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Maxim DL

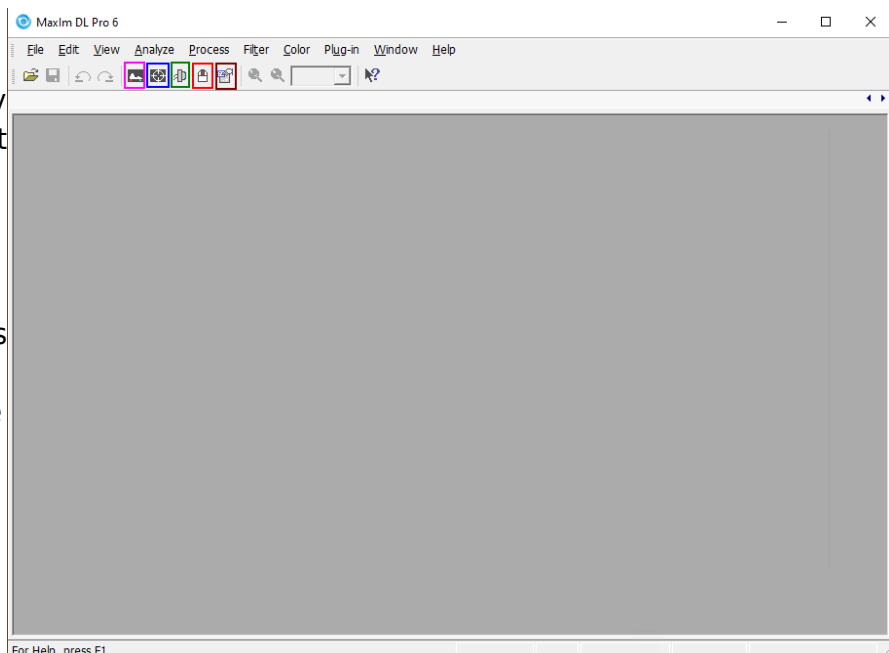
Maxim DL is currently the main interface for controlling the observatory and cameras as well as for performing the observations.

Interface und grundlegende Bedienung

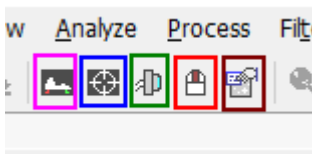
Maxim DL can be started most easily by double-clicking on the icon Maxim DL 6 on the desktop or via the taskbar.

Main window

The help, picture part of the toolbar shows the display information of Maxim DL, the most important images. The header is highlighted. The red button opens the **Observatory Panel**, which contains, for example, for the display, the controls to the scope. The green button opens the **Camera Control Panel**, which provides scaling controls for the cameras. These two windows will be discussed in detail below.



Main window of Maxim DL

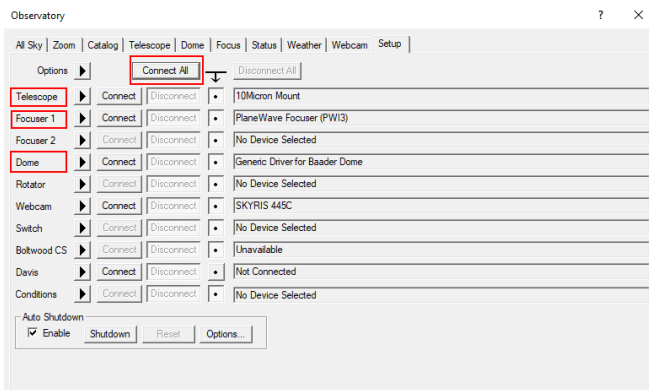


Observatory Panel

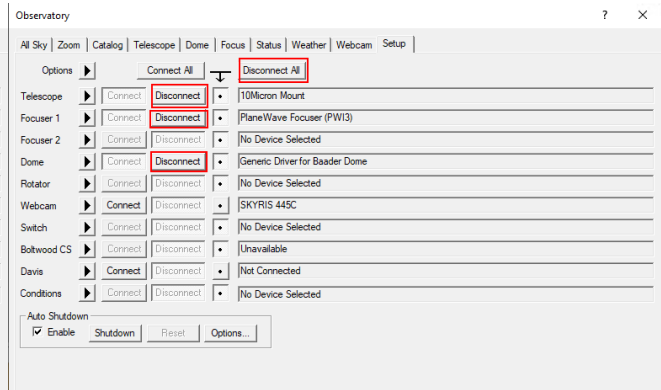
The **Observatory** control window has different tabs to control the different parts of the observatory. You can move to objects by entering their coordinates, selecting them from a catalog or marking them on an all-sky map. The dome can be opened, closed, and if necessary moved manually. Furthermore, the telescope can be moved manually via this control window and parked again after the observations are finished.

Setup Tab

The setup tab is used to establish the connection to the telescope, the dome, and the focuser. You can click on the **Connect** button behind the respective entry or on **Connect All** to establish the connection to all components simultaneously. All other entries like **Rotator** are not relevant for us.



