IKARUS TECHNOLOGIES
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StellarMate X

User Manual

Version 2.3
Released 2023.03.15

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Warnings

WARNING: NEVER LOOK AT THE SUN WITH YOUR TELESCOPE OR CAMERA WITHOUT APPROPRIATE FILTERS IN PLACE. PERMANENT AND IRREVERSIBLE DAMAGE TO YOUR EYES AND YOUR EQUIPMENT WILL OCCUR.

Package Contents

Thank you for purchasing StellarMate! Please follow this guide before you starting using your StellarMate Gadget.

After unboxing your package, you should have the following items:

1. StellarMate X Unit.
2. USB-C Power Supply with international socket adapter
3. Quick Start Guide.
4. VESA-Mount
5. Optional plug depending on the region.

Connect the USB-C power supply cable to StellarMate X and then turn power on. There is no need to push the power button as the unit automatically boots up when power is connected. A soft blue light indicates the unit is powered up. Startup time should take less than 30 seconds after which the unit is ready to be used.

Introduction

Description:
StellarMate X is a compact and powerful Astrophotography Controller that supports numerous Mounts, Cameras, and other astronomical equipment. Powered by Open Source technologies and designed and built by Astrophotographer for Astrophotographers.

It provides unparalleled freedom in selecting your favorite platform to remotely control your equipment. You can use Ekos astrophotography tool on Windows, MacOS, or Linux. Furthermore, use StellarMate App on iOS and Android to automate your complete astrophotography workflow. StellarMate X is simple:

1. Connect your equipment (Mount, Camera, DSLR, Focuser, Filter Wheel..etc) to StellarMate X via USB or WiFi.stellarmate x tablet
2. Connect to StellarMate X from either your Mobile, Tablet, or Laptop/Desktop Computer.
3. Start controlling your observatory and image from any major platform.

StellarMate X is quiet with no moving parts. It is four times faster than its predecessor StellarMate Plus and comes with double the storage and memory capacity enabling fast and seamless control for the most demanding and high-resolution astro cameras. It features a special VESA mount to secure it to standard dovetails and clamps.

Quick Startup

The following is the quick startup guide to getting StellarMate X up and running in a few minutes using your phone/tablet:

1. Download Stellarmate App from the Android/iOS store.
2. Launch the App and Register an account.
3. Connect the power adapter to StellarMate and turn power on.

4. Open network settings in your phone/tablet and connect to the StellarMate WiFi hotspot.
5. Open StellarMate App. Go to Setup tab. Click Rescan.
6. After StellarMate is detected, click on it.
7. Start the default Simulators equipment profile or create a new equipment profile.
8. Go to Ekos tab and start using your equipment.
9. Check StellarMate network settings and status from the Device tab.

Specifications

StellarMate X leverages a passive cooling technology, and has a good thermal dissipation to prevent overheating. No fan no noise, reaching a totally silent, dust free performance:

- CPU: Intel Gemini Lake Celeron J4125 Quad-Core
- GPU: Intel HD Graphics 600
- Operating System: StellarMate OS
- Memory: 4GB/8GB LPDDR4
- Storage: 64GB/128GB eMMC Built-in
- Expandability: Micro USB up to 2TB, M.2 SSD/NVMe 2280 up tp 4TB
- 4x USB 3.0 Ports
- 2x HDMI 2.0 port, support 4K@60Hz
- 1x 3.5mm Audio jack
- 1x Gigabit LAN Port
- 1x Gigabit LAN Port
- 1x Kensington Lock Slot
- 1x USB Type-C (Only for power supply)

Passwords

- The default StellarMate OS password is **`smate`**
- The default StellarMate WiFi HotSpot password is **`stellar@mate`**

Learning StellarMate

For new users, using StellarMate effectively can take a bit of a learning curve (like everything else) especially given the breadth of the features if provides. Here are some useful resources to get you started:

- First Time Setup tutorial.
- StellarMate Video tutorials.
- Ekos Video Tutorials.

StellarMate App

You can connect to StellarMate X Controller in several ways, including:

1. StellarMate Mobile App for Tablets.
2. PC/Mac using KStars.
3. Any Web browser or VNC client.

StellarMate App is the Official App for StellarMate gadget. It is available for both Android and iOS smartphones and tablets. It is primary designed for tablets in portrait mode. While it can be used for phones, for the best experience, use it with a tablet/iPad. Download and install the App on your device before you continue.

StellarMate on the Google Play

StellarMate on the App Store

WARNING

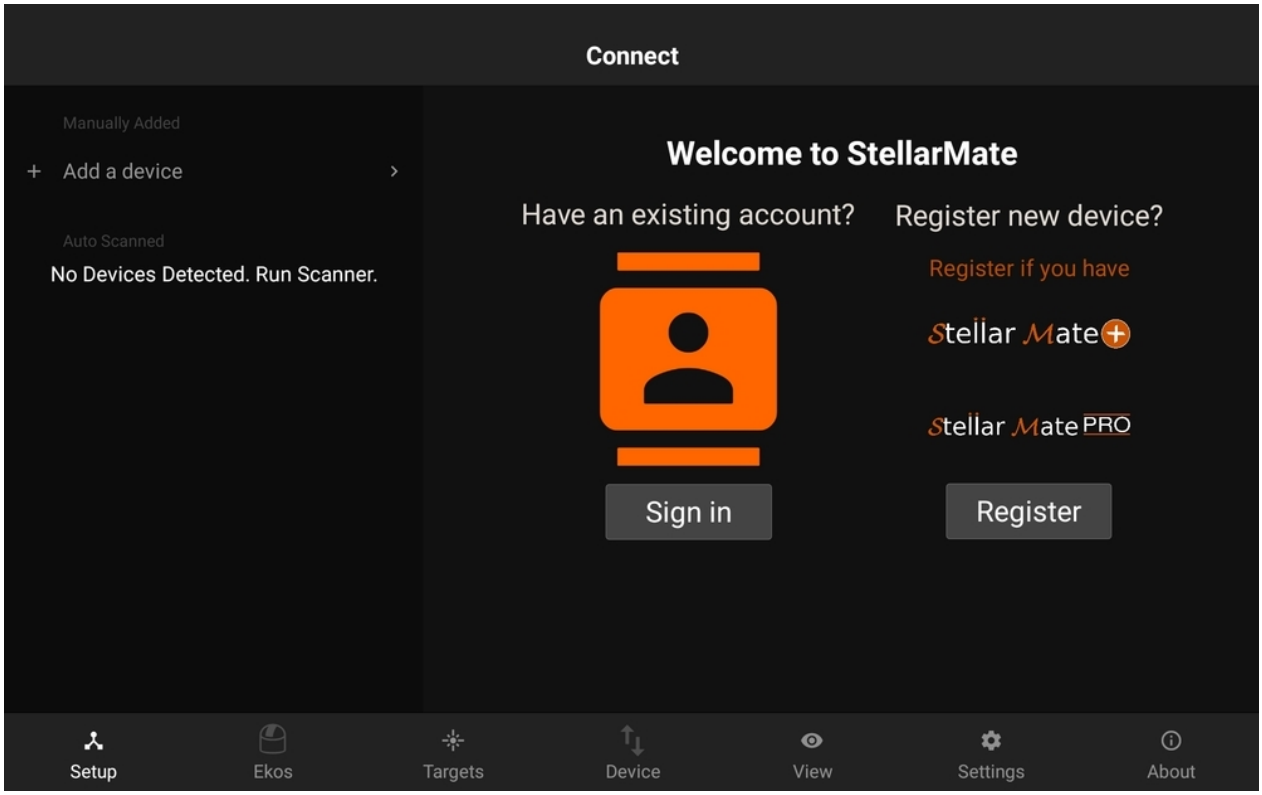
The App is required to connect to the unit and configure it for first-time use, so do this step now and do not skip ahead!

Registration

When using StellarMate App for the first time, you need to register your device, or sign in using your existing stellarmate.com credentials:

1. StellarMate X: If you purchased an SM X or SM Pro device, you need to register the device first before proceeding. Click on the Register button and then follow the on screen guide.

2. StellarMate OS: If you purchased StellarMate OS, or already have registered the device before, you can simply sign in using your stellarmate.com username and password. Beware that you must be connected to the internet for the initial sign in to proceed. After sign in is successful, no internet connection is required and you can switch network to StellarMate hotspot if desired.



IMPORTANT

The StellarMate Mobile App requires a QR Code (on the back of StellarMate Controller) in order to operate the StellarMate Controller. NO registration is required to use the StellarMate Controller if you intend to use it directly via Web or via Ekos client on Mac/PC/Linux. This step is only required if you want to use the StellarMate Mobile App. You can continue to use StellarMate as is, including accessing the Web Manager and VNC:
Web Manager URL: http://stellarmate.local:8624
Web VNC URL: http://stellarmate.local:6080

QR Code

If you received the StellarMate Controller, you will find the Device QR Code on the back of the unit.

If you purchased StellarMate OS, the Device Serial Number is automatically generated for you.

Steps

Register your controller after downloading the SM App. Make sure your tablet is connected to the internet.

1. Launch StellarMate App on iOS or Android.
2. Tap on the Register button.
3. Enter registration information to sign up in StellarMate website and then click Next.
4. Scan the QR Code found at the back of the unit.

After registration is successful, you will be logged in automatically. Check your email for your license and login information.

Setup

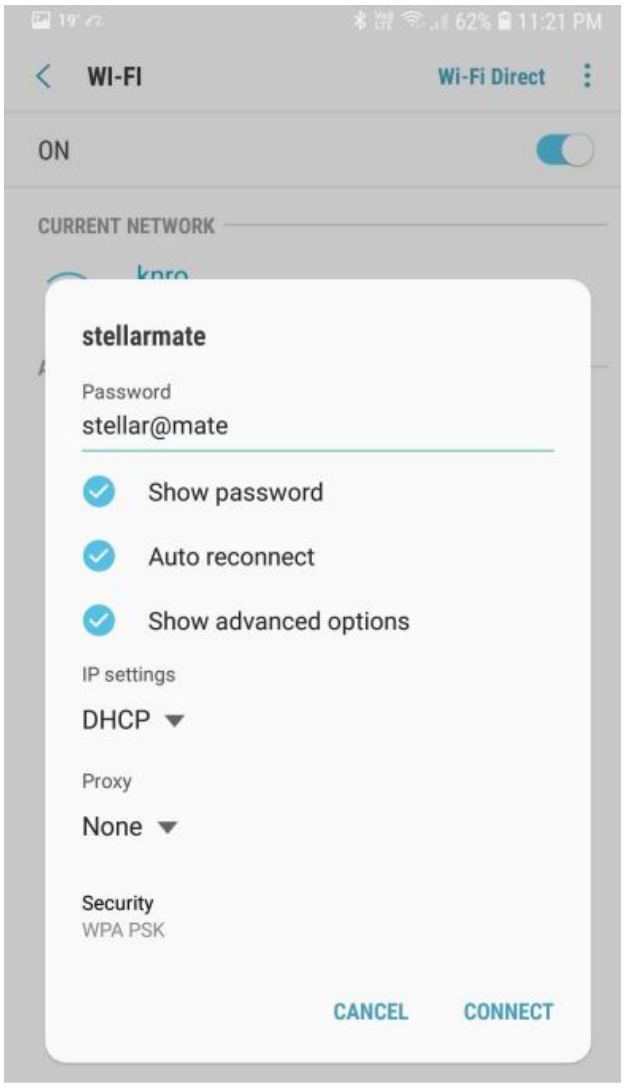
Go to your mobile OS WiFi settings and connect to the StellarMate hotspot.

Hotspot: **`stellarmate`**

Password: **`stellar@mate`**

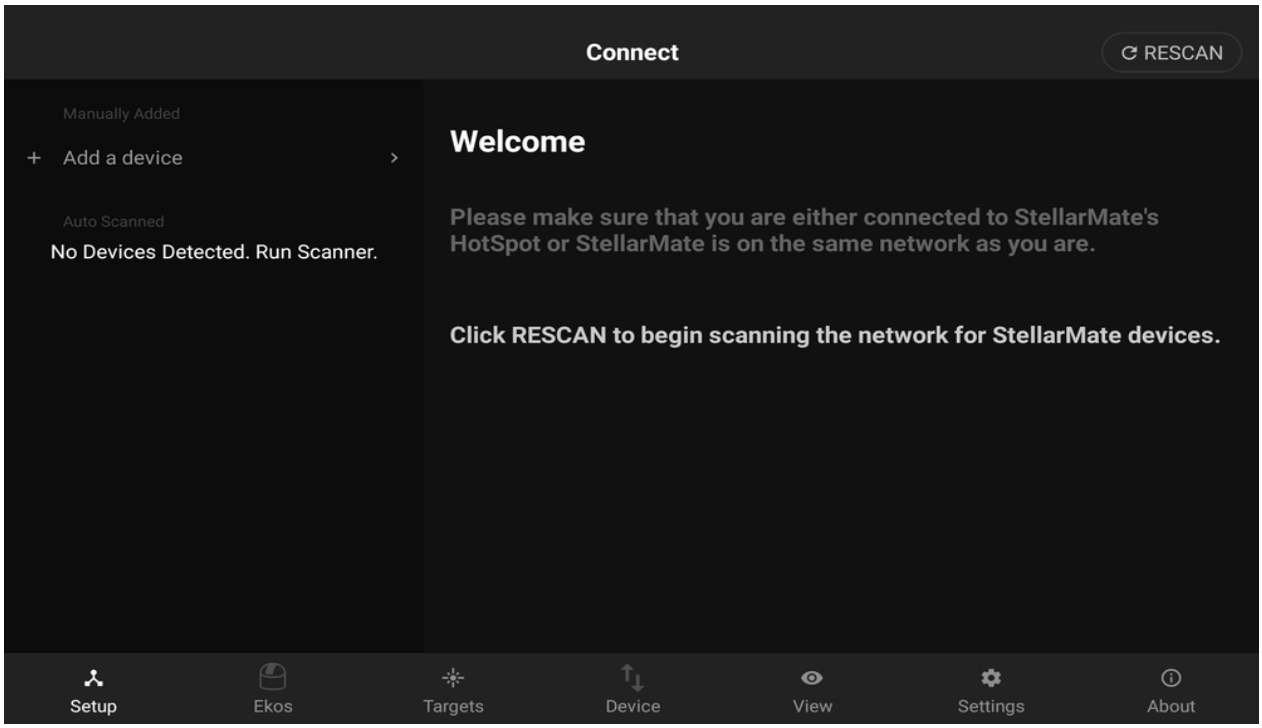
IMPORTANT

Before using the StellarMate App to configure your unit for the first time, please use the networking settings in your iOS/Android phone/tablet to connect to the HotSpot first. Once connected, proceed to run the StellarMate App.

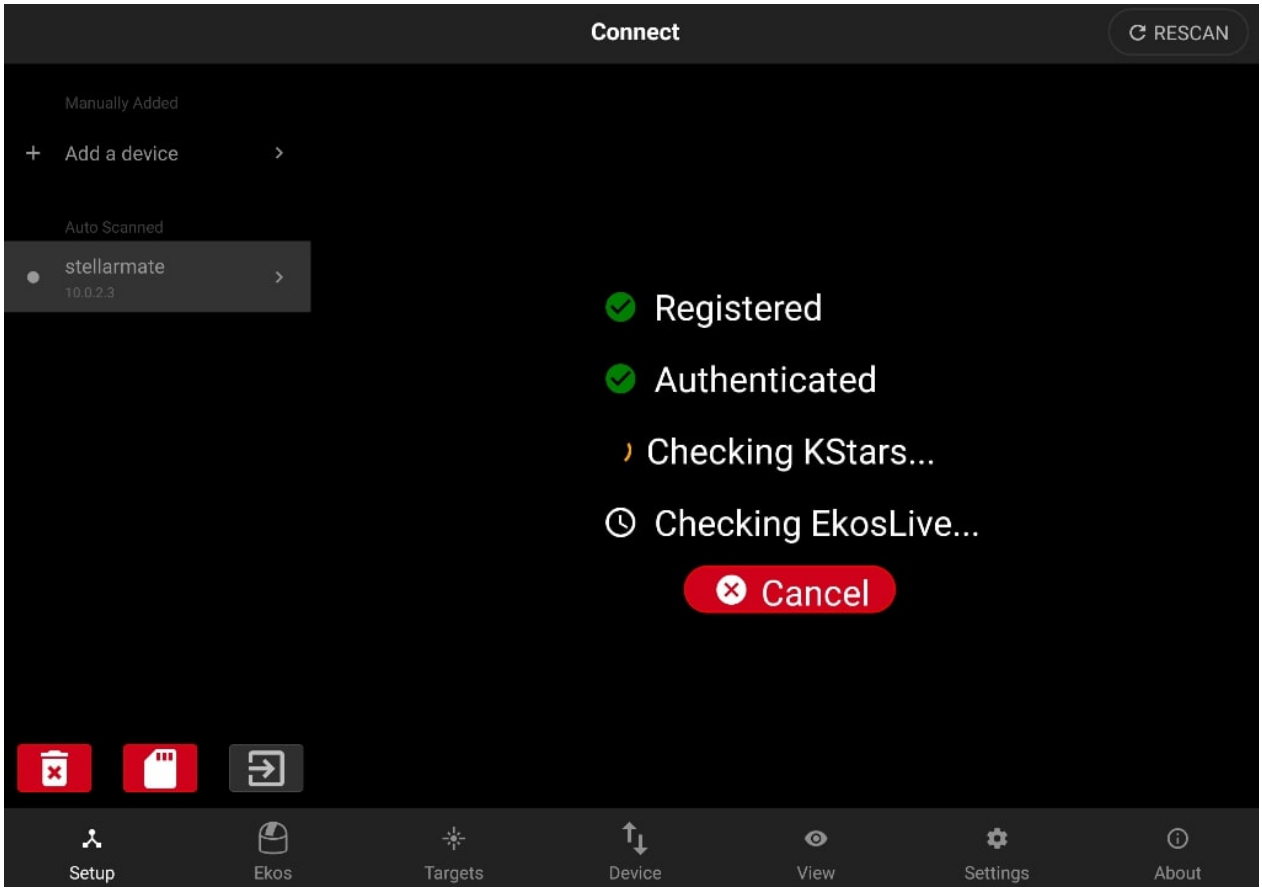


After connecting to StellarMate, go back to the App:

- Tap on RESCAN to start the scanning process. Discovered devices would be listed on the left side pane.



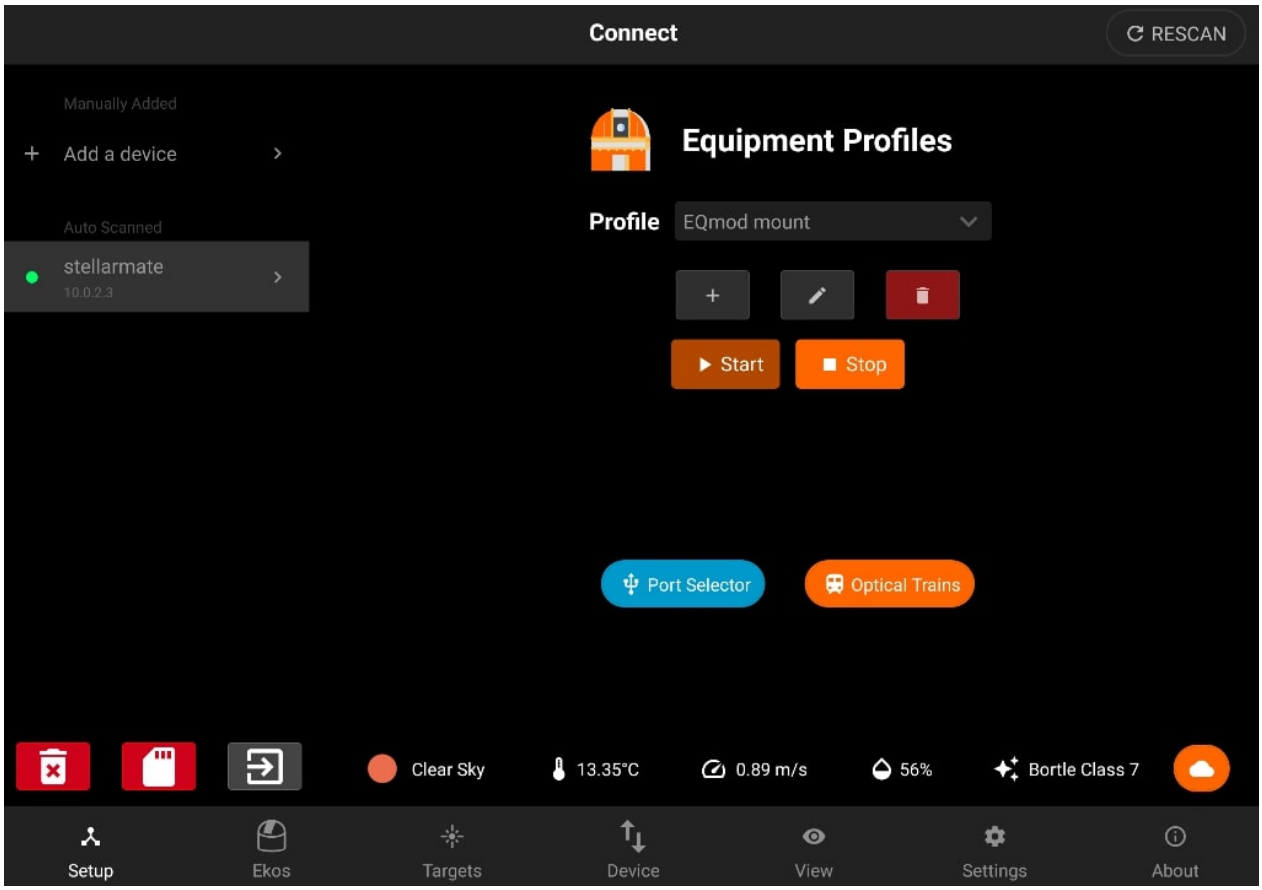
- After StellarMate is detected, tap on it to establish connection. Wait for a few seconds and the LED would turn green indicating a stable successful connection.



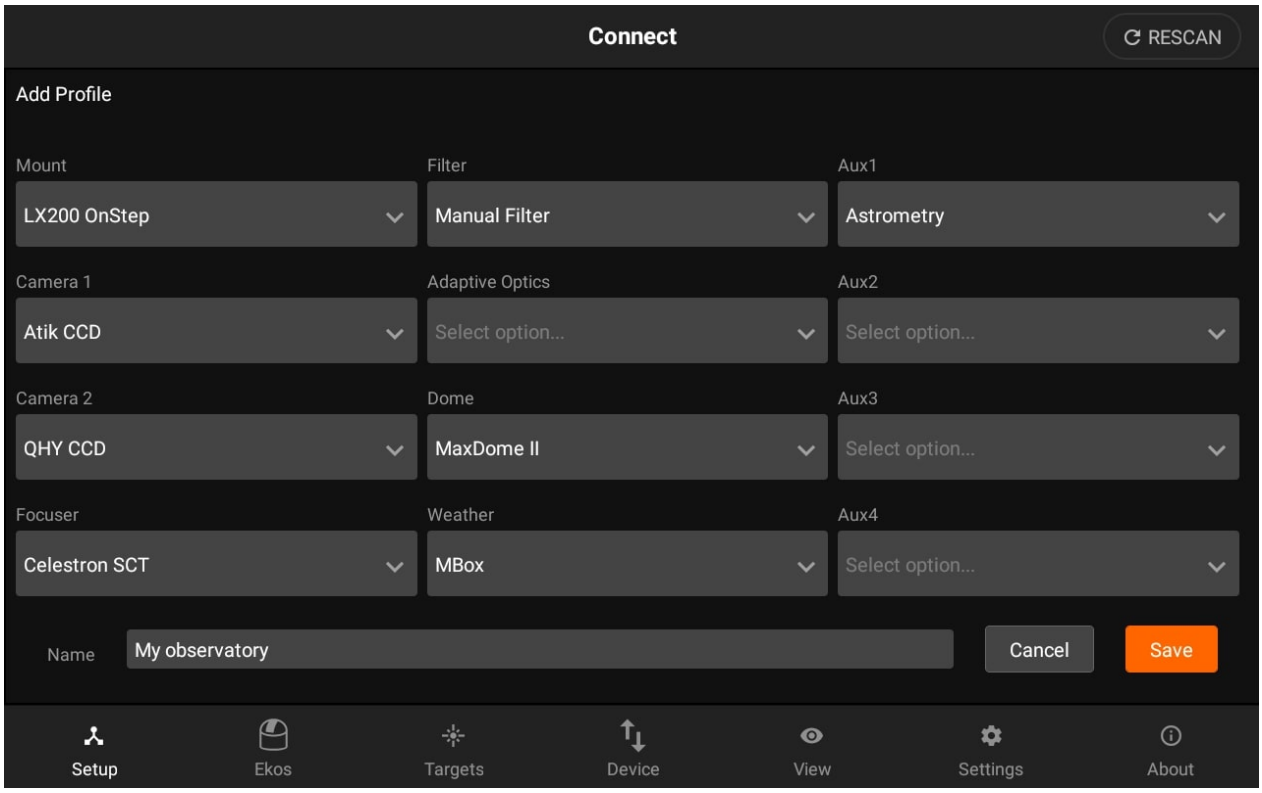
The right side pane should now display the Equipment Profile page. Now you are ready to connect to your astronomical equipment.

Connecting your devices

Most astronomical equipment such as telescopes, cameras, filter wheels, and focusers connect via a USB cable. To add your devices, you need to create a new Equipment Profile. Tap on the Add (+) icon next to the profiles to start the equipment profile wizard.



You can select the drivers for your devices manually, or you can let StellarMate detect them automatically by tapping on the Auto Detect button on the top-right corner. You can then insert each device and wait for a confirmation after it gets detected. Sometimes you need to confirm the type of device before you can continue. This is especially important when using serial To USB adapters that are used for mounts and focusers.



After all drivers are selected, enter the desired profile name and tap Save.

Ports

StellarMate uses a number of ports for different services:

5624: SSH Port

7624: INDI Server Port

8624: INDI Web Manager Port

6080: Web VNC Port

5900: VNC Server Port

3000: StellarMate Dashboard

To make StellarMate accessible from internet, some of the ports could be open in the firewall. However, there is no authentication/authorization portal provided by StellarMate, so only open portals at your own risk or by providing an additional layer of security. The minimum required ports that have to be opened to allow using INDI remotely over the internet are ports 7624 and 8624.

Port Selector

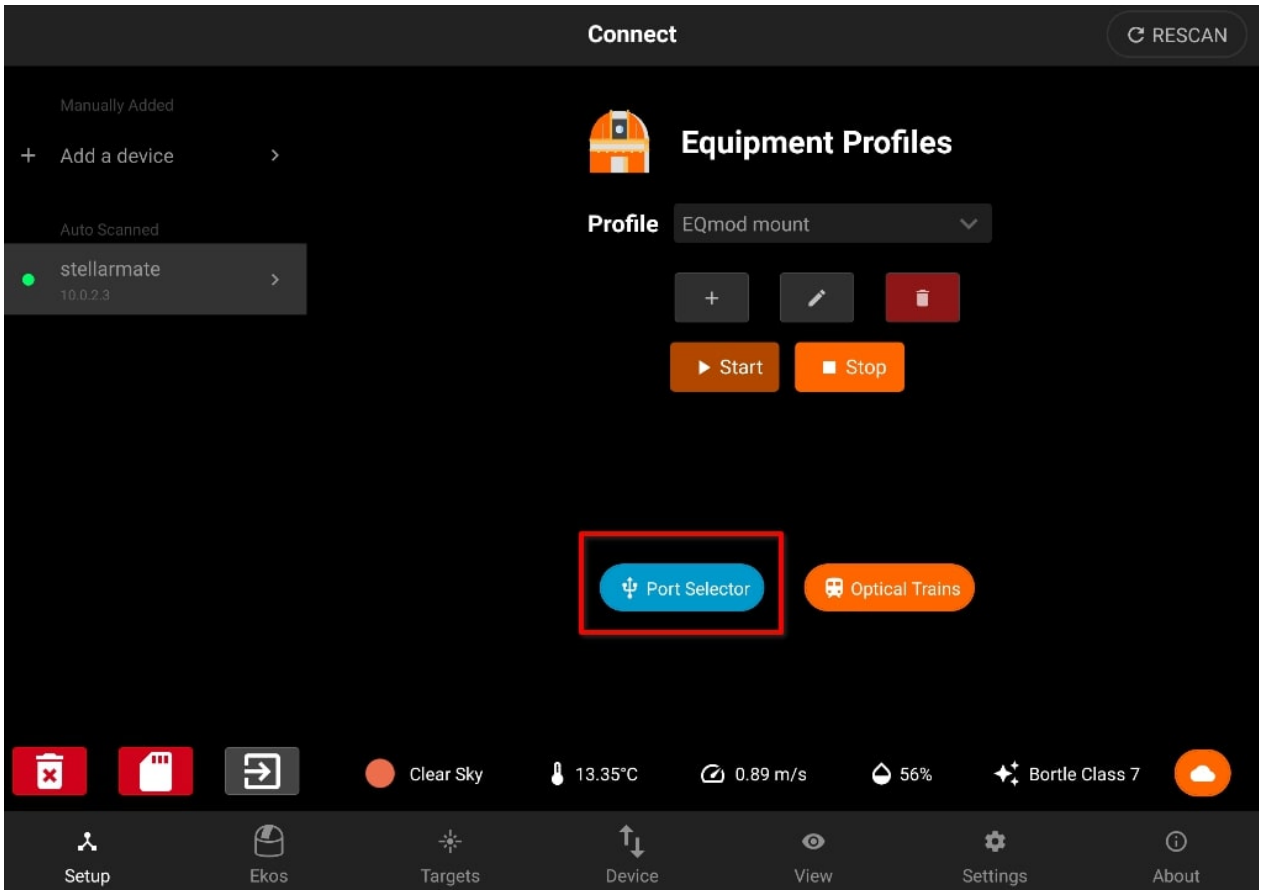
Your equipment profile may contain one or more serial port and/or network-enabled

devices. Before establishing connection to such devices for the first time, StellarMate Port Selector tool helps you to assign the appropiate ports and addresses for each. Serial devices may include mounts, focuser, and filter wheels using USB-to-Serial adapters. You need to know the baud rate for the device as by default it is set to 9600.

NOTE: PORT SELECTOR IS NOT APPLICABLE TO PURE USB DEVICES SUCH AS CAMERAS.

For networked devices over Ethernet or WiFi, you need to supply the device hostname or IP address and the device port. This information is usually supplied by your device manufacturer. It is important to ensure that all networked devices are within the same network as StellarMate. For example, if StellarMate is operating in hotspot mode (IP 10.250.250.1) then your network-enabled device must be connected to the same hotspot network and have an IP address in this range (e.g. 10.250.250.5). On the otherhand, when StellarMate is operating in infrastrcture mode (i.e. it is connected to an external WiFi network like Home WiFi), then the other network-enabled devices must be connected to the same network in order for all devices to talk to each other.

The Port Selector dialog can be accessed as any time by click on the Port Selector button. When creating an equipment profile for the first time, it is automatically opened so you can configure the ports before establishing connection to your devices either individually or via clicking Connect All buton.



You can specify the ports for serial and network devices using the Port Selector.

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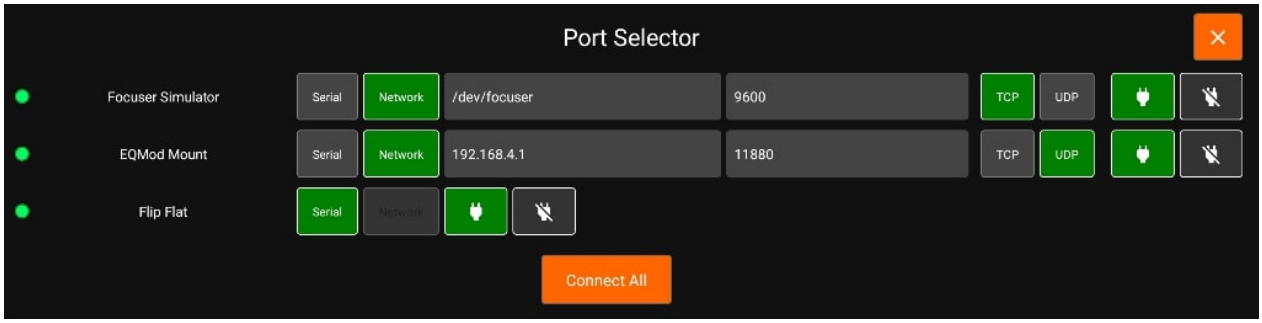


Connection Status

- Green: device is connected.
- Yellow: connecting to device.
- Red: connecting to device failed.

Connection Mode

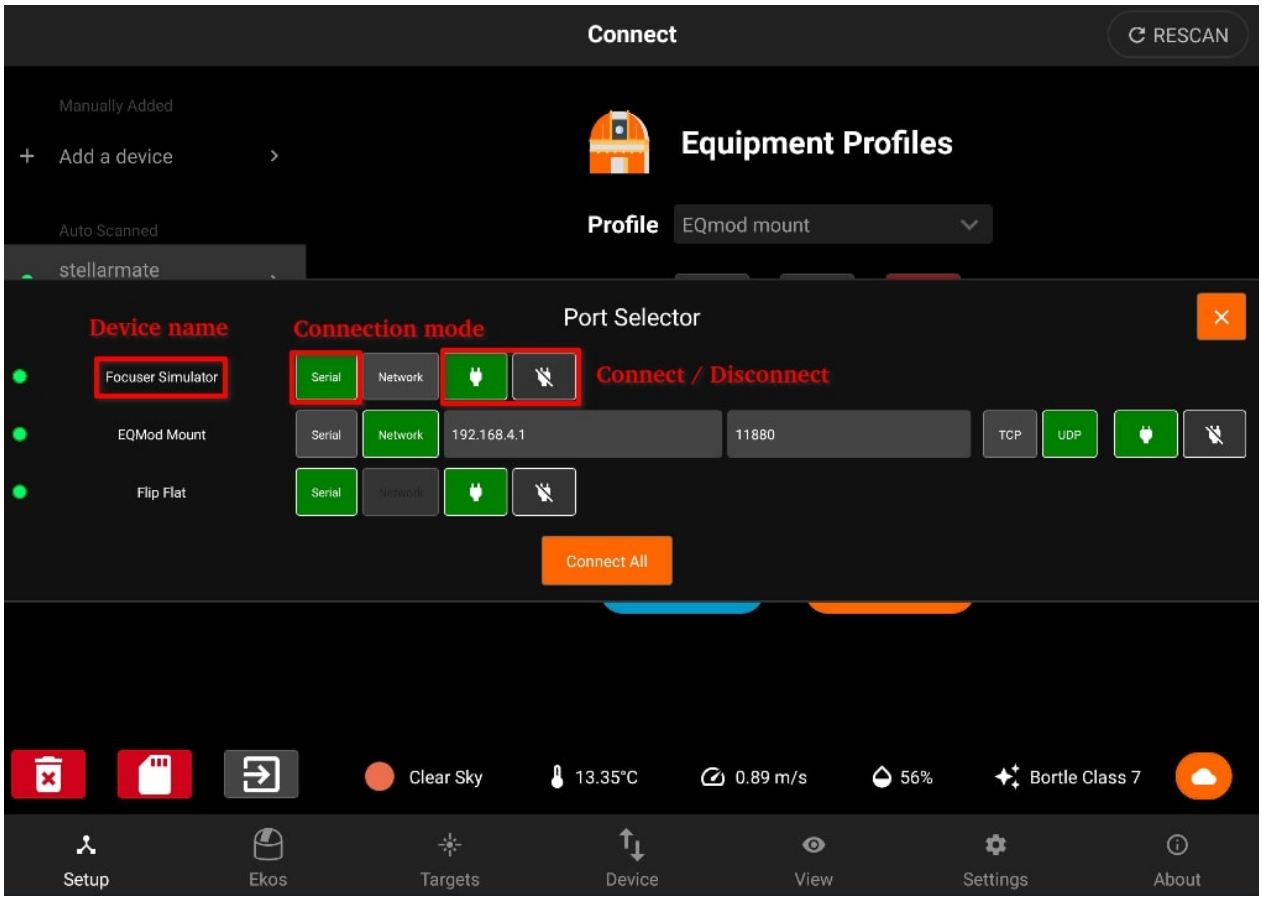
- Serial: For mounts, filter wheels, and focusers that are connected via a Serial-to-USB

adapter. To connect to serial devices, you need to select the port and baud rate. StellarMate provides the detected system ports in a dropdown menu to select from, but you can also enter your own port manually.

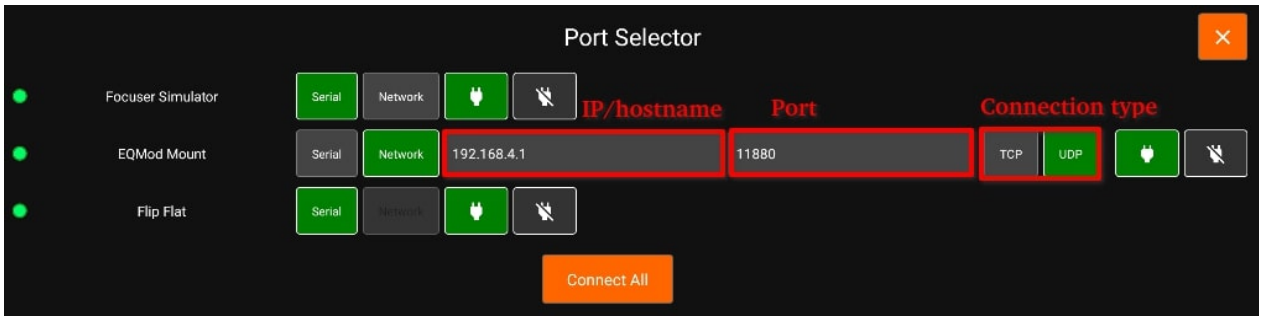
- Network: For any network-enabled device (e.g. Mounts over WiFi like SkyWatcher AZ-Gti).To connect to networked devices, ensure they are connected to the same network where StellarMate is connected to. You need to enter the hostname or preferably the IP address of the device in addition to the connection port and connection type (TCP or UDP).

Baud Rate: Set the devices baud rate

Connect All: Connects to all the devices and closes the Port Selector

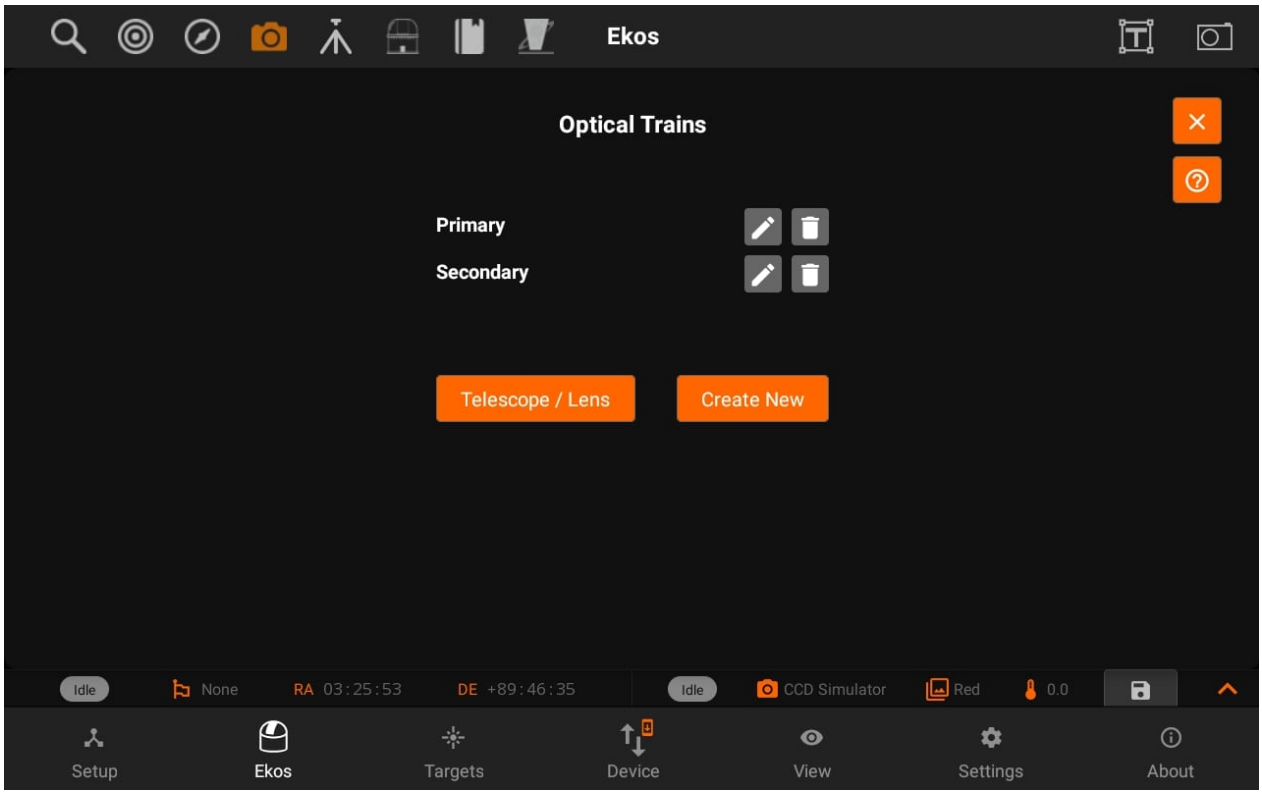


When connecting a serial device, you can specify the port by selecting from the dropdown or typing it in the text field



For network devices, you have to specify the hostname or IP of the device and the port. Also you can choose the network type (TCP/UDP).

Optical Trains



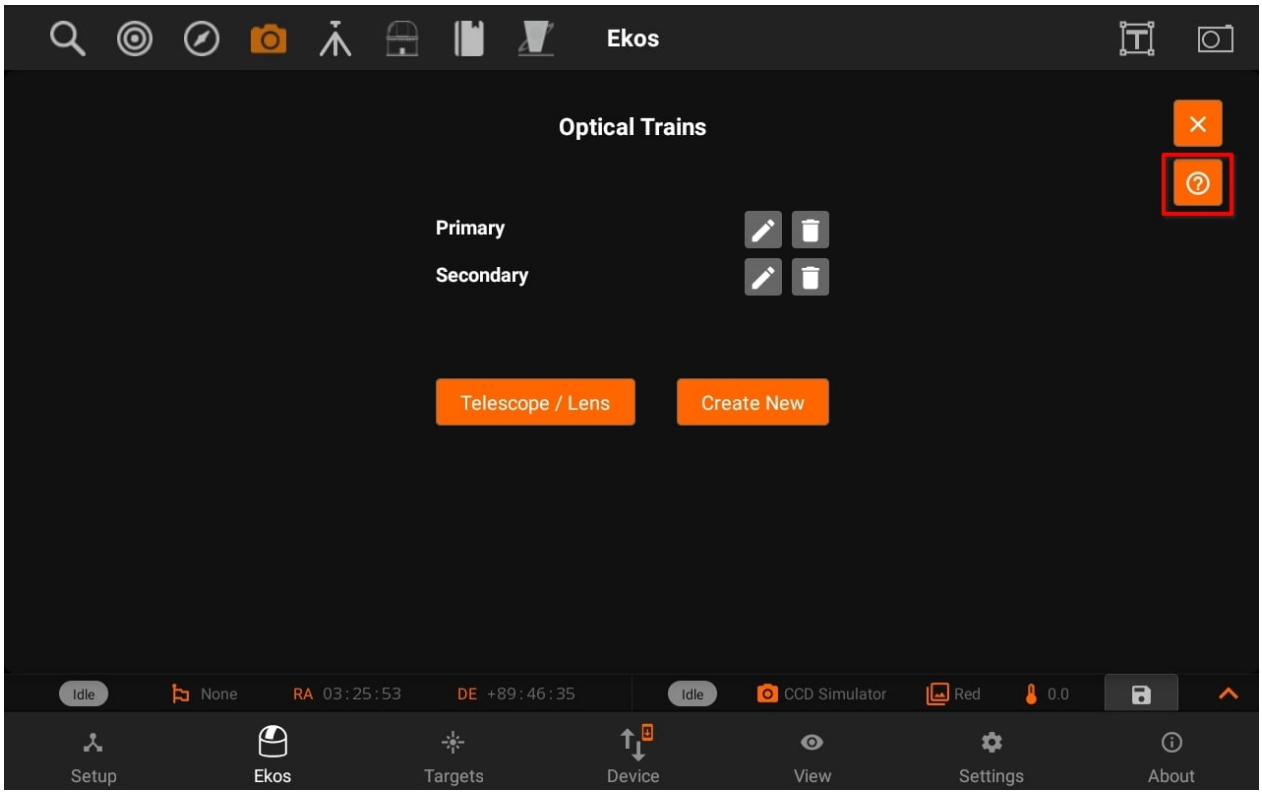
Optical Trains organize your equipment into separate unique optical paths. Each camera must have its own optical train. The following elements are specified in each train:

1. Mount: Select which mount to use. Typically, all optical trains in the same profile use the same mount.
2. Dust Cap: Select a mechanized dust cap if any (e.g. FlipFlat).
3. LightBox: Select a flat field lightbox if any (e.g. FlipFlat).
4. Scope or DSLR Lens: Select the scope or lens used in the optical path. To add,

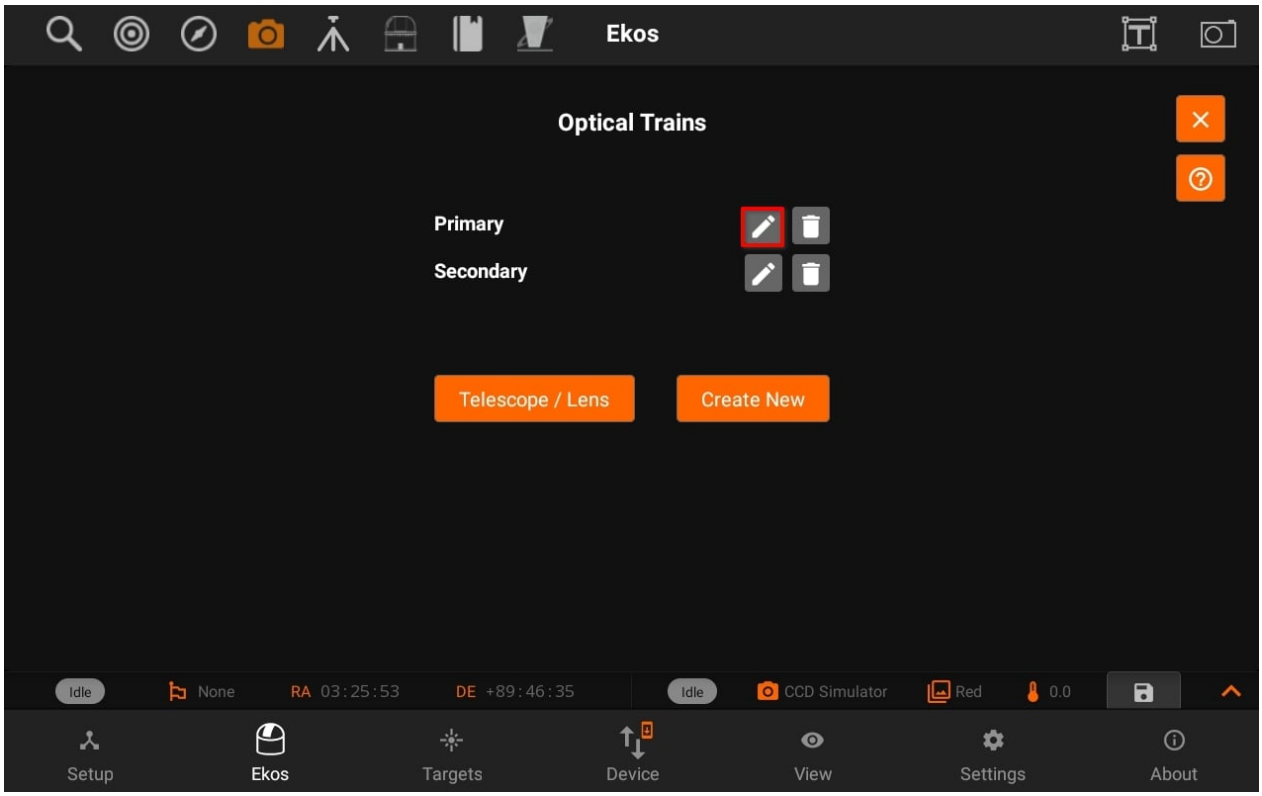
edit, or delete optical elements, tap the Telescope & Lens button.

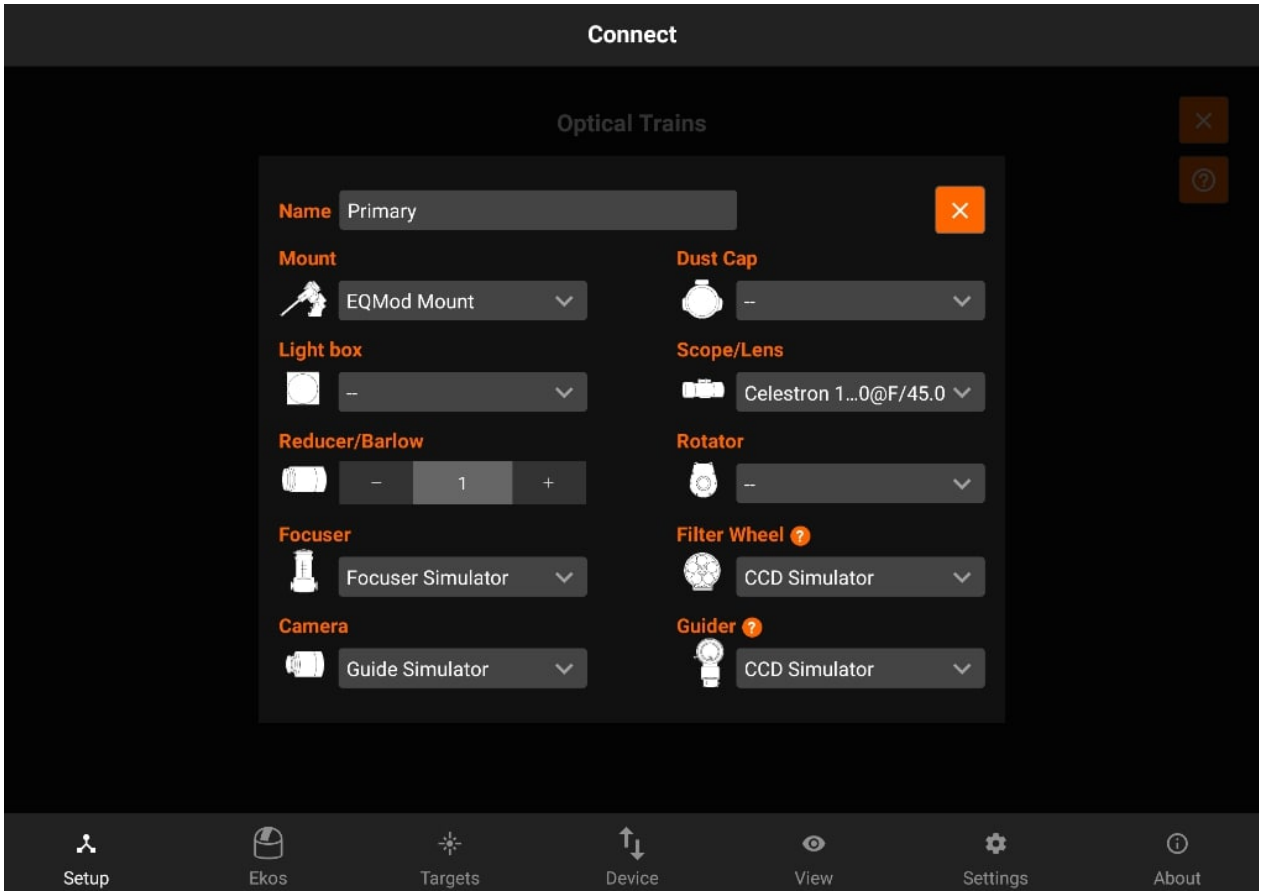
5. Reducer / Barlow: Select if any reducer or barlow is used in the train.
    a. Reducer: By default it is specified at 1.0 which means that has no effect. Range is 0.1x to 0.9x.
    b. Barlow: If the value specified is over 1.0x, then it is considered a barlow element (focal length is increased by this factor).
6. Rotator: Select a mechanized rotator if any.
7. Focuser: Select a mechanized focuser if any.
8. Filter Wheel: Select a filter wheel. This must be a standalone filter wheel connected to Stellarmate via USB. If you have a filter wheel that is embedded in a camera, leave this field mandatory.
9. Camera: Select imaging camera for this train. Each camera must have its own train.
10. Guider: Select the device that receives the guiding correction pulses. This can be one of the following devices:
    a. Mount: If the Mount can receive guiding correction pulses, then it is best to select it so that the pulses are directly sent to the mount. This is the recommended option.
    b. ST4: If using an ST4 cable between the guide camera and mount, then you should select the Guide Camera as the Guider.
    c. Dedicated Guider: If using a dedicated guider interface device (like Shoestring GPUSB) then select it as the Guider.

If a device provides more than one functionality, then it should be specified in all relative fields. For example, MoonLite Nightcrawler is a Rotator and Focuser at the same time, so we select NightCrawler under both Rotator and Focuser fields.
Once the optical trains are configured, specify which trains to use in each Ekos module. Typically, the Primary optical train is used in Capture, Focus, and Align modules while the Secondary train is used in Guide.
Tap the help Button to view an external video tutorial on Optical Train.

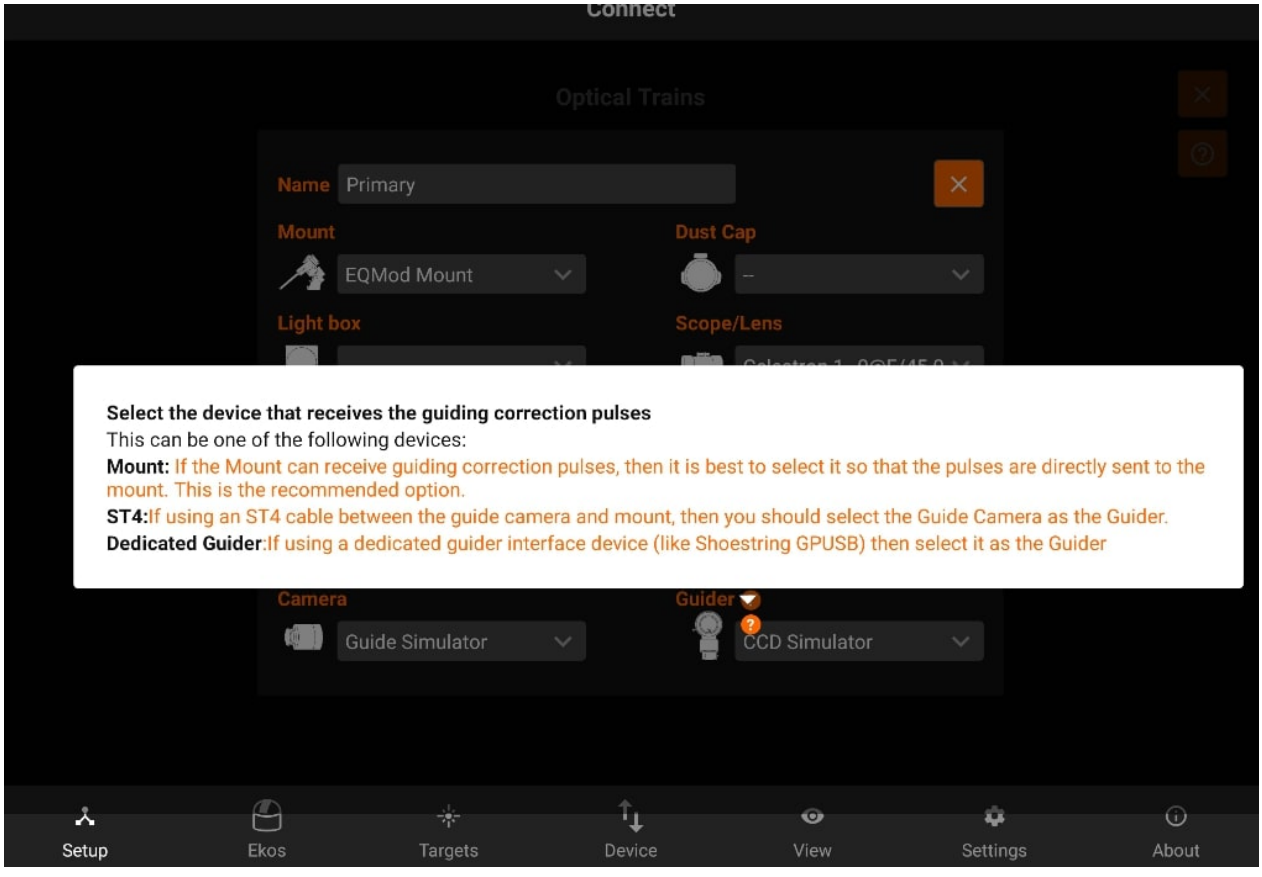


Tap the edit button and it will open the Optical train modal with the specific settings of a trian.



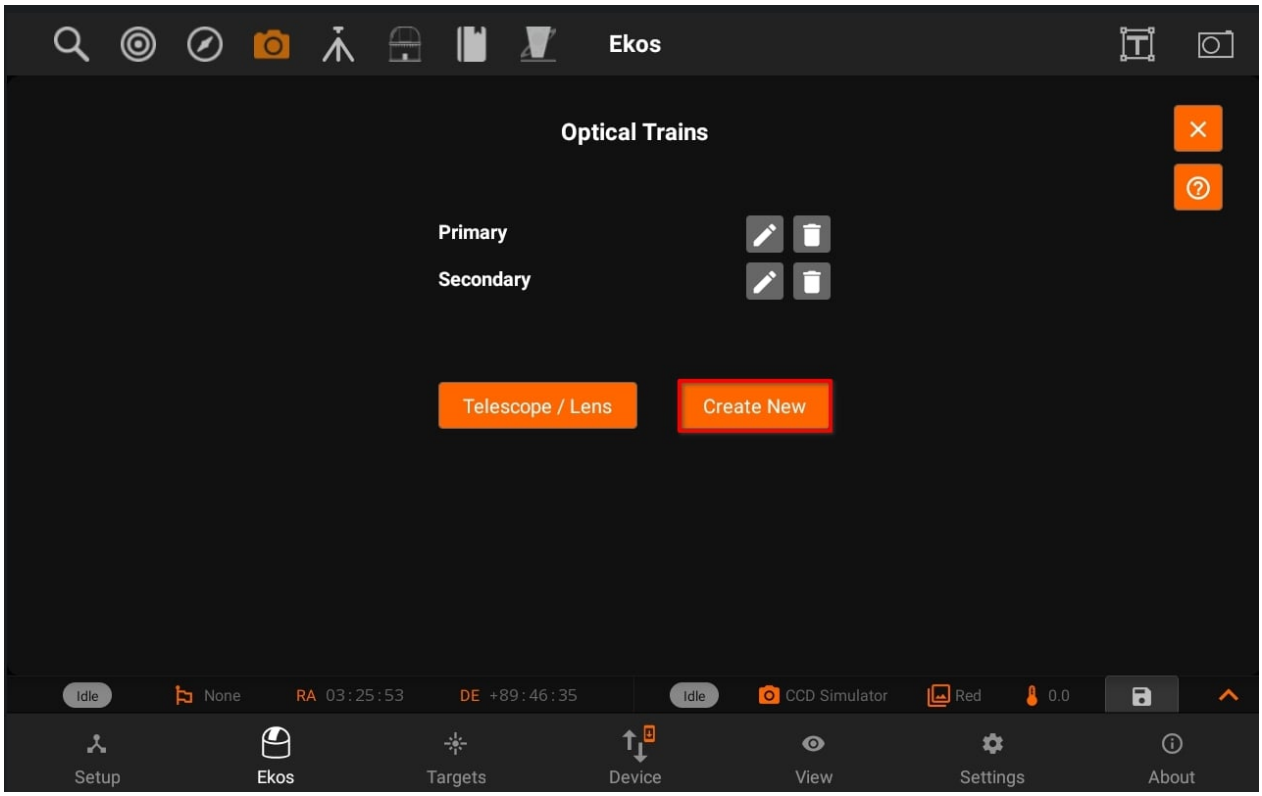


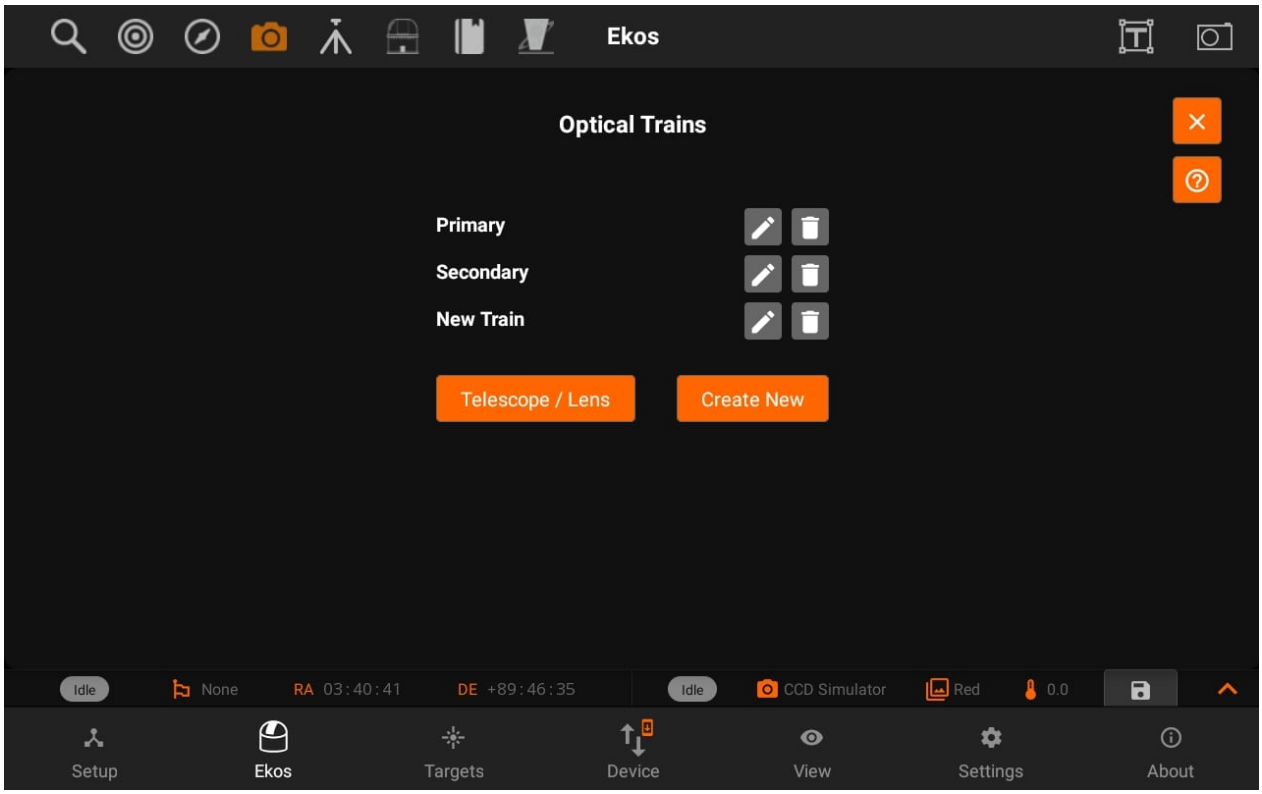
You can now view tooltip for the desciption of some devices as shown in the images below:



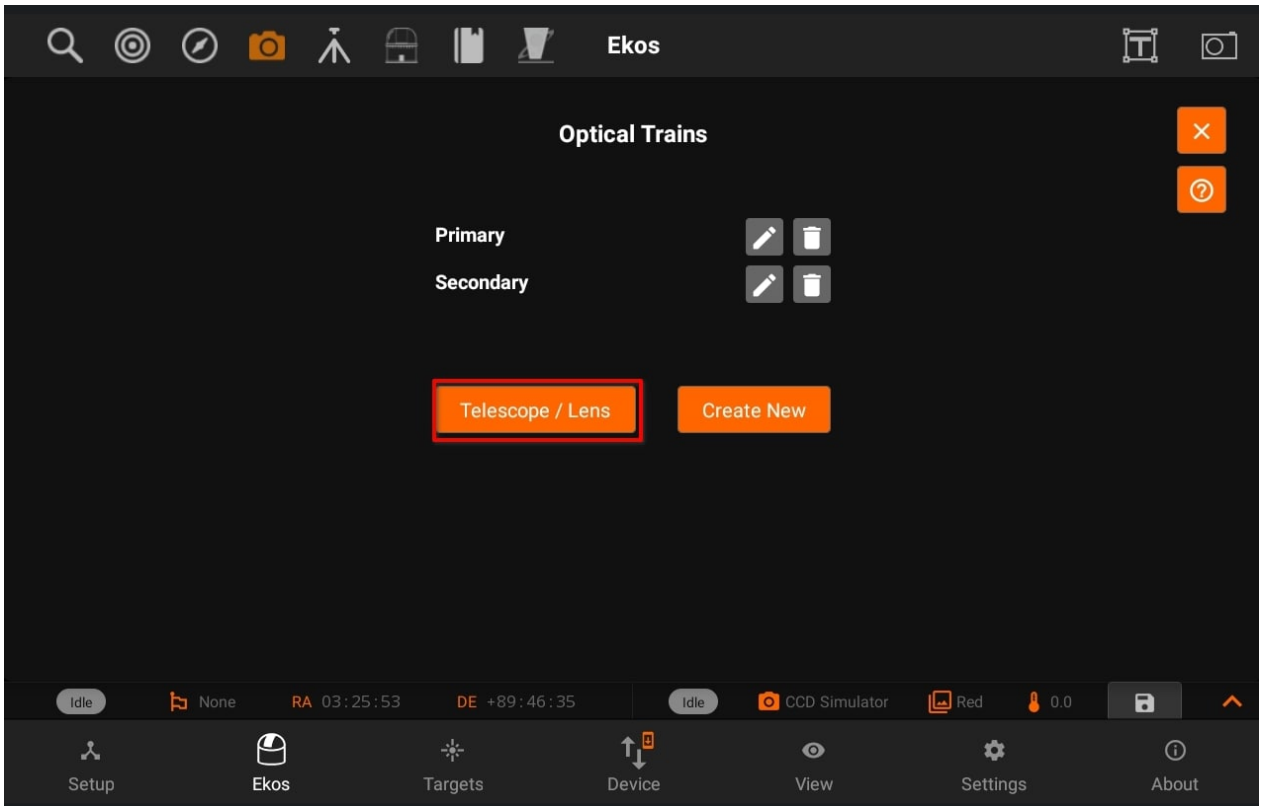
Tapping on Create new to creates a new train with a "New Train" name of previous /

default settings.

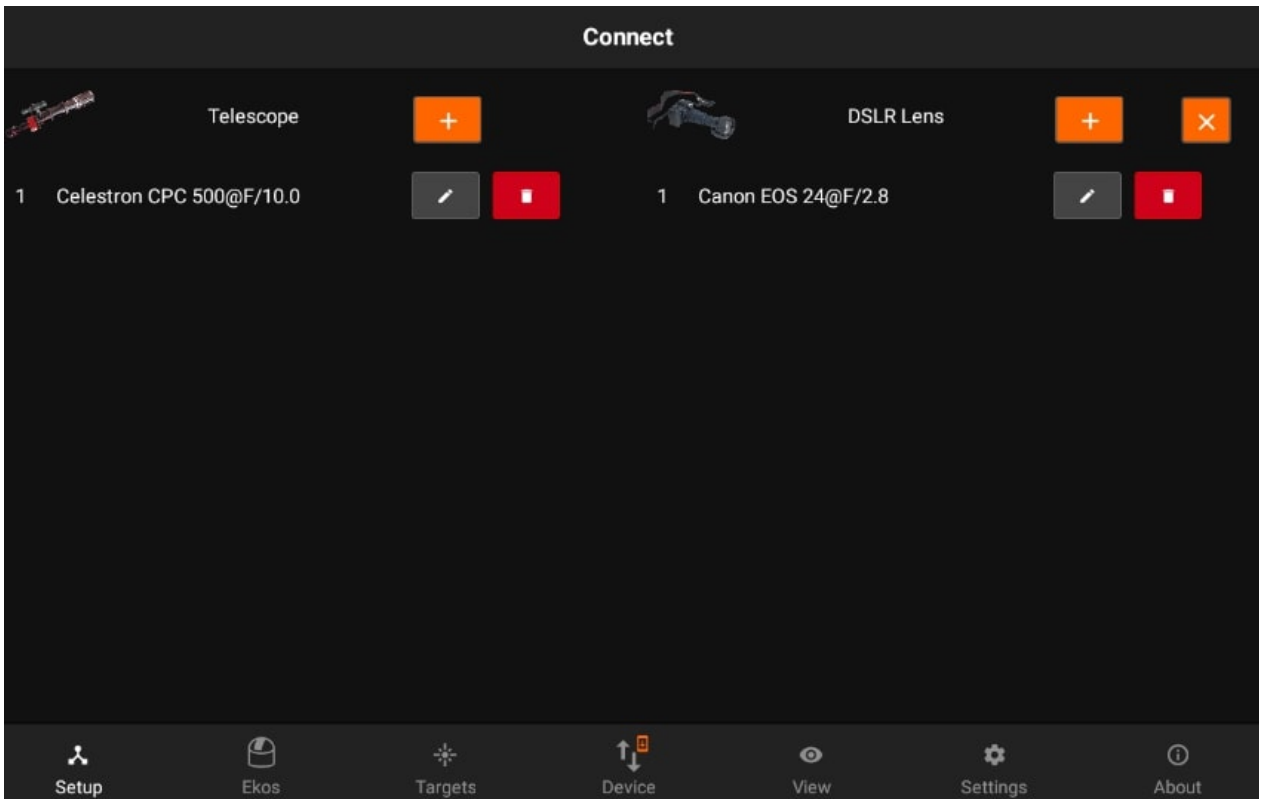




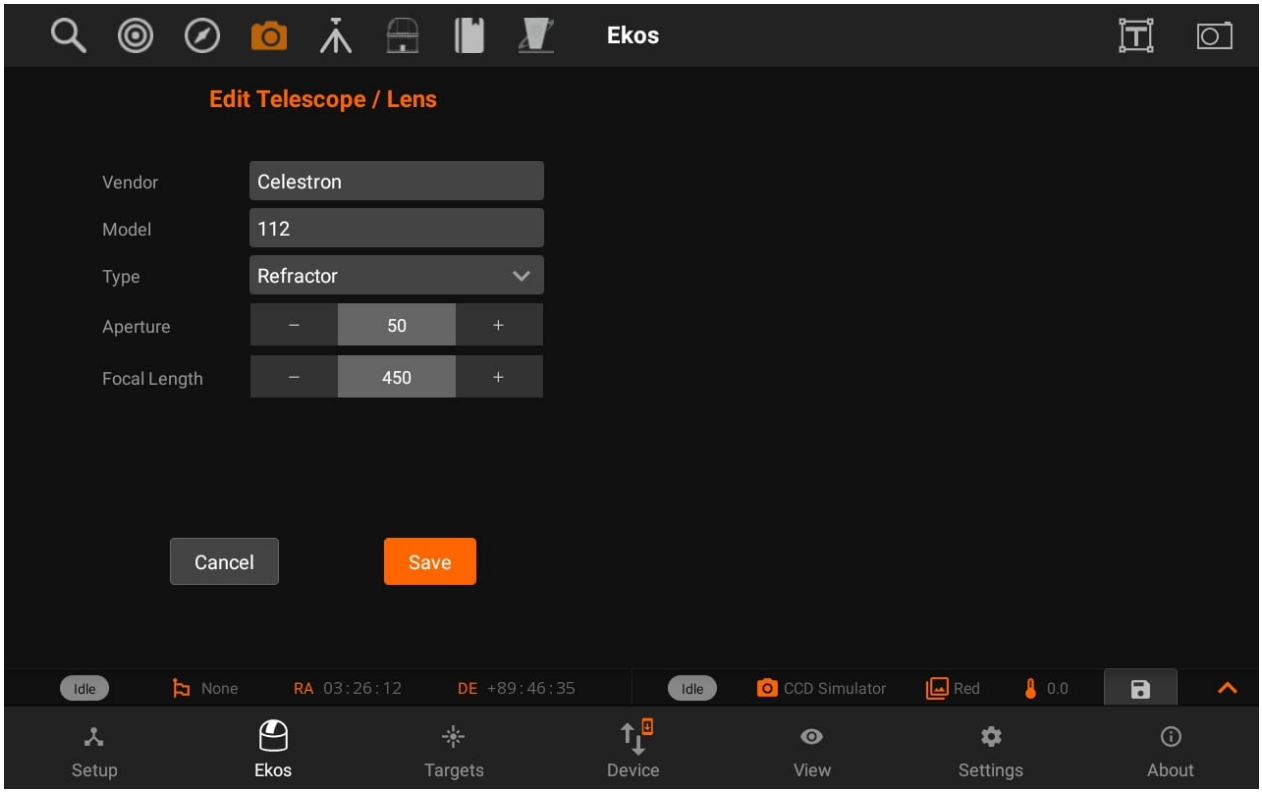
Telescope & Lens:



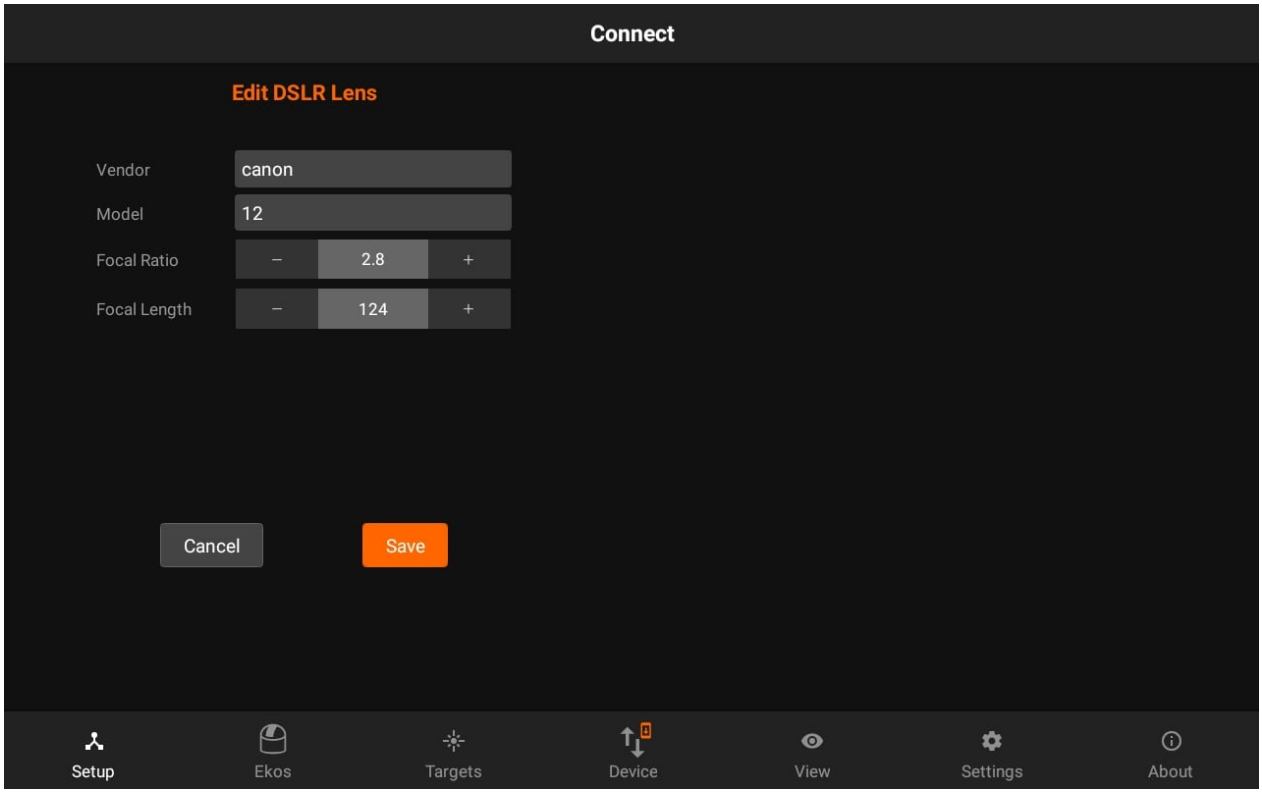
Displays Telescope / Lens View. So, you can Add / Update telescope and lens and then use those in different trains.



Tap on the Add/Edit button next to the telescope to edit the details of the telescope. All units are in millimeters.You can specify a Telescope and DSLR lens for your trains.



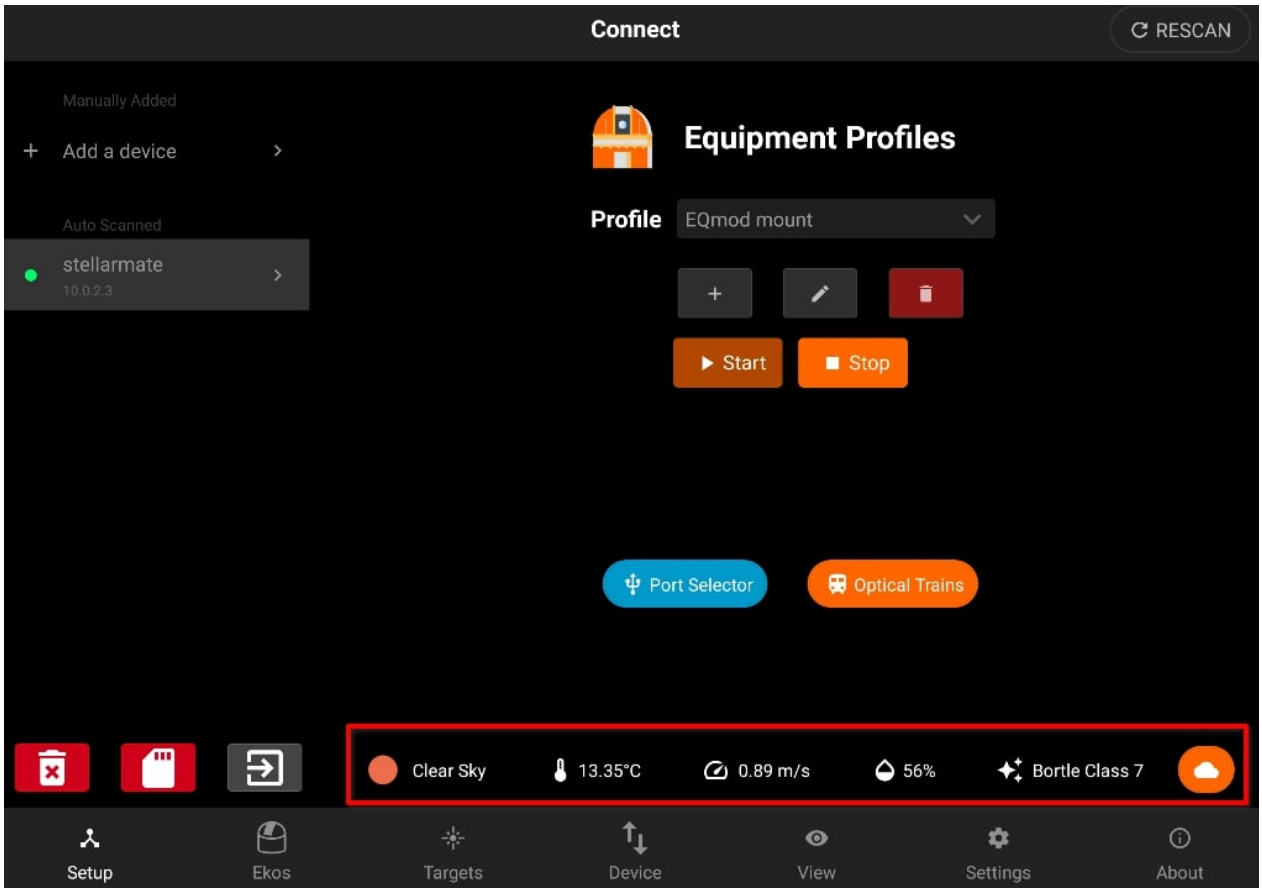
Similarly, you can add/edit DSLR lens and then use Scope/Lens in different Optical trains.



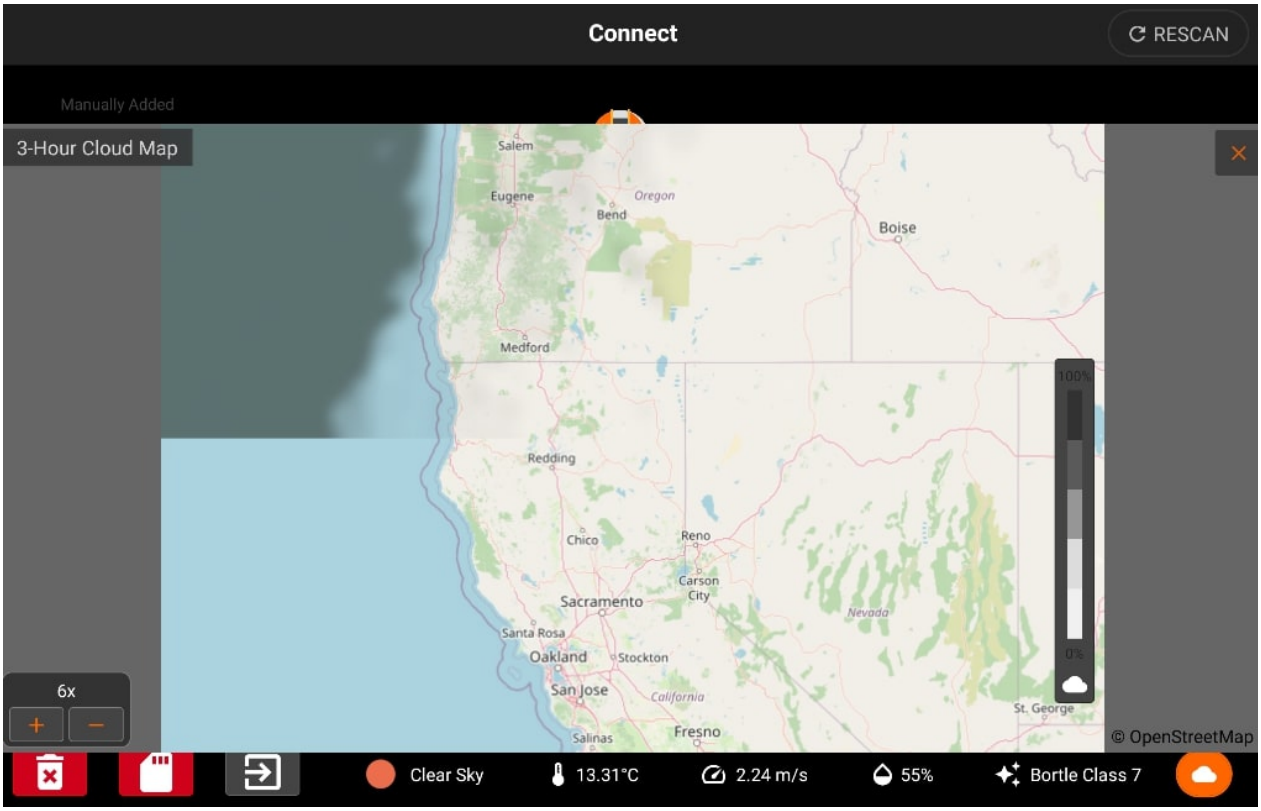
You can also access Optical train from the Setup Tab and Camera quick controls.

Weather Inforrmation

Weather Information are available in the setup page. The weather bar displays current weather information for the surrounded region. It provides the current state of the weather, temperature, wind speed, humidity and the Bortle Class. The Bortle Class is a measure of the brightness and observability of the sky relative to light pollution. Bortle Class 1 is ideal and 9 is the worst.



The cloud button displays the 3-hour cloud map based on your current location.

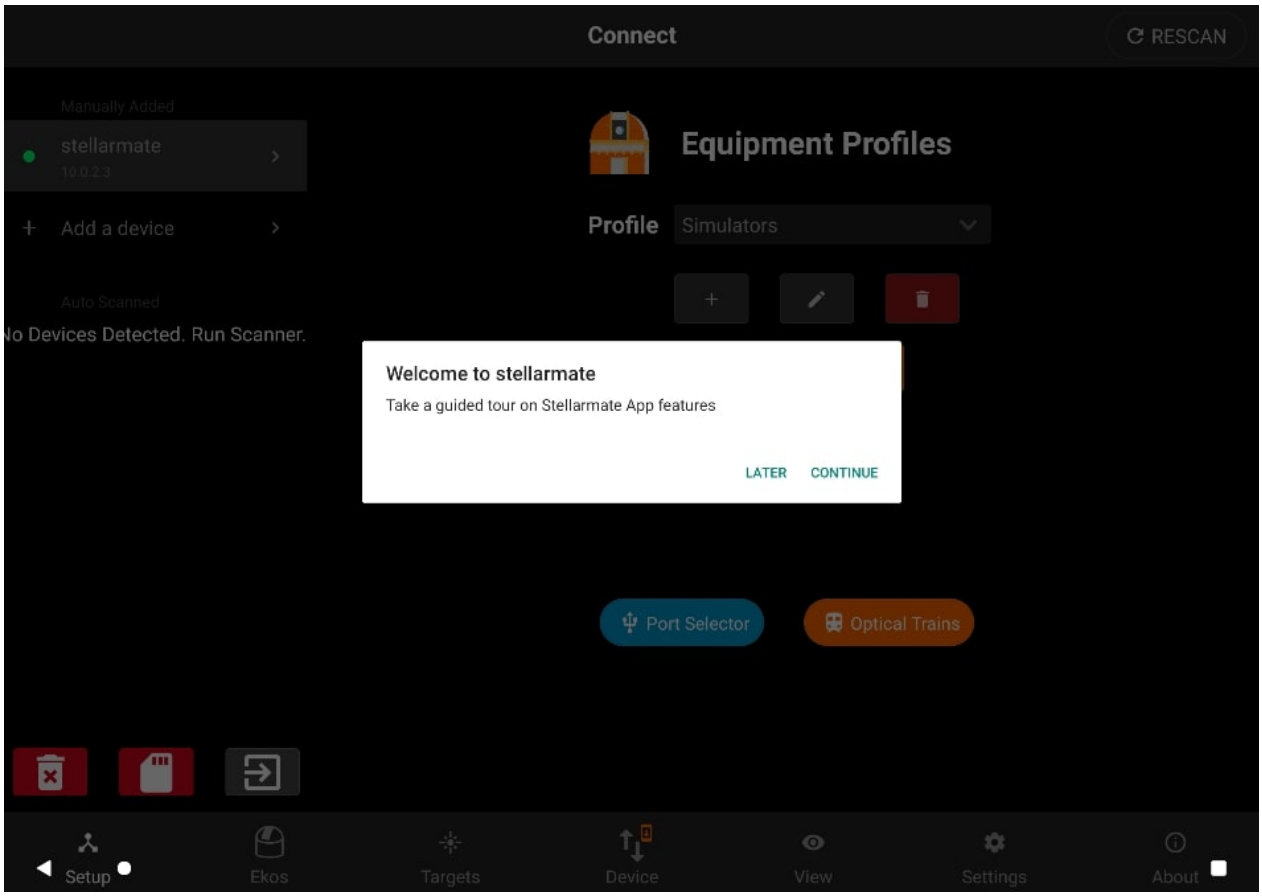


The visibility bar displays the percentage of cloud coverage over the map.

Tour Guide

Tour guide has been added to Stellarmate v2.5.8.

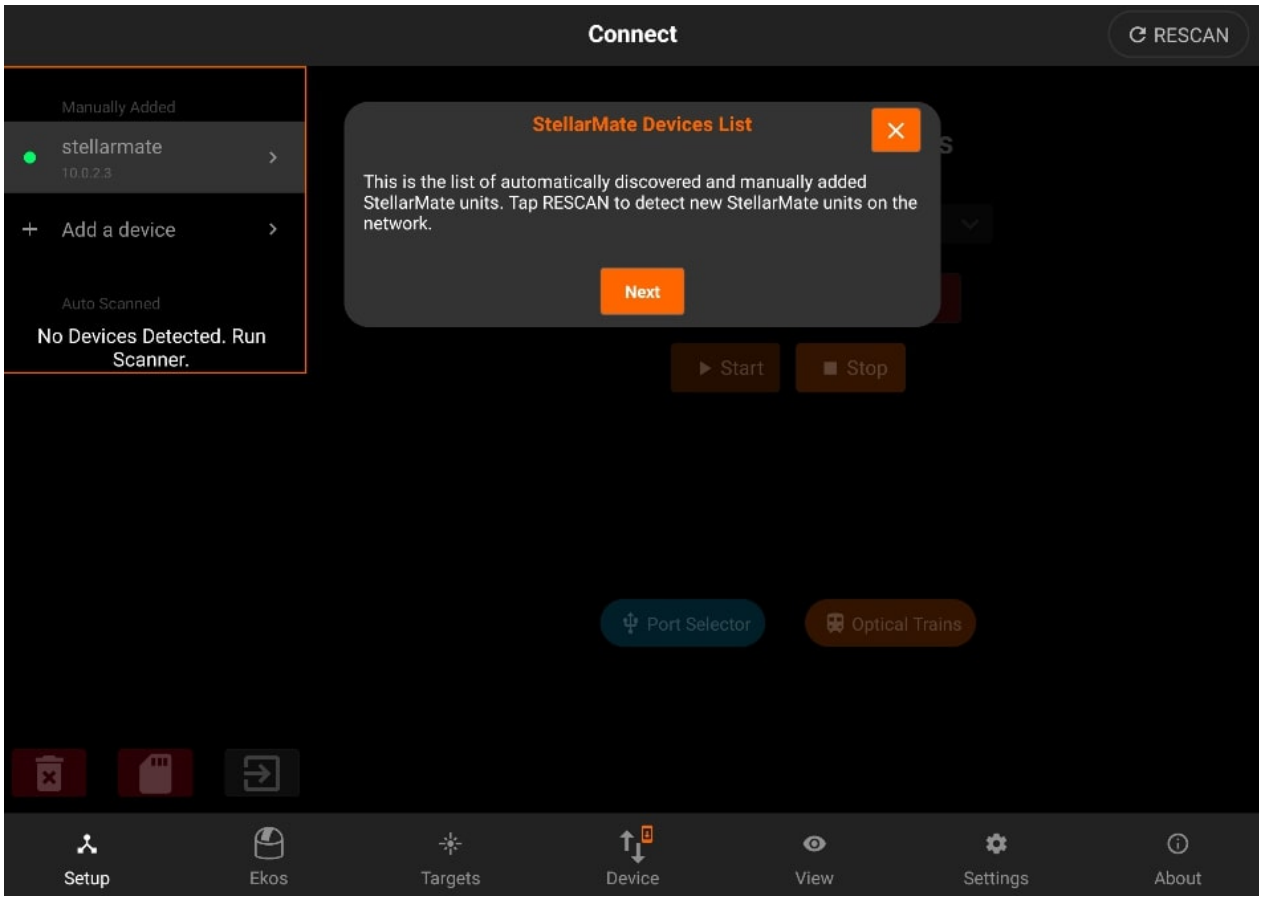
If you would like to take aTour guide, you will see a pop up whether to continue Tour Guide or later.



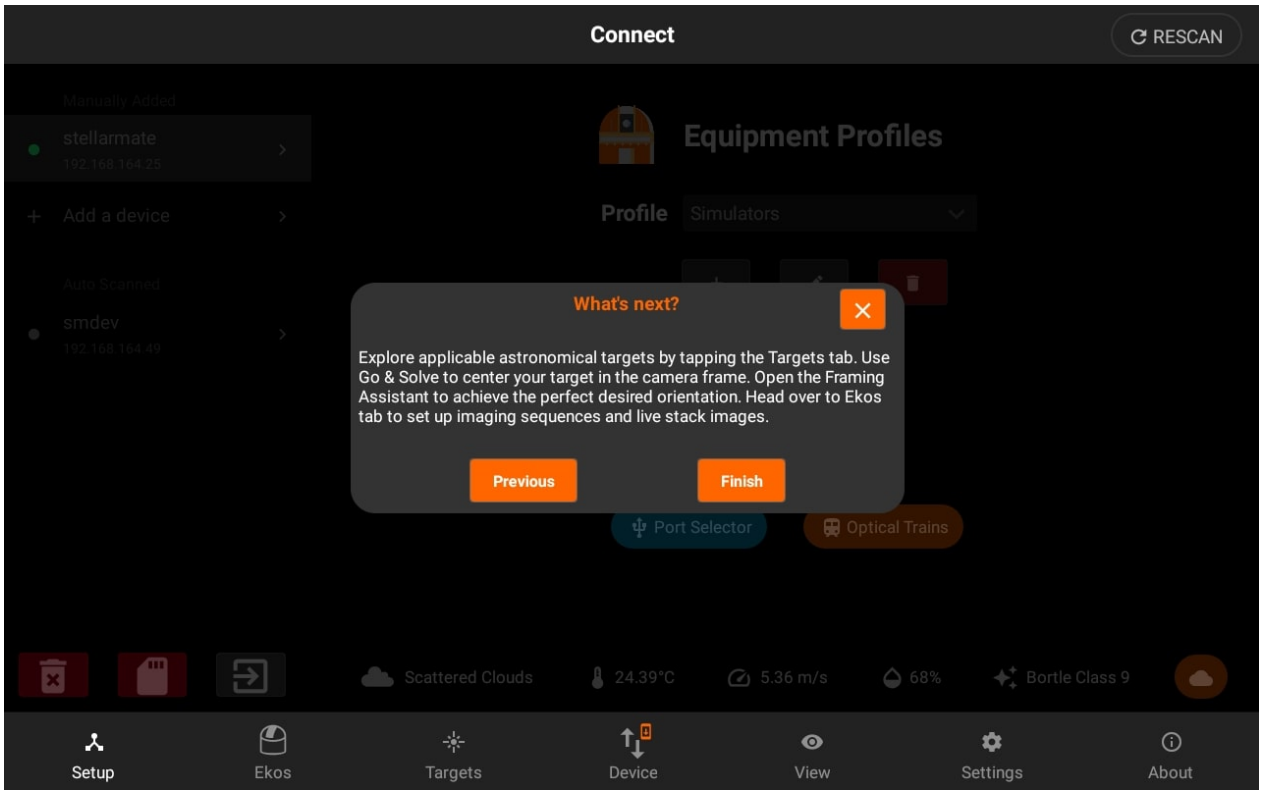
Currently Tour guide is available for few important features i.e Setup, Ekos & Targets.

