

## Dusk

### Getting Started

#### Installing the Software

We recommend downloading the latest core installer for our software from our website. This can be found at:

<https://www.atik-cameras.com/downloads/>

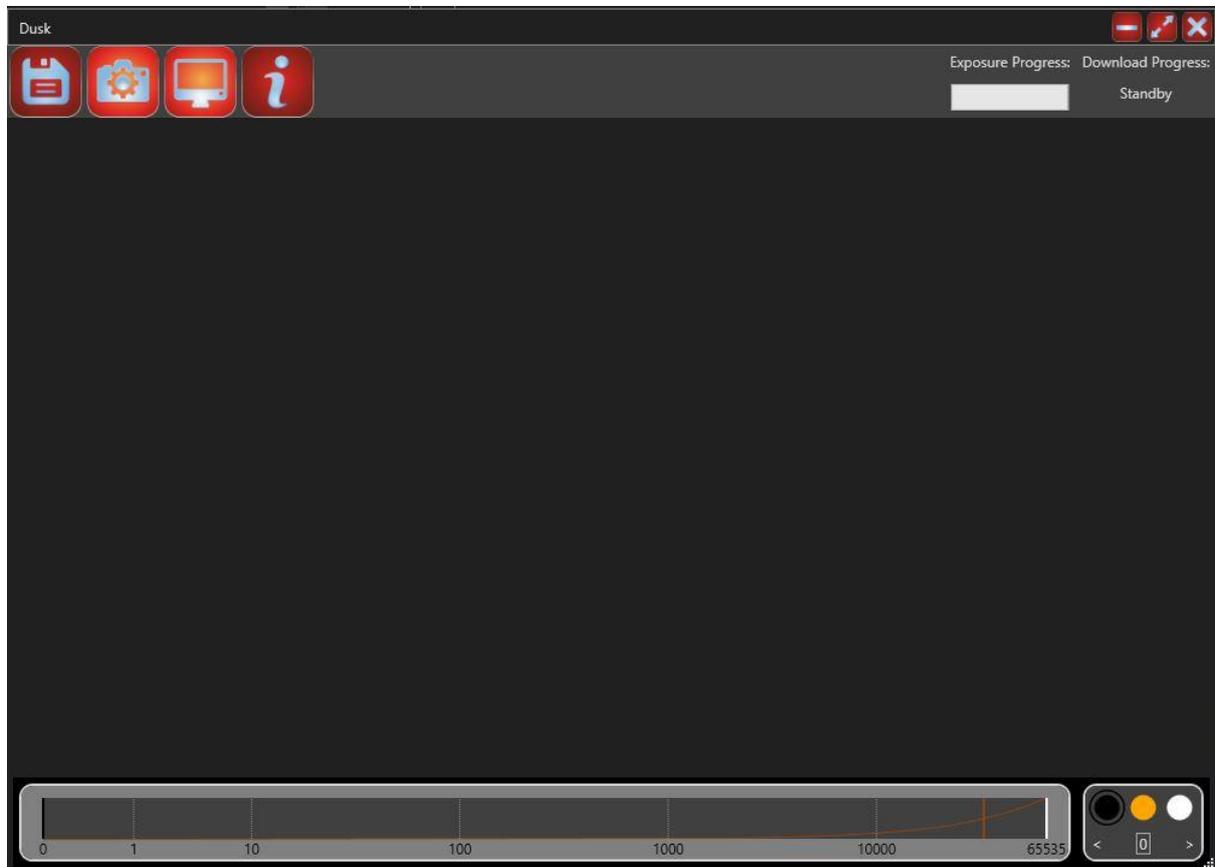
Locate and run the SetUpArtemisUniversal file. The file name will also include the version number of the software.

To install the Dusk software, ensure the Dusk check box is ticked.

Once the driver is installed, the camera is ready to use.

## Opening Dusk

After opening Dusk, you will be met with the main window.



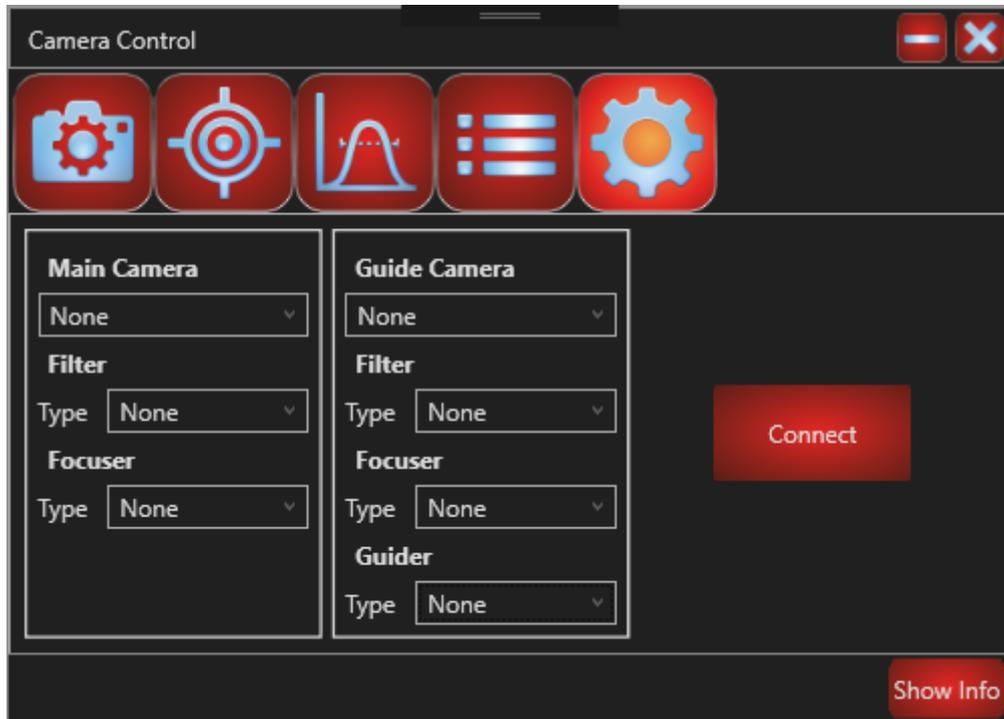
There are four main buttons to interact with that open dialog boxes, the first being the save menu, next the main control dialog, then the main image display settings and finally the application info dialog.