Setup-Tab - Nothing connected

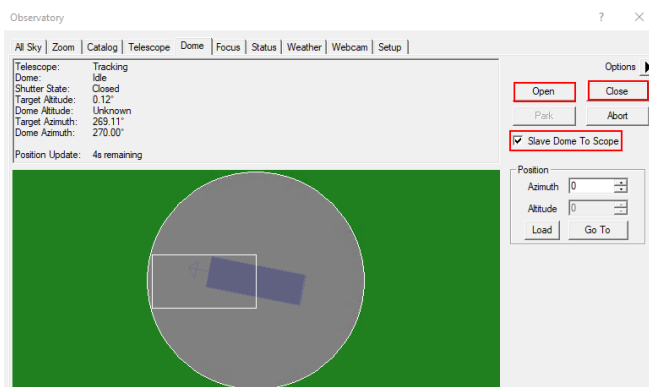


Setup-Tab - Telescope, dome, and focuser connected

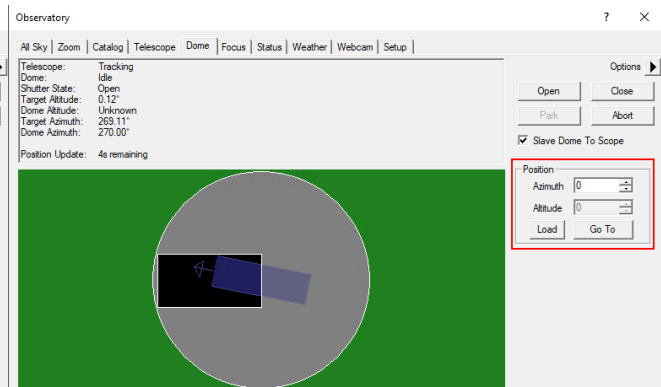
In order to disconnect the devices after the observation, you can click on the individual **Disconnect** buttons or on **Disconnect All**.

Dome Tab

The **Open** and **Close** buttons can be used to open and close the dome. The dome always opens or closes completely. It must be ensured that the **Slave Dome To Scope** option is activated, otherwise the dome will not follow the telescope. Unfortunately, this option turns off every time the dome is opened, closed, or the telescope is parked.



Dome closed

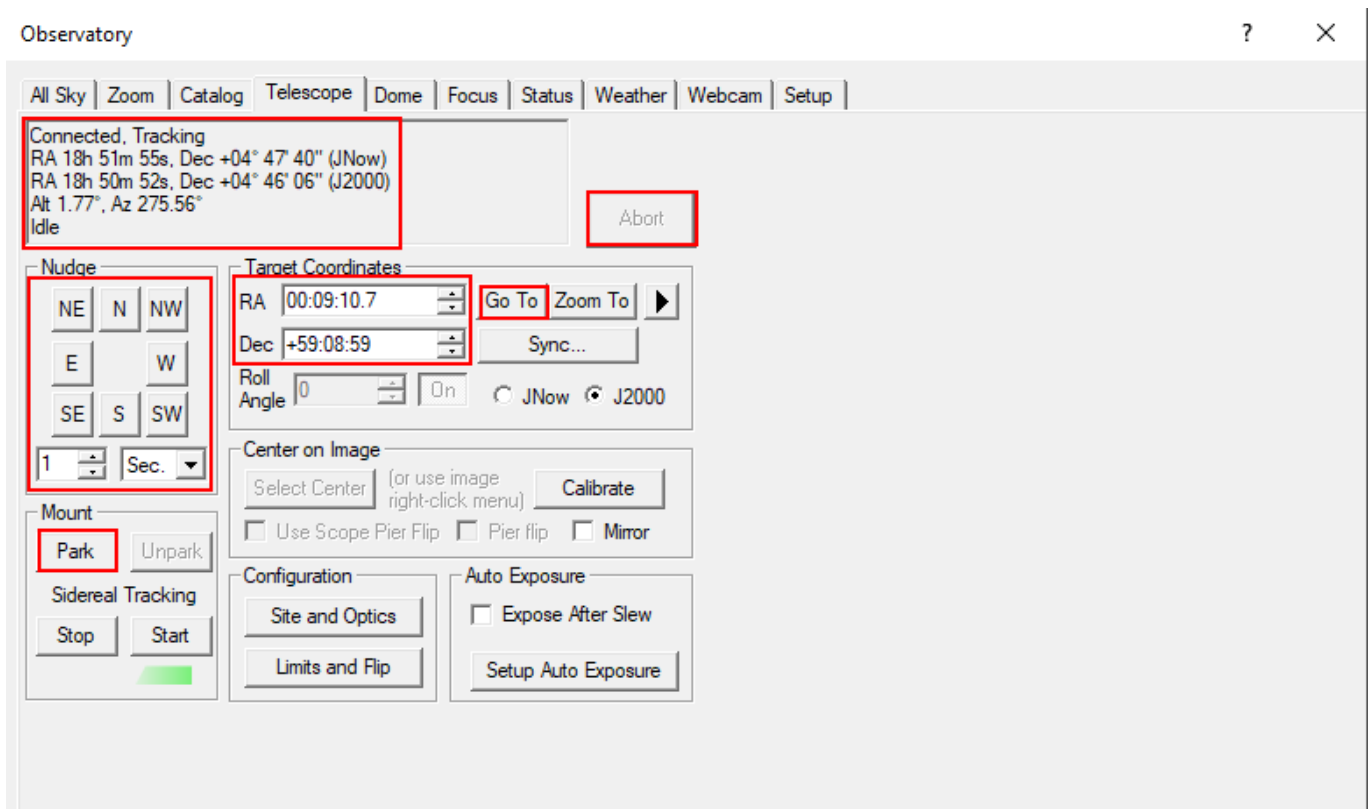


Dome open

The dome can be moved manually via the functions in the **Position** box. This is especially useful when the telescope and the slit are not correctly aligned and the dome needs to be recalibrated. On the example shown above, the alignment is not optimal but still so good that the telescope does not look at the dome.