Tour Guide can be seen in the few images below:

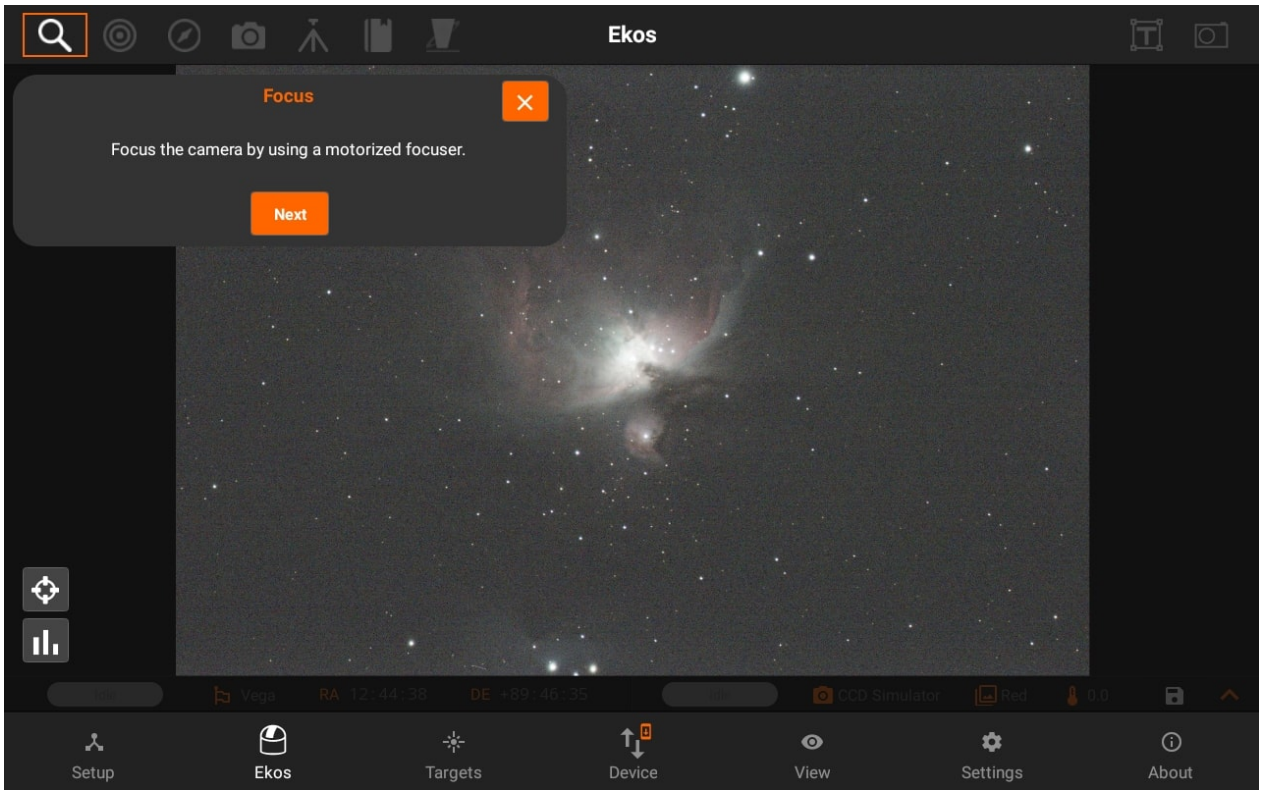
For Setup, you can tap "Next" to proceed to the next tour zones.

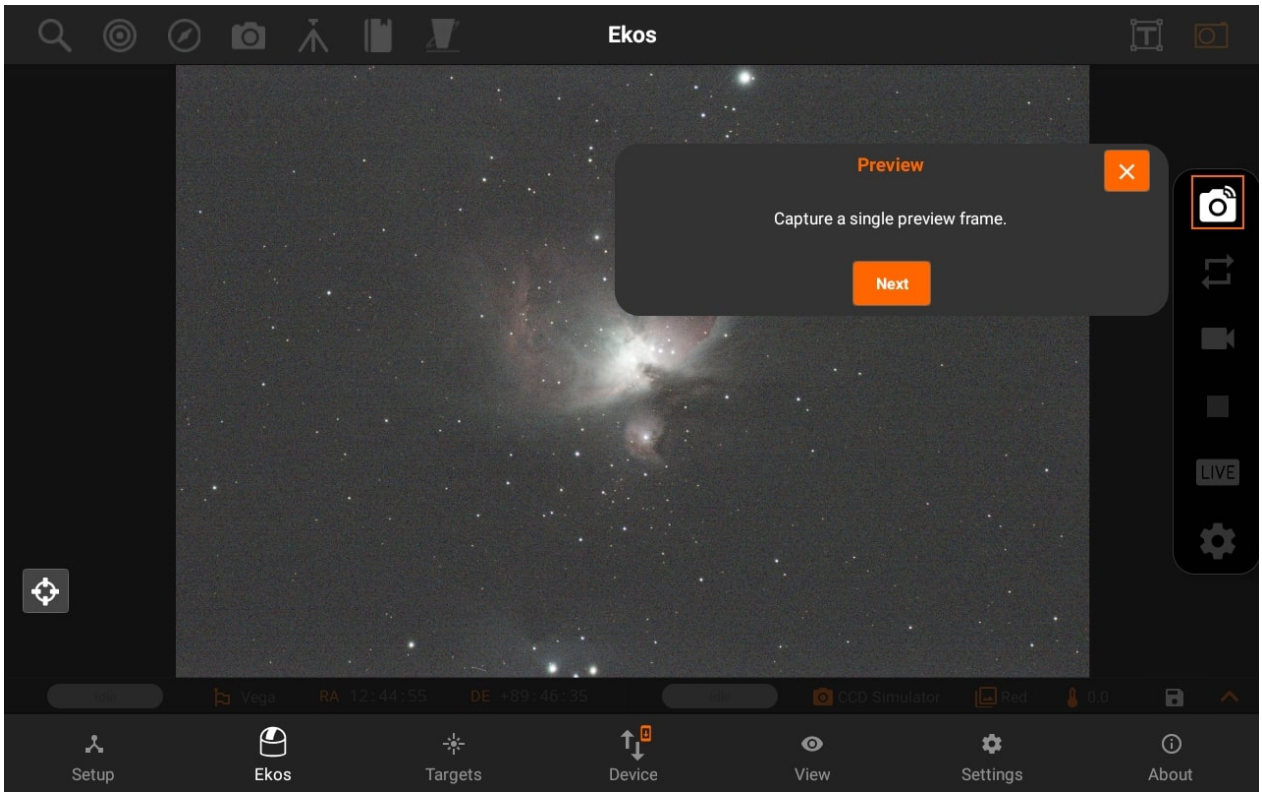


On tap "Finish", the tour guide for specifc tap will be considered as completed. You can also tap "X" during Tour guide to close it. That will also be considered as completed.
ON tap "Previous" button, to view the previous tour guide zone.

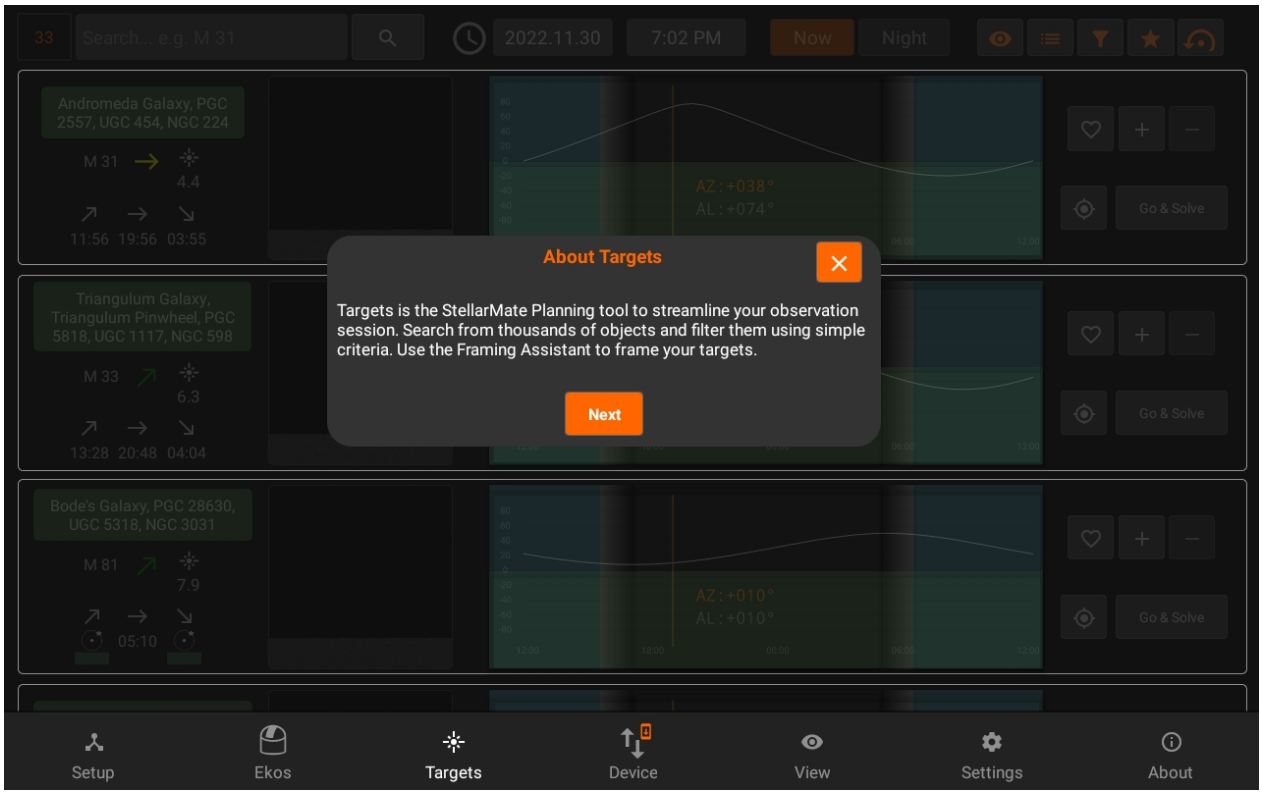


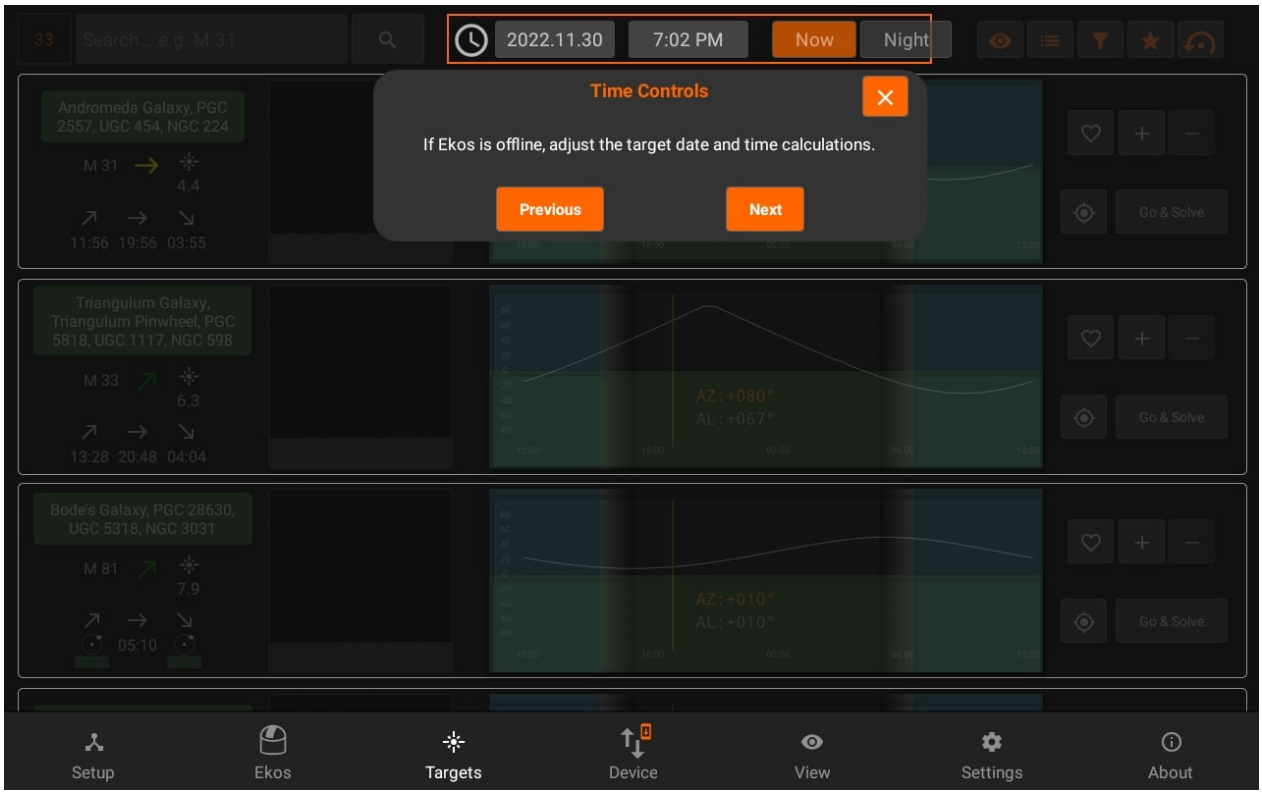
In Ekos, one line description of modules and Quick controls is explained.





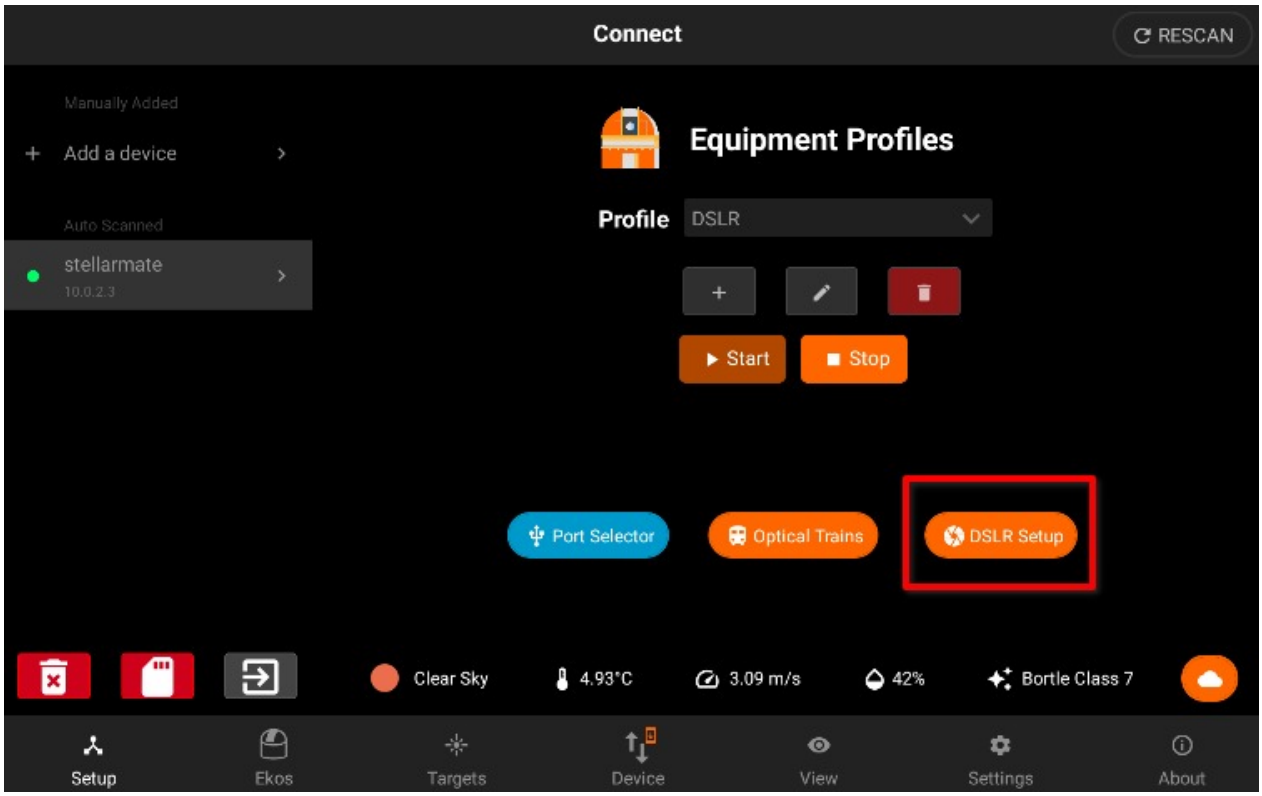
In Targets, the main features are explained as shown in the few images below.



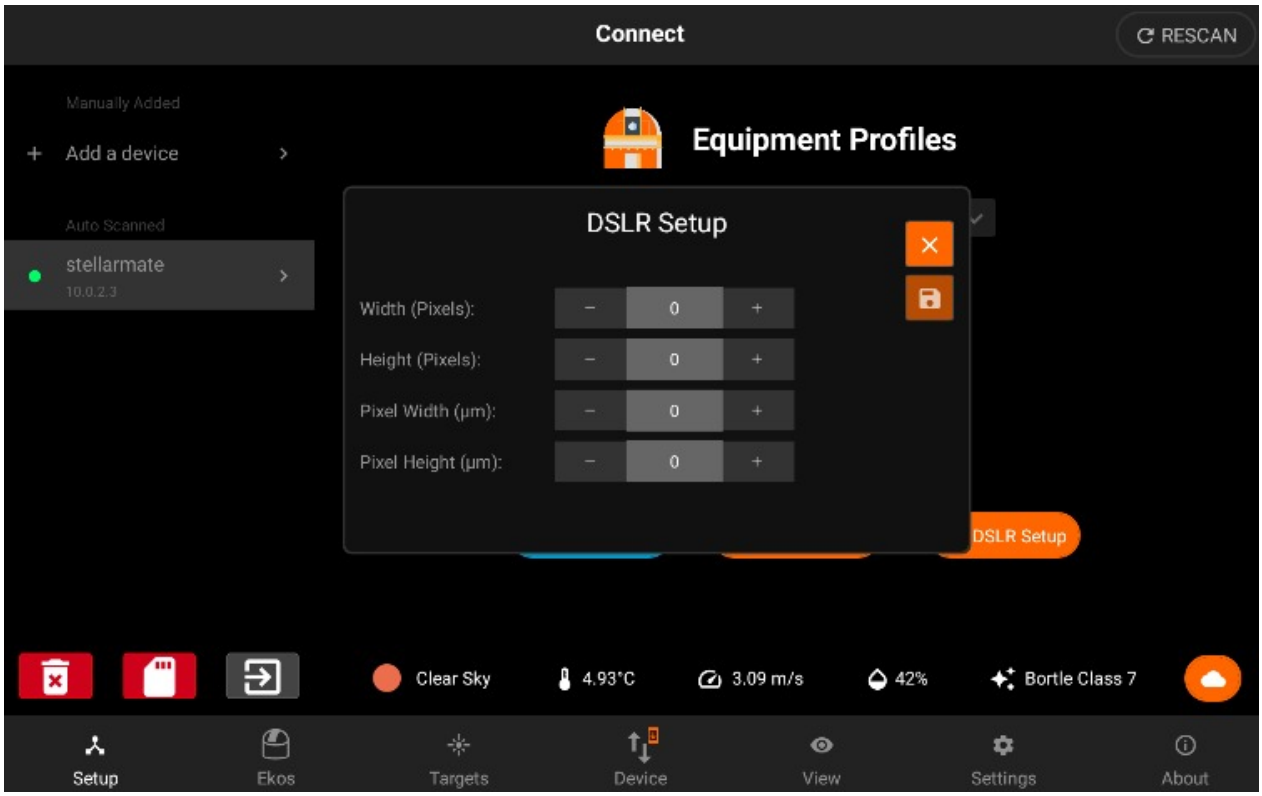


DSLR Setup

Once your DSLR is connected, it will ask you to setup it.



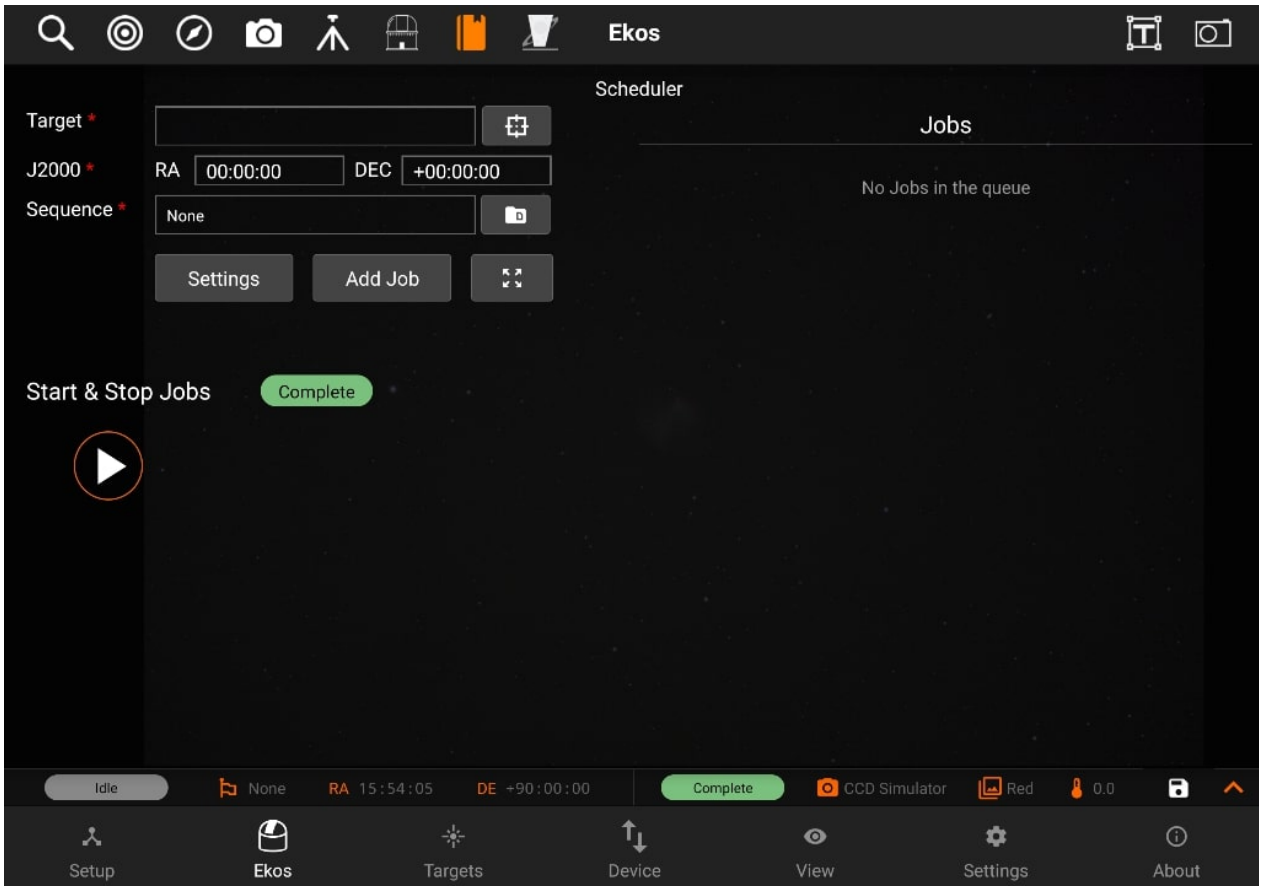
After configuring it, you can tap the save button.



Ekos

When an equipment profile is not started, only the Ekos Scheduler module is available for use. From the scheduler, you may select targets and sequences to create jobs. You may specify job constraints and observatory startup and shutdown procedures. Once the scheduler is running, it will select the best targets to image and would automate the rest of

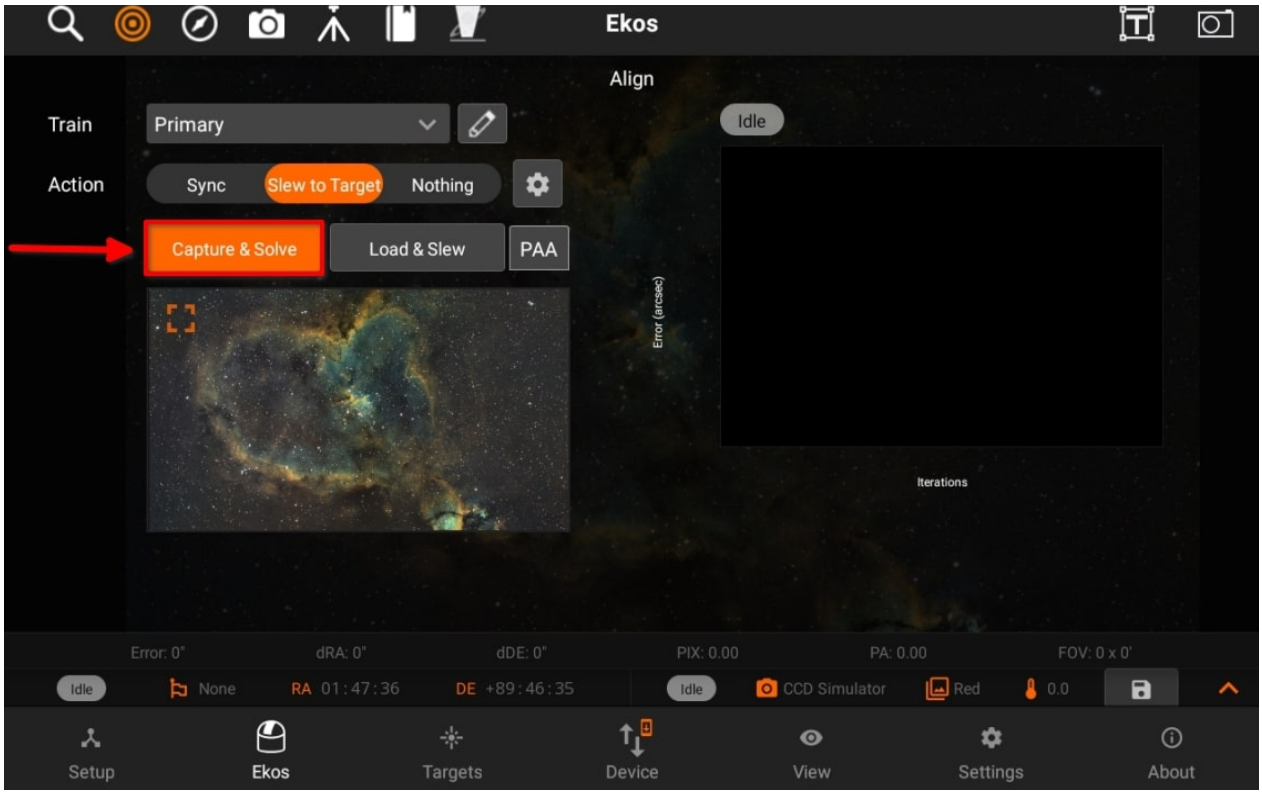
the workflow without any human intervention.



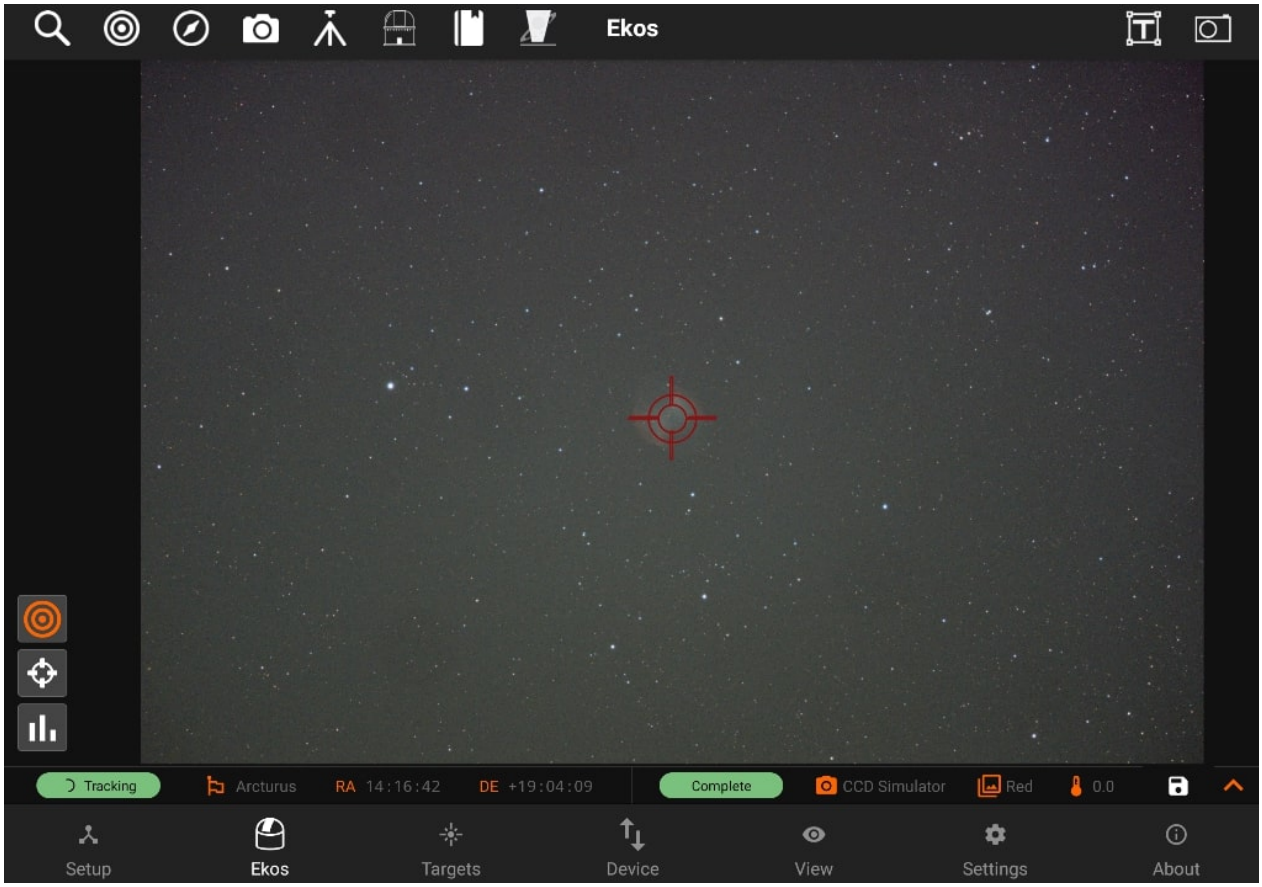
When an equipment profile is started, the Ekos modules becomes active. In the Ekos screen, you can capture images, stream video, and create image sequences. Furthermore, it provides the following facilities:

Canvas on Main Image:

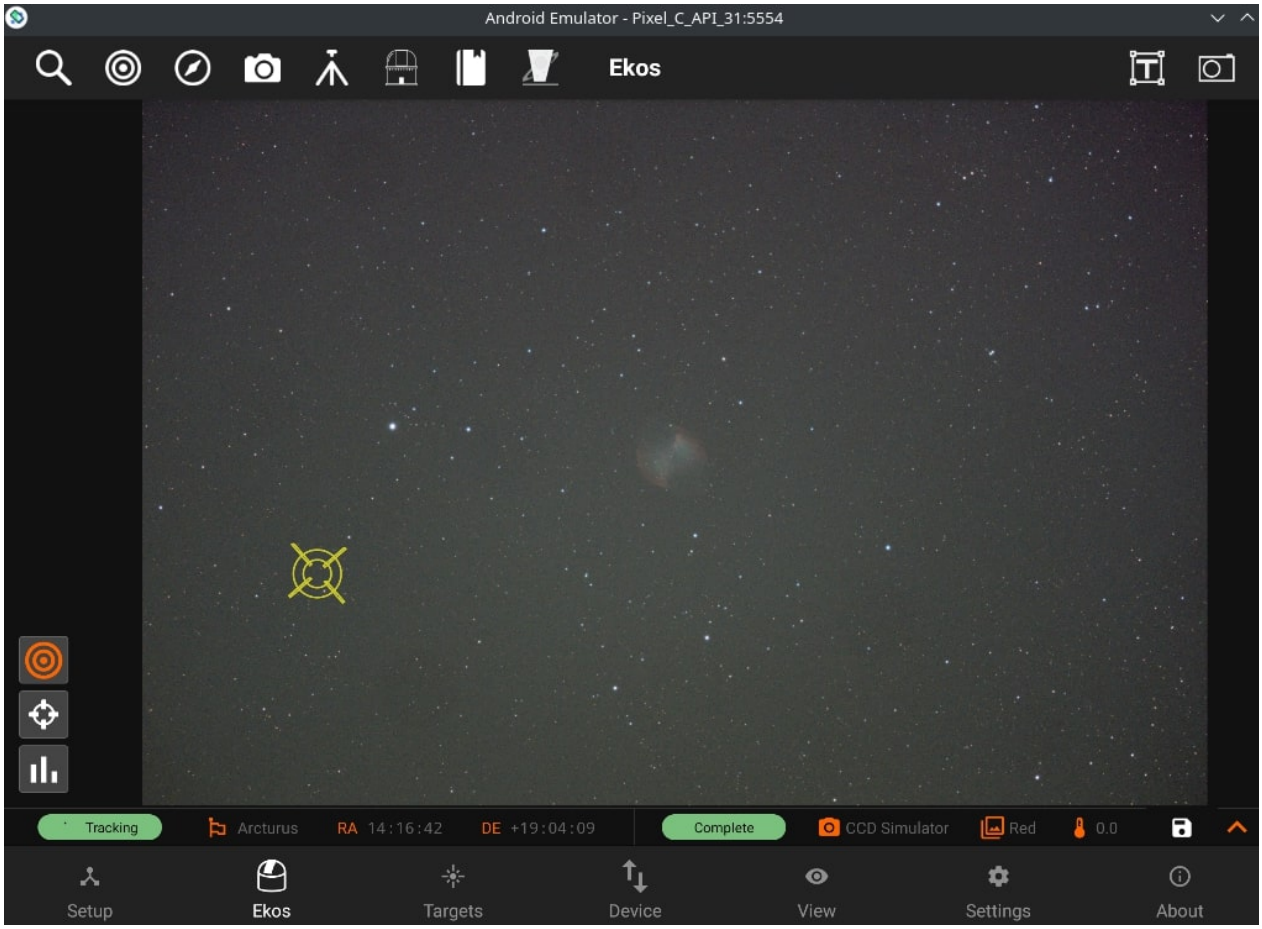
You can center the mount to a specific target in the main image if plate-solving was successful. From Ekos Align module, Capture and Solve an image. If successful, an orange align icon is displayed in the Main Image View indicating that solving is successful. For any subsequent images captured and displayed in the Main Image View, you may now select the target by tapping on it. A red bullseye animation designates the target.



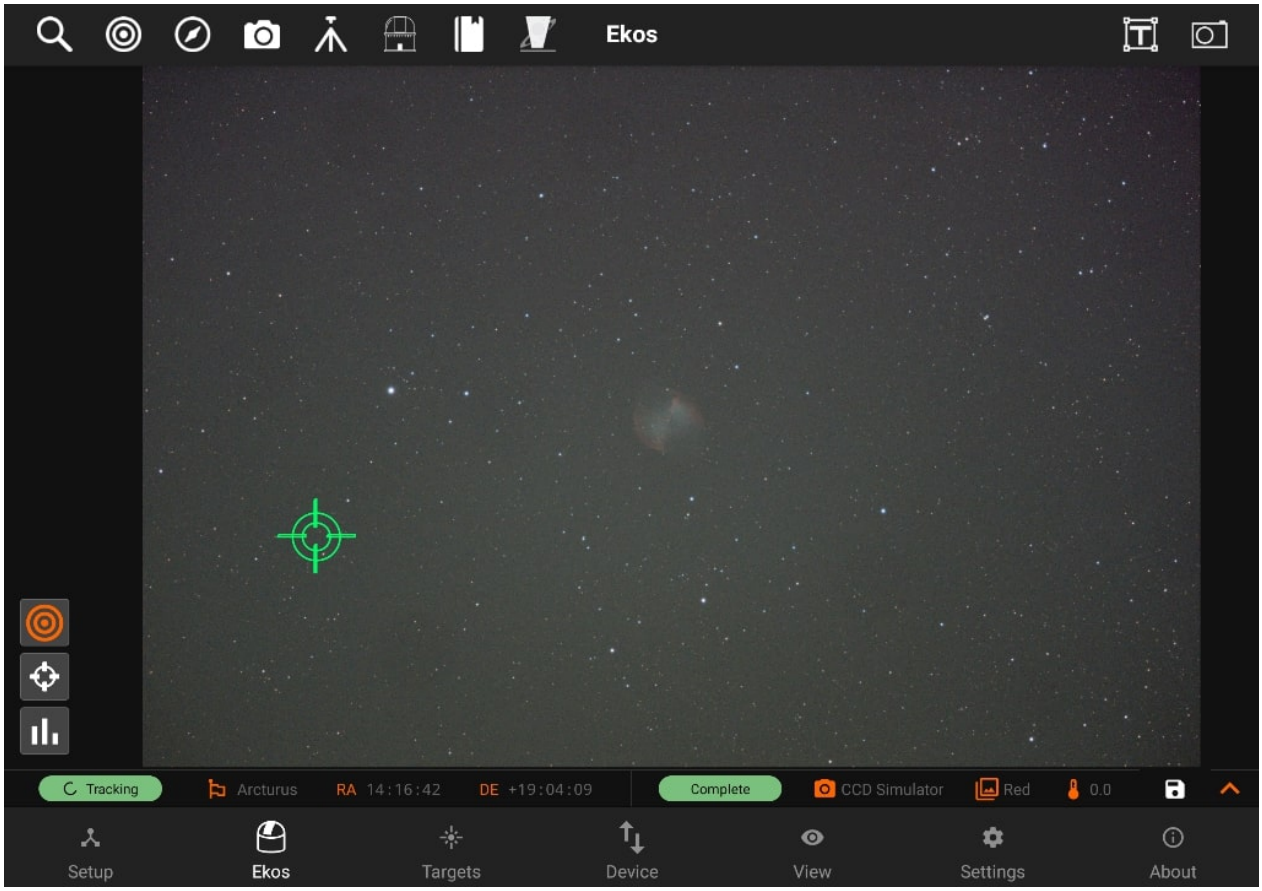
Tap and hold the target for approximately one second to command the mount to slew. If successful, the indicator icon changes to yellow and once motion is complete, it switches to green. Capture a preview to verify the mount indeed centered the target as desired. Repeat if necessary. Can also be seen in the below images.



Hold on your desired target, mount will star moving to that specifc target. Yellow animation will be appeared while it in in process.



On success, the animation will turn to green.
On capture new image, the target lock animation will be reset to default.


Ekos
Tracking
Arcturus
RA 14:16:42
DE +19:04:09
Complete
CCD Simulator
Red
0.0
Setup
Ekos
Targets
Device
View
Settings
About

- Modules

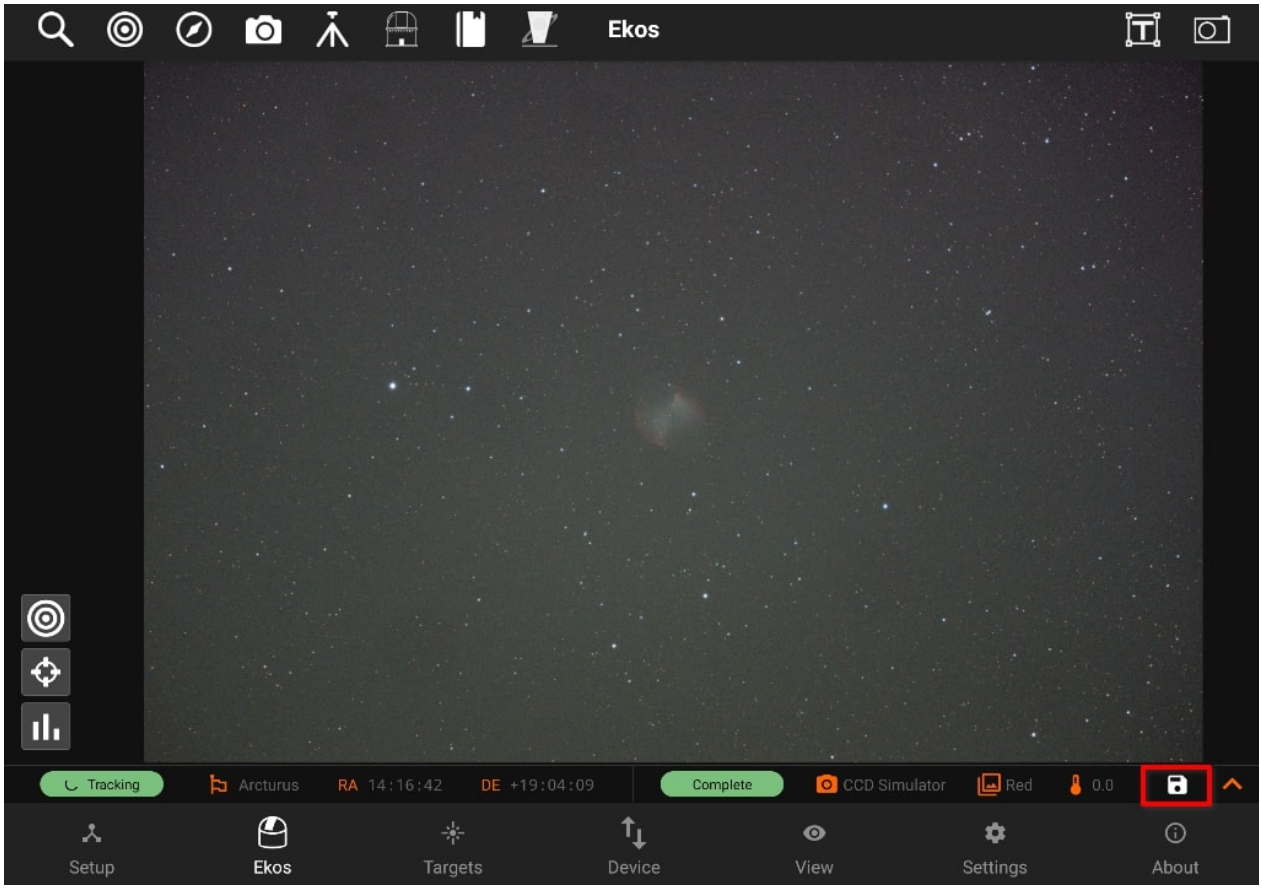
1. Focus: Focus your camera either automatically via an electronic focuser, or manually by adjusting the focus while framing, or by using Bahtinov Mask Assistant. Create presets for different configurations and set advanced settings to control the star detection and focusing algorithms.
2. Align: Align your mount to get highly accurate GOTOs and to ensure you target is always in the center. You can also load an existing image to plate solve and then command the mount to go to the exact center in the sky.
3. Guide: Guiding enables long-exposure astrophotography by ensuring your mount tracks accurately with time. It can automatically select and lock a guide star and send correction pulses to the mount to keep it always centered.
4. Capture: create, edit, and delete presets, job sequencing, Filter Settings, Limit Settings, Calibration Settings, File Settings.
5. Mount: tracking on/off, park/unpark, Meridian Flip, Limit Settings (Alt and HA Limits), and Pier Side.
6. Observatory: park/unpark cap, park/unpark dome, dome goto absolute position and current angle representation.
7. Scheduler: Schedule your session depending to the targets and on different timings.
8. INDI Control Panel: INDI Control Panel provides an interface to interact with the drivers of the devices connected to Stellarmate.

- Quick Controls: Quick Controls are simplified quick-access settings for the camera, mount, and rotator located on the top-right panel. They can be toggled at any time. Once toggled, the corresponding control is overlayed on the top of your existing view where you can quickly and efficiently control your devices.

1. Mount: park/unpark, tracking on/off, mount speed, GOTO/Sync, and directional pad control.
2. Camera: preview, loop, video stream, live stacking, and quick settings.
3. Rotator: goto absolute position and CCW/CW step rotation.

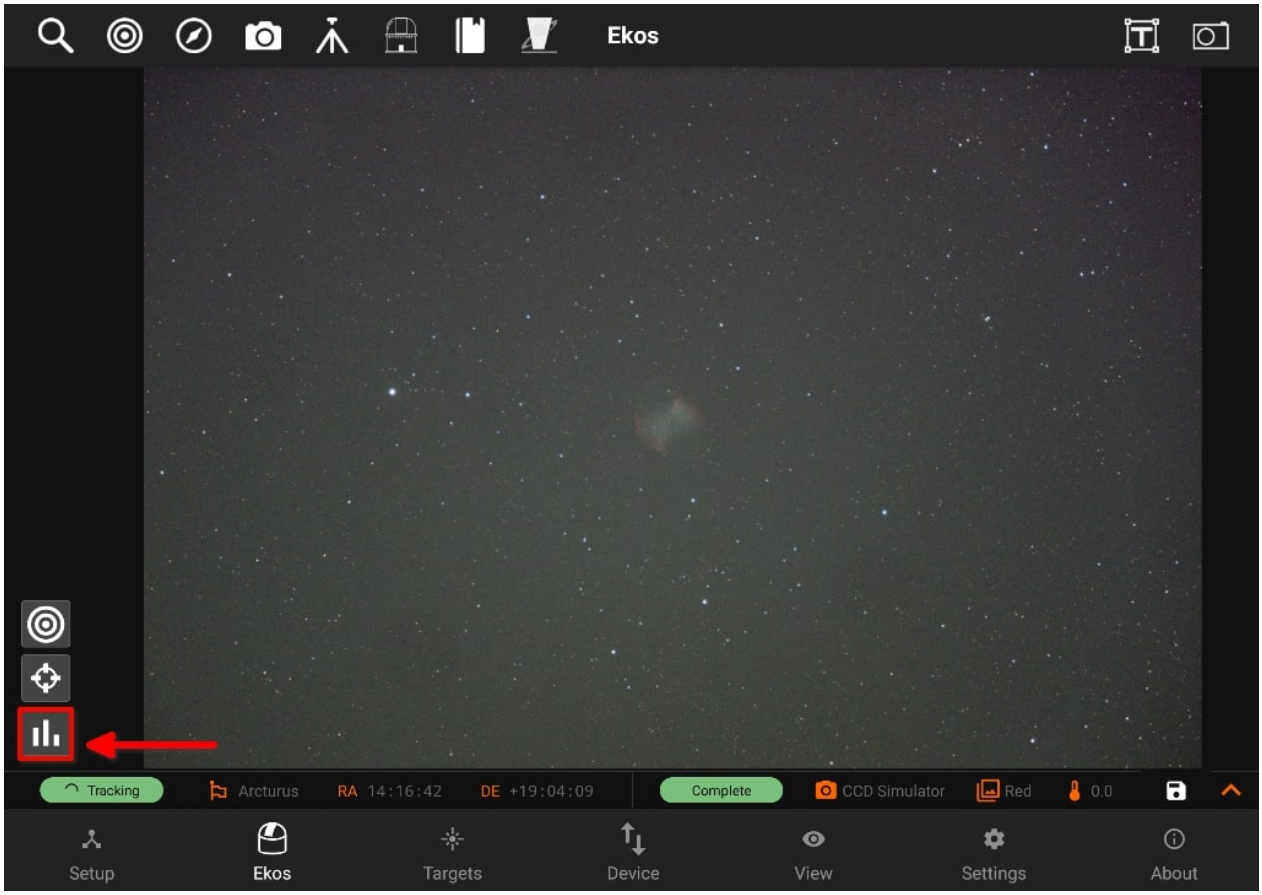
- Mount Status Bar

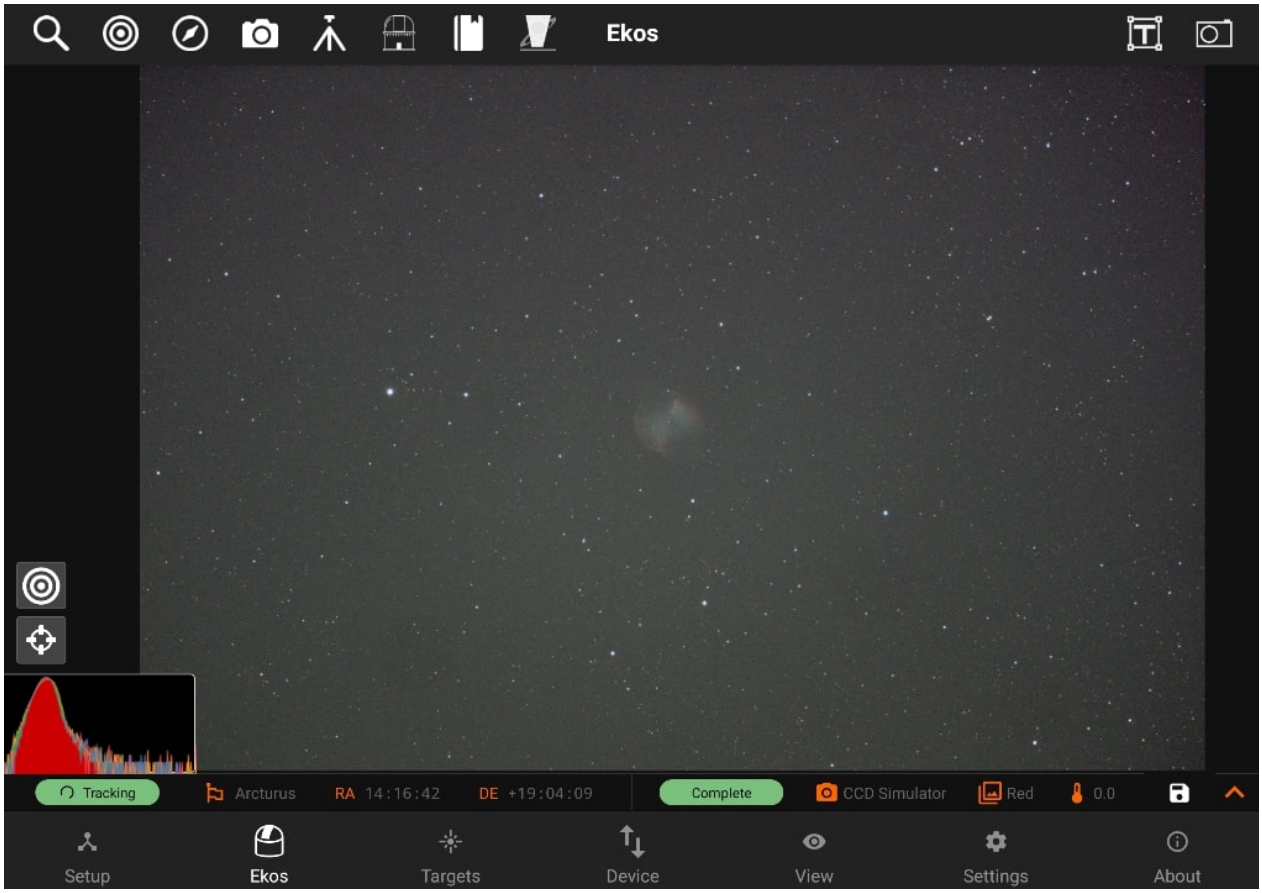
1. Shows the status of the mount if it is parking/unparking, slewing, tracking, etc. as well as the target. Moreover, the Right Ascension, Declination, Azimuth, Alt-Azimuth, and Pier Side are also shown in the status bar.
2. Also, Shows the camera information, temperature.
3. Save image icon is also added in status bar. You can now save your captured images to tablet/Ipad by clicking the Save Icon Button. It will save



- Histogram

When available, clicking the histogram button in the main image view toggles the non-linear histogram. The histogram is generated for both mono and rgb images.

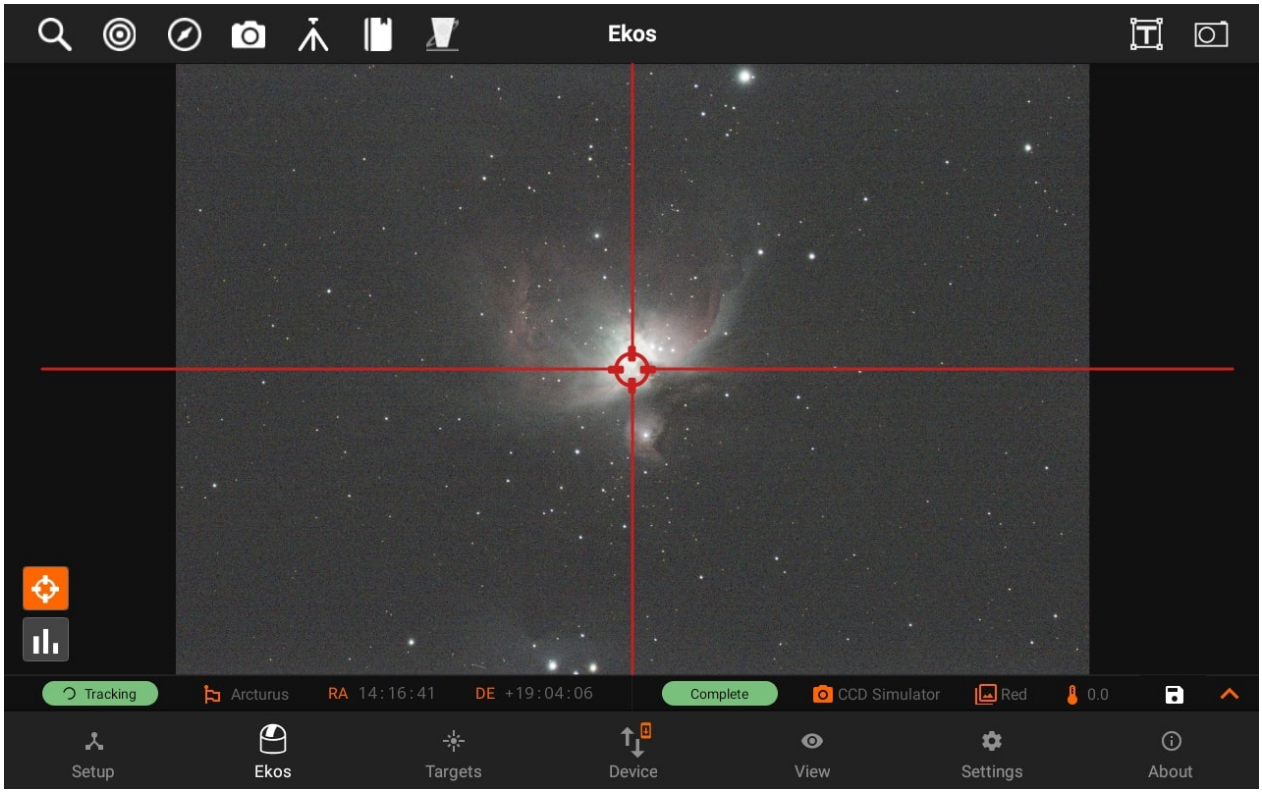

Ekos
Tracking
Arcturus
RA 14:16:42
DE +19:04:09
Complete
CCD Simulator
Red
0.0
Setup
Ekos
Targets
Device
View
Settings
About


Ekos
Tracking
Arcturus
RA 14:16:42
DE +19:04:09
Complete
CCD Simulator
Red
0.0
Setup
Ekos
Targets
Device
View
Settings
About

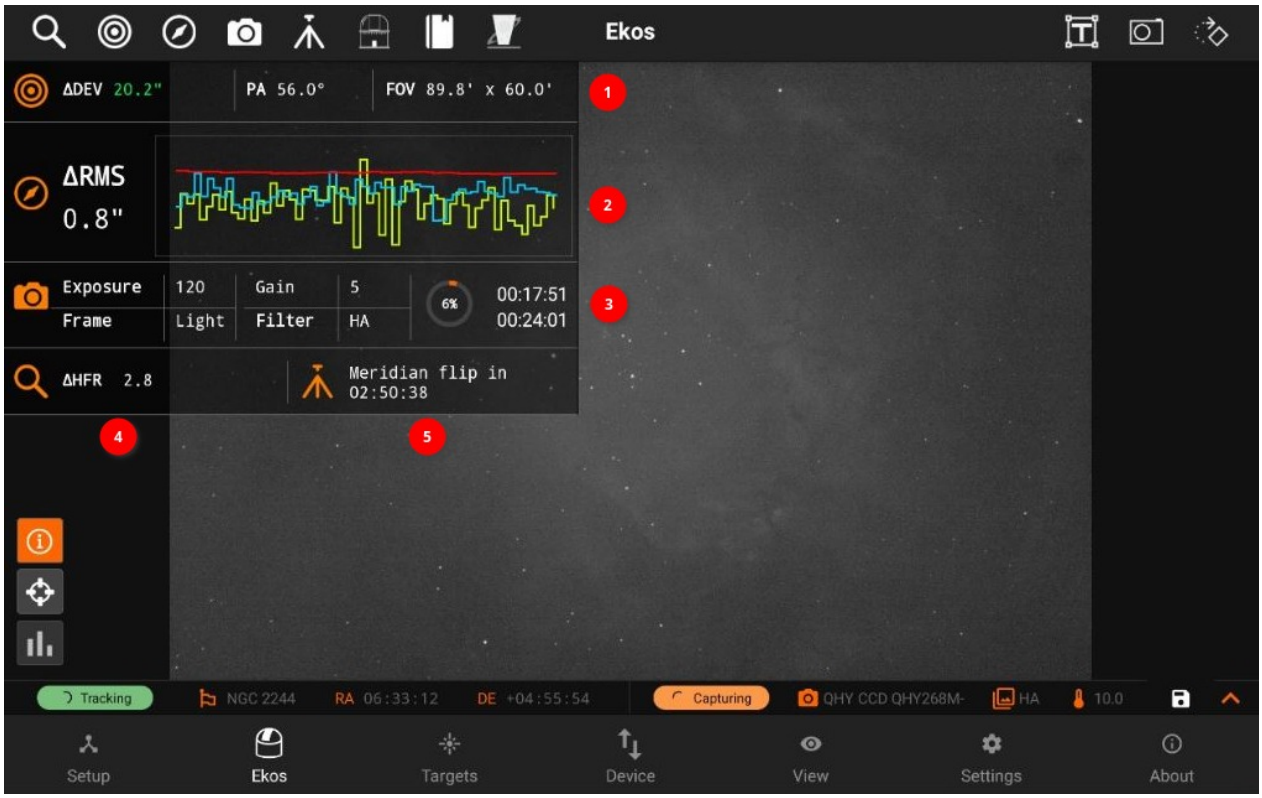
Crosshair:

Use crosshair on captured image, which is appeared on the center of captured image.

Once it is toggled, you can see the crosshair on the image.



Summary

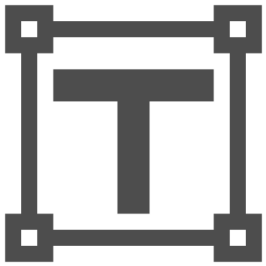


The summary view includes the gist of your astrophotography workflow so you can always take a quick look at the most important parameters without navigating to other screens. Depending on which Ekos modules are active, the information may include the following:

1. Alignment
    a. Total deviation error in arcsecs. The deviation is updated when you perform a capture and solve operation.
    b. Position Angle (PA) in degrees East of North.
    c. Field of View (FOV) in arcminutes.
2. Guide: Total RMS error in addition to the guide deviation chart.
3. Capture: Current sequence settings and a progress indicator. Two timers are displayed to the right of the progress indicator when a sequence is running:
    a. Top timer: Sequence job timer countdown. This is the countdown until the current active sequence is complete.
    b. Bottom timer: Overall timer countdown. If you have multiple sequences, the timer indicates the estimated time until all sequences are complete.
4. Focus: Half-flux-radius (HFR) measurement.
5. Mount: Current meridian flip status.

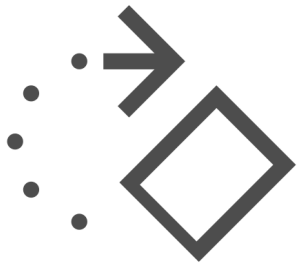
Quick Controls

StellarMate App has a total of three Quick Controls Modules which are used to control three astronomical instruments as suggested by their names: mounts/telescopes, cameras, and rotators.



Mount Quick Controls

Camera Quick Controls



Rotator Quick Controls

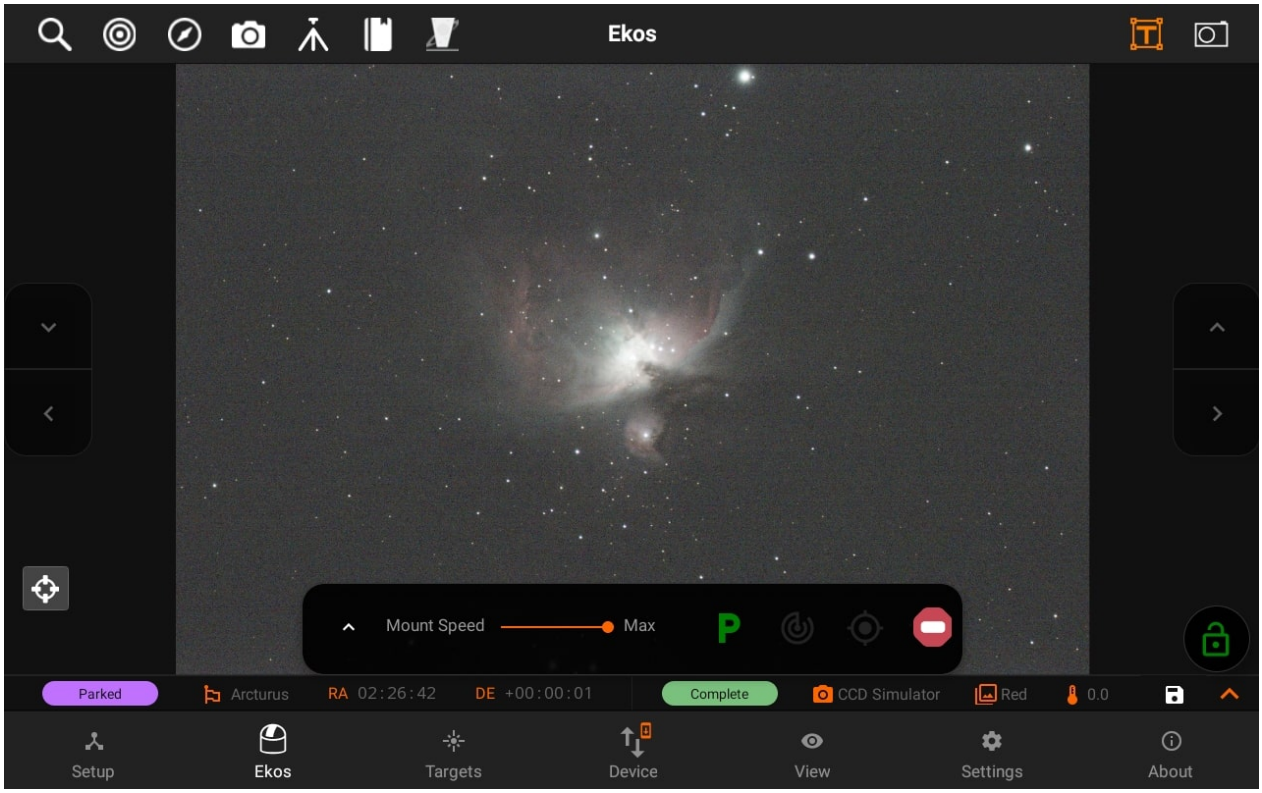
Mount

Mount quick controls allows you to control your mount quickly and easily, it has the following features:

- Mount Speed
- Park/Unpark
- Tracking On/Off
- Goto/Sync
- Directional Pad Control
- Lock Mount Controls
- Reverse North/South
- Reverse West/East

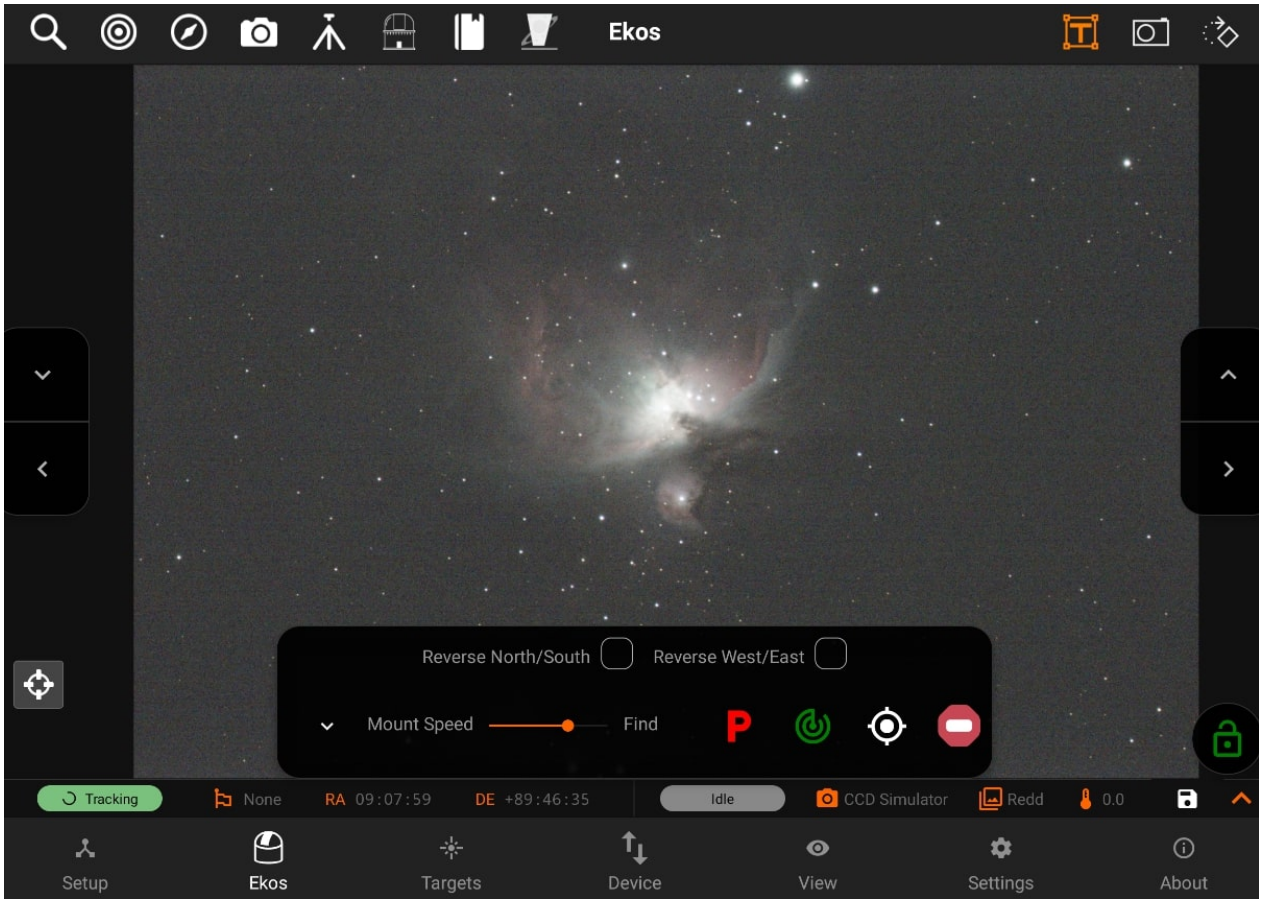
Unparking Your Mount

To unpark your mount, tap on the green button, it should turn red signifying that the mount is now UnParked, and the mount status bar shows Idle.



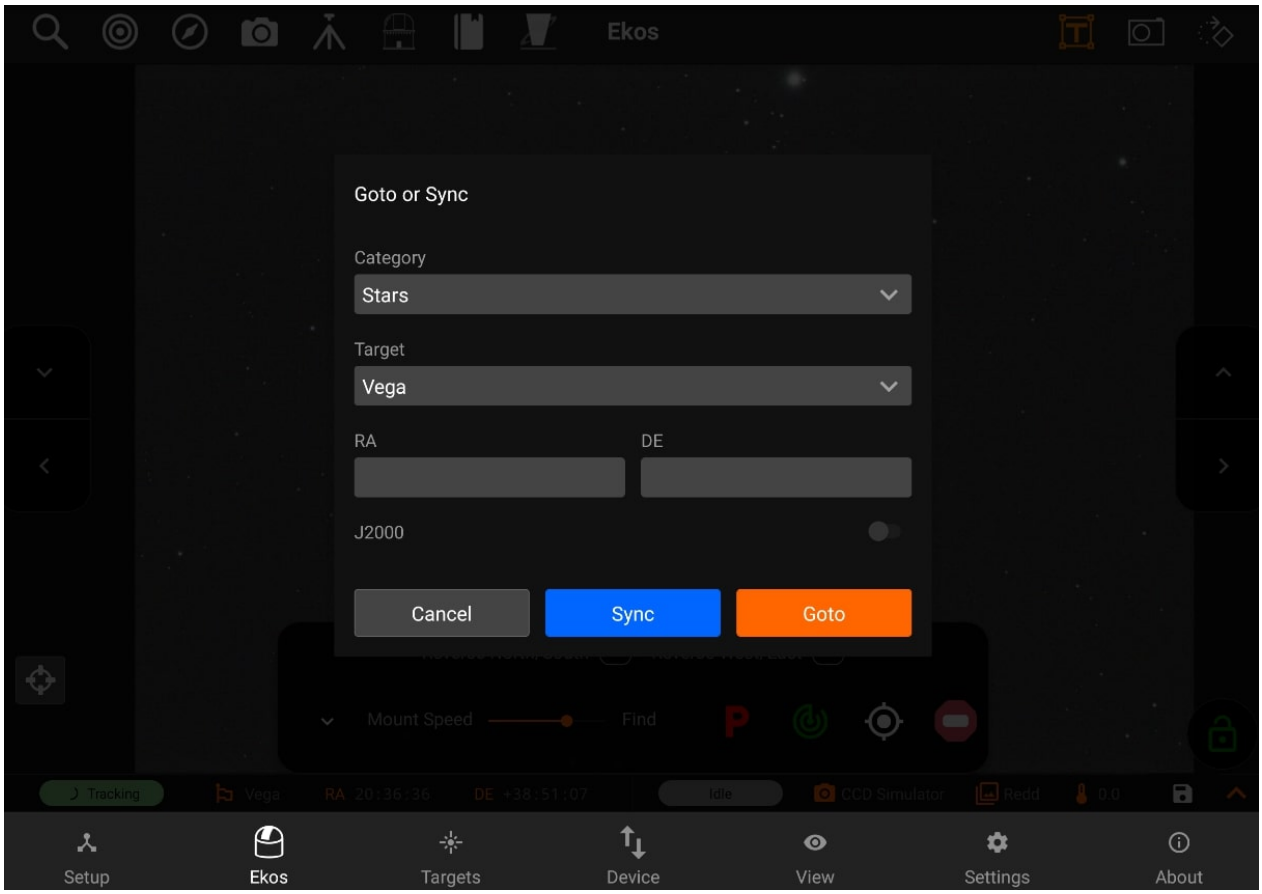
Tracking On/Off

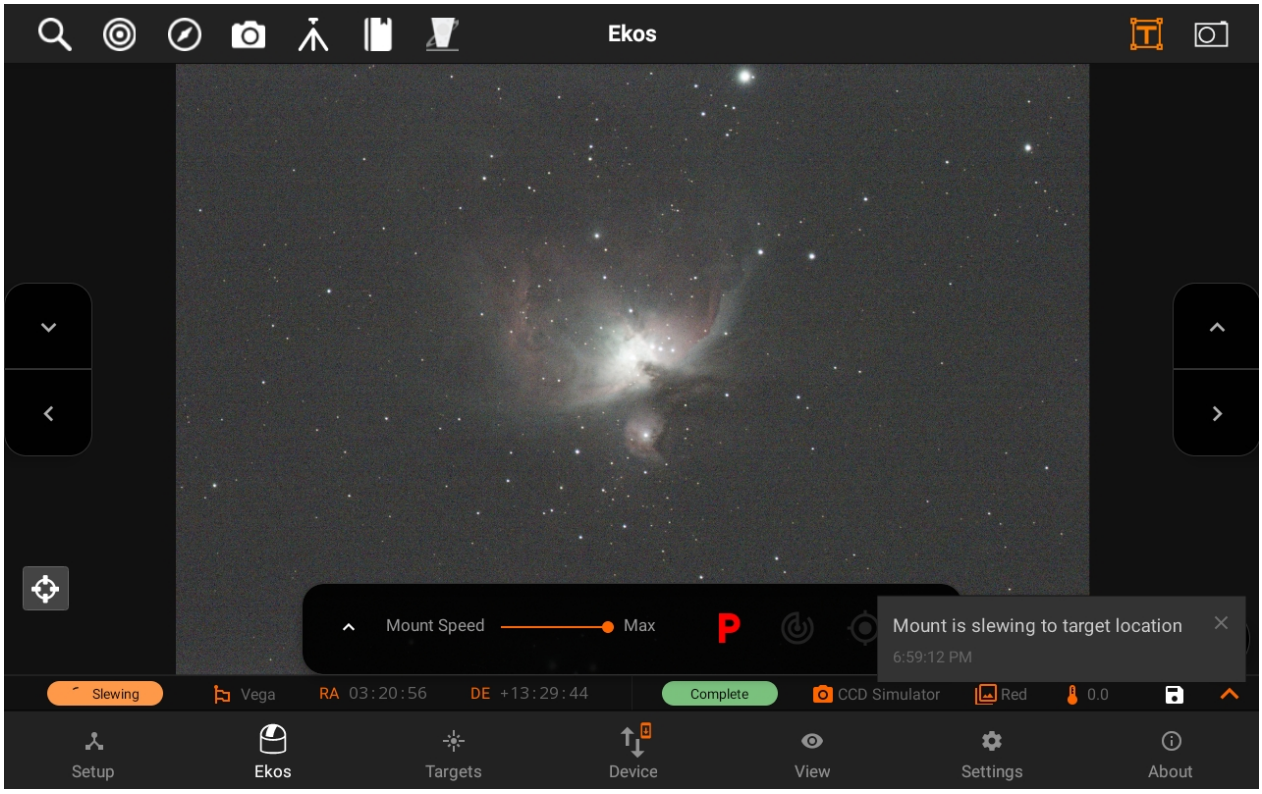
For mount that support tracking control, you can toggle tracking by clicking on button. If tracking is engaged, the icon turns to green and the mount status bar will show Tracking.



Goto or Sync

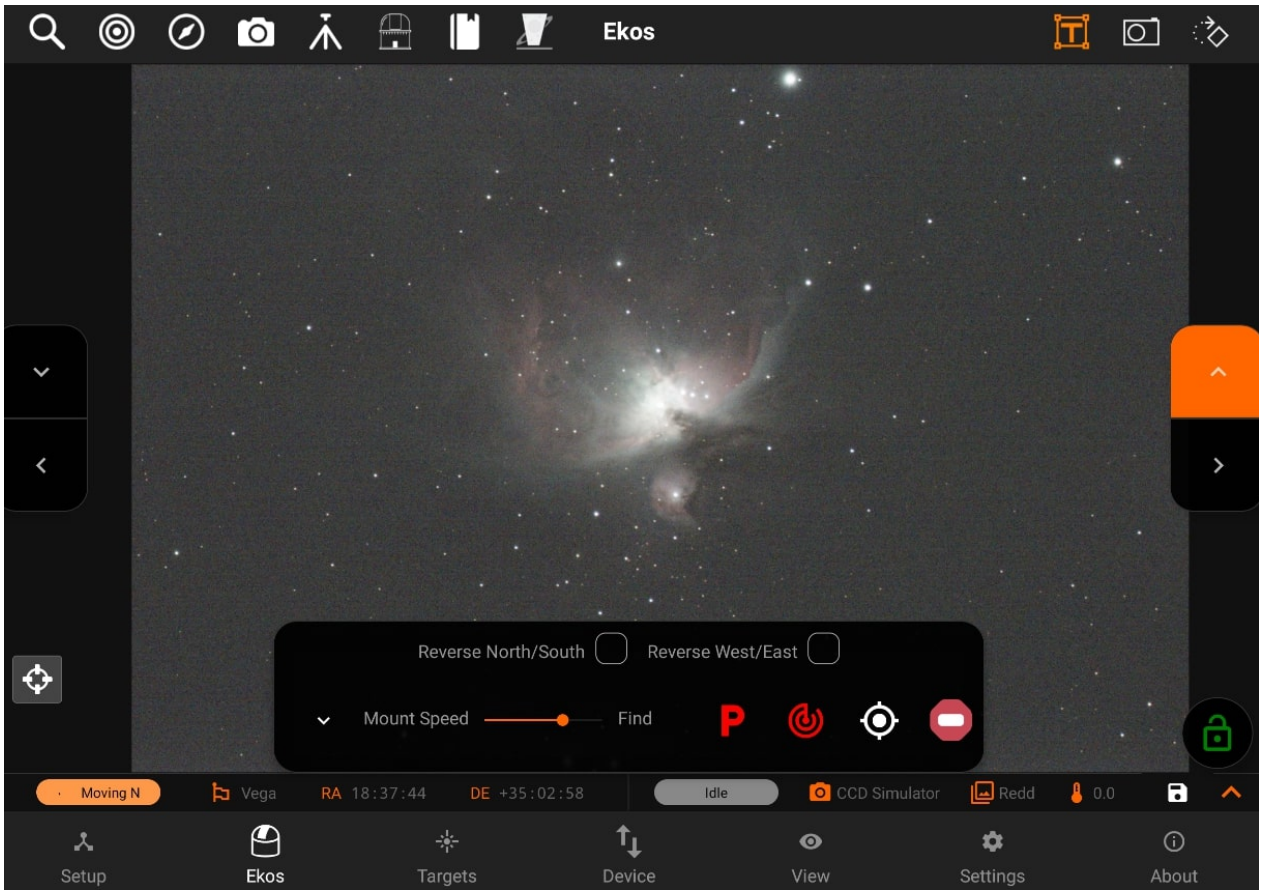
You can goto or sync by clicking on the GOTO button, a dialog will pop-up where you can goto or sync to your last target, choose one of your last recently used targets, or select and category and choose a new target.





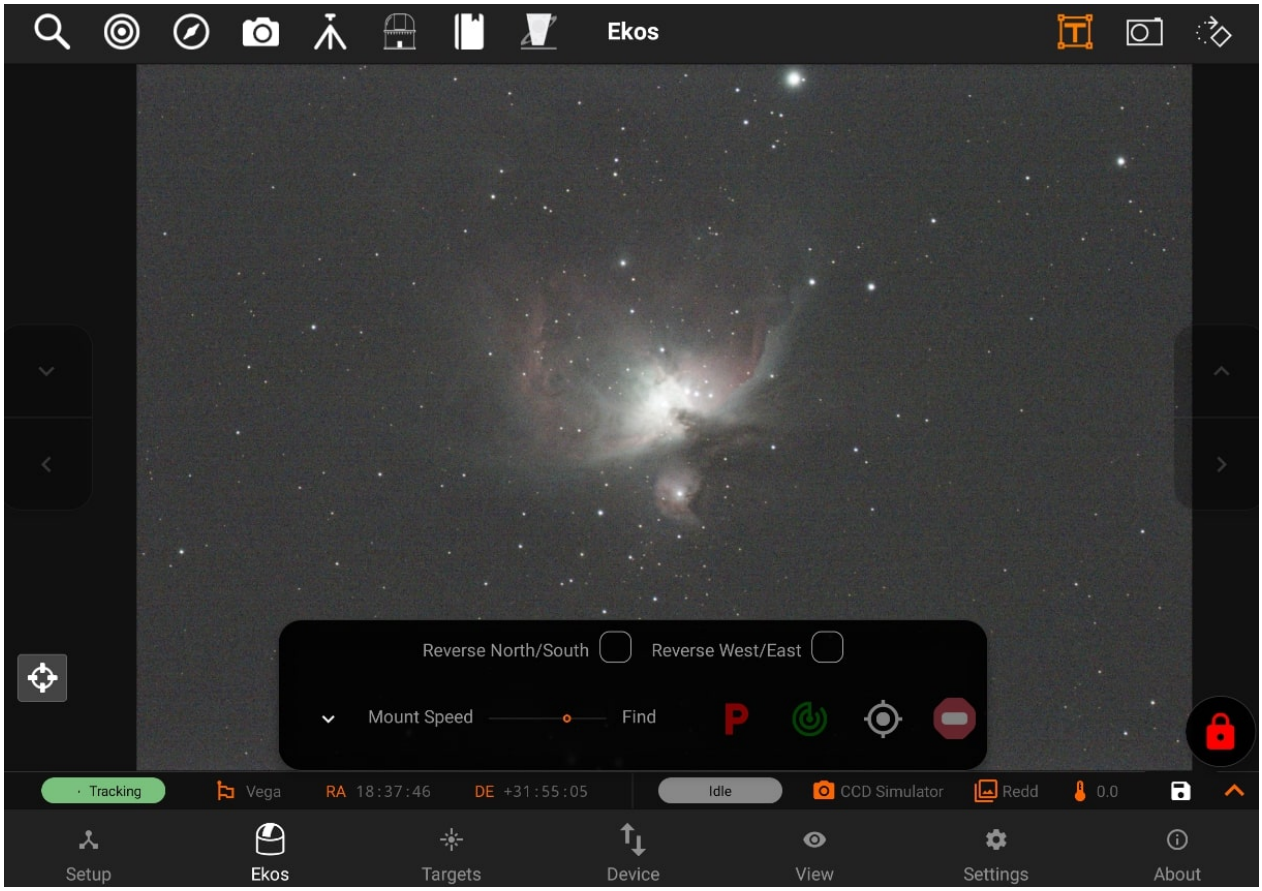
Moving to a specific direction manually

You can move your mount to a specific direction manually by using the Directional pads on the left and right side of the screen.



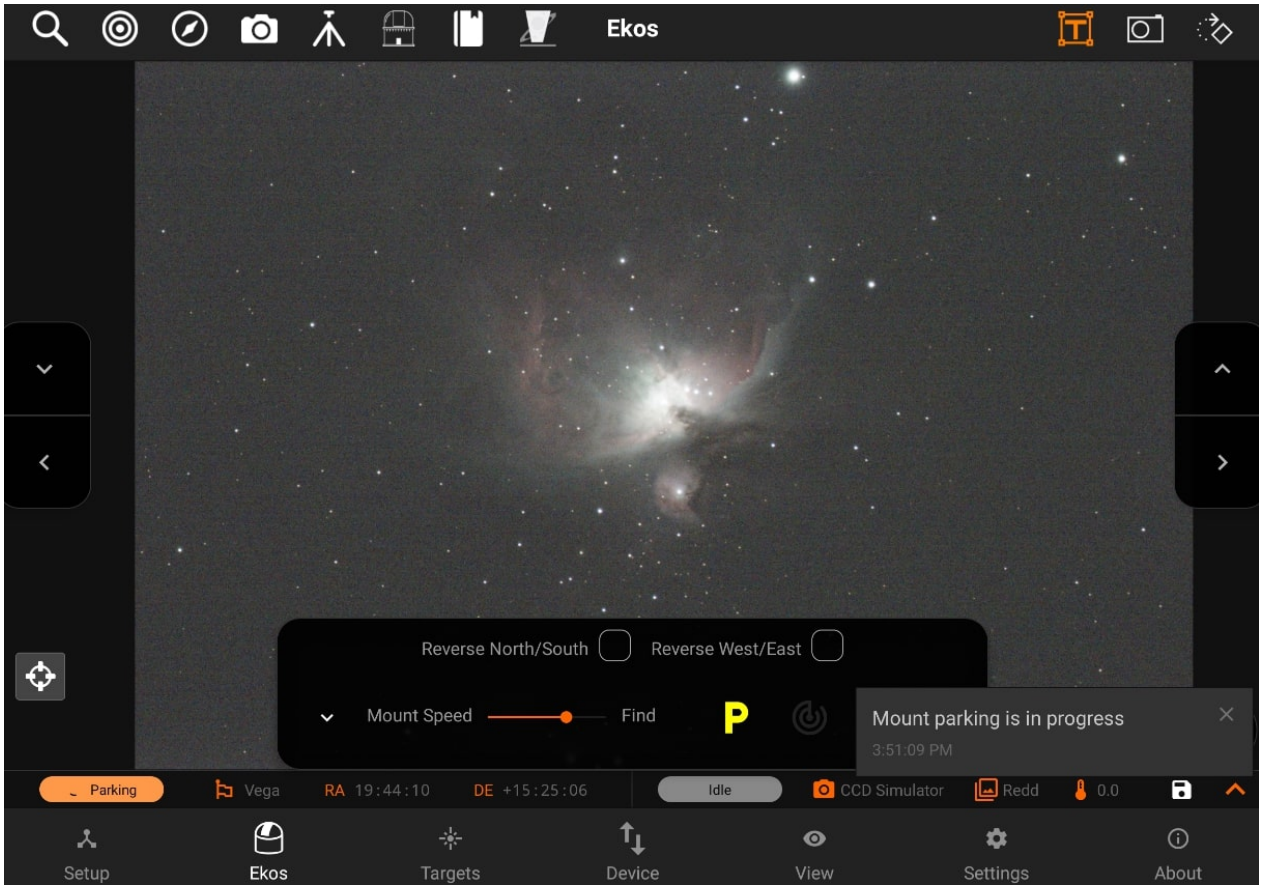
Locking Mount Controls

You can lock mount controls using the Lock button on the bottom-right of the screen. This will disable all the controls, and can be used to avoid any accidental touches.



Parking Your Mount

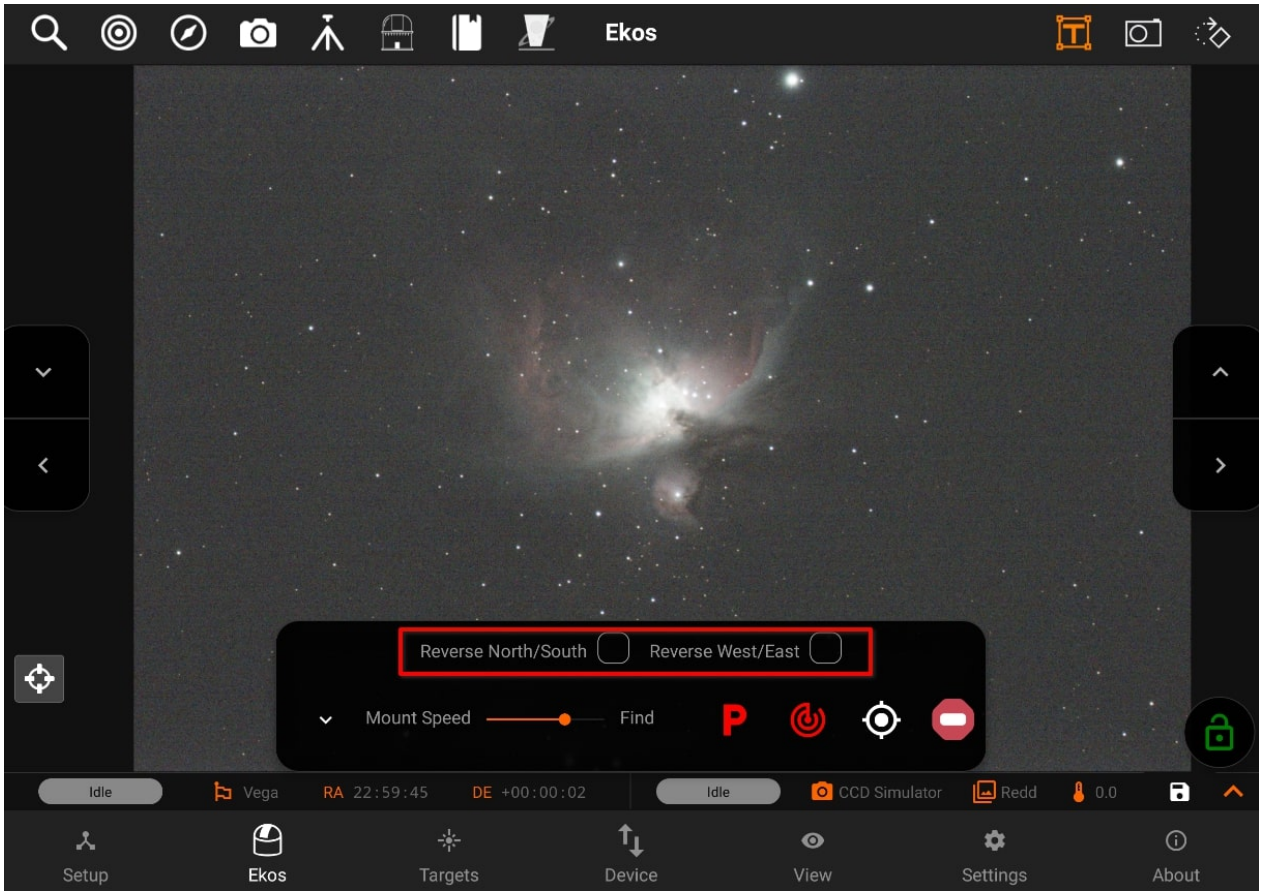
You can park your mount by clicking on the red button, this will turn the button to the yellow color while Parking your mount. After it is done parking, the button will turn to the color green, showing Parked status in the mount status bar.



Reverse Directions:

You can reverse the directions of your mount:

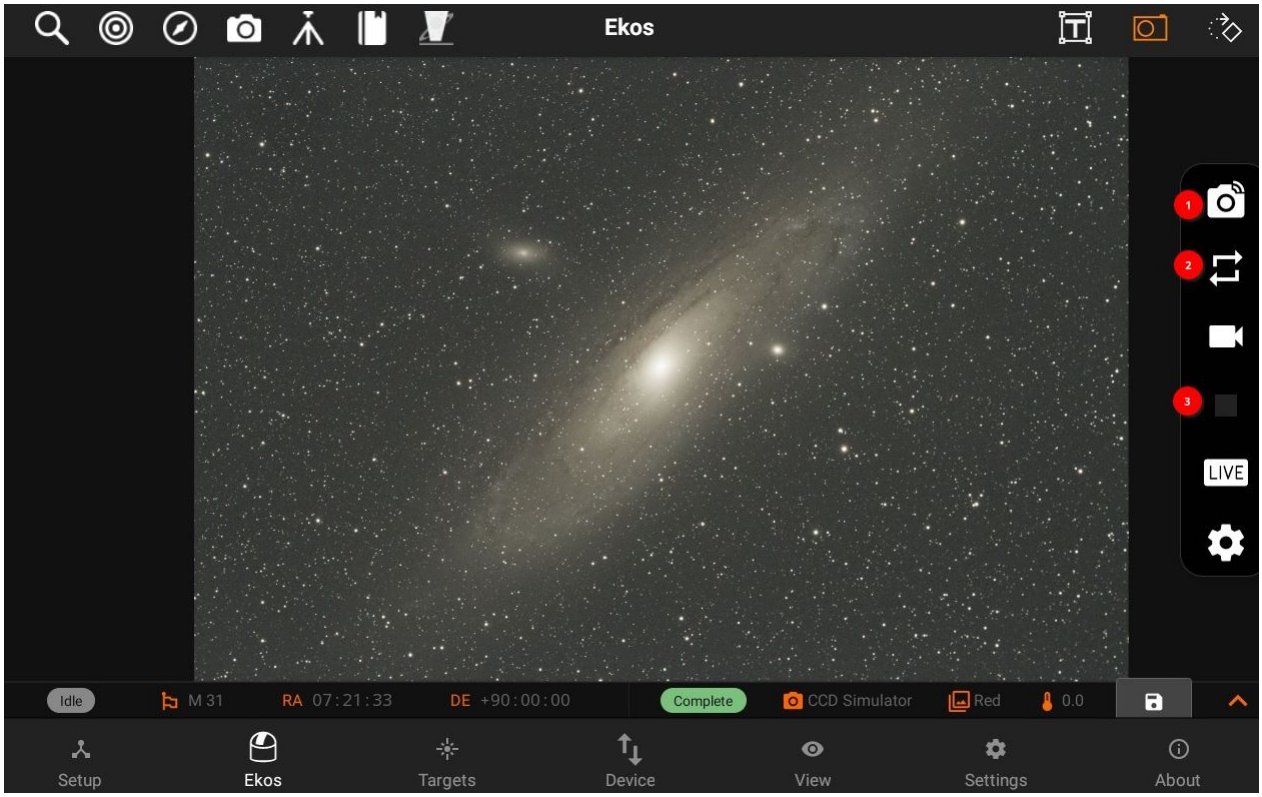
- North/South: Mount directions will be reversed for North/South when enabled.
- West/East: Mouth directions will be reveresed for West/East when enabled.



Camera

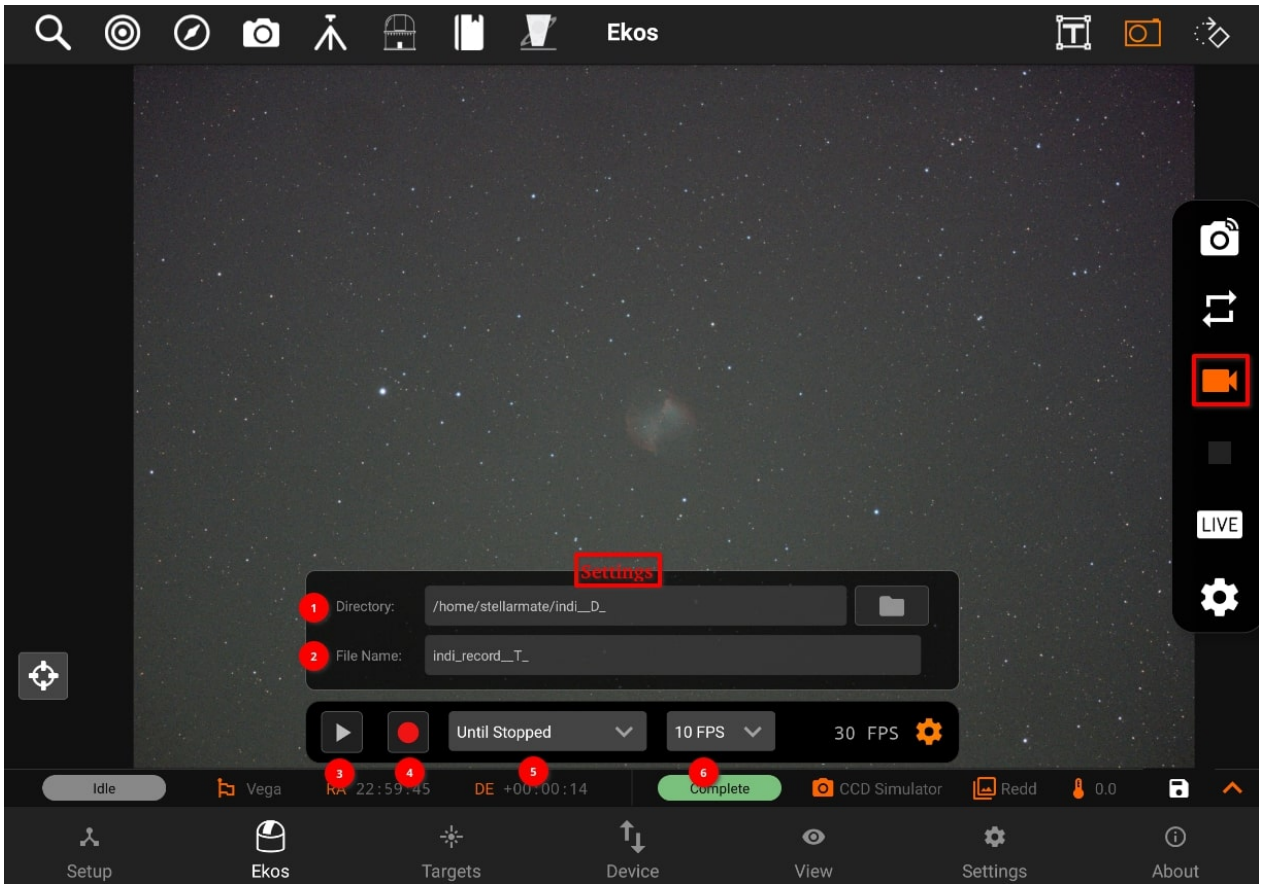
- Camera quick controls allows you to control your camera quickly and easily.
- You can quickly change Settings and capture a Preview image, or start a continuous loop Framing until explicitly stopped.
- Stream and Record videos if supported by your camera.
- Get amazing pictures with Livestacking

Preview & Framing



1. You can capture a preview image by tapping on the Camera button.
    - An animated circular progress icon will show the progress of the current capture and will show you when the image is being downloaded to the app by showing a green cloud download icon.
2. Looping can be done as well by tapping on the Loop button (repeat icon).
3. You can stop the capturing process by tapping on the Stop button anytime while it's capturing.

