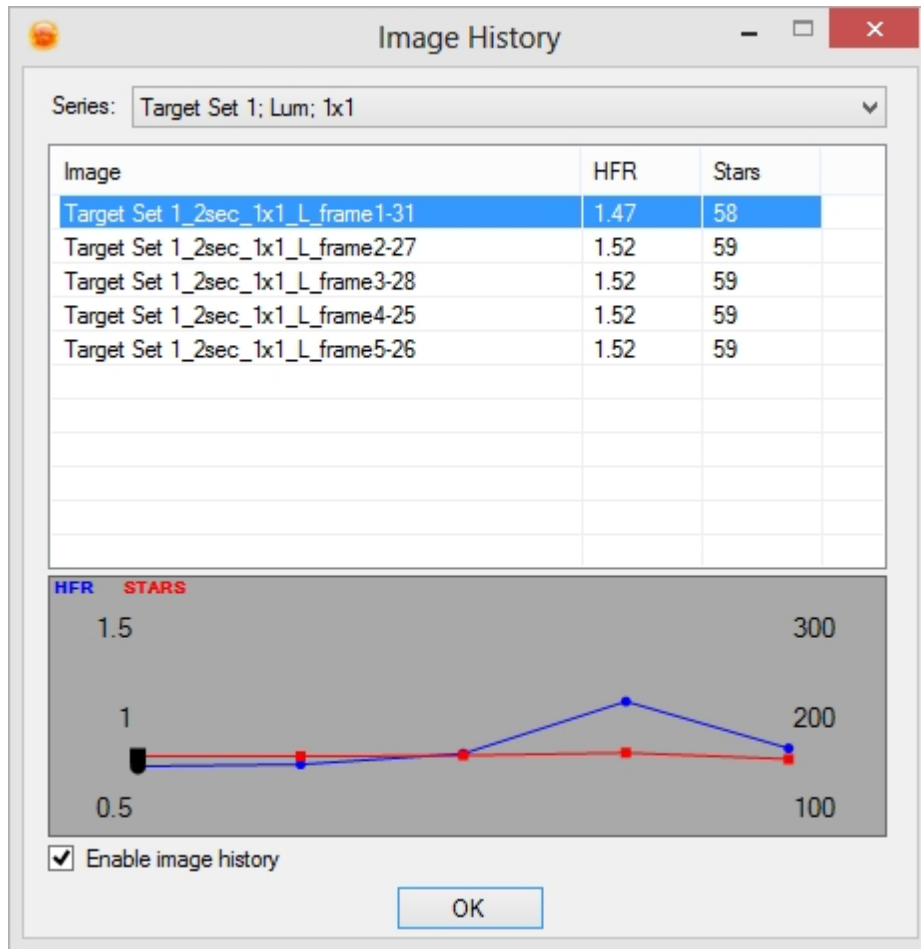
The Image History tool will give you insight, at a glance, as to which recently captured images might be bad.

Each series is defined by the target, binning and filter and contains data for HFR and Star Count.

Regardless of the originating event, a history item will be grouped together if all three of these items are identical. Using the drop down box at the top, you can select any series and view a chronological display of HFR and Star count data. In an ideal world, both HFR and Star Count would remain relatively flat. In reality, there are many environmental factors out there that aim to destroy your images... temperature drop, clouds, guiding, differential flexure, etc. If you see a significant deviation from a typical straight line, this might be an indication of a bad image. To inspect an image, simply double click on the list view or click on the graph point representing the image you would like to inspect. If you decide it's bad, simply click the "X" icon on the image or right click the image in question and choose "Mark as Bad". This will prepend the image with "BAD".

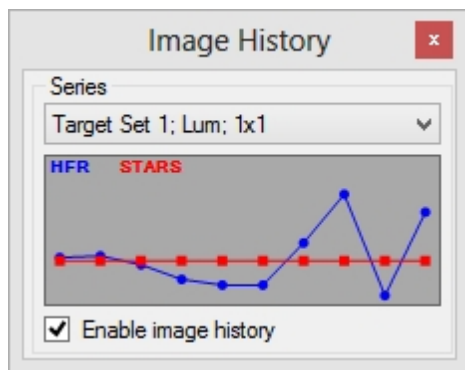
Notes:

- The collection of image history data is disabled by default. To enable it, check the "Enable image history" checkbox below.
- To change the color of either the HFR or Star Count series, click the corresponding label and choose a new color.

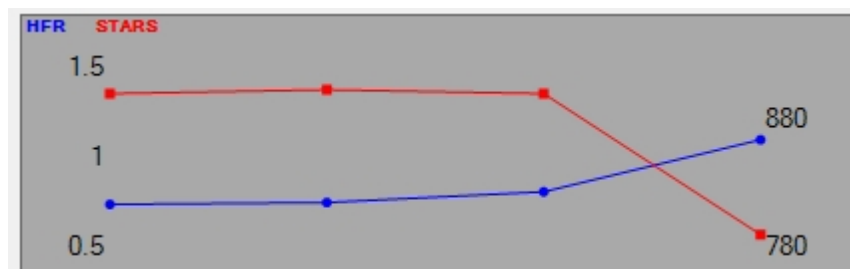


To clear all image history, right click almost anywhere and select "Clear image history". You can also clear just the current series by clicking "Clear current series".