Telescope Tab

The telescope tab shows in the upper left area where the telescope is currently looking and which action it is currently performing. The right ascension and declination are displayed for the current date as well as for the standard epoch J2000. Furthermore, the altitude above the horizon and the azimuth are displayed. In the example shown below, the telescope is tracking and apart from that is inactive.



The buttons in the **Nudge** section can be used to move the telescope manually, with the step size selected via the drop-down menus. Each movement can again be aborted via the **Abort** button.

In the **Target Coordinates** area you can enter the right ascension and declination of an object and slew to it via the **Go To** button. The **Zoom To** button switches to the Zoom tab, which displays a map of the sky at the respective coordinates.

The **Park** button in the **Mount** area can be used to park the telescope after the observation.

Catalog Tab

Using the Catalog tab, the built-in catalogs can be searched for objects. To do this, first select a category from the **Category** drop-down menu. You can choose between Stars, Deep Space and Solar System. From the drop-down menu **Object ID** either the object directly or a catalog can be selected. In the latter case the catalog number of the object, or only a part of it, can be entered (see example below). After a click on **Search** a list of possible objects is displayed. The desired object can be selected from this list. With a click on **Go To** the object is approached.

Observatory

All Sky | Zoom | Catalog | Telescope | Dome | Focus | Status | Weather | Webcam | Setup

Search ID | Search Region

Object ID Search: Category (Deep Space), Object ID (NGC 381)

Region Search: Criterion, Min, Max

Buttons: Search, Cancel, Zoom To, Sync, Go To, Abort

ID1	ID2	Type	RA	Dec	Mag	Size	HA	Alt	Az	Sle...
NGC381		Open Cluster	01h 08m 18s	61° 35' 00"	9.3	7'	01h 51m 17s	72.5°	312.8°	77.6°
NGC3810	PGC3...	Galaxy	11h 40m 59s	11° 28' 11"	11.3	4' x 3'	15h 18m 52s	-13.3°	50.2°	126.9°
NGC3812	PGC3...	Galaxy	11h 41m 08s	24° 49' 19"	13.6	2' x 2'	15h 18m 42s	-1.6°	43.9°	122.4°
NGC3811	PGC3...	Galaxy	11h 41m 17s	47° 41' 26"	12.9	2' x 2'	15h 18m 32s	18.6°	32.8°	111.2°
NGC3813	PGC3...	Galaxy	11h 41m 18s	36° 32' 46"	12.3	2' x 1'	15h 18m 31s	8.8°	38.3°	117.1°
NGC3814	PGC3...	Galaxy	11h 41m 28s	24° 48' 18"	15.7	0' x 0'	15h 18m 22s	-1.6°	43.8°	122.4°
NGC3815	PGC3...	Galaxy	11h 41m 39s	24° 47' 59"	14.1	2' x 1'	15h 18m 10s	-1.6°	43.8°	122.3°
NGC3816	PGC3...	Galaxy	11h 41m 48s	20° 06' 11"	13.5	2' x 1'	15h 18m 02s	-5.8°	45.9°	124.1°
NGC3817	PGC3...	Galaxy	11h 41m 53s	10° 18' 14"	14.2	1' x 1'	15h 17m 58s	-14.5°	50.6°	127.0°
NGC3818	PGC3...	Galaxy	11h 41m 57s	-06° 09' 22"	12.7	2' x 1'	15h 17m 54s	-28.7°	59.5°	129.2°

Zoom Tab

In the zoom tab, the sky map around the selected object is displayed. Via the option button (arrow) on the right and via the context menu, many options are accessible, such as the zoom level. If one clicks with the right mouse button on any point of the map, one can slew the telescope to this point via Slew to Mouse Position. If you click on an object, it can be selected directly. In the example below the corresponding option is Slew to 119 Tau.

Observatory

All Sky | Zoom | Catalog | Telescope | Dome | Focus | Status | Weather | Webcam | Setup