Video Recording



These are the following options in Video Recording:

1. Directory: Path of videos is set using Directory browser.
2. File Name: Set SER video file name. Record files may contain some patterns to make them dynamic.
    - _D_: For the date in YYYY-MM-DD
    - _H_: For time in HH:MM:SS.
    - _T_: For ISO8601 time stamp.
    - _F_: For filter name, if any.
3. Play: Enables the video streaming if supported by the camera.
4. Record / Stop: Starts the recording, if the recording is started. Icon will be changed to stop icon. So, you can stop the recording.
5. Until stopped: Select one from the predefined video durations or select Until Stopped to to make the recording continues until explicitly stopped.
6. FPS: Record stream until these many frames are captured

Videos are recorded as lossless SER format. By default, they are saved to the StellarMate Videos directly which can be accessed via Network share on Windows, Mac, and Linux.

Live Stacking

StellarMate App includes support for Live Stacking. Live stacking works by combining data from multiple images to increase the *Signal to Noise* ratio. This would reduce the overall noise in the image and increase the contrast of the objects in the frame. Faint objects like

galaxies and nebulae should pop up only after a few images are combined. As you continue to live-stack, the graininess of the image would be substantially reduced resulting in a crisp and smooth image.

The livestacked images are only as good as the data. Therefore, for Live-stacking to operate successfully, the following conditions must be met:

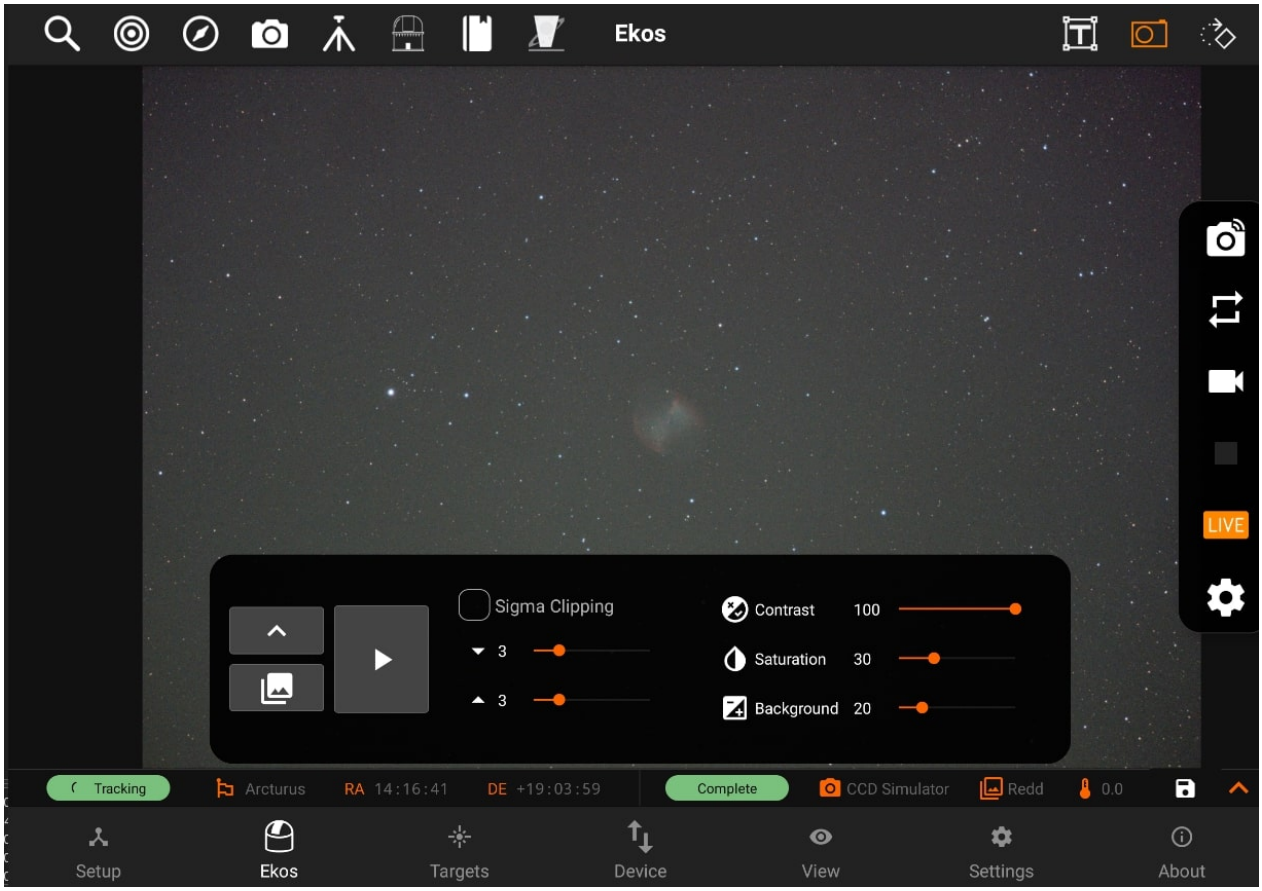
1. The image must be well-focused.
2. The image must contain sufficient stars for the algorithm to work. The livestacking algorithm inspects stars in each captured frame and performs the necessary star-alignment to compensate for any offsets or rotations among the captured images.
3. For exposures above 30 seconds, **you must have guiding activated**. Star trails tend to form with most consumer-grade mounts after usually 30 seconds. The maximum unguided exposures should be less than 30 seconds, or as appropriate given the tracking performance of the mount. Good Polar alignment significantly helps the livestacking performance.

Livestacking can be toggled directly or during the execution of a sequence job in the Capture module. When no sequence queue is running, the livestacker would trigger a capture loop using the primary camera in the Quick Controls Settings. For example, if the exposure duration was set to 5 seconds, then a 5-second capture loop is automatically started by the livestacker. The capture loop would run indefinitely until stopped by the user.

Alternatively, if a sequence queue is already running, then toggling the liverstacker would make it wait for the next frame to arrive before processing it.

In either case, the first frame is used to extract the reference stars information, and the actual stacking begins starting with the second frame.

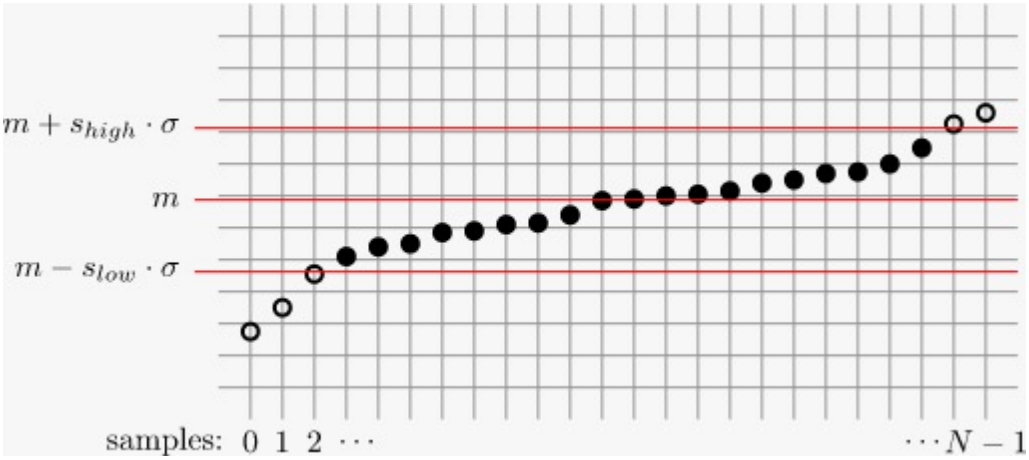
To toggle live stacking options, tap the **LIVE** button in the Camera Quick Controls. Tap the **Play** button to start the process. Livestacker utilizes a median stacking algorithm and automatic background extraction followed by contrast adjustments to bring out the details.



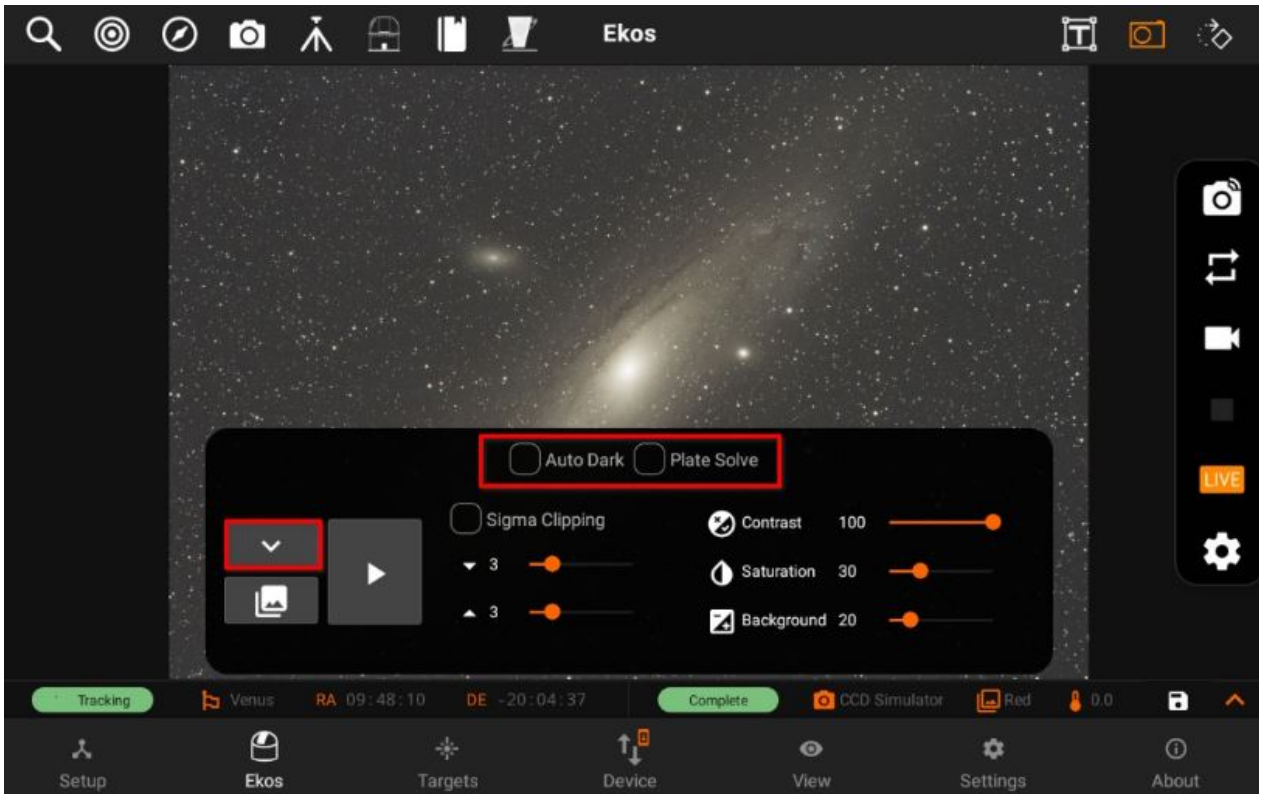
Sigma clipping helps with noise reduction during the stacking process. The mean and standard deviation are calculated from the first three captures. Subsequent captures are then sigma-clipped to remove any outliers outside the envelope of acceptable ranges around the mean.

The diagram below shows how values outside the envelope are masked and not included in the stacking process. You can control the upper and lower limits of this envelope by adjusting the s_{lower} and s_{upper} (default is set to 3) parameters in the app.

The *contrast* and *saturation* controls do not affect the stacking process itself, but apply some cosmetic adjustments to the final image to improve its quality. Some non-nebulae objects might benefit from the automatic background subtraction controlled by the Background parameter. Increasing this value would attempt to compensate for sky glow in the background, but might also result in loss of detail.



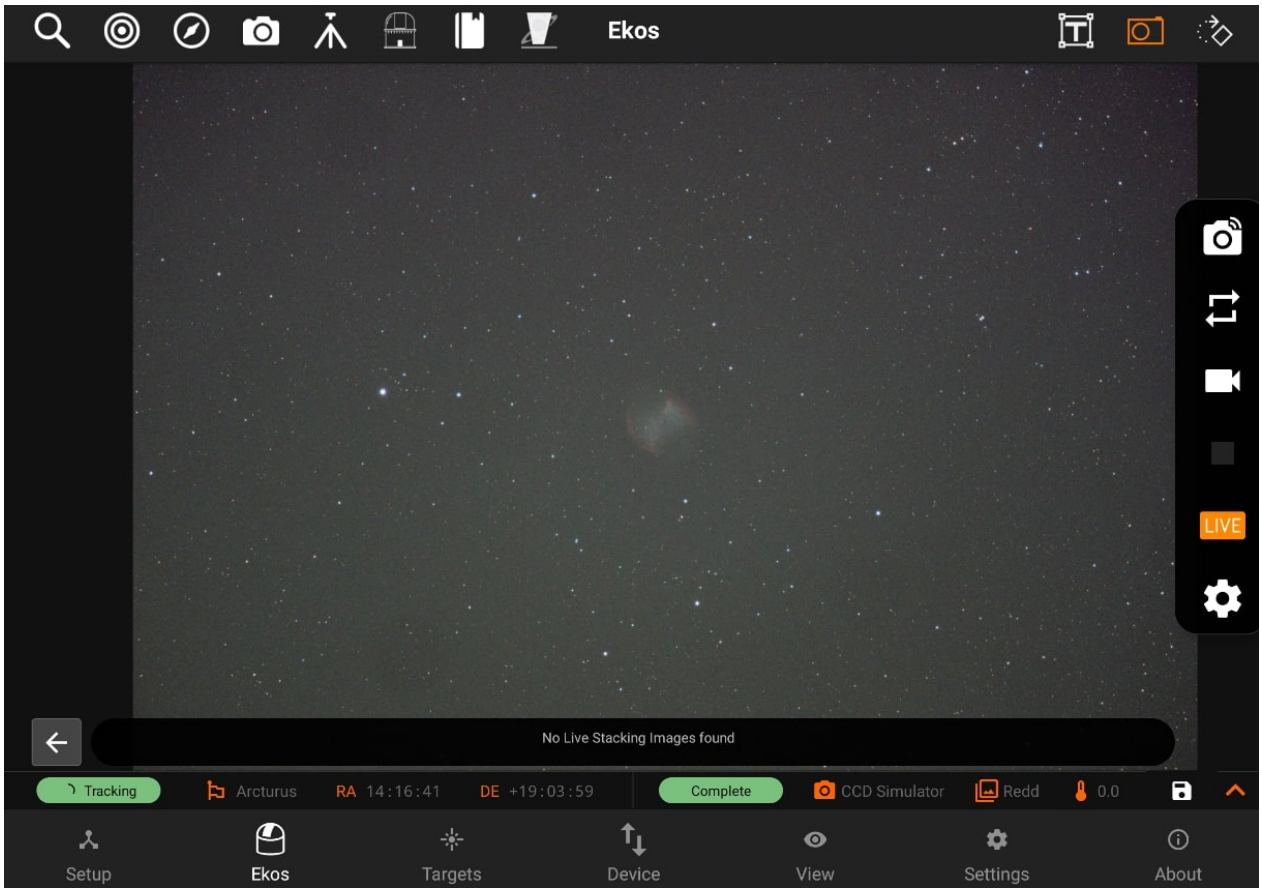
https://pixinsight.com/doc/tools/ImageIntegration/ImageIntegration.html

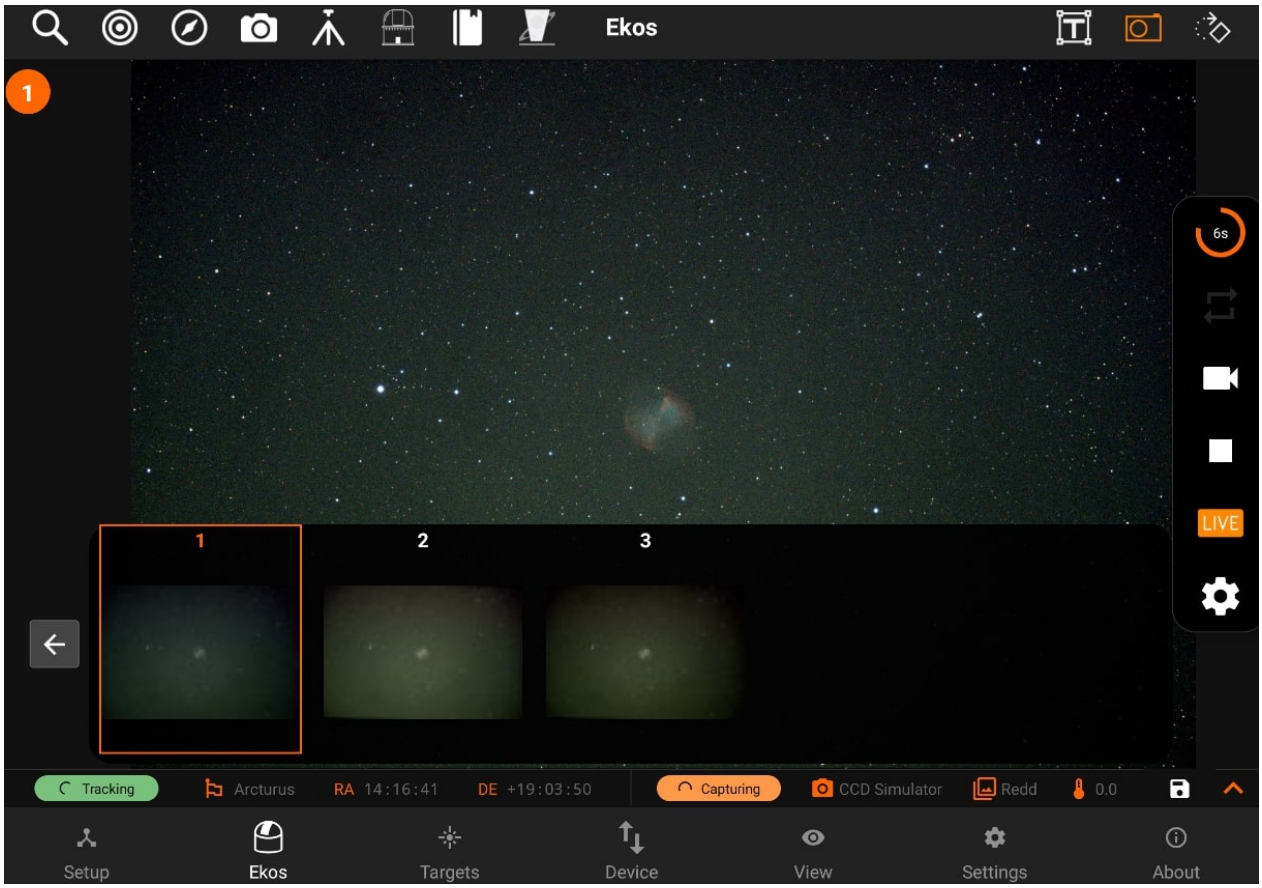


Auto Dark: Subtract dark frames when applicable.

Plate Solve: Solve each frame and align frames accordingly (beta).

When Livestacked images are received, they are displayed in the main view with a thumbnail carousel at the bottom. Each image is numbered sequentially. To ensure proper performance, only the last 10 captured images are available in the carousel. To view a specific image, simply tap its thumbnail in the carousel. When the livestacking is restarted again, all images would be cleared.


Ekos
LIVE
No Live Stacking Images found
Tracking
Arcturus
RA 14:16:41
DE +19:03:59
Complete
CCD Simulator
Redd
0.0
Setup
Ekos
Targets
Device
View
Settings
About



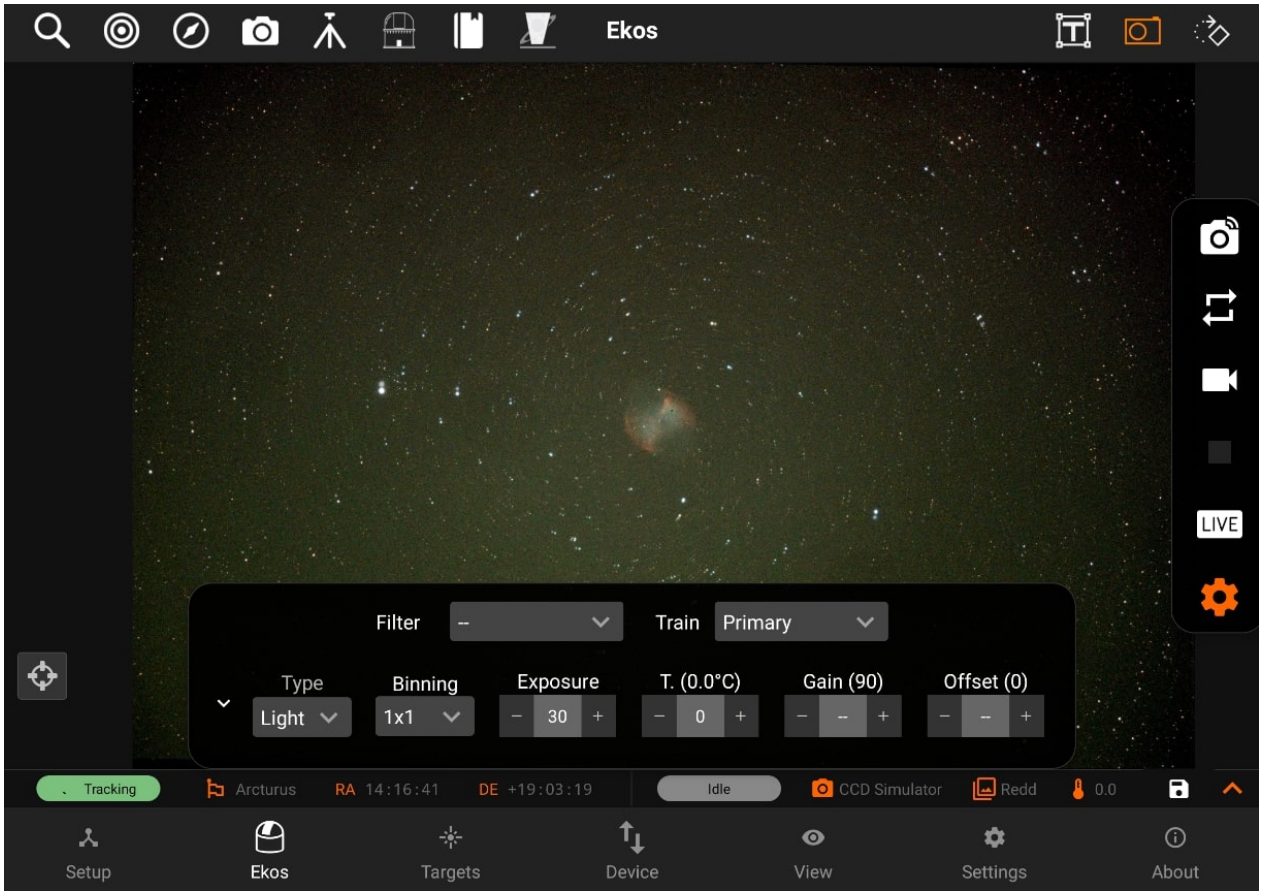
All livestacked images are saved as JPG in StellarMate Pictures directory, where they can be accessed later via the Gallery, StellarMate network share, or FTP.

To save an image in the tablet/phone storage, tab the Disk icon in the camera's info bar.

Settings

You can quickly take custom preview captures or loop frames by tweaking the settings in the quick settings bar by tapping on the Quick Settings button. The quick settings bar can be expanded by tapping on the up expand arrow on the left side of the bar.
Different settings can be changed for a specific camera i.e Frame type, Binning, Exposure, Temperature, Gain & Offset.

Note: Choosing a temperature will set the temperature immediately.



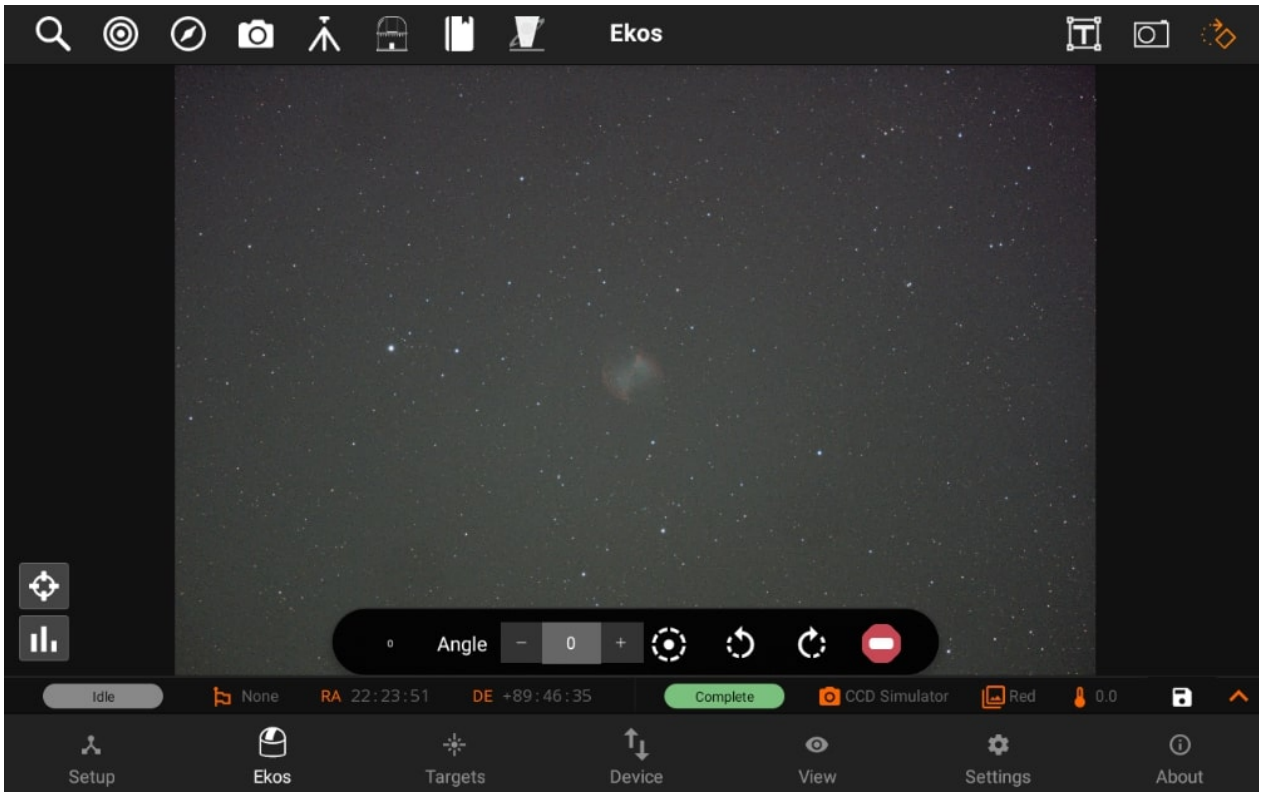
Rotator

Rotator quick controls allows you to control your rotator quickly and easily, it has the following features:

- Display Current Angle (please note all angles are in degrees)
- Goto absolute angle
- 10-step Counter-ClockWise Movement
- 10-step ClockWise Movement
- Abort Motion

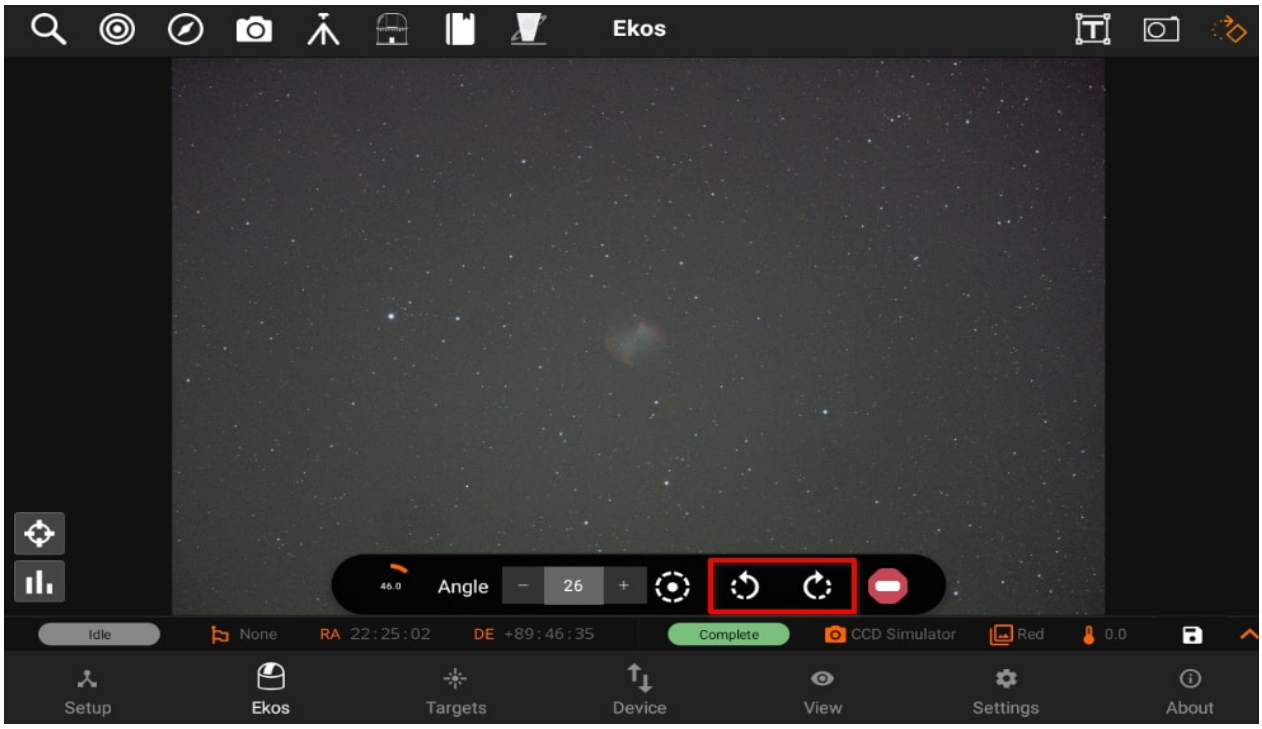
Going to absolute angle

You can go to an absolute angle by tapping on the textbox and typing it the angle you want to go to, then tap on the Goto button next to the textbox on the right. You will be able to see the angle display view changing along the way to its final angle.



Going to an angle position by steps

You can rotate the rotator to a different angle using the CW and CCW rotation buttons, which will change the rotation by 10 steps depending on the direction chosen.



Modules

StellarMate App has a total of six Ekos Modules which are used to control various

astronomical instruments such as: CCD cameras, DSLR cameras, mounts/telescopes, dustcaps, domes, roll-off shutters, filter wheels, rotators, focusers, and more.

Focus

Align

Guide

Capture

Mount

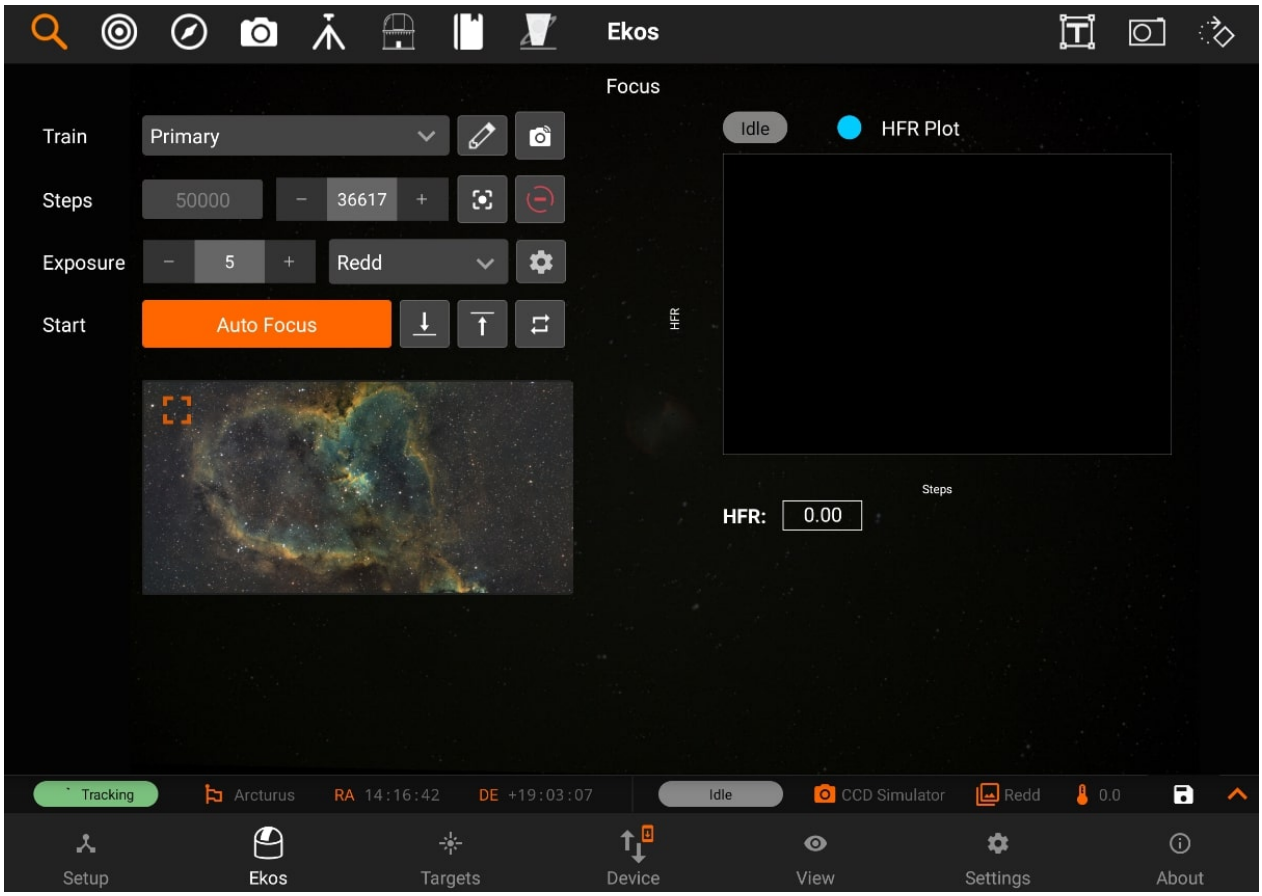
Observatory

Scheduler

Focus

The Focus module allows you to do focusing using your focuser, it has the following features:

- Manage / Select Optical trains.
- Goto absolute motor step
- In/Out step movement: can be edited in Mechanics settings.
- Preview
- Loop
- Advanced options (settings, process, mechanics)
- Image viewer
- HFR Plot

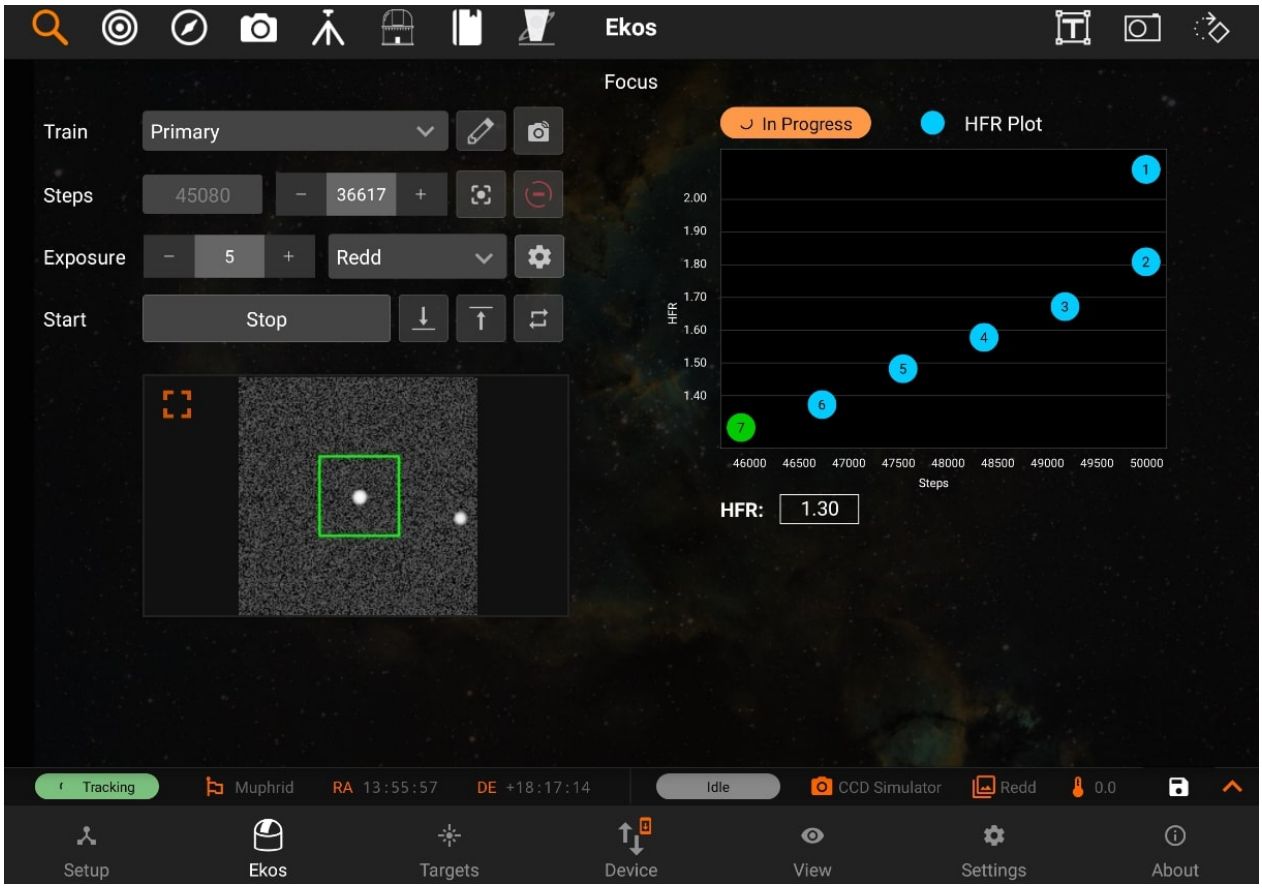


Train

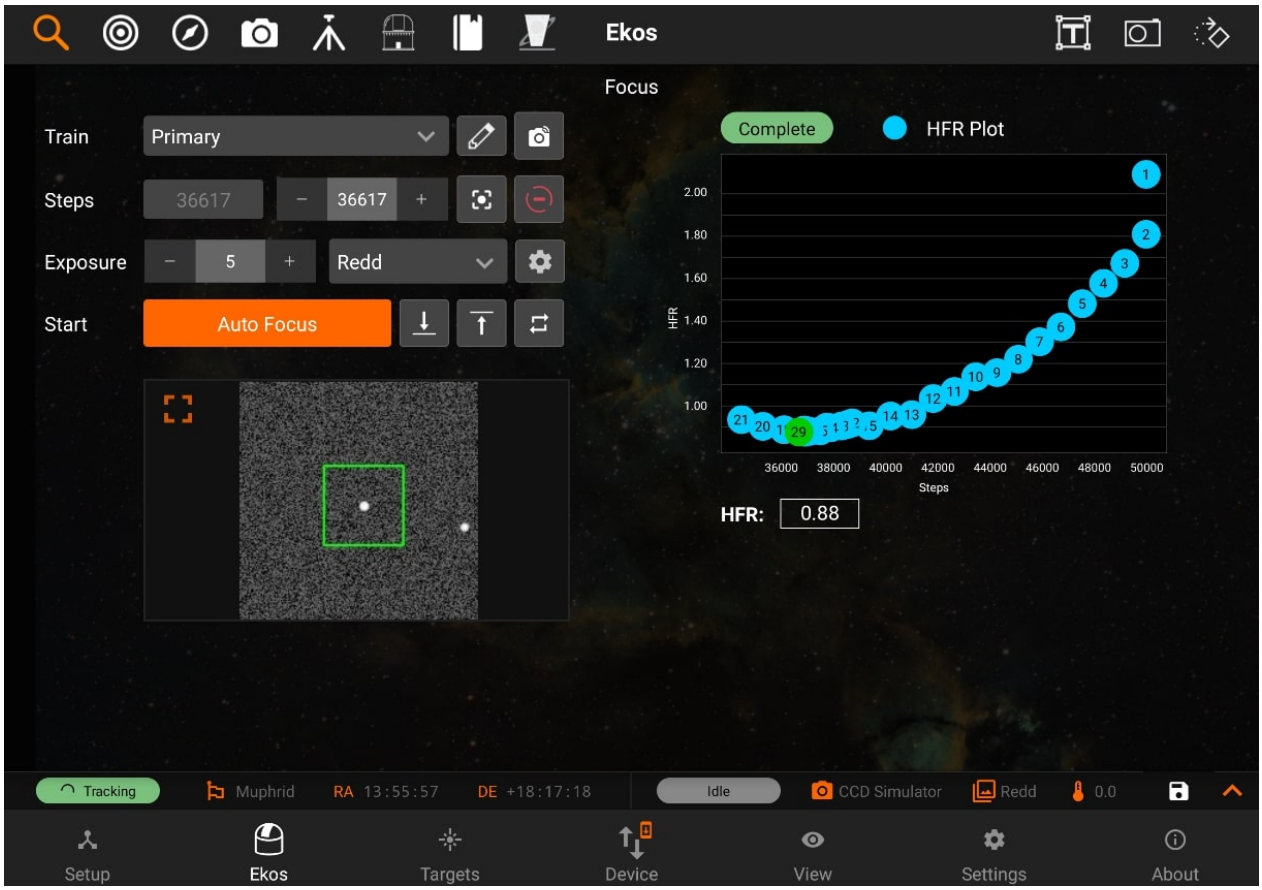
You can Select / Edit a train specifically for Focus module. Each module has it's own train. Visit Optical trains topic for more.

Auto focusing

You can do auto focusing by either keeping the preset setting as default or choosing an existing preset and then tapping on Auto Focus. The image viewer will show you the current image being captured by your camera, with a square around the detected star. An HFR Plot is also available on the right side of the screen to inform you about the current motor step and the HFR (Half-Flux-Radius). The blue points are the previous focus points, and the green point is the latest focus point. The HFR value is displayed under the HFR Plot.



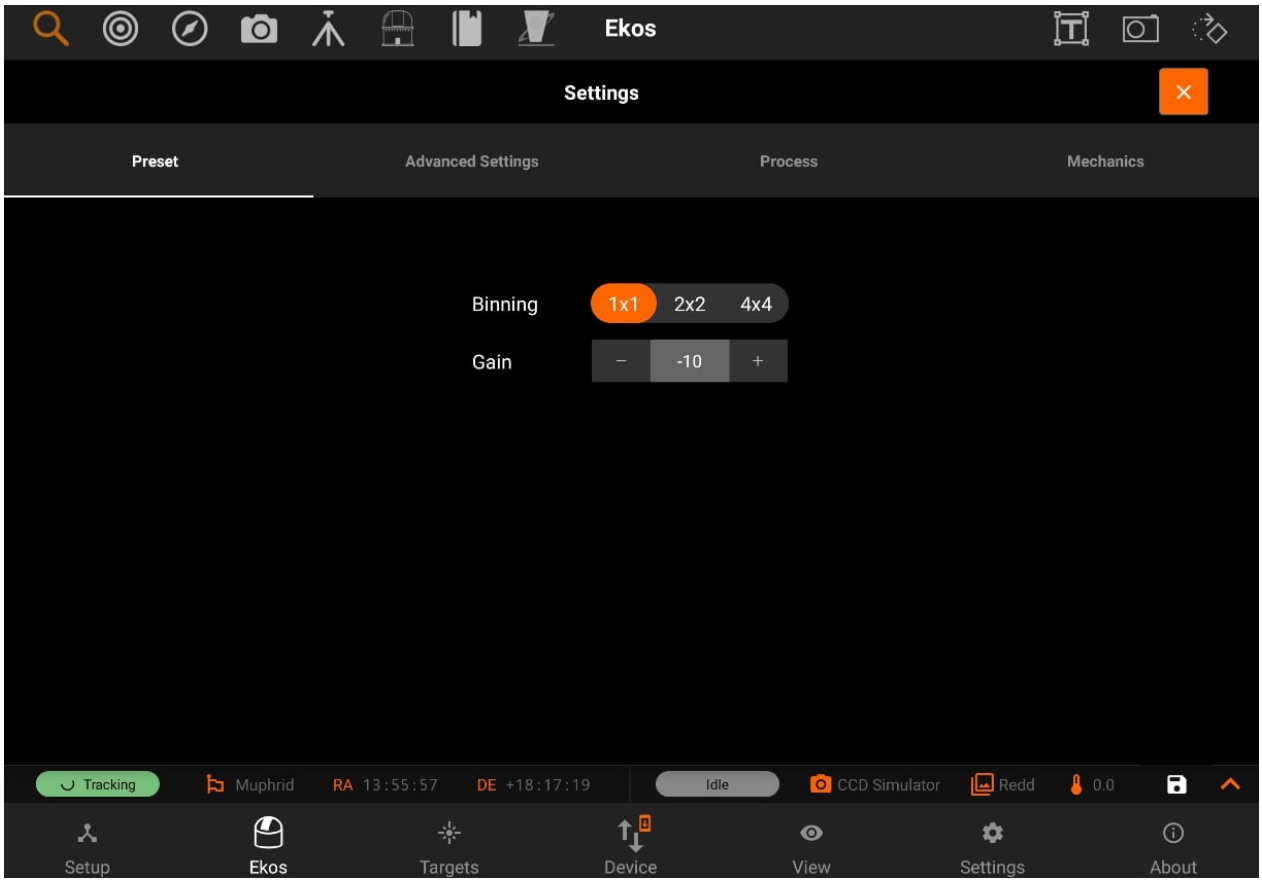
When the Auto Focusing is done, the status badge above the HFR Plot will turn to green and say "Complete".



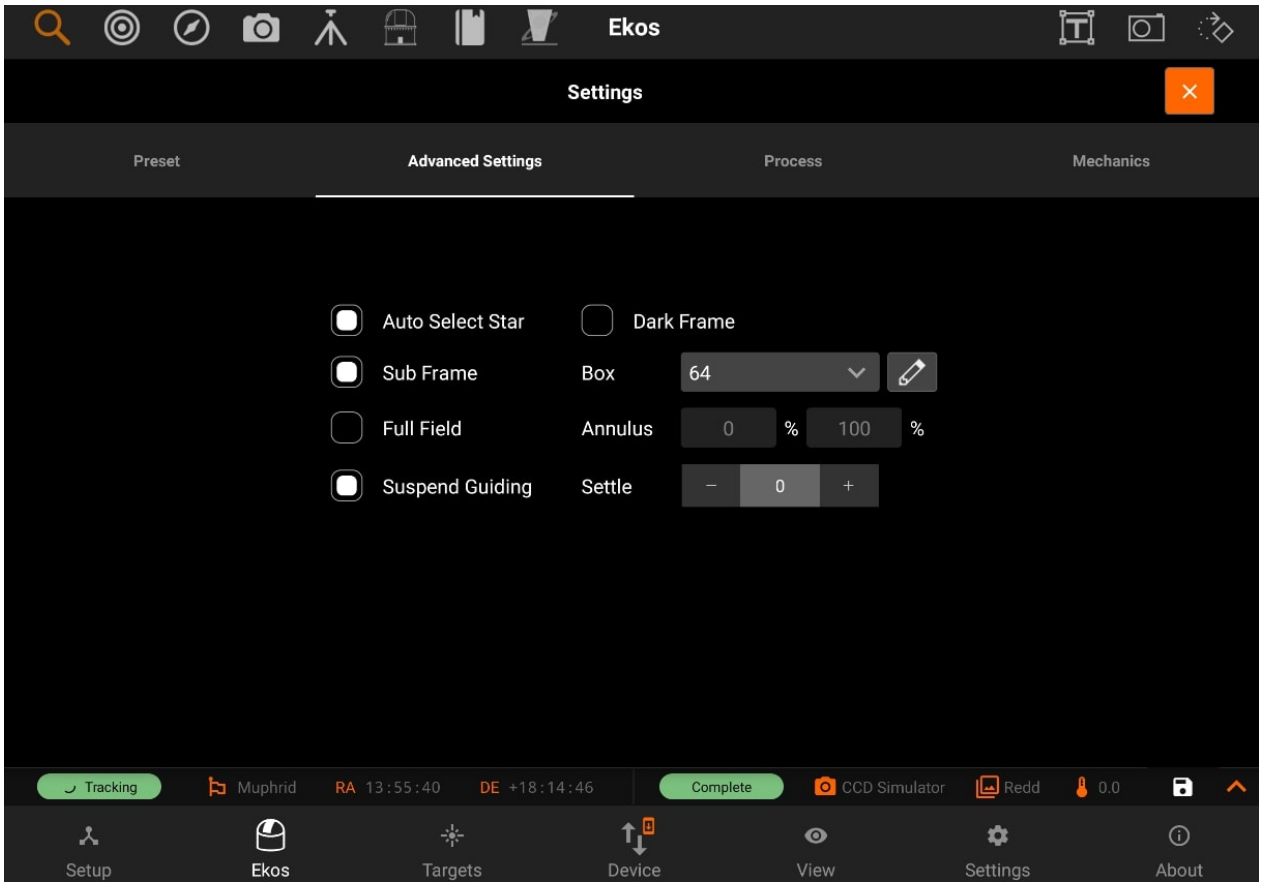
Settings

You can change lots of settings by going to the Settings: Preset, Process, and/or Mechanics setting pages.

Preset: Camera settings to adjust binning and Gain.



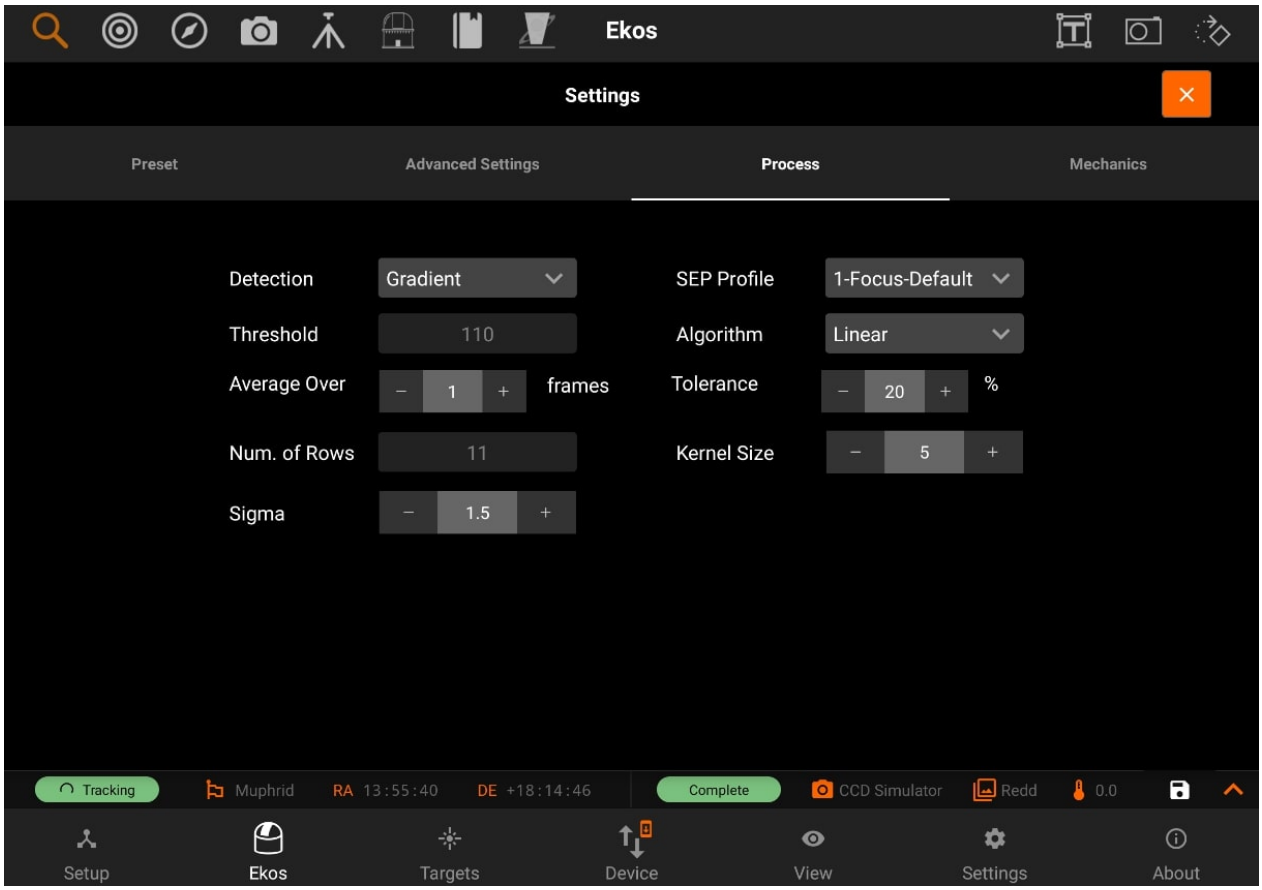
Advanced setting



The Settings page has the following options:

- Auto Select Star: Automatically detect and select best star for guiding in the image.
- Subframe: Subframe around the focus star during the autofocus procedure. Enabling subframing can significantly speed up the focus process.
- Full field: Measure average HFR from all stars combined in a full frame. This method defaults to the Centroid detection, but can use SEP detection too. Its performance decreases as the number of stars increases.
- Suspend Guiding: Suspend Guiding while autofocus in progress. If the focus process can disrupt the guide star (e.g. when using Integrated Guide Port IGP whereas the guider is physically attached to the primary CCD), then it is recommended to enable this option. When using Off-Axis guider, then this option is not necessary.
- Dark Frame: Check this option to capture a dark frame if necessary and perform dark-frame subtraction. This option can be useful in noisy images.
- Box: Sets the box size used to enclose the focus star. Increase if you have very large stars.
- Annulus: During full field focusing, stars which are inside this percentage of the frame are filtered out of HFR calculation (default 0%). Detection algorithms may also have an inherent filter.
- Settle: Sets the amount of seconds to wait before resuming guiding.

Process



The Process page has the following options:

- Detection: Select star detection algorithm. Each algorithm have its strengths and weaknesses. It is recommended to keep the default value unless it fails to properly detect stars.
    - SEP: Source Extractor and Photometry, an efficient source detection method based on Source Extractor (Bertin and Arnouts 1996; Bertin 2016). See SEP: Source Extractor as a library in the Journal of Open Source Software.
    - Centroid: a source detection based on estimating star mass around signal peaks.
    - Gradient: a single source detection based on the Sobel filter. Initial or full-field analysis will use SEP instead of this method.
    - Threshold: a single source detection based on pixel values. Initial or full-field analysis will use SEP instead of this method.
    - Bahtinov: This is useful for users who do not have a motorized focuser and prefer to focus manually with the aid of a Bahtinov Mask. After capturing an image in the focus module with the Bahtinov mask algorithm selected, Ekos would analyze the images and stars within it. If Ekos recognizes the Bahtinov star pattern, it will draw lines over the star pattern in circles on the center and on an offset to indicate the focus.
- Threshold: Threshold percentage value is used for star detection using the Threshold detection algorithm. Increase to restrict the centroid to bright cores. Decrease to enclose fuzzy stars.
- Effect: Apply filter to image after capture to enhance it for preview purposes. It is highly advisable to turn off any effects during the focusing process as it may interfere with HFR calculations.
- Kernel size: This is the gaussian blur kernel size. Used for blurring the image before

for instance the Bahtinov edge detection.

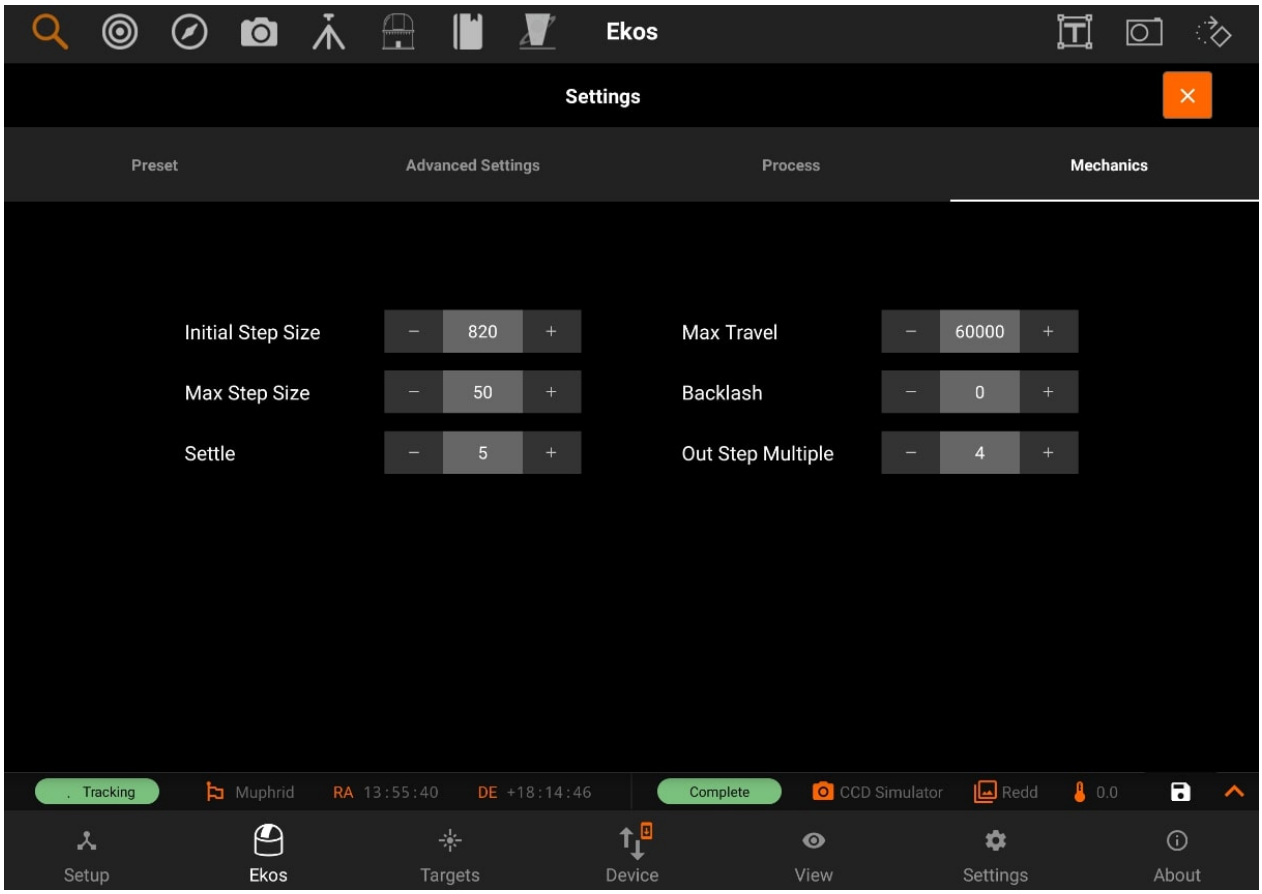
- Sigma: This is the gaussian blur sigma value. Used for blurring the image before for instance the Bahtinov edge detection.
- Algorithm: Select the autofocus process algorithm:
    - Iterative: Moves focuser by discreet steps initially decided by the step size. Once a curve slope is calculated, further step sizes are calculated to reach optimal solution. The algorithm stops when the measured HFR is within percentage tolerance of the minimum HFR recorded in the procedure.
    - Polynomial: Starts with iterative method. Upon crossing to the other side of the V-Curve, polynomial fitting coefficients along with possible minimum solution are calculated. This algorithm can be faster than purely iterative approach given a good data set.
    - Linear: Samples focus inward in a regular fashion, using 2 passes. The algorithm can be slow, but it is more resilient to backlash. Start with the focuser positioned near good focus. Set Initial Step Size and Max Travel for the desired sampling interval and range around start focus position. Tolerance should be around 5%.
- Tolerance: The tolerance percentage values decides when the autofocus process stops in the Iterative algorithm. During the autofocus process, HFR values are recorded, and once the focuser is close to optimal position, it starts measuring HFRs against the minimum recorded HFR in the sessions and stops whenever a measured HFR value is within % difference of the minimum recorded HFR. Decrease value to narrow optimal focus point solution radius. Increase to expand dsolution radius.

Caution

Setting the value too low might result in repetitive loop and would most likely result in a failed autofocus process.

- Average over: Sets the number of frames to capture in order to average the HFR value at the current focuser position.
- Num. of rows: The number of rows set in this field will be combined in the Bahtinov max average calculation. Changing this value might help to match the Bahtinov lines on the star pattern more accurately.

Mechanics



The Mechanics page has the following options:

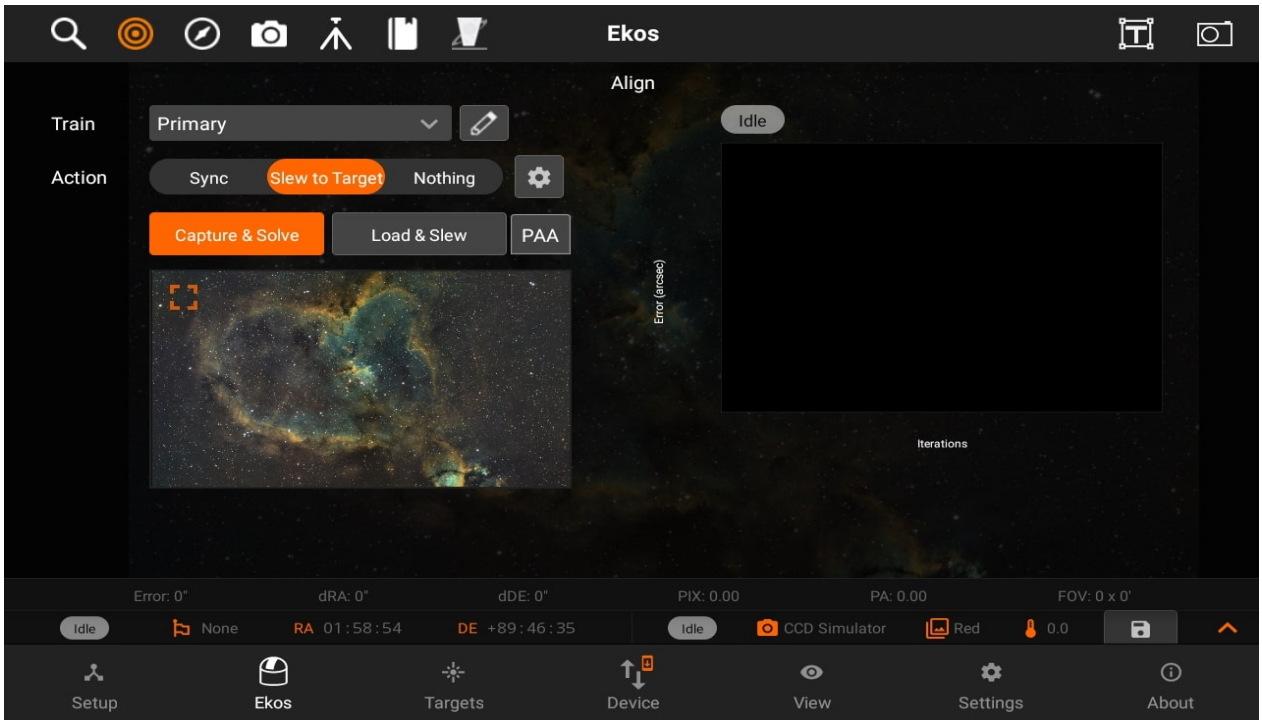
- Initial Step size: Initial step size in ticks to cause a noticeable change in HFR value. For timer based focuser, it is the initial time in milliseconds to move the focuser inward or outward.
- Max Step size: The maximum single step size the algorithm is allowed to command as it searches for the critical focus zone. The calculated step size would be limited to this maximum value.
- Settle: Sets the amount of seconds to wait after moving the focuser before capturing the next image during Auto Focus.
- Max Travel: Maximum travel in ticks before the autofocus process aborts.
- Backlash: Number of average frames to capture. During each capture, an HFR is recorded. If the instantaneous HFR value is unreliable, you can average a number of frames to increase the signal to noise ratio.
- Out Step Multiple: This is the number that is multiplied by initial-step-size to get the number of outward steps that the Linear Focus algorithm moves away from the initial position at the start of focusing.

Align

The Align module enables highly accurate GOTOs and dead-center target images by utilizing plate-solving. The process starts with capturing an image and plate-solving it to get the exact sky coordinates. Once the coordinates are obtained, the mount is synchronized and then commanded to slew to the correct target position. This cycle repeats until the mount is within a few arcsecs from the target.

It has the following features:

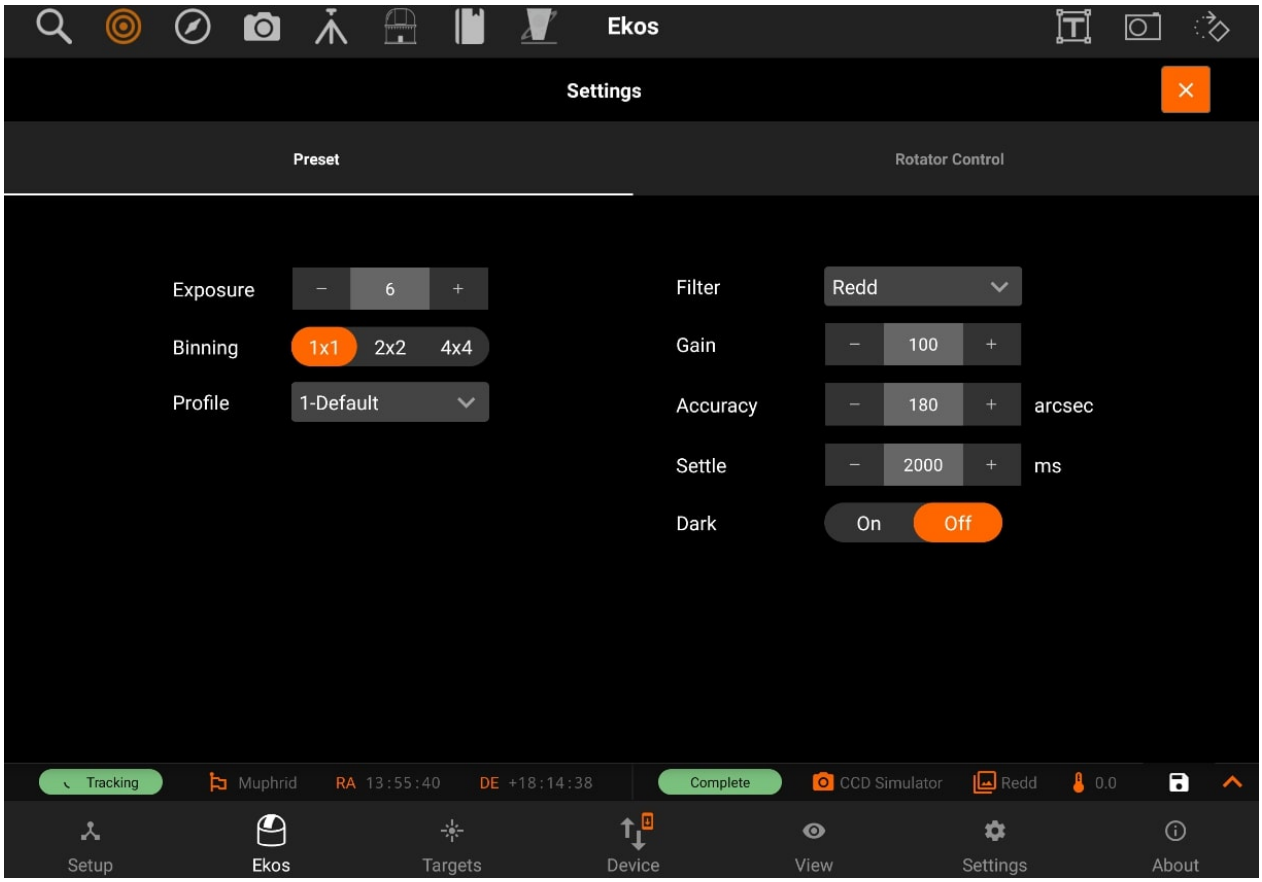
- Manage / Select Optical trains.
- Three Actions: sync, slew to target or do nothing.
- Polar Alignment Assistance
- Capture & Solve
- Load and Slew
- Image Viewer
- Alignment Plot



Train

You can Select / Edit a train specifically for Align module. Each module has it's own train. Visit Optical trains topic for more.

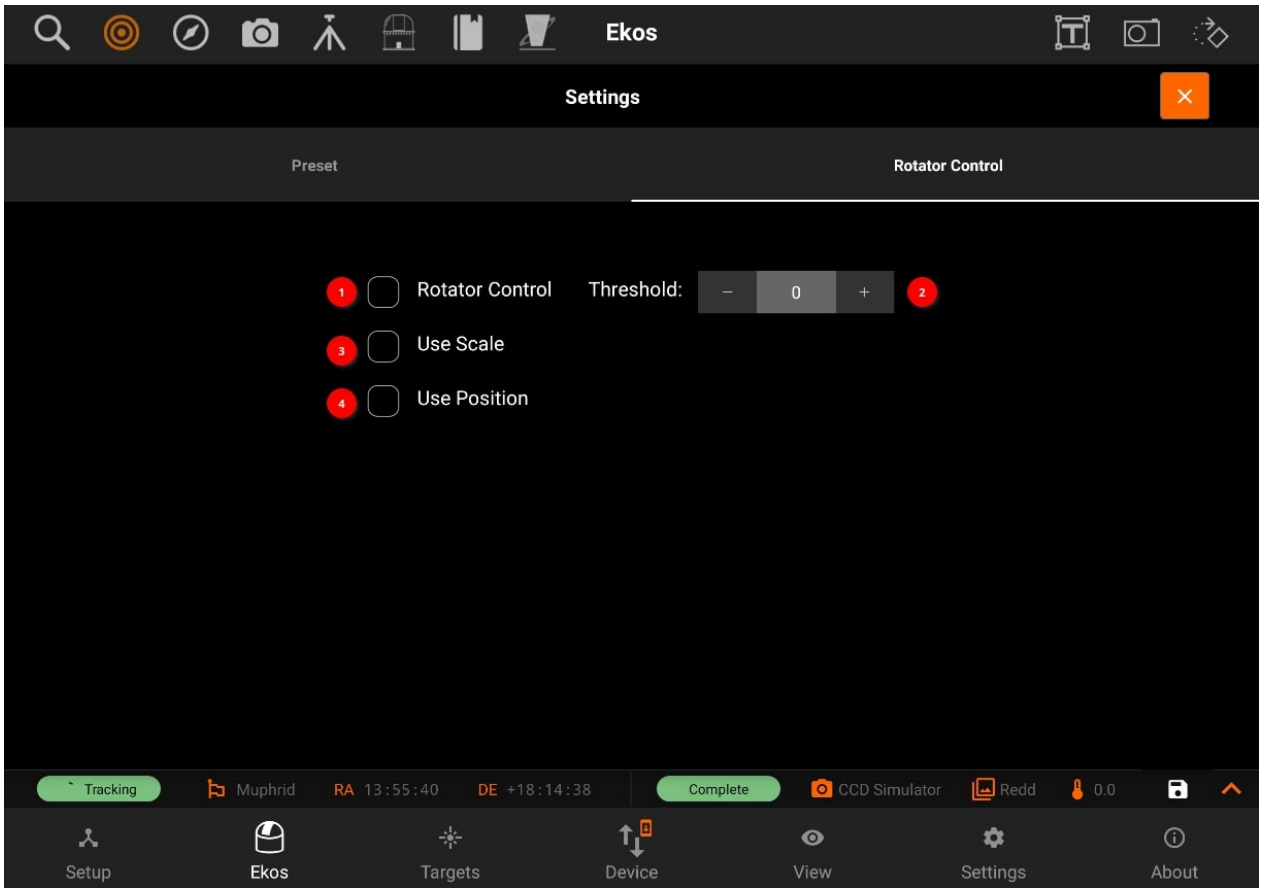
Preset Settings



Preset settings has the following structure:

1. Exposure
2. Binning
3. Filter
4. Gain/ISO
5. Accuracy: Acceptable difference between reported telescope coordinate and actual solved coordinates
6. Settle: amount of time to allow mount to settle (in milliseconds)
7. Dark Frame

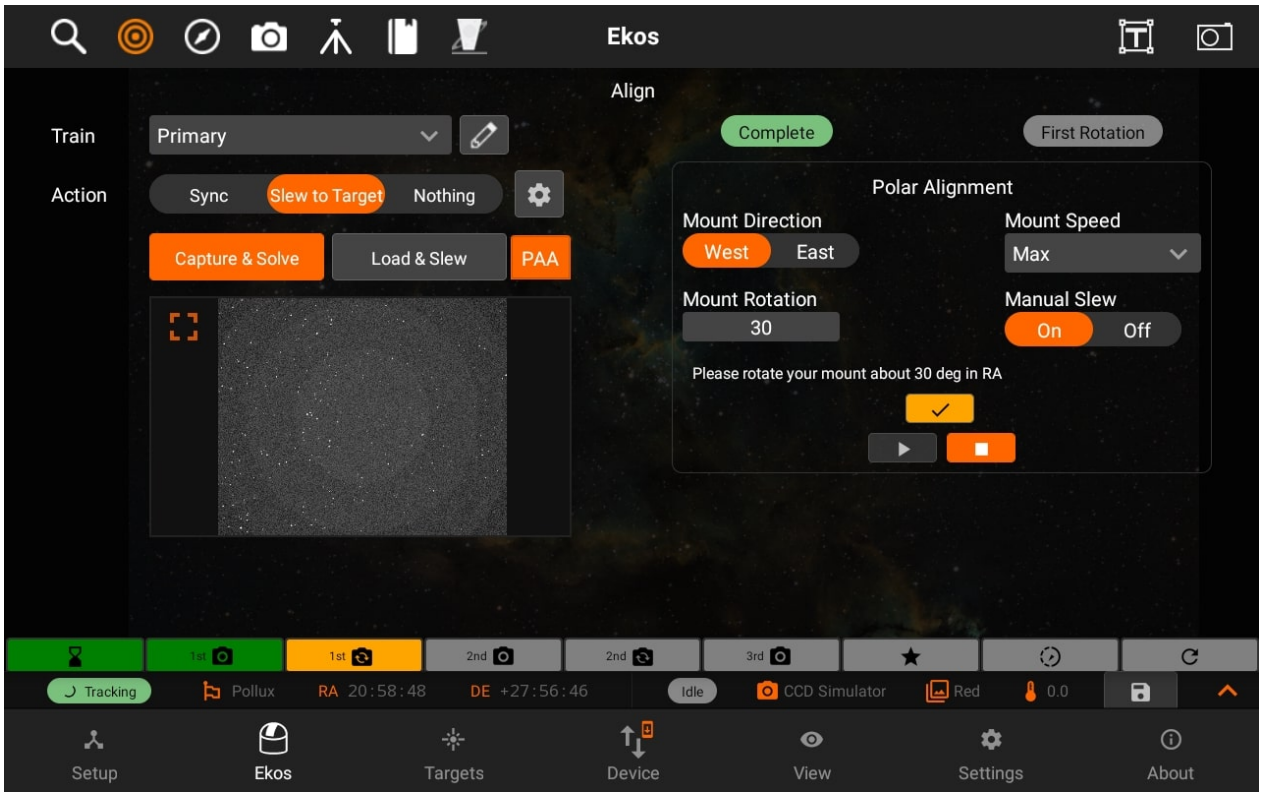
Rotator control



1. Rotator Control: Use automatic or manual rotation control when using Load & Slew. For automatic control, the mechanized rotator is commanded to rotate to match the desired position angle. For manual control, the user is asked to manually rotate the camera until the desired position angle is reached.
2. Threshold: Rotator threshold in arc-minutes when using Load & Slew. If the difference between measured position angle and FITS position angle is below this value, the load & slew operation is considered successful.
3. Use Scale: Set image scale to speed up solver as it does not have to search index files of different images scales.
4. Use Position: Set estimated speed to speed up astrometry solver as it does not have to search in other areas of the sky.

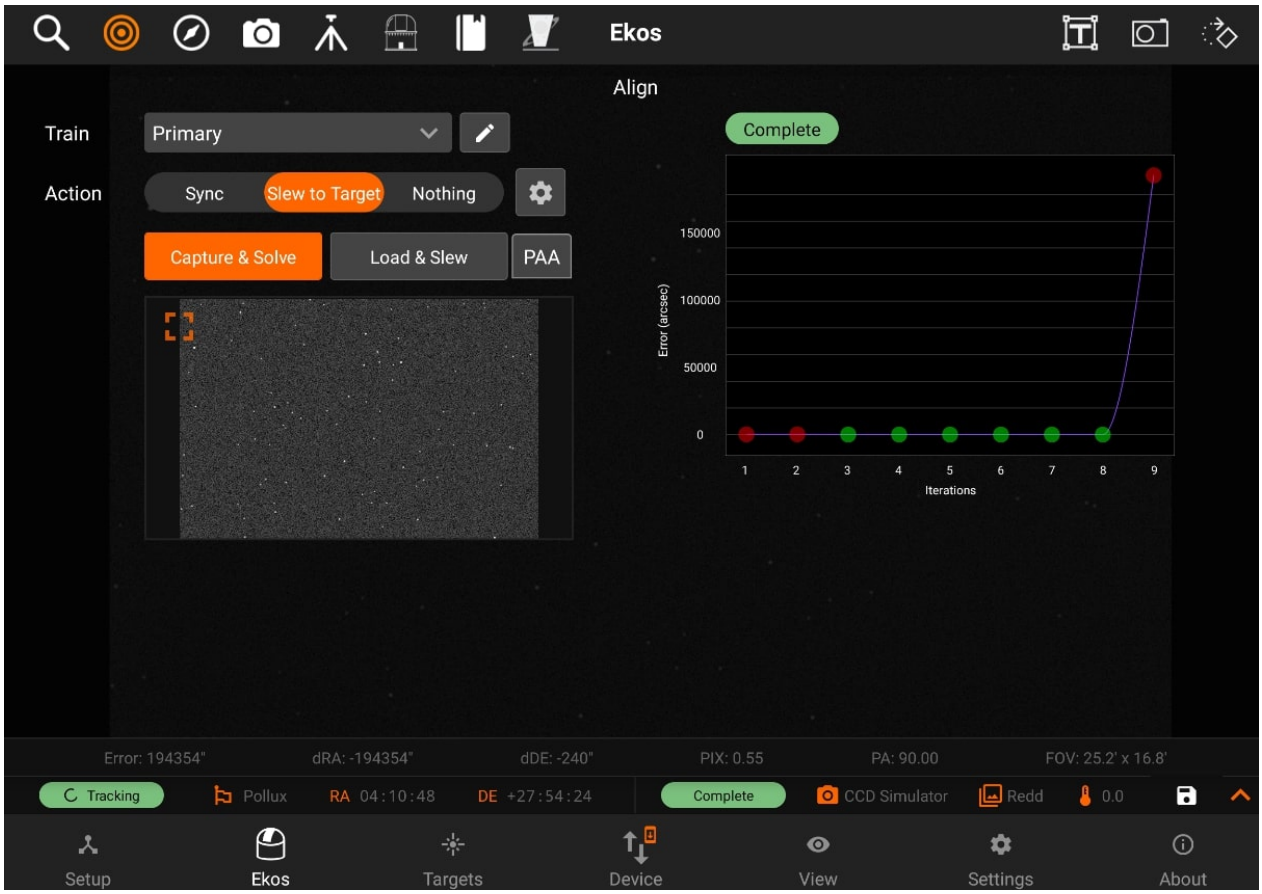
Manual Slew

If the option is enabled, after each capture, the you have to rotate the mount apporixmately by the specified amount as shown. Once done, press the yellow check button to continue.



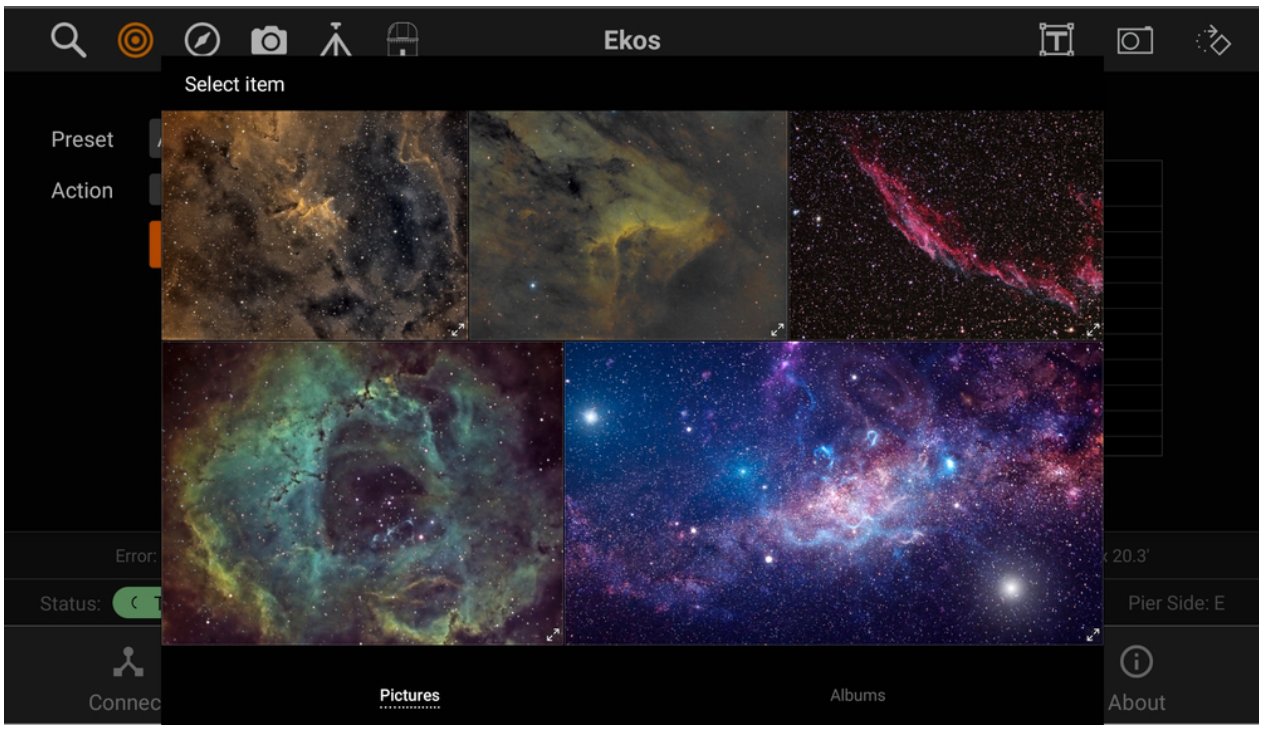
Capture & Solve

To start capturing and solving, just tap on the Capture & Solve button and the StellarMate will take care of the rest. When it's done, you will be able to see the current Alignment capture preview, alignment info on the solution bar on the bottom, and the points on the Alignment plot. The points on the alignment plot have 3 different colors: Red, Yellow and Green. If a point is red, that means that the error is 1.5 times or more above the accuracy value, if it's yellow, that means that the error is between 1 times to 1.5 times above the accuracy value, and finally, if it's green, that means that the error is within the accuracy value. The accuracy value can be changed in the preset settings.



Load and Slew

You can start a load and slew action by tapping on Load & Slew and selecting an image to slew to. StellarSolver is very accurate at this and will be able to slew to object in the image.

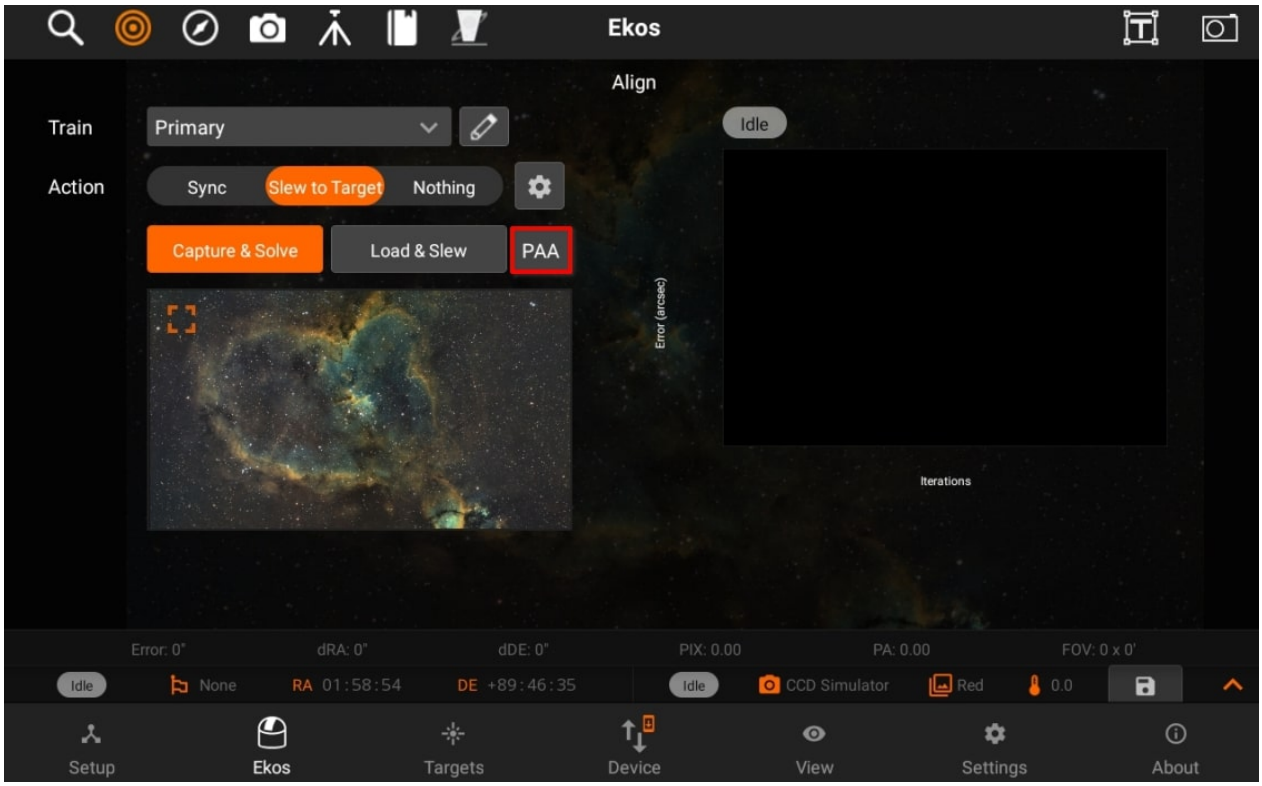


PAA

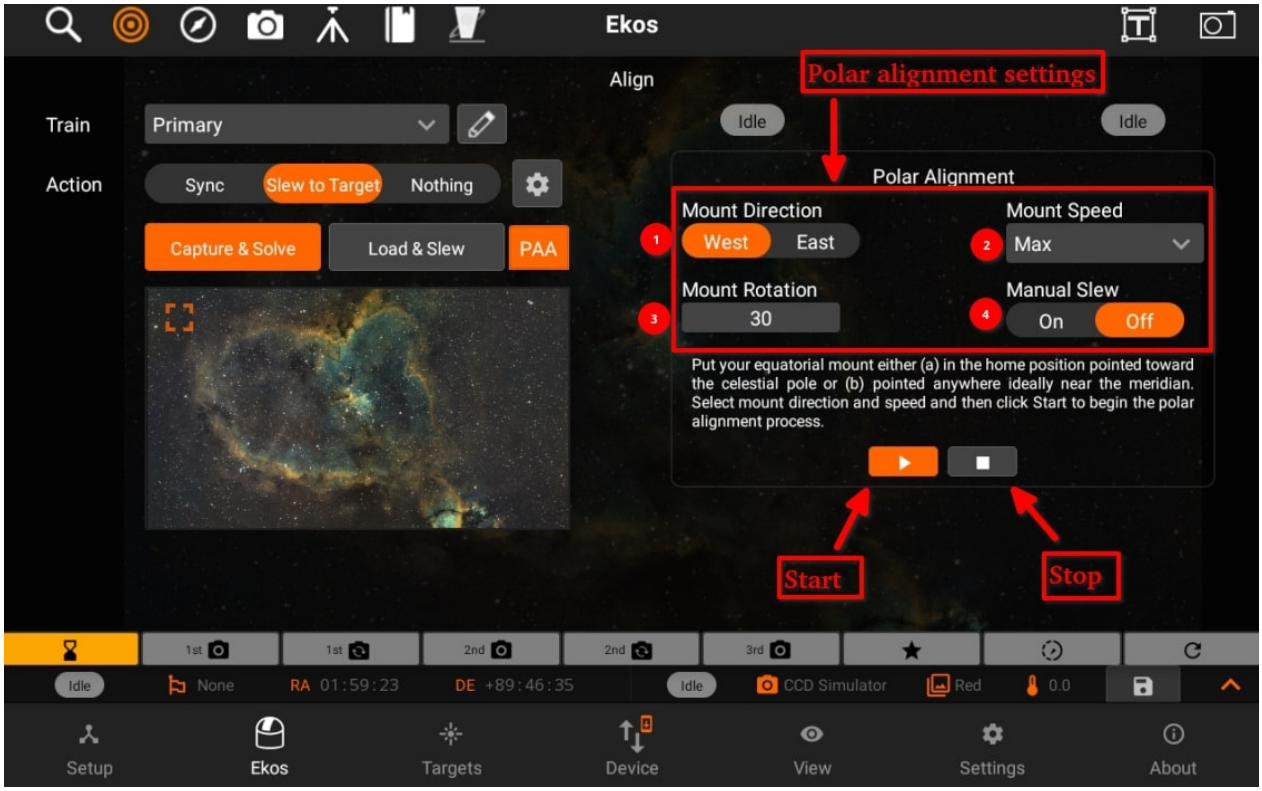
Polar Alignment Assistance (PAA)

If your mount supports Polar Alignment, you can use the Polar Alignment Assistant (PAA) to improve your alignment.

To start the polar alignment process, open the polar alignment assistance by clicking on PAA button.



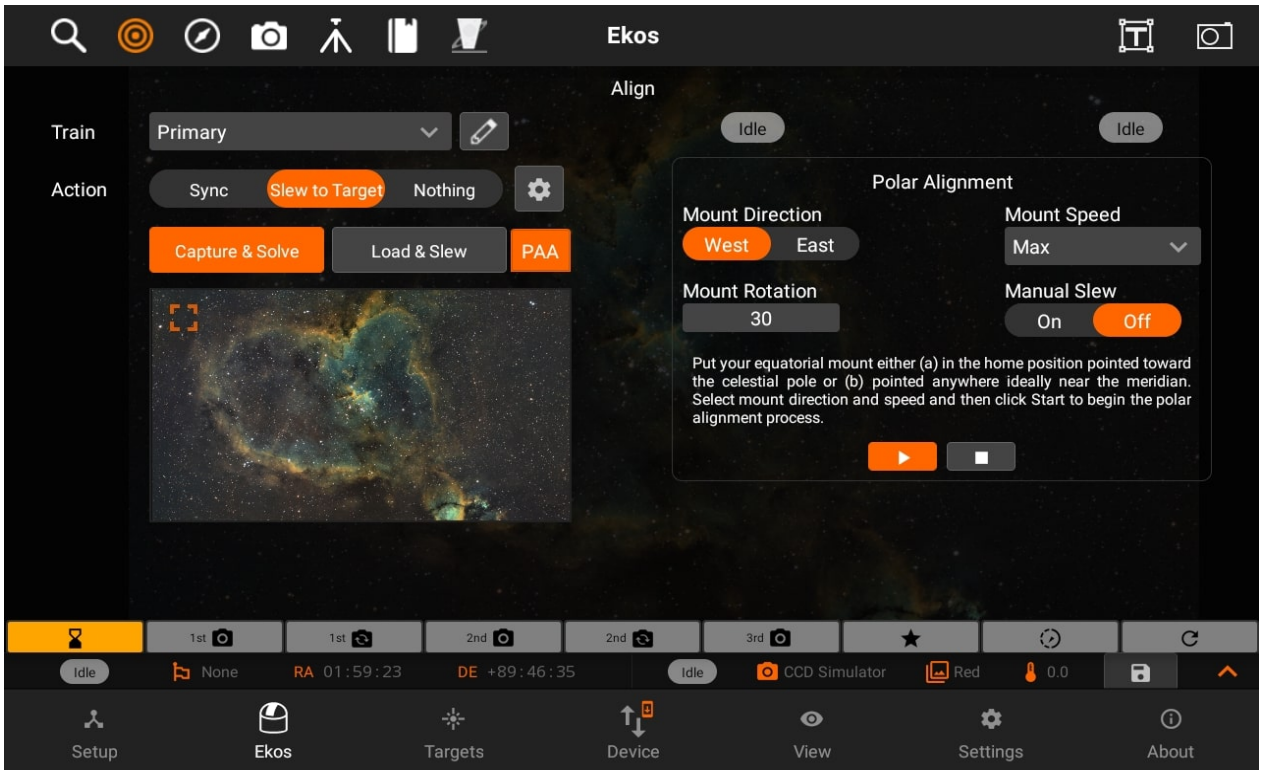
Use the Polar Alignment Settings to modify the settings.



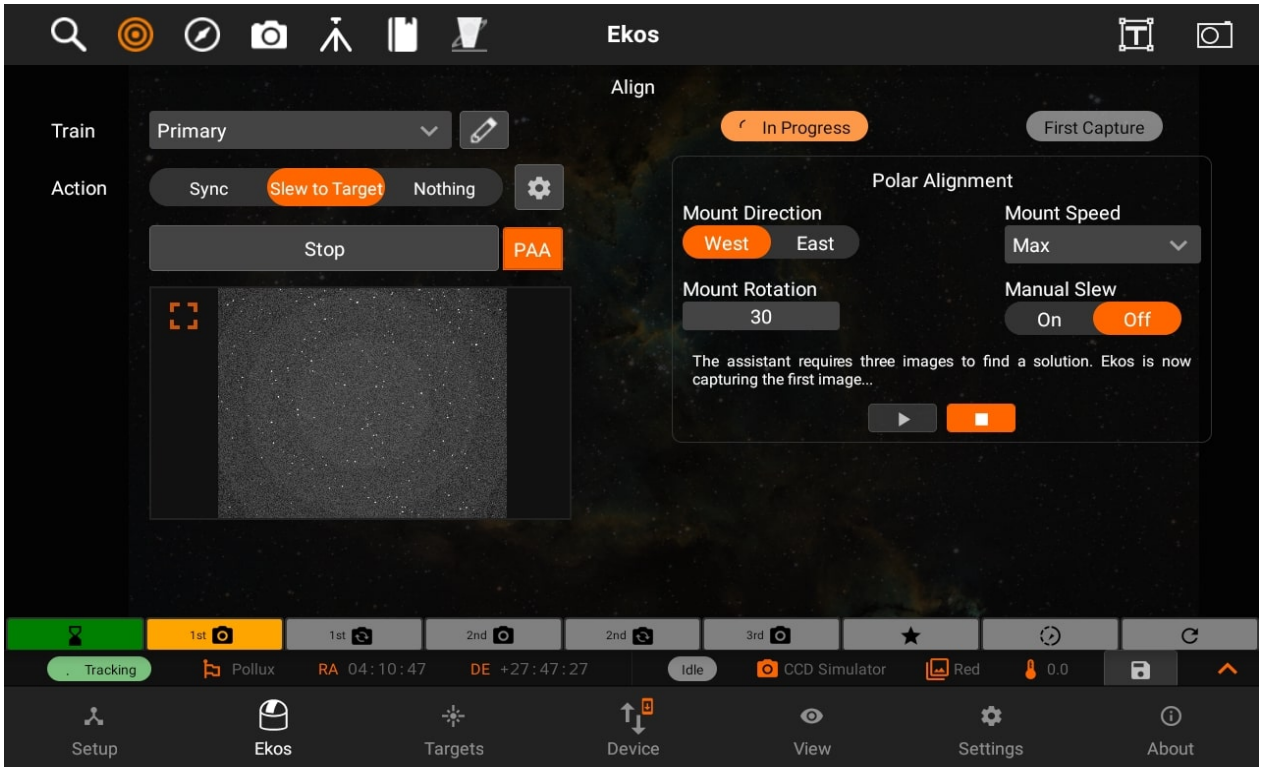
You can adjust the mount direction (1) by selecting West or East rotation. Adjusting the Mount Speed (2) by opening the speed menu and selecting the preferred rotation speed. Mount Rotation (3) allows the user to modify the amount of rotation the mount rotates after every capture. Manual Slew (4), the option to allow the user to manually rotate the mount after every capture and continue the process manually.