Thus tool has a [dockable module counterpart](#) for convenient viewing:



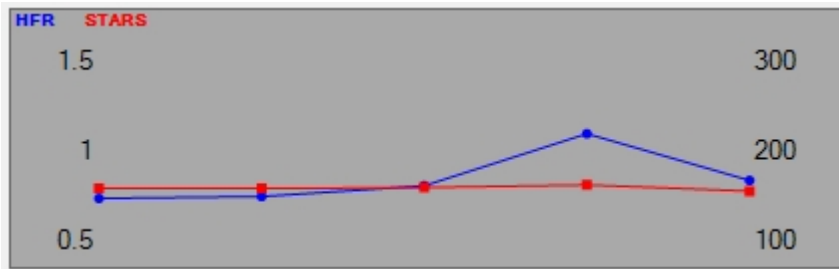
**Possible example of bad image from temperature drop (loss of focus):**





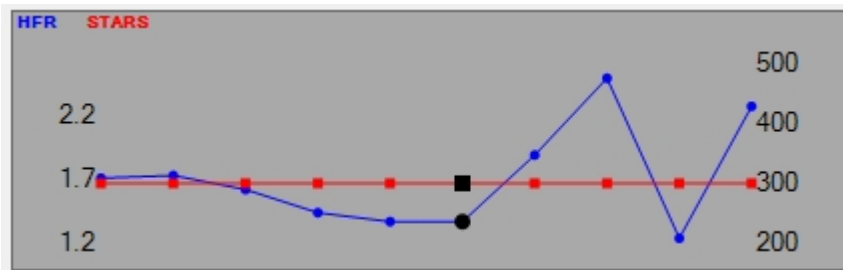
Notice the drop in star count with a simultaneous rise in HFR.

**Possible example of bad guiding on a single frame:**



Notice the star count was relatively constant, but HFR increased. The next frame returns to normal.

When you are imaging in a star rich area, the number of stars that can be detected is capped at 300. In this case, the graph will appear as such:



Notice the star count is constant, but bad images are still easily detectable by referencing the HFR data. In this case images 7, 8 and 10 are bad (this graph is from real data).

Created with the Standard Edition of HelpNDoc: [Free iPhone documentation generator](#)

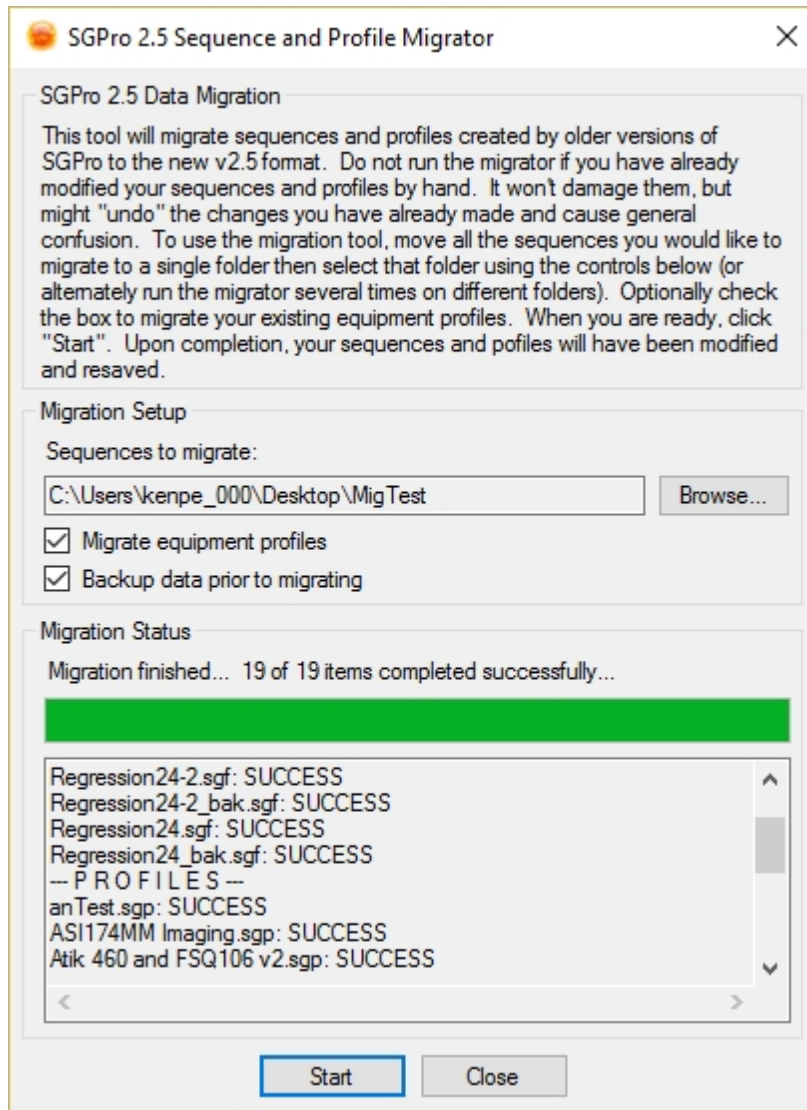
## SGPro 2.5 Sequence Migration

SGPro 2.5 was introduced with some fairly substantial changes to the way in which it stores sequence and equipment profile data. The most prominent change (to the user) is the movement of settings that used to be global into individual settings and profiles. As an example, the setting to use Astrometry.NET remotely or locally (ANSVR) used to be global (meaning, the same for all sequences and profiles). Now, in 2.5 this setting belongs uniquely to each sequence or profile.