Options | Slaved to Telescope

Moving Scope

View RA: 05h 35m 40s, View Dec: 23° 32' 46", View FOV: 10°, Rotator PA: 94°

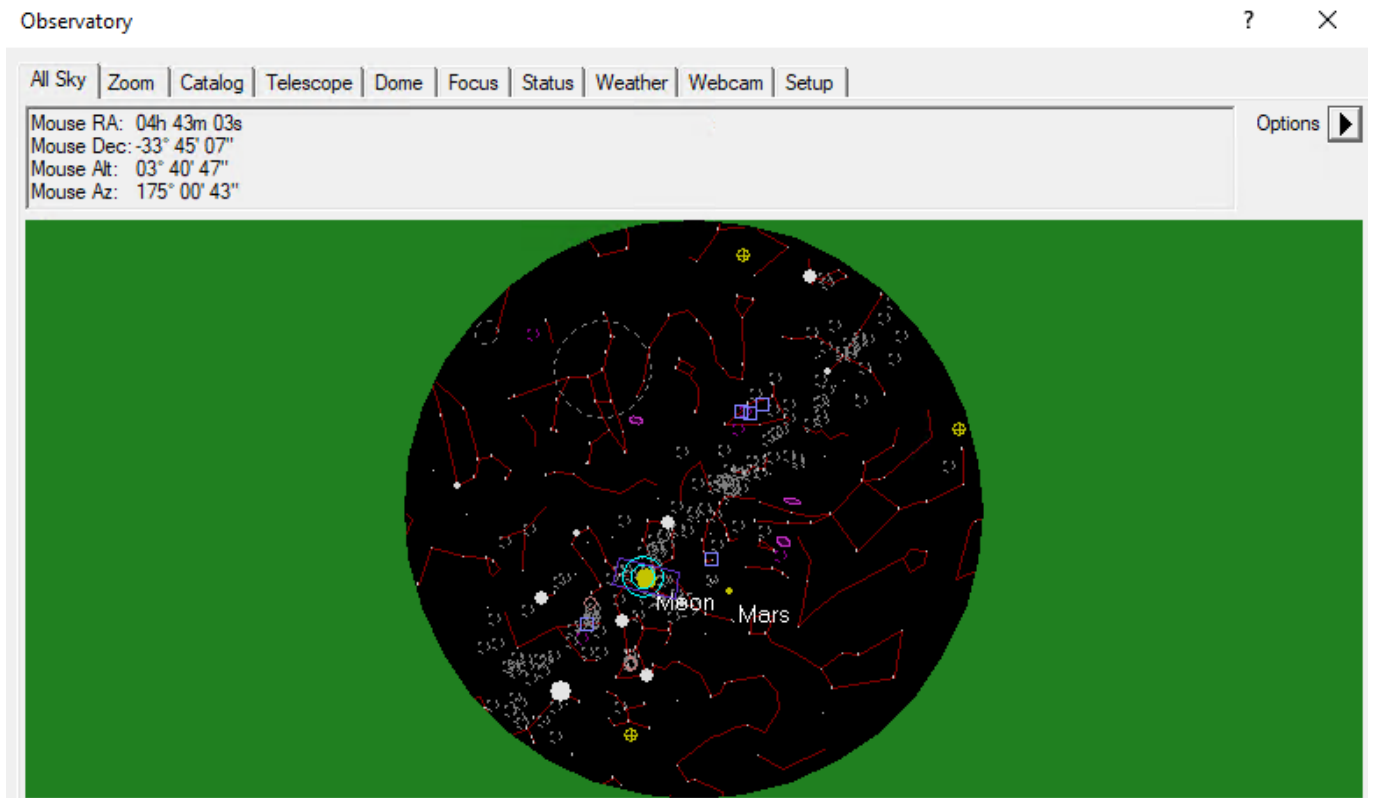
Mouse RA: 05h 32m 37s, Mouse Dec: 18° 47' 42", Mouse Alt: 52° 57' 26", Mouse Az: 147° 36' 15"

119 Tau/HIP25945 (Star), RA: 05h 32m 13s, Dec: 18° 35' 33", Mag: 4.3

Context Menu: Slew to 119 Tau, Slew to Mouse Position, Confirm Slew, Expose After Slew, Abort Slew, Find Scope Position, Sync to Mouse Position..., Move Rotator..., Sync Rotator to Solved Image, Overlay Image, Auto Overlay Solved Images, Clear Overlay Image, Zoom, Density, FOV Indicator, Show Labels, Set Label Font, Flip

All Sky Tab

The All Sky tab shows the current sky. By right-clicking, you can zoom into any area. When you do that you will be redirected to the zoom tab. The option button (arrow) on the right provides access to many setting options.

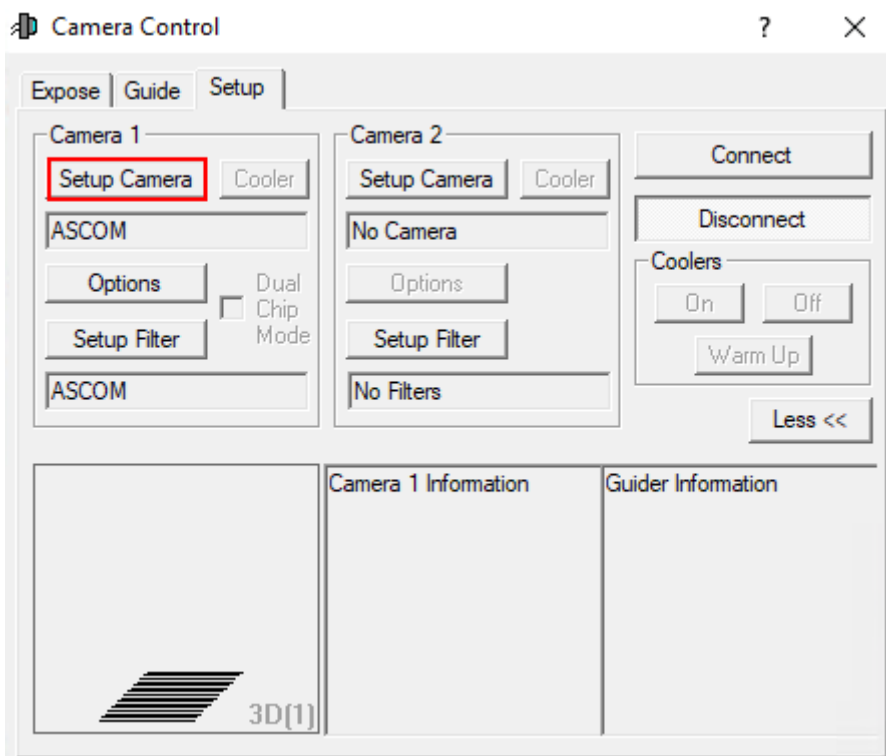


Camera Panel

The **Camera Control** window can be used to control the cameras and take the images.