There are also indicators for the main cameras exposure time and also the download status of the current image.

The main window can be resized by using the grip at the bottom right corner of the window.

## Camera Setup Tab

Before you can use most of the features of Dusk, you will need to connect your camera(s) and other equipment. To do this, you will need to use the 'Camera Setup Tab':

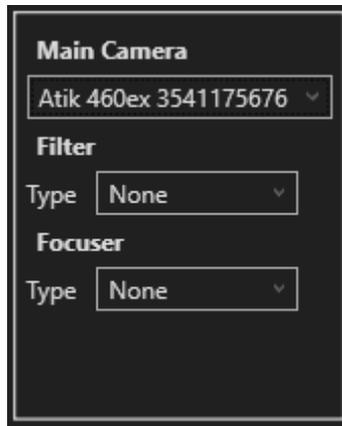


The 'Camera Setup Tab' will allow you to select your main camera, guide camera and any filter wheels, focusers and guiders you are using. The page is split into 3 areas:

- 1) On the left there is the 'Main Camera' section. This allows you to choose your main camera, plus any filter wheel and focuser connected to it.
- 2) In the middle there is the 'Guide Camera' section. This allows you to choose your guide camera, plus any filter wheel, focuser or guider you have connected to it.
- 3) On the right there is a connect button. Once you have selected your equipment, you must press the connect button to connect to it.

## Main Camera:

To set up the main camera, simply select the camera you want to use from the drop down menu underneath 'Main Camera':



The image shows a configuration panel for a camera. It has a dark background with white text. At the top, it says "Main Camera". Below that is a dropdown menu showing "Atik 460ex 3541175676". Underneath is a section labeled "Filter" with a "Type" dropdown menu set to "None". Below that is a section labeled "Focuser" with a "Type" dropdown menu set to "None".

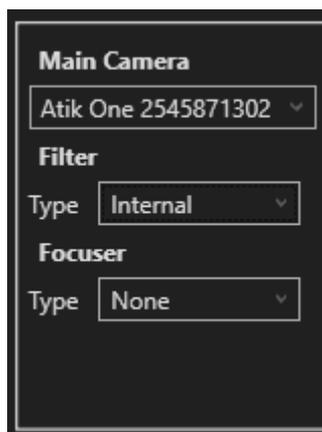
The name of the camera is displayed, along with its serial number.

## Filter Wheel

If you are using a filterwheel with this camera, you can select it by using the drop down menu underneath 'Filter'. There are three options here:

- 1) None: If you are not using a filterwheel
- 2) Internal: If you are using a filterwheel which is built into the camera. For example, and Atik One.
- 3) External: If you are using an external filterwheel. Such as the EFW2.

Here is how you would set up an Atik One, with an internal filter wheel:



The image shows a configuration panel for a camera. It has a dark background with white text. At the top, it says "Main Camera". Below that is a dropdown menu showing "Atik One 2545871302". Underneath is a section labeled "Filter" with a "Type" dropdown menu set to "Internal". Below that is a section labeled "Focuser" with a "Type" dropdown menu set to "None".

Here is how you would set up another camera, with an external filterwheel:



The screenshot shows a configuration window with a dark background. It is divided into three sections: 'Main Camera', 'Filter', and 'Focuser'. Under 'Main Camera', there is a dropdown menu with 'Atik Horizon 5' selected. Under 'Filter', there are two dropdown menus: the first is labeled 'Type' and has 'External' selected; the second is labeled 'EFW2 15501214' and has a dropdown arrow. Under 'Focuser', there is a dropdown menu labeled 'Type' with 'None' selected.

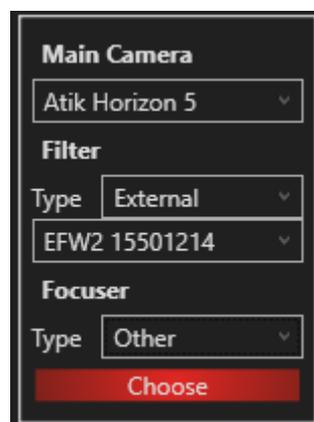
Note: You will need to select the filter wheel with the second drop down menu the will appear when 'External' is selected.

### **Focuser:**

If you are using a focuser, you can selected it by using the drop down menu underneath 'Focuser'. There are two options here:

- 1) None: If you are not using a Focuser
- 2) Other: If you are using a focuser.

If you select 'Other', a 'Choose' button will appear. Pressing this button will open the 'ASCOM Focuser' dialog. You can then choose your focuser.



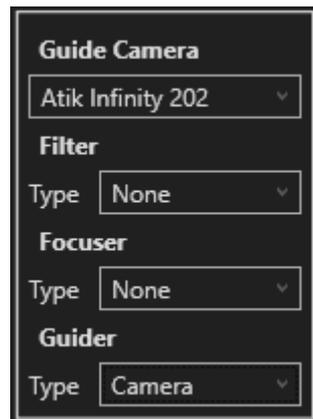
This screenshot is identical to the one above, but the 'Focuser Type' dropdown menu now has 'Other' selected instead of 'None'. A red button with the text 'Choose' in white is now visible at the bottom of the configuration panel.

## Guide Camera:

The setup of the guide camera works in the same way as the main camera, except that you can also select the 'Guider'. There are 3 options for the guider:

- 1) None: If you are not using a guider
- 2) Camera: If the guider is controlled by the camera
- 3) Telescope: If you are using an external guider, such as one controlled via ASCOM

Here is how you would set up an infinity camera as a guide camera:

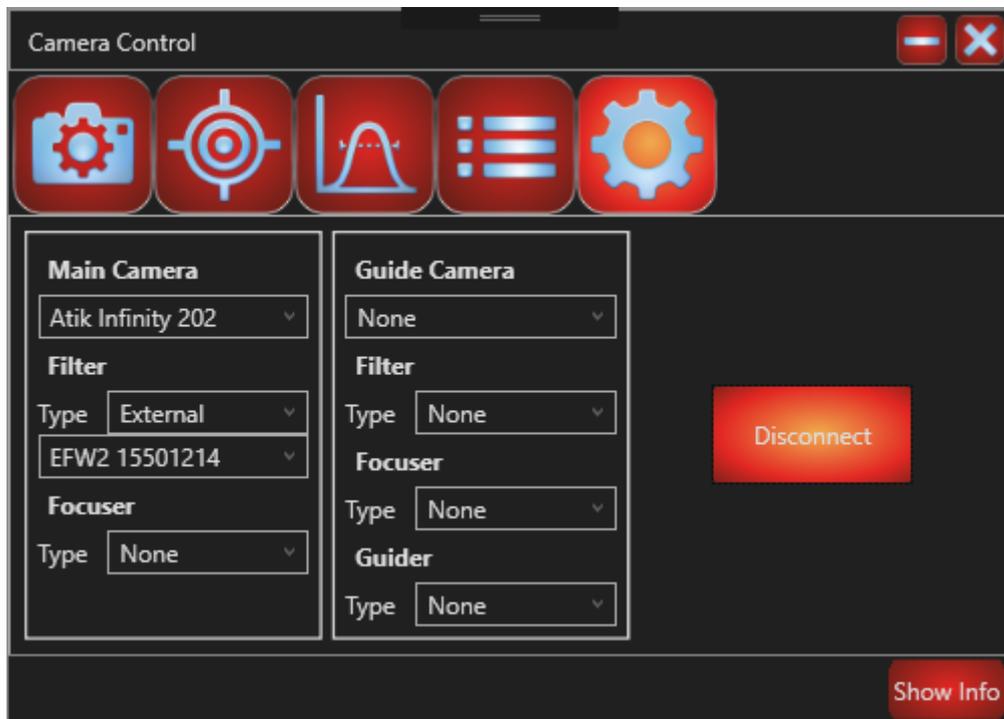


The image shows a configuration window titled "Guide Camera". It contains several dropdown menus for setting up the camera and its accessories. The "Camera" dropdown is set to "Atik Infinity 202". Under the "Filter" section, the "Type" dropdown is set to "None". Under the "Focuser" section, the "Type" dropdown is set to "None". Under the "Guider" section, the "Type" dropdown is set to "Camera".

If you select 'Telescope' a 'Choose' button will appear. Pressing this button will open the 'ASCOM Telescope' dialog. You can choose your guider from there.

## Connect / Disconnect:

Once you have selected your cameras and equipment, you can connect them by pressing the connect button:

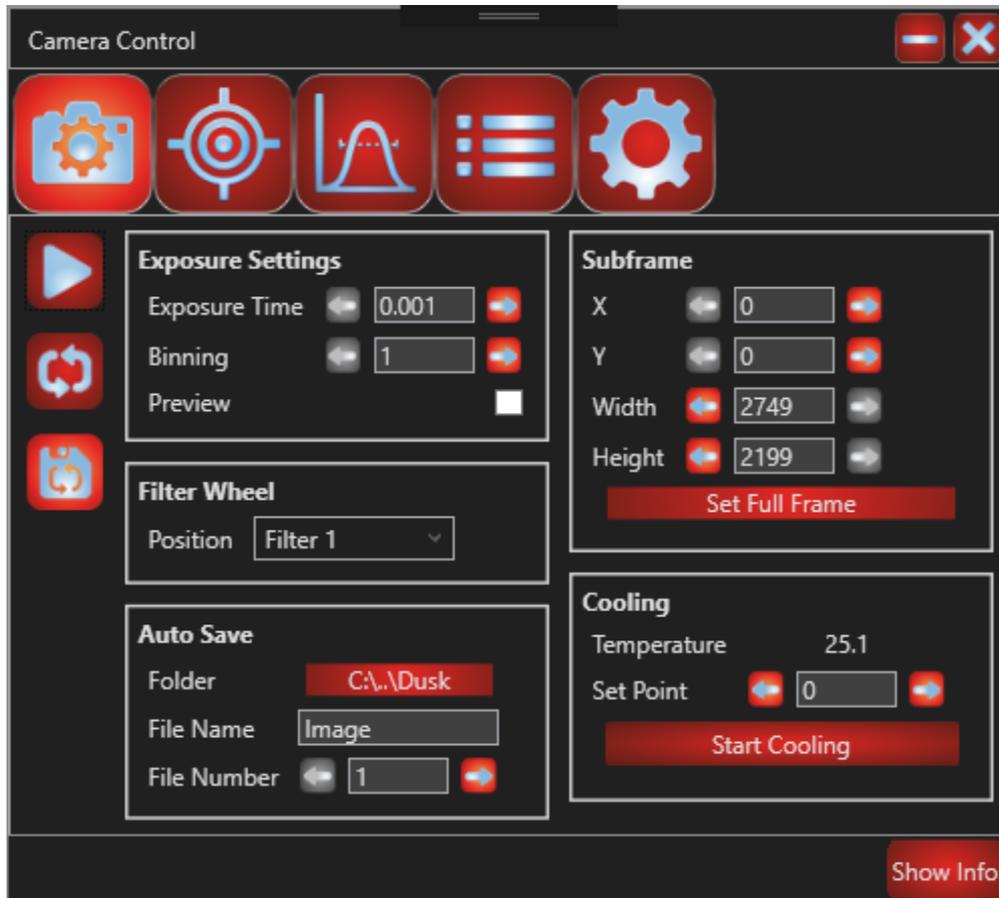


Once connected, you cannot change the setup. If you wish to make a change, press the 'Disconnect' button first.

Once you have setup and connected to your cameras, you are now ready to use them. The next few sections will describe the various pages in dusk and how to use them.

## Main Camera Tab

This tab controls the main camera. The page will look slightly different depending on which camera and equipment you are using, but a typical layout looks like this:

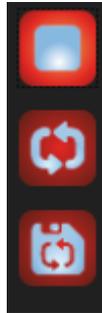


The page has two main sections:

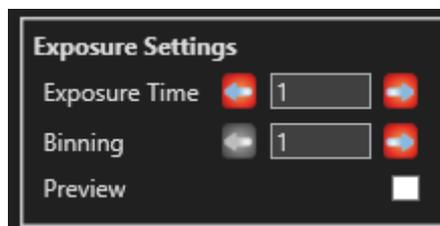
- 1) On the left, you have three buttons: A play button, for taking an image. A loop button, which will keep taking images if selected and an auto save button
- 2) The rest of the window contains settings for the camera.