Affected settings (these are global in SGPro 2.4 and are now part of sequences and profiles in SGPro 2.5) are as follows:

- Astrometry.NET settings
- Pinpoint settings
- Alnitak flatbox settings
- All Canon camera settings
- All Nikon camera settings
- All SBIG camera settings
- All SBIG CFW settings
- All FLI Camera settings
- Some QSI camera settings

In order to alleviate support issues and general confusion, SGPro 2.5 provides a sequence and profile migration tool (Tools->Sequence & Profile Migration (v2.5)) that will handle all this stuff for you (if you want to have it automated):



The introductory paragraph has pretty concise instructions, but to summarize, you can:

- Migrate a folder of sequences only
- Migrate your sequence profiles only
- Migrate both at one time

Migrations modify and save your files in place. This means that some of their settings will be overwritten during the process. If this makes you nervous, make sure the "Backup data prior to migrating" option is selected.

**Note: If you migrate your equipment profiles, you will need to restart SGPro!**

**Note: If you migrate a sequence that is currently open, you will need to reload it in order to see the newly migrated settings.**

---

Created with the Standard Edition of HelpNDoc: [Write eBooks for the Kindle](#)

---

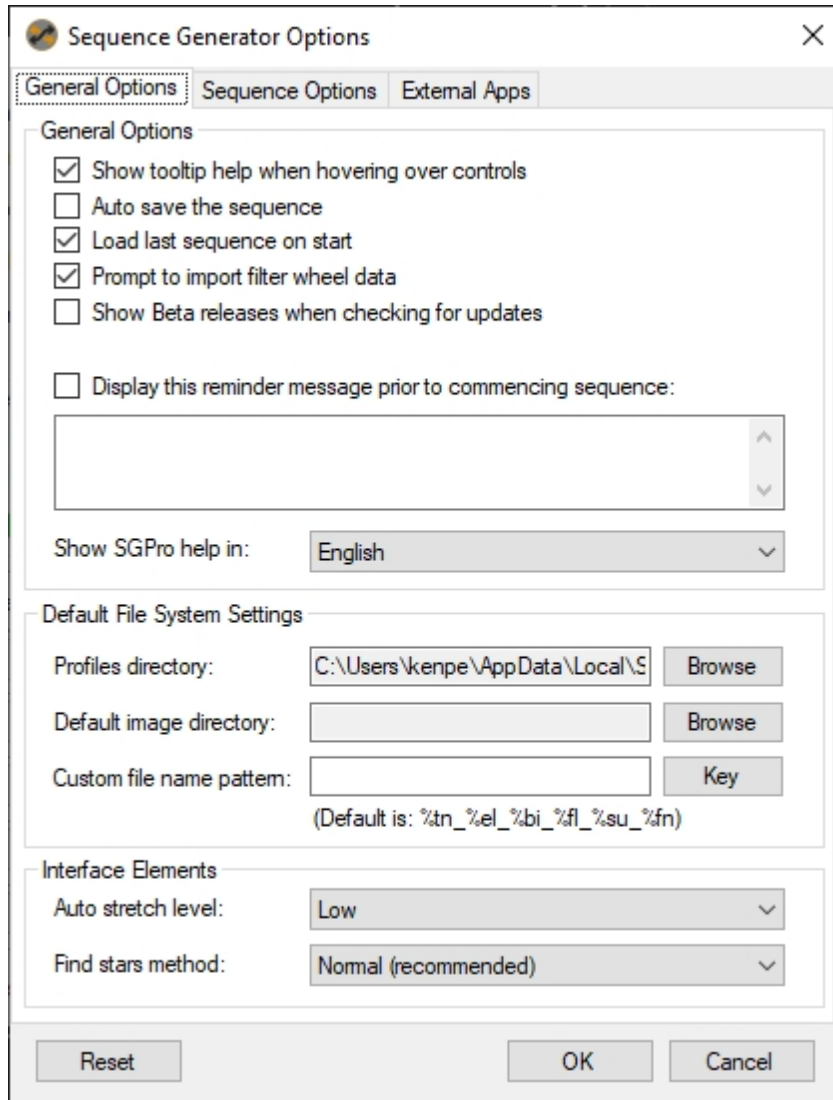
## Environment Options

---

In addition to [Sequences](#) and [Profiles](#), Sequence Generator Pro also has some options that are set at an application level.

## General Options

*Description:* The General Options tab can be access by using the "Tools" menu and selecting "Options"



General Options:

- *Show tooltip help when hovering over controls:* Specifies if tooltips should be shown when running Sequence Generator Pro. These can provide quick help and information about what specific button/fields to but they do not augment this document.
- *Auto save the sequence:* When checked the sequence will be saved every 30 seconds. This is useful if something hangs or you make changes to your sequence and forget to save them. For this to function you must create and save the sequence initially.
- *Load the sequence on start:* When checked the last sequence you had open will open when SGPro starts up.
- *Show Beta releases when checking for updates:* SGPro will perform a check once every week for updates. If this is NOT checked, you will not be informed about new betas.
- *Prompt to import filter data:* When SGPro connects to an ASCOM filter wheel and the current sequence has no filters defined, you will be prompted to import filter data from the driver.
- *Display this reminder message prior to commencing sequence:* Allows you to enter a message that will be shown whenever the "Run Sequence" button is pressed.