Setup tab

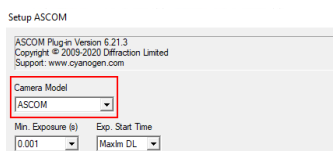
As the name suggests, this window is used to connect the cameras to Maxim DL. This is done slightly differently for each camera manufacturer. Here, we will discuss the procedure for QHYCCD cameras and for SBIG cameras, since these are the cameras we primarily use. For each camera model, the appropriate driver must be selected. This must be done for the actual camera as well as for the filter wheel. If a guiding camera is to be used, it must also be connected here. Normally the guiding camera is connected as **Camera 2**, while the main camera is connected as **Camera 1**.



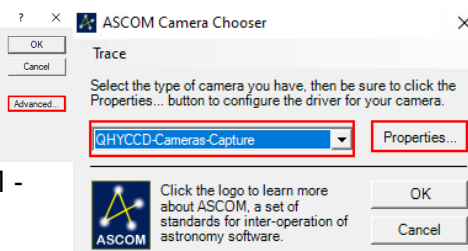
The first thing to do, regardless of the manufacturer, is to click on **Setup Camera**.

Connecting QHYCCD cameras:

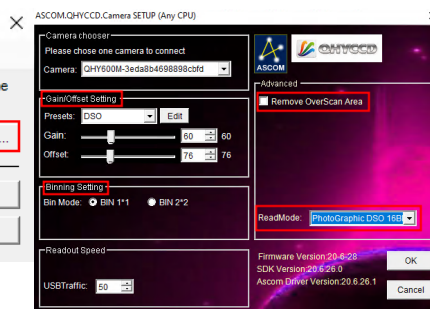
In the window that opens, select ASCOM from the **Camera Model** drop-down menu and then click **Advanced...** (step 1). After that another window will open. In this window, select QHYCCD-Cameras-Capture from the dropdown menu and click on **Properties...** (step 2). After that, the settings menu for the **ASCOM** driver for the QHYCCD cameras opens. **ASCOM** is the basic interface through which many of the observatory's operations are controlled.



Connecting the QHY600M - Step 1



Connecting the QHY600M - Step 2

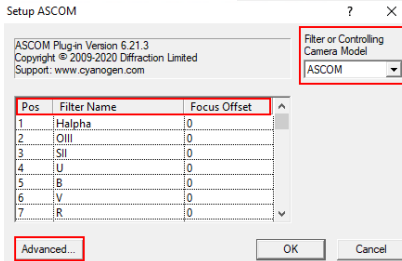
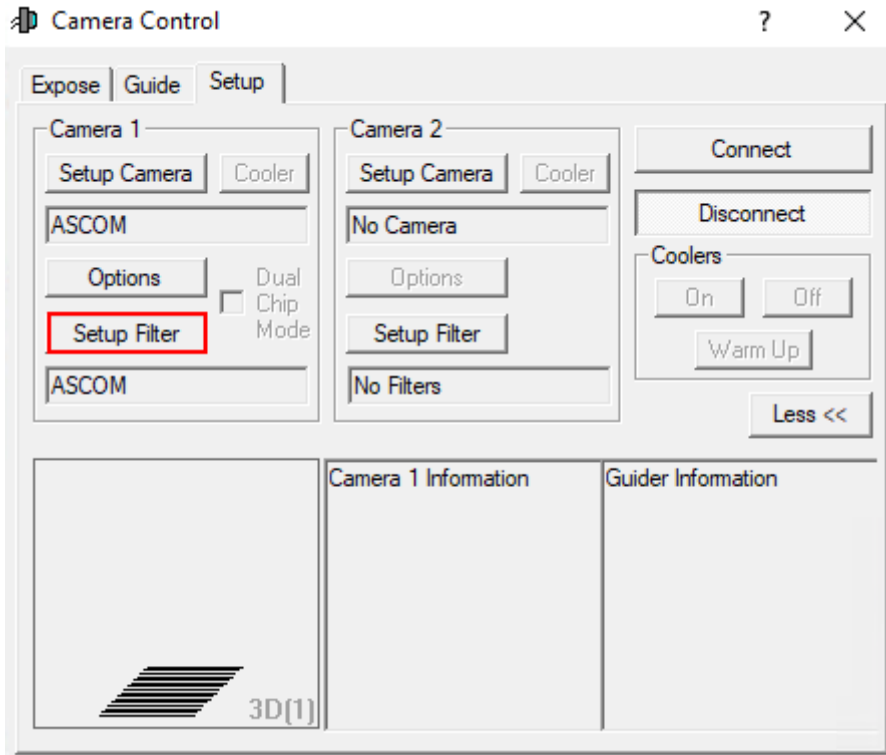


Connecting the QHY600M - Step 3

In the last step (3) all important settings for the **ASCOM** driver can now be configured. These include the readout mode, which can be selected from the **ReadMode** drop-down menu. The following can be selected: PhotoGraphic DSO 16bit, High Gain Mode 16bit, Extend Fullwell Mode and Extend Fullwell 2CMS. Under **Gain/Offset Setting** the **Gain** and **Offset** can then be set. These settings can be saved as **Preset**. In addition, the **Remove Overscan Area** option should also be activated for scientific images. Afterwards, all three windows can be closed by clicking **OK**.