Set the preferred settings and follow the intstructions at each step to complete the process.

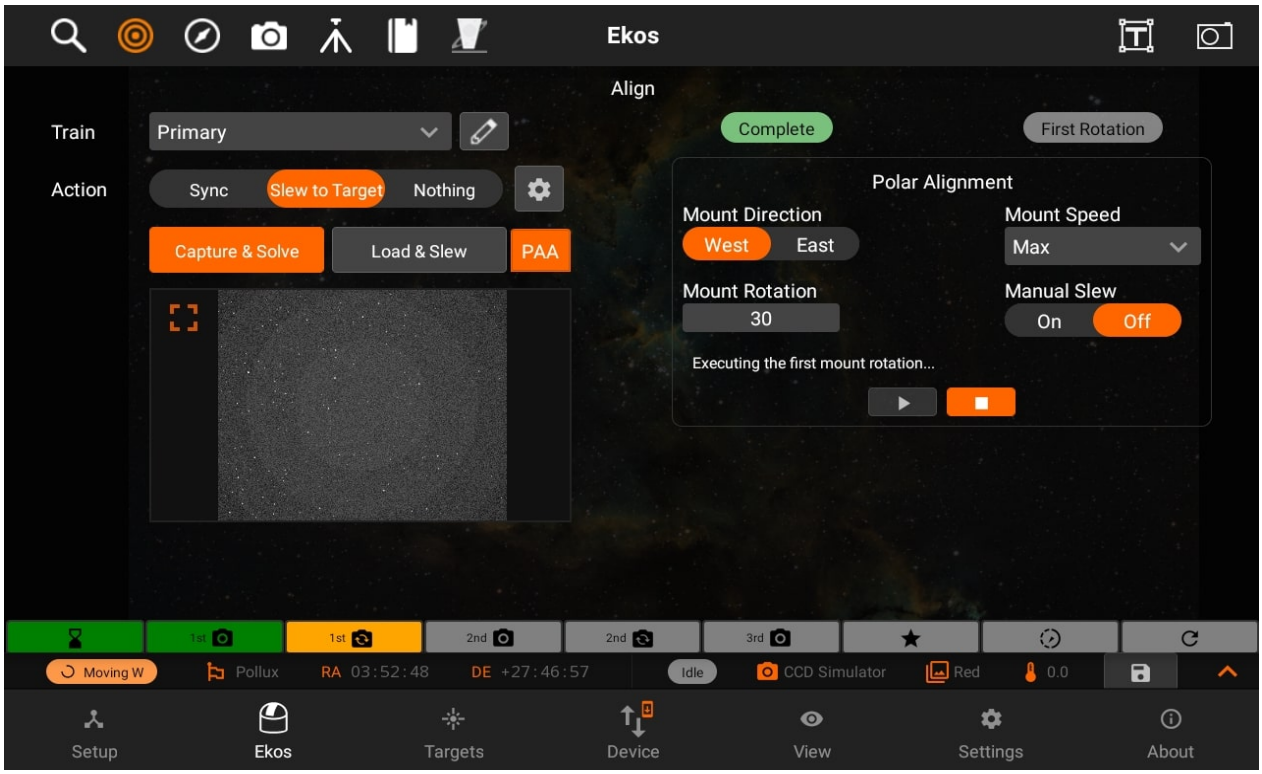
Idle



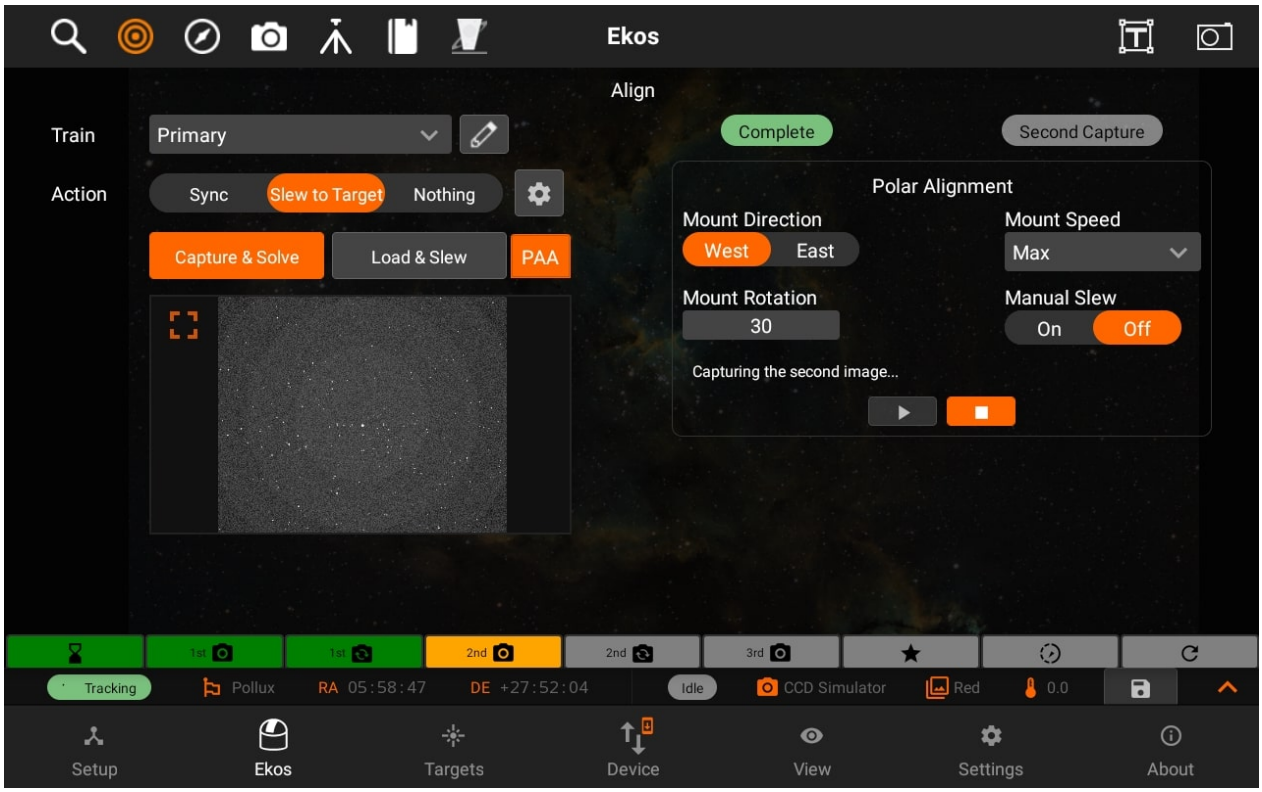
First Capture



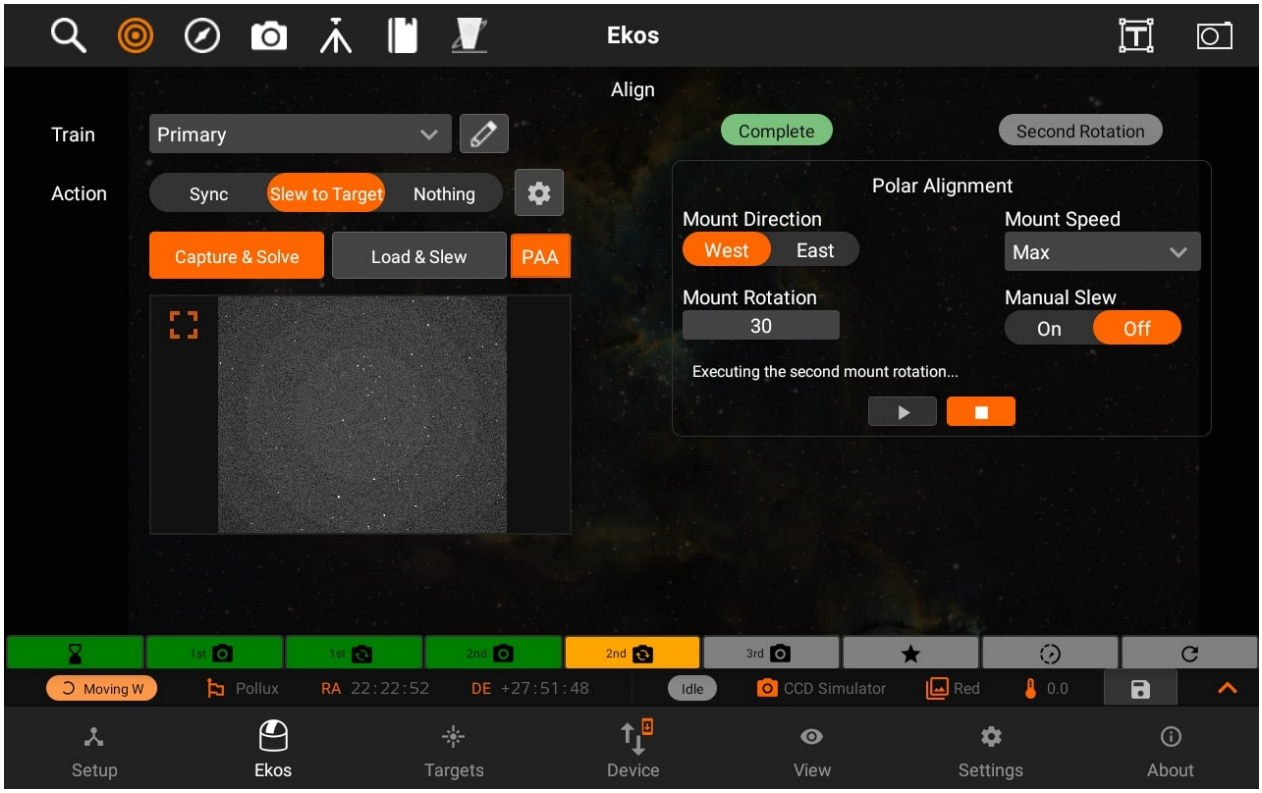
First Rotation



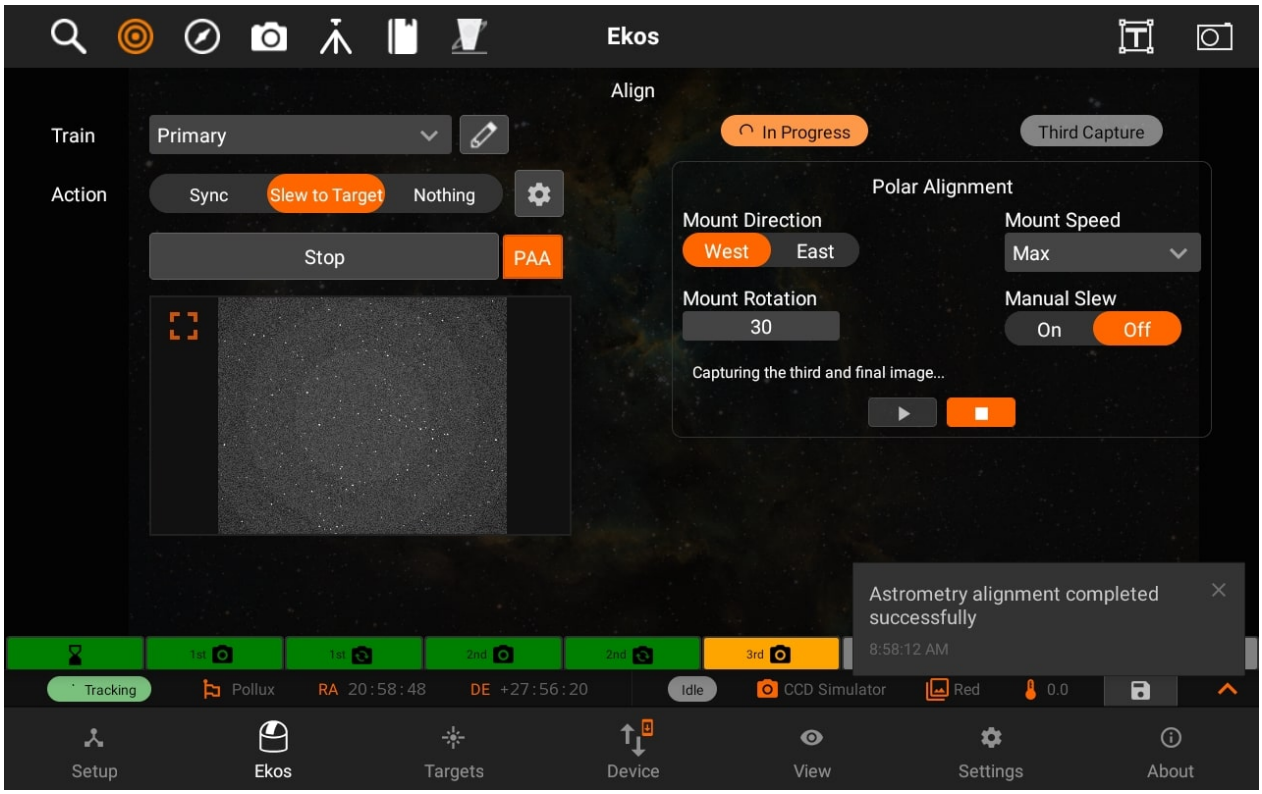
Second Capture



Second Rotation

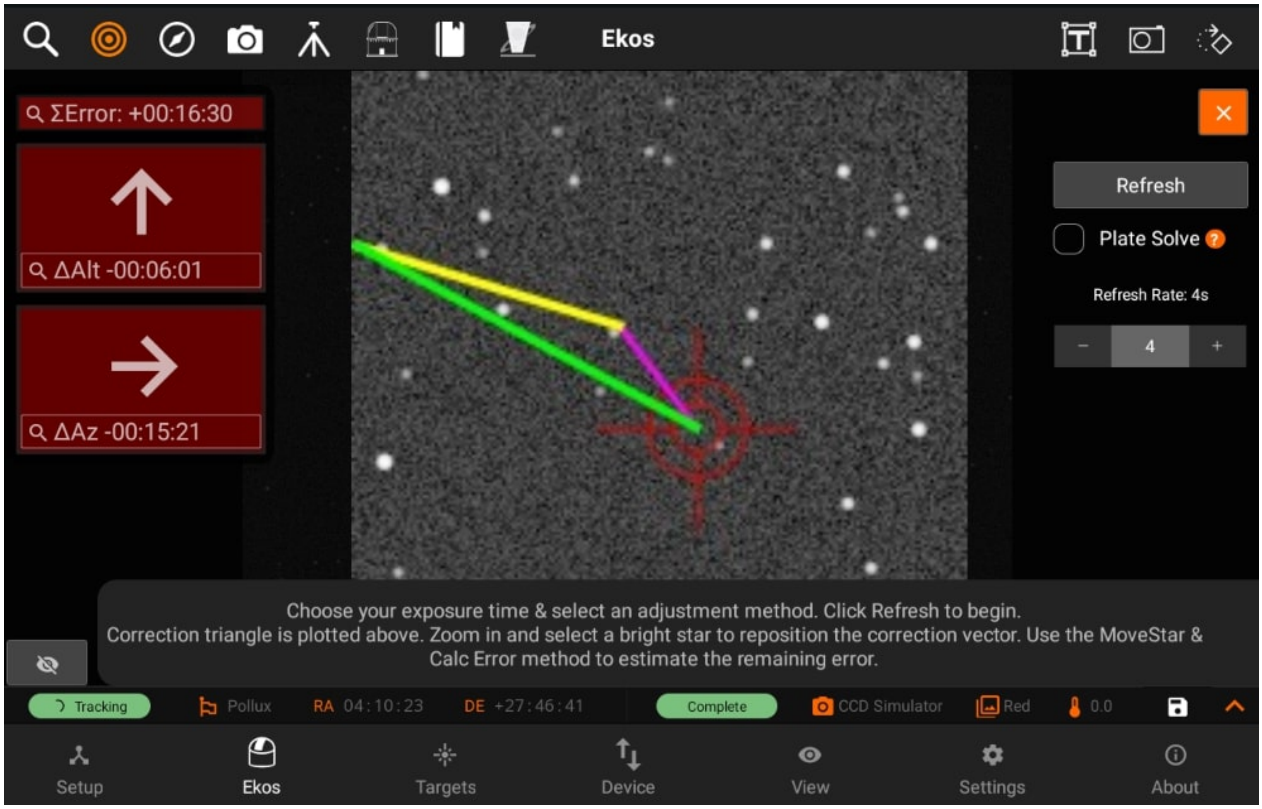


Third Capture

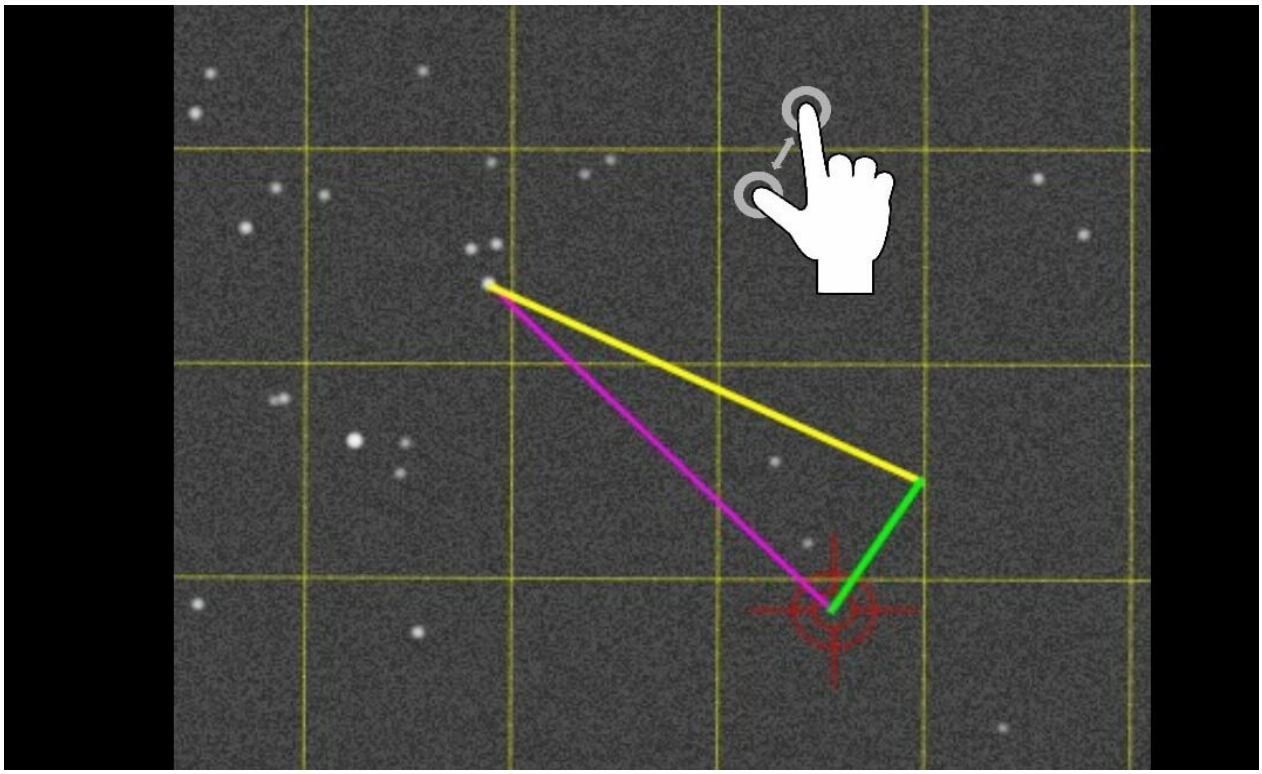


Select Star

Once all 3 images have been captures, you are shown the correction vectors. You can select a star to see the correction vectors relative to the selected star.



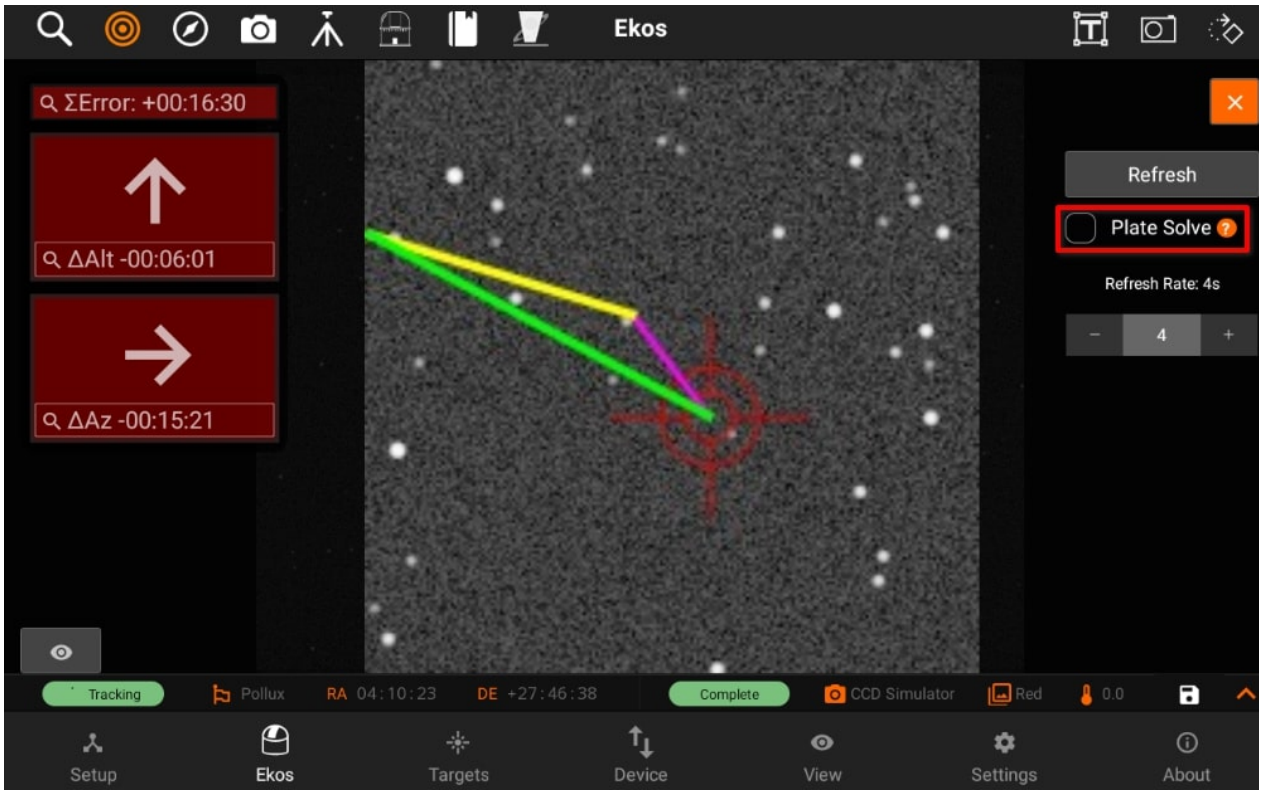
The correction vectors and screen will move to the selected position. At this stage you can use the pinch or spread gesture to use zoom in or out as shown. The zooming and tap features also works while the image is minimized.



Select Refresh & Algorithm

In the Refresh Stage, the user can adjust the refresh rate by changing the input on the right side, pressing Refresh to start the process.
(Note: at this stage, the refresh only starts once Refresh is clicked)

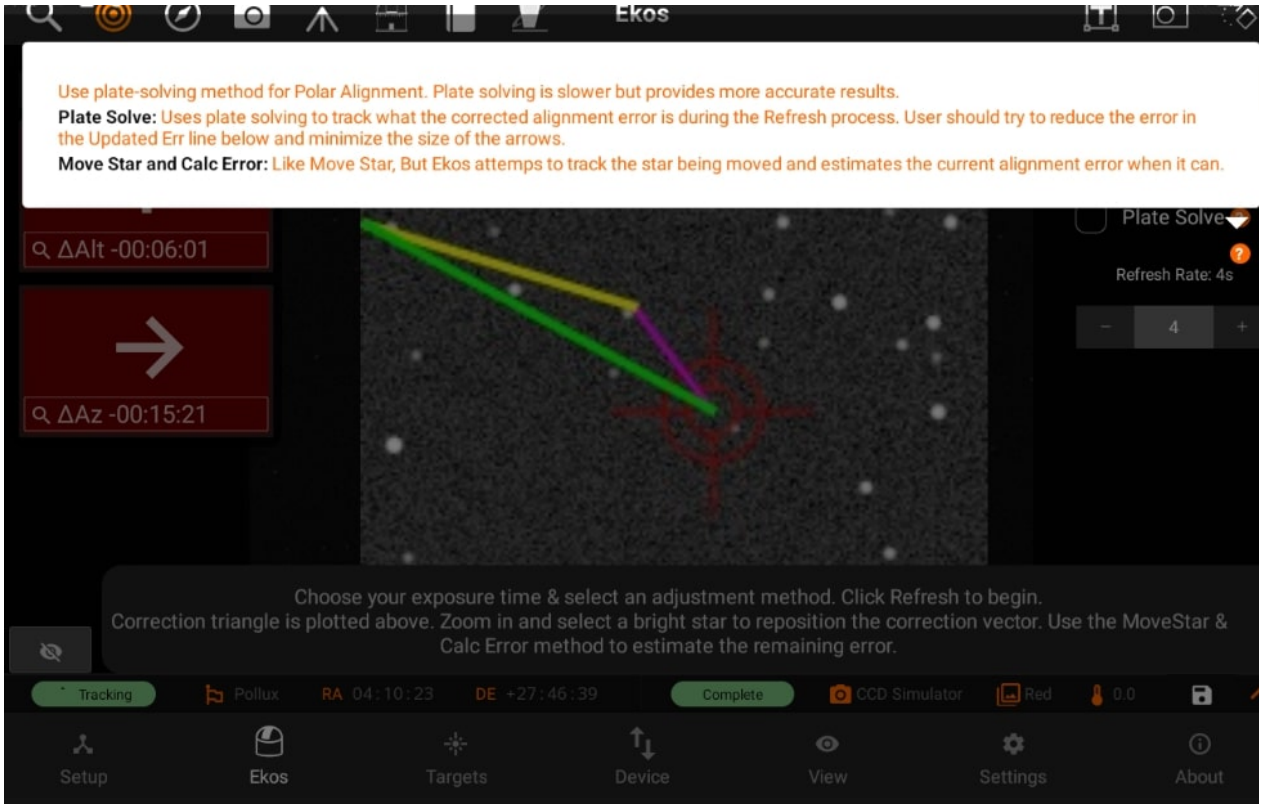
There are two different algorithms you can choose for PAA:



1. Plate Solving: Uses plate solving to track what the corrected alignment error is during the refresh process . User should try reduce the error in the Updated error line below and minimize the size of arrows. This is the only scheme that can fully correct an error larger than the image field-of-view, but depends on reliable plate solving.

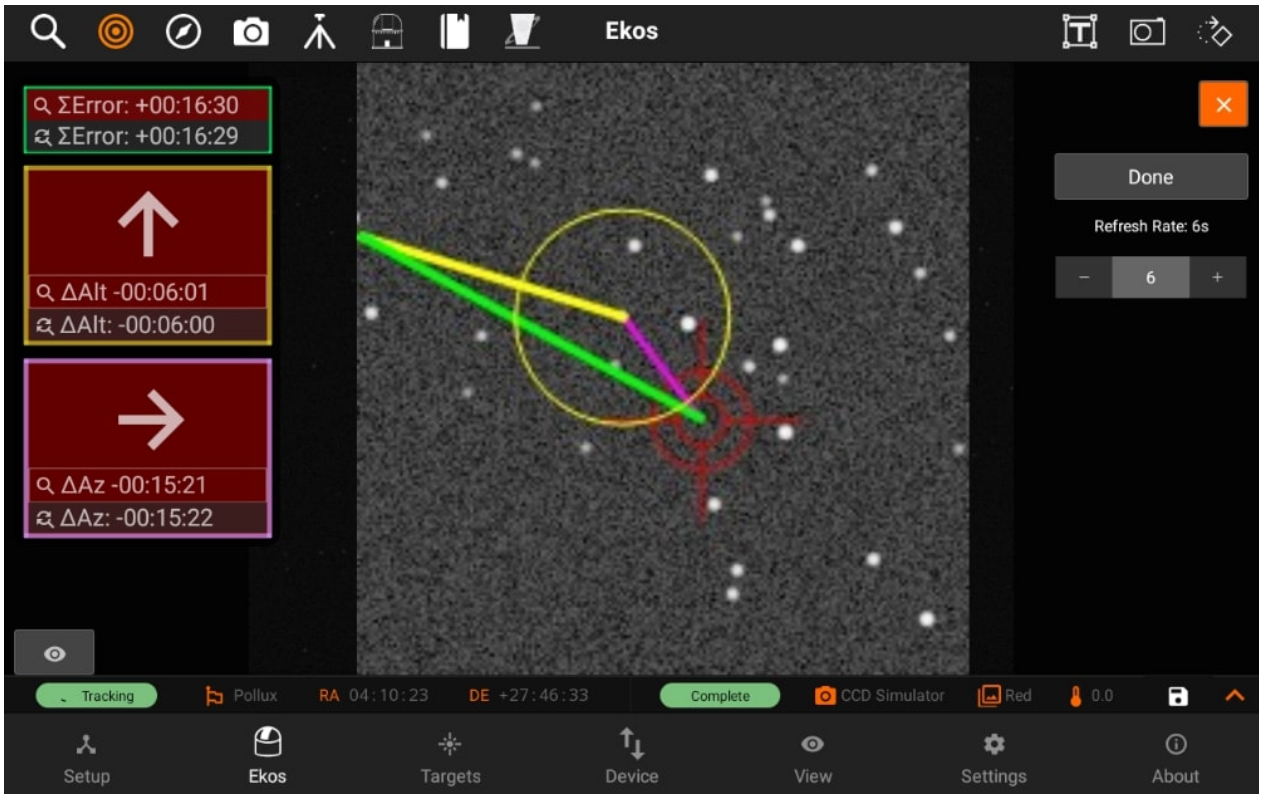
.

2. Move Star and Calc error: Like Move Star, but Ekos attempts to track the star being moved and estimates the current alignment error when it can.



Refreshing

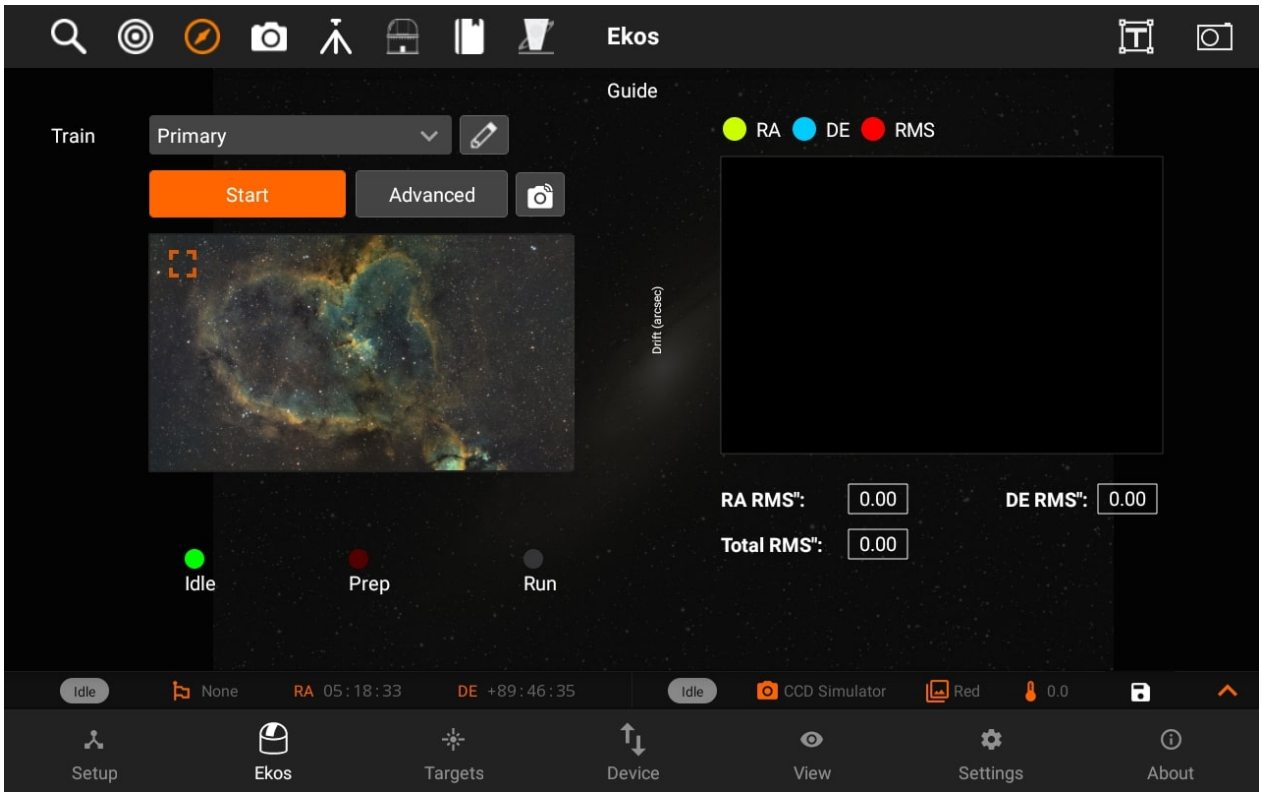
Refreshing begins and can still be adjusted using the slider. Once done with Polar Alignment, simply press the Done button.



Guide

The Guide module manages guiding the mount to ensure targets are locked at the center during imaging. A dedicated guide camera is required in the secondary optical train. It has the following features:

- Manage / Select Optical trains.
- Start guiding
- Preview
- Advanced Settings
- Image viewer
- Guide Plot

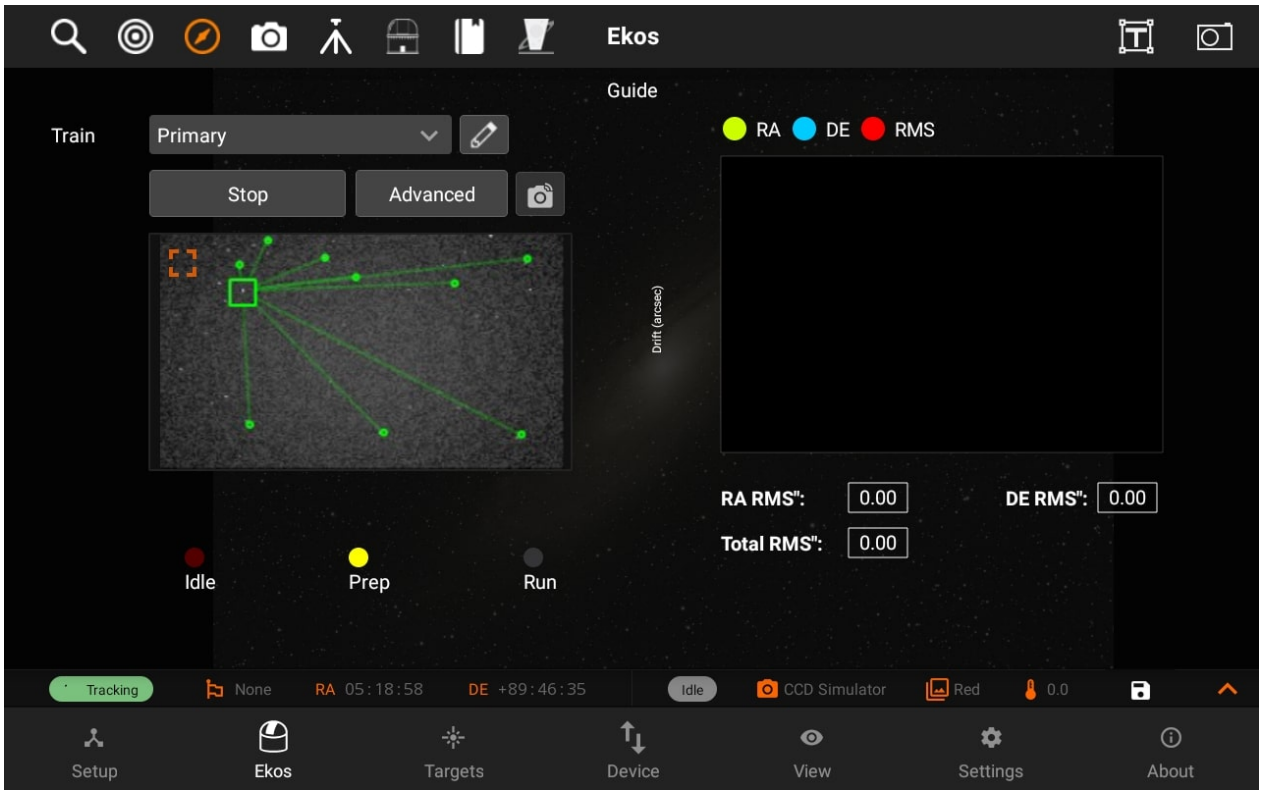


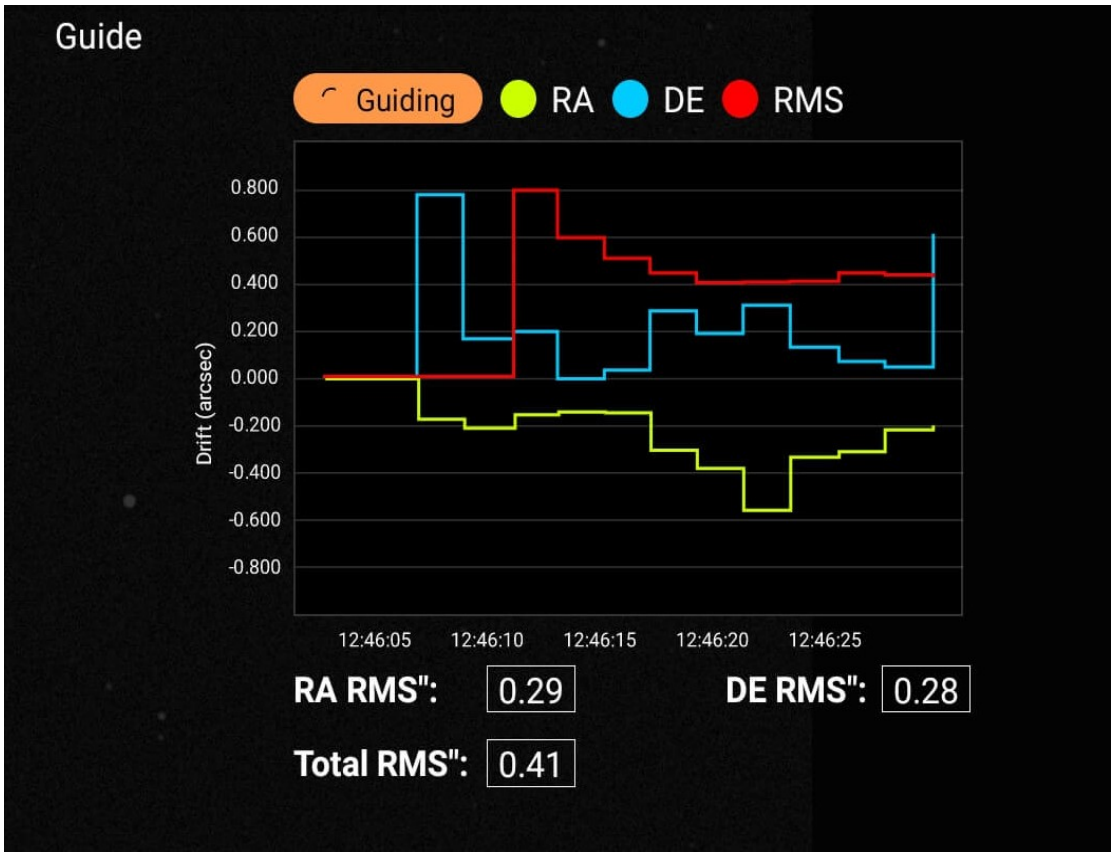
Train

You can Select / Edit a train specifically for Align module. Each module has it's own train. Visit Optical trains topic for more.

Guiding

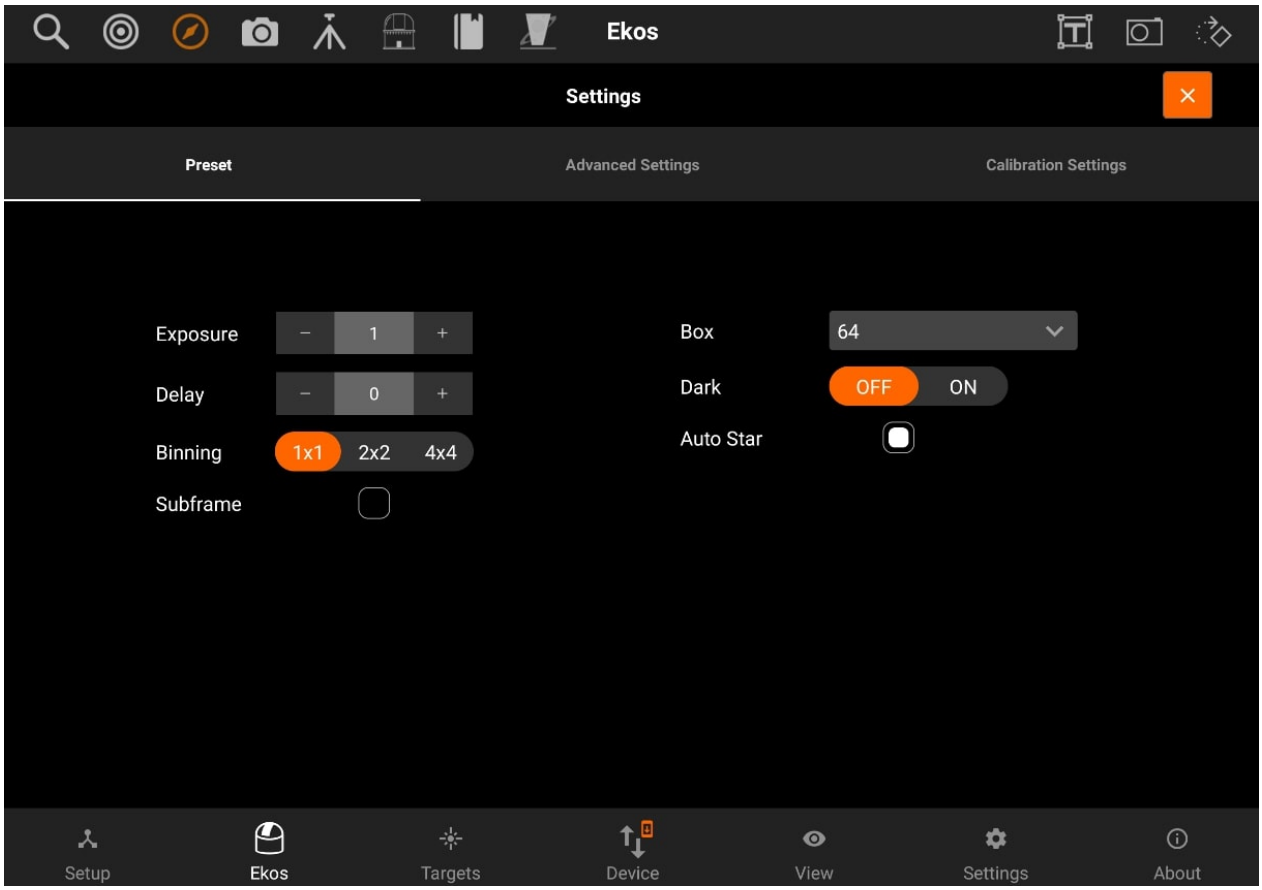
You can start guiding by tapping on the Start button. The guide module will start by calibrating, and then will start the guiding process. When guiding is in progress, you will be able to see the Guide plot being populated with lines for the RA drift, DE drift and the Total RMS. You can also check the values for RA RMS, DE RMS and Total RMS under the plot.

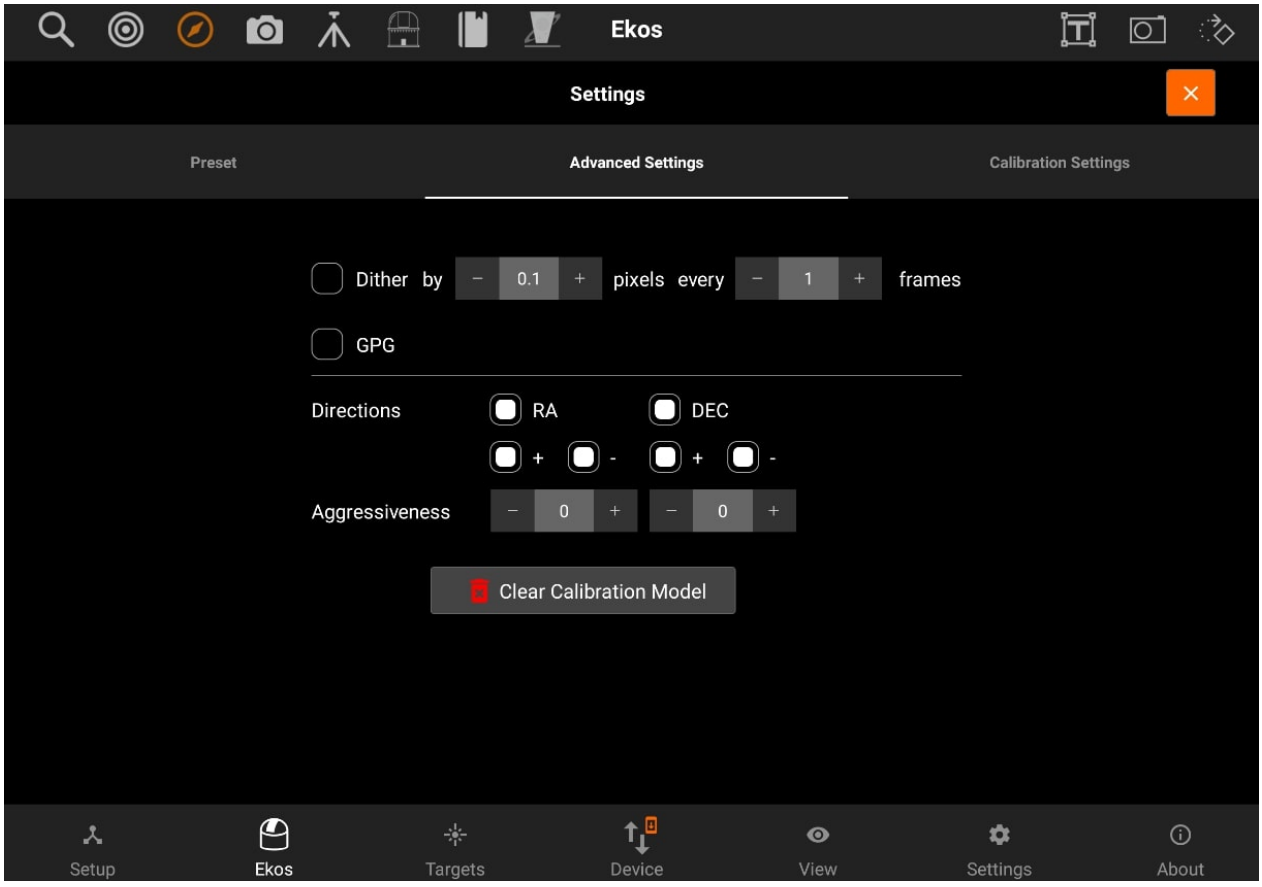


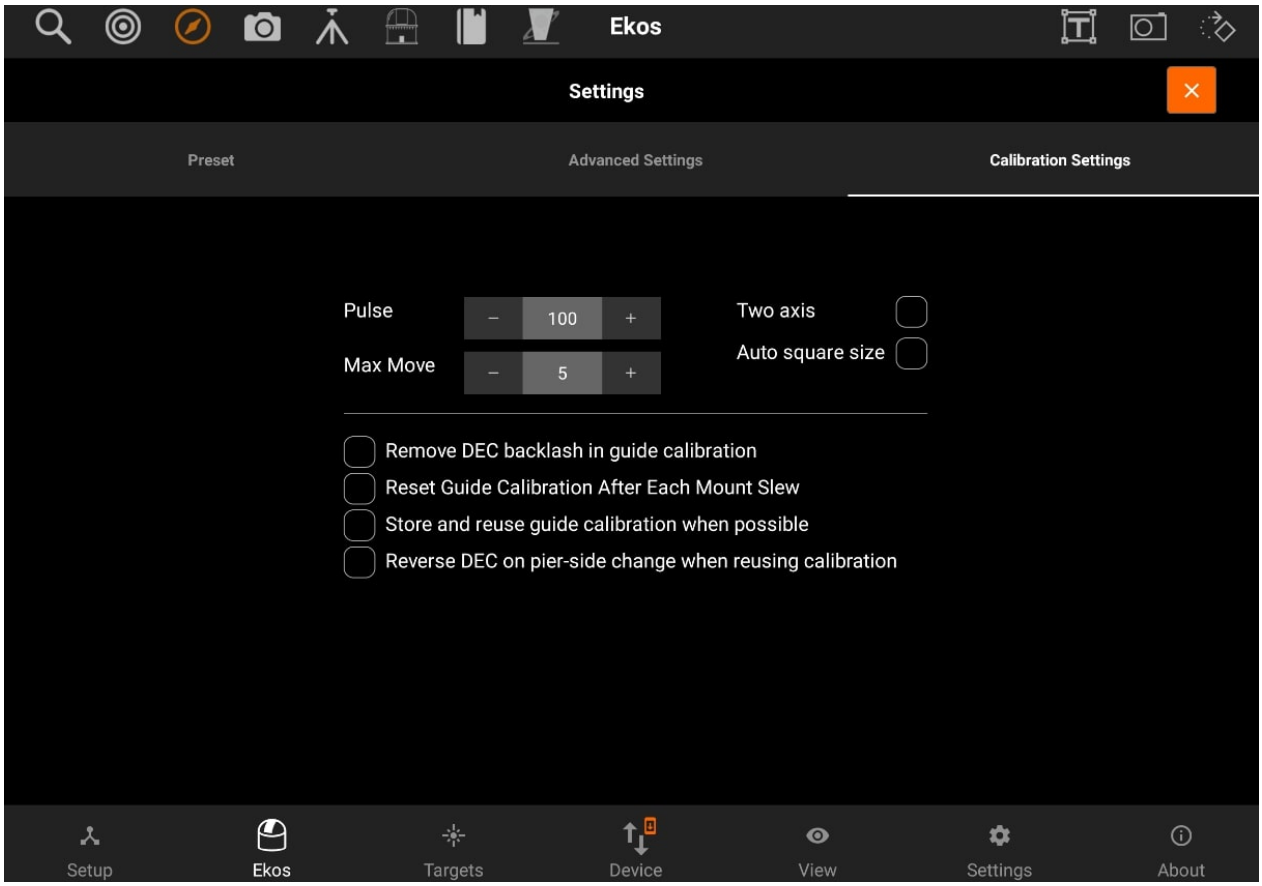


Guide Advanced Settings

You can edit the directions for guide corrections and the proportional gain in this settings page. You can also clear the calibration model if you want to restart the calibration process.


Ekos
Settings
Preset
Advanced Settings
Calibration Settings
Exposure
1
Delay
0
Binning
1x1
2x2
4x4
Subframe
Box
64
Dark
OFF
ON
Auto Star
Setup
Ekos
Targets
Device
View
Settings
About


Ekos
Settings
Preset
Advanced Settings
Calibration Settings
Dither by
0.1
pixels every
1
frames
GPG
Directions
RA
DEC
Aggressiveness
0
0
Clear Calibration Model
Setup
Ekos
Targets
Device
View
Settings
About



Capture

The Capture module is where you create sequences to capture your targets. In the typical astrophotography workflow, Capture module is used last after you finished Focusing, Aligning, and Guiding your target. Let us first define some common terms:

Train

You can Select / Edit the train specifically for Capture module. Each module has it's own train. Visit Optical trains topic for more.

- **Presets:** Specific camera and File Settings. This includes:

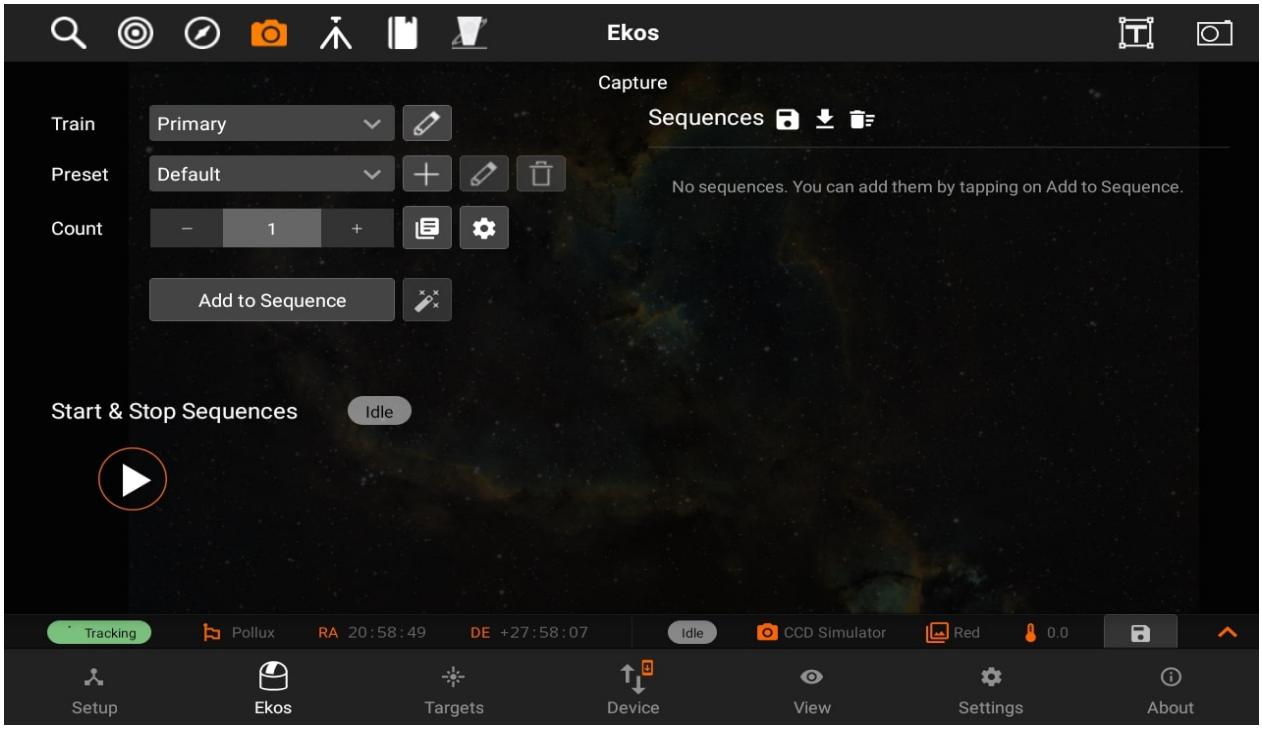
1. ROI, binning
2. Frame type
3. Format filter (if any) etc.
4. You need to create a preset with your desired settings and give it a descriptive name (e.g QHY_HA_300 would refer to using QHY camera using HA filter for 300-second) exposure.

- **Sequence:** Capture a number of images with the settings specified in a preset.

1. The count field in capture module specify the number of images to capture using that

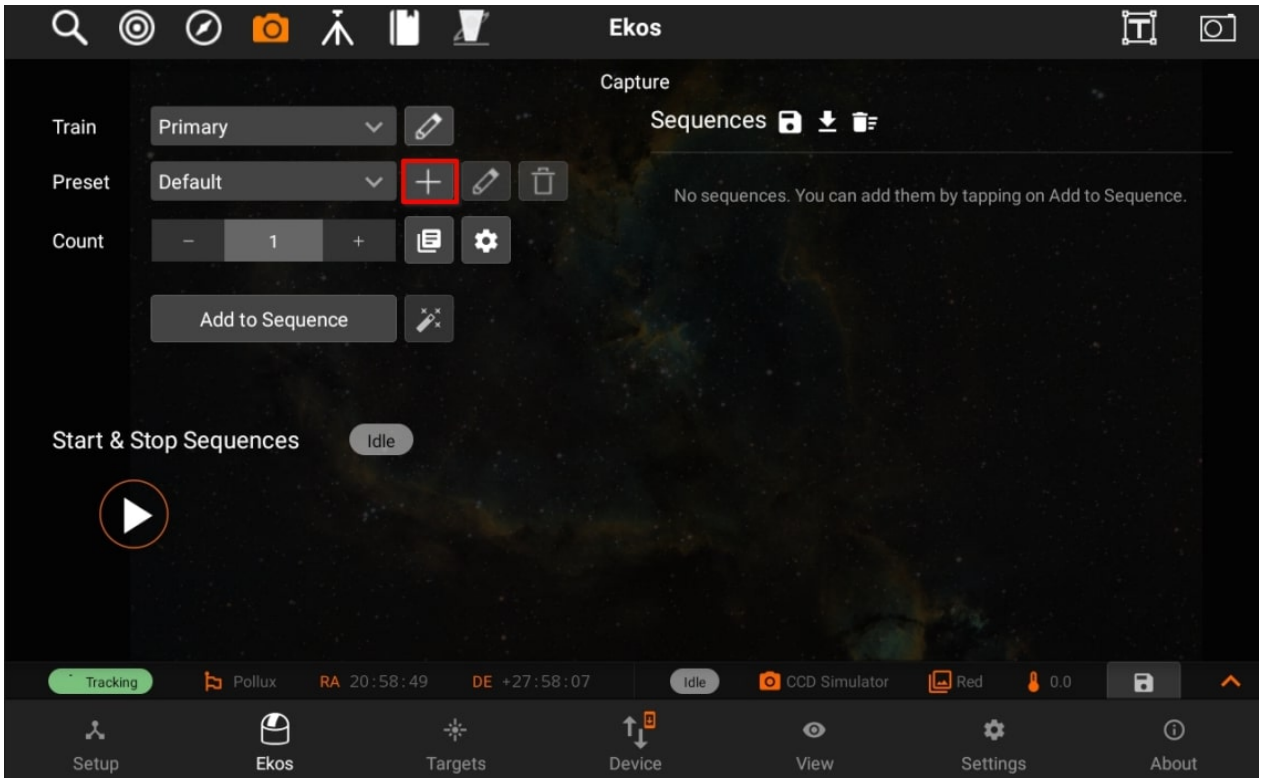
preset.

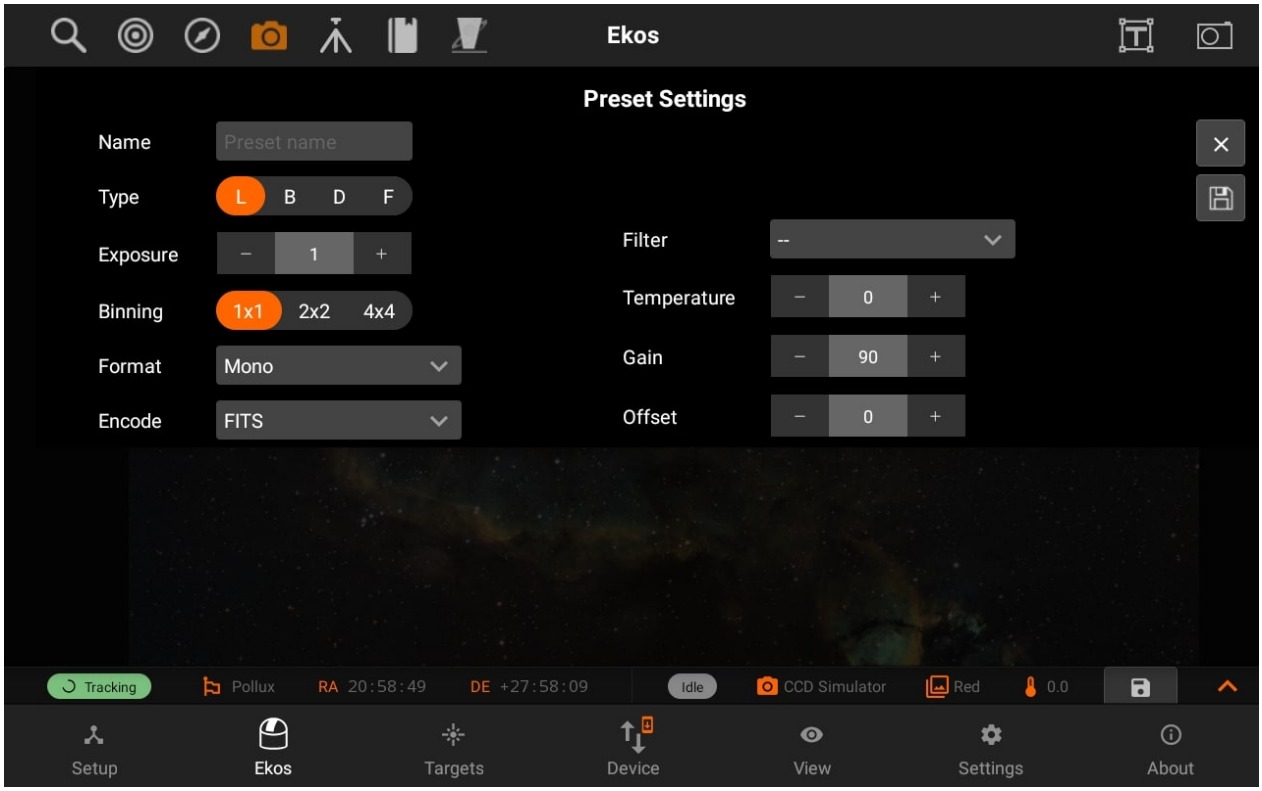
2. Delay parameters is used to introduce a delay in seconds between each captured image and default to zero.
3. A sequence is also referred to as Job



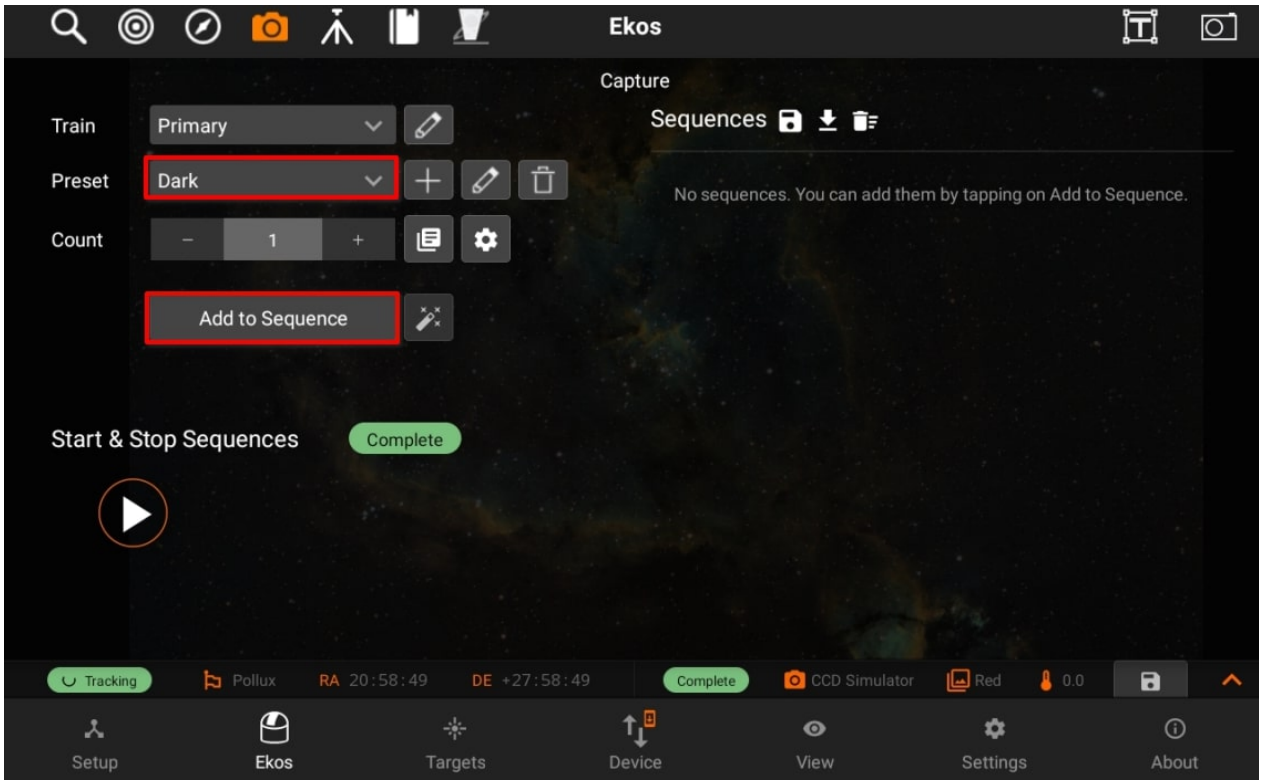
Creating a sequence

To create a sequence, you should first create a new preset by tapping on the + button next to the preset dropdown box.

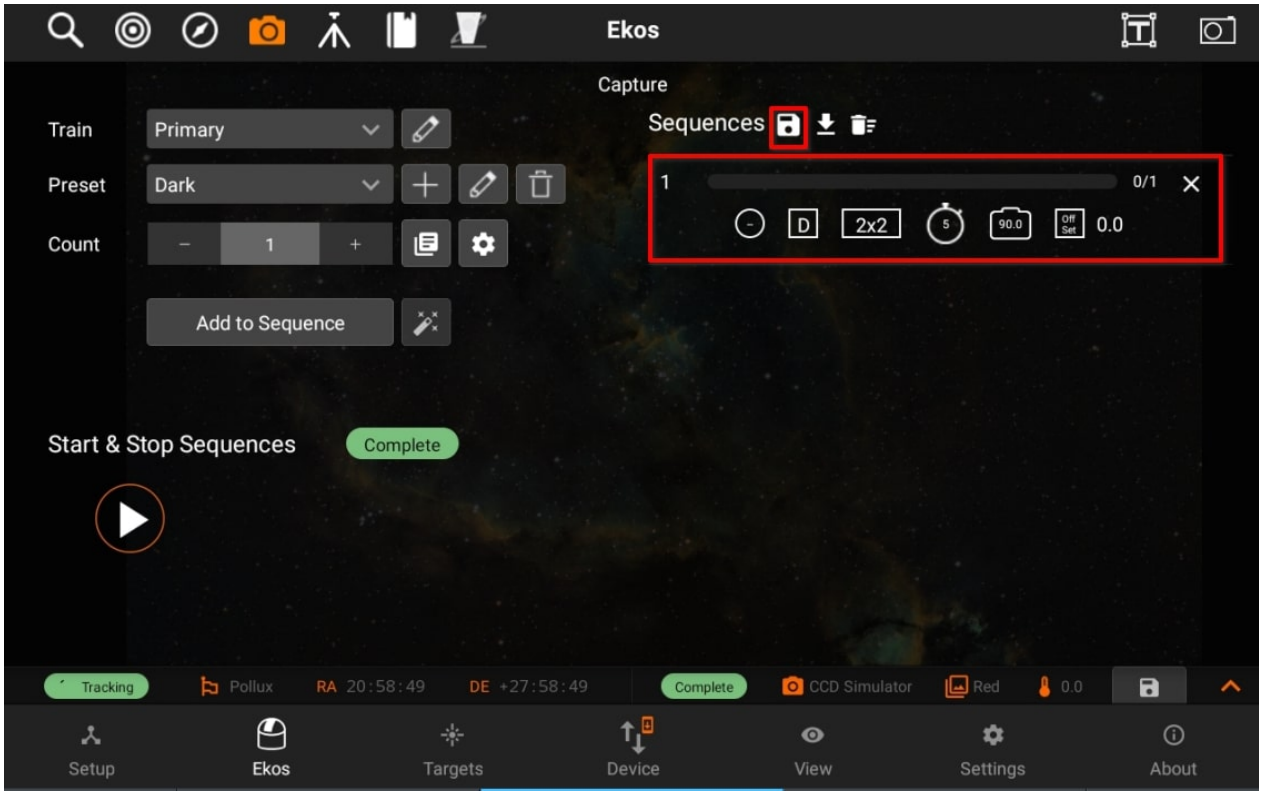




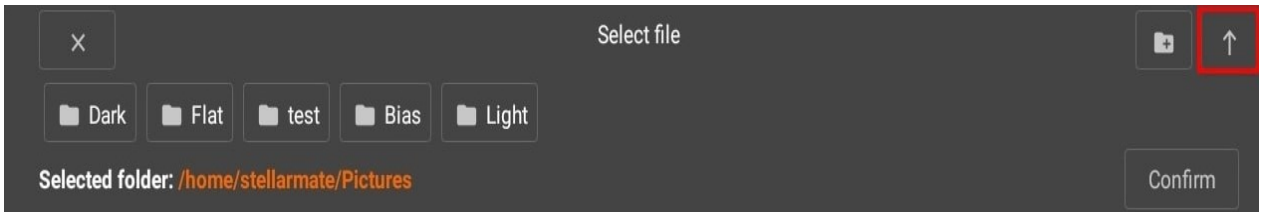
After filling the preset settings, you need to add a sequence



Once the sequence is added, you have to tap on the Save Icon on the top-right.

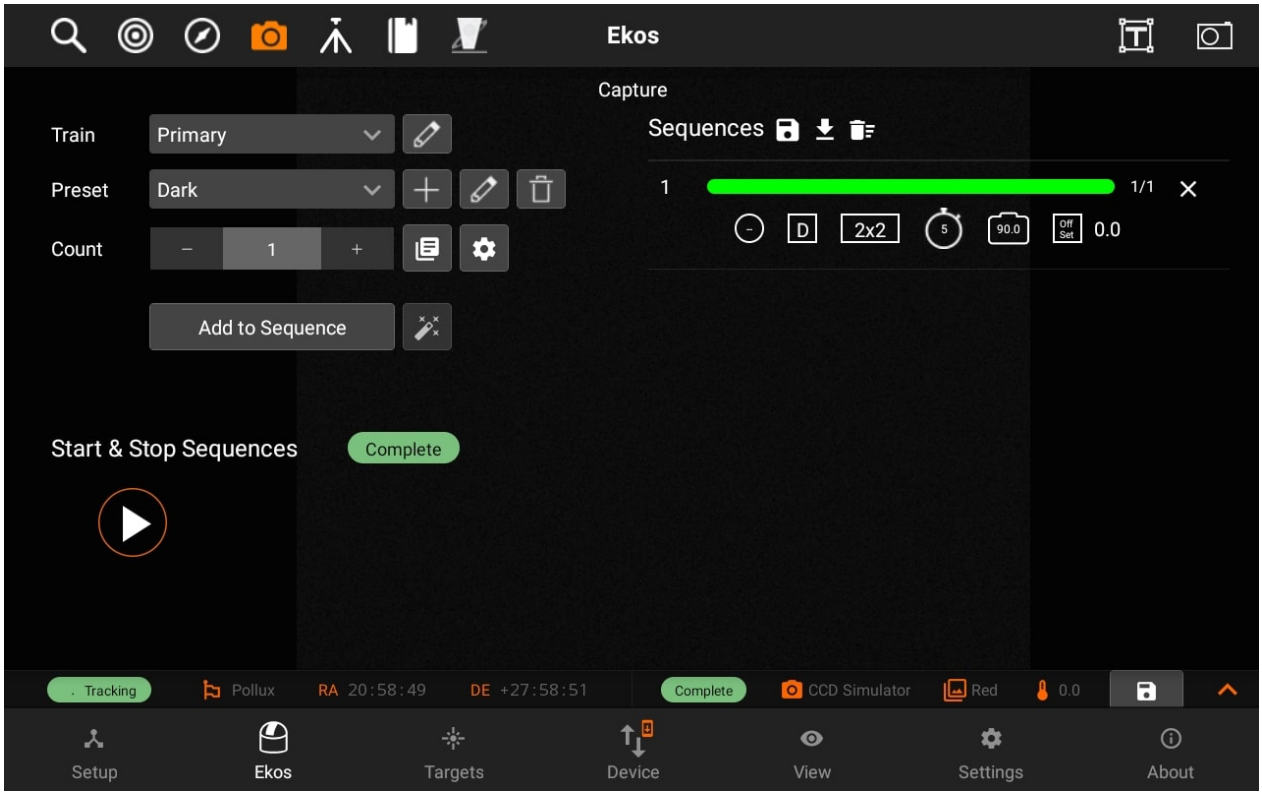


The default directory is under "Pictures". You can go back to previous directories by going back.

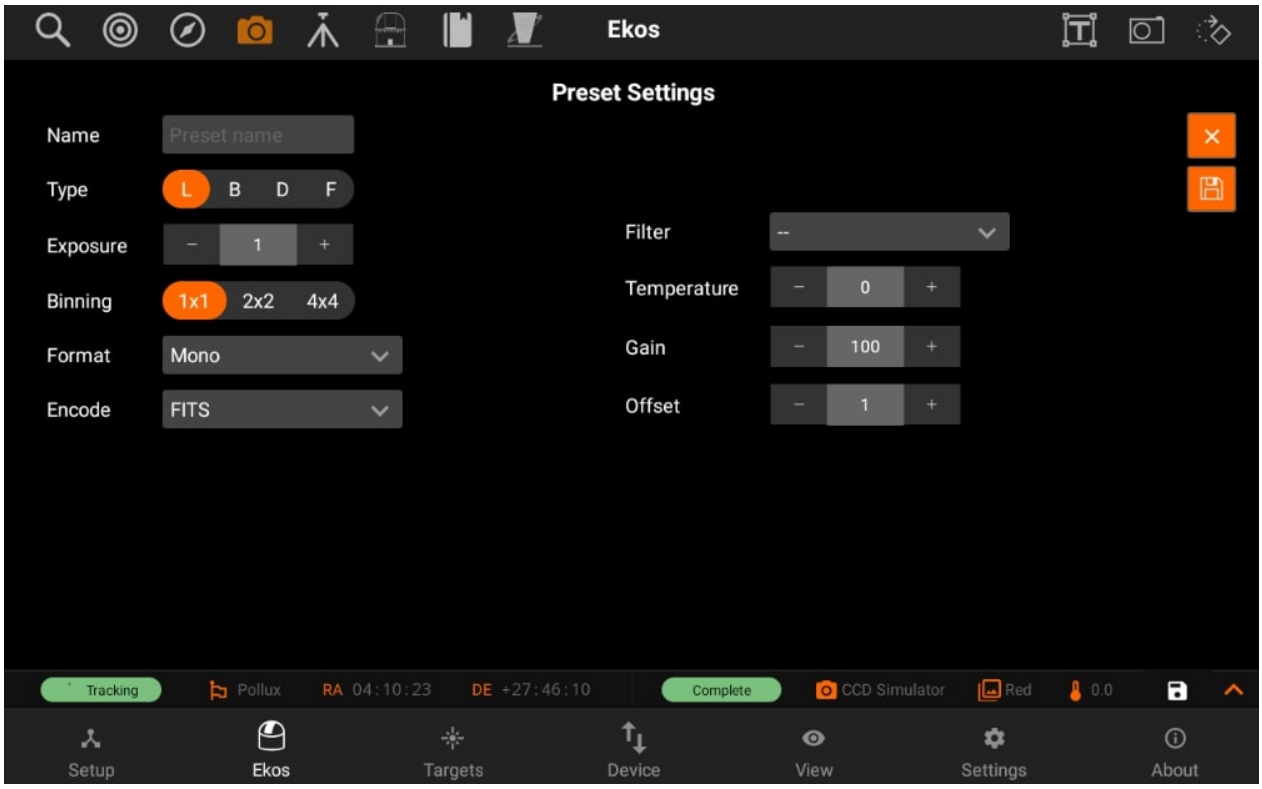


Sequence files are saved in "/home/stellarmate/sequences" path with respect to camera name.

By selecting the sequence file, you will be able to add a sequence in your sequences and can capture your images accordingly.



Capture Presets has the following structure:



1. Preset name
2. Frame Type
3. Exposure
4. Binning
5. Format
6. Encode
7. Filter
8. Temperature
9. Gain/ISO
10. Offset

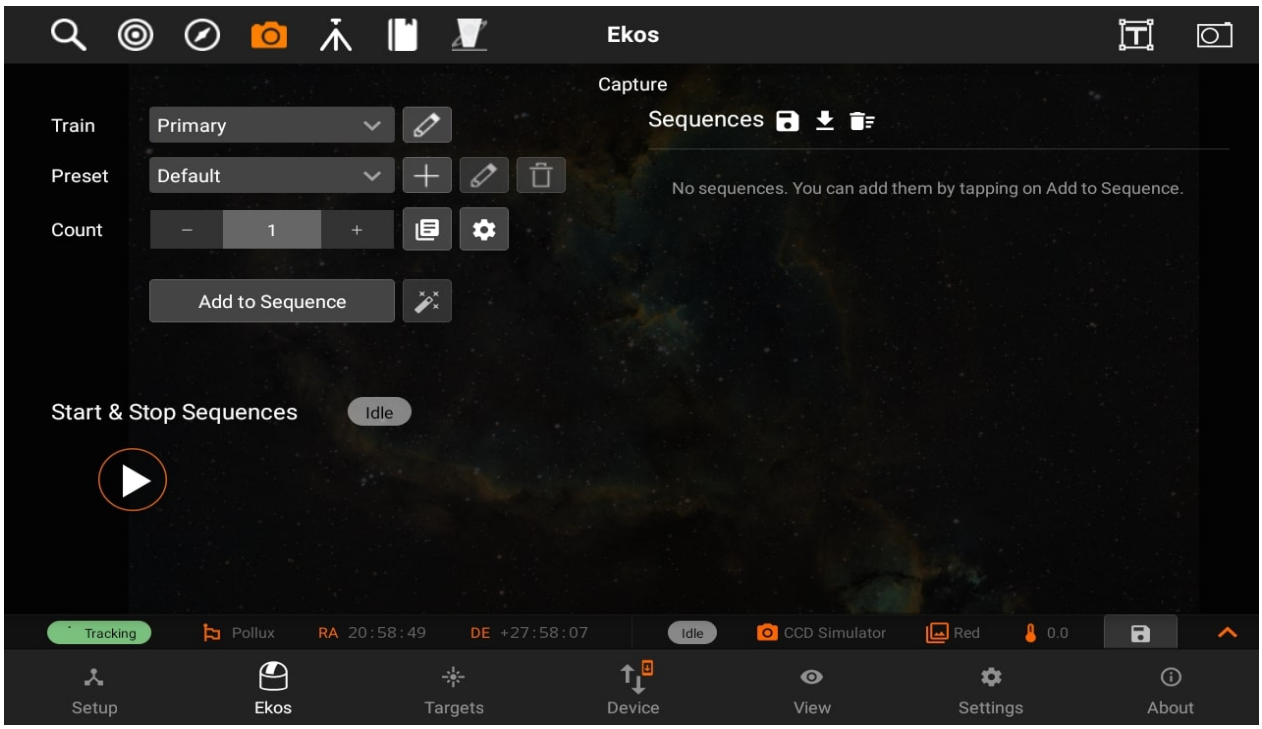
After creating your presets, you can now tap on the preset dropdown in order to select the preset you want, and then tap on Add to Sequence, so the sequence can be added to the sequence list.
In the below example, you can see that there are 3 different jobs in the sequence list as shown by the filter in the beginning of each one. (red, green, and blue)

Sequences have the following structure, displayed through icons for simplicity:

- Top row
    1. Job Number
    2. Job Progress Bar
    3. Count Progress
    4. Delete Job

- Bottom row
    1. Filter
    2. Frame Type
    3. Binning

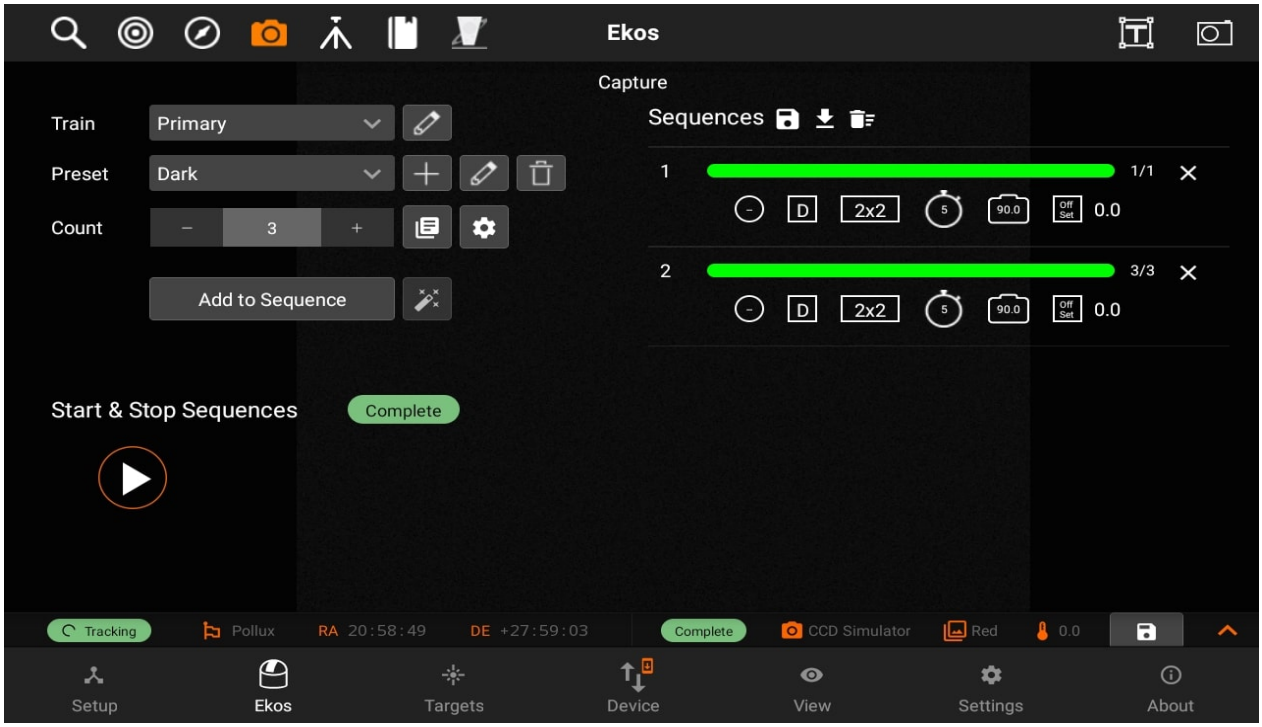
4. Exposure
5. Gain/ISO
6. Offset



After adding the sequences, tap on the **Play** button under the Progress header to start the sequence.

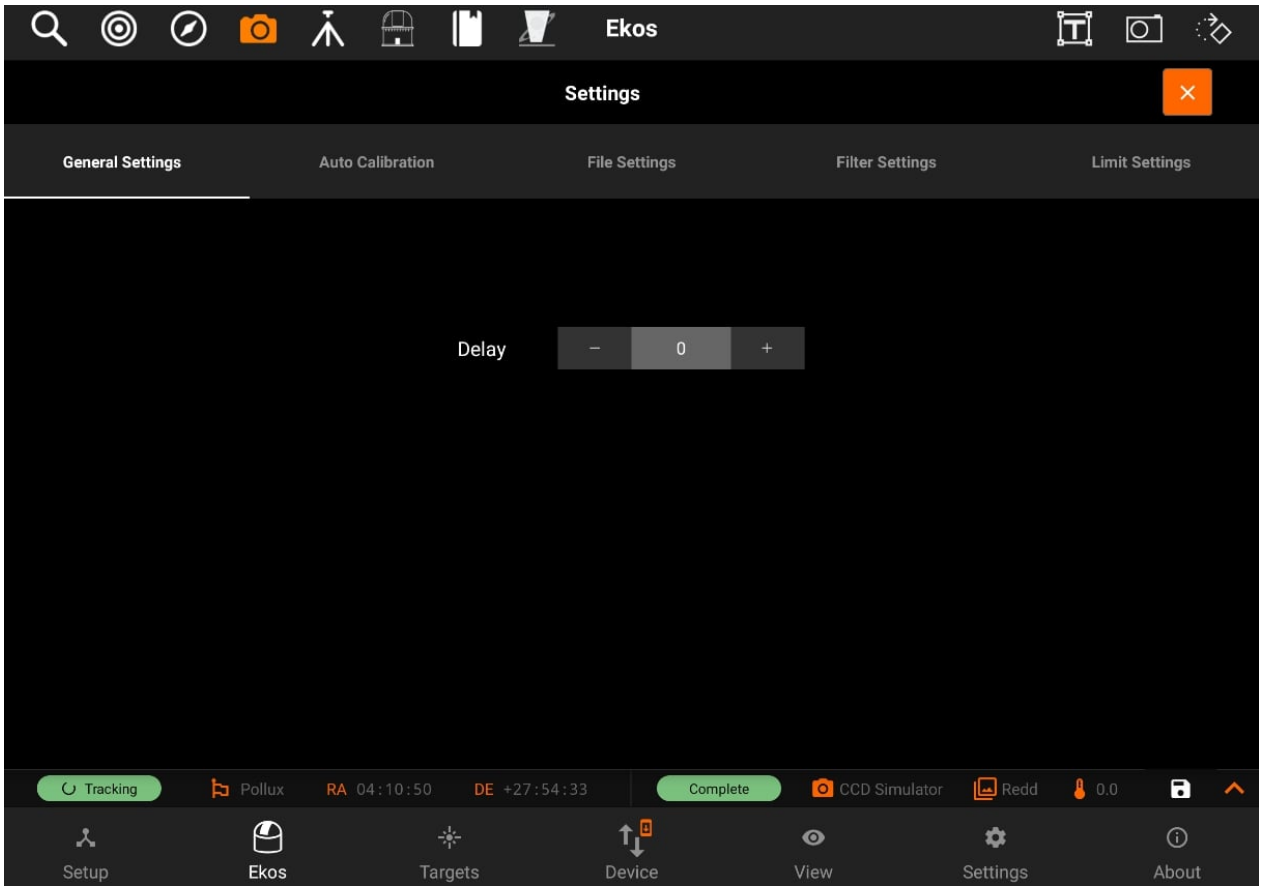
During the capture, a soft "ding" sound will be played for each capture (you can turn on

sounds by switching from Ekos Tab to Settings Tab and then toggling sounds on). After the capture is complete, you will see a notification message that says "CCD capture completed" and a "complete" sound will be played. In the case of the capturing process eing aborted for any reason, an "error" sounds will be played, and a notification message will be shown.



Delay control:

Delay in seconds between image captures.



Filter Settings

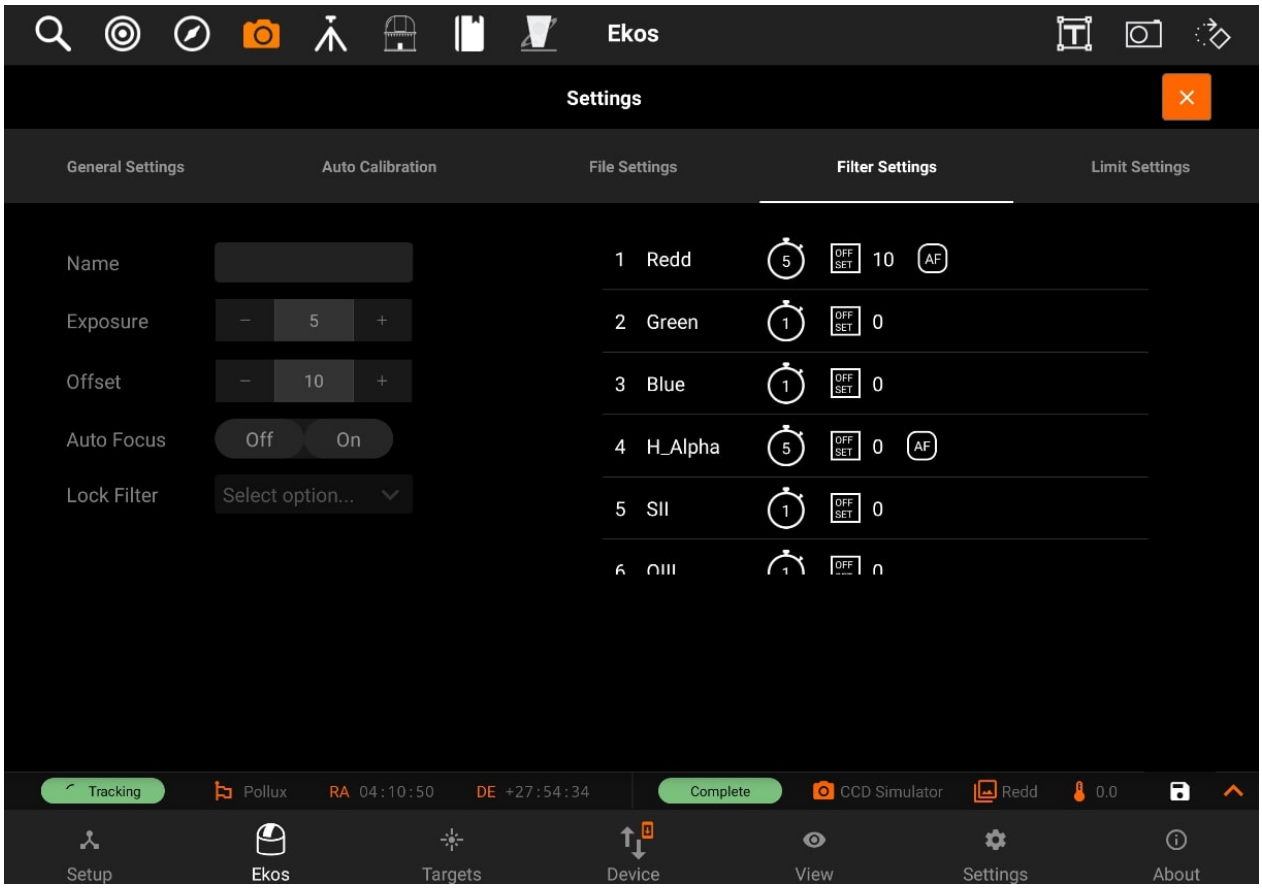
You can edit filters by tapping on the **Filter** button. The filter settings page will open and allow you to edit filter settings for each filter of the filter wheel selected in the dropdown menu.

Configure settings for each filter individually:

- Name: Filter Name
- Exposure: Set exposure time used when performing focus under this filter. By default, it is set to 1 seconds.
- Offset: Set relative offsets. Ekos will command a focus offset change if there is a difference between the current and target filter offsets. For example, given the values in the example image to the right, if the curernt filter is set to *Red* and next filter is *Green*, then Ekos shall command the focuser to Focus In by +300 ticks. Relative positive focus offsets denote Focus Out while negative values denote Focus In.
- Auto Focus: Check this option to initial AutoFocus process whenever the filter is changed to this filter.
- Lock Filter: Set which filter should be set and *locked* when performing autofocus for this filter.

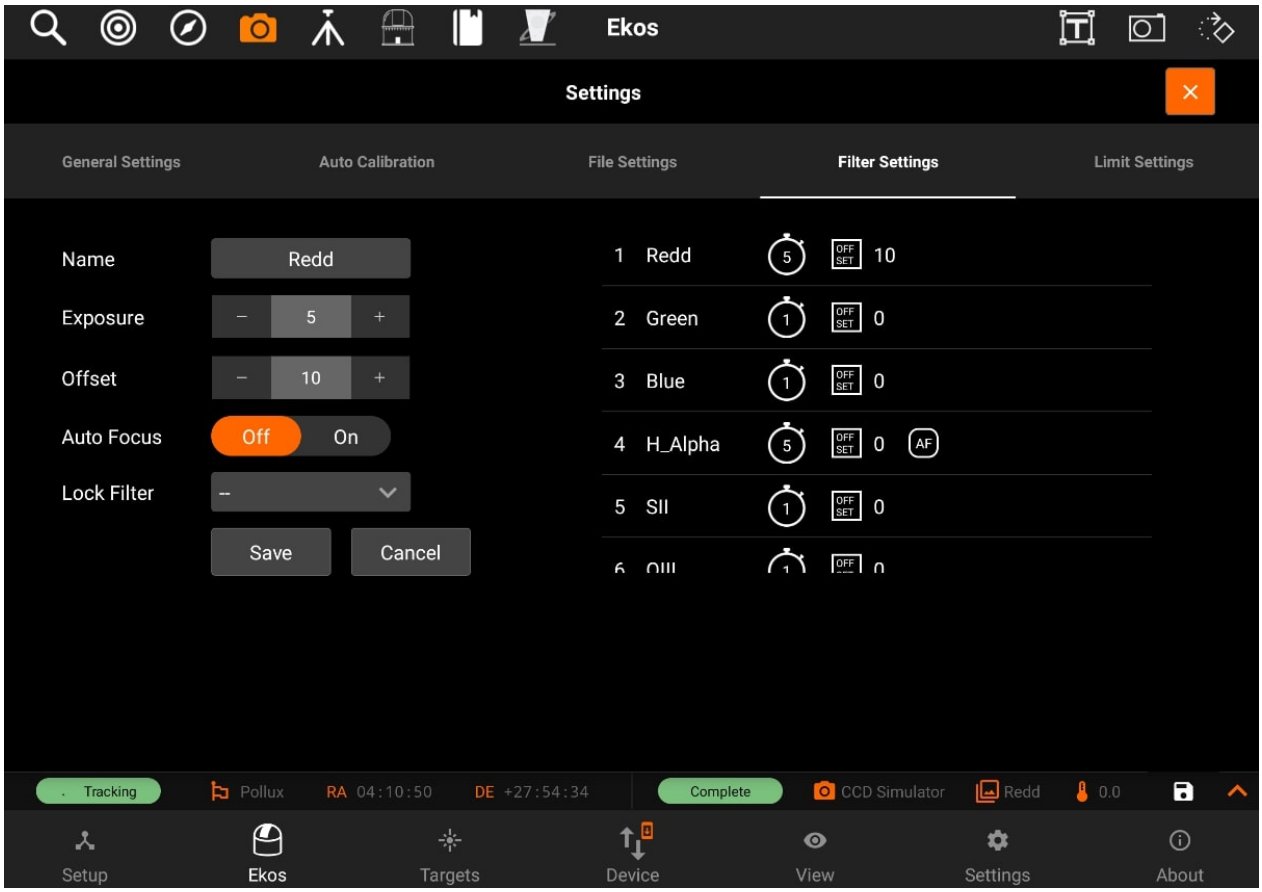
Let's take an example. Suppose the capture sequence is running and the current filter is *Green*, so the relative already offset is set to +300. The next image in the sequence uses Hydrogen Alpha (H_Alpha) so before Ekos captures the next frame, the following actions take place:

- Since Lumonisity is specified as the locked filter and auto-focus is checked, the filter is changed to Lumonosity
- A focus offset is -300 is applied since the prior filter *Green* was moved +300 previously.
- Auto Focus process is initiated.
- Once Auto Focus is complete, the filter is changed to H_Alpha.
- A focus offset of -1200 is applied.
- Capture sequence is resumed.