#### Default File System Settings:

- *Profile Directory:* SGPro stores equipment profiles as \*.sgp files and user profiles as \*.sgu files. When you create new profiles they will be saved to this directory. By the same token, if you navigate to this directory, you can copy, backup or transport all of your profiles (possibly to a new machine).
- *Default Directory:* Allows you to specify a default directory for saving images in. Whenever you create a new sequence this directory will be set as the save directory.
- *Custom file name pattern:* Allows you to specify a default file [naming pattern](#) that will be used on all new sequences.

#### Interface Elements

- By default, new images will use this level for auto stretch. The "high" setting uses the most aggressive stretch. See [image stretching](#) for form information.
- The method SGPro uses to detect stars in an image can be very CPU intensive for some machines. If you capture very large images or have an older machine, it may be wise to set this to "Fast". This setting ONLY affects how image history images are analyzed and does NOT affect how the auto focus routine detects stars. Note that the fast detection method performs poorly on "donut" stars, but since this setting only affects image history, these images should normally be in focus.

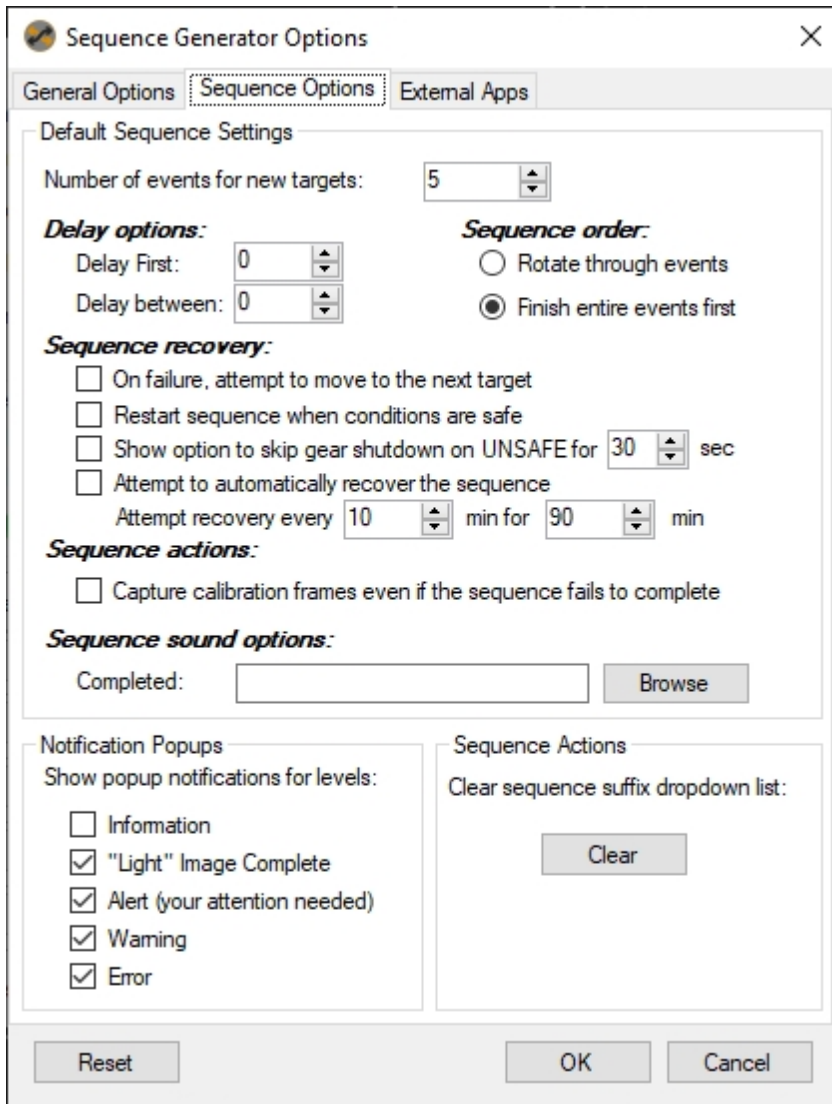
---

Created with the Standard Edition of HelpNDoc: [Create help files for the Qt Help Framework](#)

---

## Sequence Settings

*Description:* The Sequence Settings dialog can be opened from the Tools menu under Options. These options relate to global sequence settings.



#### Default Sequence Settings:

- **Number of events for new sequences:** Sets the initial number of events that new sequences will be created with. The default is 5. Additional events can be added or deleted at a sequence level.
- **Delay Options:**
  - *Delay First:* Sets a delay in seconds before the first frame is taken after "Run Sequence" is pressed.
  - *Delay between:* Sets a delay in seconds between each frame.
- **Sequence order:** These options change how events are ran when the sequence is running.
  - *Rotate through events:* This will run one frame from each event and then move onto the next event.
  - *Finish entire events first:* This will complete all of the frames in an event before moving onto the next event. This is generally the recommended method.
- **Sequence recovery:**
  - *On failure, attempt to move to the next target:* When a sequence fails, attempt to proceed to the next target. Note that is you have sequence recovery enabled, the sequence will not fail until that time period has elapsed and no recovery made.
  - *Restart sequence when conditions are safe:* If you have a "[Safety Monitor](#)" available and set up to issue an UNSAFE command for certain conditions, SGPro will [automatically terminate the sequence](#) and safely shut down all gear. When this option is enabled, after protecting gear, SGPro will restart the sequence and wait for safe conditions. [When detected, SGPro will restart \(recover\) the sequence.](#)
  - *Show option to skip end of sequence options on UNSAFE:* This option will allow you to turn

sequence recovery on or off. Additionally, you can define how often and for how long the sequence will try to recover. This is great for people that are imaging with intermittent clouds and will allow the sequence to continue if the weather turns cloudy for a few minutes. More on [sequence recovery can be found here](#).