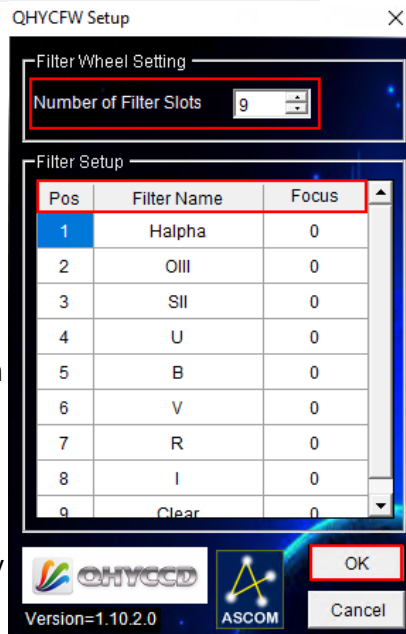
Connecting QHYCCD filter wheels:

To connect a filter wheel, first click on **Setup Filter**.

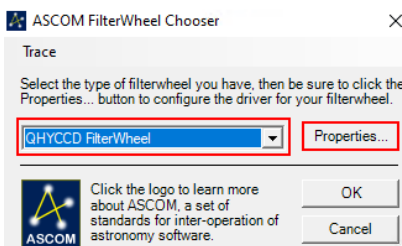


Connecting the CFW-3 filter wheel - Step 1

In the first step you have to select ASCOM from the drop-down menu **Filter or Controlling Camera Model**. Then click on **Advanced...**. In the window that opens, select QHYCCD FilterWheel from the drop-down menu and then click **Properties...** (step 2). Thereupon another window opens, which shows the possible driver settings. The settings in this window usually have to be made only once. You have to select the **Number of Filter Slots** (in our case 9) and the respective filter names as well as any corrections for the focus (step 3). Afterwards all three windows have to be confirmed and closed by clicking **OK**.



Connecting the CFW-3 filter wheel - Step 3



Connecting the CFW-3 filter wheel - Step 2

Connecting SBIG cameras:

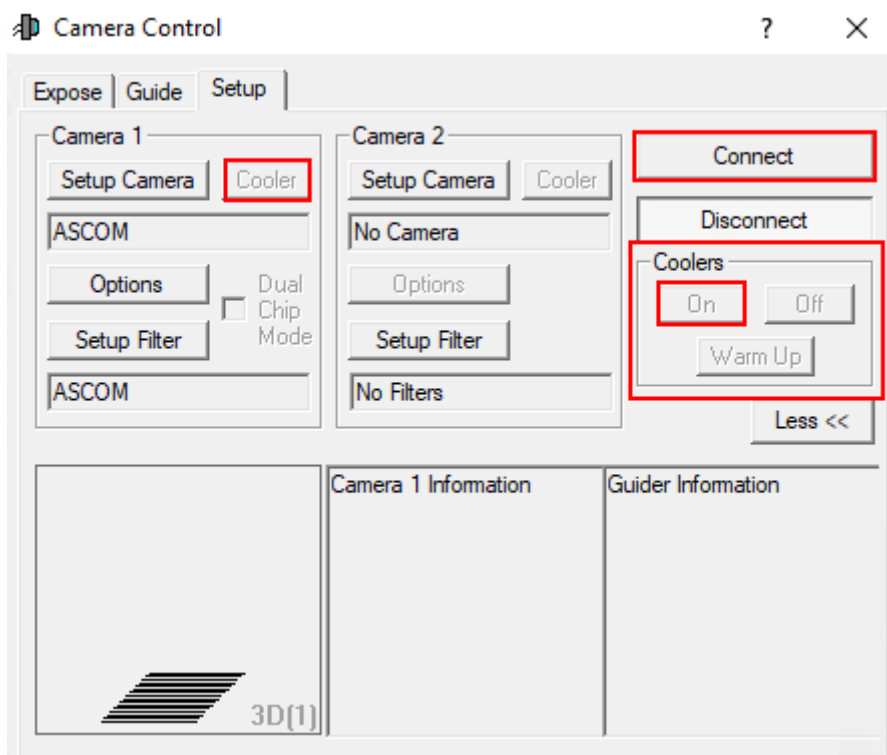
Still to come...

Connecting SBIG filter wheels:

Still to come...

Final Step:

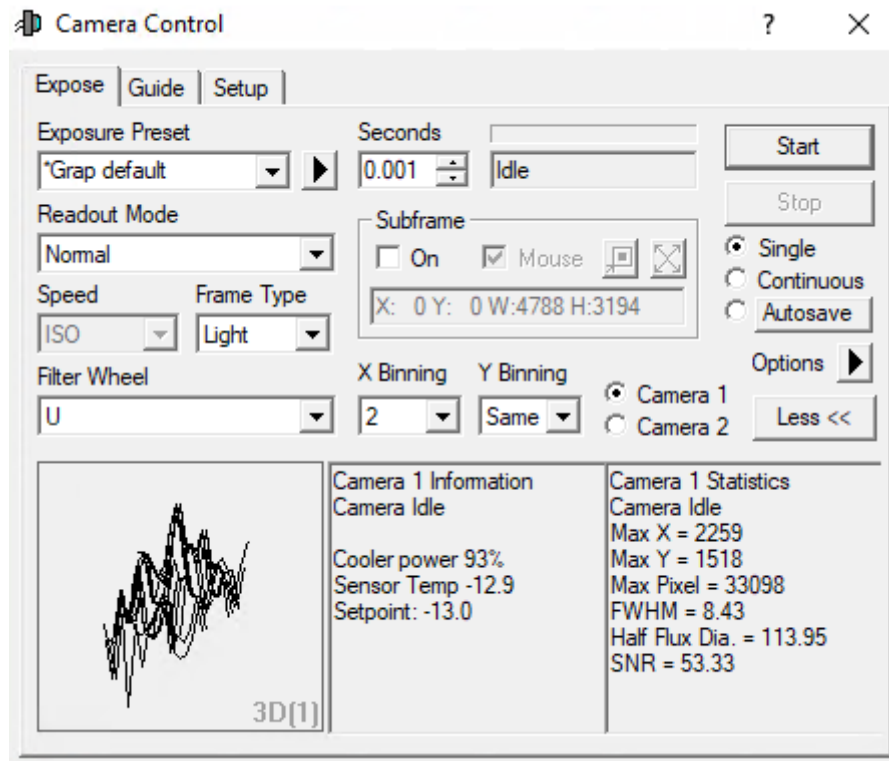
Now **Connect** has to be clicked. Then the cooling can be activated under **Coolers** and the target temperature can be set under **Cooler**.