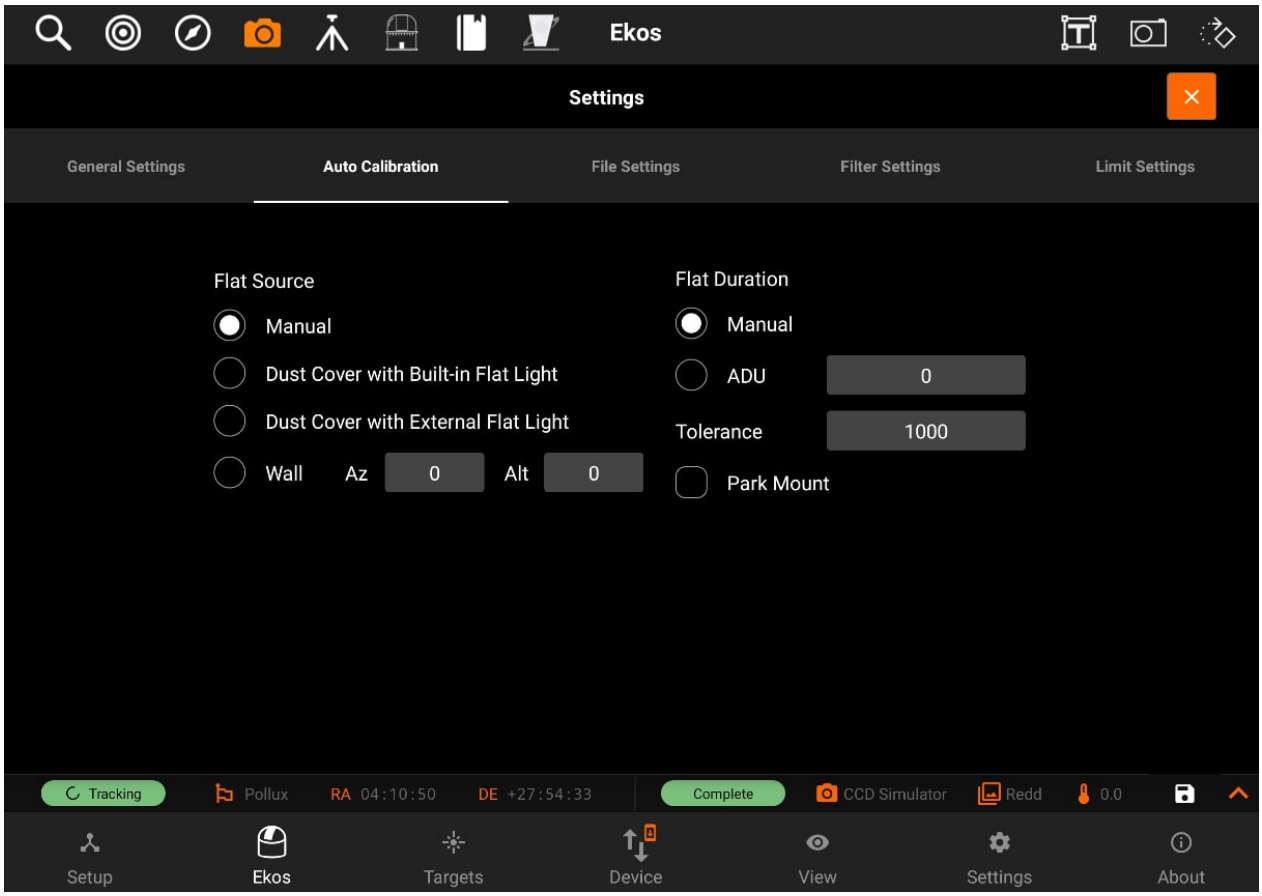


To edit a filter, tap on it on the panel on the right-side of the page. All of its details will be filled in the panel on the left-side to be edited.

After you edit the filter, tap on the **Save** button to save the filter settings. The panel on the right-side will shown the new settings for the filter you just edited.



Calibration Settings



Note: You can only edit calibration settings for capture jobs that have the frame type as Bias (B), Dark (D), or Flat (F).

For Flat Field frames, you can set calibration options in order to automate the process. The calibration options are designed to facilitate automatic unattended flat field frame capture. It can also be used for dark and bias frames if desired. If your camera is equipped with a mechanical shutter, then it is not necessary to set calibration settings unless you want to close the dust cover to ensure no light at all passes through the optical tube. For flat fields, you must specify the flat field light source, and then specify the duration of the flat field frame. The duration can be either manual, or based on ADU calculations.

1. Flat Field Source
    - **Manual**: The flat light source is manual.
    - **Dust Cover with Built-In Flat Light**: If using a dust cover with built-in light source (e.g. FlipFlat). For dark and bias frames, close the dust cap before proceeding. For flat frames, close the dust cap and turn on the light source.
    - **Dust Cover with External Flat Light**: If using a dust cover with external flat light source. For dark and bias frames, close the dust cap before proceeding. For flat frames, open the dust cap and turn on the light source. The external flat

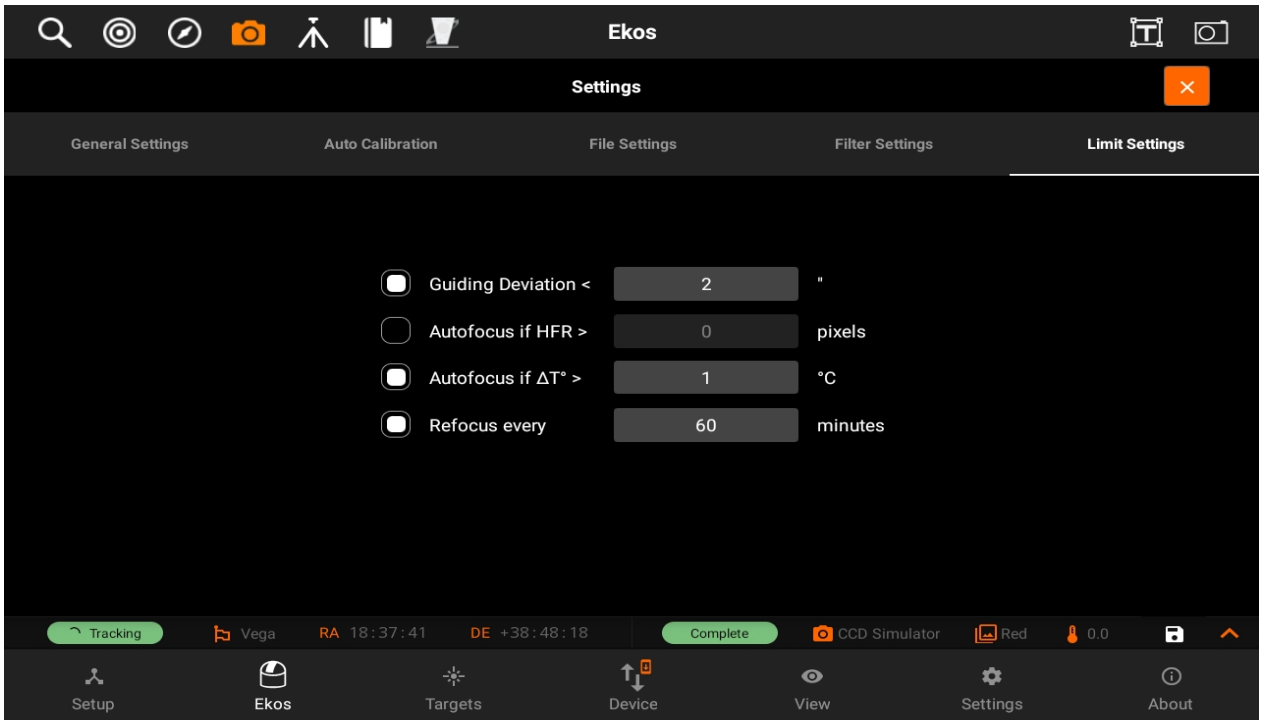
light source location is presumed to be the parking location.

- **Wall**: Light source is a panel on the observatory wall. Specify the Azimuth and Altitude coordinates of the panel and the mount shall slew there before capturing the flat field frames. If the light panel is controllable from INDI, Ekos shall turn it on/off as required.

2. Flat Field Duration
   - **Manual**: Duration is as specified in the Sequence Queue.
   - **ADU**: Duration is variable until specified ADU is met.

Before the calibration capture process is started, you can request Ekos to park the mount and/or dome. Depending on your flat source selection above, Ekos will use the appropiate flat light source before starting flat frames capture. If ADU is specified, Ekos begins by capturing a couple of preview images to establish the curve required to achieve the desired ADU count. Once an appropiate value is calculated, another capture is taken and ADU is recounted until a satisfactory value is achived.

Limit Settings

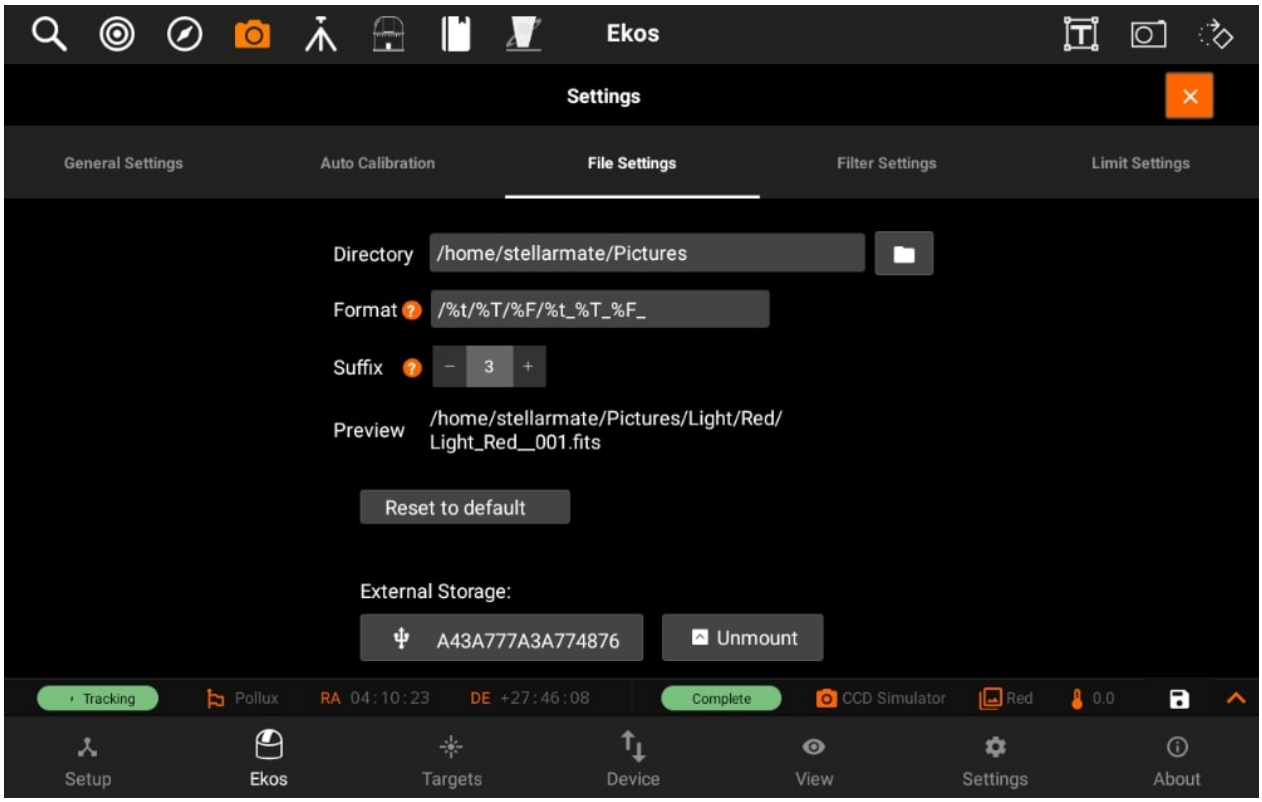


Limit settings are applicable to all the images in the sequence queue. When a limit is exceeded, Ekos shall command the appropiate action to remedy the situation as explained

below.

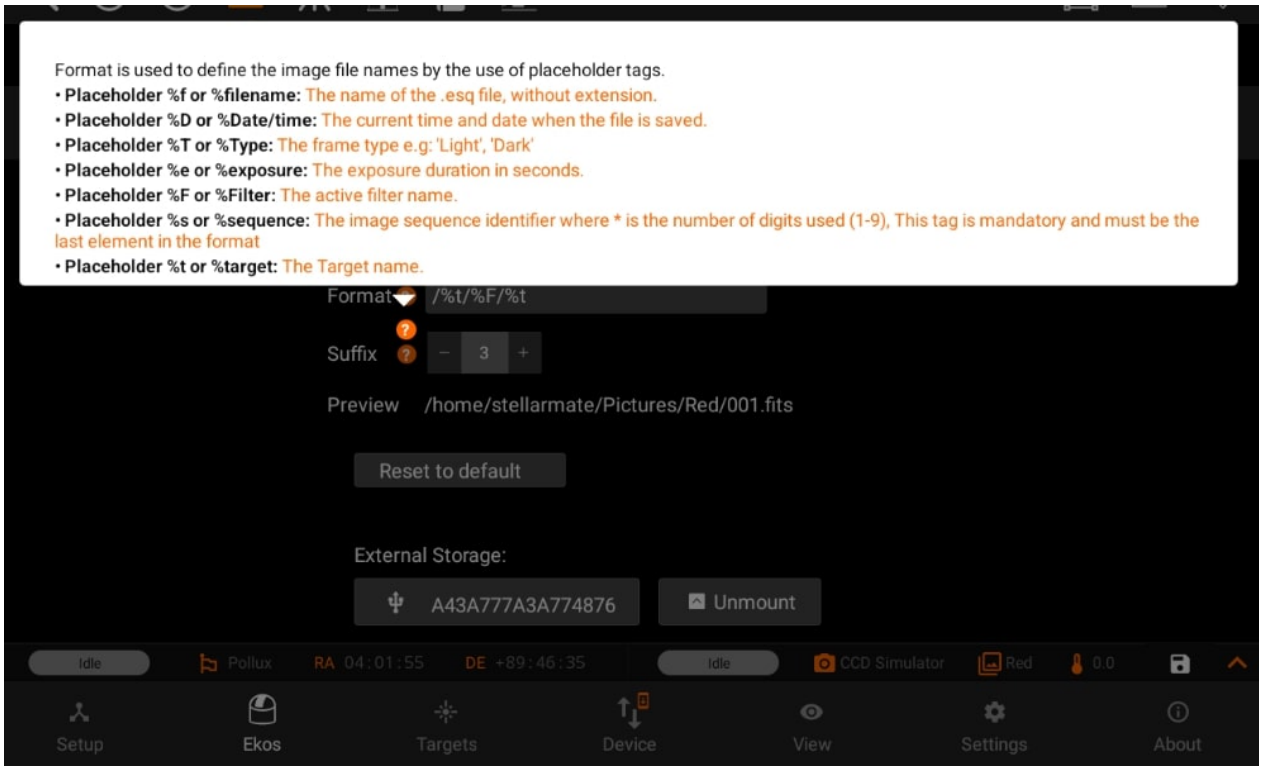
- Guiding Deviation: If checked, it enforces a limit of maximum allowable guiding deviation for the exposure, if autoguiding is used. If the guiding deviation exceeds this limit in arcseconds, it aborts the exposure sequence. It will automatically resume the exposure sequence again once the guiding deviation goes below this limit.
- Autofocus if HFR exceeds a value: If autofocus is enabled in the focus module and at least one autofocus operation was completed successfully, you can set the maximum acceptable HFR value. If this option is enabled then between consecutive exposures, the HFR value is recalculated, and if found to exceed the maximum acceptable HFR value, then an autofocus operation is automatically triggered. If the autofocus operation is completed successfully, the sequence queue resumes, otherwise the job is aborted.
- Autofocus if change in temperature exceeds a value: If autofocus is enabled in the focus module and at least one autofocus operation was completed successfully, you can set the maximum acceptable change in temperature value. If this option is enabled then between consecutive exposures, the change in temperature value is recalculated, and if found to exceed the maximum acceptable change in temperature value, then an autofocus operation is automatically triggered. If the autofocus operation is completed successfully, the sequence queue resumes, otherwise the job is aborted.
- Refocus every x minutes: you can set your focuser to refocus every x minutes. (where x is the amount minutes input by the user)

File Settings

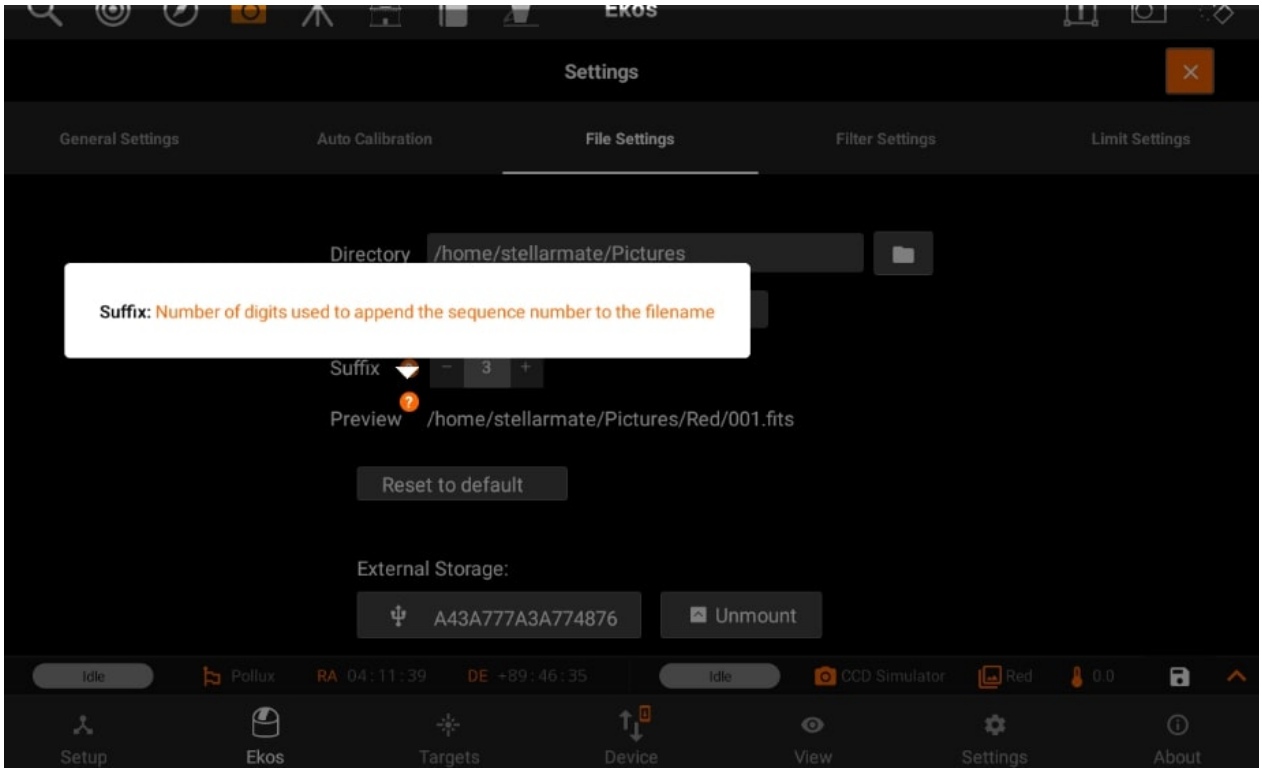


Settings for specifying where captured images are saved to, and how to generate unique file names.

- **Directory**: Local directory to save the sequence images to.
- **Format:** Format is used to define the image file names by the use of placeholder tags.

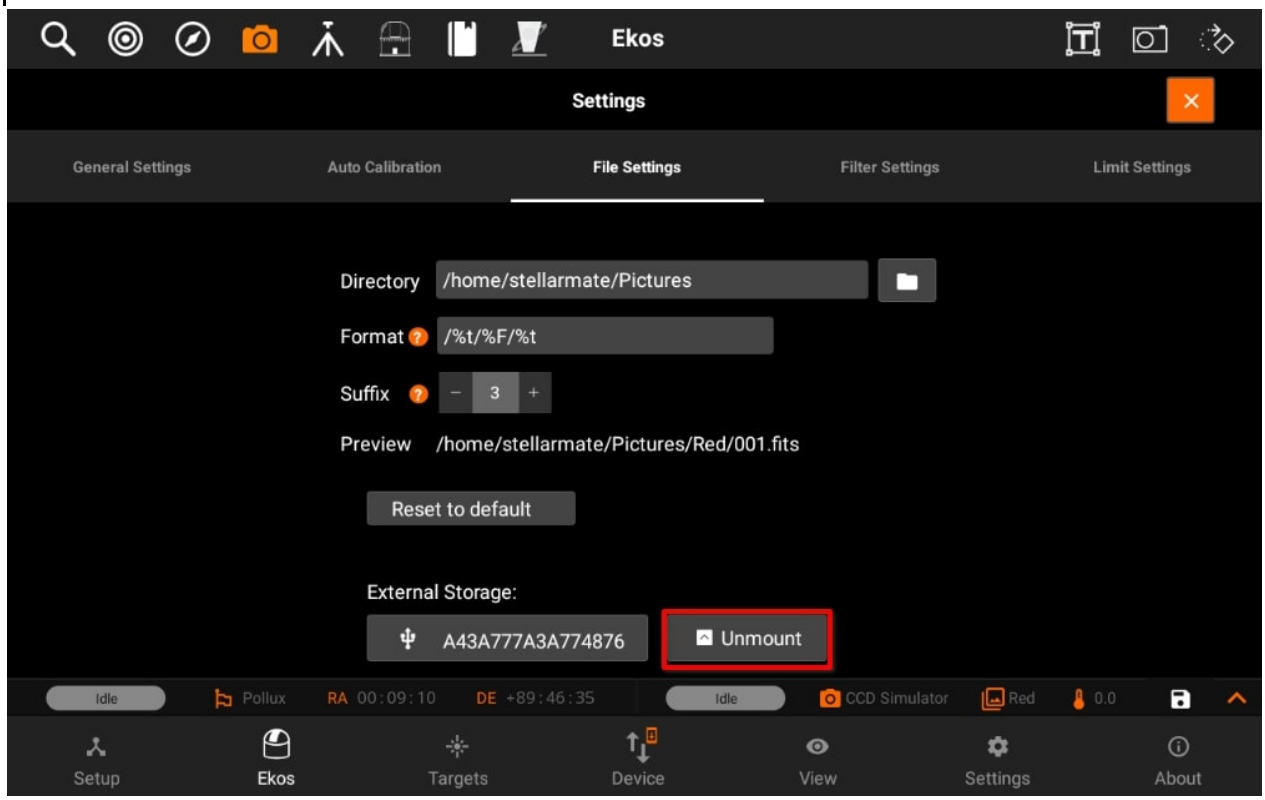


- **Suffix**: Number of digits used to append the sequence number to the filename

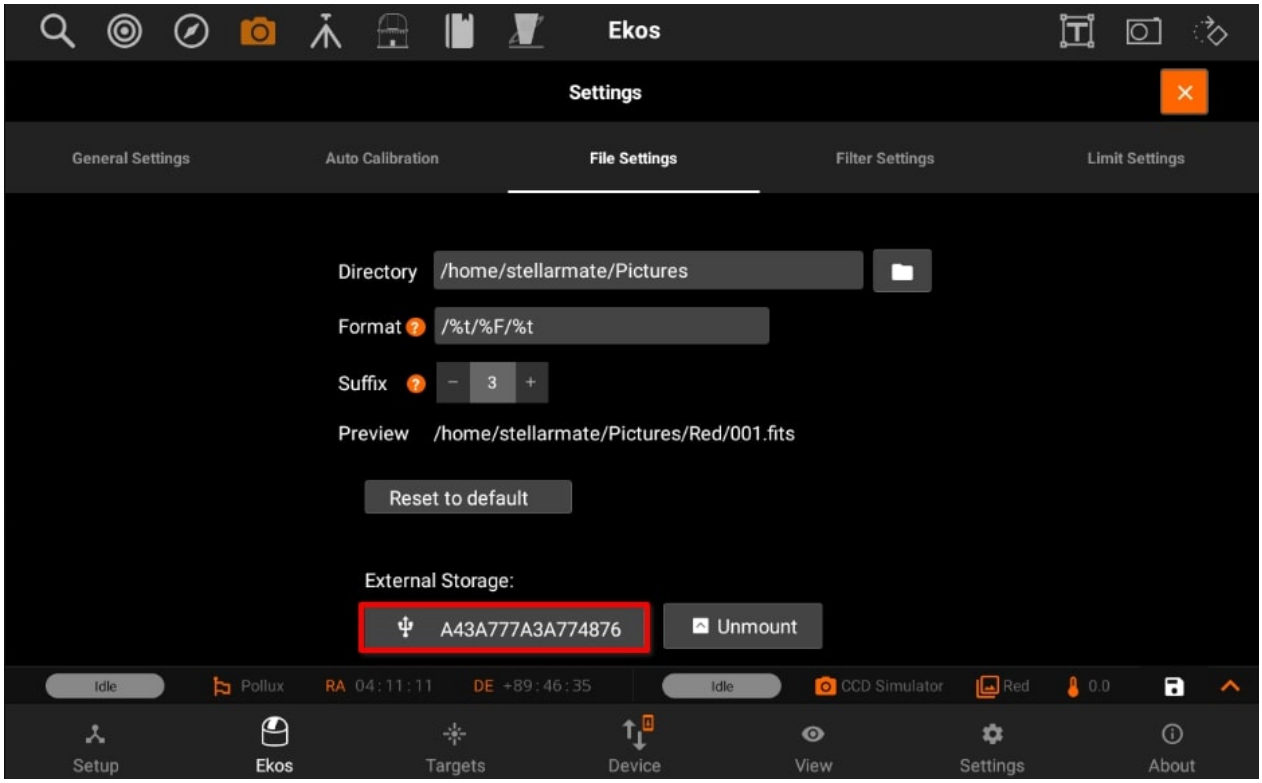


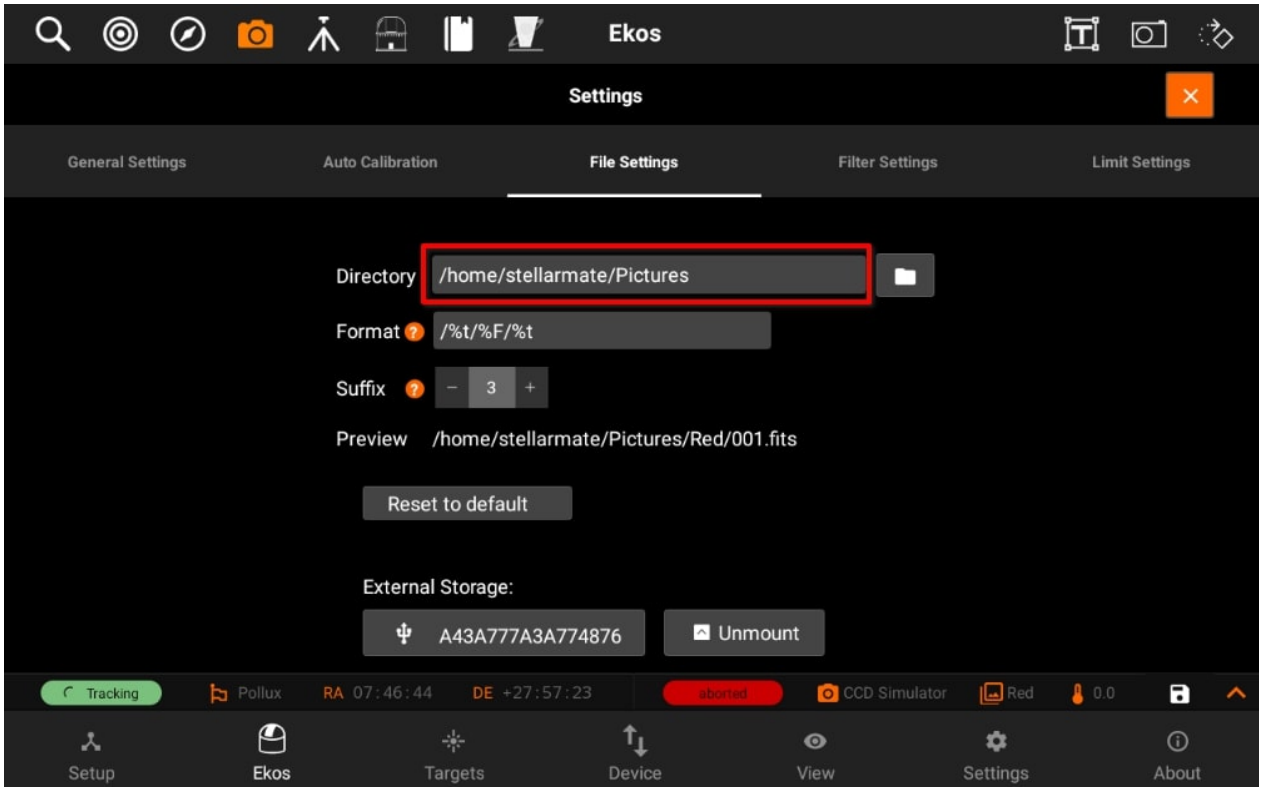
- **Preview**: Path of your filename

You can now also unmount your USB device by pressing "Unmount" button next to your external storage device.



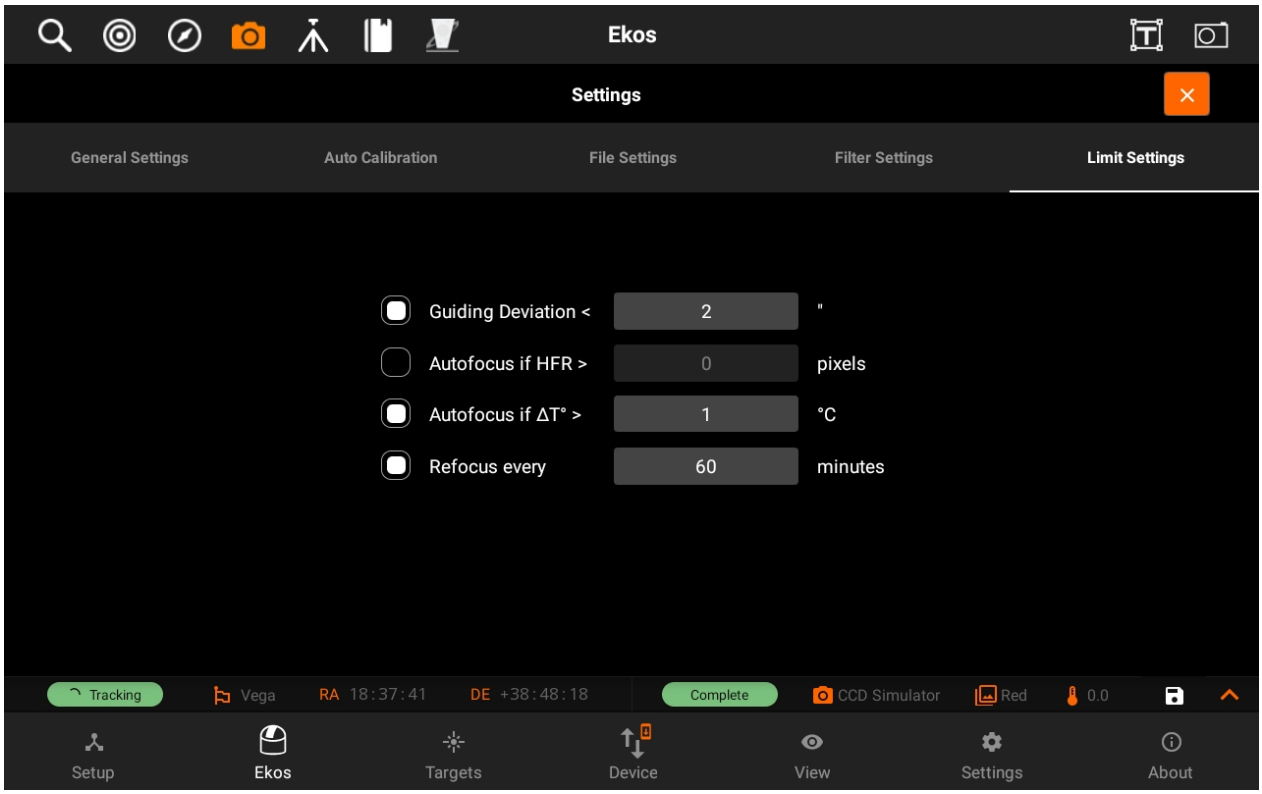
You can also set the directory path of your USB device (if attached). If USB device is connected, then External Storage devices are visible.
By selecting on of them, will set the Directory path of it.





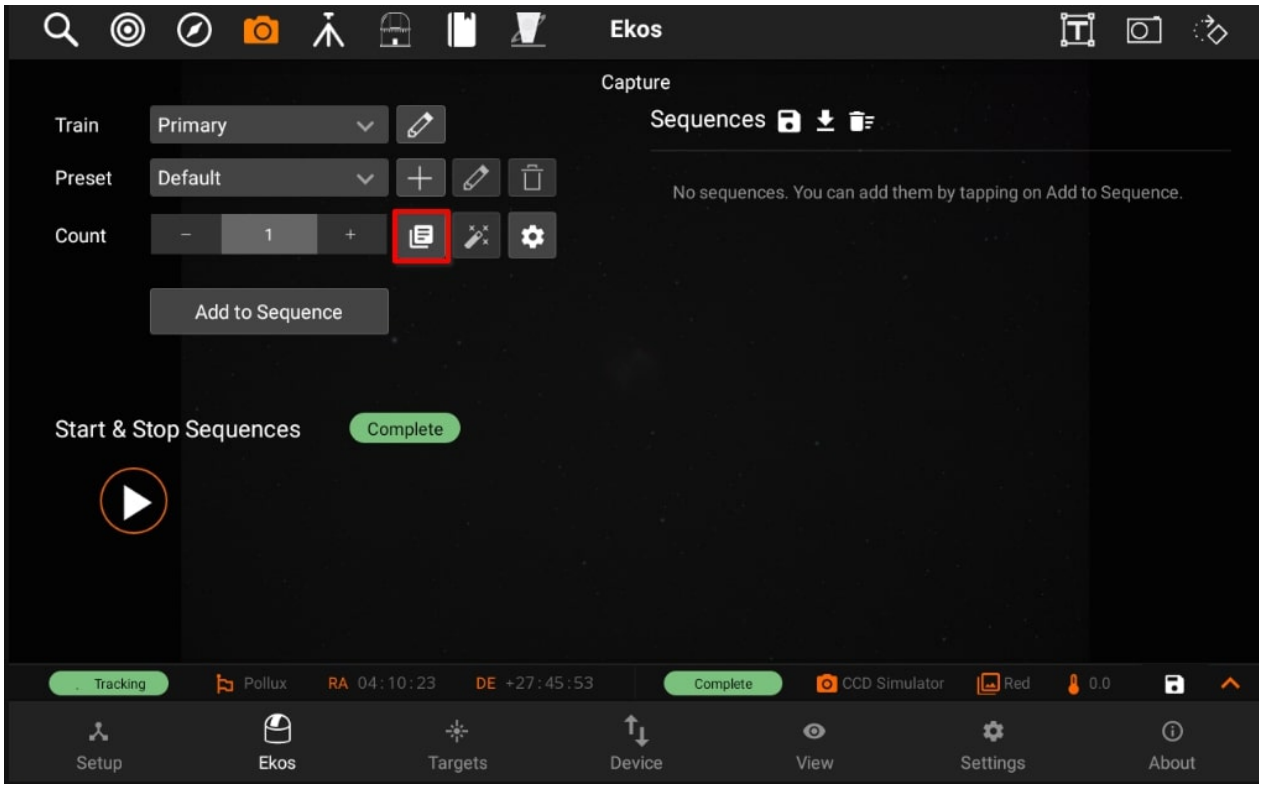
Limit settings:

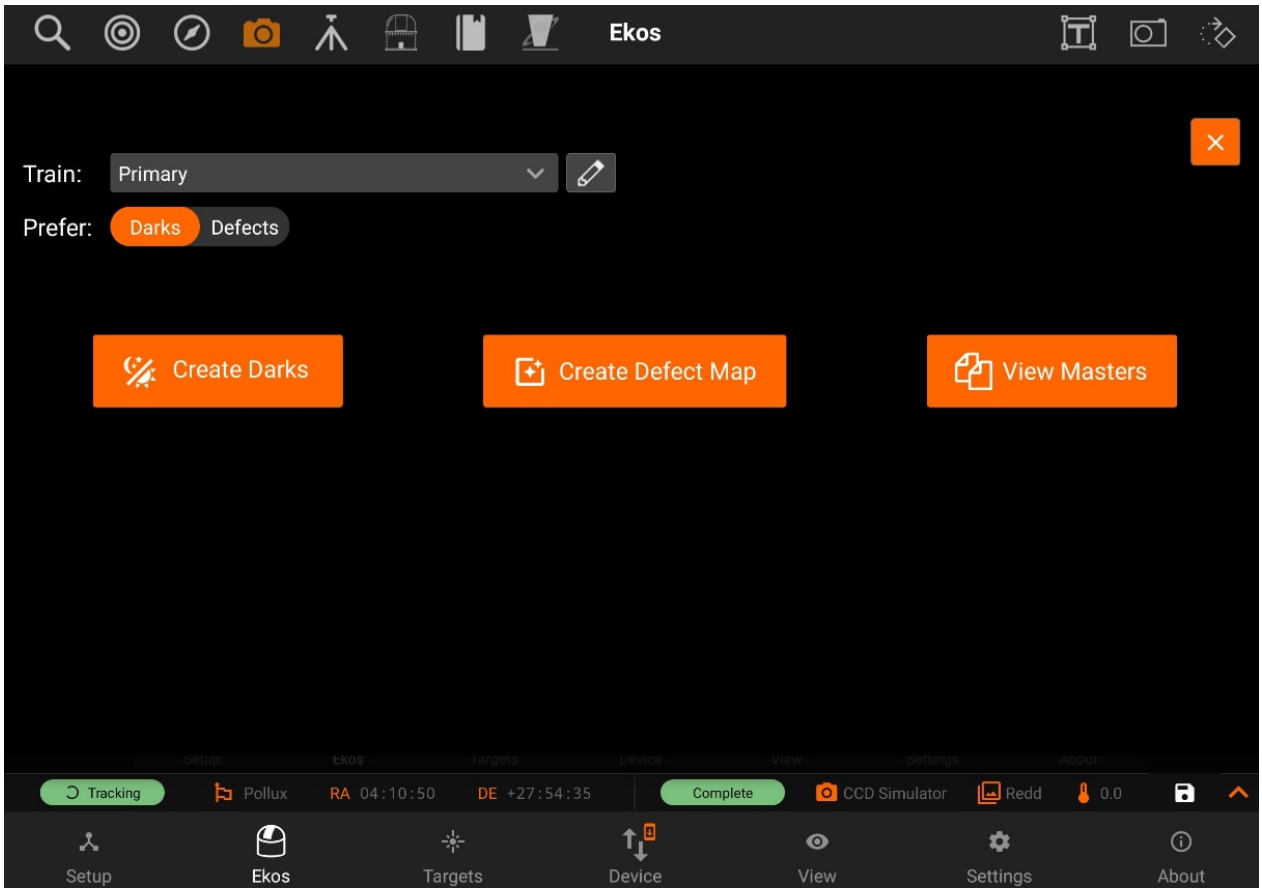
Limit settings are application to all the images in the sequence queue. When a limit is exceeded, Ekos shall command the appropriate action to remedy the situation.



Dark Library

Dark Library





The Dark Library is a collection of dark frames captured from your cameras under different

settings. There are basically five primary types of frames:

1. **Light Frame:** This is the regular image captured by your sensor. It is called light because it captures the incoming light received at the sensor.
2. **Dark Frame:** A frame captured with the same settings as the light frame (same temperature, exposure time, and binning) but with the shutter **closed** so that no photons reach the sensor. This is used to record the electronic noise generated by the sensor without any incident photons. It is used to remove noise from the Light Frame by means of subtraction since the Light Frame includes signal from both the incoming photons and electronic noise generated by the sensor.
3. **Bias:** A very short exposure with the shutter closed.
4. **Flat:** A frame captured with the same settings as the light frame (same temperature, exposure time, and binning) but subjected to an illuminated flat field source (such as an LED panel). This is used to correct for optical aberrations in the imaging train including dust motes.
5. **Dark Flats:** Special type of dark frames captured at the same exposure of flat frames. This is used to calibrate the flat frames.
   Dark Library is used to capture dark images.

Generating a dark library for your equipment profile is highly recommended. When capturing frames in focus, guide, and align modules, the system searches the dark library for suitable dark frames. If a suitable match is found, the light frame is calibrated and this can greatly enhance the performance and accuracy of all Ekos modules.

Note: "Dark Library is not used to calibrate your sequence images, it is only used to calibrate the Align, Focus, and Guide module frames."

Dark frame calibration can be applied using two methods:

1. **Dark Subtraction**: The dark frame is simply subtracted from the light frame. This is the recommended method when using a cooled camera.
2. **Defect Maps**: For uncooled cameras (e.g. Guide), dark frames may not be suitable for removing the hot and pixels present in the image. An alternative method generates a map of bad pixels that should be treated in the light frame. You can adjust the Hot and Cold pixels sliders to include or exclude pixels. It's recommended not to include more than 5,000 pixels as it can become computationally expensive to

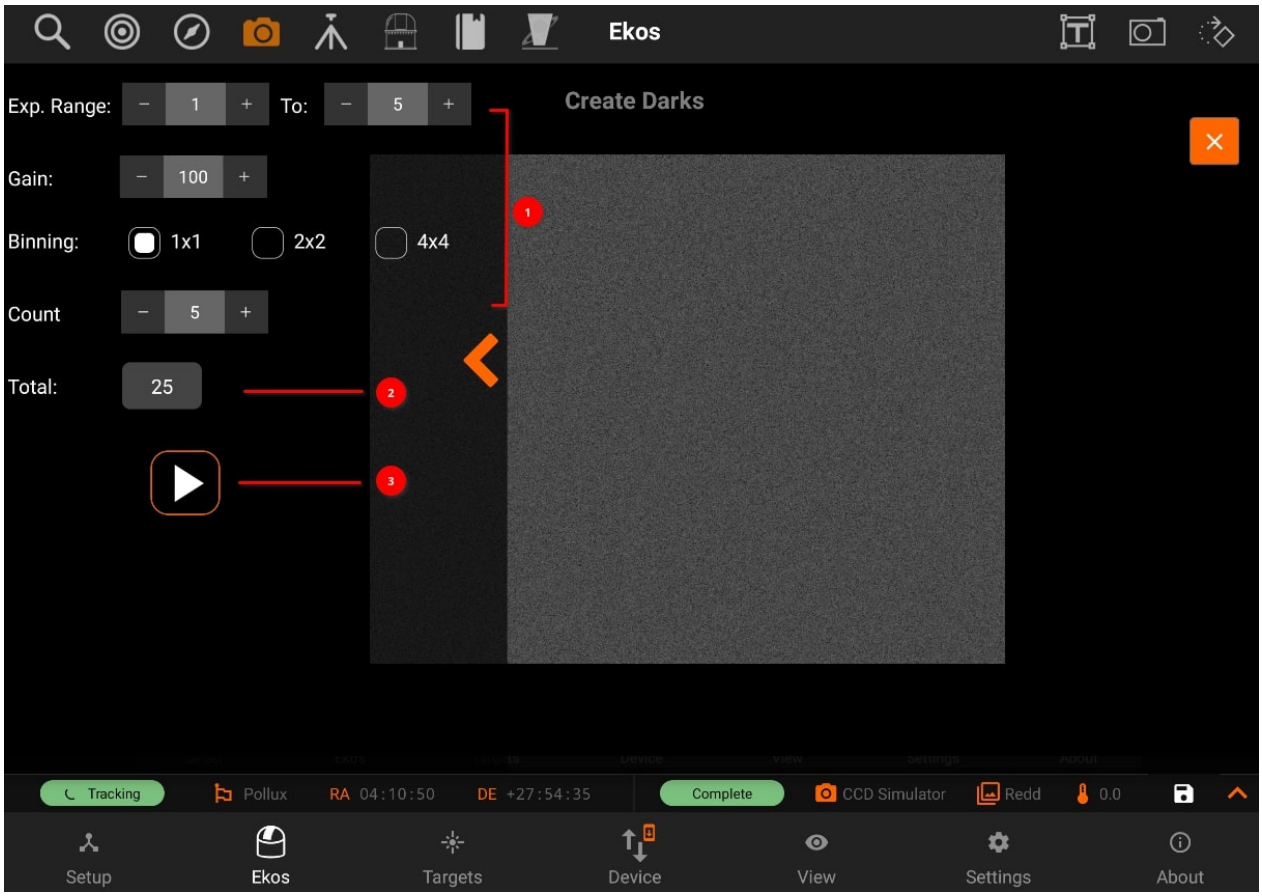
correct this many pixels in guide images. Ekos corrects each defective pixel by using calculating the median value from surrounding pixels.

Preset: Select which capture preset to use. The camera name, gain, and offset are used from the preset while the exposure and temperature settings (if supported) are configured in the Create Dark Library window.

Prefer: Select which dark calibration method to utilize for the selected preset. Both methods are used to remove noise from the light frame:

- **Dark**: Remove noise by means of dark frame subtraction.
- **Defect Maps**: Remove noise by means of defect map substitution.

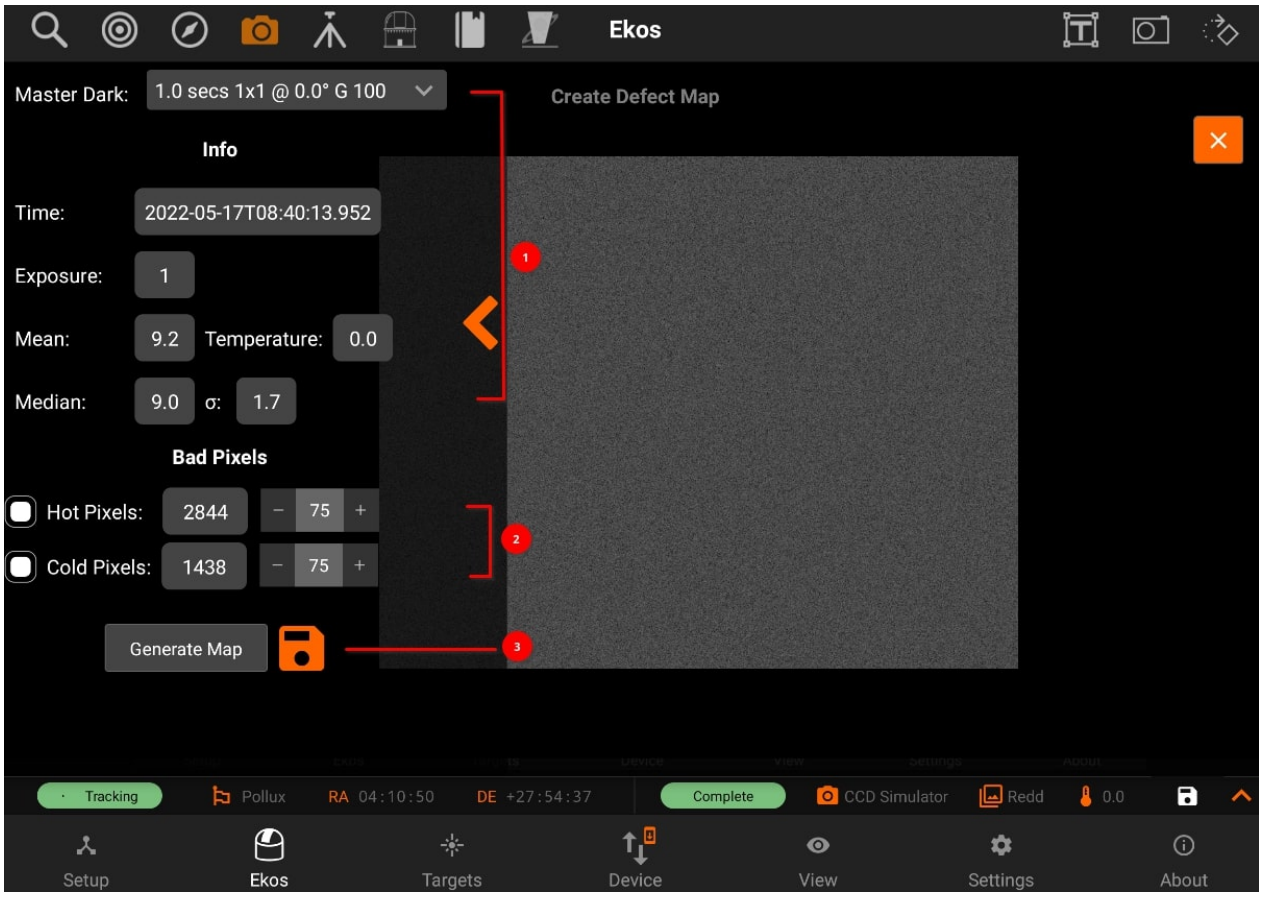
1. Create Darks:



Create a **master** dark frame by capturing and averaging a number of individual dark frames.

1. Select the range of exposures, binning, temperatures and count (if applicable) required.
2. Each time you change a selection, the Total Frames count is updated to reflect the required frames.
3. When ready, tap the Play button to start the process.

2. Create Defect Map:



After creating a master dark, you can create a defect map for your camera. Usually, defect maps are used when dark frame subtraction does

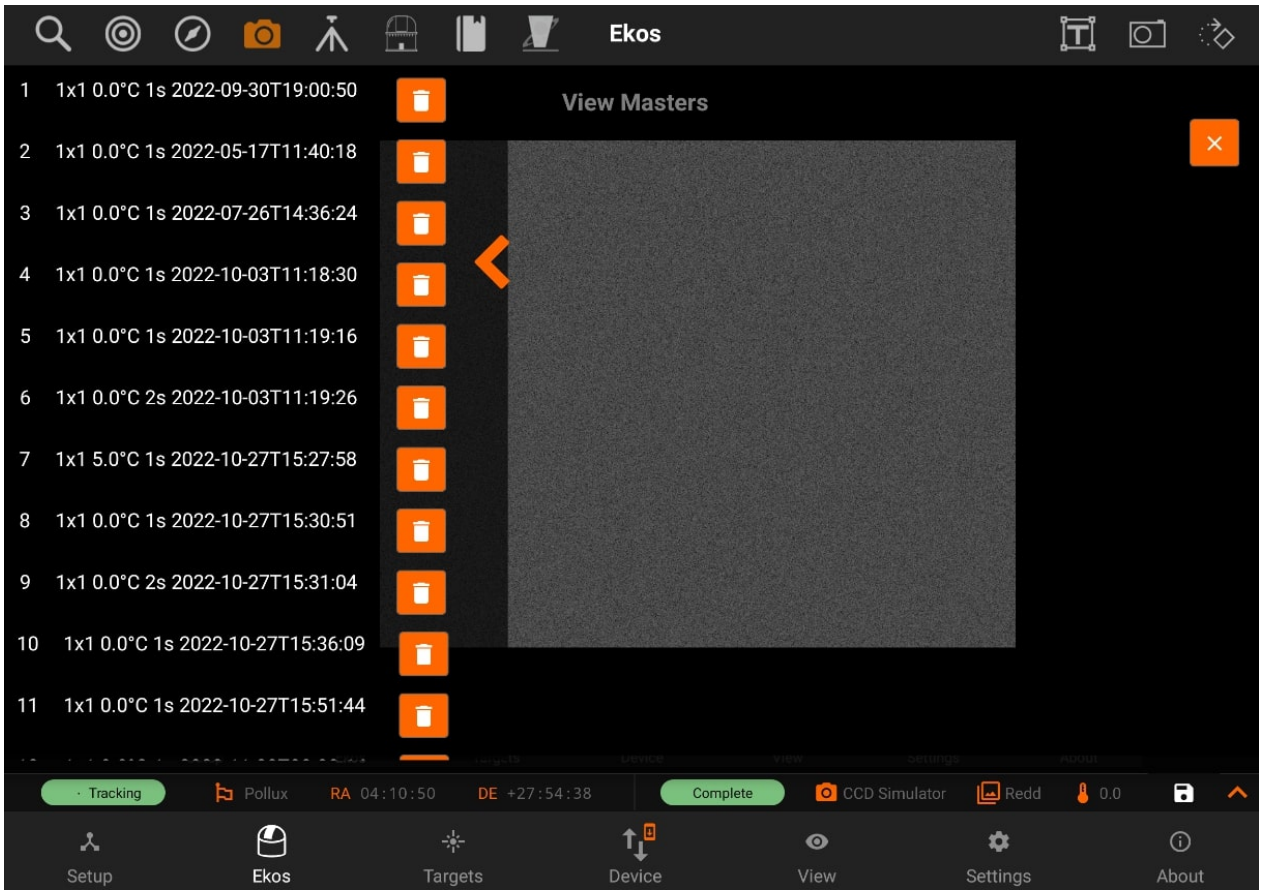
not improve the quality of the calibration result. This is especially evident when using uncooled guide cameras that can exhibit hot pixels that are

hard to treat with classical dark frame subtraction methods.

1. Selecting the master dark frame, loads the infomation of the image
2. Then adjust Hot and Cold pixel sliders to include or exclude pixels.
3. Click Generate Map to inspect the results and once satisfied tap the save button

to store the defect map for future use.

3. View Masters:



Inspect master frames of a specific camera.

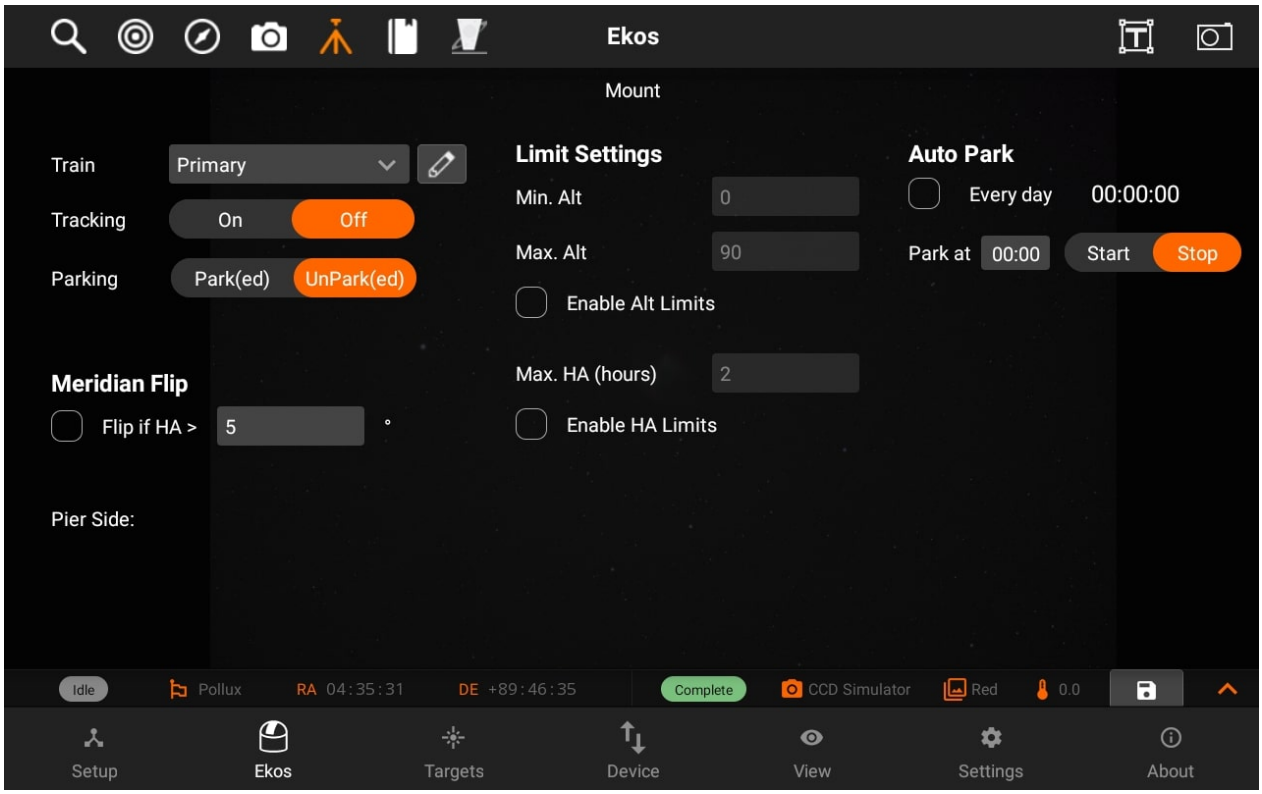
Mount

The Mount module allows you to do Meridian Flips and set limits for your Mount, it has the following features:

- Manage / Select Optical trains.
- Tracking On/Off
- Mount Park/UnPark
- Meridian Flip
    - Flip if HA >: Request a meridian flip if the hour angle exceeds the specified value. Capture and Guiding will be suspended and resumed after the flip is complete.
    - Pier Side: Shows the pier side direction.
- Limit Settings: You enable Altitude Limits or Hour Angle Limits if you do not wish your mount to move past a specific limit. The values are expressed in hours. Setting a 1 hour (HA) limit means your mount is restricted to 15 degrees east and west of the meridian.

Setting it to 3 HA (3*15) means your mount is free to move 45 degrees east and west of the meridian.

- Auto Park



Train

You can Select / Edit a train specifically for Mount module. Each module has it's own train. Visit Optical trains topic for more.

Meridian Flip

You can do a Meridian Flip from the Mount Module.

Equatorial mounts flip after crossing the meridian in order to prevent the imaging equipment train from hitting the tripod. With Ekos, you can set an hour angle limit which if exceeded, the mount will be commnded to flip. The mount must begin tracking east of the meridian in order to the meridian flip to be commanded in Ekos.

When commanding a meridian flip, Ekos will suspend the autoguiding process and waits until the mount completes the flip. Once the mount begins tracking again post meridian flip, Ekos will plate-solve and make any necessary slew commands to bring the mount to the exact location it was tracking prior to the flip.

Next, it will automatically capture a frame and select a suitable guide star, performs calibration, and resumes autoguiding. If In-Sequence focuing is enabled, it will also capture and focus a suitable star. It then resumes the capture process form where it left.

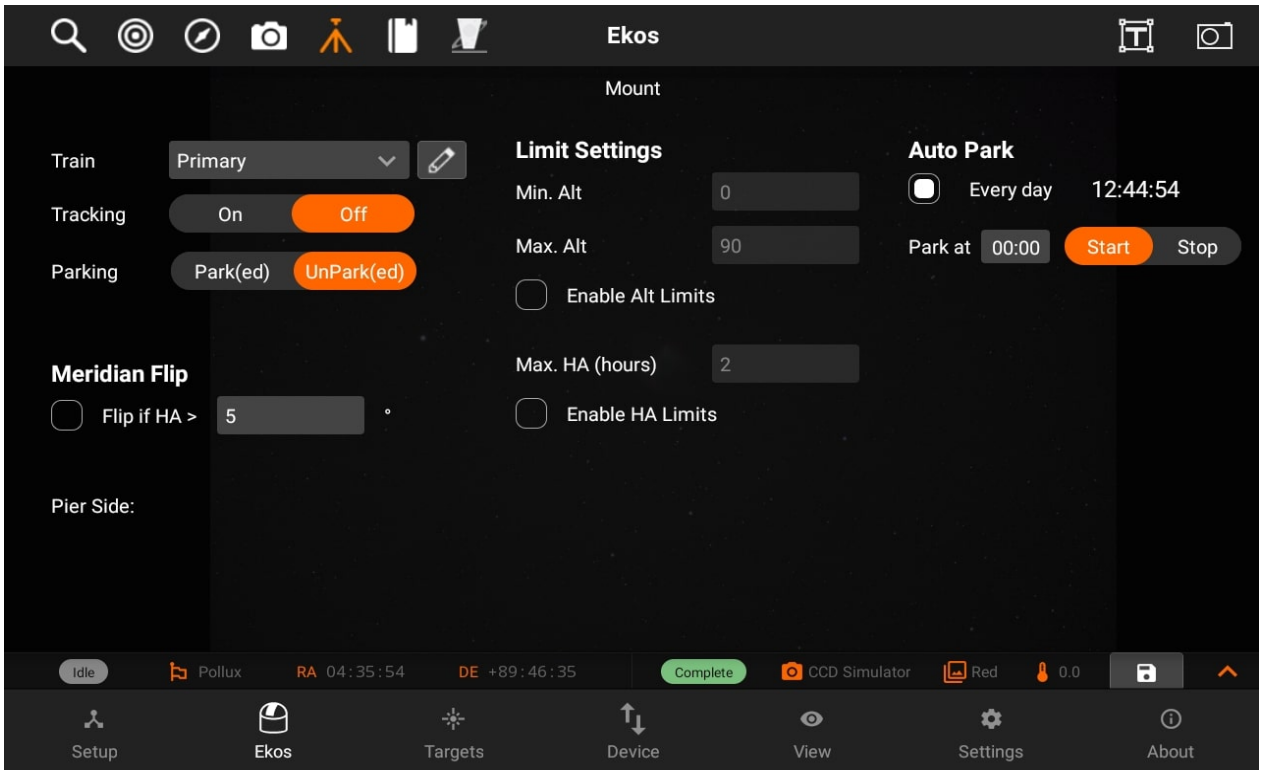
All these steps are completely automated and require no user intervention!

So just set when you want the meridian flip to occur at the mount module. Remember that the setting is in Hour Angle (HA). 1 HA = 15 degrees, therefore 0.1 HA = 1.5 degrees West of the Meridian.

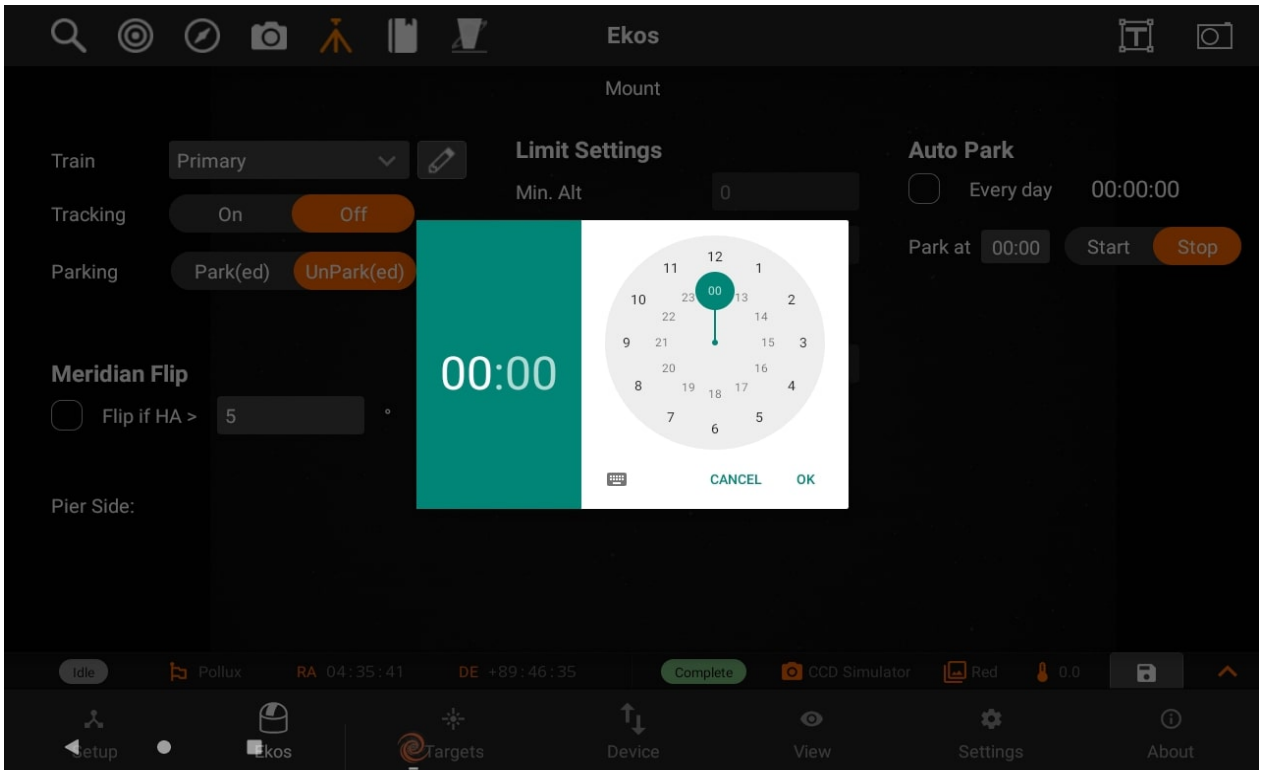
Always use a positive value to ensure proper meridian flip takes place. Using zero could theoretically work but it is at the very edge where the decision to flip or not is made by the mount, so it's safer to use a slightly higher value like 0.1 HA.

Auto Park

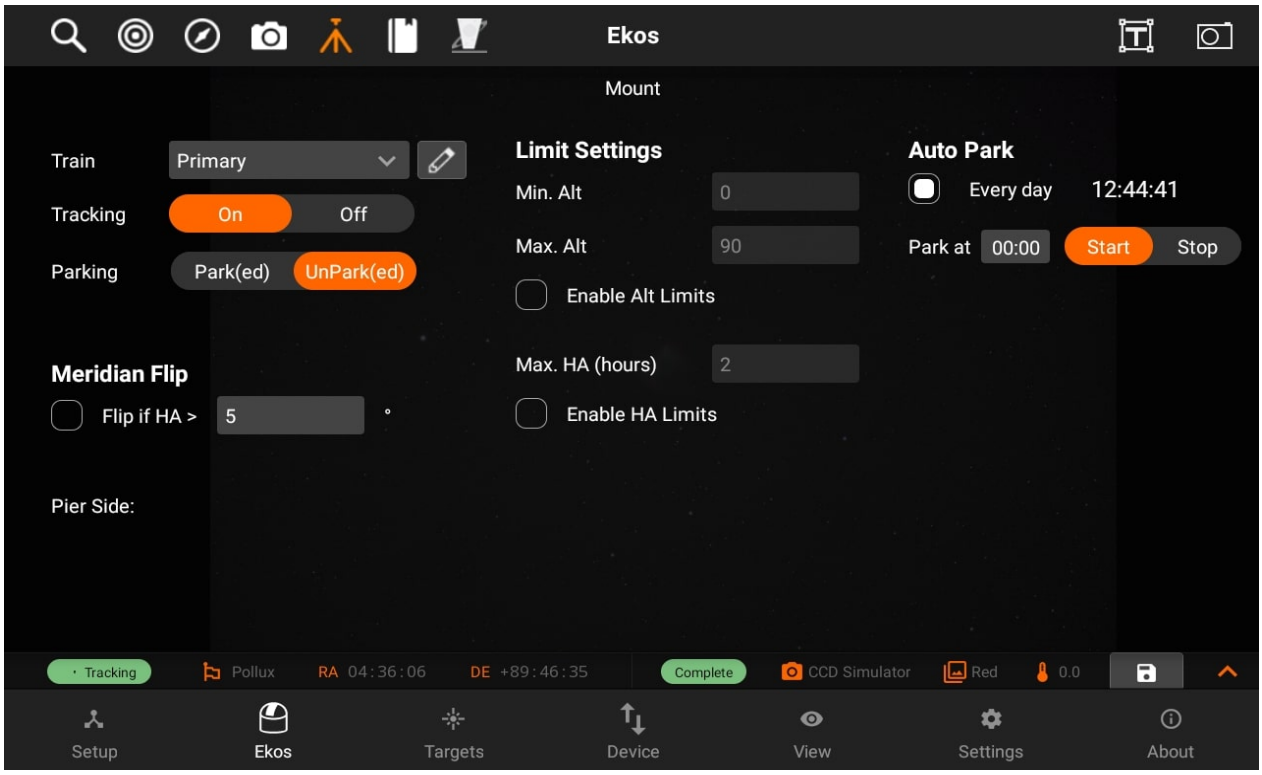
To enable auto park every day, check the Every day box. Otherwise if the desire is only to park it once, keep it disabled.



Select the time you want to park the mount.



To start the countdown timer, press start.

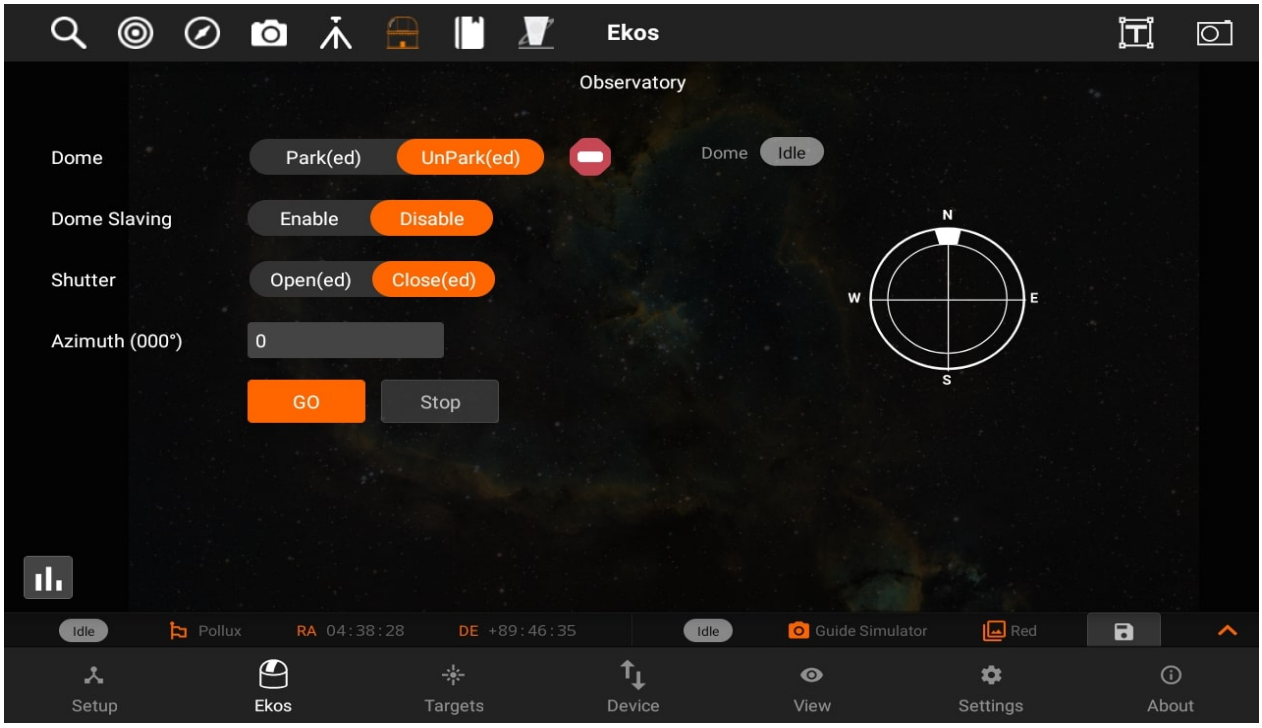


Observatory

The Observatory module allows you to control your Dust Cap and Dome/Roll-off roof, it has the following features:

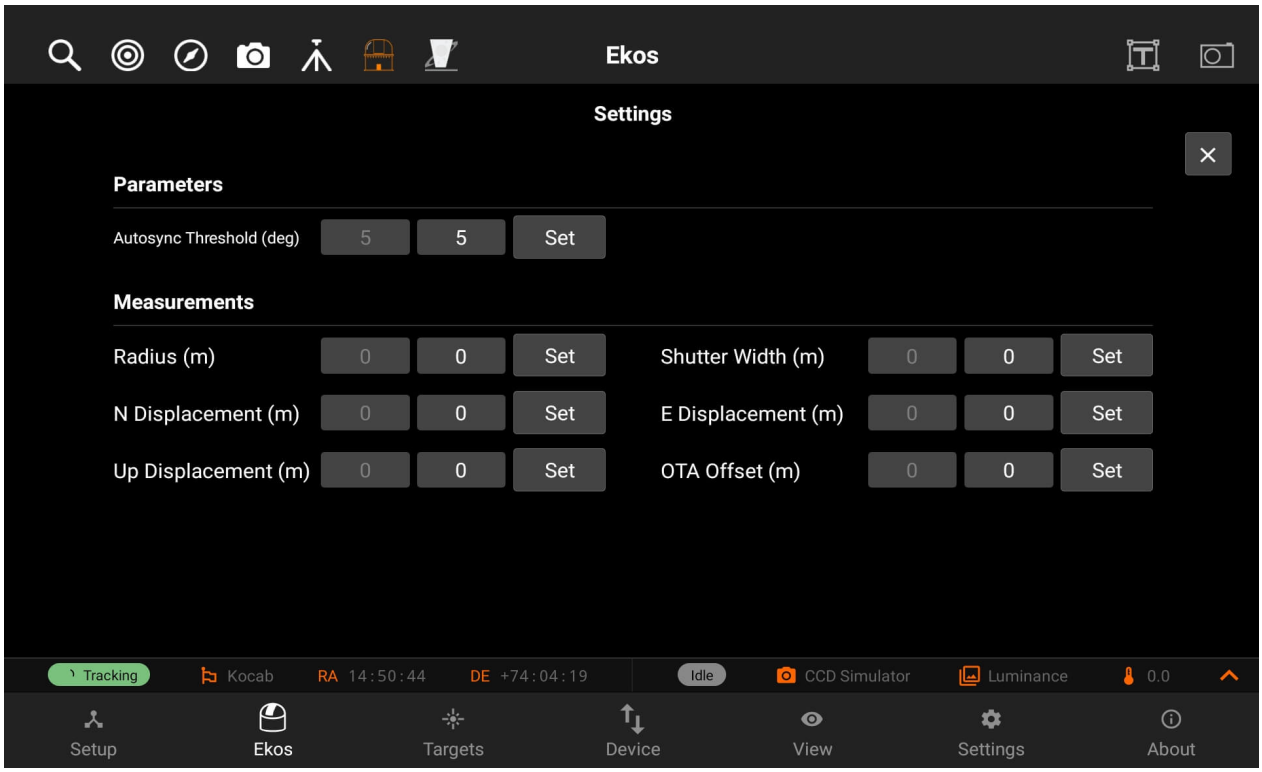
- Dust Cap Park/UnPark
- Dome Park/UnPark
- Roll-off roof Park/UnPark

- Abort Dome Motion
- Goto Absolute Dome Angle



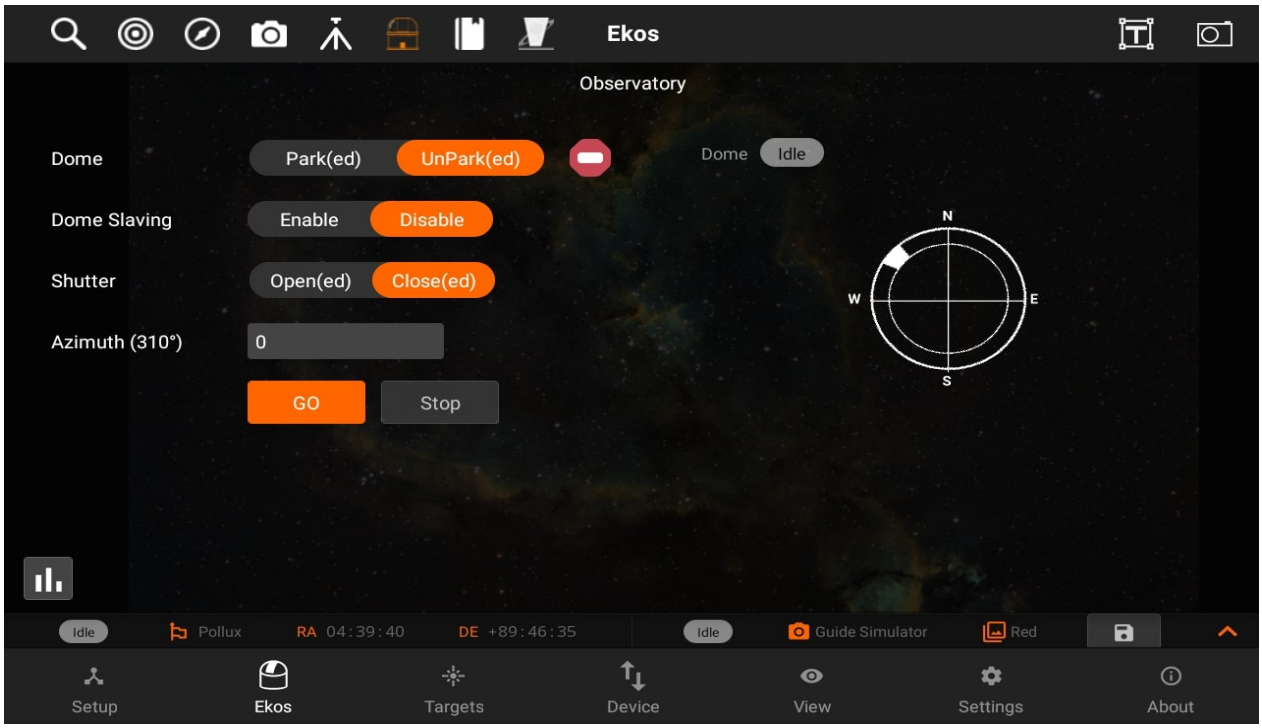
Changing Dome settings

To change the settings, click on Parameters:



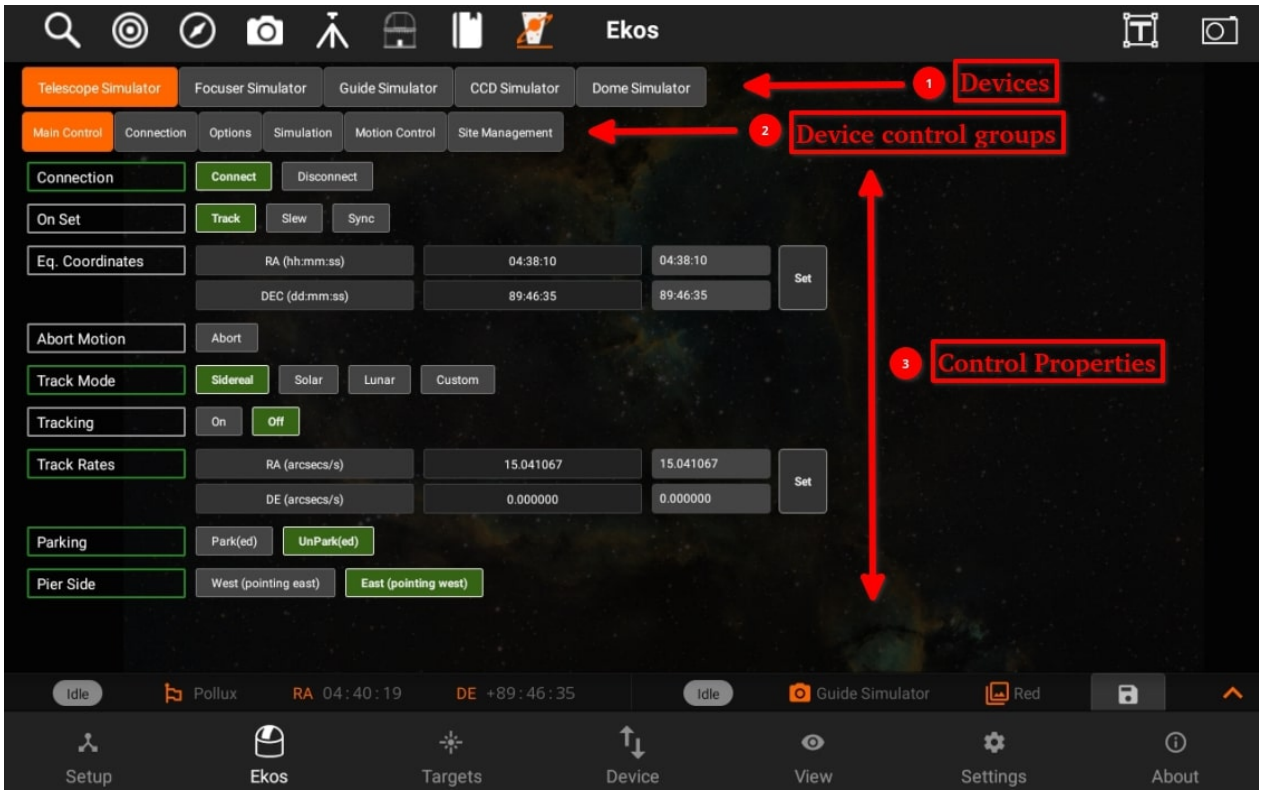
Going to an absolute angle position

You can go to an absolute angle position on your dome by tapping on the textbox next to the Azimuth label and setting the angle value to go to. Now tap on the GO button to go to that angle position. The dome will now try going to that position, the dome status badge will show what type of rotation the dome is doing, and a compass preview will show a representation of the dome angle. After the movement is complete, you will be able to see the status badge change to "Tracking".

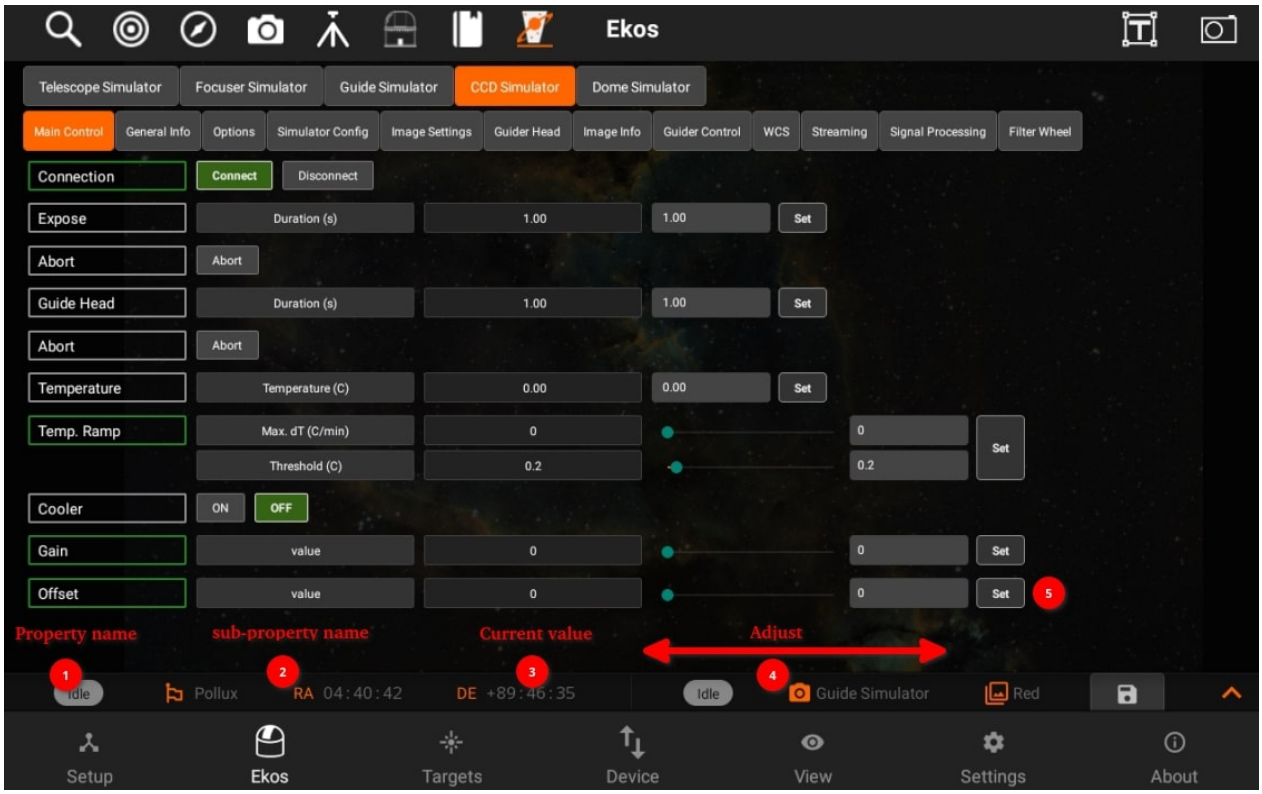


INDI Control Panel

INDI Control Panel provides an interface to interact with the drivers of the devices connected to Stellarmate. It is a front-end for the INDI controls available on KStars.



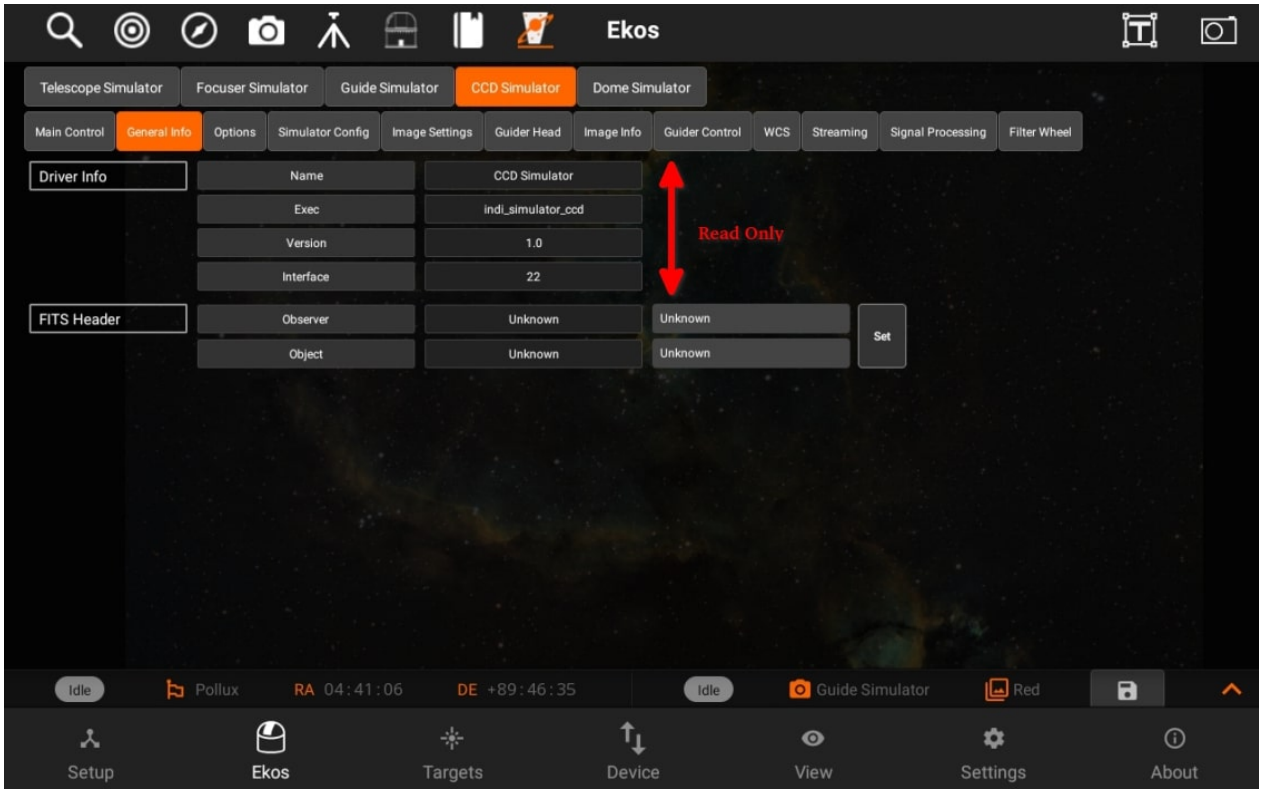
The connected devices are show at the top (1). Selecting one will show it's control groups (2). Selecting one of the control groups displays it's properties in (3).



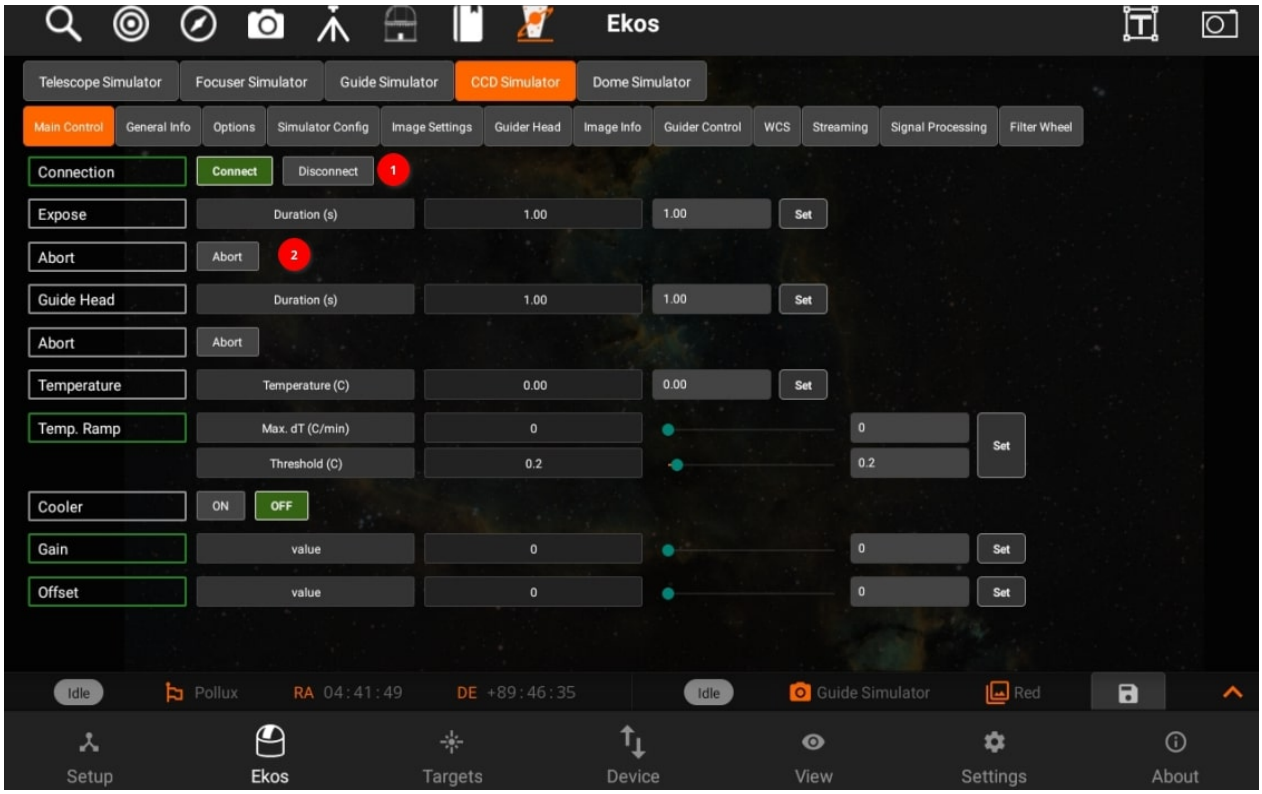
Each property (1), can have multiple sub-properties (2). The current value for the sub-

property is shown at (3). The status of the property (1) would change from gray (idle) to green (successful), red (failed) or yellow (in-progress) when any changes have been set.

Some properties allow values to be adjusted. They can be changed using text field (and sometimes a slider for some number properties), and once you are done changing a property, you press Set (5) to send the new property settings to the corresponding device, to change the value.



Some properties are read only and cannot be changed.

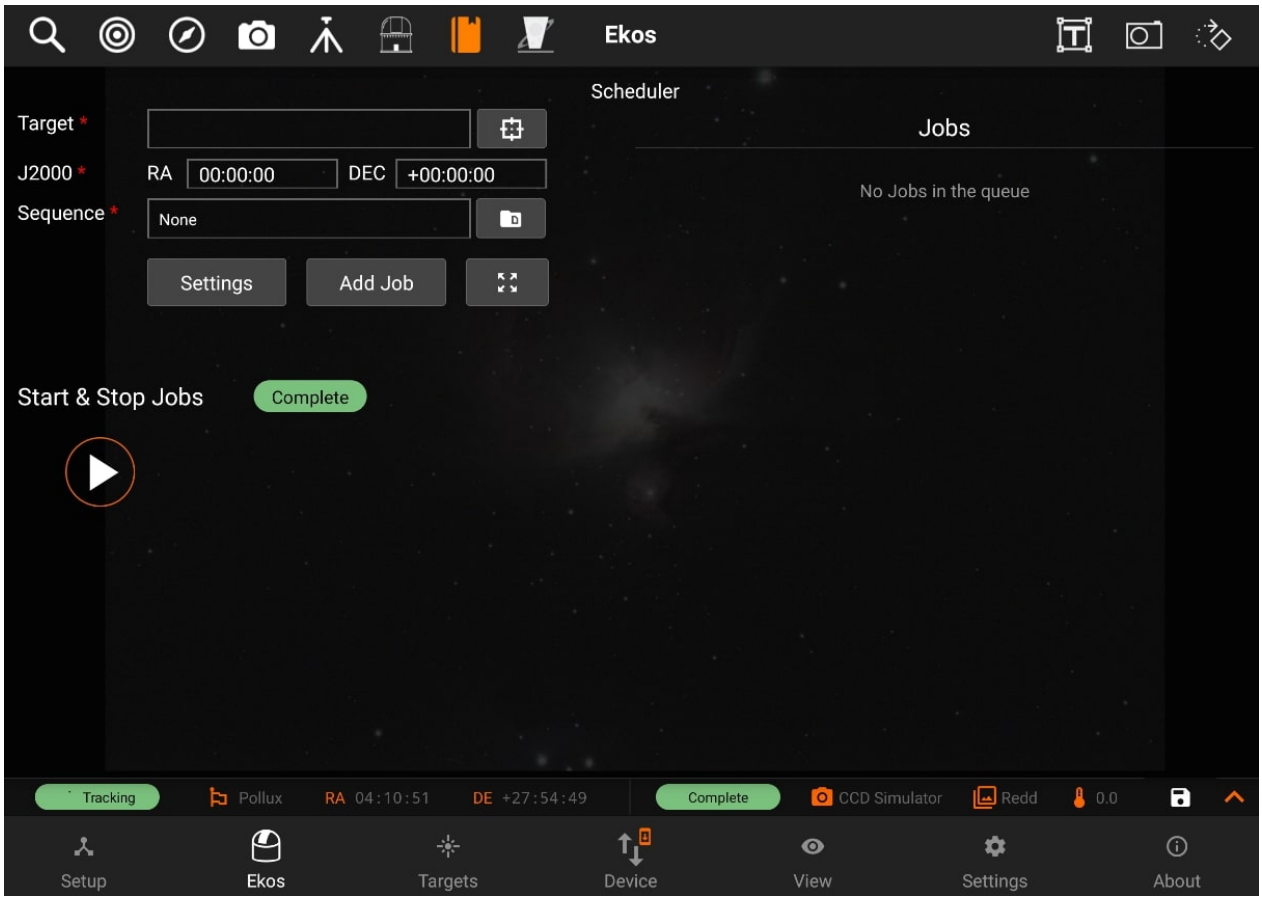


Some buttons show the active button (1), and a different button can be set active simply by pressing it. Other buttons (2) only send the action once pressed and we can tell if it was successful from the property status (3).

Scheduler

Ekos Scheduler is an indispensable arsenal in building your robotic observatory. A Robotic observatory is an observatory composed of several subsystems that are orchestrated together to achieve a set of scientific objectives without direct human intervention.