## Taking an image:

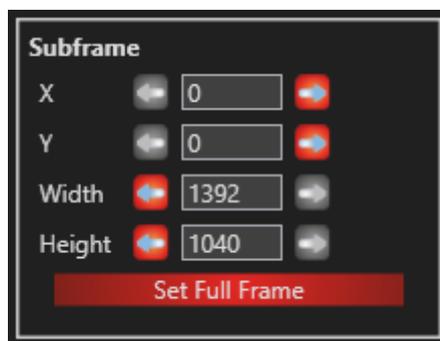
To take an image, simply press the play button on the left side of the window. Once pressed it'll look like this:



You can change the exposure time, binning level and other camera settings in the 'Exposure Settings' section:

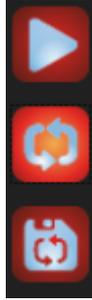


You can also create a subframe by right clicking on the image and using the mouse to drag an area. Alternatively, you can use the subframe section to specify the subframe dimensions:



## Loop Exposure:

You can use the 'Loop Exposure' button to automatically take another image after each image is completed. To do this, press the loop exposure button:



Note: You will need to press the start button to start the loop exposure. And the 'Stop' button to finish it.

## Auto Save:

You can use the auto save button to automatically save each image as it is created:



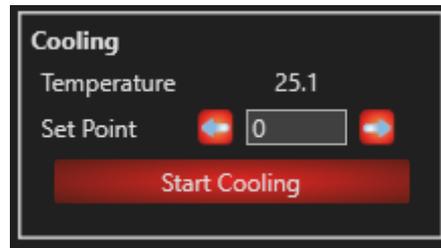
You can use the following settings to set where the images get saved, the file name and the number that the next image gets. After each image, this number will automatically increase by 1.

Auto Save	
Folder	C:\Dusk
File Name	Image
File Number	1

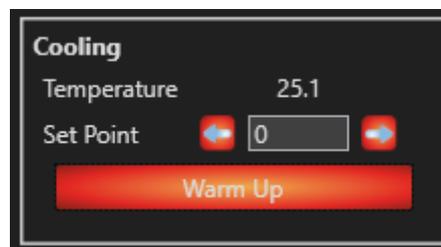
All files are saved as .fits files.

## Cooling Control:

If the camera has cooling, you can control it in the Cooling section:

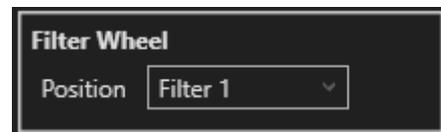


The section tells you the current temperature and allows you to select the target temperature. To start cooling press the 'Start Cooling' button. To warm up, press the warm up button:



## Filter Wheel:

If you are using a filter wheel. You can control it in the filter wheel section:



## Guide Camera Tab

The guide camera tab allows you to control your guide camera. On this tab, you will find many of the controls you will find on the main camera tab, as well as everything you need to auto guide using either the camera or telescope via ASCOM. Instructions for setting up the guide camera can be found in the Camera Setup Section. This section will describe the Guide Camera Tab itself.

Assuming your guide camera is all setup. The Guide Camera Tab will look like this:



The guide tab is split into three sections:

- 1) A top bar, which allow you to take an image, calibrate the auto guider and start/stop auto guiding
- 2) A middle section which allows you to change the settings of the of the guide camera / auto guider.
- 3) A bottom row, which allows you to open the Guide Window, Guide Display, Guide Info and Pulse windows. These will all be described in this section.

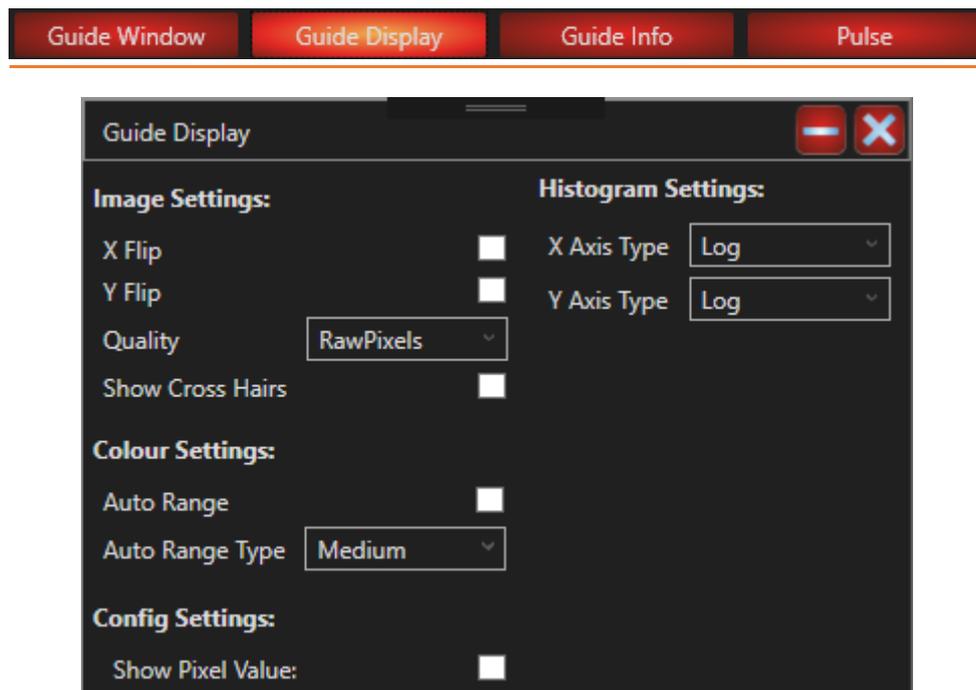
To take an image with the guide camera, simply press the 'Take Image' button. To see the image, you need to open the Guide Window. To do this, press the 'Guide Window' button on the bottom row:



This will open the Guide Window:

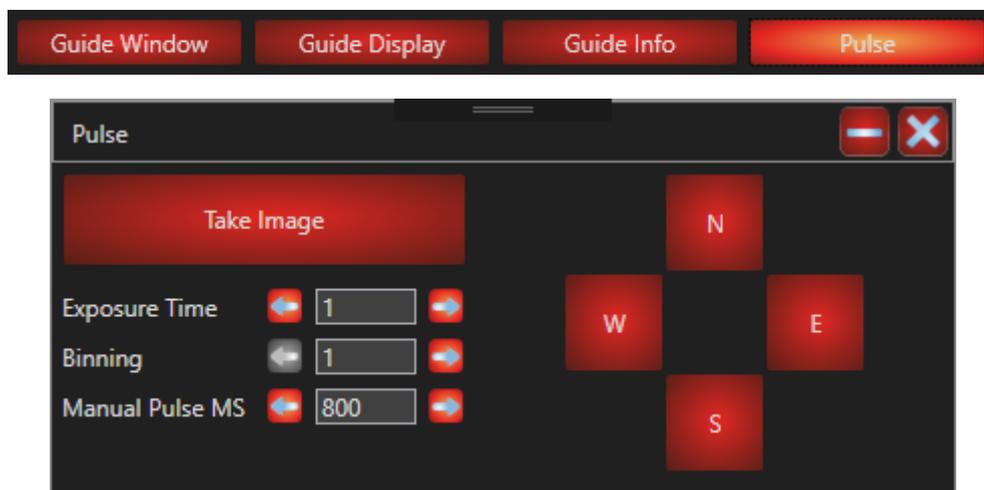


You can also open the display settings, by pressing the 'Guide Display' button:



### Pulsing:

You can check that the guider is working correctly by using the 'Pulse' window:



This window will allow you to pulse the guider in one of the four directions: North, South, East and West. You can control how long it pulses for, using the 'Manual Pulse MS' setting. You can then take an image to see how far it has moved. This is useful for working out the 'Calibration Pulse MS' in the calibration step described below. The pulse window will also reflect any pulses from the calibration or auto guider, so you can see what's being pulsed on this page.

## Auto Guiding Calibration:

Before you can start Auto Guiding, you will need to calibrate the Auto Guiding. The Auto Guide Calibration will pulse the guider several times in all four directions (North, South, East and West) and calculate both how far, and in what direction, these pulses move the telescope. You can control the pulse length by using the 'Calibration Pulse MS' setting in the 'Settings' section. The default is 800ms, but you will probably need to adjust this depending on your setup.

You can run the calibration on any subframe of the image (provided there are stars in the image). But it is usually best to run the calibration as a full frame.

When you are ready to start, press the 'Calibrate' button in the top row. This will start the calibration:

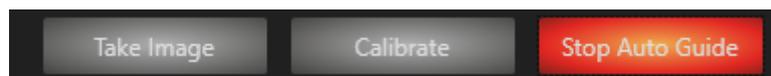


A progress bar will appear on the right to show you how much has been done. You can cancel the calibration by pressing the 'Cancel Calibrate' button.

Once the calibration has completed, the calibration values will be saved. This means that once you're happy with the calibration, you shouldn't need to do it again. However, if you change your equipment, or realign your guide camera, you will need to run the calibration again.

## Auto Guiding

Once the calibration is finished, you can start auto guiding by pressing the 'Start Auto Guide' button in the top bar. This will start Auto Guiding:



You can stop the Auto Guiding at any time by pressing the 'Stop Auto Guide' button.

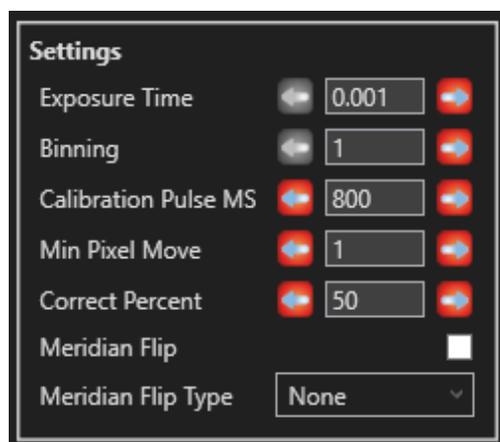
Note: You can auto guide to a full image, a single star or a subframe of stars. You can drag a subframe area using the right mouse button on the guide window, or by setting the values in the 'Subframe' section on the Guide Camera Tab.

You can track the progress in the 'Guide Info' window in the bottom row:





There are a few more settings for the auto guider which you might find useful:

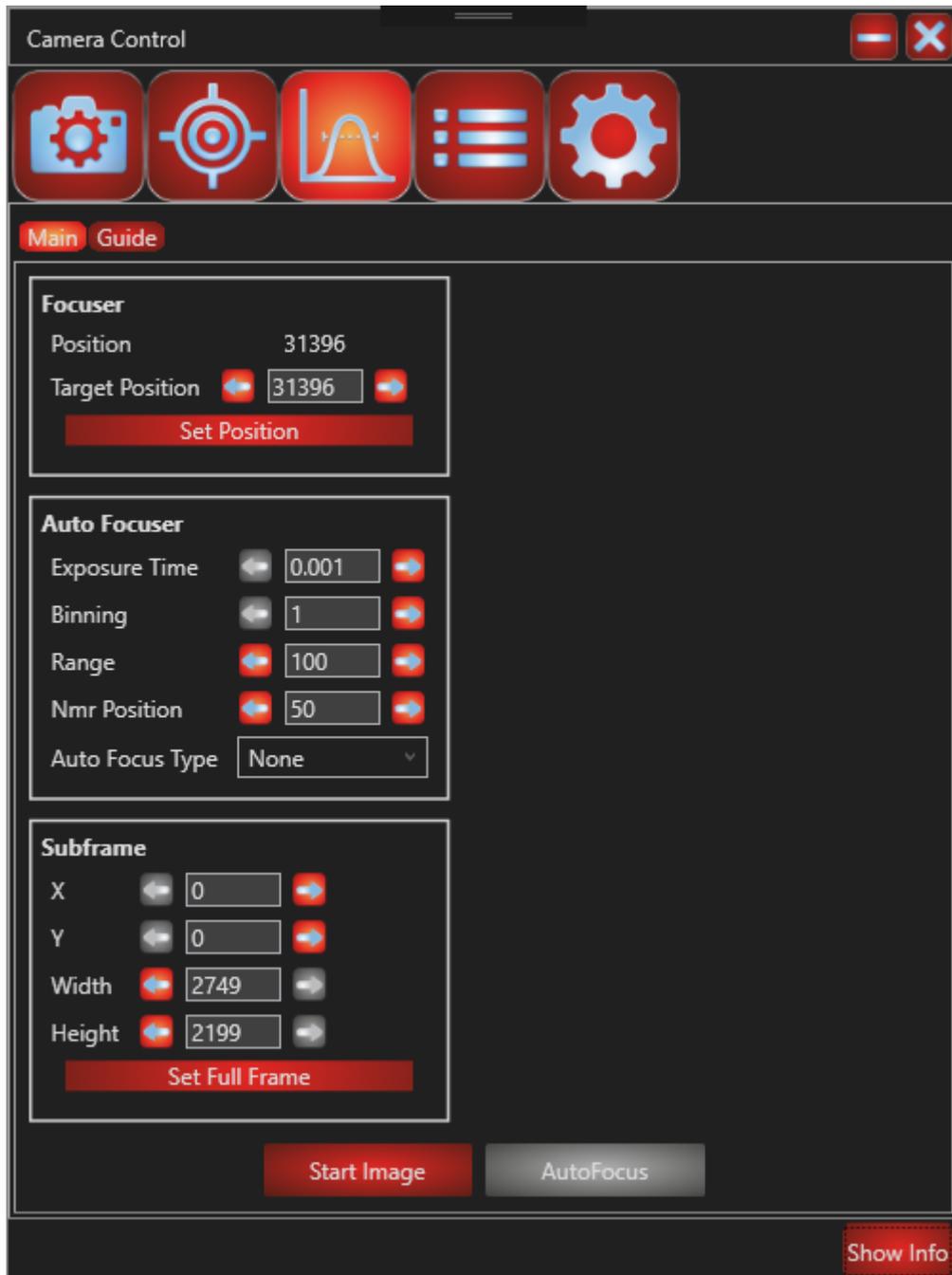


- 1) Min Pixel Move: This is the minimum number of pixels the image has to move before the auto guider will try to correct
- 2) Correct Percent: This is how far the auto guider will try to correct in each pulse. For example, if the image has moved 10 pixels and the correct percent is 50, then the auto guider will try to move 5 pixels. If it is set to 25, then it will move 2.5 pixels.
- 3) Meridian Flip: This will flip the X and Y directions calculated by the calibration, depending on the Meridian Flip Type
- 4) Meridian Flip type: This selects which axis gets flipped when the Meridian Flip checkbox is checked. The choices are: None, X, Y and XandY.

## Focus Tab

The focus tab helps you focus the camera. You can focus the camera manually or, if you have a focuser connected, you can use our Auto Focus feature. Connecting to a focuser is described in the 'Camera Setup' section. Here we will describe the Focus tab.

Assuming you have a camera connected, the focus tab will initially look like this:

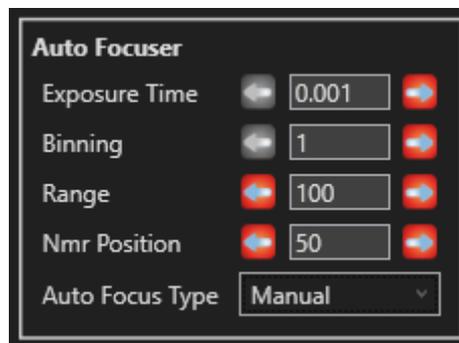


The Focus Tab is split into 3 sections:

- 1) At the top you have the Main / Guide selection buttons, which allows you to choose between the main and guide camera.
- 2) The middle is split into two sections. The left side contains a control for the focuser (if available) and the settings for the auto focuser. On the right, you will see either a FWHM value (if in manual mode), a graph (If in auto mode) or nothing (If set to none). See below for more details.
- 3) At the bottom, you have the 'Start Image' and 'Auto Focus' buttons.

## Manual Focusing

To focus the camera manually, you will first need to set the 'Auto Focus Type' to 'Manual':



At this point, you should see a red number appear on the right hand of the screen:

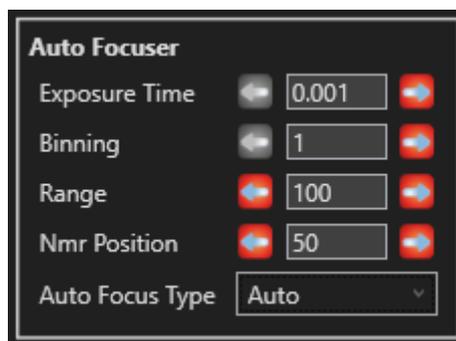


The number is the Full Width Half Max (FWHM) or the image. This is a calculation based on all the stars in the image. The lower the number, the better. Note: If no image is displayed, the FWHM will be 0.00.

Note: Manual focus can be done with either a full frame or subframe of the image. However, you will need at least one star in the image in order for the FWHM calculation to work.

### Auto Focusing

To use the Auto Focus feature, you need to set the 'Auto Focus Type' to 'Auto':



At this point, you will see a graph appear on the right hand side:



The 'Auto Focus' button should also be available.

Note: The 'Auto Focus' button will only be available if you are connected to a focuser and the 'Auto Focus Type' is set to 'Auto'. You will also need to take an image before the button is available.

In order for Auto Focusing to work properly, you will need an image which isn't too out of focus. Ideally, you need stars that are point like (I.e. not rings). The Auto Focuser will use the current position as a start point and then check focus positions either side to calculate the best focus position. We have included 'Range' and 'Nmr Position' settings which allows you to set how far the Auto Focuser will check either side of the current position and how many positions it will check. As all focusers are different, you will need to change these settings to suit your setup.

Auto Focusing works best if you select a single star. Therefore, it is recommended that you drag a subframe (using the right mouse button) on the image around a star in the image.

When you are ready to Auto Focus, press the 'Auto Focus' button. This will start Auto Focusing:



You can cancel the Auto Focus by pressing the 'Cancel Auto Focus' Button. You will see a progress bar appear on the right and you will see the graph update.

Once the Auto Focus has finished, it will calculate the best position and set the focuser to that position. If the best position can't be found, or if the Auto Focus is cancelled, the focuser is returned to the original position.

## Sequencer Tab

The sequencer tab allows you to create multiple sequences, easily swap between and edit them.