Der Expose-Tab

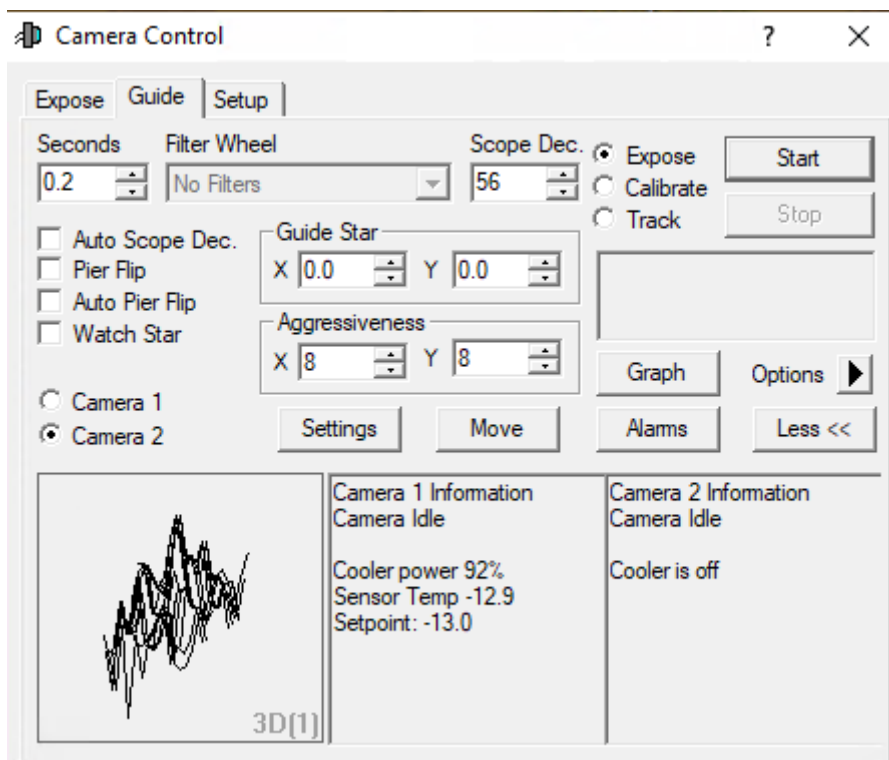
In diesem Tab findet man, auf kleinem Raum, die wichtigsten Einstellung rund um die Aufnahme der Bilder. Eigene und bereits vordefinierte Einstellungsets können unter **Exposure Preset** gefunden bzw. neu angelegt werden. Die wichtigste Einstellung ist die Belichtungszeit (**Seconds**). Rechts daneben findet sich die Statusinformationszeile, welche anzeigt was die Kamera aktuell tut. Im unteren Beispiel ist die Kamera inaktiv (Idle).

Die Filter sind unter **Filter Wheel** zu finden. Die Binning-Optionen sind wiederum über die beiden Dropdown-Menüs **X Binning** und **Y Binning** zugänglich. Des Weiteren kann der Auslesemodus (**Readout Mode**) ausgewählt werden, was z. B. für die QHY600M wichtig ist. Über die Optionen **Single**, **Continuous** und **Autosave** sind als grundlegenden Modi auswählbar. Beim ersten wird nur eine einzelne Aufnahme angefertigt, wohingegen beim letzten ganze **Aufnahmeserien** erstellt werden können. Beim Modus **Continuous** werden hintereinander Aufnahmen mit der eingestellten Belichtungszeit erstellt und dargestellt. Dieser Modus eignet sich besonders gut zum **Fokussieren**. In dem entsprechenden Artikel gehen wir auch genauer auf die unteren 3 Paneele ein. Weitere Optionen sind noch über **Options** (Pfeilbutton) zugänglich.