It's recommended to use Ekos Scheduler after you are familiar with using all the Ekos modules manually first. Fine-tune the settings for each module to suit your particular equipment setup.



Ekos Scheduler provides a simple interface to aid the user in setting the conditions and constraints required for an observation job.
To add a new scheduler task, or job as it is called in Ekos, you need to select the following:

To add a new scheduler task, or job as it is called in Ekos, you need to select the following:

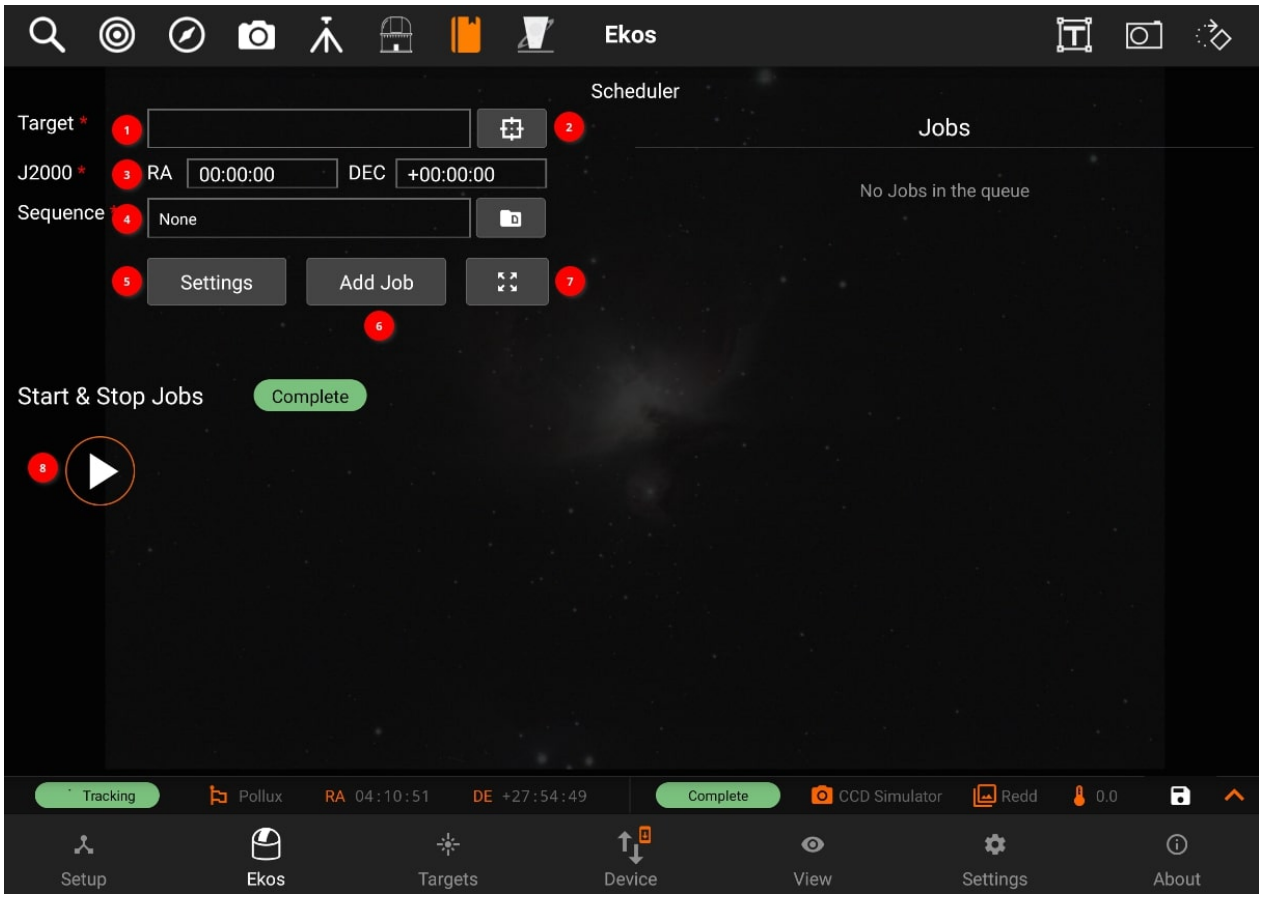
1. Target: Target can be selected directly by tapping on the Select Target button or by finding a target in the Targets module and then tapping Schedule while Ekos is in offline mode.
2. Sequence: A sequence file describes the required settings for each batch of images. Create a sequence file in the Capture module and save it for later.
3. Steps: Each job goes through a sequence of discrete steps. Each step or stage can be toggled on or off as desired:
    a. Track: Mount is commanded to slew to target.
    b. Focus: Camera autofocus (if applicable) is started.
    c. Align: Plate-solving is performed to ensure the correct location, framing and orientation of the target is met. If a FITS file is specified in General Settings,

then this file is first plate-solved and then mount is commanded to to slew to target solution coordinates. This is followed by another plate-solving process to ensure we are within tolerance at the target solution coordinates. If the position angle of the FITS image is different from the current camera orientation, the camera orientation can be automatically adjusted if a mechanized rotator is detected. Otherwise, a manual camera rotation is required until the image position angle is satisfied.

d. Guide: Using a guide camera, the mount tracking is locked to a guide star to enable long-exposure astrophotography

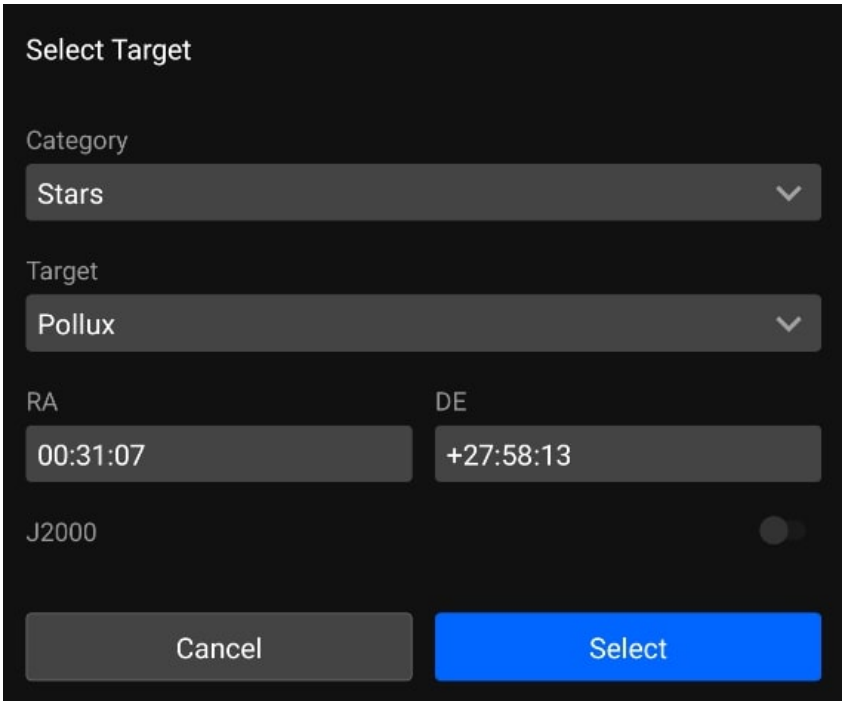
After the first 4 stages are complete, the sequence file is loaded in the capture module and batch capture commences. All images are saved to storage and can be accessed in the View tab. For EkosLive Pro subscribers, all images are also uploaded to the cloud storage if StellarMate is connected to the internet.

Settings

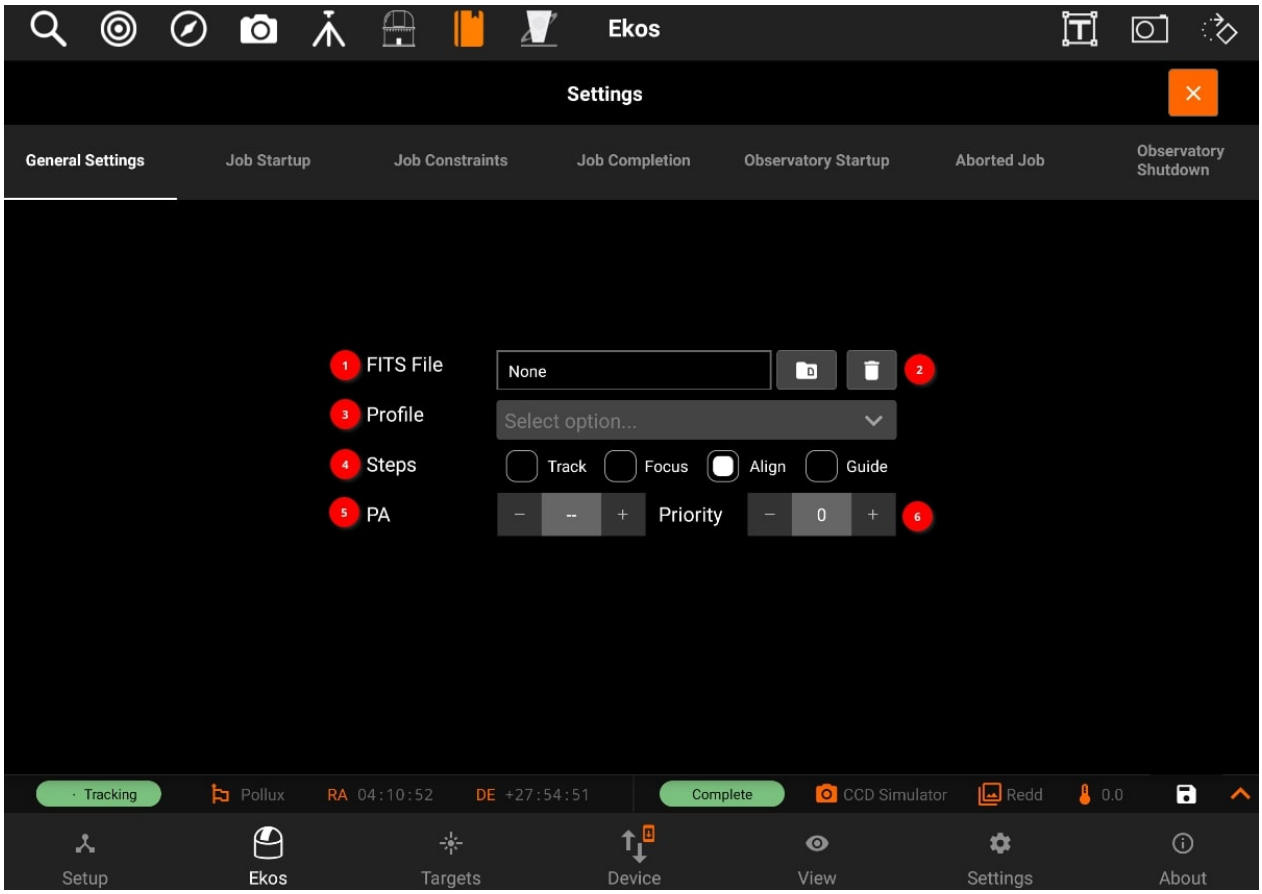


1. Target name: Target designation is automatically filled. It can be adjusted manually..
2. Target Selector: Search for targets by category and name. Targets can be also

selected from the Targets tab when Ekos is offline.



3. J2000: RA and DEC are displayed of a specific target.
4. Sequence File: Sequence: A sequence file describes the required settings for each batch of images. Create a sequence file in the Capture module and save it for later. You can select the file using Directory browser.
5. Settings: Contains all of the settings of Scheduler module.
    - General Settings:



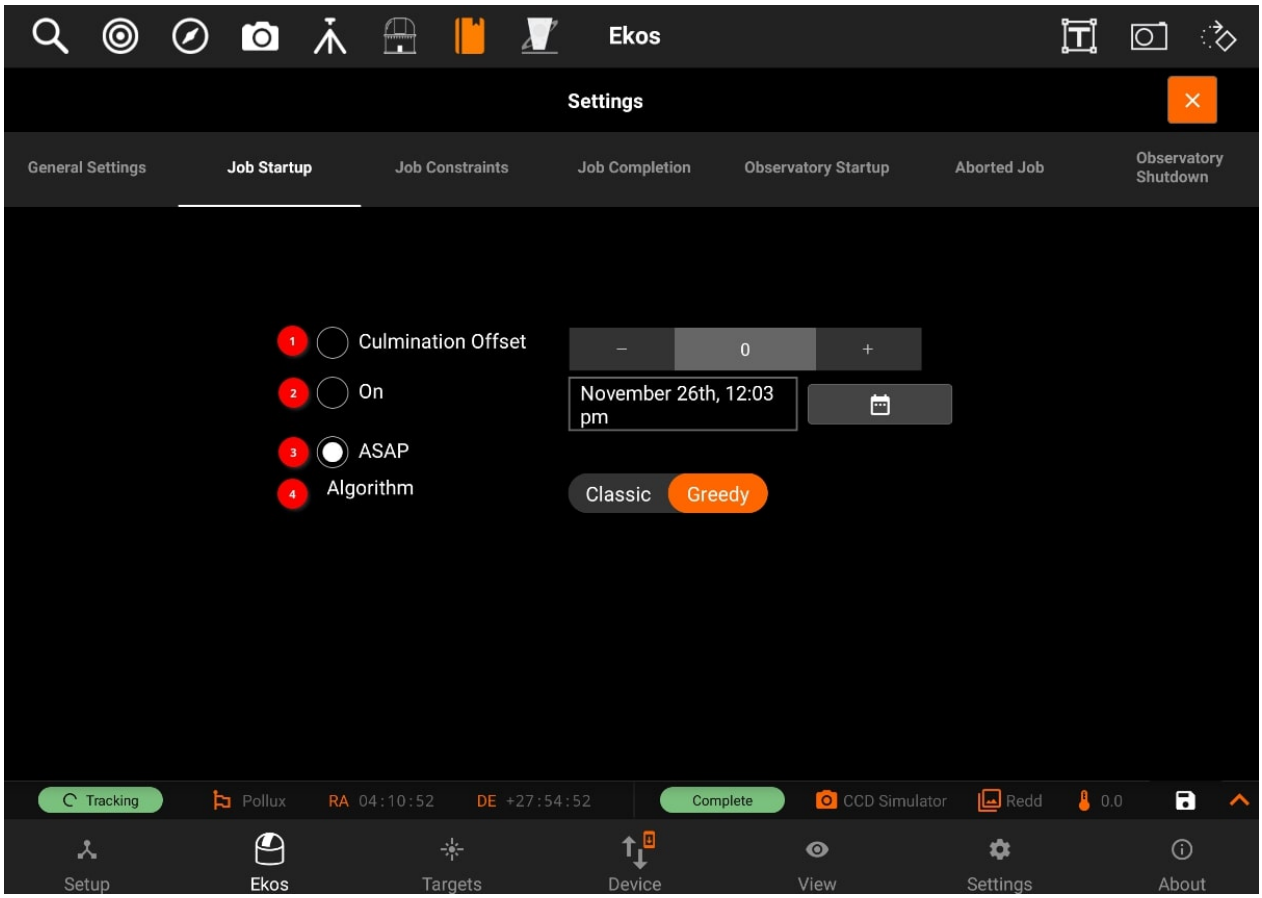
1. Optional FITS file: If a FITS file is specified, the astrometry solver shall solve the file and use the central RA/DEC as the target coordinates. You can select the file using Directory browser.
2. Removes selected FITS file.
3. Profile: Select which equipment profile to utilize when starting Ekos. If Ekos & INDI are already started and online, this selection is ignored.
4. Steps: Each job goes through a sequence of discrete steps. Each step or stage can be toggled on or off as desired:
    1. Track: Mount is commanded to slew to target.
    2. Focus: Camera autofocus (if applicable) is started.
    3. Align: Plate-solving is performed to ensure the correct location, framing and orientation of the target is met. If a FITS file is specified in General Settings, then this file is first plate-solved and then mount is commanded to to slew to target solution coordinates. This is followed by another plate-solving process to ensure we are within tolerance at the target solution coordinates. If the position angle of the FITS image is different from the current camera orientation, the camera orientation can be automatically

adjusted if a mechanized rotator is detected. Otherwise, a manual camera rotation is required until the image position angle is satisfied.

4. Guide: Using a guide camera, the mount tracking is locked to a guide star to enable long-exposure astrophotography

5. Position Angle: Select the desired Sky Position Angle in degrees (East of North). Ignore this setting to image using the camera current position angle. Use Target tab Framing Assistant tool to visually adjust the field of view until the desired orientation is achieved.on angle: You can also specify and position angle.

- Job Startup

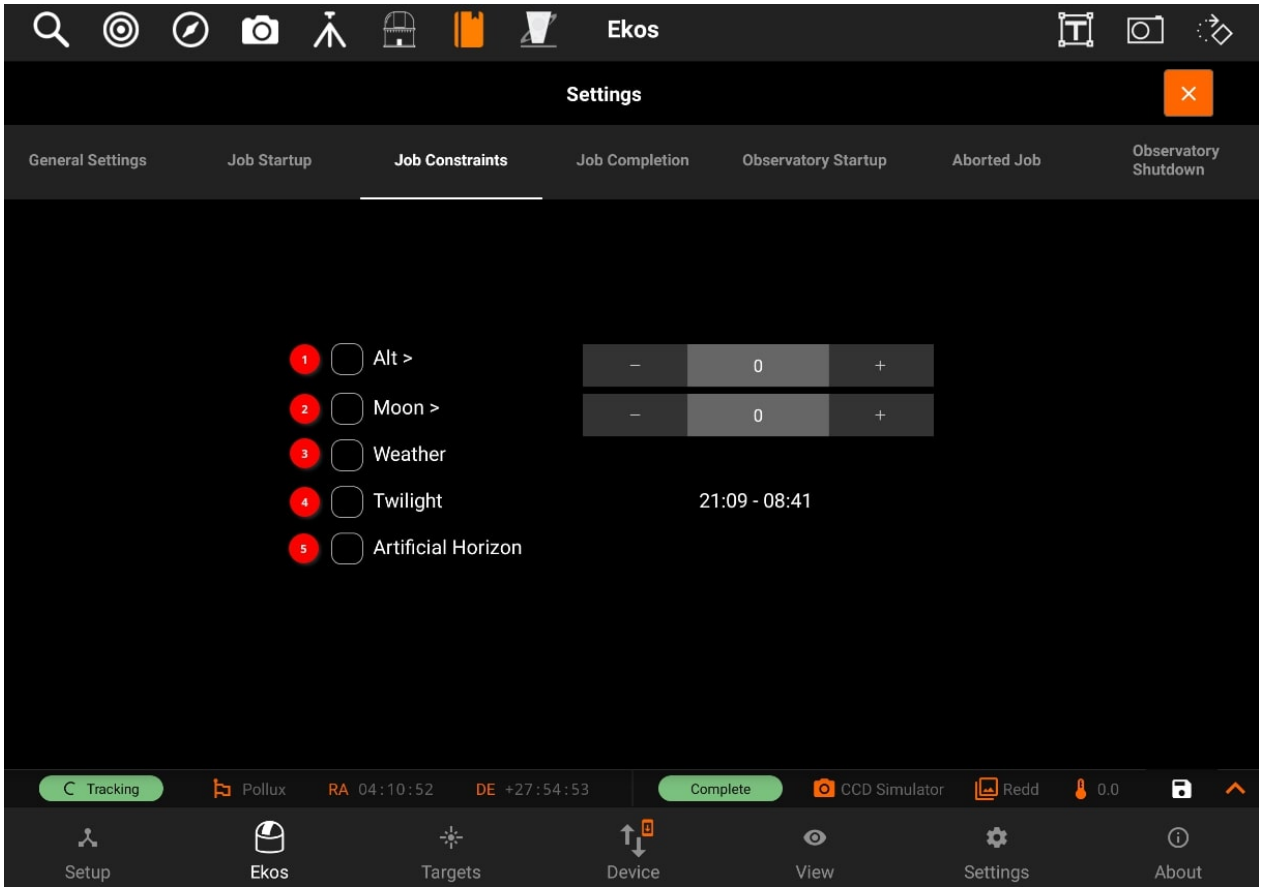


1. Culmination Offset: Start the observation job when the object reaches culmination adjusted for the offset value in minutes. By default, the observation job runs 60 minutes prior to culmination.
2. ON: Start the job on the specified date and time.
3. ASAP: Start the observation job as soon as all the contraints, if any, are

met. The best candidate target shall be imaged first.

4. Algorithm:
    - Classic: Start jobs that meet the constraints by priority and score.
    - Greedy: Always attempt to run a job. It picks the highest priority job that can run according to its contraints. It will interrupt running jobs if a higher priority job can run.

o Job Constraints:

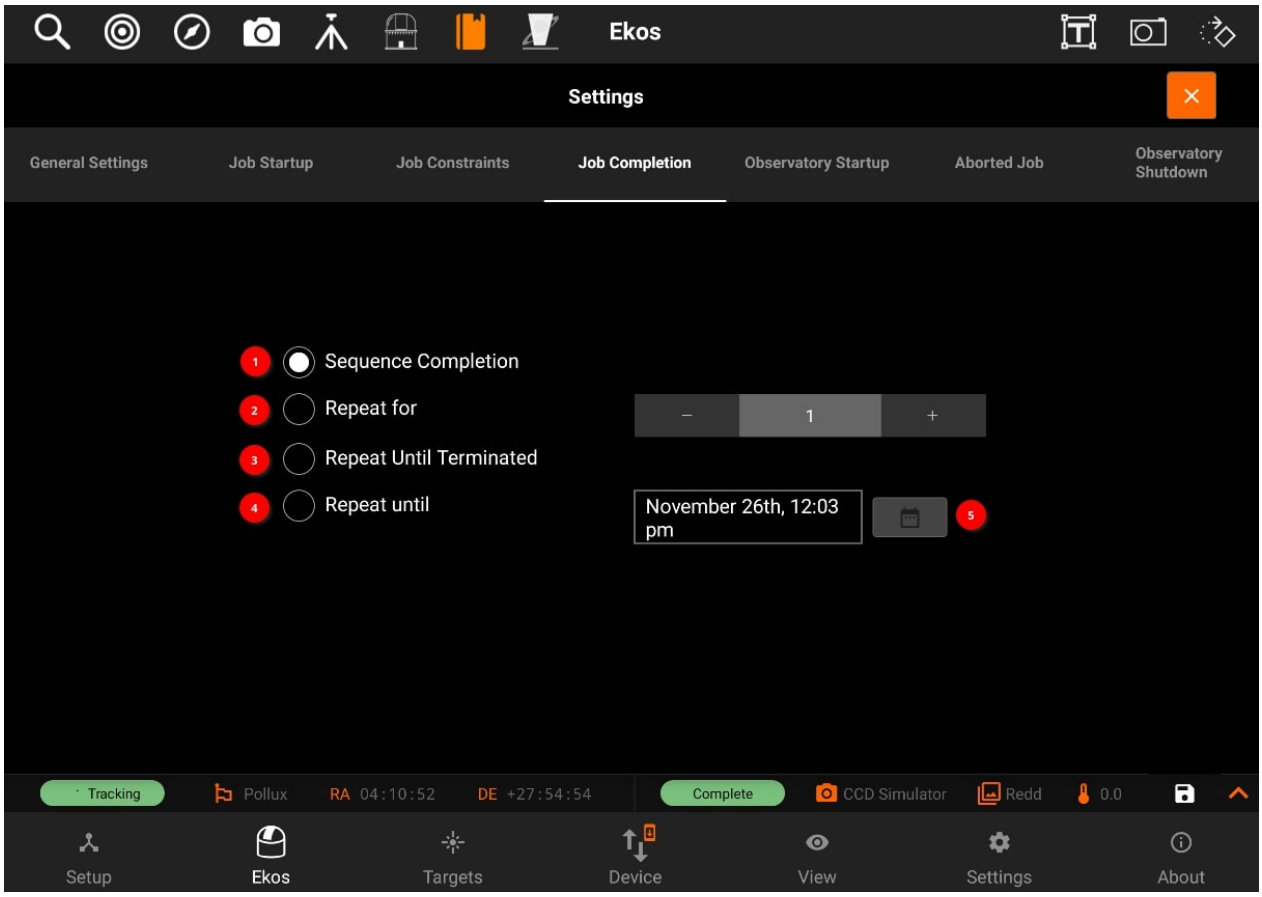


1. Alt: The object's altitude must remain equal or higher than the given value.
2. Moon: The moon separation must remain equal to or higher than the given value.
3. Weather: Weather conditions must remain safe. When weather conditions become dangerous, shutdown procedure is initiated.
4. Twilight: The twilight restriction constraints jobs to execute in

astronomical darkness. Use the dusk and dawn offsets in the Ekos Scheduler options to adjust the interval.

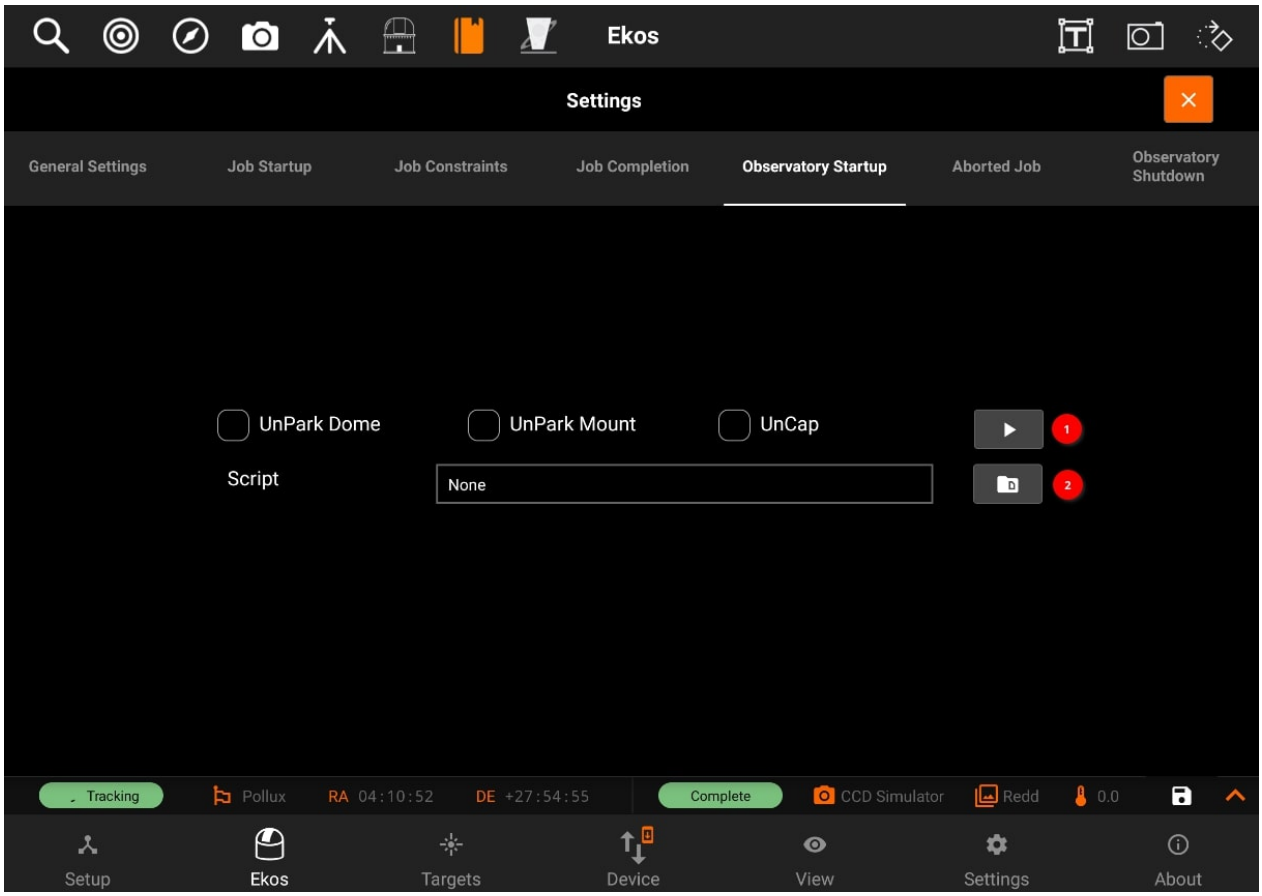
5. Artificial Horizon: The A.H restriction constrains the attitude of the target to be above the artifical horizon. If any are defined and enabled. See the artificial horizon item in the KStars Settings menu.

- Job Completion:



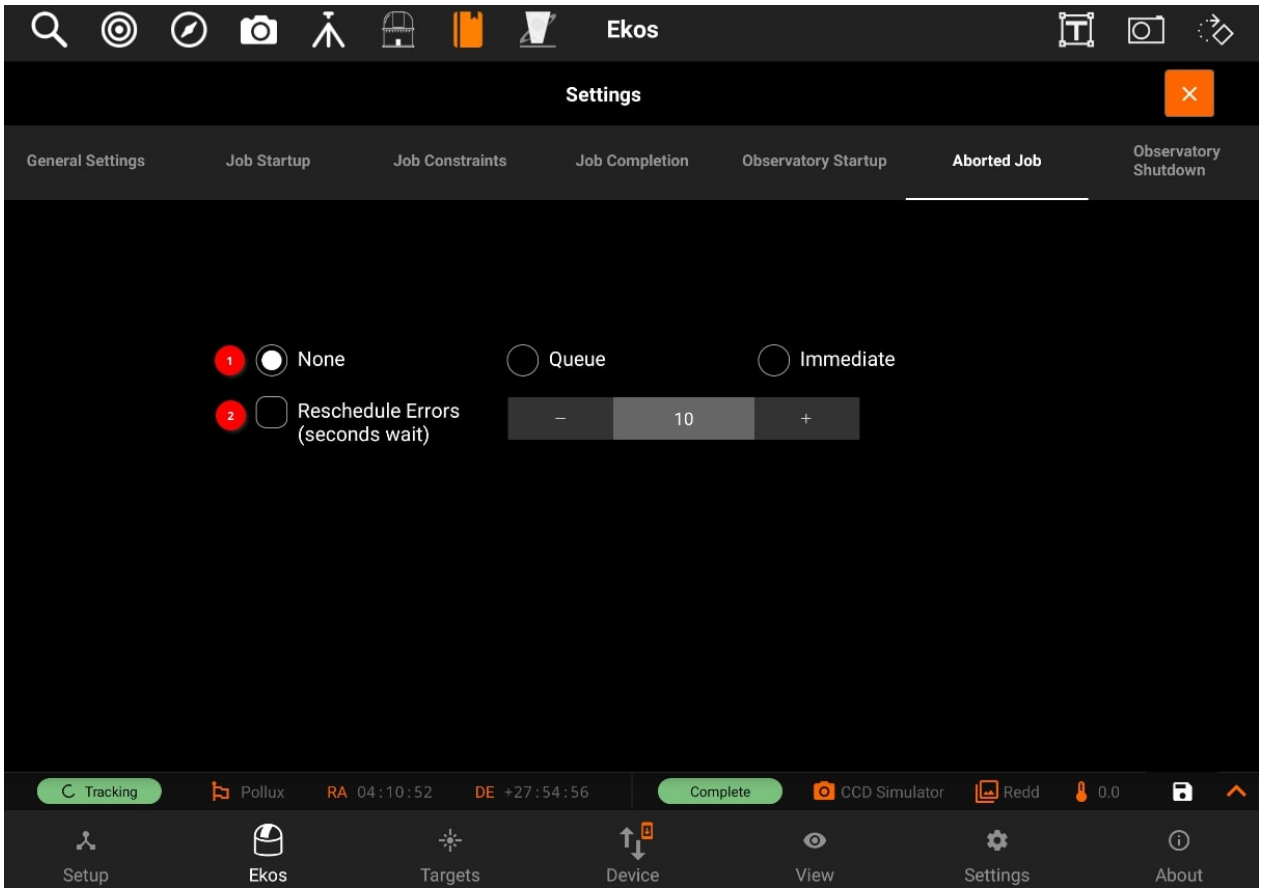
1. Sequence Completion: The observation job is completed when the sequence is complete.
2. Repeat for: No. of times sequence will repeat.
3. Repeat until teminated: Restrat the sequence job indefinetly.
4. Repeat until: Terminate the job on given date and time.

- Observatory Startup:



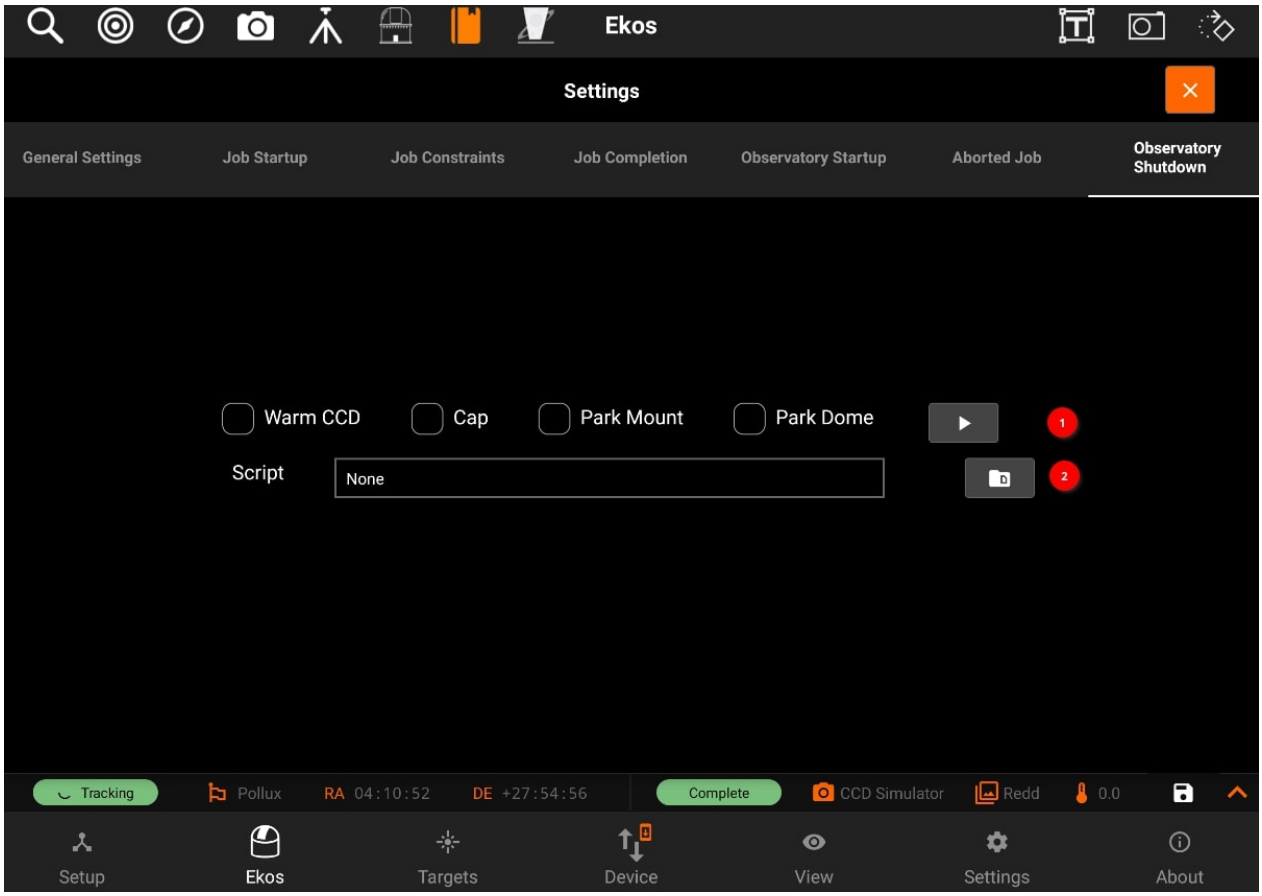
1.
    - **UnPark dome:** Park dome tohome position
    - **UnPark Mount:** Park telescope to home position.
    - **Uncap:** Open dust cover.
2. **Script:** One time startup procedure to be executed before starting Ekos. The script is executed before the startup procedures (i.e Unpark scope), if Selected, are executed.

- **Aborted Job:**



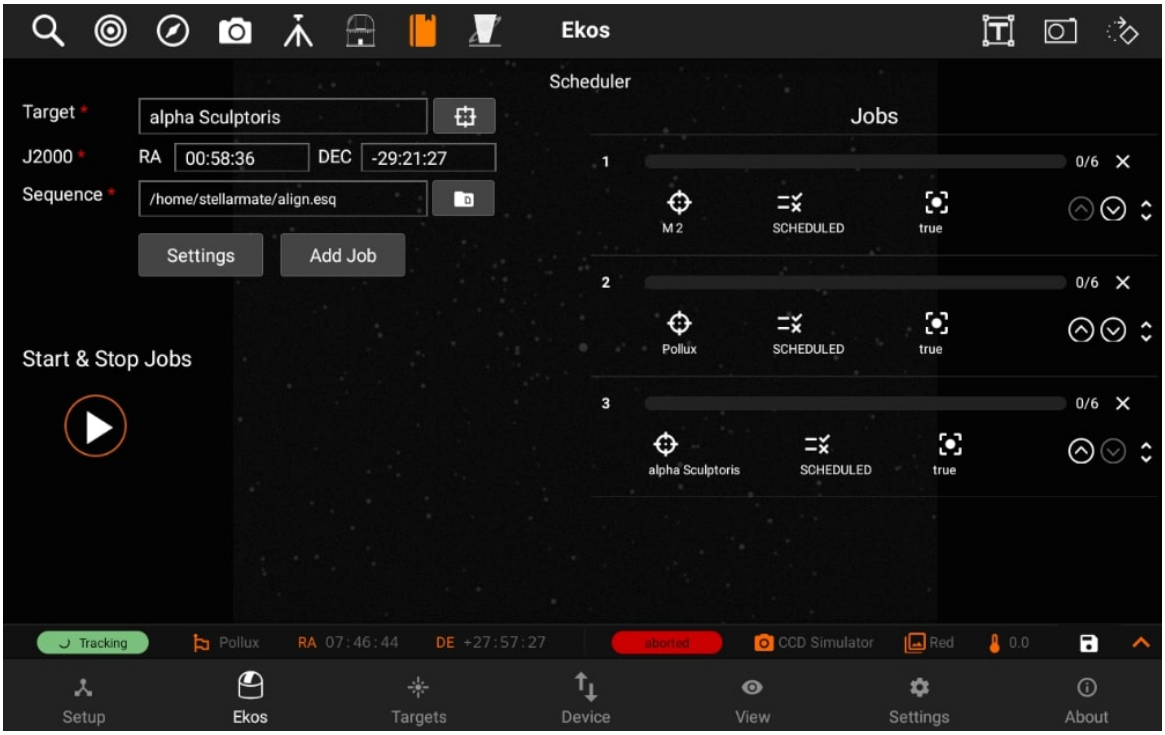
1.
    - **None:** Do not reschedule abored jobs.
    - **Queue:** Reschedule aborted jobs as soon as all executable jobs are either completed or aborted.
    - **Immediate:** Reschedule an aborted job immediately.
2. **ReSchedule errors:** Treat errors like aborts. (Delay in seconds).

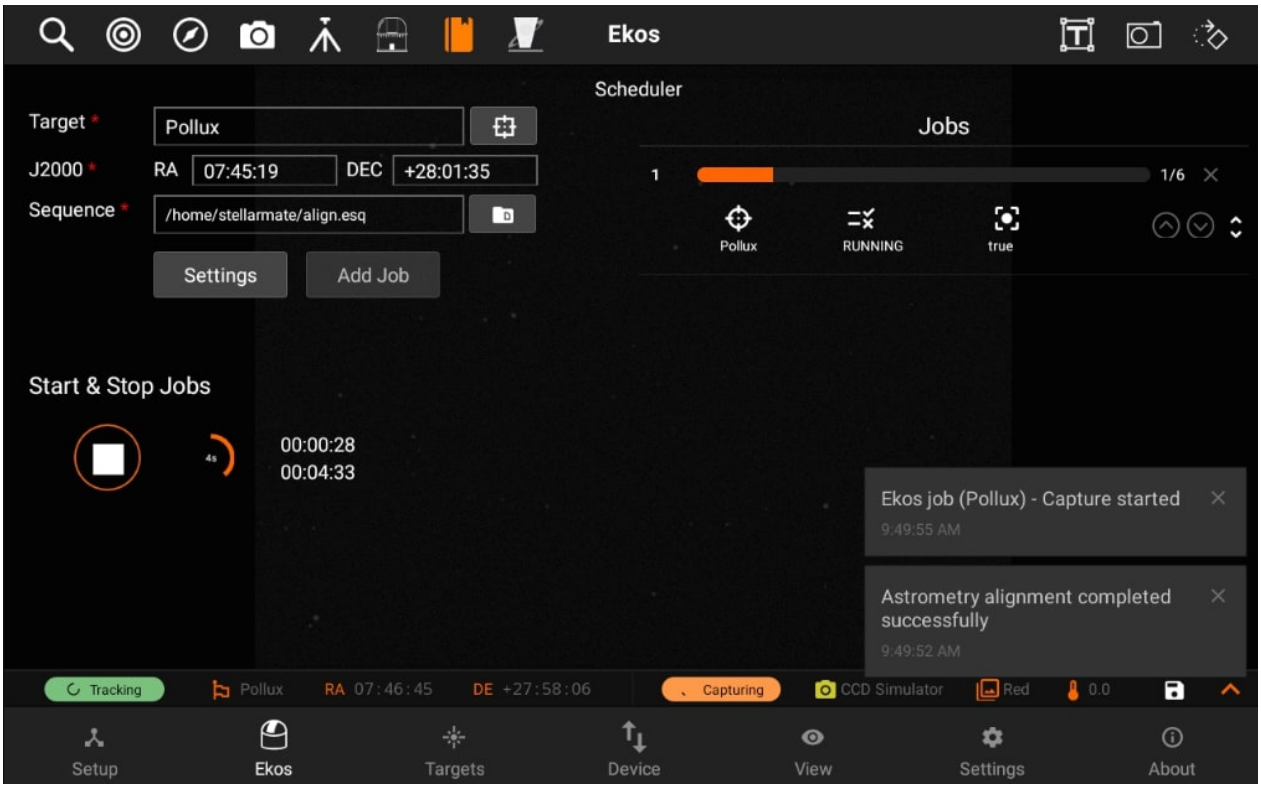
- **Observatory shutdown Procedure:**
    - For more complex observatory environments, there are usually predefined custom procedures to be executed to prepare the observatory for imaging, and another set of procedures on shutdown. The user may plan to image one or more targets during the night, and expects data to be ready by morning.



1.
    - **Warm CC:** Turn off CCD cooler.
    - **Cap:** Close dust cover.
    - **Park Mount:** Park telescope to home position.
    - **Park Dome:** Park dome to home position.
2. **Script:** One-time shutdown procedure to be executed after all Scheduler jobs are completed. The script is executed after the shutdown procedure (i.e Parking), If selected, are completed.

You can also swap the jobs priority by moving the Jobs to Up/Down





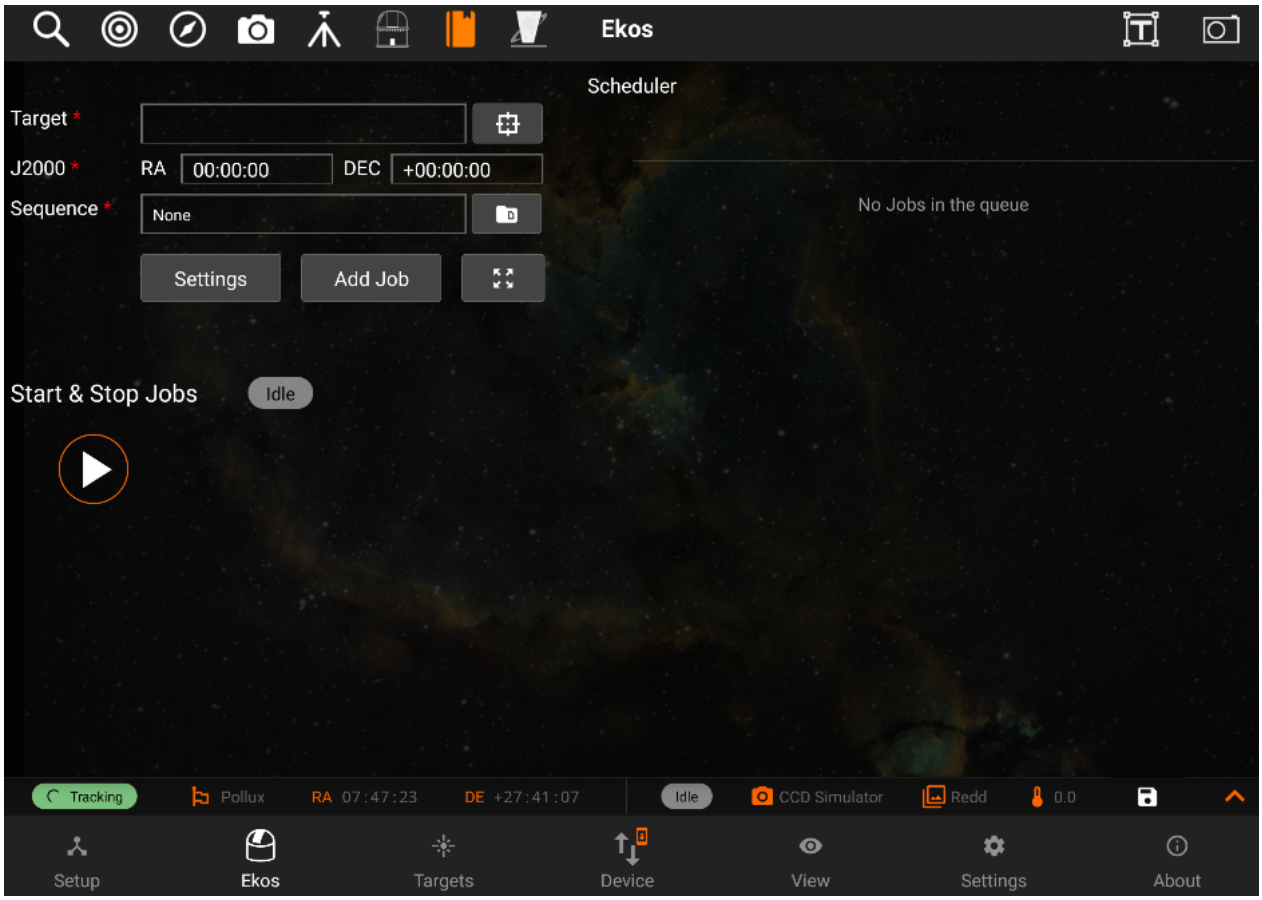
You must select the **Target** and **Sequence** before you can add a job to the Scheduler. When the scheduler starts, it evaluates all jobs in accord to the conditions and constraints specified and attempts to select the best job to execute. Selection of the job depends on a simple heuristic algorithm that scores each job given the conditions and constraints, each

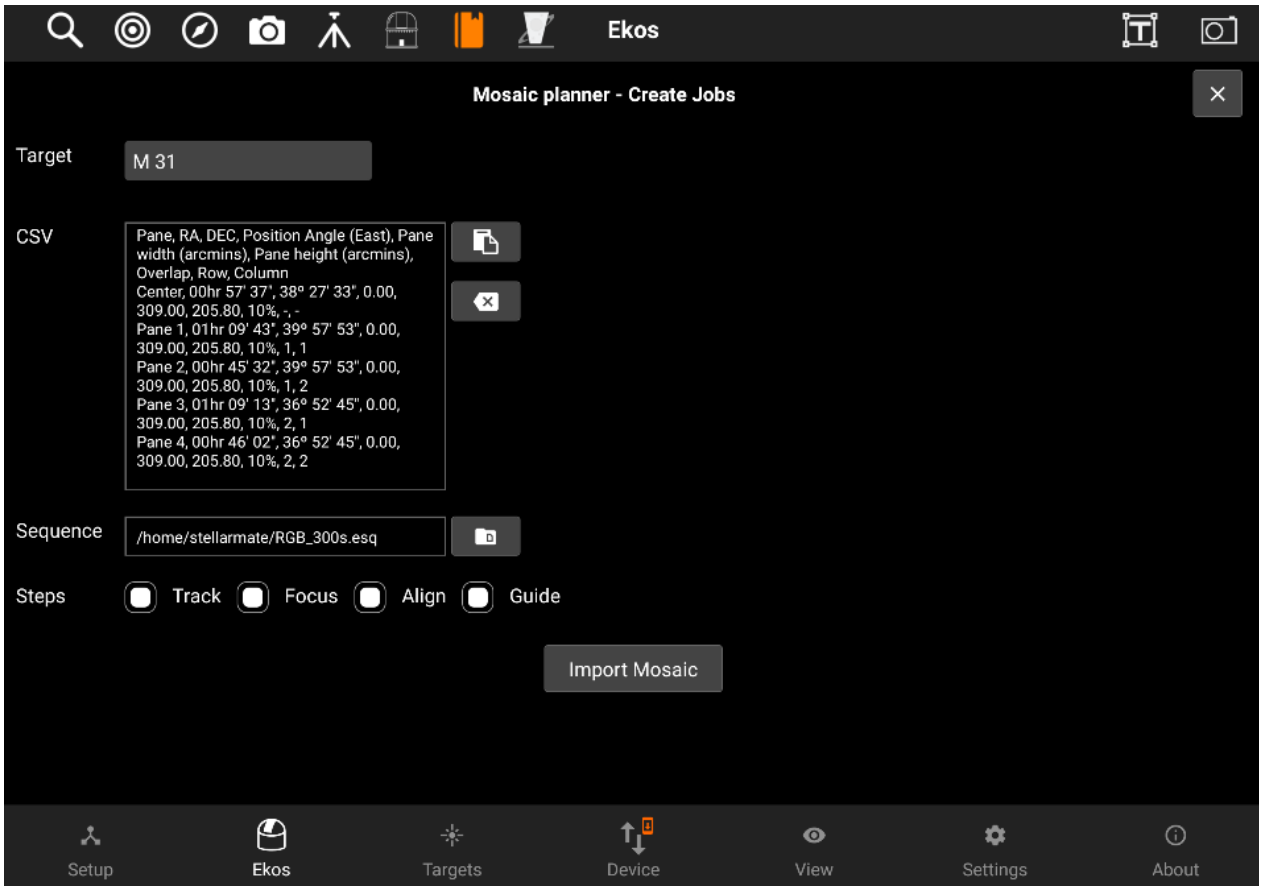
of which is weighted accordingly.

Mosaic Planner

Mosaic planner:

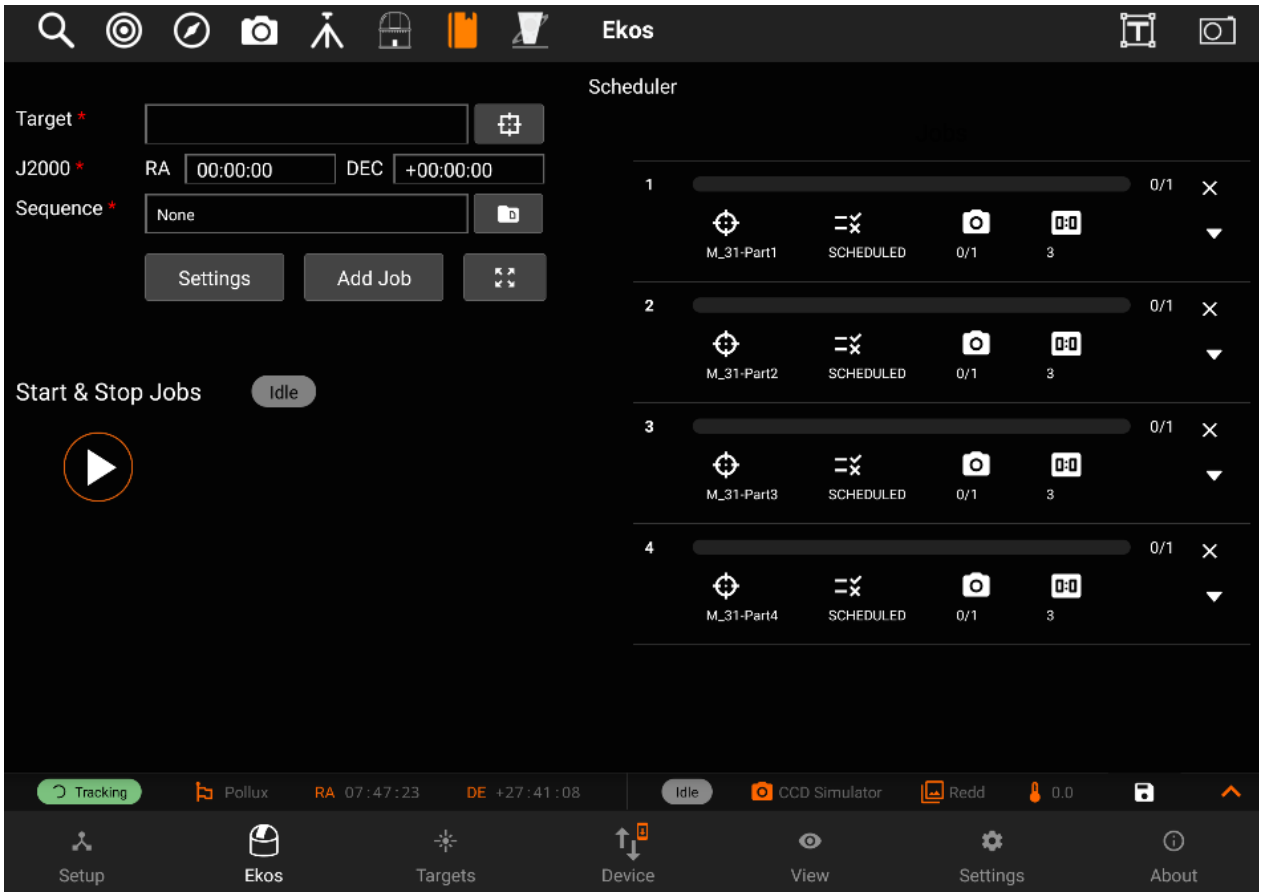
Mosaics can be imported from Telescopius online tool.





1. **Target:** Name of the target.
2. **CSV:** You can copy coordinates from https://telescopius.com/ and paste it here. Makue sure you include center coordinates and then copy csv.
3. **Sequence:** Include sequence from the directory browser.
4. **Steps:** Enable steps to perform.
5: **Import Mosaic:** Imports mosaic sequences.

Mosaic planner sequences are added here, After importing mosaic.



Data acuisition

The overall procedure typically utilized in an observatory can be summarized in three primary stages:

1. Startup
2. Data Acquisition (including preprocessing and storage)
3. Shutdown

Ekos Scheduler only initiates the startup procedure once the startup time for the first observation job is close (default *lead* time is 5 minutes before *startup* time). Once the startup procedure is completed successfully, the scheduler picks the observation job target and starts the sequence process. If a startup script is specified, it shall be executed first.

Data aquisition:

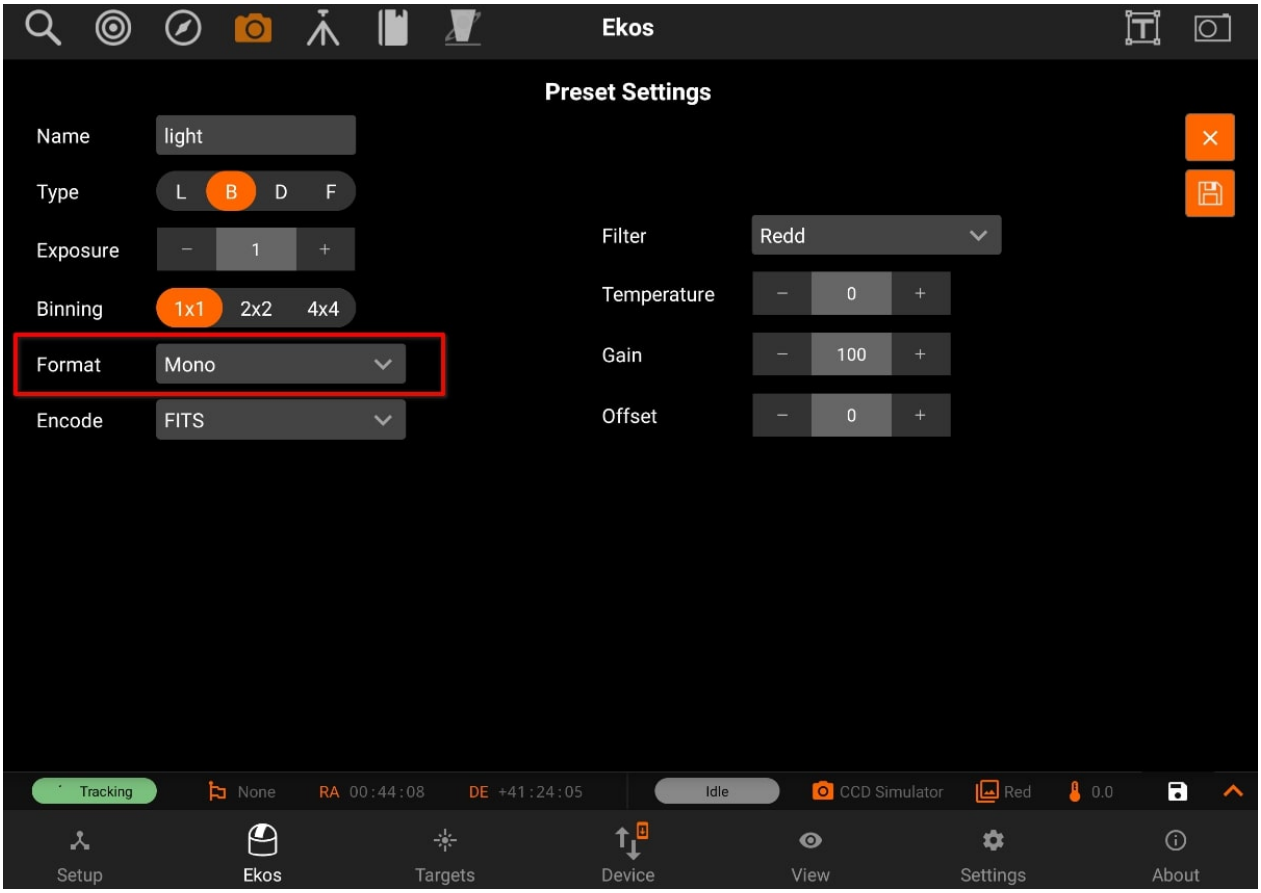
Depending the on the user selection, the typical workflow proceeds as following:

- Slew mount to target. If a FITS file was specified, it first solves the files and slew to the file coordinates.
- Auto-focus target. The autofocus process automatically selects the best star in the frame and runs the autofocus algorithm against it.
- Perform plate solving, sync mount, and slew to target coordinates.

- Perform post-alignment focusing since the frame might have moved during the plate solving process.
- Perform calibration and start auto-guiding: The calibration process automatically selects the best guide star, performs calibration, and starts the autoguide process.
- Load the sequence file in the Capture module and start the imaging process.

Data Storage

Formats



By default, all captured images are saved as FITS (Flexible Image Transport System) files. FITS is the standard image format for astronomical images and is supported by all astronomical image processing software. For DSLR cameras, saving RAW images directly (e.g. CR2) is also supported by editing the DSLR camera capture preset.

Depending on the camera settings and support, images can be captured as Mono, RAW, or RGB.

1. **Mono:**
   Monochromatic single channel images store only intensity information in either 8bit or 16bit. Camera sensors generating 10bit or 12bit data are stored as 16bit by padding zeros, they are not up-scaled or modified.

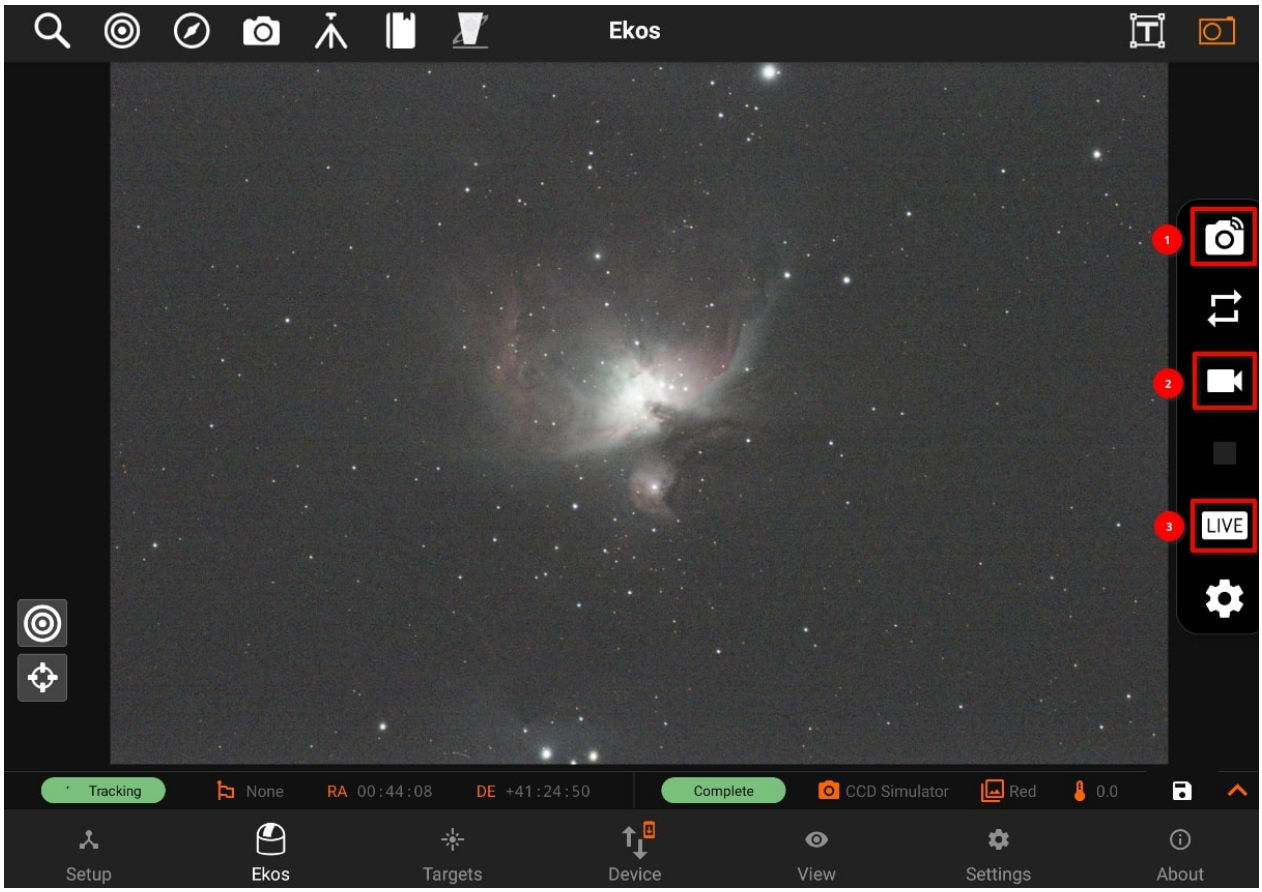
2. **RAW:**

Color cameras with a Bayer filter often support RAW8 or RAW16 formats. The bayer pattern (e.g. RGGB) depends on the camera model. StellarMate saves the RAW images as is, but debayers them for display purposes. RAW format is the recommended format for color cameras.

3. **RGB:**

Color cameras can export a three channel RGB24 (8 bit per channel) or RGB48 (16 bit per channel) if supported by the camera sensors. Usually, the RGB output is generated by an internal debayer mechanism in the camera firmware. Files tend to be larger in size compared to RAW images but do not require any debayering.

Capture modes:

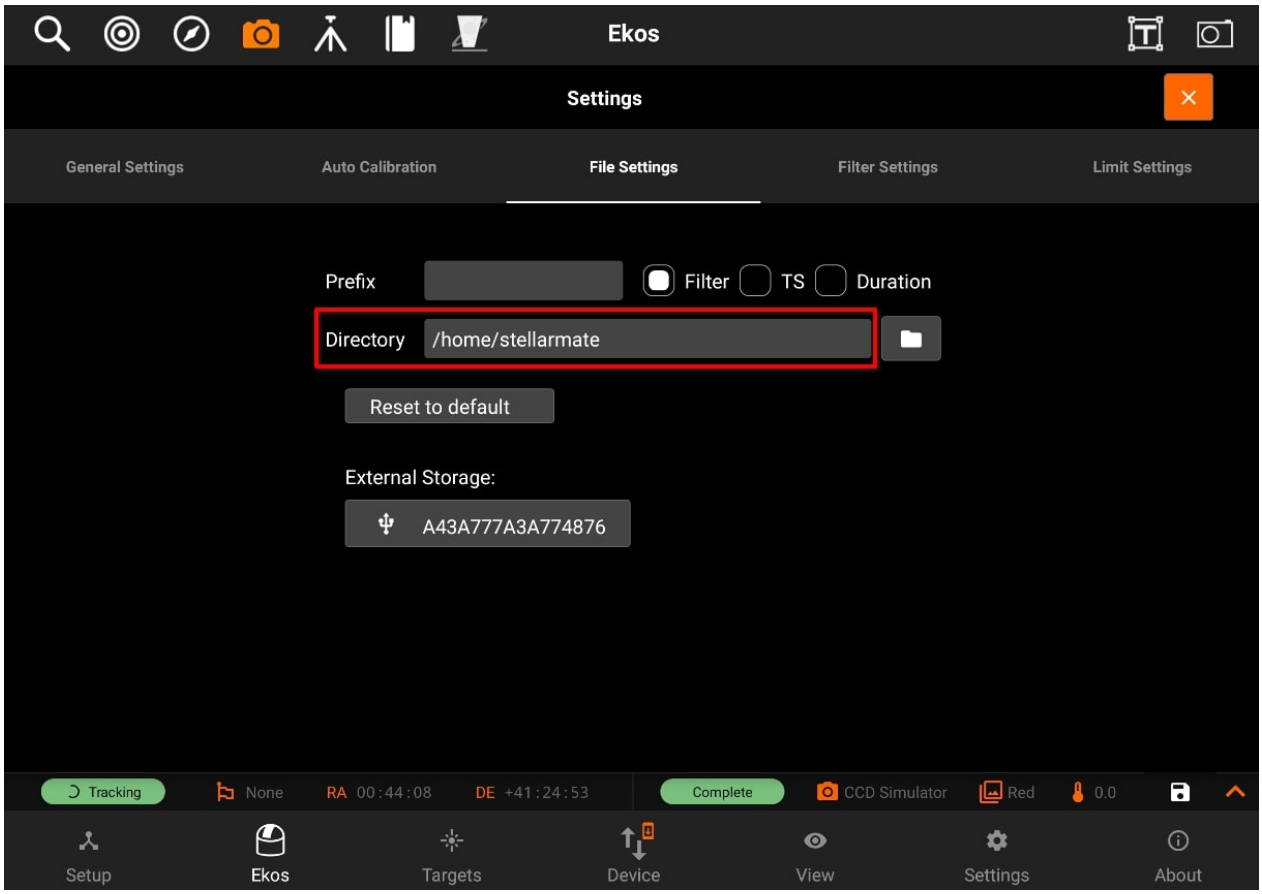


1. **Previews**

Preview images captured using **Quick Camera Control** are not saved to the internal StellarMate storage.

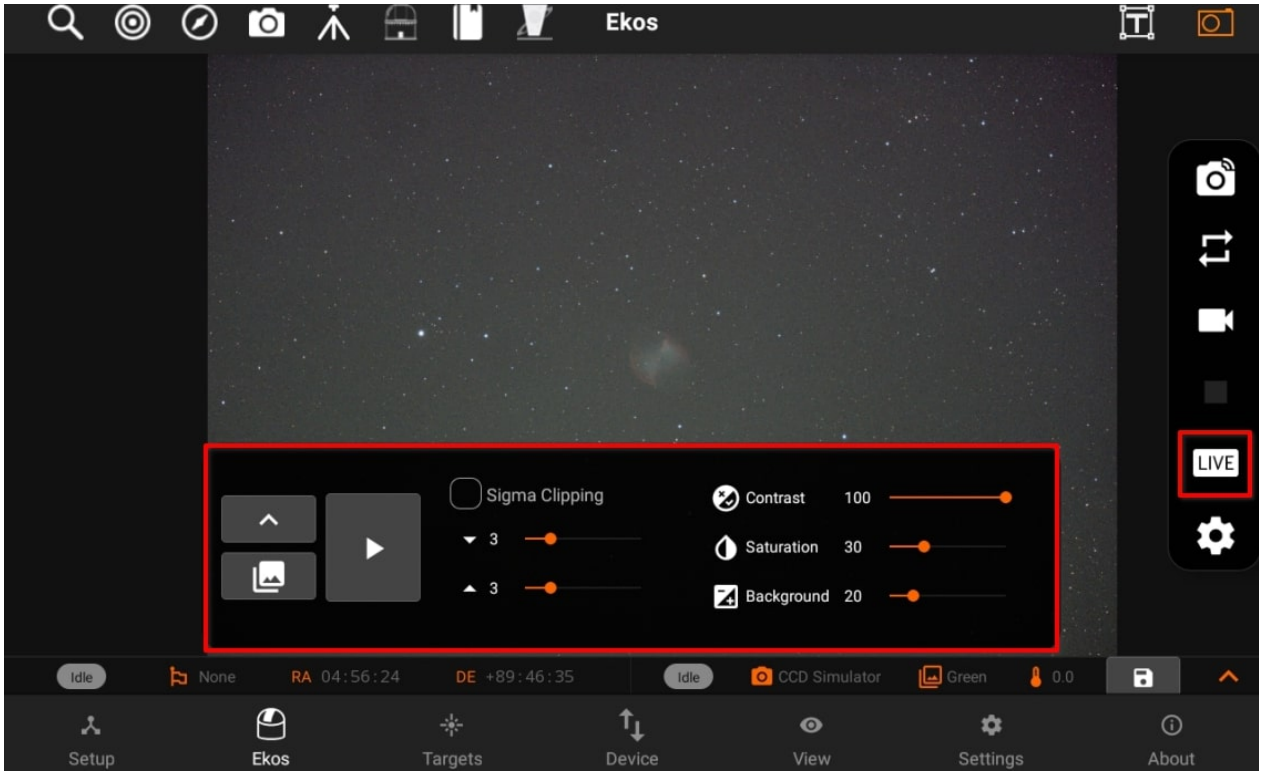
2. **Sequences**

- Sequence images captured in the Capture Module are saved to default storage location on StellarMate internal storage. The default full directory path is /home/stellarmate/Pictures.
- The Pictures directory can be changed in the Capture Module File Settings. If an external storage (e.g. SSD) is detected, you can select it as the default storage location.



- All sequence images are saved along with their metadata and can be viewed in the View tab.

3. Live Stacking



- Live Stacked images are automatically saved to /home/stellarmate/Pictures/livestacking and are also available in the View tab.
- If a sequence is already in progress, then live stacking starts when the next sequence image is captured. When no sequences are in progress, StellarMate starts capturing images continuously (looping) as per the settings in the Camera Quick Settings.
- After each image is captured, it is then live-stacked and the generated output is displayed sequentially in the thumbnail carousel.

4. Video

If supported by the camera, video streams can be saved to the internal storage by clicking on the Video icon in Camera Quick Control. By default, video files are stored under /home/stellarmate/indi_D where D designates the date.

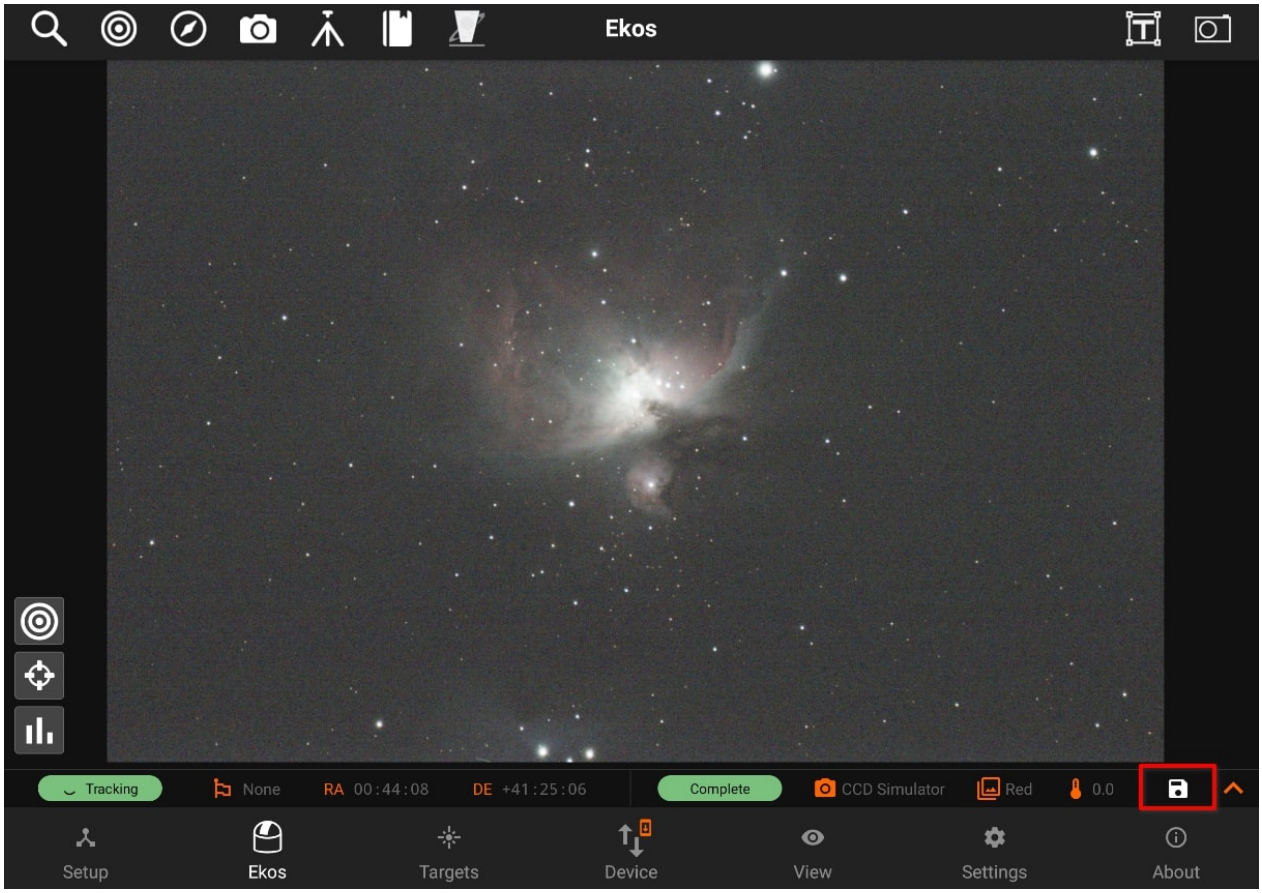
1. SER

Save streaming images in SER lossless format. Beware that this can consume storage space very quickly. To view the video, you need to export the SER video file to a PC/Mac and open it using an SER player.

2. OGV

Ogg Theora is a free and open lossy video compression format that sacrifices image quality to decrease storage space. To view the video, you need to export it to a PC/Mac and use a video player with support for Ogg Theora format.

Exporting to Phone/Tablet storage

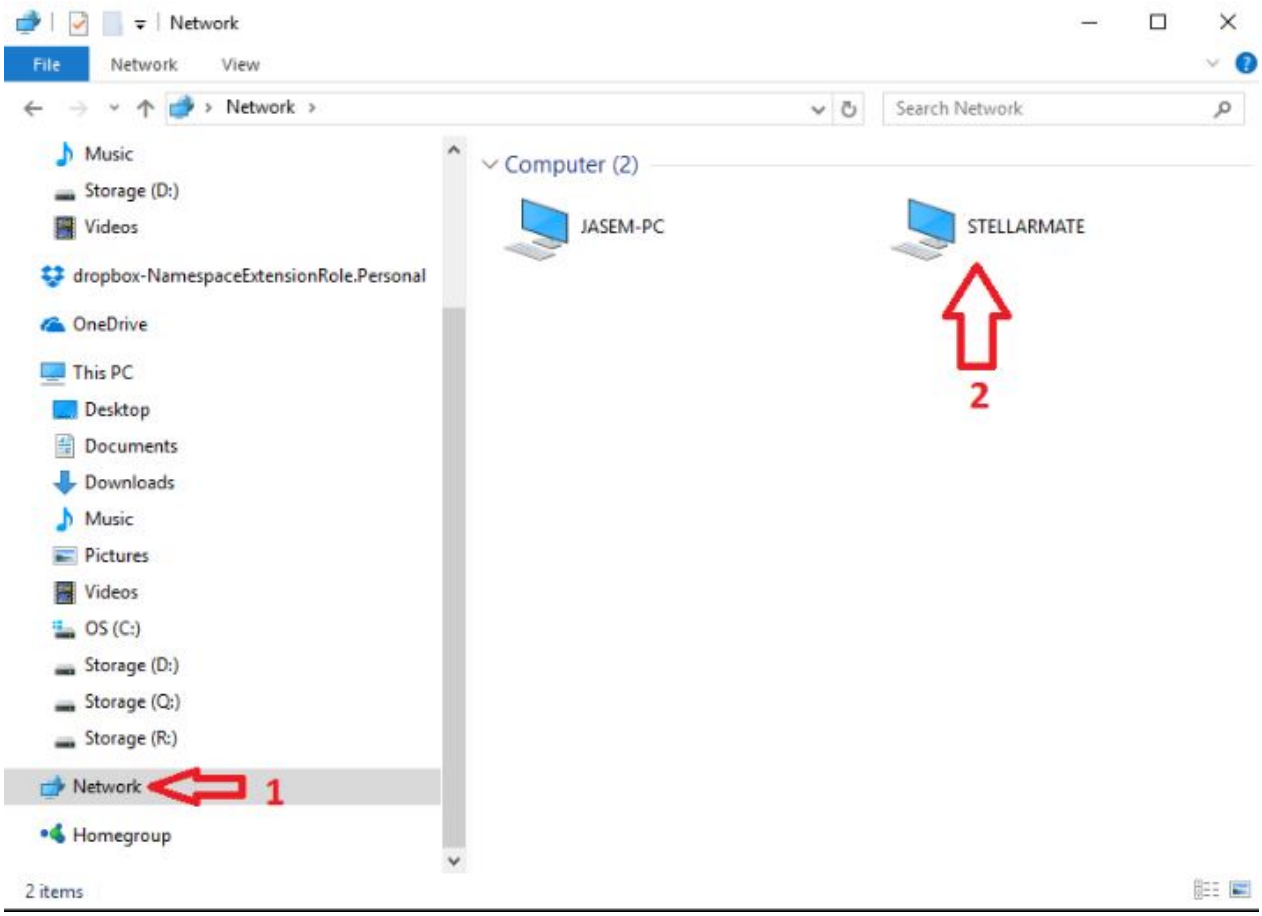


Any images displayed in the main image view can be exported to phone/tablet storage by clicking on the save icon on the camera status bar. It is saved as a time-stamped JPG image.

Exporting to PC/Mac

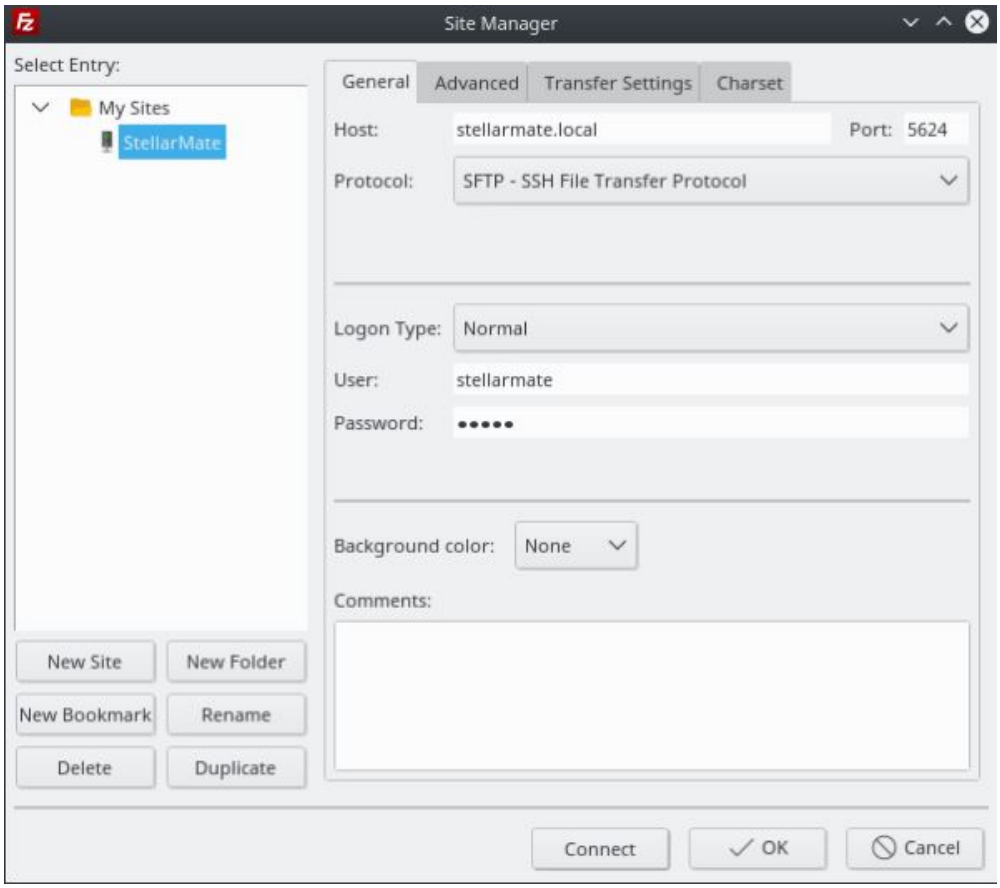
If you captured images and saved them to StellarMate, then they should be available by default under **/home/stellarmate/Pictures**. To access the images over the network, there are two options:

On Windows, click on the Network icon in the left pane of File Explorer as illustrated below.



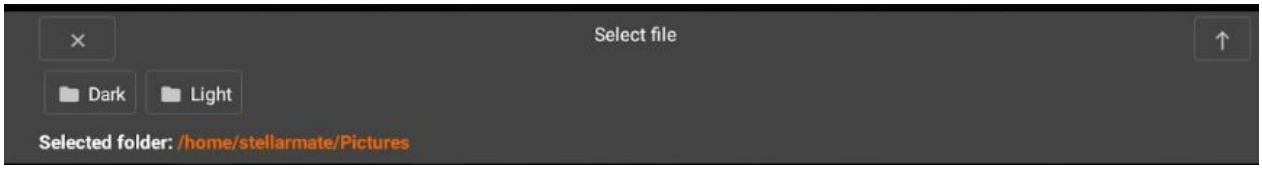
If you do not see the StellarMate network share, please map the network drive as shown in this video:

On Linux & MacOS: Use FileZilla to connect to StellarMate via Secure FTP (sftp) using your username (stellarmate) and password (smate). Remember to set port to 5624.



Directory Browser

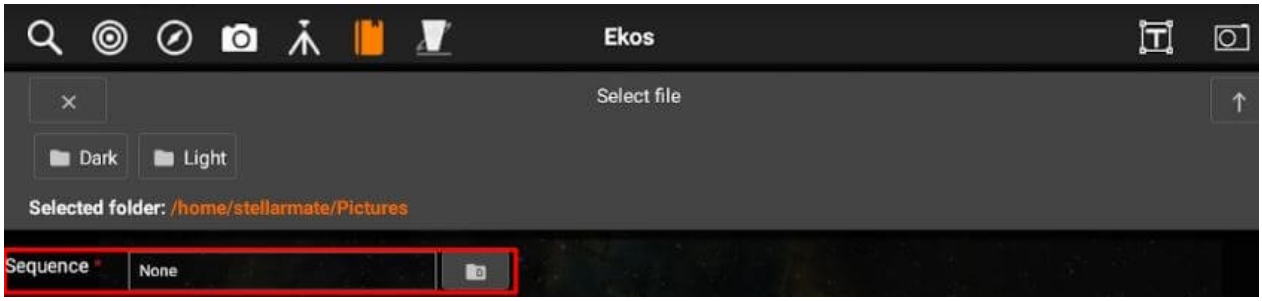
Directory browser:



You can now choose files i.e Script file, Sequence file, fits file etc.
Directory browser will extract the path from Stellarmate dolphin and set it according to the requirement input.

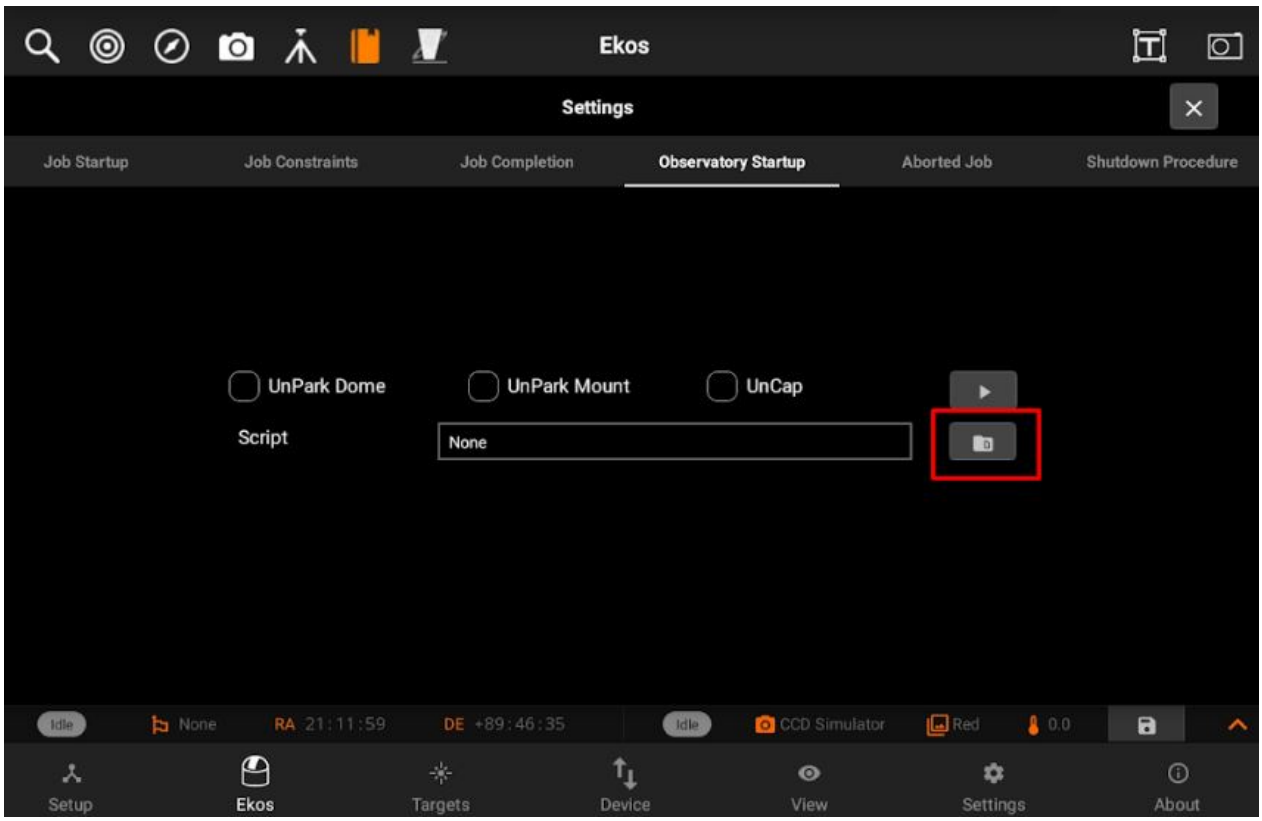
We are using Directory browser on different places.

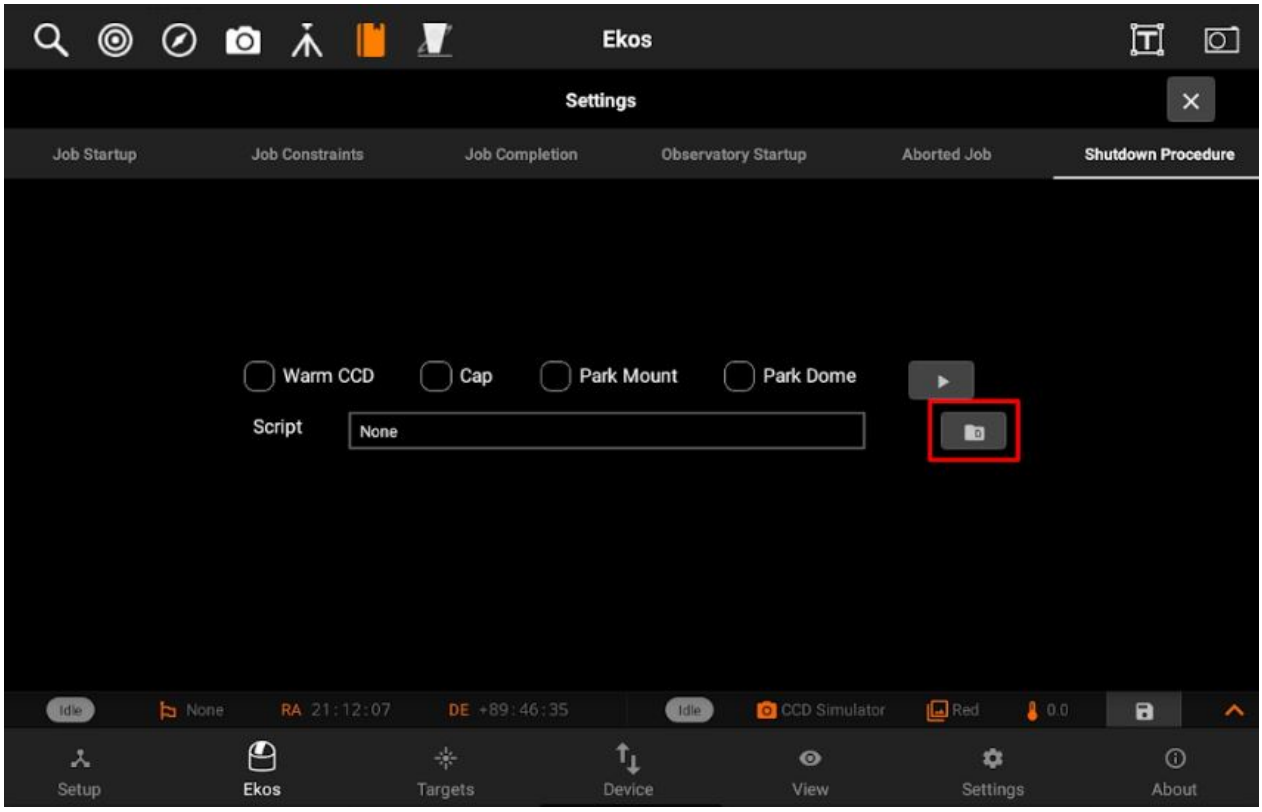
1. Scheduler:



While selecting the sequence file or .fits file for Scheduler, we use Directory browser.

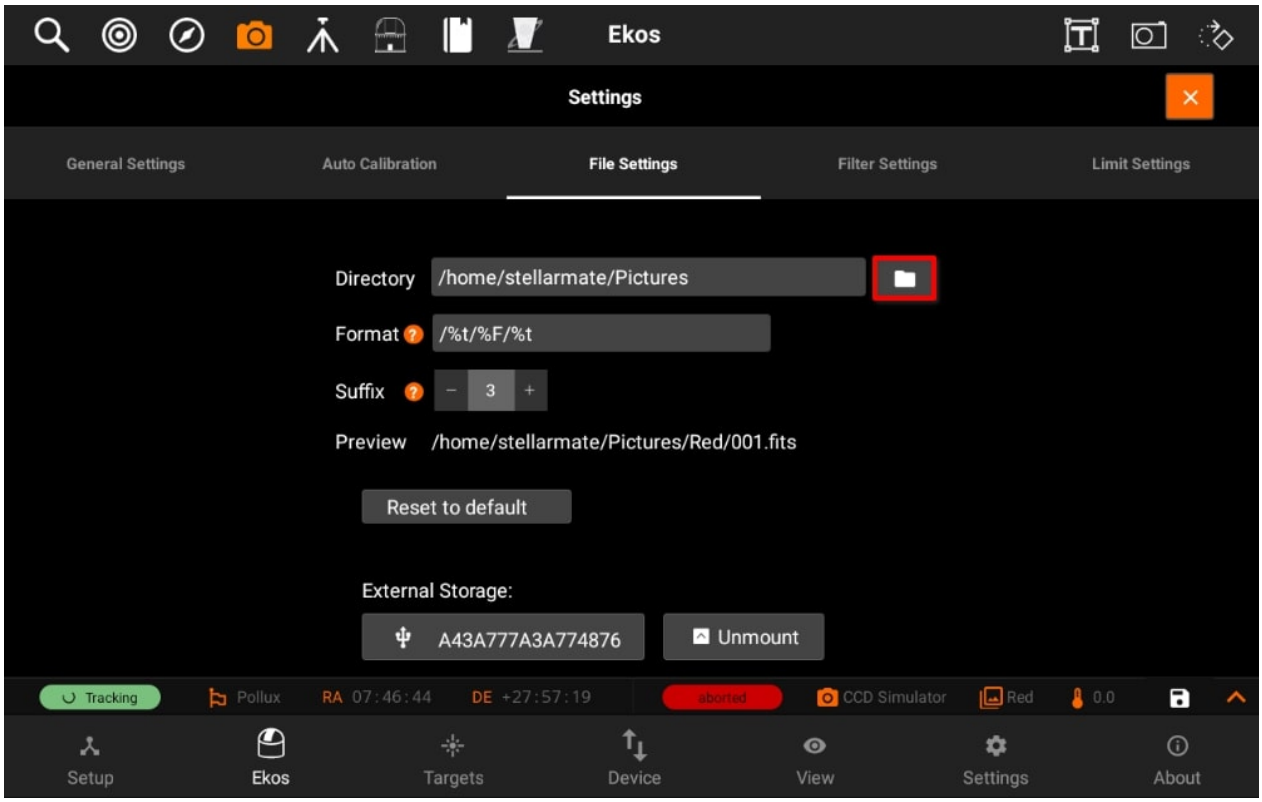
Directory browser is alsi used in Scheduler Settings in order to add script files.