The top half of the tab will show your current selected sequence with each row laid out in a table.

## Creating a sequence

To create a sequence with the default name of 'Sequence 1' just click on the plus button to the bottom right of the sequence table. This will add a row to the table and enable the save button.

If you wish to create a named sequence just click in the text box and enter a name that is 15 characters or less and click the new button. This will create and new empty sequence and save it to disk. You can then add rows to the sequence by clicking the plus button.



The screenshot shows the 'Camera Control' software interface. At the top, there are five icons: a camera, a target, a graph, a list, and a gear. Below these is a table with the following columns: On, Exposure, Binning, Filter Wheel, Filename, Script, Order, and an empty column. The first row is checked in the 'On' column and contains the following values: Exposure: 1, Binning: 4, Filter Wheel: 1, Filename: Image 1, Script: C:\\Users\\Cr, and Order: 1. Below the table, there is a 'Standby' button, a 'Sequence repeat mode' dropdown set to 'Sequential', and 'Repeat' and 'Delay between exposures' controls. At the bottom, there is a 'Sequence 1' dropdown, a 'New' button, and a 'Show Info' button. The bottom section contains two columns of camera information: 'Main Camera Info' and 'Guide Camera Info'.

On	Exposure	Binning	Filter Wheel	Filename	Script	Order	
<input checked="" type="checkbox"/>	1	4	1	Image 1	C:\\Users\\Cr	1	

Standby

Row 0 of 1 Sequence 0 of 1

Sequence repeat mode: Sequential Repeat: 1

Delay between exposures: 0 Delay before Start: 0

Sequence 1 New

Show Info

Main Camera Info	Guide Camera Info
Name: Atik Horizon	Name: No Camera
Connected	Not Connected
Status: Standby	Status: NotConnected
Cooler Connected	No Cooler
Sensor Temp: 30.18	Sensor Temp: 0

You can decide whether a row will actually be used whilst sequencing by clicking the checkbox in the "On" column. The filename of each row can be changed by double clicking in the "Filename" column, editing the name and then pressing enter on the keyboard. If you

have the “Show Scripting” option selected the script column will appear, which will allow you to run a script after each step of the sequencer. The order of the rows can be changed by clicking on the arrow buttons in the “Order” column. Individual rows can be deleted by using the cross at the end of the row.

After you have added rows and edited the exposure settings don't forget to save the changes you have made by clicking the save button.

### Setting sequence options

A few more options are listed in the lower half of the tab.

The repeat option determines the number of times that the sequence will run before stopping.

The ‘Sequence Repeat Mode’ drop down menu works in tandem with the repeat setting and will determine whether the sequence you have created will take images in sequential order (1->2->3) for the specified number of repeats or if it will take the images in grouped order (1 x number of repeats, 2 x number of repeats, 3 x number of repeats)

Below this you can set a delay between each exposure of the sequence.

The ‘Delay before start’ option will set the delay before the start of the of the sequence, this will also give a delay between each repeat of the sequence if you have selected a number of repeats.

If you have saved a sequence the rubbish bin button allows you to delete the currently selected sequence.

The drop-down menu shows the current sequence and your other saved sequences.

The save button allows you to save any changes to the current sequence, the save button will be disabled if there are no rows in the current sequence.

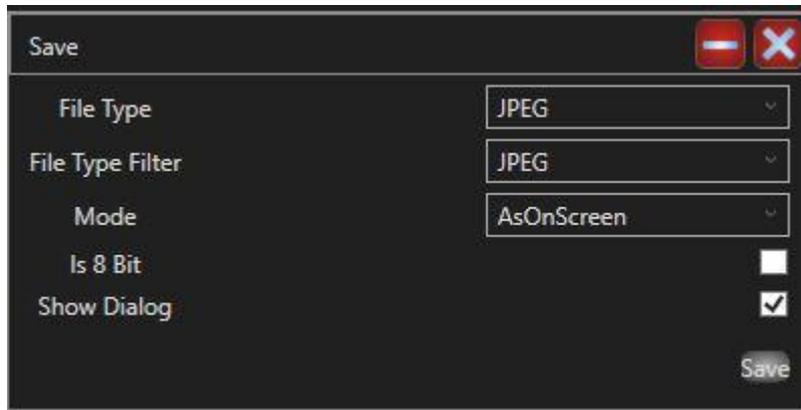
The textbox allows you to set the name of a new sequence. If the text box is left empty a sequence with the name ‘Sequence i’ will be created (the i being a number incremented every time a sequence with no name is generated).

Finally, in the bottom right of the tab is the play button. Once clicked you currently selected sequence will start and the button will switch to a stop button. If the stop button is clicked while sequencing the current exposure will be cancelled and the sequence will stop. As the sequence is running the information just under the rows will update to indicate what the sequencer is currently doing and which row/repeat of the sequence you are currently on.

The images from the sequence are automatically saved to your pictures folder under ‘\Pictures\Dusk\Images’

## Save Dialog

Once you have taken an image you can open up the save dialog choose a few options and then save your images.



Here you can select your file type choosing from:

- FIT
- PNG
- JPEG
- TIFF

File type filter will show you the other files of that type in the folder you open with the save button.

The Mode option allows you to choose between 'AsOnScreen' which saves the images as you currently see it with your chosen stretch, or 'Unprocessed' which saves the image without any pixel stretching.

By default, images will be saved as 16-bit, but you can also choose to save an 8-bit image by checking the 'Is 8 Bit' box. We generally recommend saving your images as 16-bit. Please note: Saving in FITs format will always save a 16-bit, unprocessed image.

## Display Settings

Dusk contains a number of options to control how an image is displayed, making sure you get the most out of different types of object.

### Histogram Function

The histogram is displayed across the bottom of the screen. This essentially shows you the saturation of your image, with 0 representing a black pixel, and 65,535 representing a fully saturated, white pixel.

The histogram can be adjusted to get the best views of any object.

## Adjusting the Histogram

The histogram can be manually adjusted using the levels sliders. There are black, grey and white level sliders to alter the different levels. These can be moved by clicking and dragging the desired slider to the desired position. The black and white levels can also be adjusted by clicking in the desired place on the histogram. Clicking the left mouse button sets the black level and clicking the right mouse button sets the white level. The grey level is represented by the orange slider and adjusts the stretch that is applied between the black and white levels. Clicking either mouse button on either the left of the black slider or the right of the white slider will adjust the corresponding slider. This is to ensure the black level can't be set above the white, or the white below the black.