Der Guide-Tab

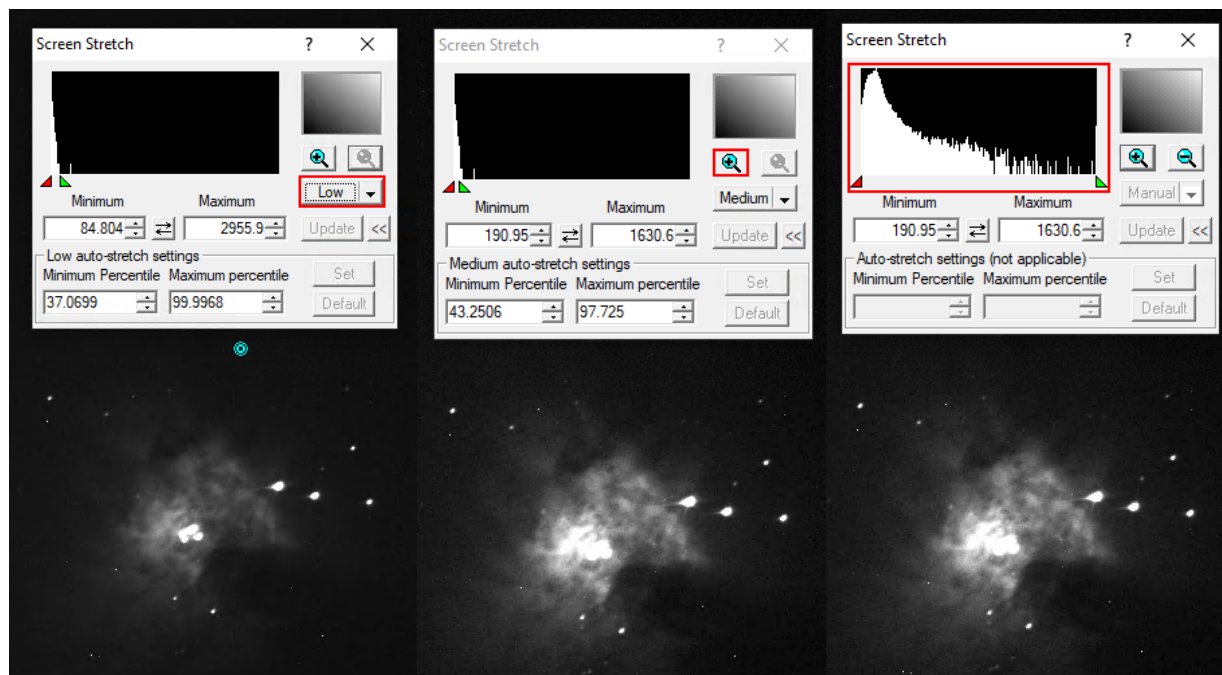
Der Guide-Tab wiederum hält die wichtigsten Einstellungen für das Guiding des Teleskops bereit. Auf die Details gehen wir in einer Kurzanleitung zum [Guiding](#) ein.



Screen Stretch Panel

Über das **Screen Stretch Panel** kann die Skalierung der Aufnahmen beeinflusst werden. Im ersten

Beispiel unten, welches M42 zeigt, ist die Skalierung auf Low gestellt. Erhöht man die Skalierung auf Medium werden deutlich mehr Details von M42 sichtbar. Viele weitere hilfreiche vordefinierte Skalierungen können aus dem entsprechenden Dropdown-Menü ausgewählt werden.



Screen Stretch - Low-Skalierung

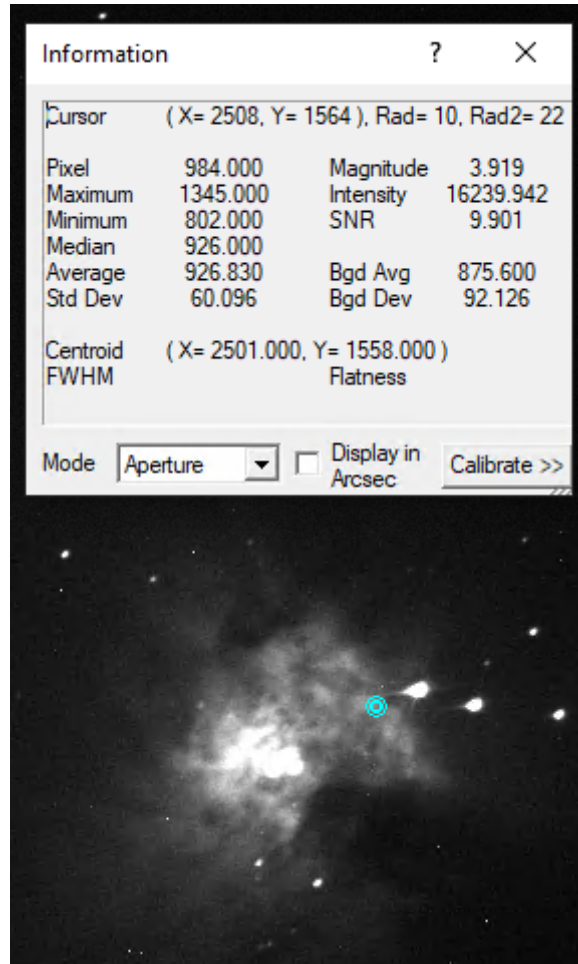
Screen Stretch - Medium-Skalierung

Screen Stretch - Histogram-Zoom

Klickt man auf das Plus-Symbol im oberen rechten Bereich, wird in das oben links dargestellte Histogramm gezoomt. Dies ermöglicht es die Skalierung über das rote und das grüne Dreieck feiner einzustellen, wobei das rote Dreieck den Schwarzwert und das grüne Dreieck des Weißwert definiert. Entsprechendes kann auch über die Felder **Minimum** und **Maximum** erfolgen.

Information Panel

Das **Information Panel** ist insbesondere hilfreich um zu prüfen, ob das Bild überbelichtet ist und herauszufinden an welchen Sternen dies unter Umständen liegt. Hier sind für uns insbesondere die Werte **Pixel** und **Maximum** interessant. Im Standardmodus Aperture werden die Informationen aus der auf dem Bild dargestellten türkisen Apertur ausgelesen, welche man z.B. aber auch auf einen hellen Stern schieben kann. Tut man dies sind z.B. noch das Signal-Rausch-Verhältnis (**SNR**) und die Full-Width-Half-Maximum (**FWHM**) von Interesse. Werte wie die **Magnitude** sind auf unseren zumeist unkalibrierten Bildern nicht von Relevanz.



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