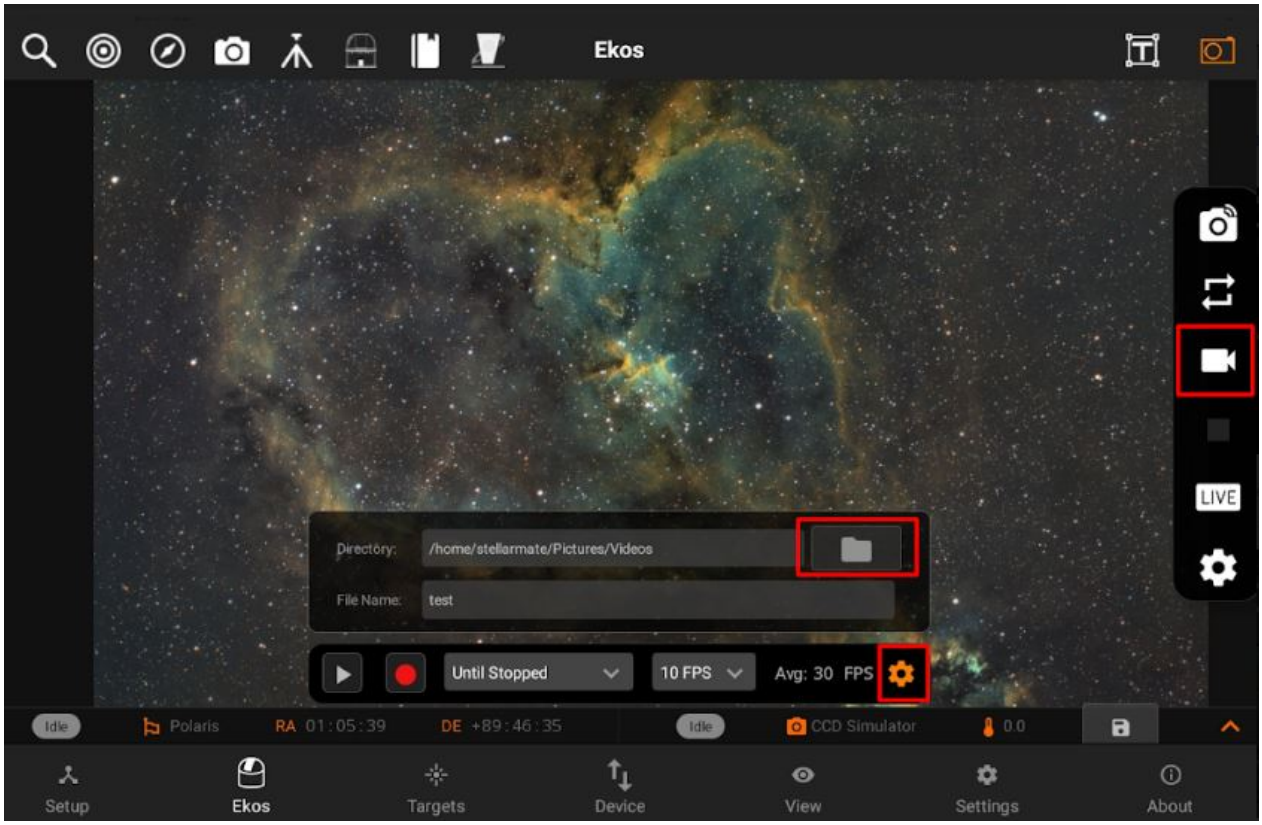




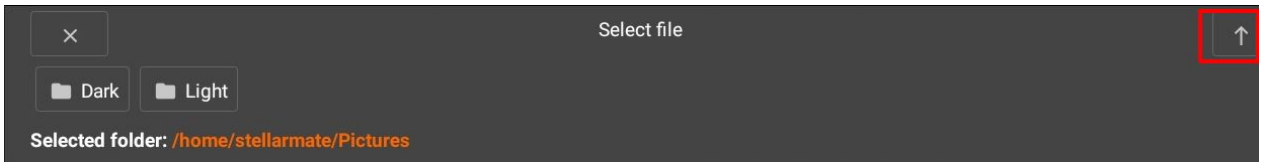
2. Path:

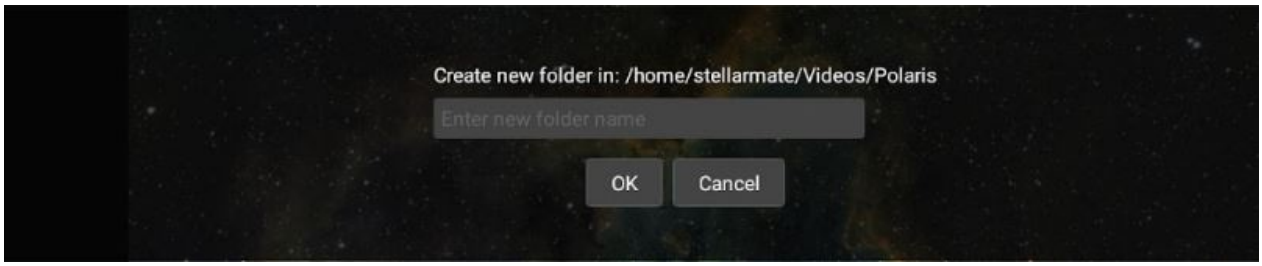
It is also used to set path for images in File Settings & recording settings using Directory browser.





You can also create directories via Directory browser.

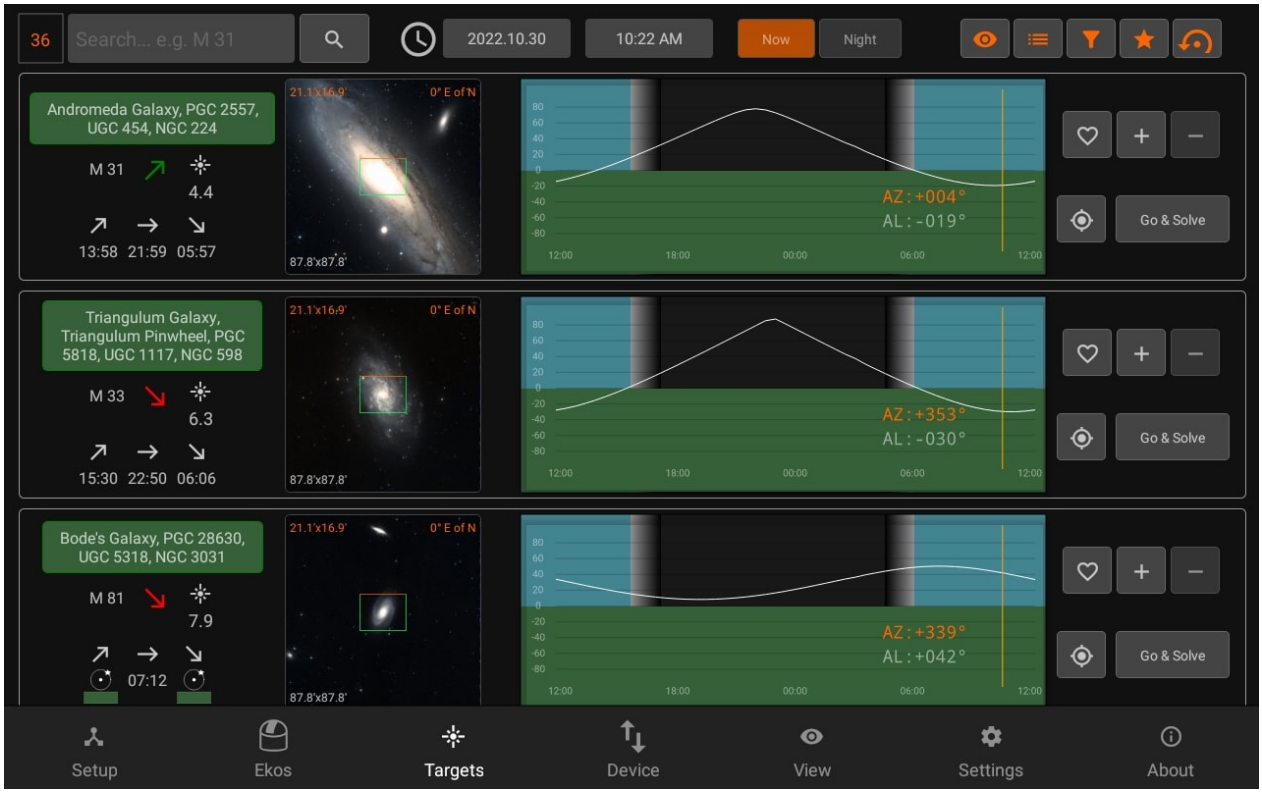




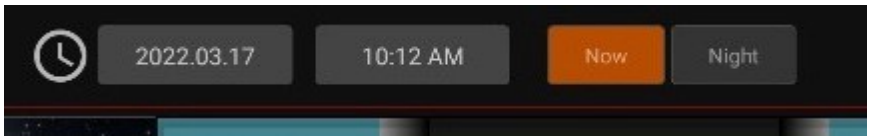
Targets

StellarMate Targets is the StellarMate Planning tool to streamline your observation session. Search from thousands of objects and filter them according to criteria important to every astrophotographer.

Add objects of interest to a quickly accessible Favorites list, or create and manage lists for your seasonal targets. Use the almanac info box to find Lunar, Solar, and Twilight times.

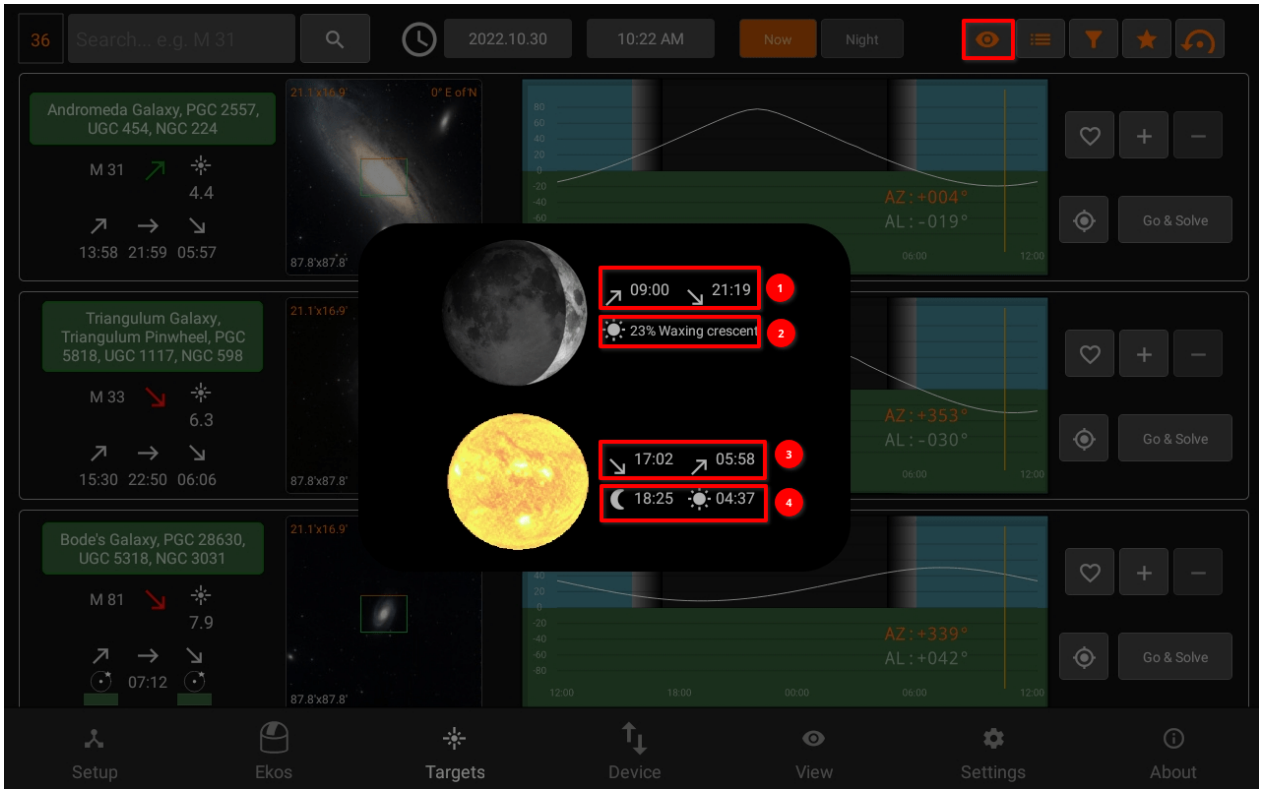


Date & Time:



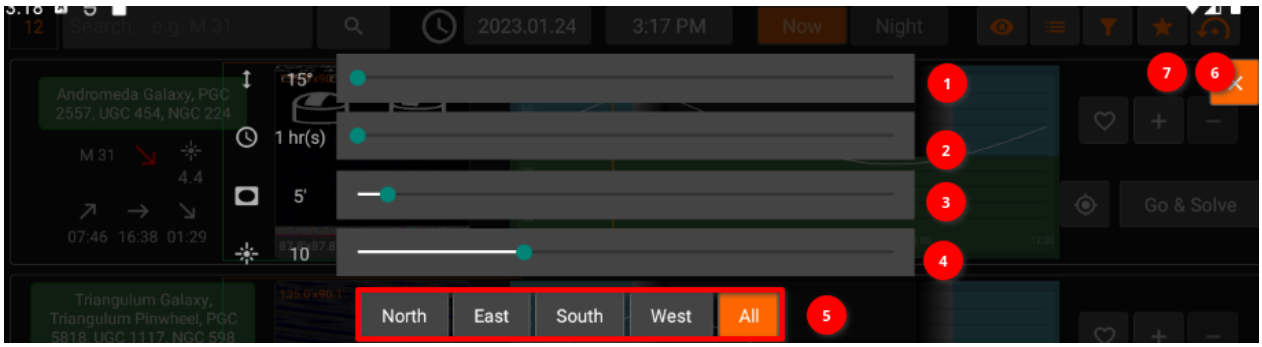
You can preview the targets available at a different date or time by changing the settings (This option is disabled if Ekos is running)

Sun/Moon Visibility



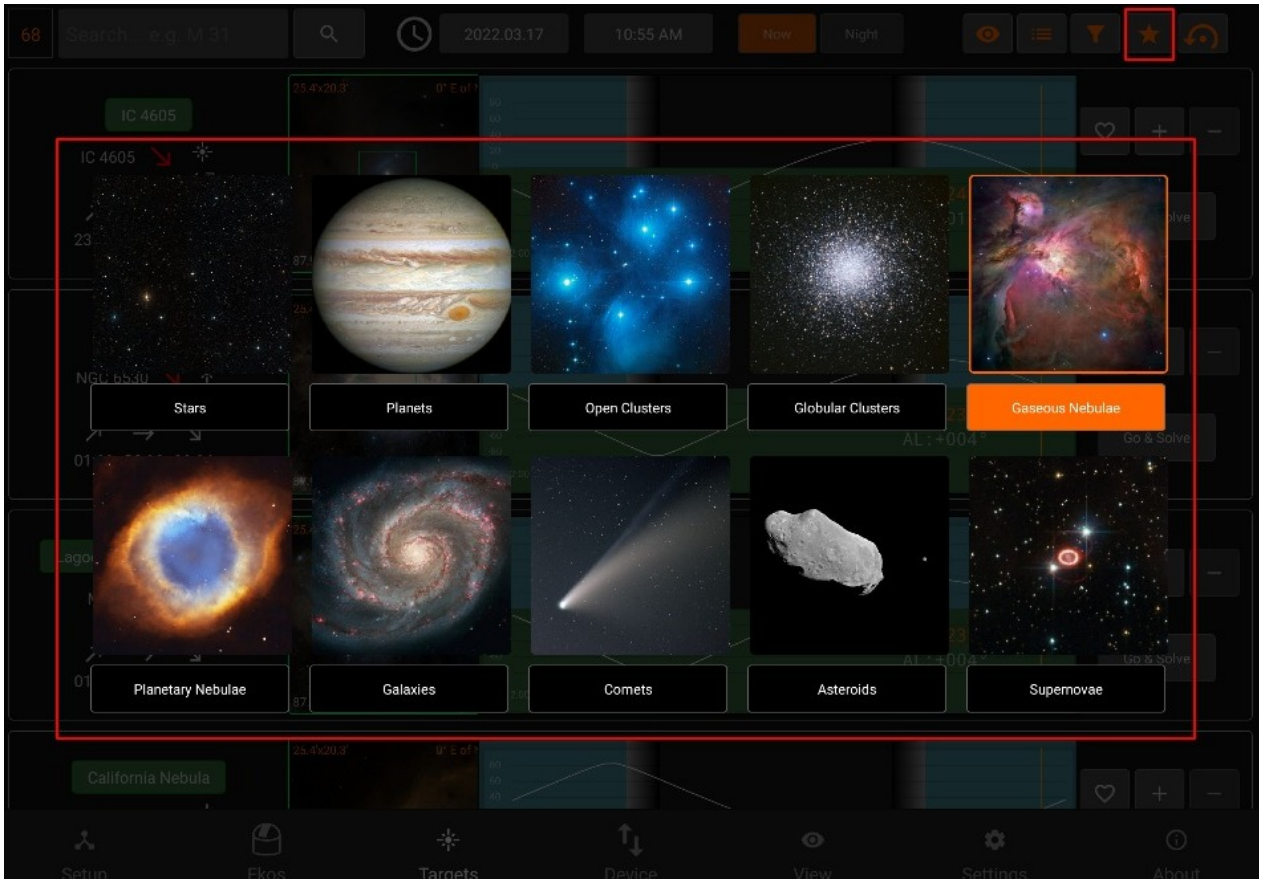
1. Moon rise/set times
2. Illumination percentage and lunar phase name
3. Sunset/Sunrise
4. Astronomical Twilight Dusk/Dawn

Filters



1. Minimum object alititude in degrees.
2. Minimum duration in hours where the object must meet the altitude condition above. For

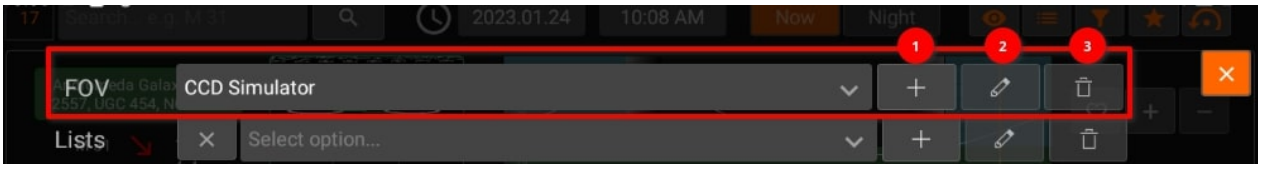
example, if altitude is 20 degrees, and duration is two hours, then only objects that remain above 20 degrees for at least two hours are going to be included in the search results.
3. Minimum Field of View (FOV) in arcminutes. This is only applicable to extended objects like nebulae and galaxies and not to point sources like stars.
4. Maximum Magnitude. Lower it to limit it to more bright objects.
5. Filter the objects by type.
6. Reset all filters to default value.
7. Filter the objects by their horizontal direction.



Search Results

1. Number of results
2. Filter by object name (only filters currently displayed results)
3. Extended Search: You can search for an object by name only without adjusting any filters. This would search for ALL objects of all types regardless of filters. If the object is found, it is then added to the My Searches list.

FOV Profile



You can overlay a Field-of-View (FOV) indicator on the top of the displayed image. This aids in target framing. By default, the FOV rectangle color is green with the top marked in orange. The top coincides with your camera/frame top. Using the overlay helps to determine exactly how l the target appears in a captured image.

All units are in arcminutes. 1 arcminute is 1/60 of a degree. For reference, the Moon is 30 arcminutes or half a degree across the sky.

When the equipment profile is running, the FOV for each connected camera is automatically generated. You can simply select it from the dropdown menu to activate it. Furthermore, you can add your own FOV indicators manually as illustrated below.

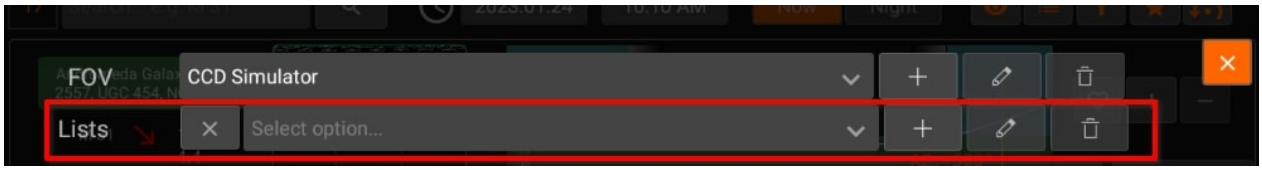
In order to use the Framing Assistant, it is necessary to select an FOV profile first.

1. FOV profile dropdown
2. Add | Edit | Delete (FOV profile)
3. Exit list (returns to normal targets browsing)

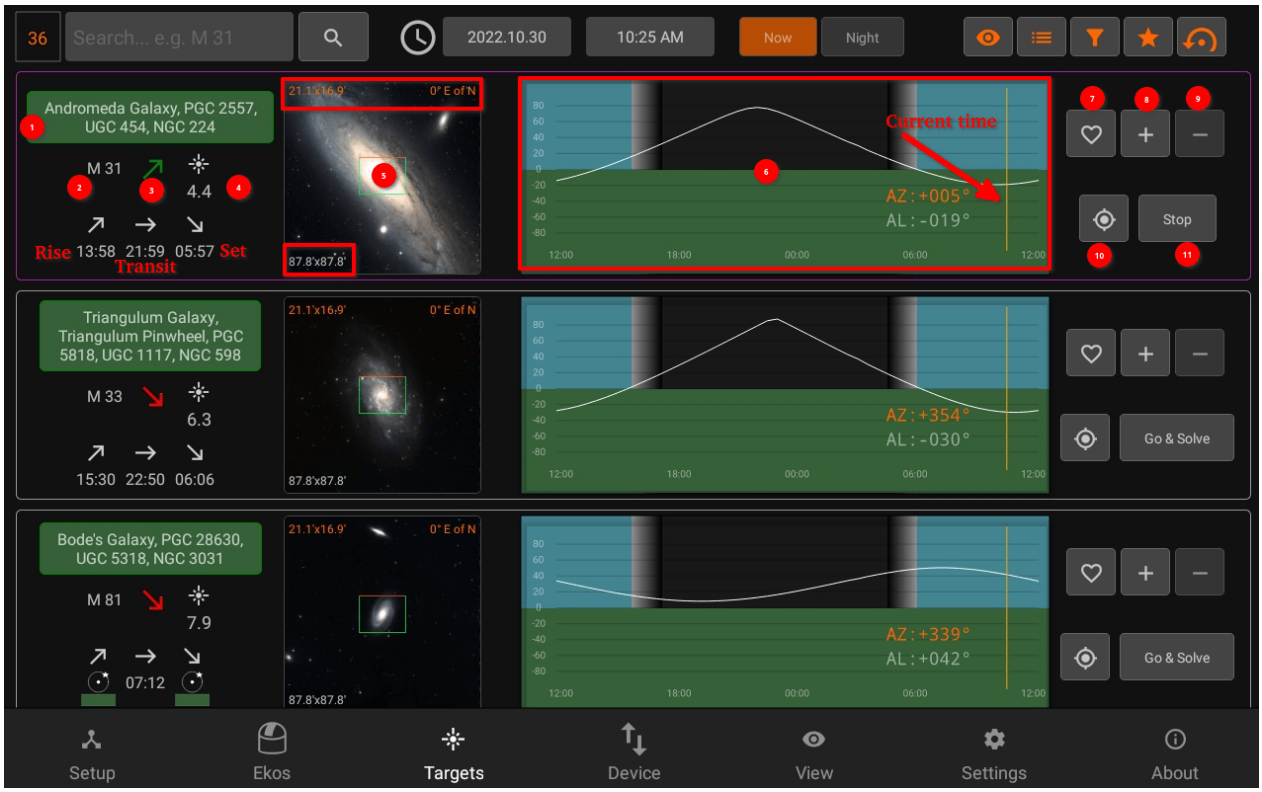
Adding an FOV profile in (5) opens up the following panel:

After setting the Focal Length, Camera width & height and pixel width & height, the FOV can be calculated by pressing the Calculate FOV button.

Lists



It contains Lists dropdown. Add, Edit the list name or Delete the selected list.

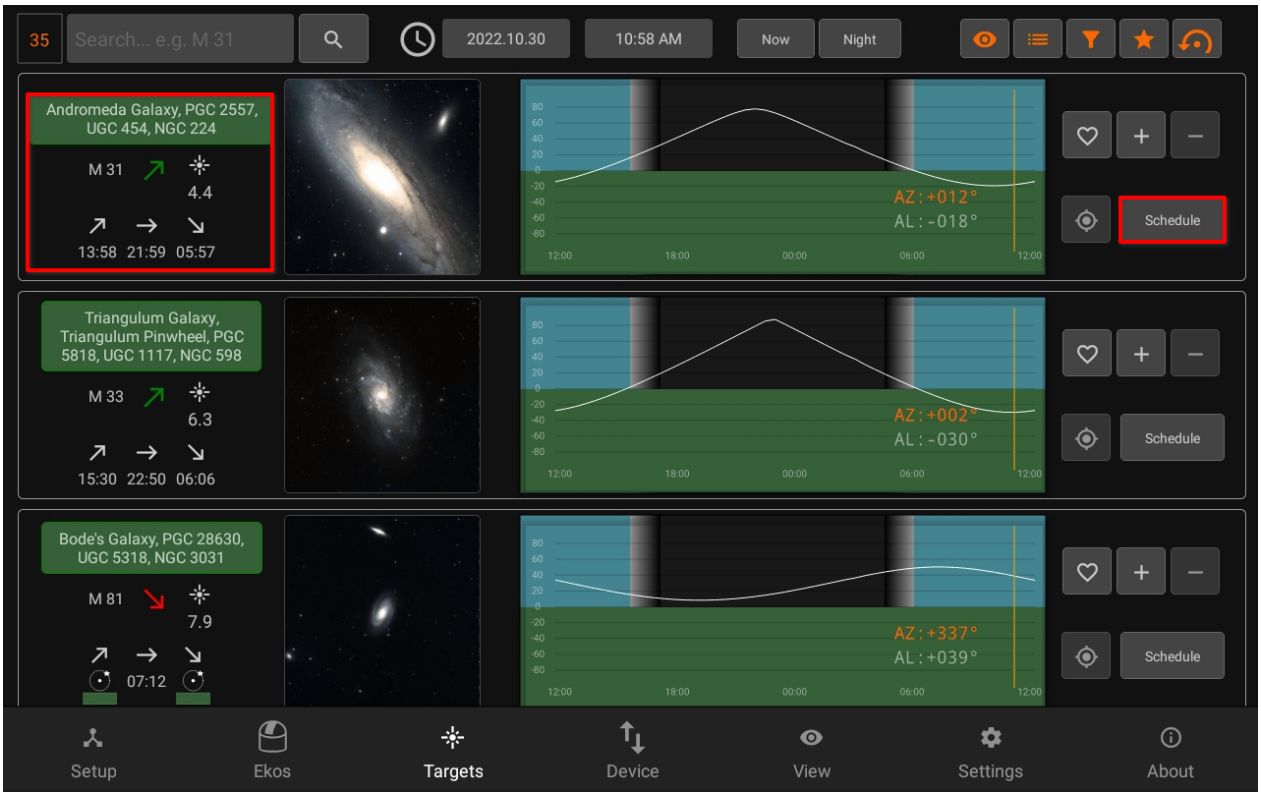


Target Info

1. Object designations.
2. Object name.
3. Object Phase:
    - Green: Object is rising
    - Yellow: Object is transiting the meridian
    - Red: Object is sitting
4. Magnitude
5. Object Image and FOV Overlay
6. Altitude vs. Time Plot. The X-Axis designates time starting from 12 PM to 12 AM, with local Midnight (00:00) at the center of the image. The yellow vertical line indicates the current time. Next to the current time line are the object's current Azimuth and Altitude values in degrees.
7. Add to Favorites
8. Add to custom list
9. Remove from current list
10. Go & Solve: Go to object and plate solve (required to use Framing Assistant)

When Ekos is offline, Targets will be used to schedule the coordinates information to

Scheduler.

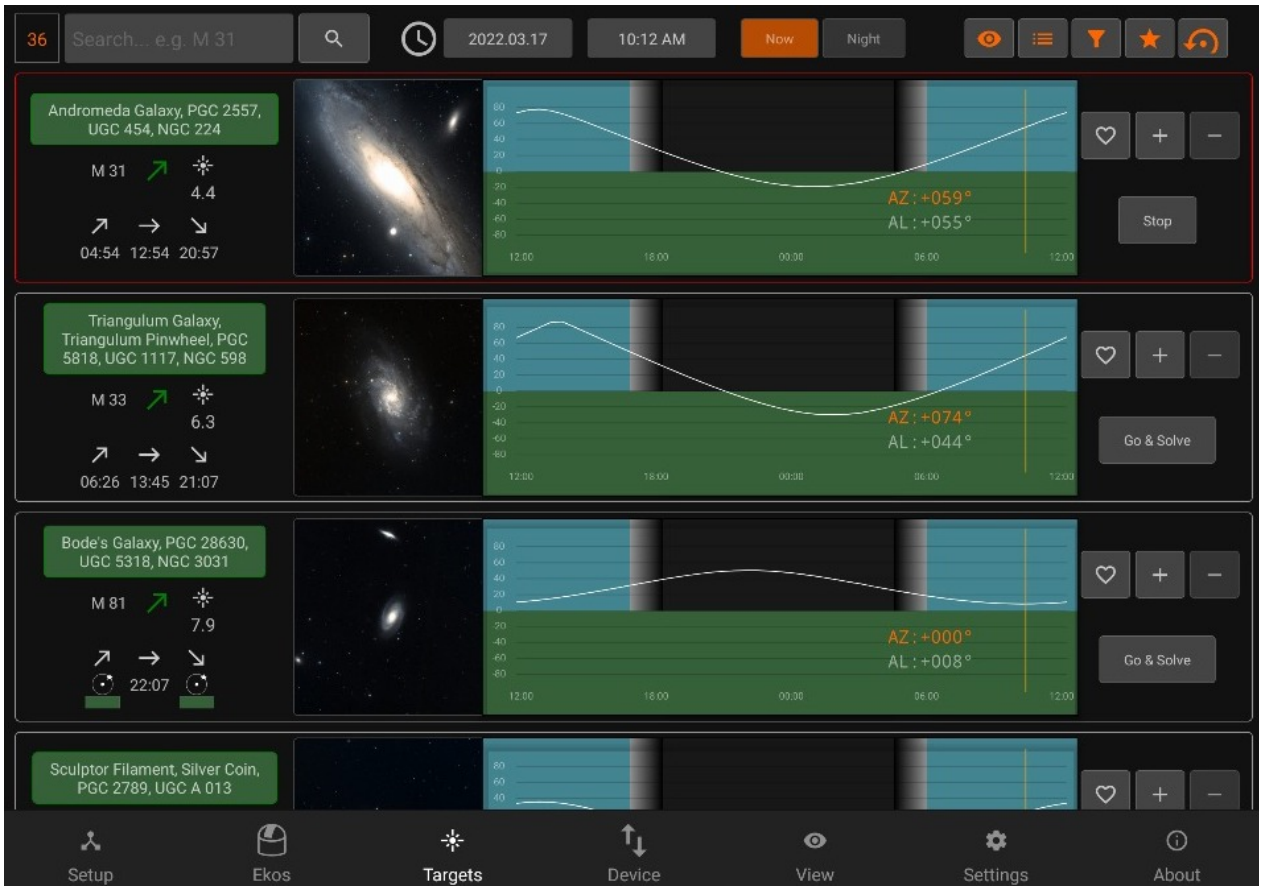


When Ekos is offline, you can also use framing assistant to Schedule the coordinates to Scheduler.

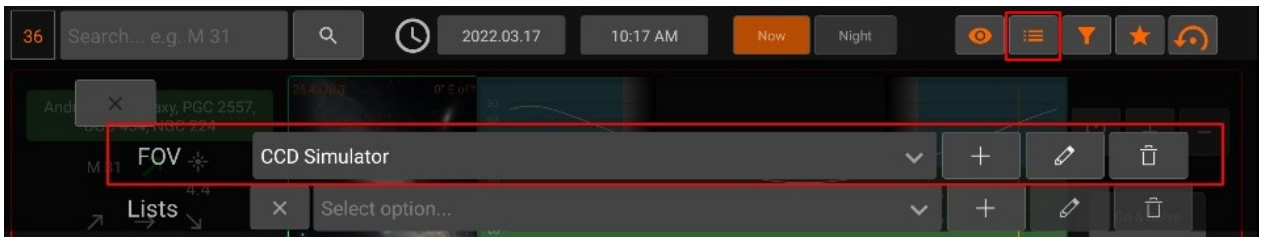
The border of each target displays it's status:

- Idle: Grey
- Plate-Solving: Yellow
- Skewing to target: Purple
- Plate-solving successful and target is centered: Green
  Plate-solving unsuccesful or beyond acceptable accuracy threshold: Red

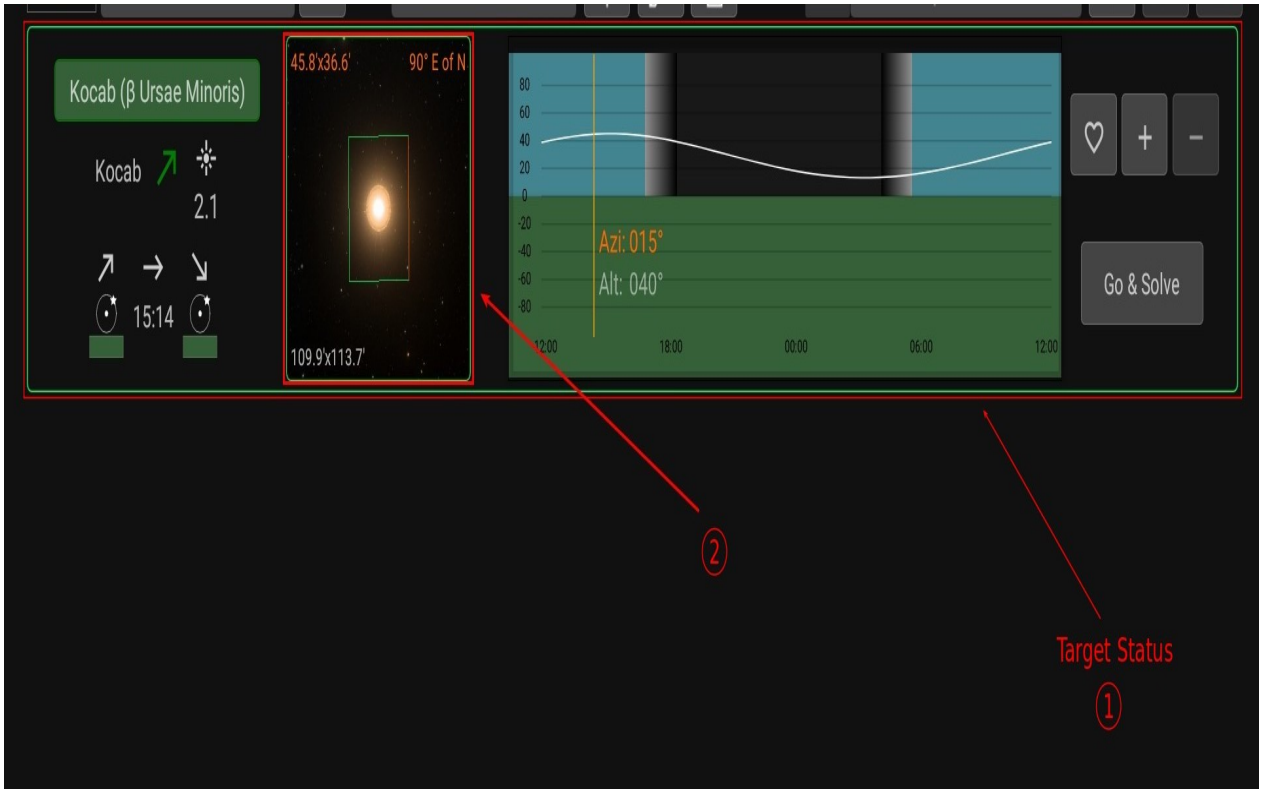
Framing Assistant



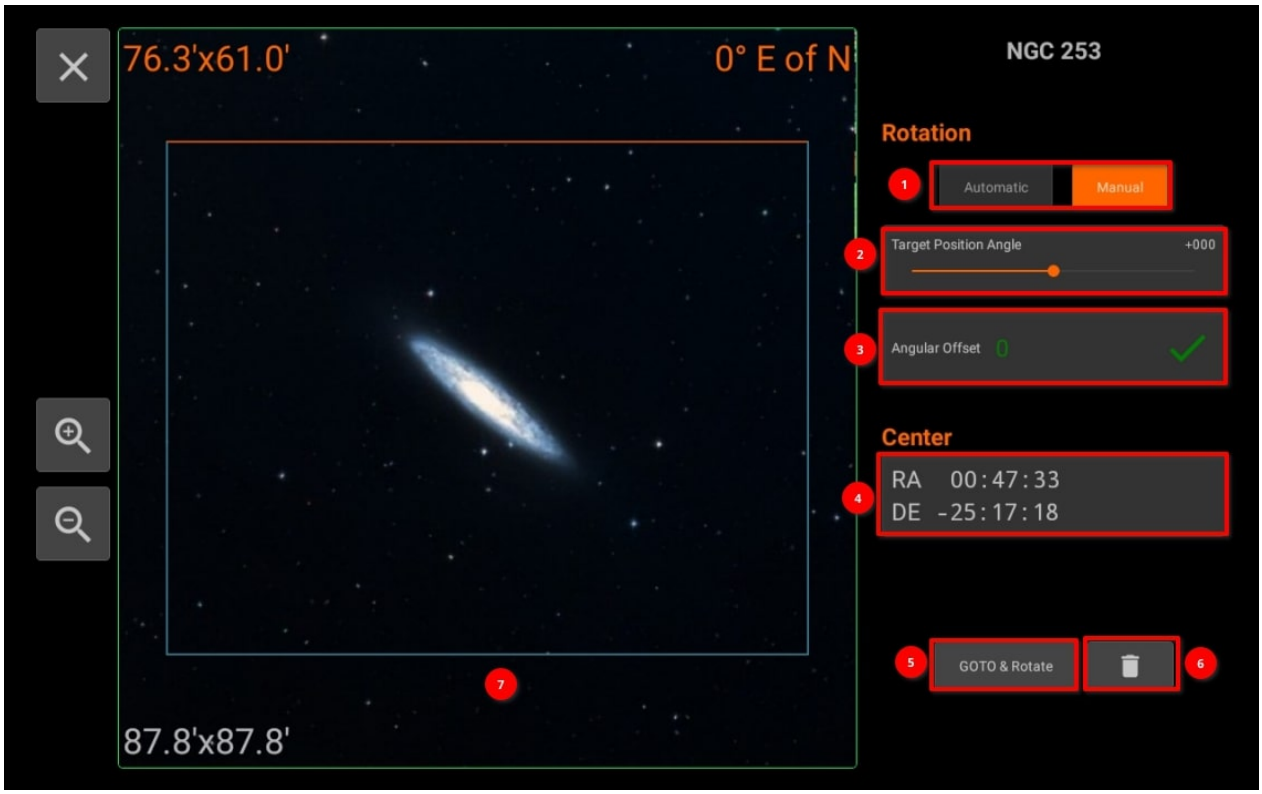
To open the framing assistant, make sure to have selected an FOV Profile and press Go & Solve.



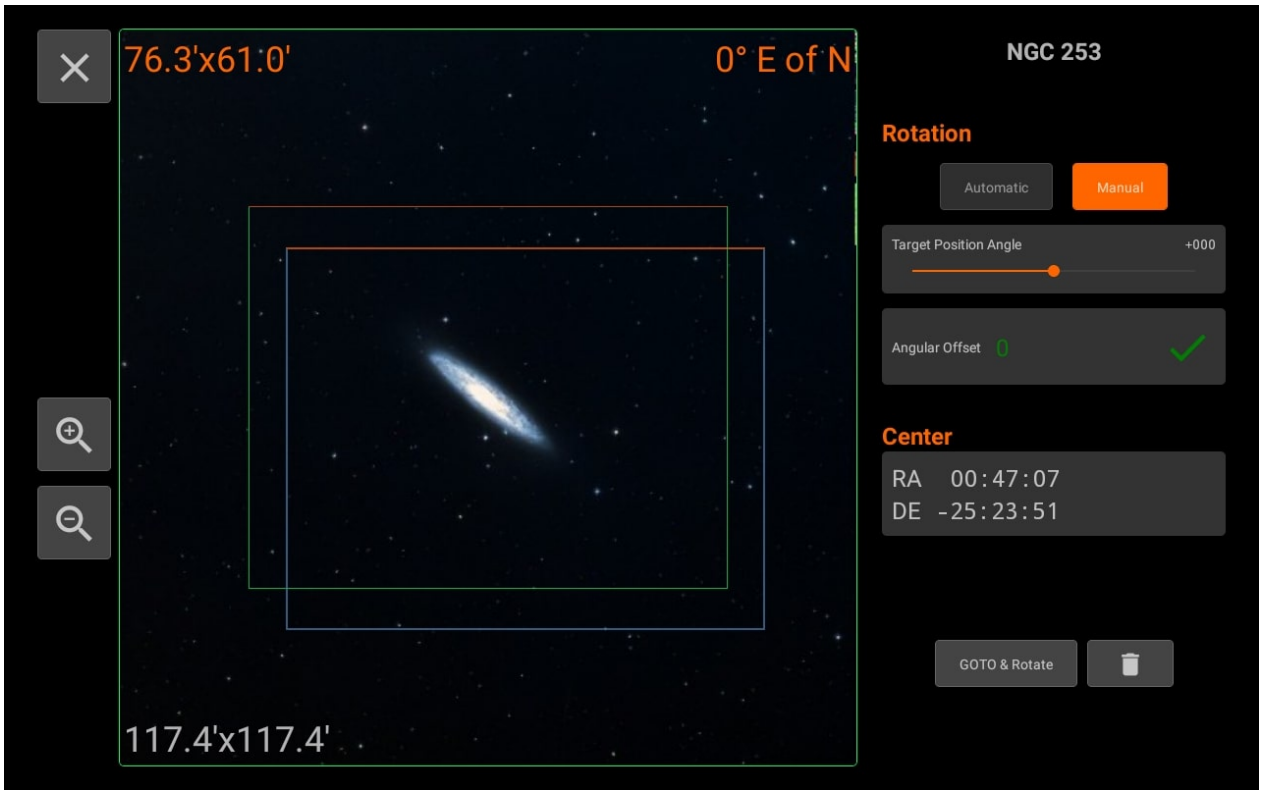
StellarMate will command the mount to slew to the target location. This is indicated by a magenta border around the target. Once Slew is complete, the alignment process begins which is indicated by a yellow border. A red border indicated alignment error or alignment is not within threshold. Please wait until the solver iterates to center the target exactly in the center of the sensor. Once this is done, the border turns to Green. Now that the plate solving is complete, you may proceed to use the Framing Assistant tool that helps you in adjustment the orientation of the camera to match your desired orientation either manually or automatically if a rotator device is detected.
Once the status turns to green (1), press the image (2) to open the Framing Assistant



1. The Framing Assistant has two modes of operation:
    - Automatic: This mode is available if a rotator device (e.g. Nightcrawler) is coupled with your imaging camera and can rotate it on its axis. With a rotator, no manual intervention is necessary as StellarMate calculates the exact offset required to arrive at the target orientation.
    - Manual: Using this mode, set the desired target rotation first, then check the required Angular Offset value. Go to your camera and rotate it manually by hand using your best judgement. Click Rotate & Capture to measure the new orientation of the camera. Once plate solving is complete, the new camera orientation and angular offset are updated. Repeat this process as many times as necessary until you are satisfied with the result. Your goal is to bring the Angular Offset down to zero.
2. Adjust the rotation of the desired FOV orientation with the slider. The target FOV rectangle color is blue with orange designating the top. The green rectangle with orange on top is your camera's current FOV & orientation in the sky.
3. Rotation offset in degrees between the current (Green) FOV and the target (Blue) FOV. When manually adjusting the camera, rotate it clockwise or counterclockwise as per the indicated icon.
4. Displays the correct RA and DE.
5. You can click "GOTO & Rotate" in order to go to the desired location and an image will be capture of the location depending on selected RA and DE.
6. Reset the set values.
7. Framing target can be seen in the blue color which you can move to different location by the gesture controls.

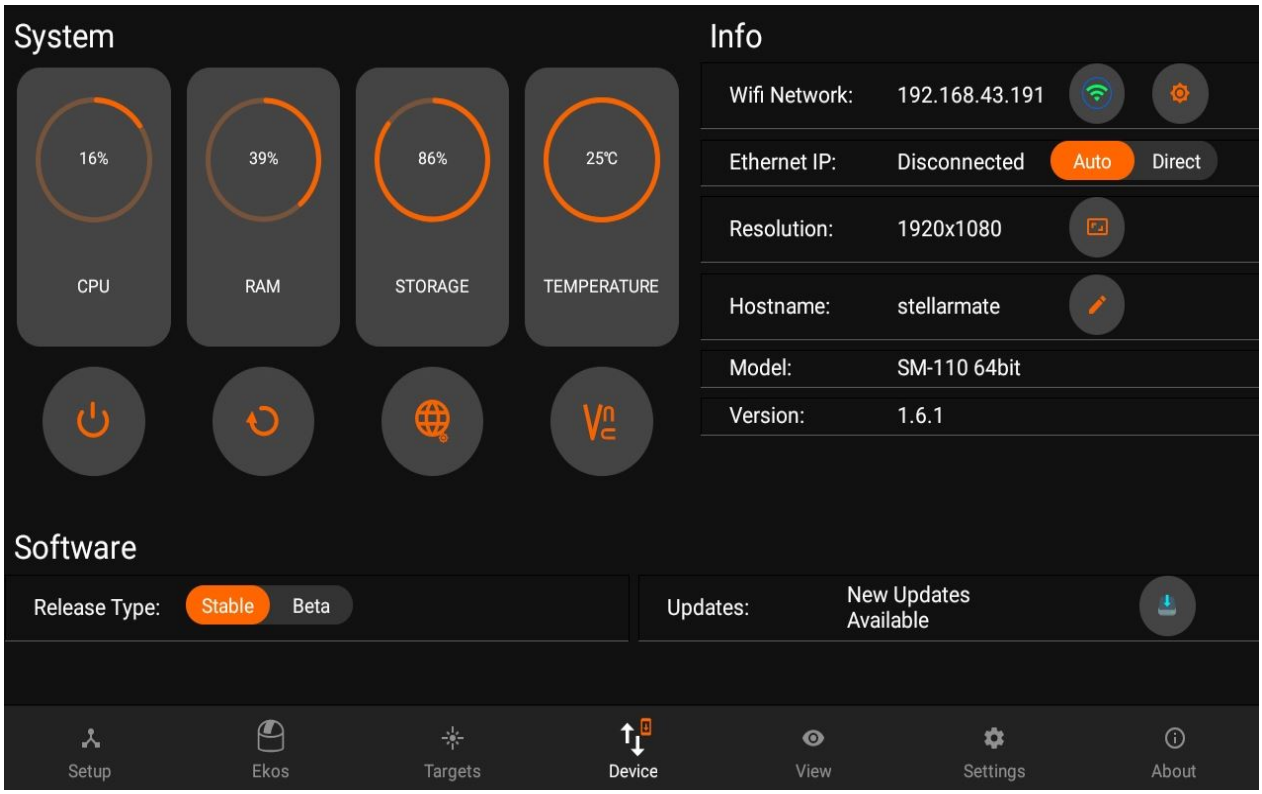


If Ekos is offline, you can Schedule your target coordinates by using framing assistant in Scheduler module.



Device

The Device tab shows the health and information of your StellarMate. If StellarMate is connected to the internet, you can also run the software updater, install the latest firmware updates and also download the Teamviewer Software in your SM device.



You can perform the following functions:

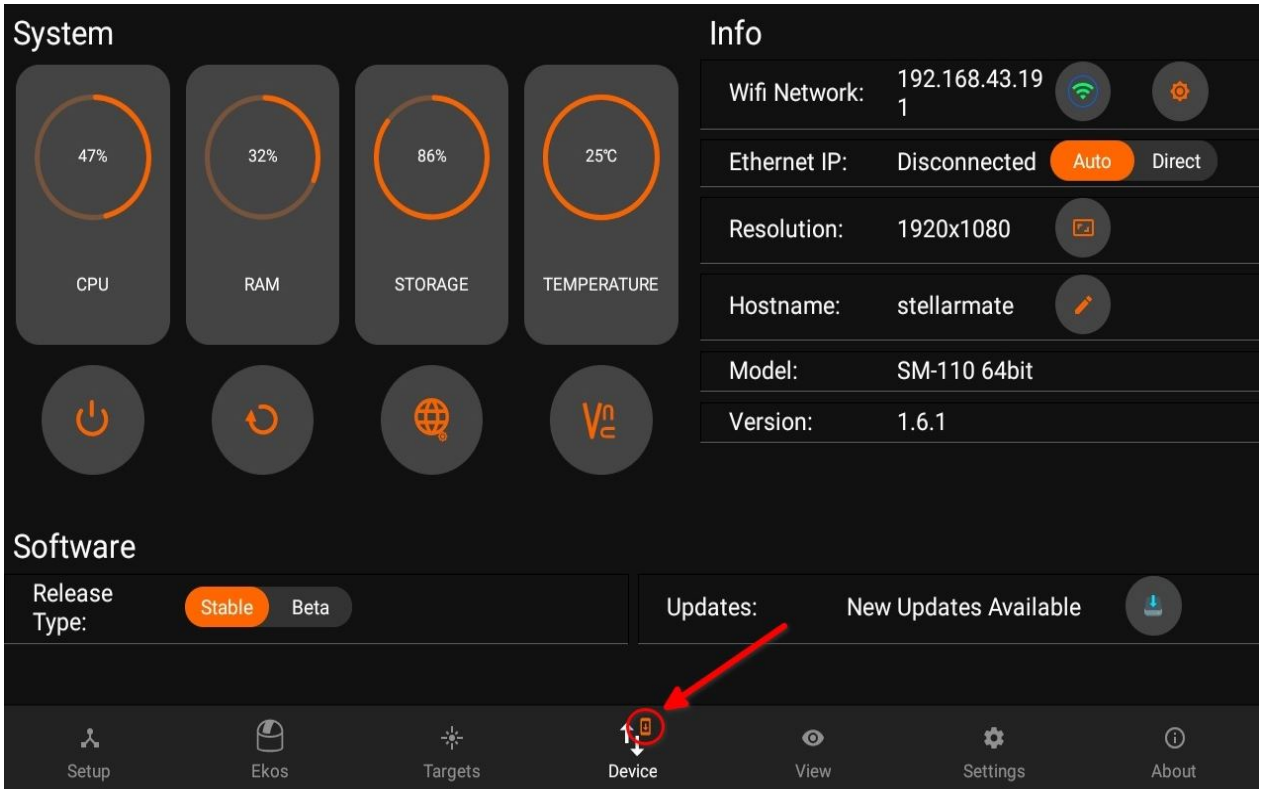
- Change Name: You can change device name (and its hostname) to another name without any spaces. For example, if you rename it to myobservatory, the host name shall be changed to http://myobservatory.local.
- Change Hotspot WiFi band (2.4GHz, 5GHz, or Automatic)
- Connect to WiFi / Forget WiFi
    - Connect to Home WiFi: Select a WiFi network as detected by StellarMate and then supply the password if it is protected. After a successful connection, please wait up to 2 minutes before using any of the unit functions again.
    - Forget WiFi: WiFi network information is removed and StellarMate reverts to HotSpot mode (IP Address 10.250.250.10). If the Unit is connected to your LAN via Ethernet, you can still access it via its LAN IP address like before.
- Access Web Manager
- Access VNC Viewer
- Restart Device
- Shutdown Device

Software:

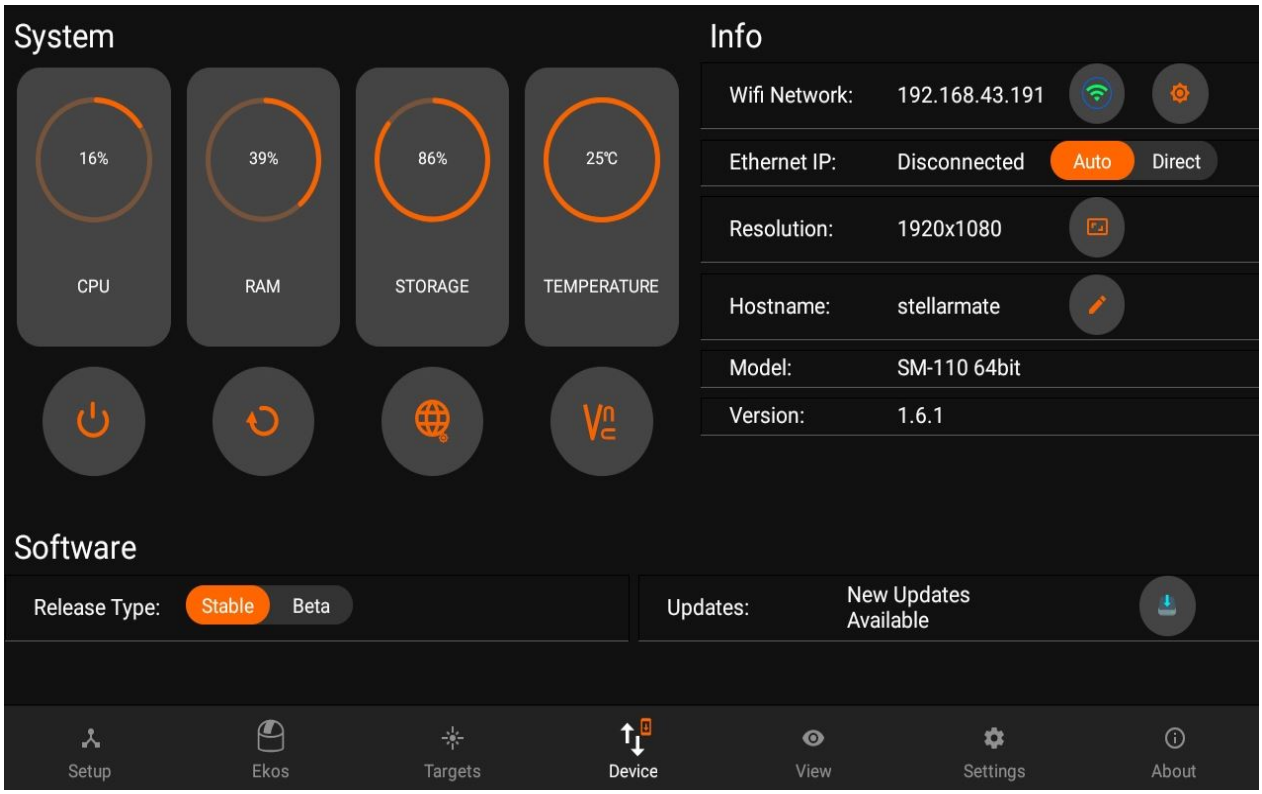
- Switch between Stable and Beta builds
- Update StellarMate Software

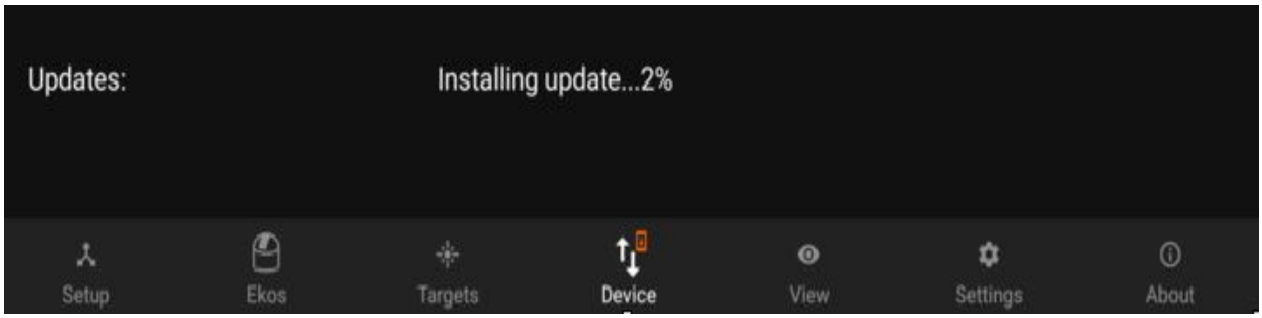
Updating StellarMate Software

When there is an update available for StellarMate, an icon will show up on Device tab.



To update StellarMate, simply click the download button and wait for the the process to complete.



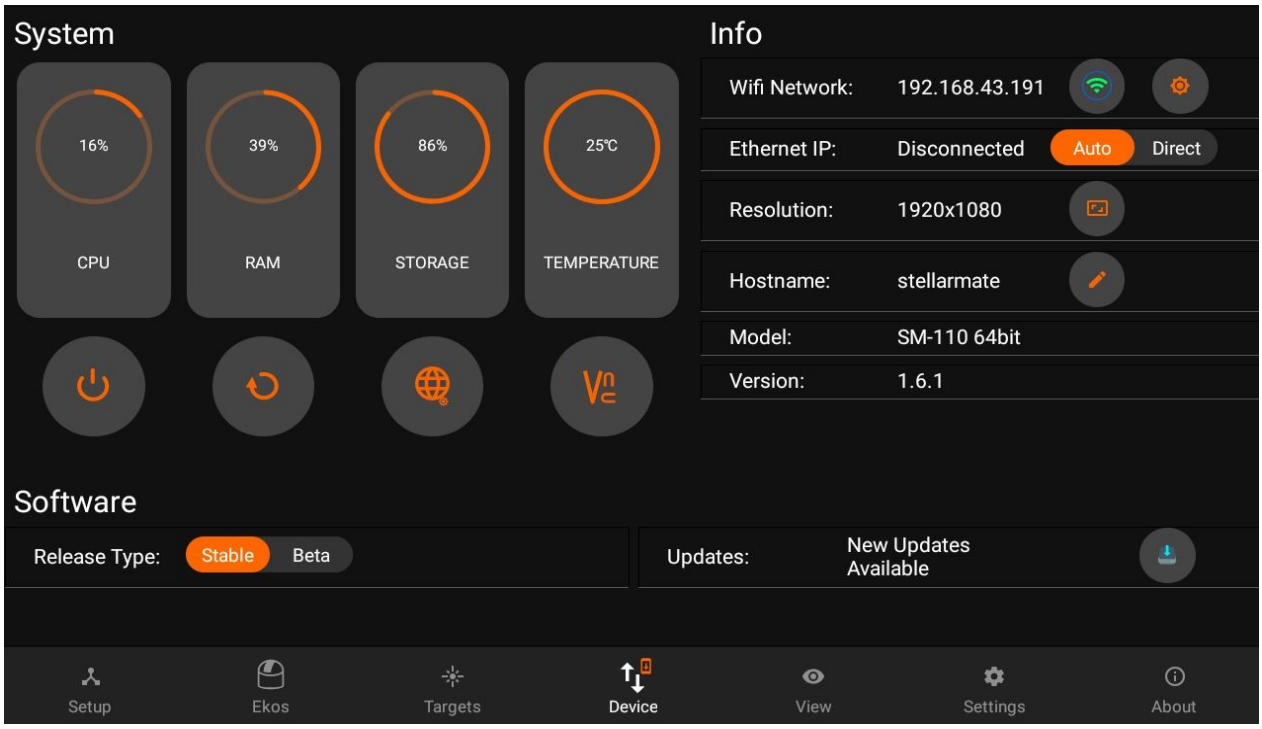


Once the update is complete, you will be prompted to restart Stellarmate for the updates to take effect.

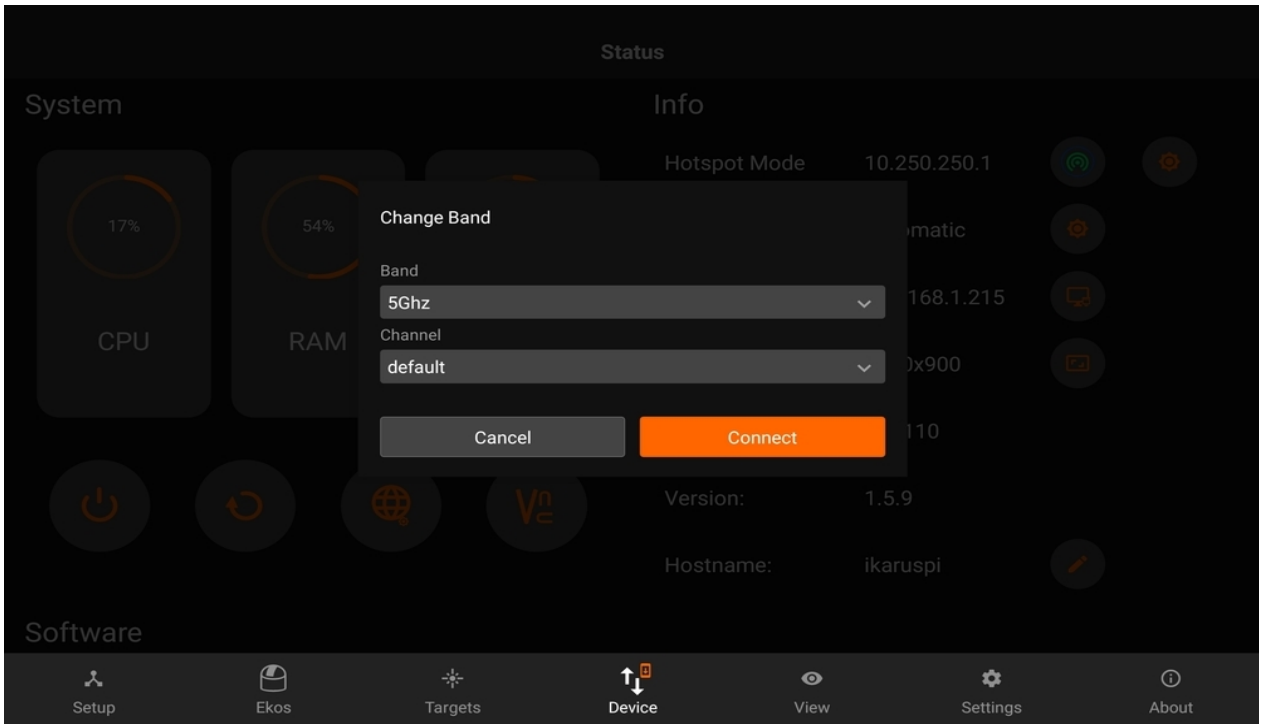
Changing Hotspot WiFi Band

Changing Hotspot WiFi Band

You can change the Hotspot WiFi band by clicking on the settings button next to the WiFi Band label.



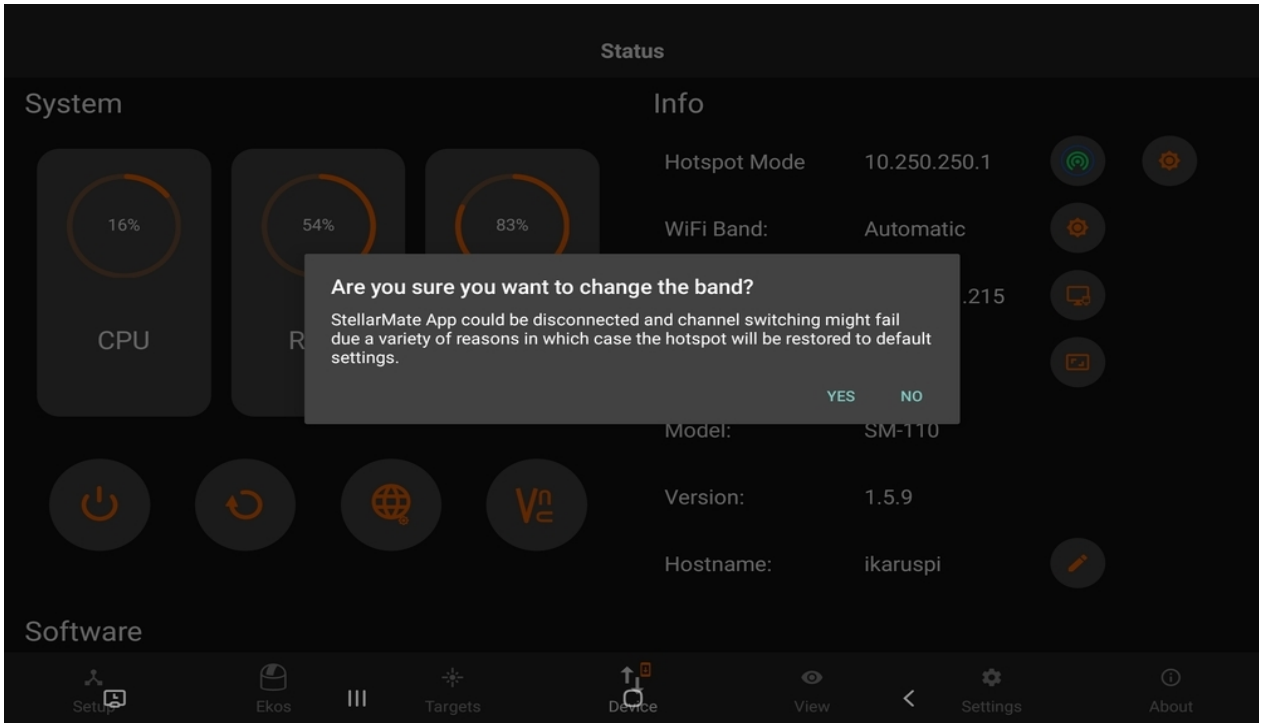
You can now choose the Band you want to switch to, as well as the channel. We recommend using default if you are not sure which Channel to choose. After choosing the band you want to switch to, tap on connect to start the switching process.



An alert will posp-up informing you about what might happen if you proceed with this operation. Tap on YES to continue with this operation.

WARNING

StellarMate App could be disconnected and channel switching might fail due to variety of reasons in which case the hotspot will be restored to default settings.

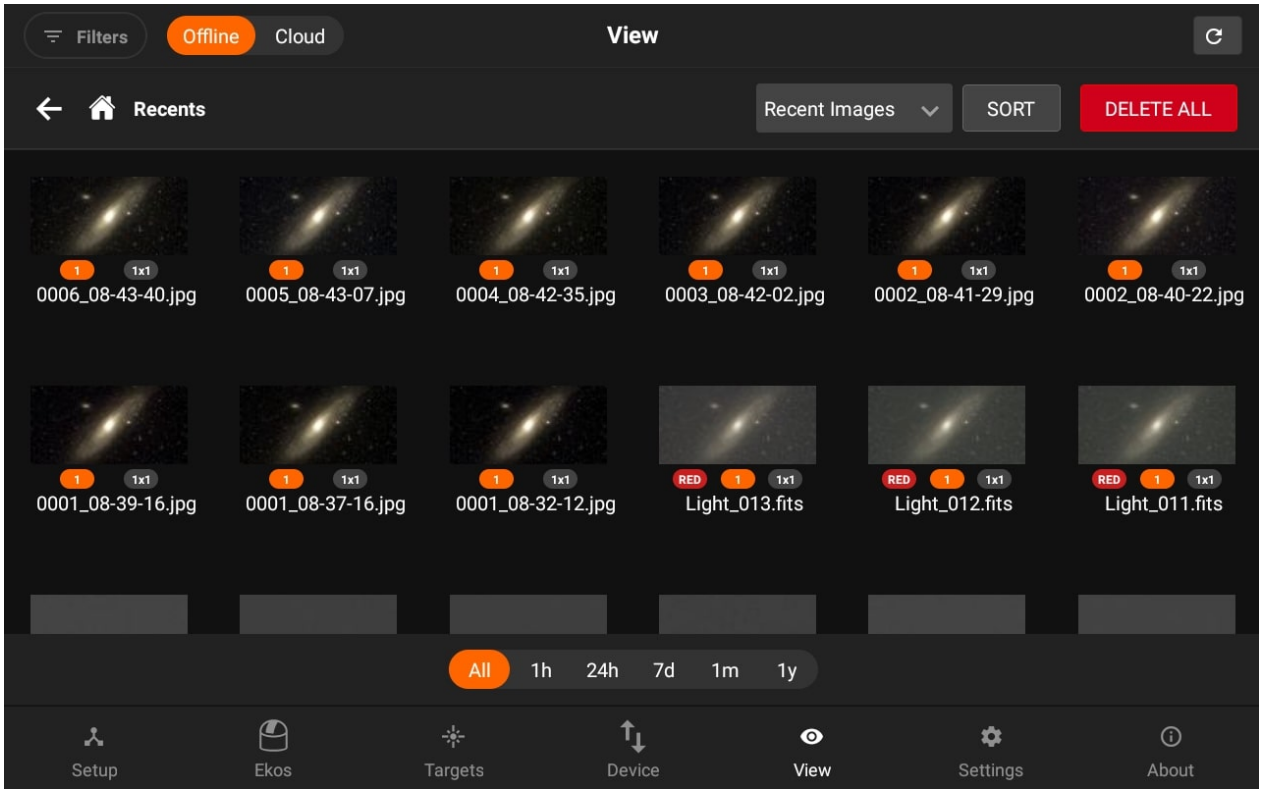


You might have to wait until the hotspot starts broadcasting a Wi-Fi signal again, if it's successful, you will be able to connect back to StellarMate and find that it shows the band

you switched to, in the Device tab.
If not, StellarMate will go back to the Automatic band.

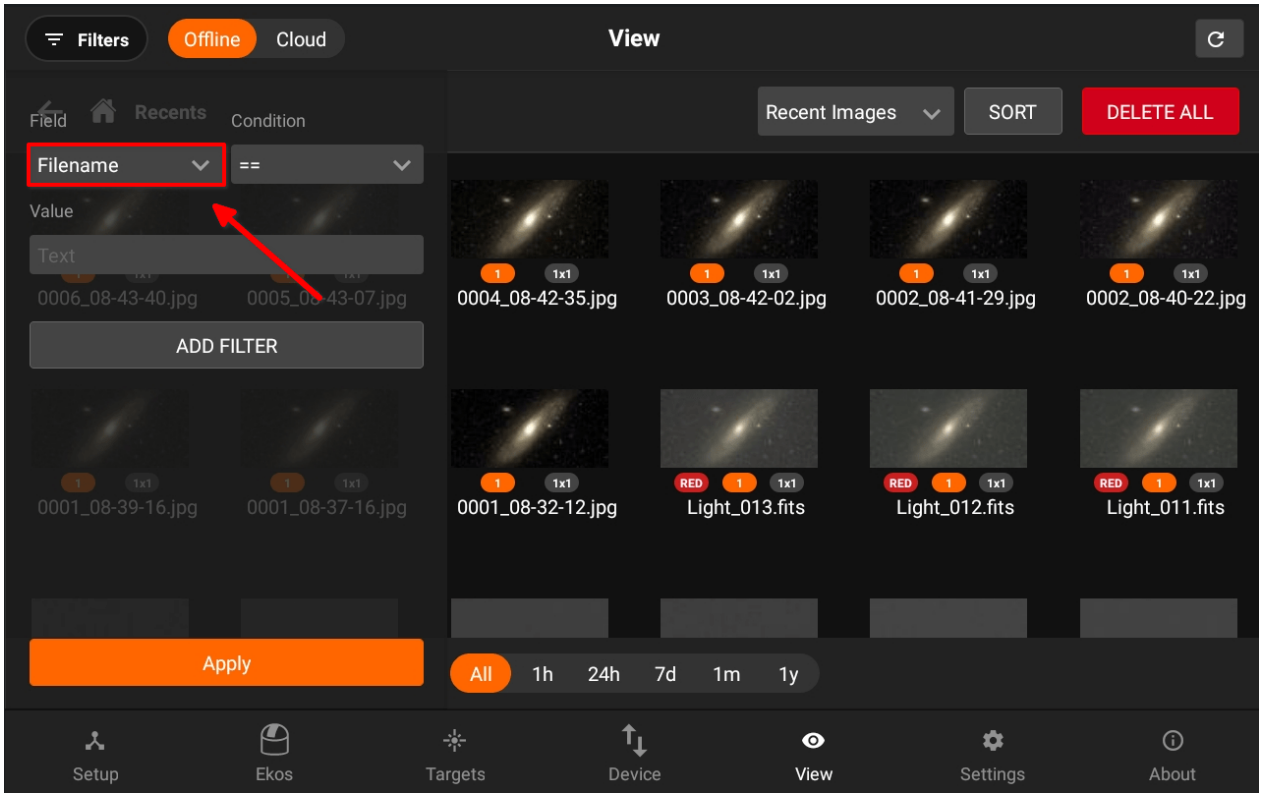
View

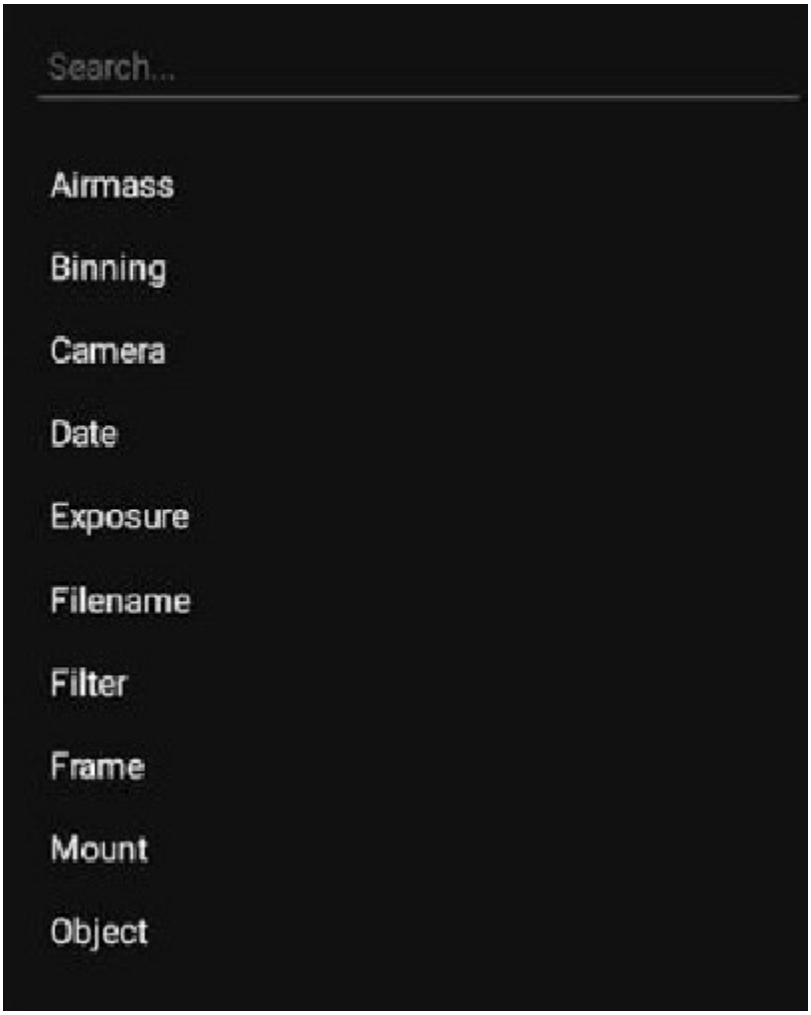
The View tab displays online images saved on the cloud (requires EkosLive Pro subscription, refer to Resources section) and offline images captured on StellarMate. All metadata is preserved so you can sort and search your images at any time. You can toggle between Cloud or Offline images.



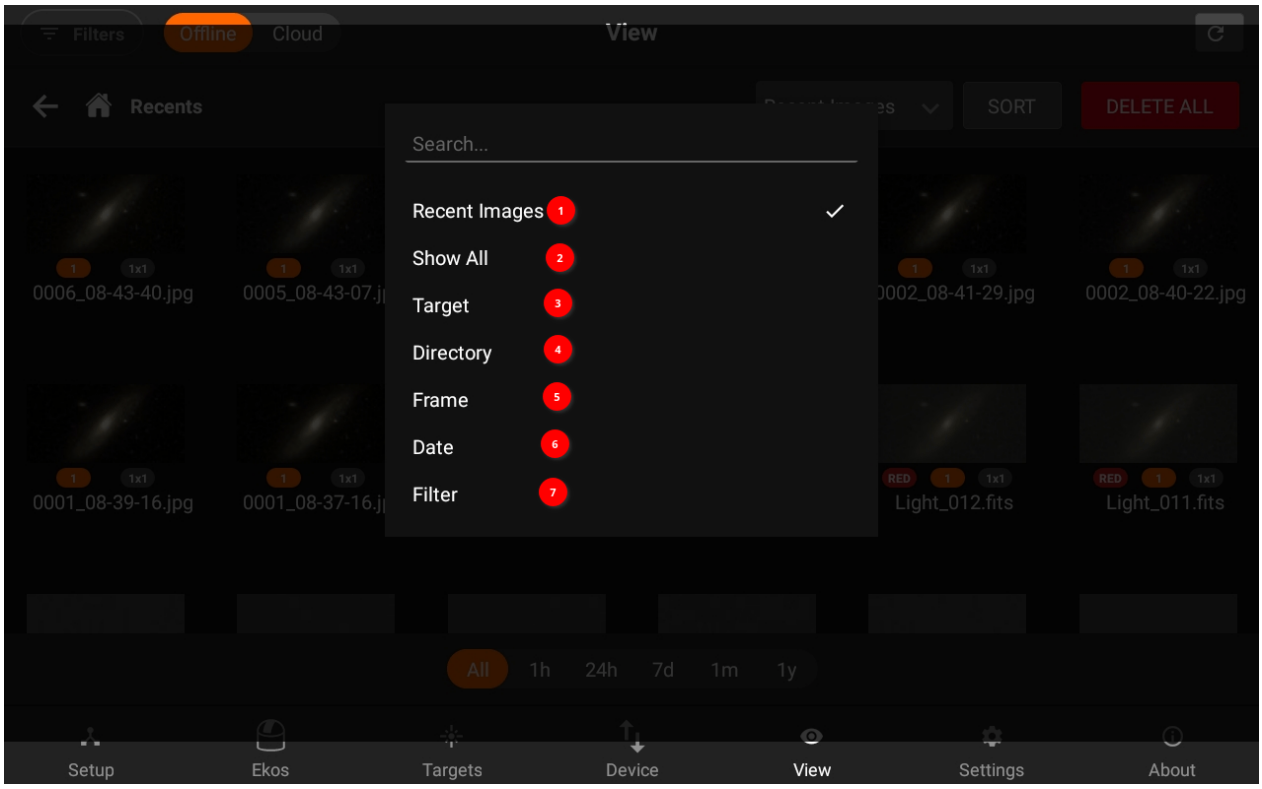
Images are displayed in a grid view, Under each image there are badges for Filter, exposure duration, and binning. By default, all images are displayed in the grid without any filtering or sorting. Click on an image to view the full-size version which also provides further actions such as export and export.
You can filter the images by using the left panel. Changing the Field, allows you to select to filter using different options based on the chosen condition.

Advanced search is available from the left panel. Select the condition that must be met from the metadata fields. You may add multiple conditions to further restrict the search.

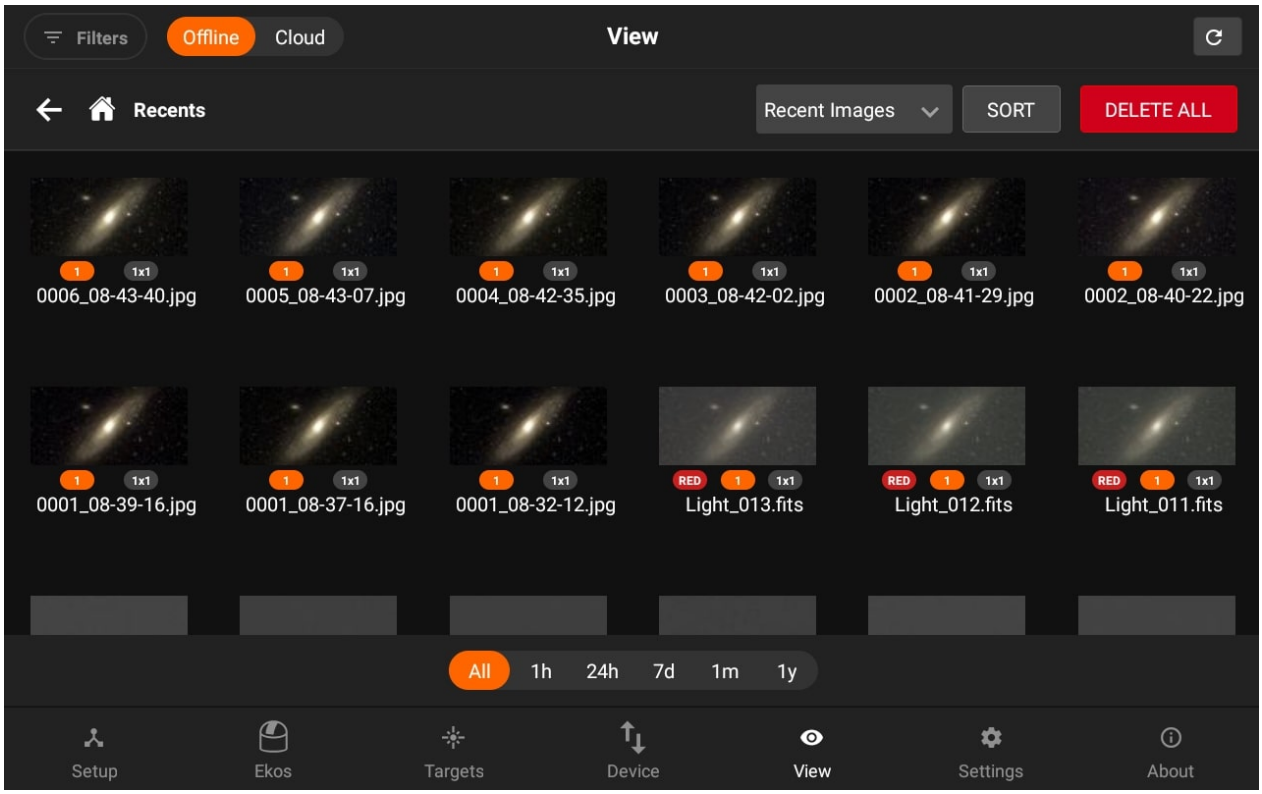

Filters
Offline
Cloud
View
Field
Recents
Condition
Filename
==
Value
Text
ADD FILTER
Apply
Recent Images
SORT
DELETE ALL
0004_08-42-35.jpg
0003_08-42-02.jpg
0002_08-41-29.jpg
0002_08-40-22.jpg
0001_08-32-12.jpg
Light_013.fits
Light_012.fits
Light_011.fits
All
1h
24h
7d
1m
1y
Setup
Ekos
Targets
Device
View
Settings
About


Search...
Airmass
Binning
Camera
Date
Exposure
Filename
Filter
Frame
Mount
Object

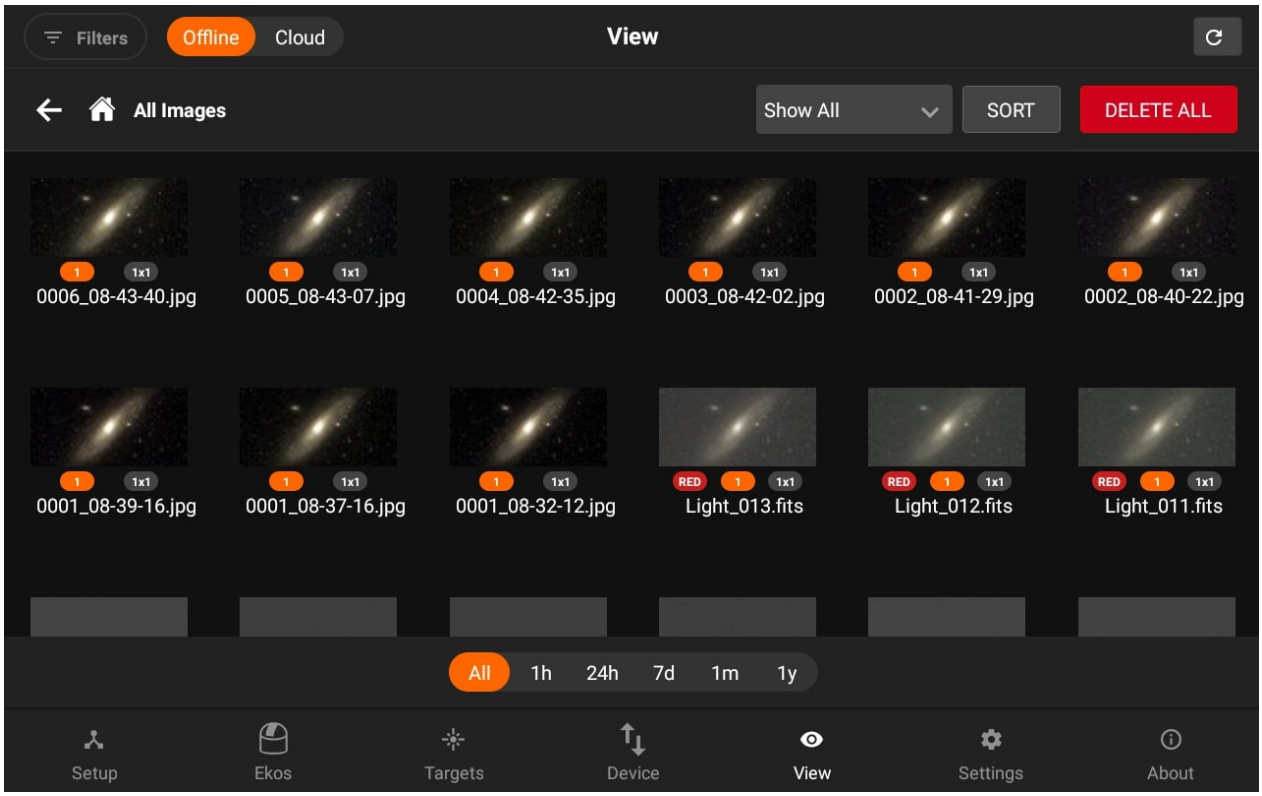
StellarMate aggregates images in Virtual Folders based on the selected Virtual Group:



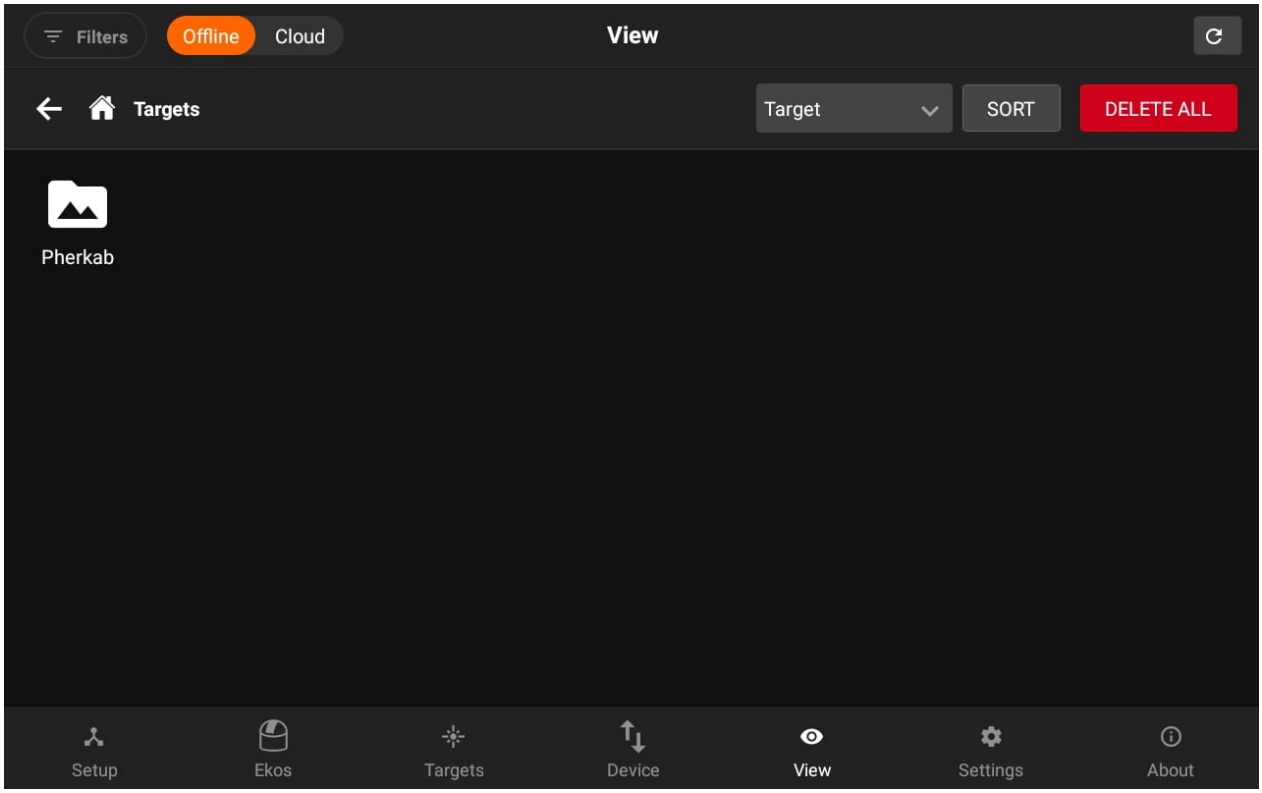
1. Recent Images: Shows 20 latest images captured.



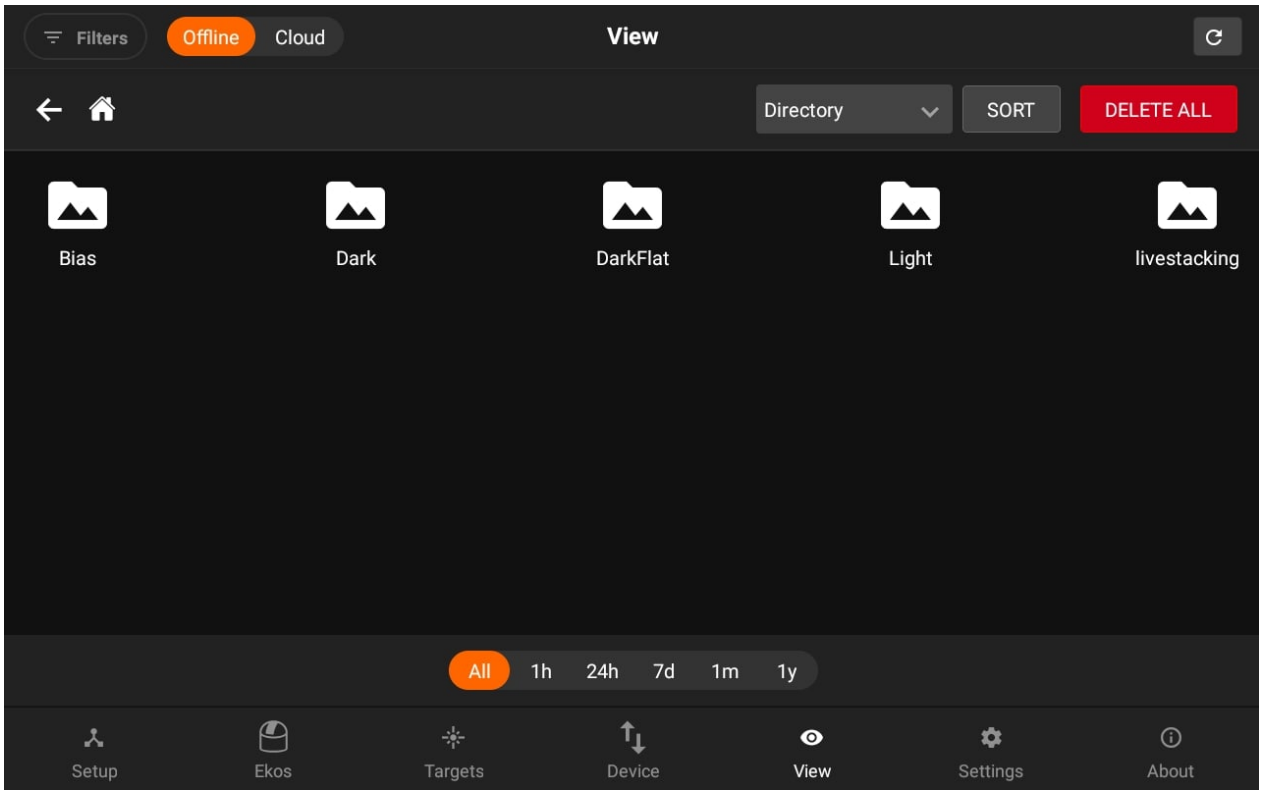
2. Show all Images: Show all directories & images under /home/stellarmate/Pictures.



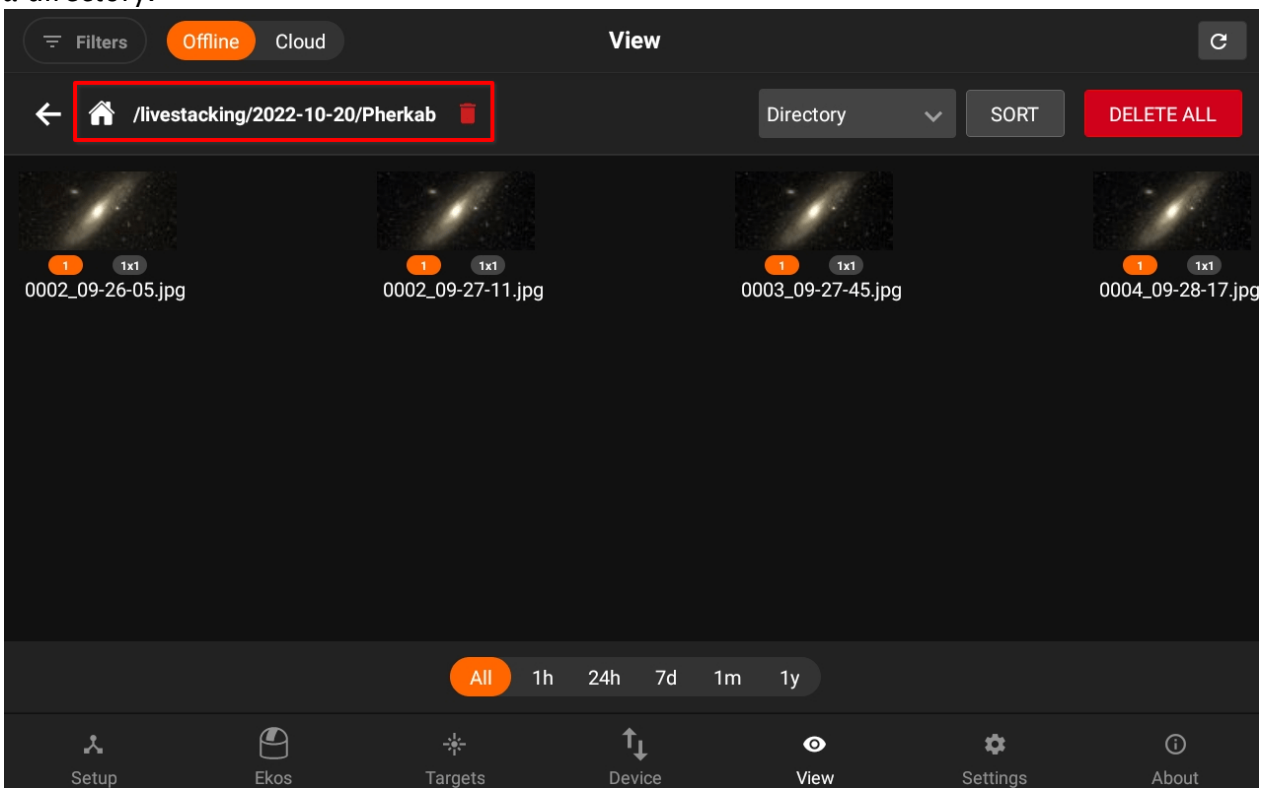
3. Target: Group images by each unique target together regardless of where they are physically located on the device.