- *Attempt to automatically recover the sequence:* On failure, attempt to move to the next target: This option will allow you to turn sequence recovery on or off. Additionally, you can define how often and for how long the sequence will try to recover. This is great for people that are imaging with intermittent clouds and will allow the sequence to continue if the weather turns cloudy for a few minutes. More on [sequence recovery can be found here](#).
- *Capture calibration frames even if the sequence fails to complete:* Use this option to force the capture of flats, darks and bias frames even if capture of "light" images fails due to weather or other reasons. Checking this option will cause all end of sequence options to run (except camera warm up) and will then proceed to capture calibration frames. This means that, if you have it checked, the mount will park (possibly point to a flats light panel). When calibration frames are complete, camera warm-up will start (assuming you have that option selected).
- *Sequence sound options:* Allows a sound file to be played to get your attention when the sequence completes or when it needs your attention.
  - *Completed:* Sound that will be played when all events in the sequence have been completed.
  - *Attention:* Sound that will be played when Sequence Generator Pro needs your attention, such as [manual focus](#) and [pause](#) events.
- *Notification and Popup Filters:* There are five broad classifications of notifications in SGPro. Checking a classification will show notifications of that type in the Notification Center:
  - Information: Status updates (generally things that show in the main status bar)
  - Image Complete Messages: Get a notification tile when a "light" image is complete. At any time during the sequence, you can open the notification center and click it to open the image.
  - Alerts (the sequence will not continue until you do something)
  - Warnings (something may be wrong, but the sequence is still running)
  - Errors (something is wrong and the sequence has stopped prematurely)
- *Clear the sequence suffix dropdown list:* If you use the suffix field in the [event table](#) for purposes of [file naming](#), this will clear all old entries you have used in the past.

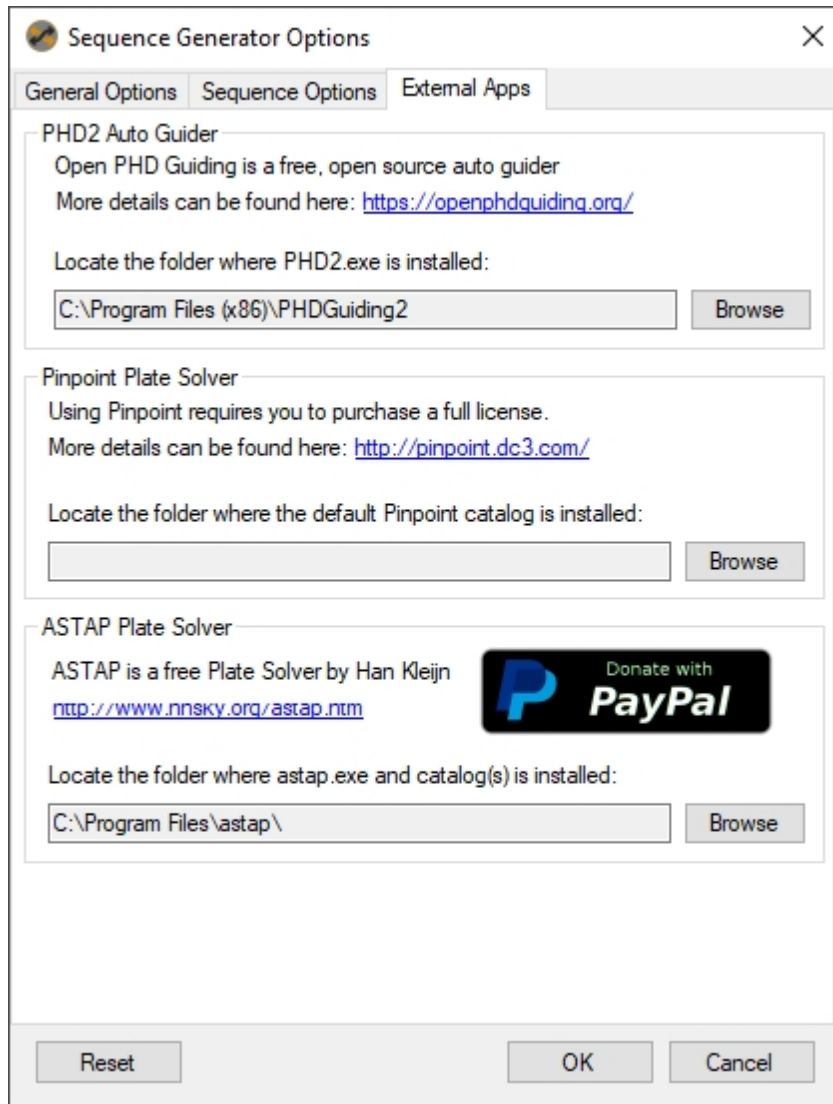
---

Created with the Standard Edition of HelpNDoc: [Full-featured Documentation generator](#)

---

## External Apps

In this tab you can specify install locations of any external application (3rd Party) SGPro supports.