## Advanced Histogram Adjustment

The fine histogram control is situated to the right of the histogram to use it, simply select the slider you would like to adjust (black level, grey level [orange slider], or white level) and then either use the control arrows in the panel, or type in your desired value to adjust the histogram. You can also use the arrows on the keyboard to adjust your selected slider. While this option is selected, you can still control the histogram as normal by dragging the sliders with the mouse or clicking on the histogram.

## Colour Histograms

When using a colour camera, the histogram will display separate curves for the red, green and blue channels, and a colour selection box to the left of the histogram. "Colour Bal Type" the colour balance type is automatically set to 'AutoAdjust'. With this option selected, the colour channels are automatically aligned to produce an accurate colour balance. Selecting 'None' will turn off automatic colour balancing. Manual mode will automatically be selected if you make manual adjustments to the colour balance as described below. Please note: These controls are only available when a suitable camera in an appropriate binning mode, and will only appear after an image has been taken. For example, they will not appear when using a mono camera, or if binning is set to higher than 1x1 in normal mode with a colour camera.

## Manually Altering the Colour Balance

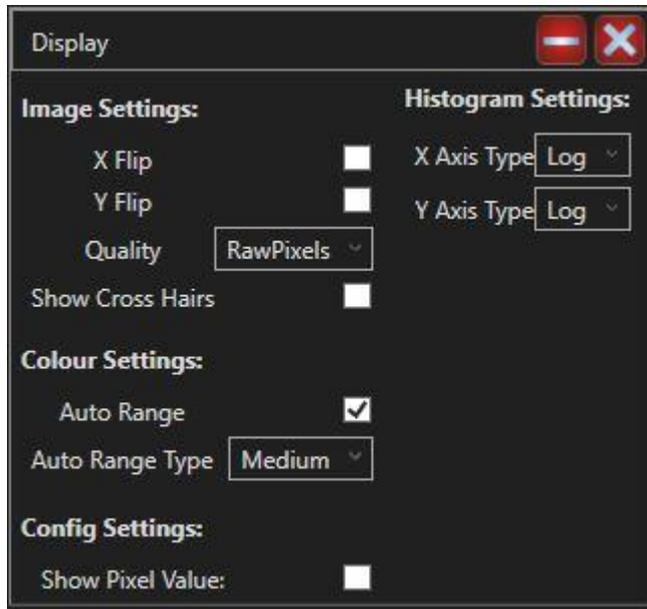
You can manually alter the colour balance using the colour selection box. Selecting the white circle allows you to control the black, grey and white levels as normal using the sliders. Selecting one of the red, green or blue circles will allow you to adjust the corresponding colour channel. You can do this by dragging the channel on the histogram using the mouse, or by using the 'Offset' and 'Stretch' buttons in the colour selection box.

The stretch and offset values modify the all the pixel values for that particular colour channel. The offset adds the given value to each pixel, whereas the stretch multiplies each pixel by the given value. Multiplication happens first, so the final pixel value is given by:

$$\text{FinalPixelValue} = (\text{OriginalPixelValue} * \text{Stretch}) + \text{Offset}$$

To reset the colour channels, reselect the AutoAdjust option from the Colour Bal Type menu at any time.

## Display Settings Dialog



### Image Settings

Here you will find options for image manipulation. You can flip the image on the horizontal and vertical axis by checking the X and Y flip box respectively.

### Colour Settings

Within the Image Settings menu is an auto range function. When selected, this automatically sets the black, white and grey levels on the histogram and continues to adjust them as each new image comes in. There are a number of different types of auto range designed to bring out different details on different types of object.

- **FullRange:** displays from the lowest to highest pixel values
- **FullRangeMinus:** displays the lowest to highest pixel values, minus around 0.01% of the pixels either side
- **Low:** large stretch, best for fainter objects
- **Medium:** medium stretch, versatile for a range of objects
- **High:** short stretch, best for finding and aligning objects
- **MeanSD:** average pixel value plus the number of standard deviations, 'Bound To Range' ensures it won't go above or below the highest or lowest pixel values
- **MaxPeak:** stretch based on highest peak

### Config Settings

Here you can find an option to show the value of the current pixel your mouse is over.

When checked the value of the current pixel your mouse is over will be displayed.

## Histogram Settings

### Note on Histogram Scale

The histogram is automatically set to a logarithmic scale as this is usually most effective when dealing with the faint signals associated with this kind of image capture. This prioritises signal at the lower end of the scale and provides control where you need it most. However, if you'd rather use a linear scale set the two settings found here to linear.

## Image Control

Once an image has been taken the image can be manipulated. If you click on the image with the left mouse button you can drag the image around, you can also use your scroll wheel to zoom in and out on the image

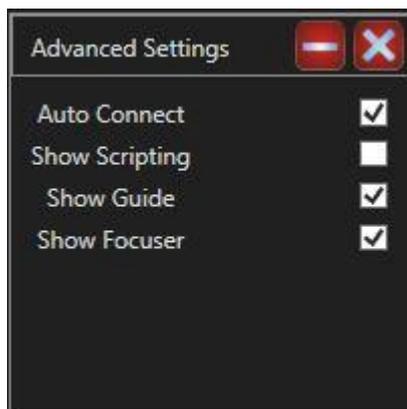
### Sub frame

Clicking on the image with your right mouse will begin a subframe, drag your mouse to the size you want and release. The image taken by the camera will now be sub framed. If you drag with the left mouse button inside the subframe it will move the frame around the image.

You can see the size of your sub frame in the relevant camera tab on the main control dialog, from here you can also clear the subframe. The sub frame can also be cleared by right clicking anywhere on the image control.

## Advanced Settings Dialog

The advanced settings list a few settings that can change various elements of Dusk.



Auto Connect will automatically connect devices that are available when you start up Dusk that you have previously connected.

Show Scripting allows you to see the scripting column of the sequencer.

Show Guide is automatically on but if switched off will hide the ability to select guide devices and will also hide the guide tab.

Show Focuser is similar to the show guide option but for the focuser tab.