- Note on the Pinpoint Catalog location: This is the location of the default catalog for Pinpoint. When a new sequence is created, it will use this catalog, but can override this value and specify its own catalog. This is useful if you find one catalog works better for one rig and another catalog works better for a different rig (probably drastically different focal lengths)

---

Created with the Standard Edition of HelpNDoc: [Full-featured EPub generator](#)

---

## Keyboard Shortcuts

Sequence Generator Pro has many keyboard shortcuts available. A good deal of them can be found by inspecting the menus. Here is a comprehensive list of current shortcut commands:

### Windows

- Control+W: View the sequencer
- Control+E: View the equipment control panel
- Control+B: View the "Big Status" window
- Control+P: View the equipment profile manager
- Control+U: View the user profile manager

### Opening / Saving / New

- Control+S: Save the sequence
- Control+Shift+S: Save the sequence as...
- Control+O: Open a sequence
- Control+I: Open an image
- Control+N: Create a new sequence
- Control+Shift+N: Create a new sequence using a profile
- Control+R: Reset the progress of the sequence
- Control+Shift+R: Restart the current frame

### Equipment

- Disconnect all Equipment: Ctrl+Shift+D
- Connect all Equipment: Ctrl+Shift+C

### Sequence

- F5: Start or pause a sequence

### Image Display Manipulation

- Left / Right Arrows: Adjust white point (Screen Transfer Function aka Stretching). See [image stretching](#) for form information.
- Alt+Left / Right Arrows: Adjust black point (Screen Transfer Function aka Stretching). See [image stretching](#) for form information.
- Up / Down Arrows: Adjust image zoom

### Other

- Up, Up, Down, Down, Left, Right, Left, Right, B, A, B, A, Start: Explodes your equipment

---

Created with the Standard Edition of HelpNDoc: [Free Web Help generator](#)

---

## License Management

---

When you purchase a retail license of Sequence Generator Pro you reserve the right to install it on up three personally owned machines. These licenses are self managed through a combination of the website (<http://www.mainsequencesoftware.com/AccountManagement>) and the actual SGPro application.

When you purchase SGPro, an account will be created automatically and sent to your email address. This is the account you will use to log in to the Main Sequence Software site and also to register machines for use of Sequence Generator Pro.

---

Created with the Standard Edition of HelpNDoc: [Free Kindle producer](#)

---

## Management

### *Managing Your Licenses*

If you need to re-arrange your licenses (add or remove authorized machines), navigate to <http://www.mainsequencesoftware.com/AccountManagement> (from SGPro you can also choose "Manage Licenses" from the "Help" menu) and perform a log in.



Local account

User name:

Password:


Remember me?

[Forgot your password?](#)

After a successful login, you will be directed to a screen showing your purchases and active machines:

Welcome Ken!

This is the user management console. Here you can view your past purchases and manage licenses for products. Add-Ons are available for use on all registered versions of the product they pertain to.

Product	Purchase Date	Remaining Licenses	Sequence Generator Pro Machines
Sequence Generator Pro	7/16/2013	2	BUZZKILL-PC 

On the left, this screen shows a purchase of SGPro on 7/16/2013 and that there are 2 licenses remaining for other install on other machines. The right side allows you to manage licenses. To remove a machine, simply click the red trashcan icon. This will reclaim one of your machine licenses and allow you to go through the process above with a new machine.

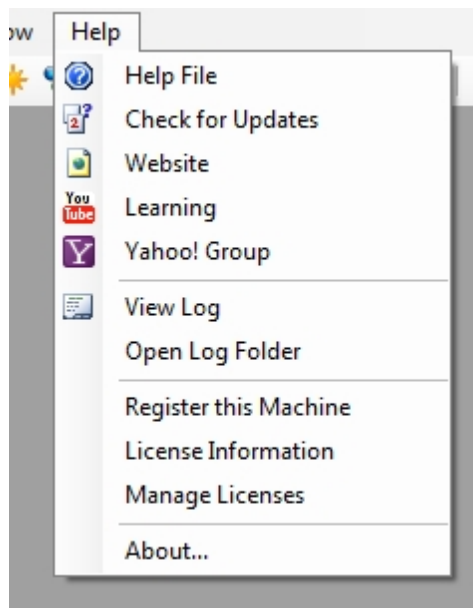
When you purchase a retail license of Sequence Generator Pro you reserve the right to install it on up three personally owned machines. These licenses are self managed through a combination of the website (<http://www.mainsequencesoftware.com/AccountManagement>) and the actual SGPro application.

When you purchase SGPro, an account will be created automatically and sent to your email address. This is the account you will use to log in to the Main Sequence Software site and also to register machines for use of Sequence Generator Pro.

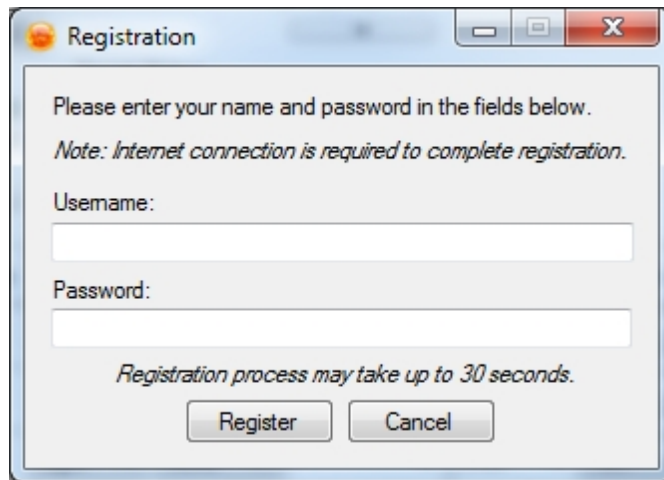
When this is all set, you can now go to SGPro and activate your license on that machine...

### ***To Register Sequence Generator Pro***

Open SGPro and navigate the the "Help" menu:



Choose "Register this Machine":



In this dialog, enter your username / PayPal email address and then the password that was sent to you when you purchased SGPro. Click Register and this machine will be set up for retail use of Sequence Generator Pro until you remove it.

---

Created with the Standard Edition of HelpNDoc: [Create cross-platform Qt Help files](#)

---

## Trouble Registering SGPro

This troubleshooting guide assumes that you are using a personal machine that has an active Internet connection. Initial registration of SGPro requires an Internet connection. After initial registration, you can be out of range of the Internet and SGPro will start just fine.

If you have followed [this guide](#) and still cannot register SGPro, it is time to reset your password.

1. [Navigate here](#) to begin the password recovery process. Remember that you **must use the email address associated with the PayPal account** you used to purchase SGPro!


### Forgot Password

Enter your Main Sequence Software login name (your PayPal email address) and click recover. You will then receive an email with further instructions. Please be sure to check your spam folder prior to contacting support. If you have any issues, please contact us at support@mainsequencesoftware.com.

Email:

- An email will be sent to the email account you entered in step 1 (check your Spam folder if you do not receive an email within 5 minutes). Complete the password recovery process by following the instruction in the email.
- Next, using your new password, make sure you can successfully [login to the MSS website](#).

### Local account

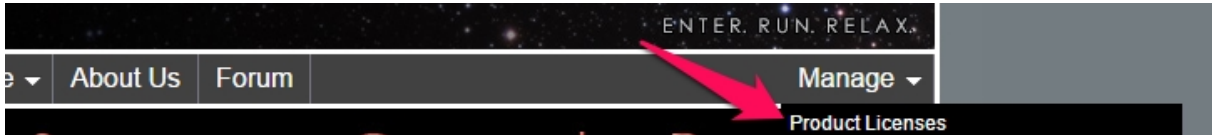
User name:  

Password:

Remember me?

[Forgot your password?](#)

- Once logged in you will see a "Manage" button on the right side of the navigation bar, hover over this and click "Product Licenses"



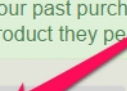
- Make sure that you have at least one of your three licenses remaining in order to register the new machine.

Welcome Ken!

This is the user management console. Here you can view your past purchases and manage licenses for products. Add-Ons are available for use on all registered versions of the product they pertain to. ×

Product	Purchase Date	Remaining Licenses
Sequence Generator Pro	7/16/2013	1
Framing and Mosaic Wizard	7/25/2013	N/A
Notification System	5/31/2015	N/A

**Sequence Generator Pro Machines**



- If you need to, click on the "Trashcan" icon to free up licenses.
- Follow the [normal registration procedure](#) now. **Keep in mind that you register SGPro with the same exact credentials you just used to login to the MSS website.**

## API Documentation

---

This section of the documentation is meant for other developers who are attempting to interface with Sequence Generator Pro in a programmatic way. If you are not a developer, you can skip this section.

Sequence Generator Pro offers a modest API to external applications that want to use it in order to capture image data (for external analysis) or to manipulate other equipment connected in SGPro. In an effort to be device and protocol agnostic, SGPro uses an HTTP based API. This means that you can make calls using SOAP, JSON, XML, JSV or CSV. Whatever your comfortable with... Almost every platform you use has a client library to help you use API calls using one of these. In terms of non-SOAP calls you can think of the API calls at REST if it makes it easier for you. That said, the SgPro API does not operate around data models and is not technically RESTful, but it does use the same basic set of protocols for communication.

To get more information about the API:

1. Start Sequence Generator Pro (version 2.3 or higher)
2. Using your favorite browser, navigate to <http://localhost:59590/metadata>

When you do so, you will see an API documentation page that looks similar to:

### Operations:

<a href="#">SgAbortImage</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgCaptureGuiderImage</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgCaptureImage</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetDeviceStatus</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetFilterPosition</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetFocuserPosition</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetGuiderImage</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetGuiderInfo</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetImagePath</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgGetTelescopePosition</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgSetFilterPosition</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgSetFocuserPosition</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>
<a href="#">SgSlewTelescope</a>	<a href="#">XML</a>	<a href="#">JSON</a>	<a href="#">JSV</a>	<a href="#">CSV</a>	<a href="#">SOAP 1.1</a>	<a href="#">SOAP 1.2</a>

This page outlines API calls available in SGPro. Here we will go through an example of how to interpret docs for a JSON call (others are similar).

First, go ahead and click the "JSON" link for one of the simpler calls "SgGetDeviceStatus". You should see something similar to:

---

## SgGetDeviceStatus

**Query a device to get its status. Possible states are "IDLE", "CAPTURING", "BUSY", "MOVING", "DISCONNECTED", "PARKED".**

The following routes are available for this service:

**All Verbs**     /**devicestatus/{Device}**  
**POST**           /**devicestatus/**

Parameters:

Name	Parameter	Data Type	Required	Description
Device	path	string	Yes	The device type to query. Values are "Camera", "FilterWheel", "Focuser", and "Telescope". Will query the selected device for status. States are "IDLE", "CAPTURING", "BUSY", "MOVING", "DISCONNECTED", "PARKED".

To override the Content-type in your clients HTTP **Accept** Header, append **?format=json**

To embed the response in a **jsonp** callback, append **?callback=myCallback**

### HTTP + JSON

The following are sample HTTP requests and responses. The placeholders shown need to be replaced with actual values.

```
POST /json/reply/SgGetDeviceStatus HTTP/1.1
Host: localhost
Content-Type: application/json
Content-Length: length

{"Device":"Camera"}
```

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: length

{"State":"IDLE","Success":false,"Message":"String"}
```

At the top, you will see a brief description of what the call does... It is important to note that this is the area that will describe the meaning of return / response values. Below it you will see a set of supported HTTP verbs. Some calls support all HTTP verbs and some, if they are more complex, use only "Post". For instance, the call to capture an image looks like:

---

## SgCaptureImage

**Ask SGPro to capture an image. This is an asynchronous operation and will return immediately. The return type (SgCaptureImageResponse) will contain a GUID and this can be used to retrieve the image when it is complete (using /imagepath/{Receipt}).**

The following routes are available for this service:

**POST**           /**image**

Below that you will see an input parameter listing. This one has only one value named "Device". As you can see in the "verb" section, there is a URI labeled **/devicestatus/{Device}**. This is meant to indicate that you substitute {Device} with the name of a real device like "Camera". For instance, the URI **/devicestatus/Camera** will return the status of the camera.

The very bottom block shows the structure of the response type (of course JSON in this case). Keep in mind that this is not RESTful. You can receive a response code of "200 OK" and still have a failure. Of course, if you do receive a response code other than 200, it does indicate a failure as well. The type of response object for various calls is dependent on the call itself. That said, all response object will return a boolean value for "Success" and an associated "Message" (string). Specific to this call you will see an additional "State" property. As indicated in the call's description, this can contain "IDLE", "CAPTURING", "BUSY", "MOVING", "DISCONNECTED" or "PARKED" (assuming Success is True).

### Further Help

In order to get further help please feel free to join our forum here <http://forum.mainsequencesoftware.com> or contact our "info" address located on the website support page. Lastly, we have provided an example of taking an image with the camera [here](#). This example happens to be from a C# console application and uses the RestSharp and the Newtonsoft JSON helper libraries.

---

Created with the Standard Edition of HelpNDoc: [Generate Kindle eBooks with ease](#)

---

## JSON Example

This example happens to be from a C# console application and uses the RestSharp and the Newtonsoft JSON helper libraries. There are literally hundreds of ways to write this in almost any language or operating system available.

```
// Let's take an image! This code snippet is from Main or some other control location
// Take a 1x1 image for 15 sec with the shutter open

SgImage img = new SgImage() { BinningMode = 1, ExposureLength = 15, FrameType =
"Light", Path = @"Z:\temp\myImage.fit" };
Guid imgReceipt;
if (!TakeImage(img, out imgReceipt))
    return;

Console.WriteLine("Camera image started!");
Console.WriteLine("Checking for image done with receipt " + imgReceipt);

string path = "NA";
// Check every second or so to see if the image is ready
while (!File.Exists(path))
{
    GetImagePath(imgReceipt, out path);
    System.Threading.Thread.Sleep(1000);
}

if (path == "abort")
    Console.WriteLine("Exposure aborted by user from SGPro...");
else
    Console.WriteLine("Image found at: " + path);

// The guts of TakeImage
private static bool TakeImage(SgImage img, out Guid receipt)
{
    RestSharp.IRestClient client = new RestClient();

    var request = new RestRequest(Method.POST);
    request.Resource = uriBase + "image";
```

```

request.RequestFormat = DataFormat.Json;
request.AddHeader("Accept", "application/json");

request.AddBody(img);

IRestResponse response = client.Execute(request);

SgImageResponse good =
JsonConvert.DeserializeObject<SgImageResponse>(response.Content);

if (!good.Success)
{
    Console.WriteLine(good.Message);
    receipt = Guid.Empty;
    return false;
}

receipt = good.Receipt;
return true;
}

private static bool GetImagePath(Guid receipt, out string path)
{
    RestSharp.IRestClient client = new RestClient();

    var request = new RestRequest(Method.GET);
    request.Resource = uriBase + "imagepath/" + receipt;
    request.RequestFormat = DataFormat.Json;
    request.AddHeader("Accept", "application/json");

    IRestResponse response = client.Execute(request);
    SgGenericResponse good =
JsonConvert.DeserializeObject<SgGenericResponse>(response.Content);

    if (!good.Success)
    {
        Console.WriteLine(good.Message);
        path = "NA";
        return false;
    }

    // When successful, Message will contain the path to the image (this might not be
the same path you passed in)
    path = good.Message;
    return true;
}

// DTOs
public class SgGenericResponse
{
    public bool Success { get; set; }
    public string Message { get; set; }
}

public class SgImage
{
    public int BinningMode { get; set; }
    public int IsoMode { get; set; }
    public int ExposureLength { get; set; }
    public string Gain { get; set; }
    public string Speed { get; set; }
    public string FrameType { get; set; }
    public string Path { get; set; }
}

```

}