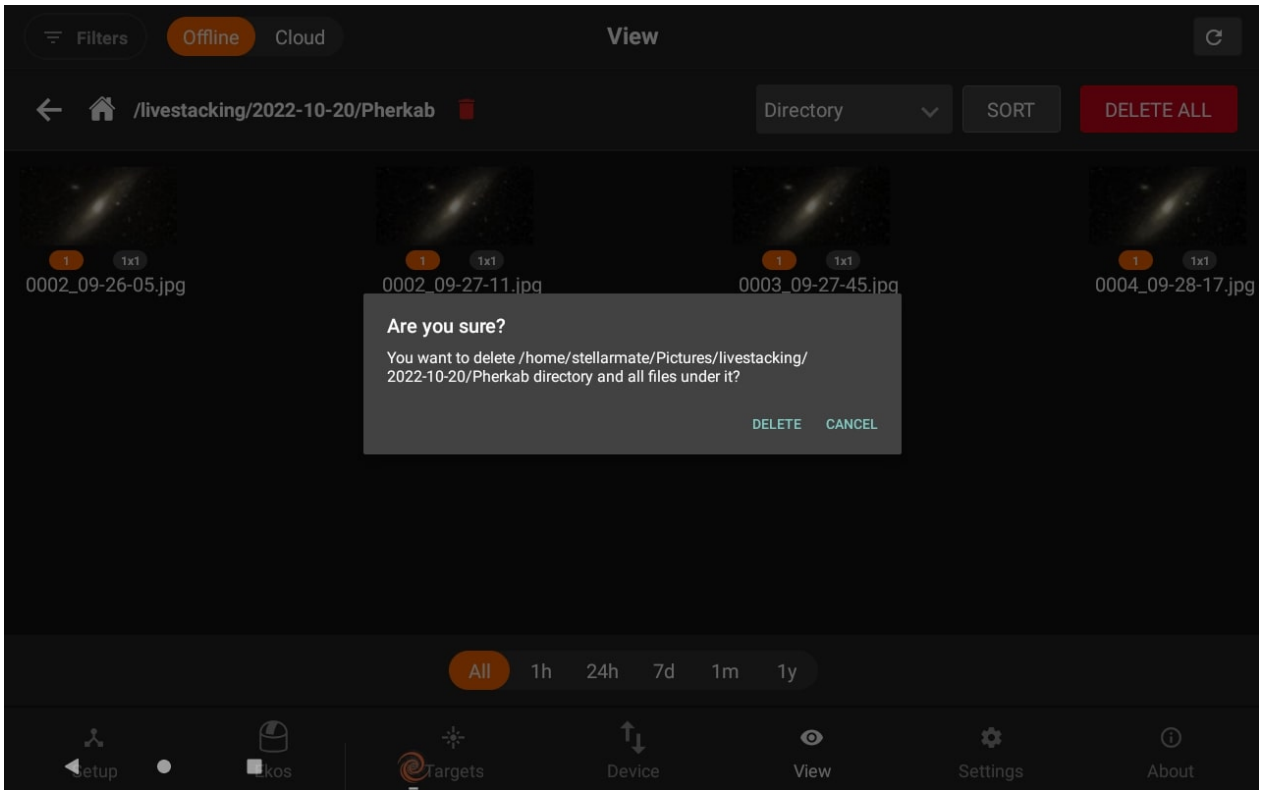


4. Directory (Default): This is similar to a traditional File Explorer where images are grouped by directory on StellarMate.

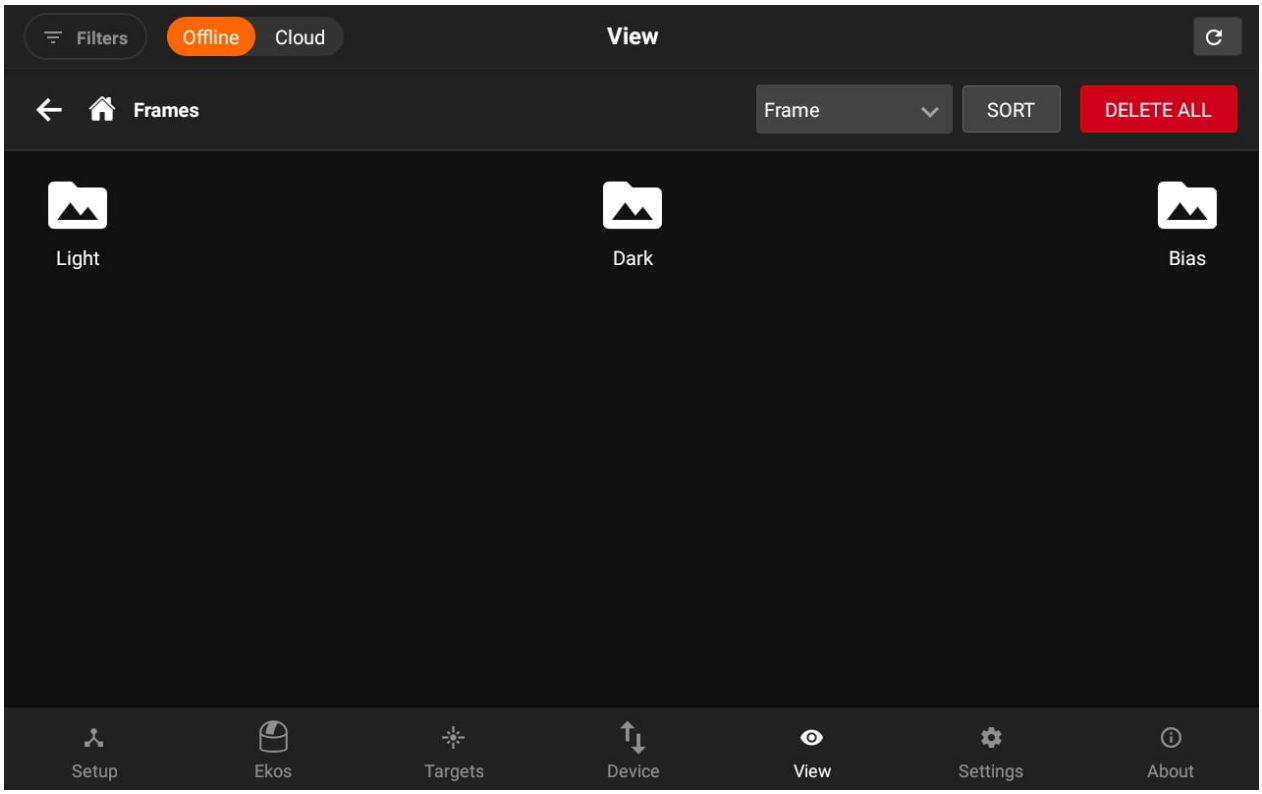


You can now also delete the directories. In order to delete a directory, just visit the directory and you will see the delete icon button beside the directory locatory to delete all images in a directory.

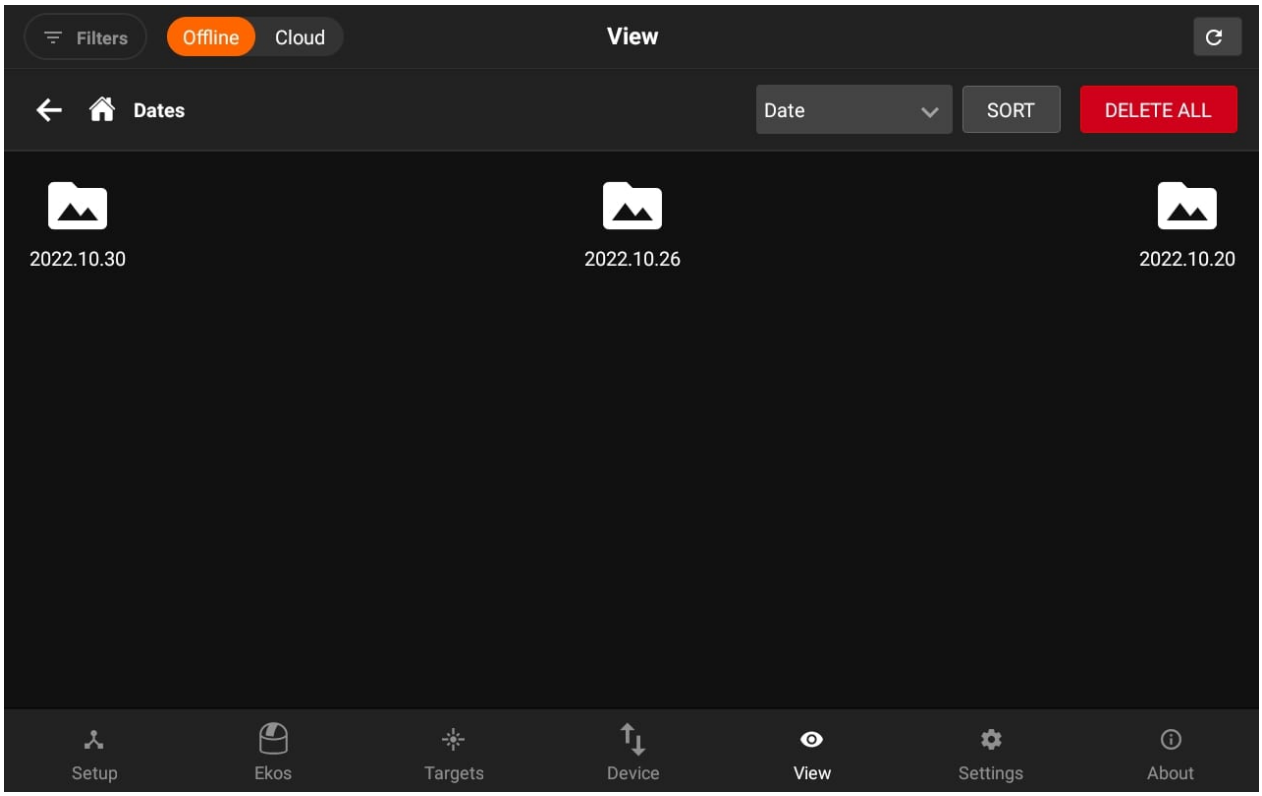




5. Frame: Group images by each unique frame type (i.e. Light, Bias..etc).

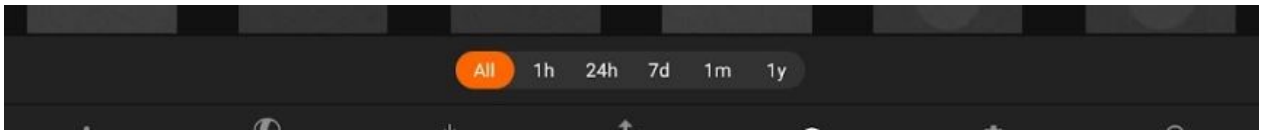


6. Date:Group images by date whereas images captured on the same day are grouped together.



1. Per filter: Images are shown per filter. Those folder directories are Virtual folders.

Images can be further filtered chronologically by tapping on the bottom chrono selector. By default, images captured at all times are displayed. To filter only recent images, tap the chrono selector. For example, tapping 1H would only show images captured within the last hour.

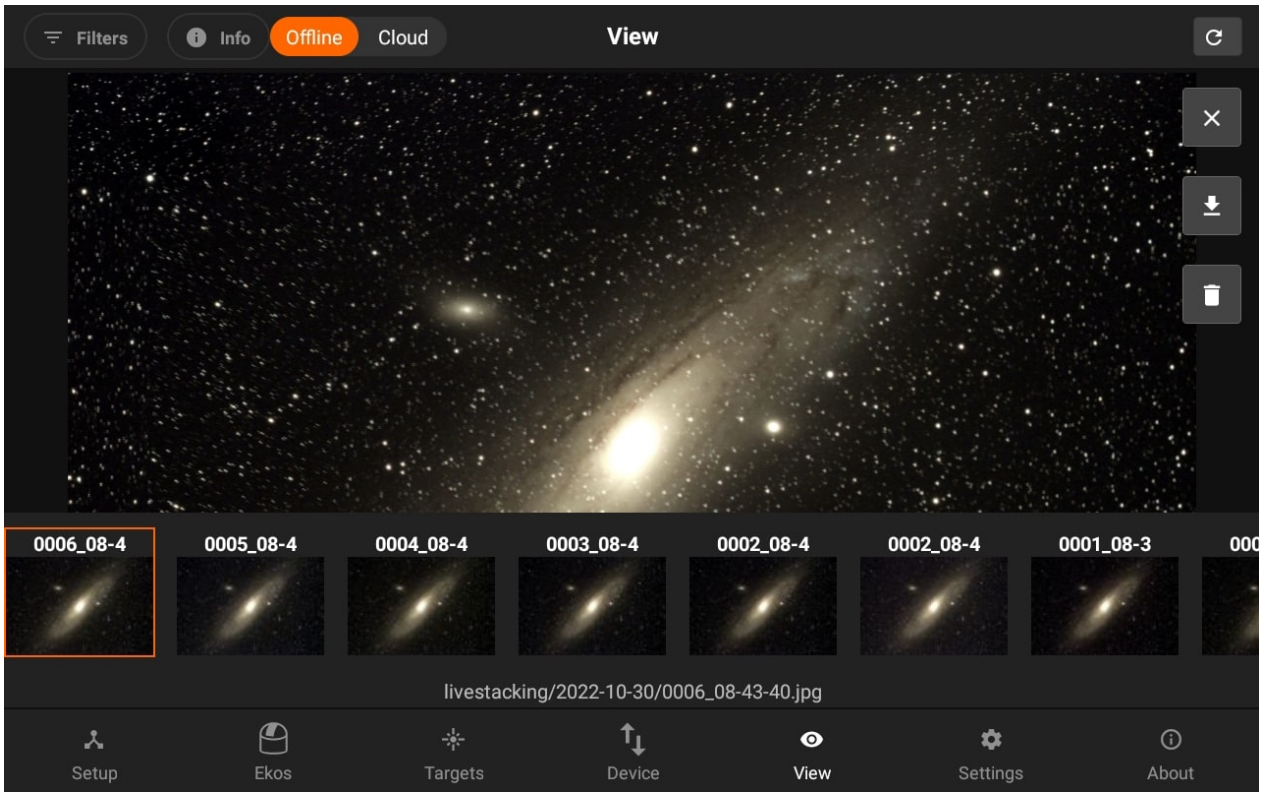


You can view the image in full size by click on a specifc image.

Below the list of images which are in that Directory are shown. On each image click, the image and it's information will be loaded.

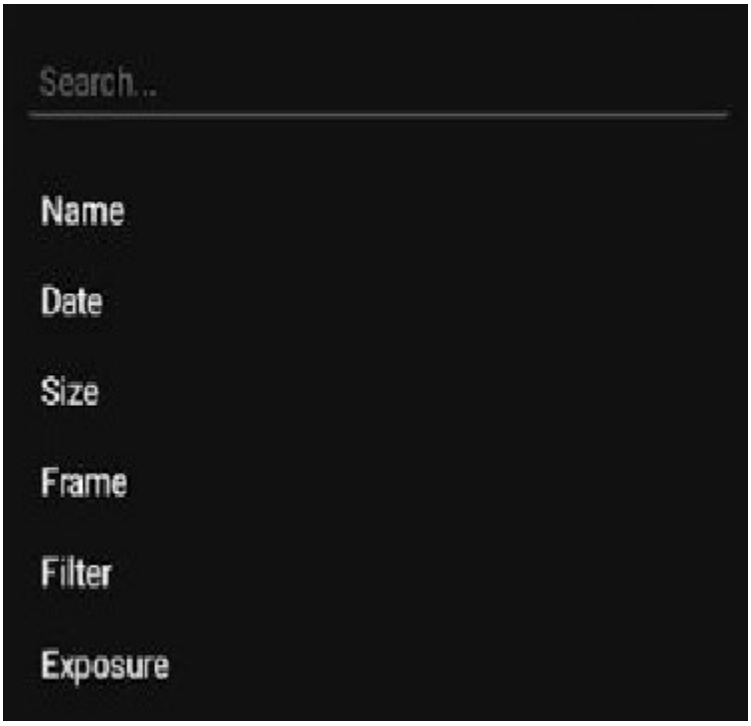
You can also download and delete the selected image on the right side.

To view detailed metadata, tap the top-left Info button, the information of a specific image is displayed as illustrated below.



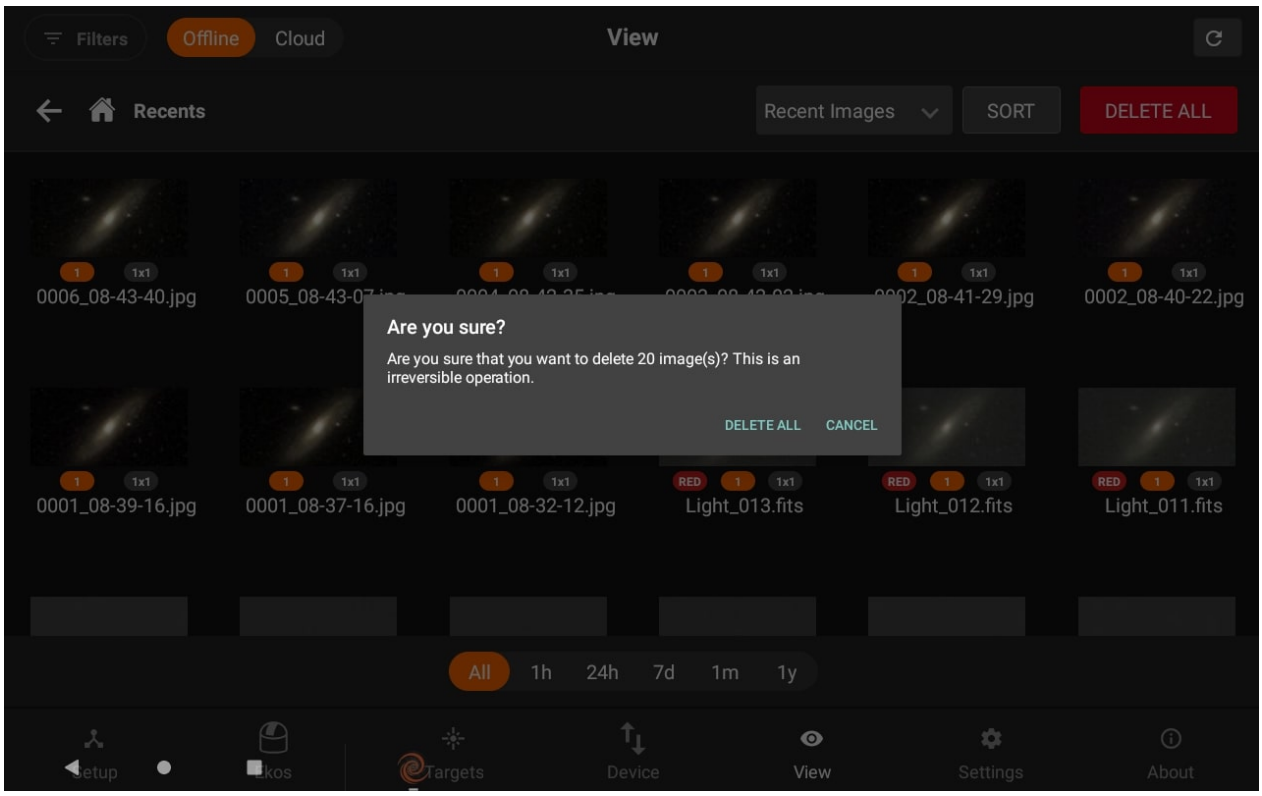
- Sort:

It allows you to sort the images according to different options which includes, Name, date, Size, frame, Filter and Exposure.



- Delete all:

Deleting all images will delete all the images exists in the specifc directory.
i.e If you are in Per filters option and RED filter directory. It will only delete your images within RED directory virtual folder.



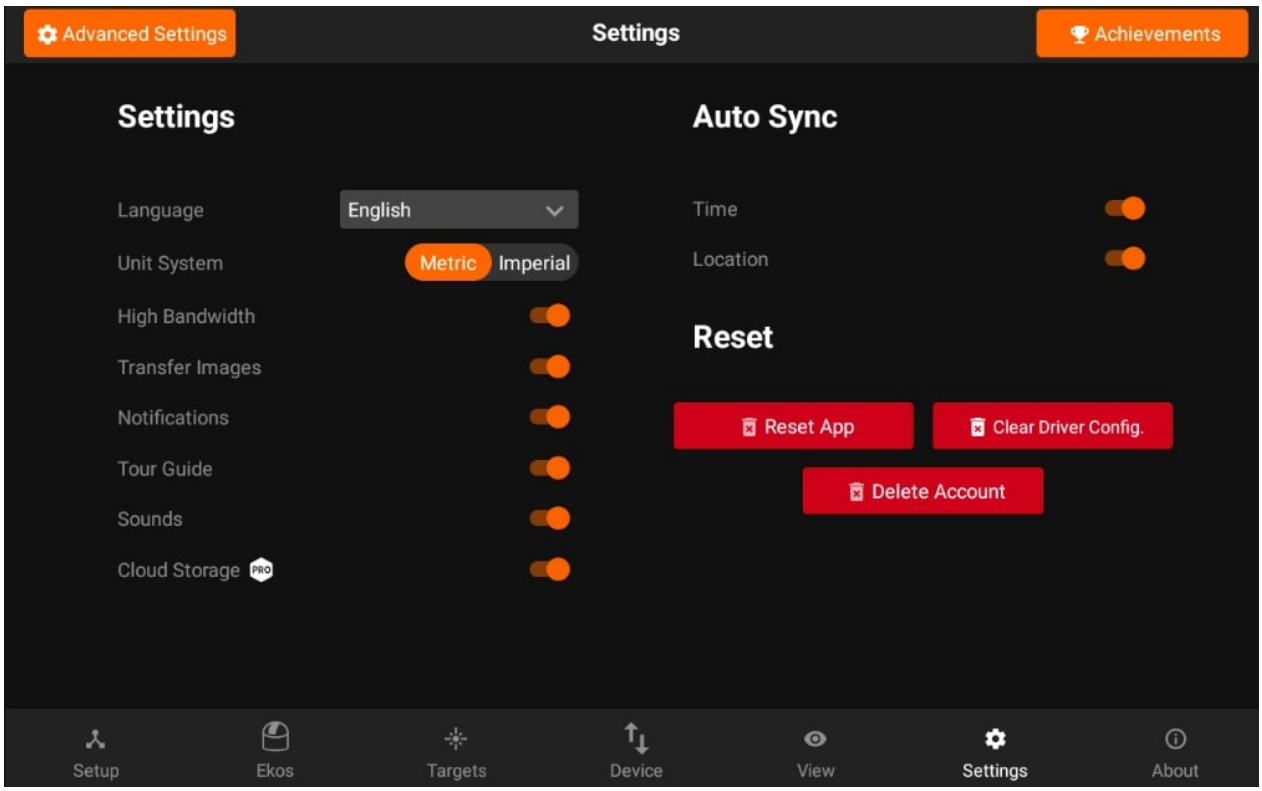
Settings

Adjust the SM App options by going to the Settings tab where you can change the following options:

- Push Notifications (Device)
- Clear Driver Config: In case you face issues with your INDI driver configurations, you can restore all configuration to default by clicking on the Clear Driver Config. button.
- Reset App
- Language
- High Bandwidth mode (not recommended on slow WiFi connections)
- Transfer images
- App Notifications
- Sounds
- Cloud Storage (requires EkosLive Pro subscription)

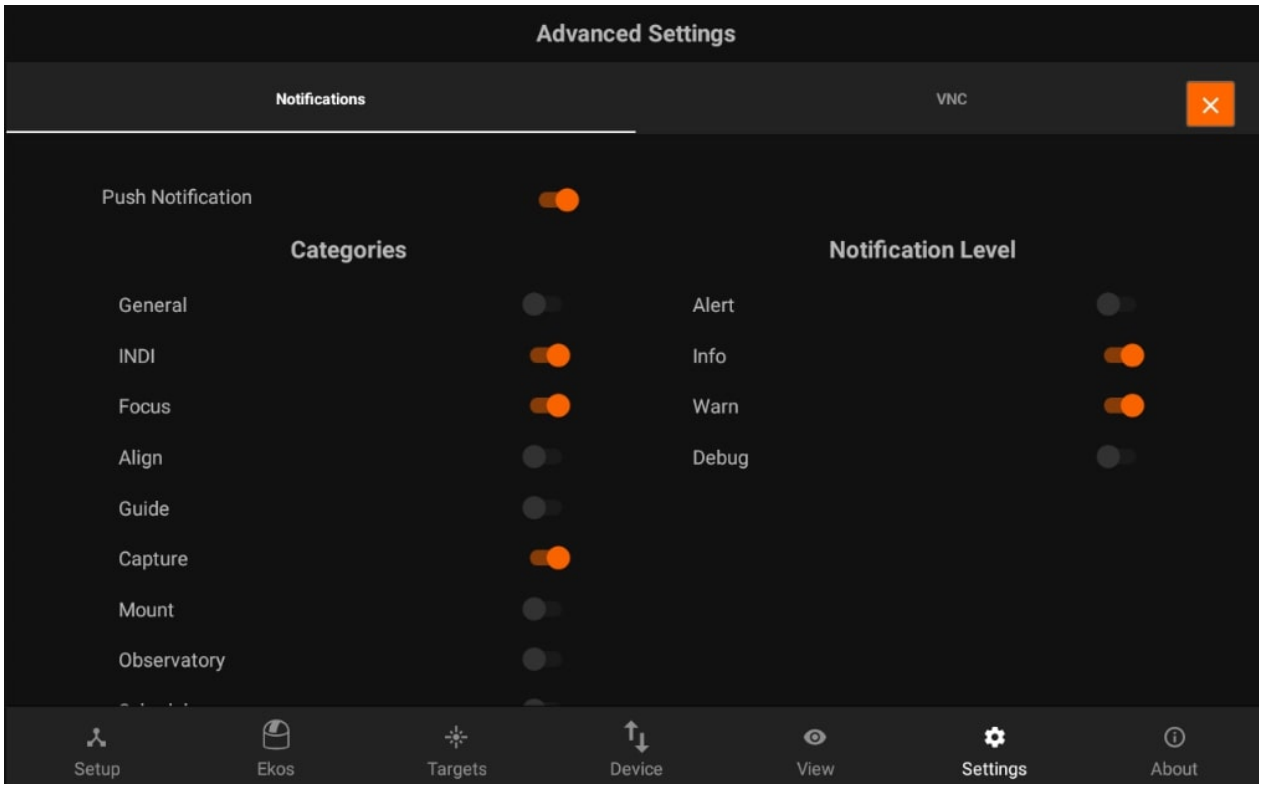
1. In case the SM App becomes unresponsive, you can wipe all the settings by tapping on the Reset App button on the settings page. Close the App afterwards then re-launch it. You can always log back into you account in order to use StellarMate App.

2. You can clear all of the driver configurations saved.
3. Deletes your account.



Push notifications

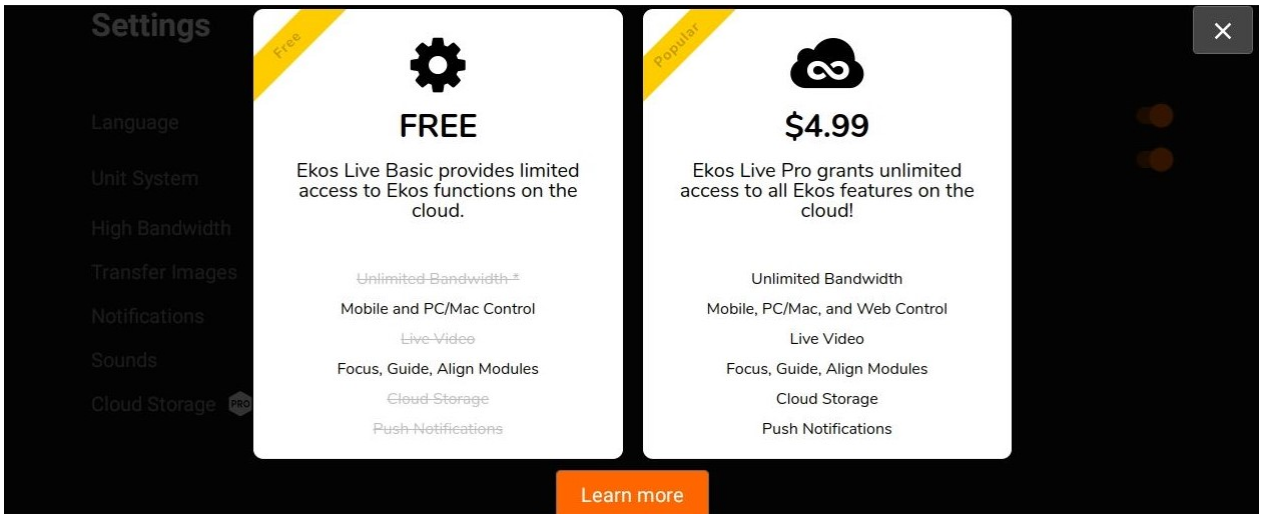
Push notifcations are only for the users for have pro subscription.



- Pro users can enable the Push notifications. If they are enabled, users will be able to get the notifications on their Tablet device.
- You can also enable nofications for specific categories i.e INDI , Mount, Scheduler etc..
- Notification level: Allow you to get notifications by the level i.e Alert, Info, Warn and Debug.

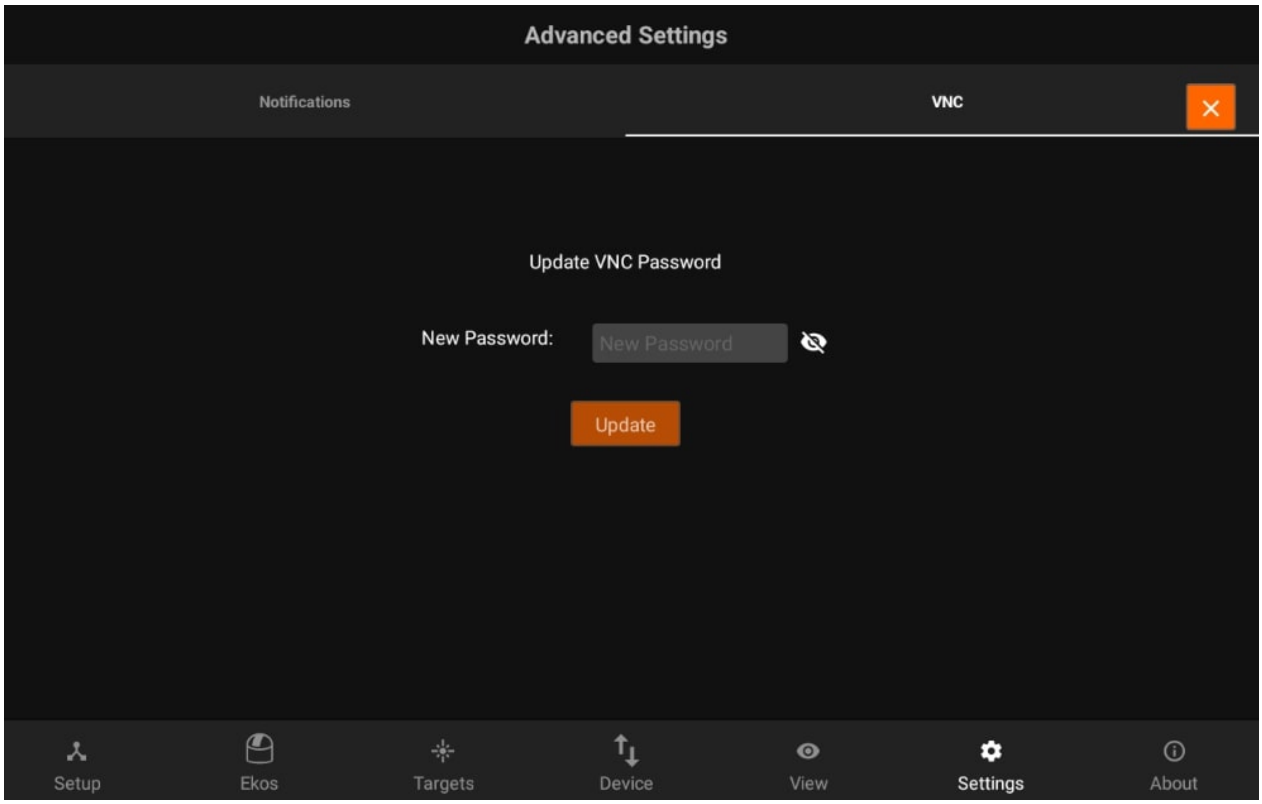
Users who are not subscribed to EkosLive Pro will see a pop up as shown below:

In order to subscribe, you can follow the link here.



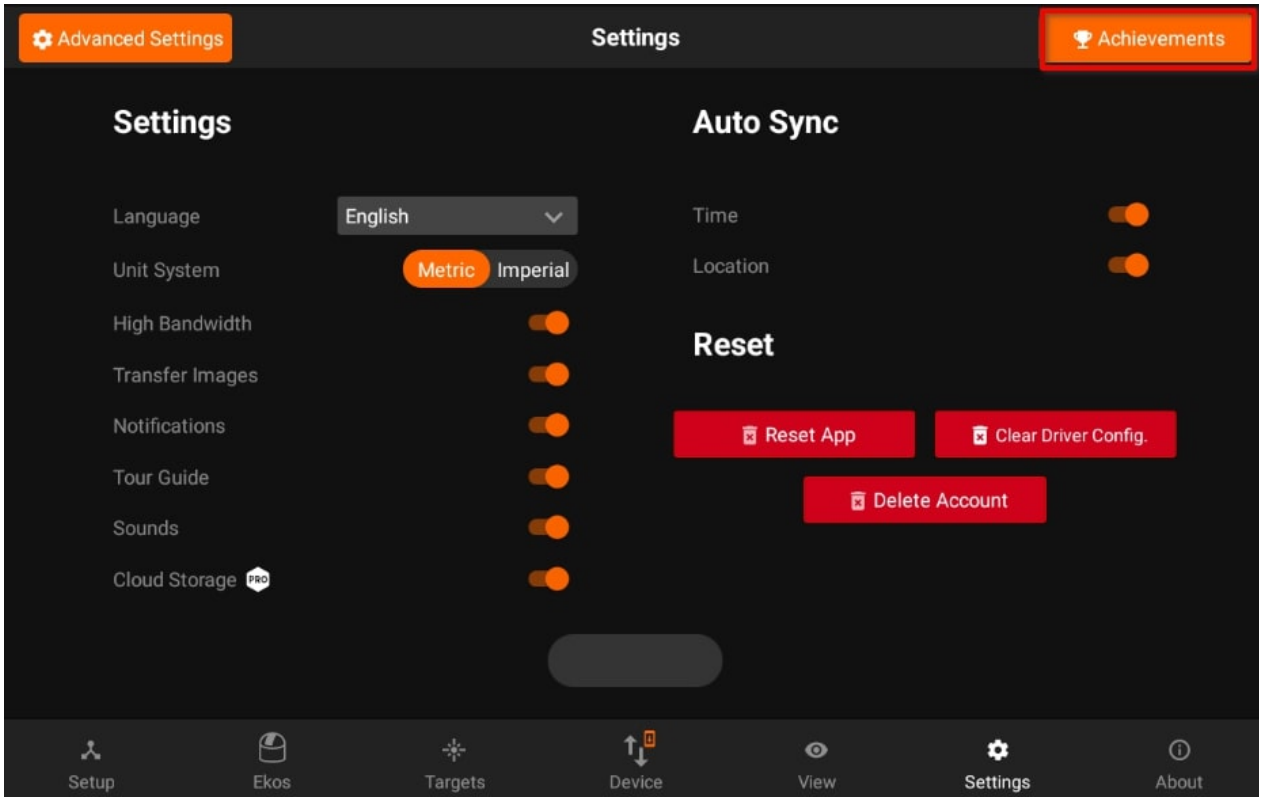
VNC

Update your VNC Password



Achievements

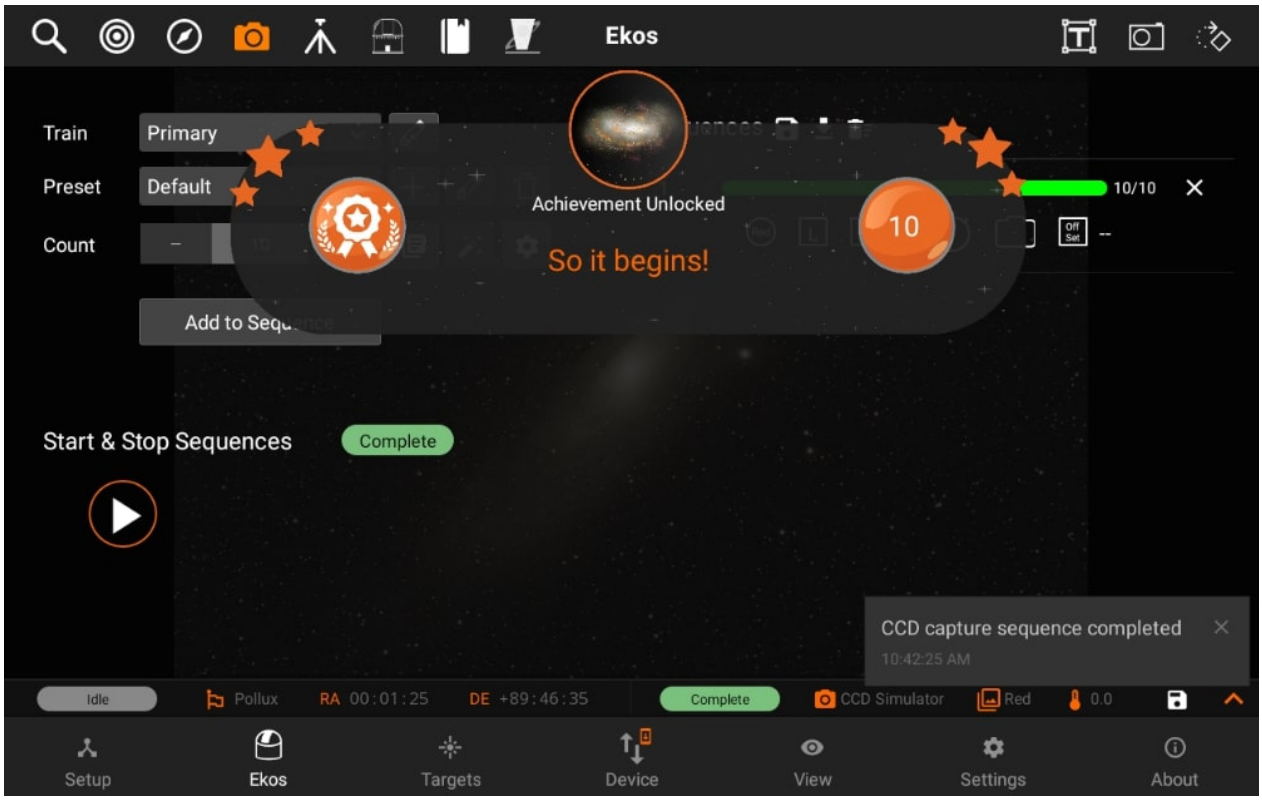
You can now completed the tasks and earn points just. Achievements's Dashboard can be found in the settings.



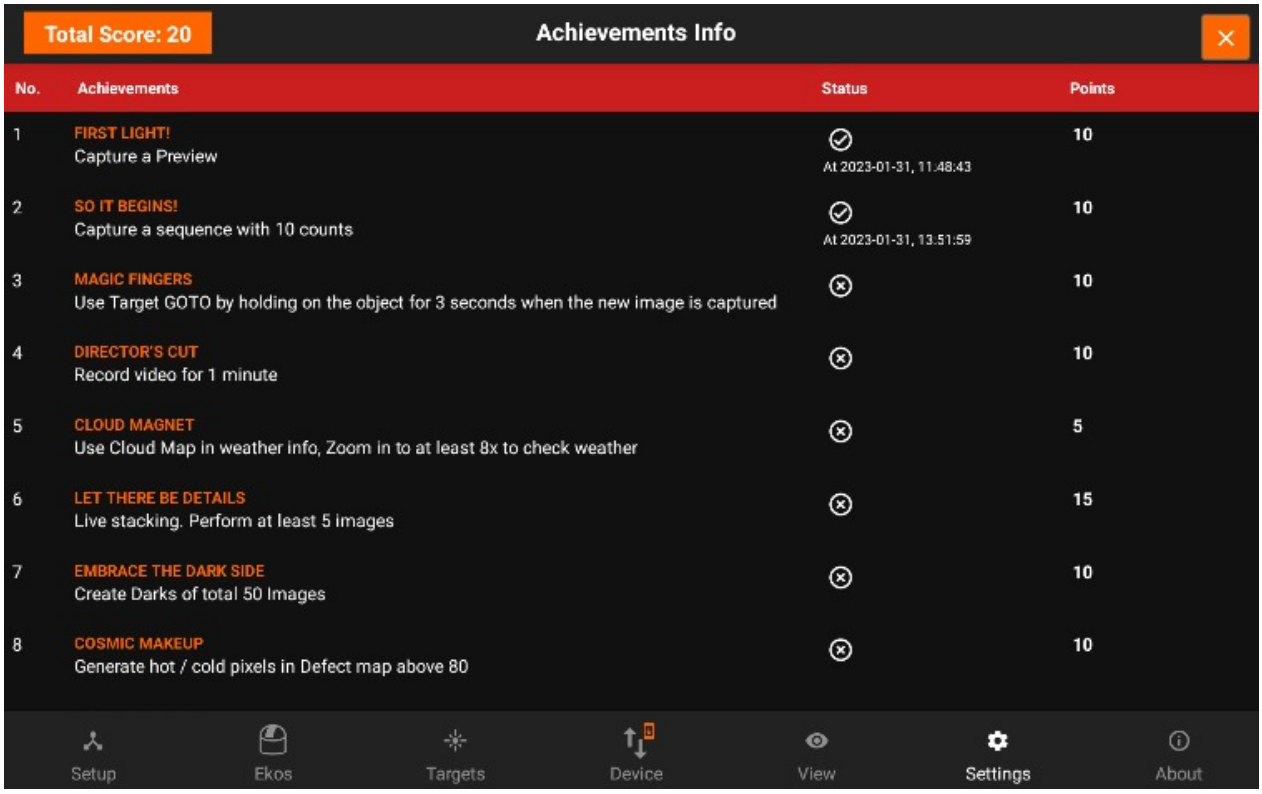
Once you complete the Achievement, Achievement earned pop up is displayed. Which includes the title of the Achievements and it's points. Few of the common achievements are:

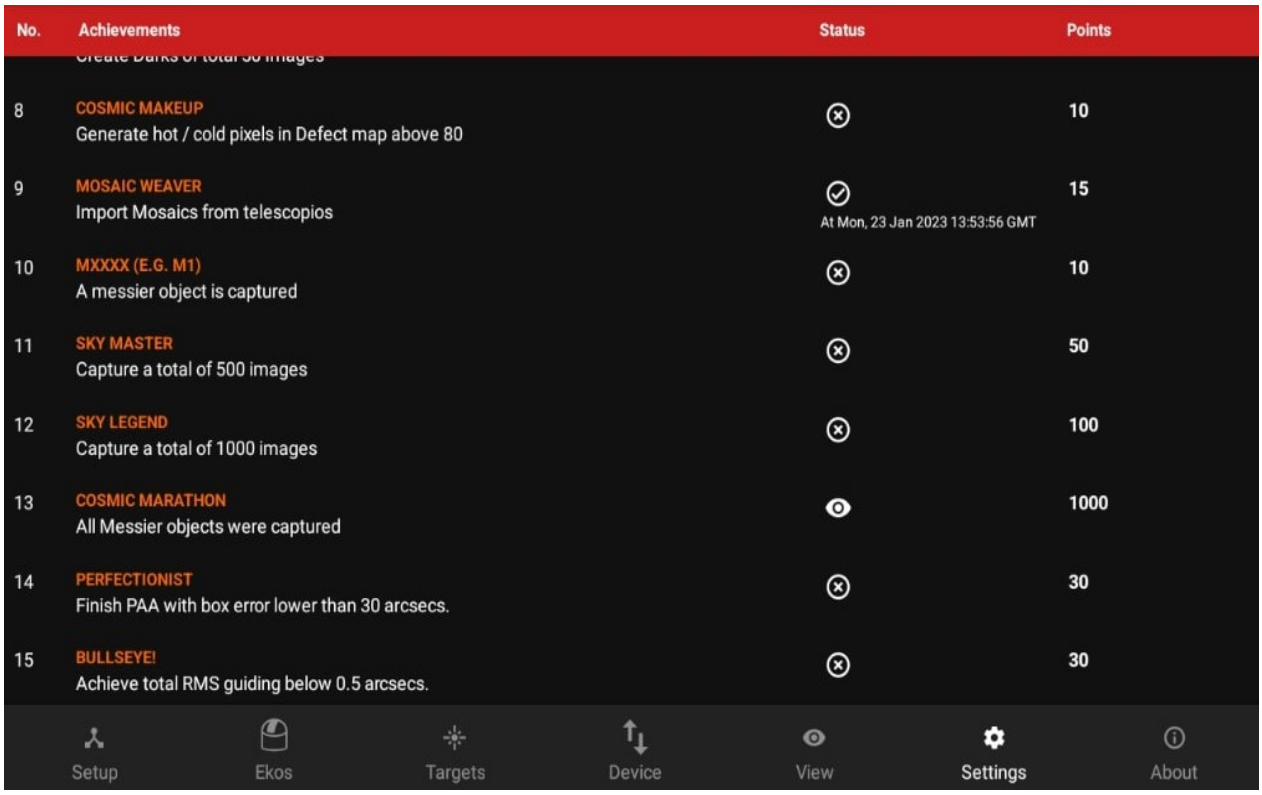
1. Capture a preview:

2. Capture ten sequences:

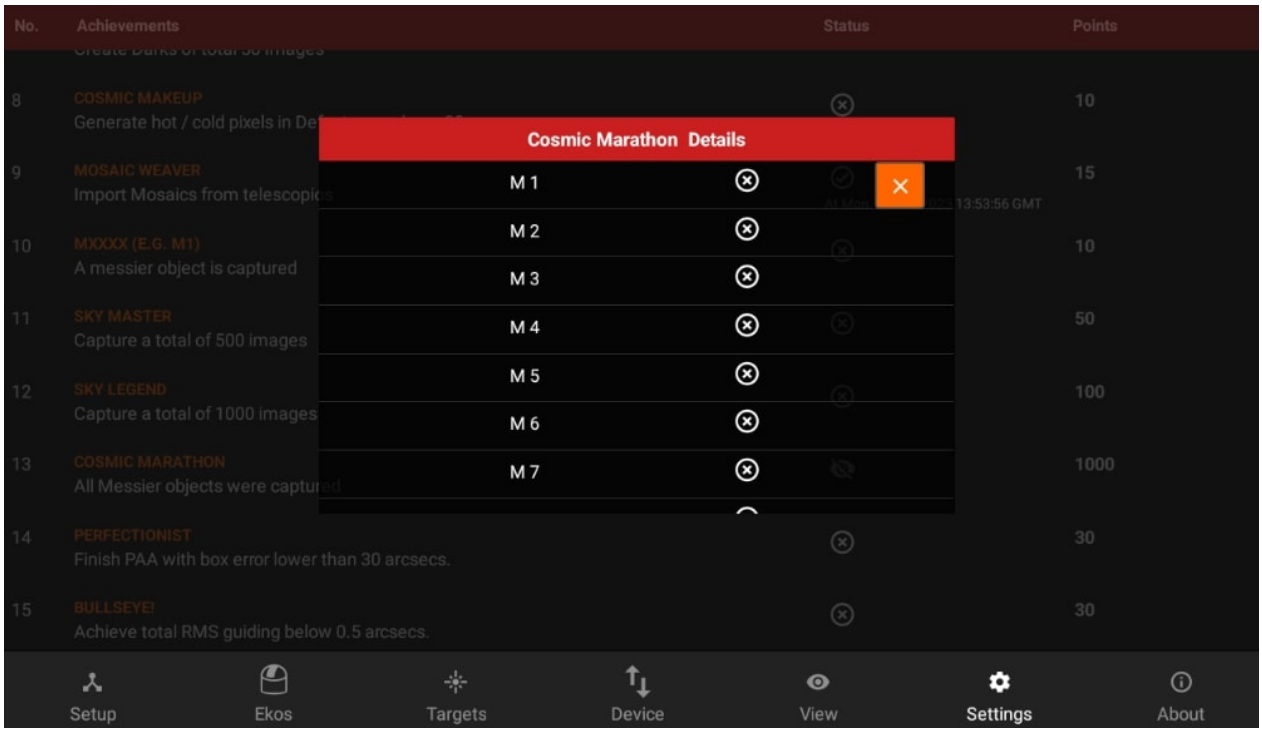


Once the Achievement is earned, it is marked as done in the Dashboard. And the points are added to your total score as shown on the top left.



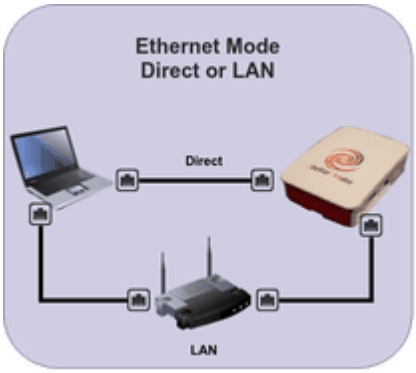


Captured messiers are marked here. If all messiers are captured then Achievement is marked as done



Connection Methods

Depending on how you want to connect to StellarMate, click on any of the following options



Direct HDMI Connection

Note

You must first complete the First Time Setup guide before proceeding with this tutorial.

By default, StellarMate operates in HotSpot mode. Even if configured for WiFi connection or LAN, StellarMate always switches back to HotSpot mode when the other connection modes become unavailable. This is to enable you to always access the device regardless of network availability.

StellarMate gadget is shipped with a 1.8 meters HDMI cable. Connect the cable to any monitor or TV. Make sure the cable is connected to StellarMate before powering on the unit.

Unless the HDMI connection purpose is for viewing only, you also need a keyboard + mouse to control to the StellarMate OS. You can use wired or wireless mouse and keyboards.

StellarMate unit is shipped with a full-featured Linux® Operation System that you can directly access. The default username and password are:

username: **`stellarmate`**
password: **`smate`**

This is the same username and password you will use when accessing the unit over Web VNC as well. It is highly recommended to change the default password after your first login to the system.

Connecting your equipment

StellarMate supports connecting to your equipment via WiFi, Ethernet, Bluetooth, or USB. USB is the primary connection method for most astronomical devices. Make sure all equipment is sufficiently powered and initialized before connecting them to StellarMate. For mounts, most mounts need to be already aligned before you connect them to StellarMate.

The following equipment-specific guides provides the standard methods for connecting such equipment to StellarMate:

- Mounts
- CCDs
- DSLRs
- Focusers
- Filter Wheels

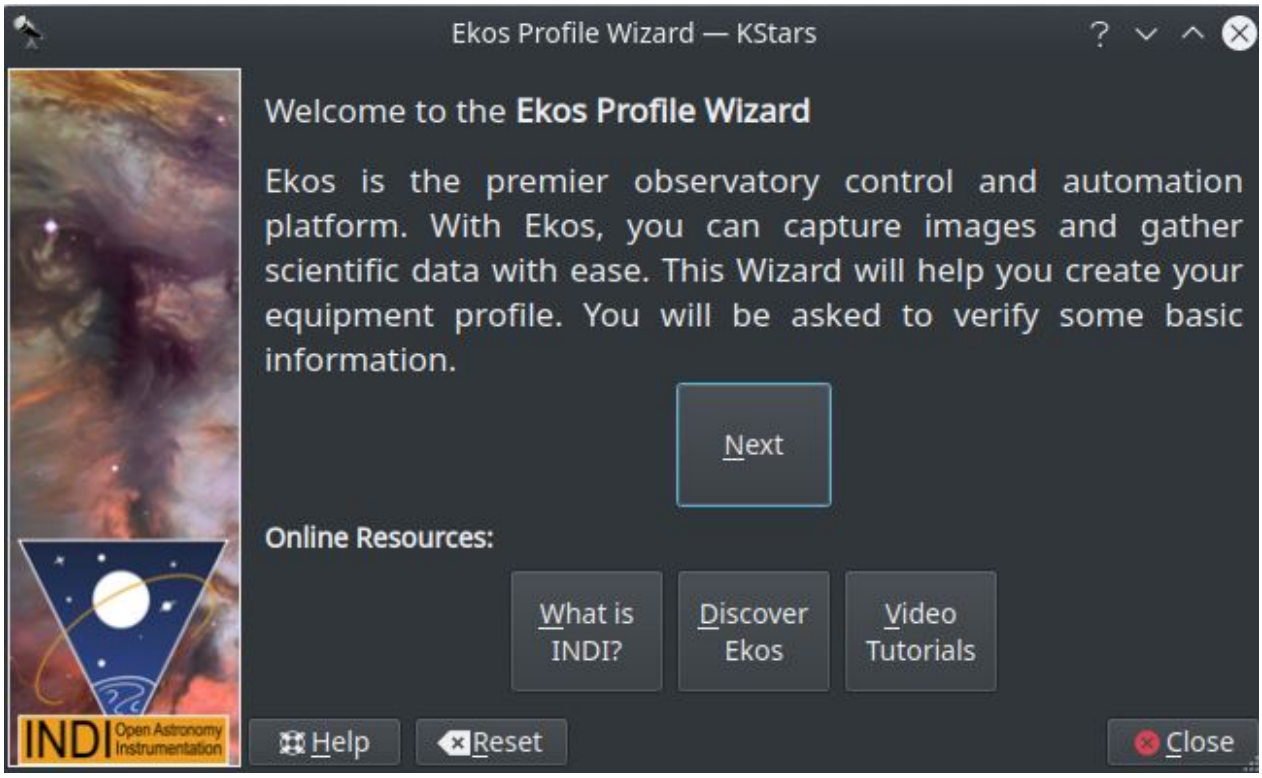
To learn more about connecting your equipment to StellarMate, find out more in the detailed equipment connection guide.

Connecting from Ekos

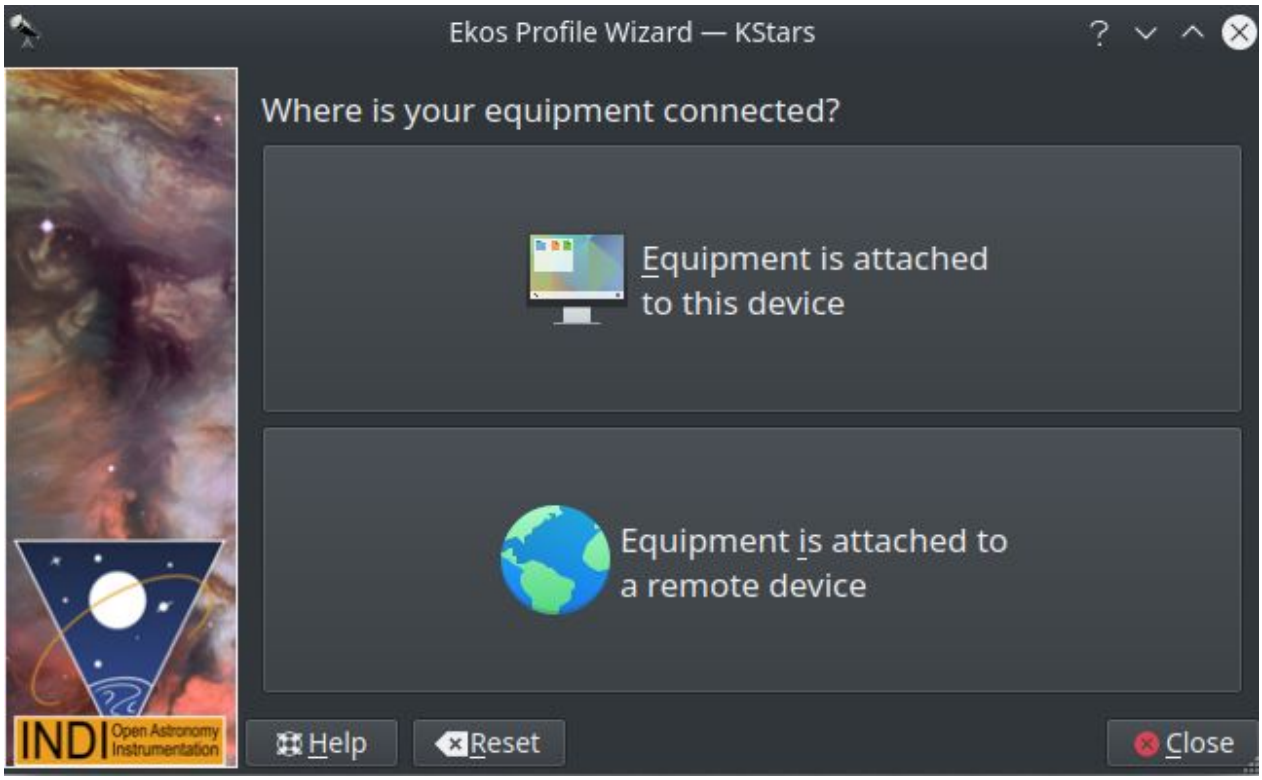
Click on KStars icon on the desktop to launch it. After initial startup, complete the wizard to set up geographical location and download any extra data (Internet connection required).

Launch Ekos either by press Ctrl+K, or by pressing on the Dome-shaped icon in the Toolbar

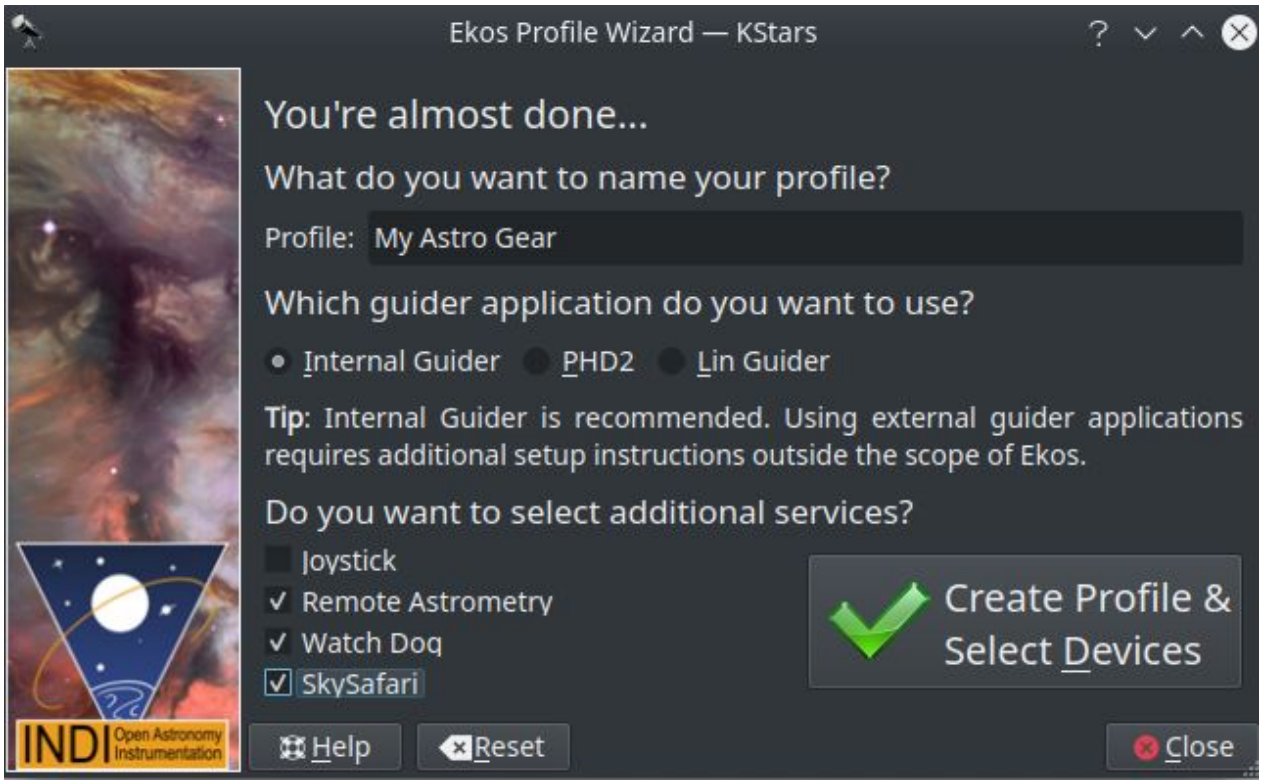
It is recommended to use the Ekos Profile Wizard to set up your first profile. The wizard automatically starts up the first time you fire Ekos in KStars. To start it again, please the wizard-wand icon in Ekos summary screen.



Click Next to proceed to the next screen.



In here you need to select if your equipment is attached to StellarMate or elsewhere. Since you are directly connected to HDMI, then you select Equipment is attached to this device.



Next, select your equipment profile name and any additional services you want to run then proceed to create the profile.

To connect to your equipment and start using Ekos, simply click the Start button as illustrated above.A

Ethernet Connection

Note

You must first complete the First Time Setup guide before proceeding with this tutorial.

By default, StellarMate operates in HotSpot mode. Even if configured for WiFi connection or LAN, StellarMate always switches back to HotSpot mode when the other connection modes become unavailable. This is to enable you to always access the device regardless of network availability.

StellarMate Address

Whether you are accessing StellarMate from PC, Mac, or Mobile, you can always reach it by the address stellarmate.local This is the address that should be used in Ekos if you are using Ekos on a PC/Mac to connect remotely to Ekos. To access StellarMate Web Manager, type in stellarmate.local:8624

Note

Alternatively, you can find out the StellarMate WiFi IP address from the My Mates page and then use the IP address directly to access the unit. For example, if the IP address is 192.168.0.12, you can then enter in the browser http://192.168.0.12:8624 to access StellarMate Web Manager.

Connecting your equipment

StellarMate supports connecting to your equipment via WiFi, Ethernet, Bluetooth, or USB. USB is the primary connection method for most astronomical devices. Make sure all equipment is sufficiently powered and initialized before connecting them to StellarMate. For mounts, most mounts need to be already aligned before you connect them to StellarMate.

To learn more about connecting your equipment to StellarMate, find out more in the detailed equipment connection guide.

Downloading Ekos

Ekos is the official astrophotography tool used for StellarMate. It is part of KStars, a popular planetarium application for Windows®, Mac® OS, and Linux®.

Download and setup KStars on your system before proceeding forward.

Connecting from Ekos

Please refer to Connecting from Ekos via Ethernet/WiFi.

WiFi Connection

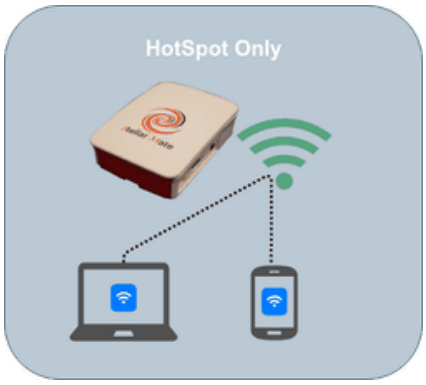
Note

You must first complete the First Time Setup guide before proceeding with this tutorial.

You can connect to StellarMate wirelessly either via:

- Direct Connection to the StellarMate HotSpot or
- Joining StellarMate to your Home WiFi.

By default, StellarMate runs in HotSpot Mode. Click on the desired mode of connect to learn more about connecting StellarMate.



HotSpot Connection

> **Note**
>
> You must first complete the First Time Setup guide before proceeding with this tutorial.

By default, StellarMate operates in HotSpot mode. Even if configured for WiFi connection or LAN, StellarMate always switches back to HotSpot mode when the other connection modes become unavailable. This is to enable you to always access the device regardless of network availability.

Infrastructure Connection

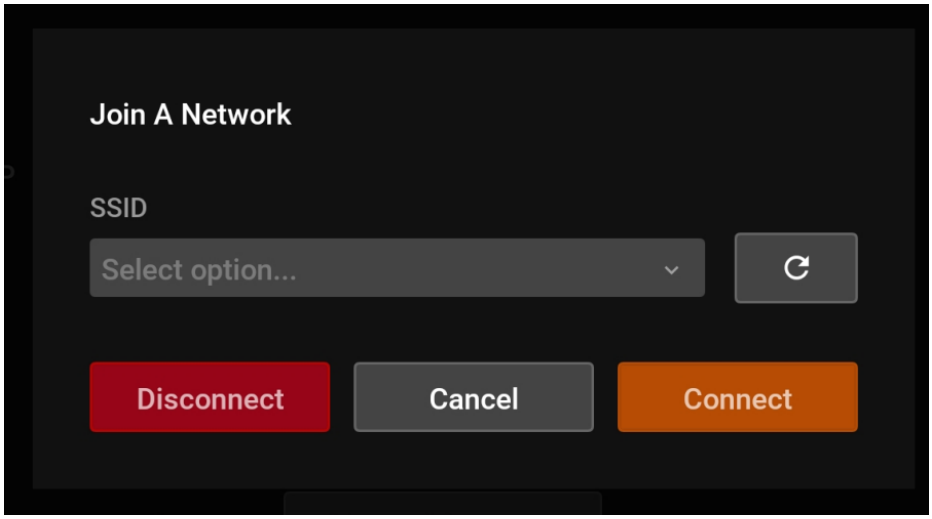
> **Note**
>
> Infrastructure mode is where StellarMate joins an existing WiFi network. You must first complete the First Time Setup guide before proceeding with this tutorial.

By default, StellarMate operates in HotSpot mode. Even if configured for WiFi connection or LAN, StellarMate always switches back to HotSpot mode when the other connection modes become unavailable. This is to enable you to always access the device regardless of network availability.

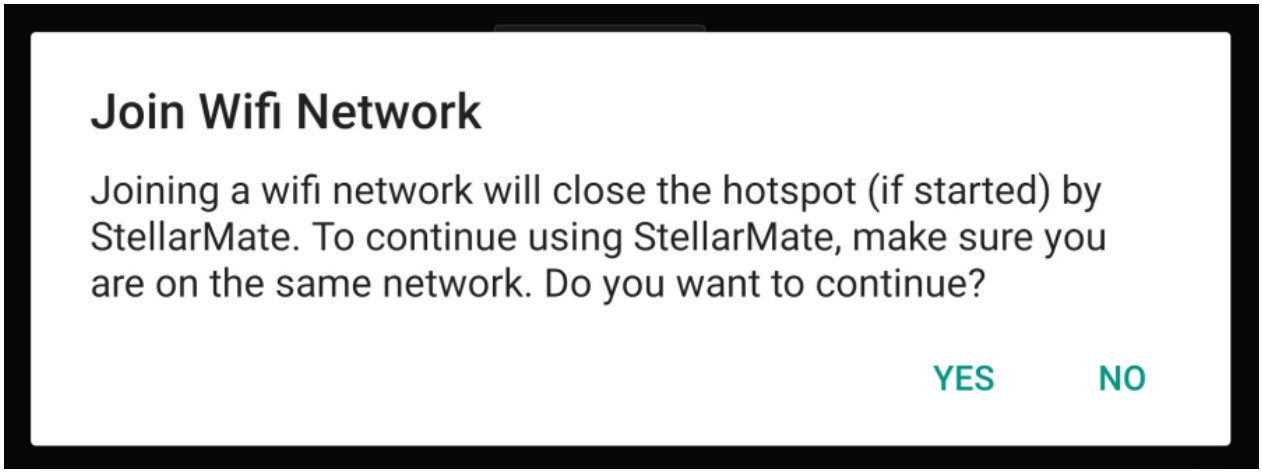
Connecting to WiFi Network

Use the StellarMate App to connect to your WiFi network. From your mobile OS, connect first to the StellarMate HotSpot, then launch the StellarMate App and go to Device tab. Here you can see a few controls to configure StellarMate.

Click on the Manage WiFi button (orange cogwheel next to green wifi icon). The App should display a list of detected WiFi networks in the vicinity.



Select the desired WiFi network from the list and press Connect. Enter and double check the WiFi password. A final confirmation warning popup about switching to WiFi infrastructure mode is displayed, press Yes to continue. The App will command StellarMate to join the WiFi network and then begins to scan for StellarMate in the local network. This assumes your phone/tablet will automatically switch to your home WiFi network since it will be disconnected from the hotspot and in most cases this causes Android/iOS to fall back to the next available network. If this does not happen, then go to Network Settings in your mobile OS and connect to the same WiFi network selected above.



This process can take up to 2 minutes. If successful, the device IP address is going to change the new WiFi IP address. Go back to the setup page to make sure the device is connected. If not, double click on the device to ensure it is connected properly.

Once StellarMate is joined to a WiFi network, it will always try to connect to this network unless it is out of range. In this case, it will default back to the HotSpot.

StellarMate Address

Whether you are accessing StellarMate from PC, Mac, or Mobile, you can always reach it by the address stellarmate.local This is the address that should be used in Ekos if you are using Ekos on a PC/Mac to connect remotely to Ekos. To access StellarMate Web Manager, type in stellarmate.local:8624

Note

When accessing StellarMate directly via Hotspot (Access Point), the unit IP address is always 10.250.250.1. Therefore, if you are having an issue accessing the unit via its hostname, you can simply use the IP address in your browser to access StellarMate Web Manager (http://10.250.250.1:8624).

Connecting your equipment

StellarMate supports connecting to your equipment via WiFi, Ethernet, Bluetooth, or USB. USB is the primary connection method for most astronomical devices. Make sure all equipment is sufficiently powered and initialized before connecting them to StellarMate. For mounts, most mounts need to be already aligned before you connect them to StellarMate.

To learn more about connecting your equipment to StellarMate, find out more in the detailed equipment connection guide.

Downloading Ekos

Ekos is the official astrophotography tool used for StellarMate. It is part of KStars, a popular planetarium application for Windows®, Mac® OS, and Linux®.

Download and setup KStars on your system before proceeding forward.

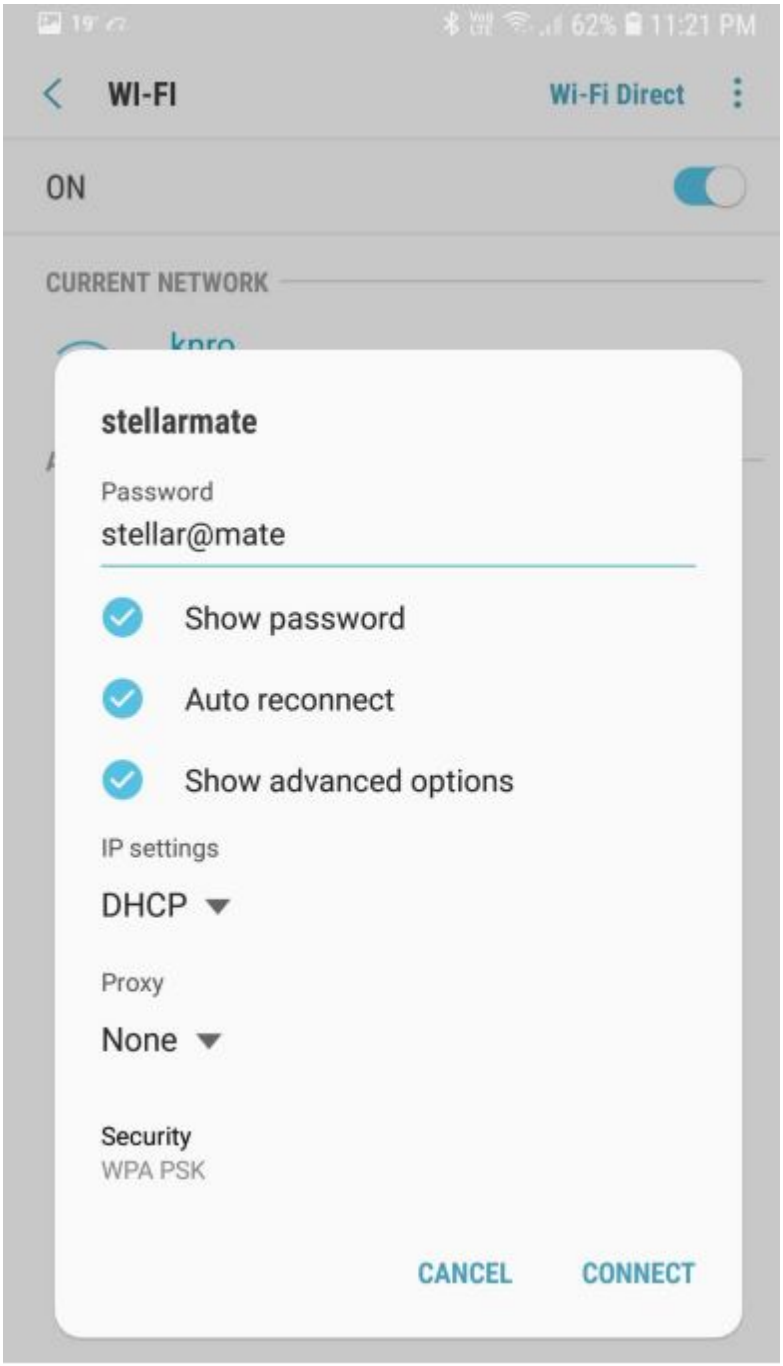
Connecting from Ekos

Please refer to Connecting from Ekos via Ethernet/WiFi.

VNC

When StellarMate is first started, it shall create a HotSpot (Access Point) named stellarmate. This is HotSpot SSID and the hostname of the unit. This information is required when you connect to the unit from browsers. The HotSpot SSID is protected.

HotSpot SSID: **`stellarmate`**
HotSpot Password: **`stellar@mate`**



To access StellarMate through VNC, you have to first connect to the WiFi Hotspot and then

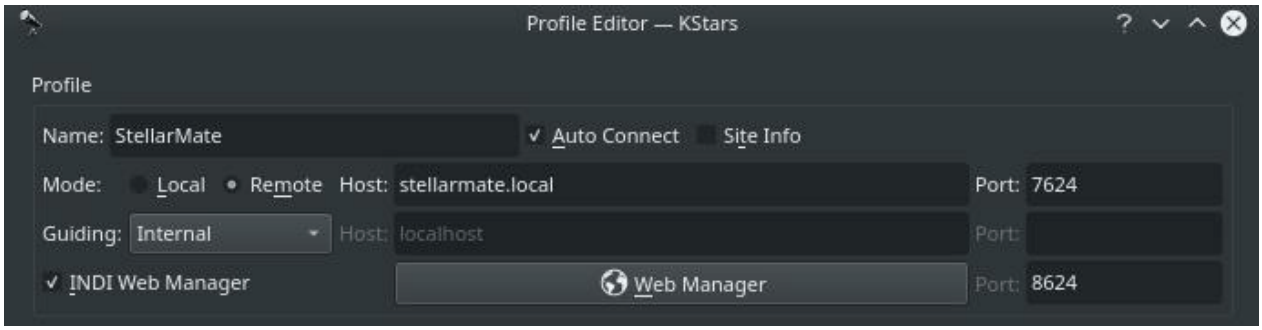
open your favorite browser and you can either:

- Go to stellarmate.local:6080 directly, click Connect and then use smate as the password.
- Go to stellarmate.local, and then click on the button on the bottom-right corner, then select Desktop, you should be redirected to the VNC portal, click Connect and then use smate as the password.

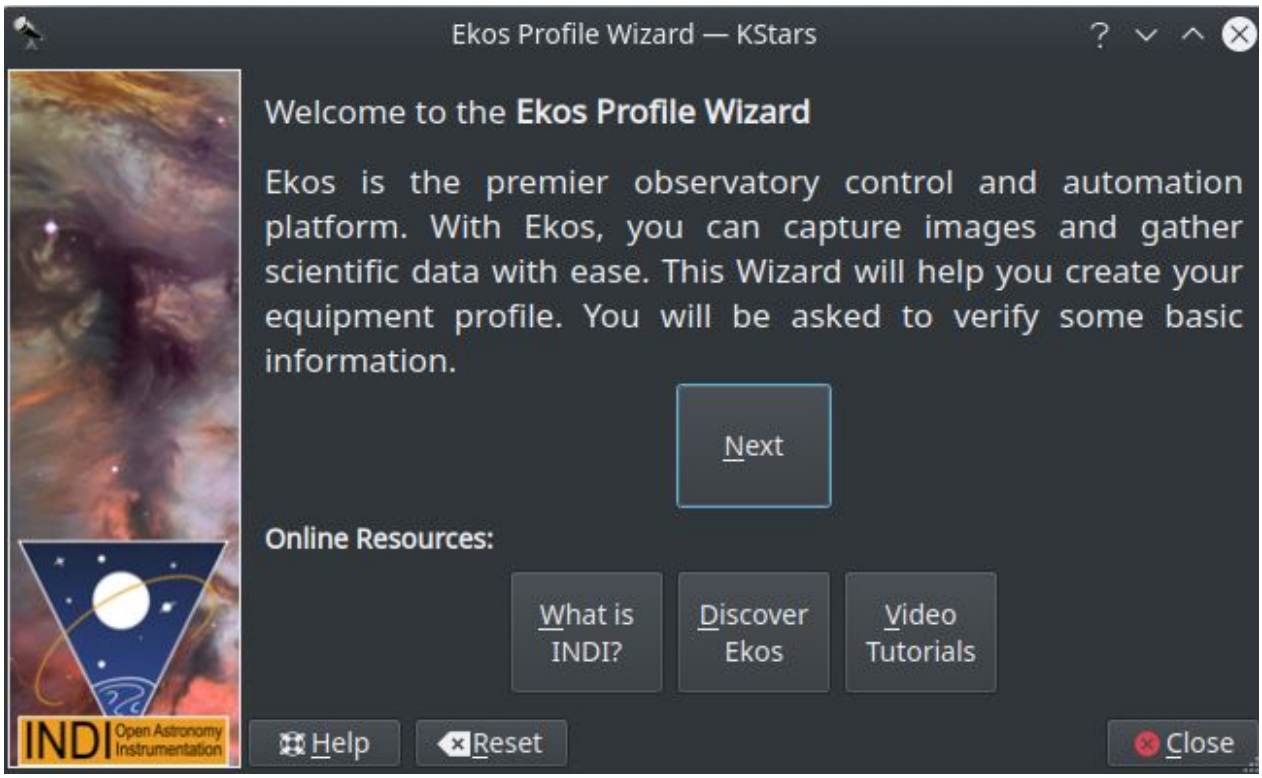
Connecting from Ekos via Ethernet/WiFi

When you use Ekos on your PC/Mac, set the profile to Remote and set the Address to stellarmate.local.

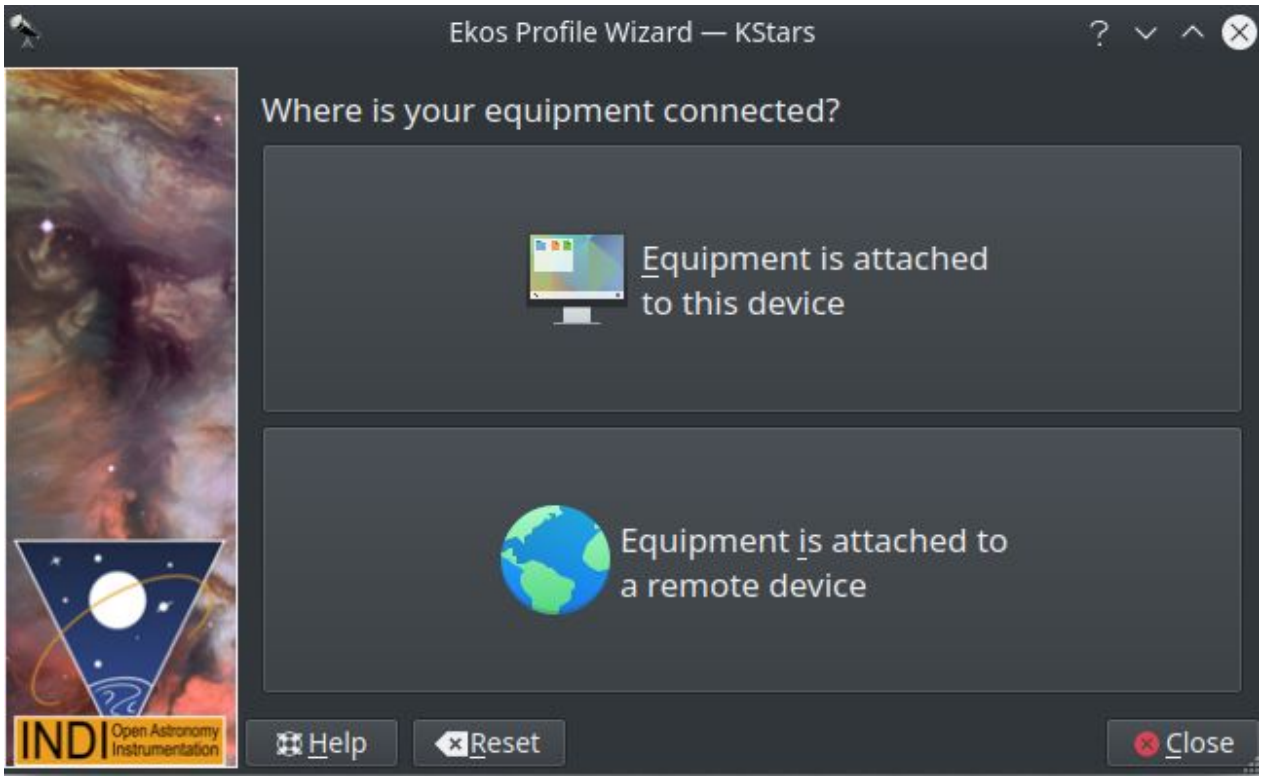
Make sure INDI Web Manager checkbox is checked.



It is recommended to use the Ekos Profile Wizard to set up your first profile. The wizard automatically starts up the first time you fire Ekos in KStars. To start it again, please click on the wizard icon in Ekos summary screen.



Click Next to proceed to the next screen.

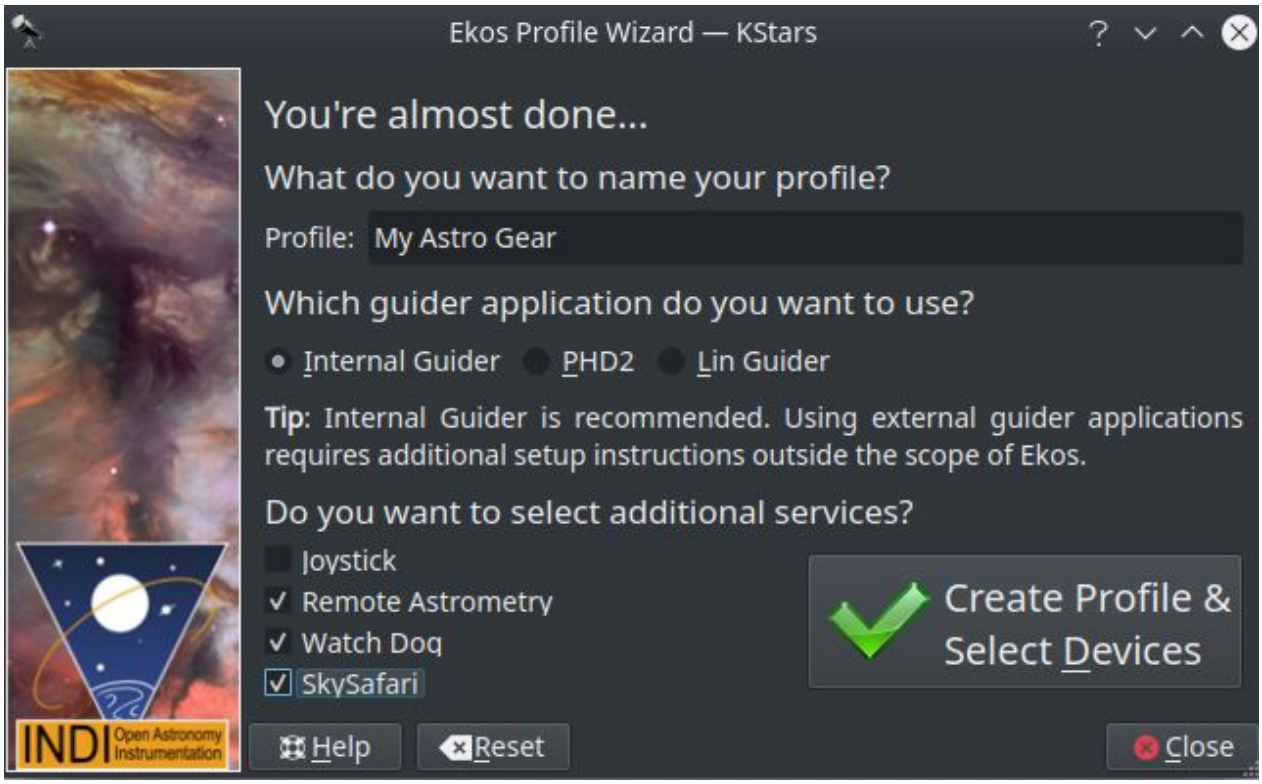


In here you need to select if your equipment is attached to StellarMate or elsewhere:

1. If you are running Ekos within StellarMate OS, then select Equipment is attached to this device.
2. If you are running Ekos on a PC/Mac, then select Equipment is attached to a remote device.

If you clicked on Equipment is attached to a remote device, this page will show up, click on StellarMate.

If you clicked on Equipment is attached to a remote device before, this page will show up. In this page you have a choice to specify the StellarMate Address & Port. These settings are for advanced usage of StellarMate, so just click the Next.



Next, select your equipment profile name and any additional services you want to run then proceed to create the profile.

To connect to your equipment and start using Ekos, simply click the Start button as illustrated above.

Direct Ethernet

StellarMate includes a Gigabit (1000Mb/s) Ethernet port. You can connect StellarMate to your home router. Alternatively, you can also directly connect StellarMate to your PC/Mac.

This can be done using a regular Ethernet cable, at home or in the field. Wired connections are very fast and highly reliable.

For users who prefer the wired solution, you can follow the video guide below to connect your StellarMate to PC/Mac.

Video Guide

Connecting Equipment Via Bluetooth

There are two ways to connect your bluetooth device:

1. Bluetooth Wizard provided in Serial Port Assistant
2. Manually pair your bluetooth device

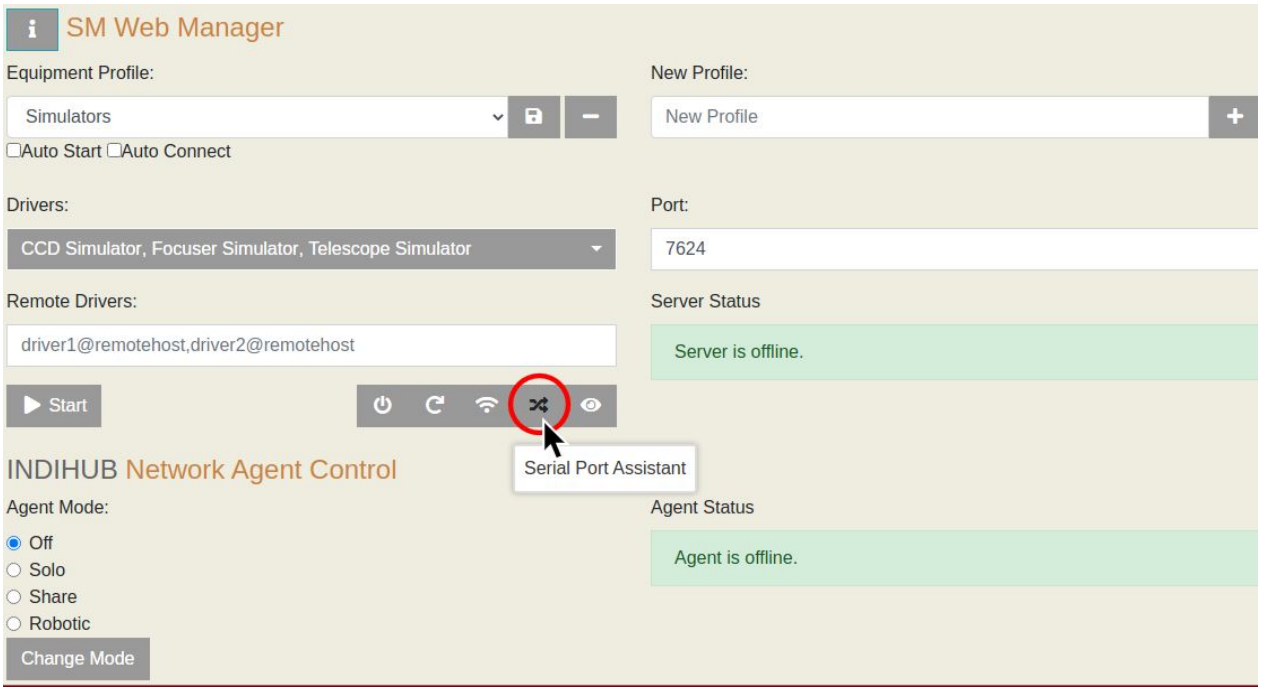
Serial Port Assistant Bluetooth Wizard

StellarMate allows connecting bluetooth mounts easily through StellarMate Web Manager, all you have to do is follow these steps:

Connecting to a Bluetooth Device

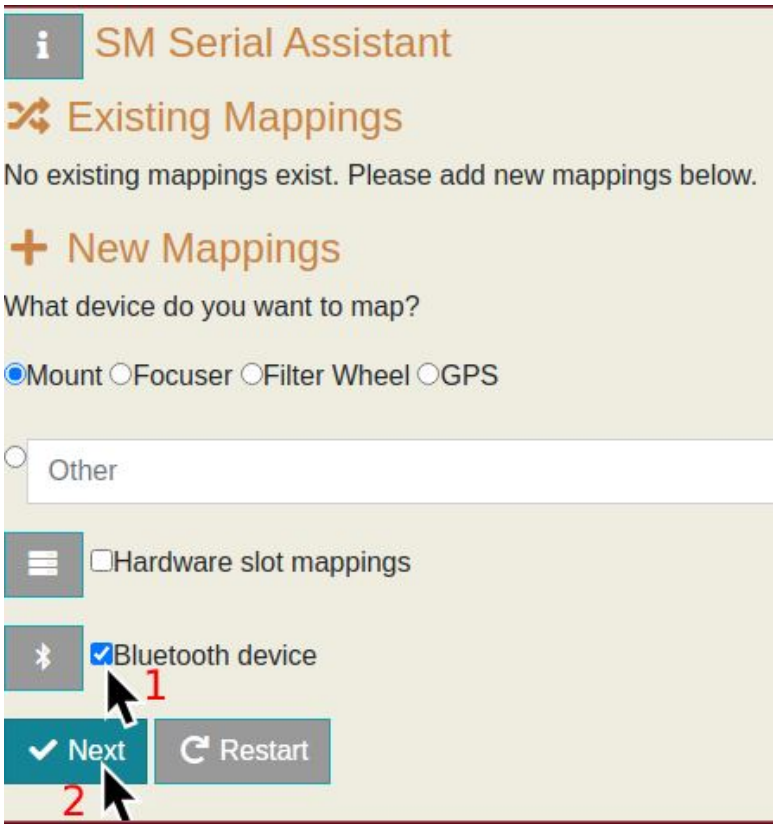
1. Open StellarMate Web Manager

2. Click on Serial Port Assistant

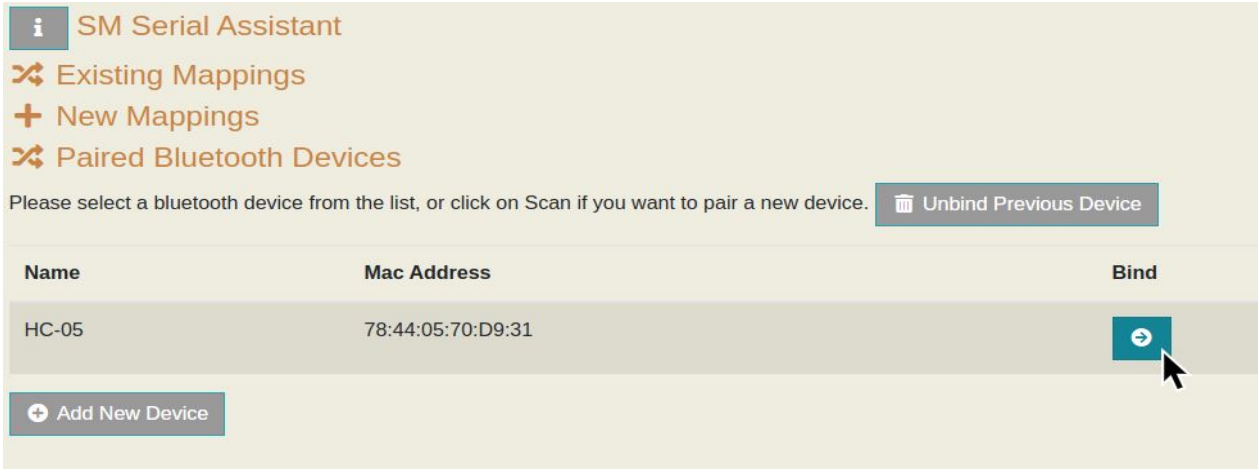


3. Click on Next.

4. Check the Bluetooth device checkbox, and then click Next.

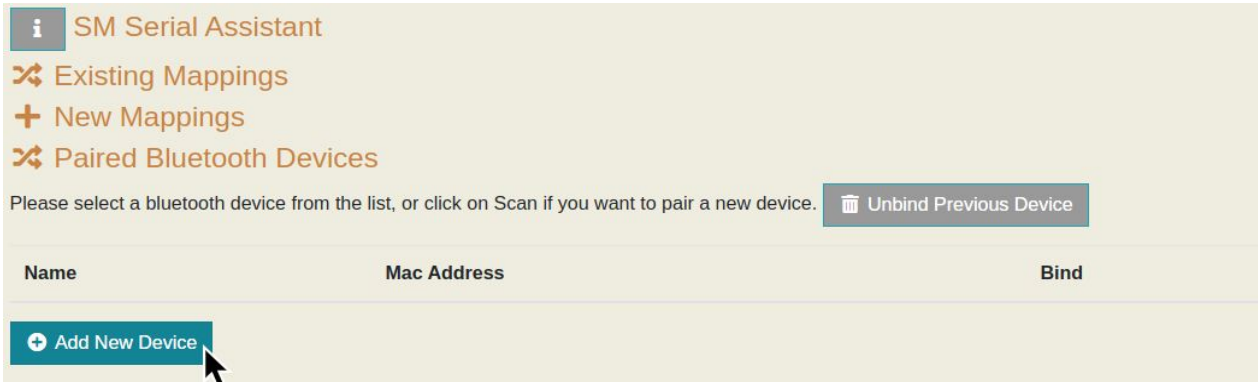


5. If you have already paired your device to StellarMate before, you can set it to Auto-bind on startup by clicking on the Bind button next to the device's details. You will be met with a dialog that confirms that your device has been binded to StellarMate.

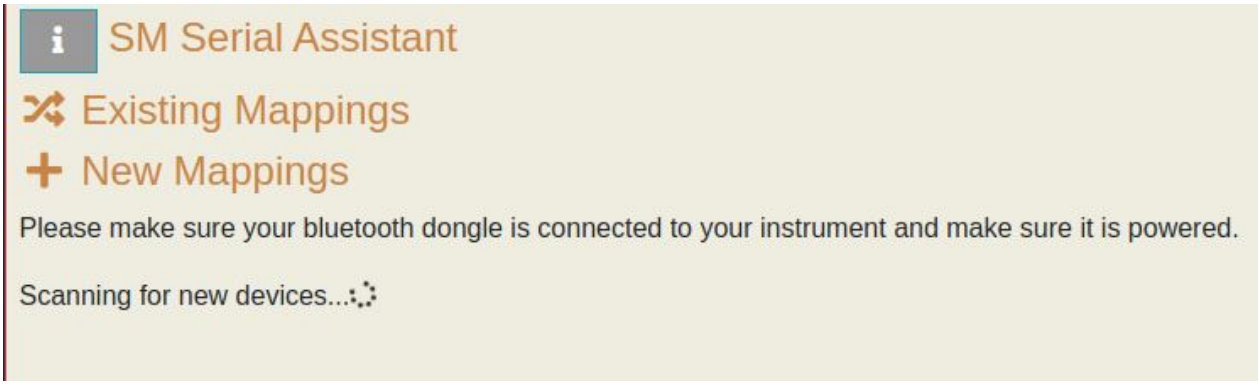


6. If you have not paired your device and would like to add a new device, click on the

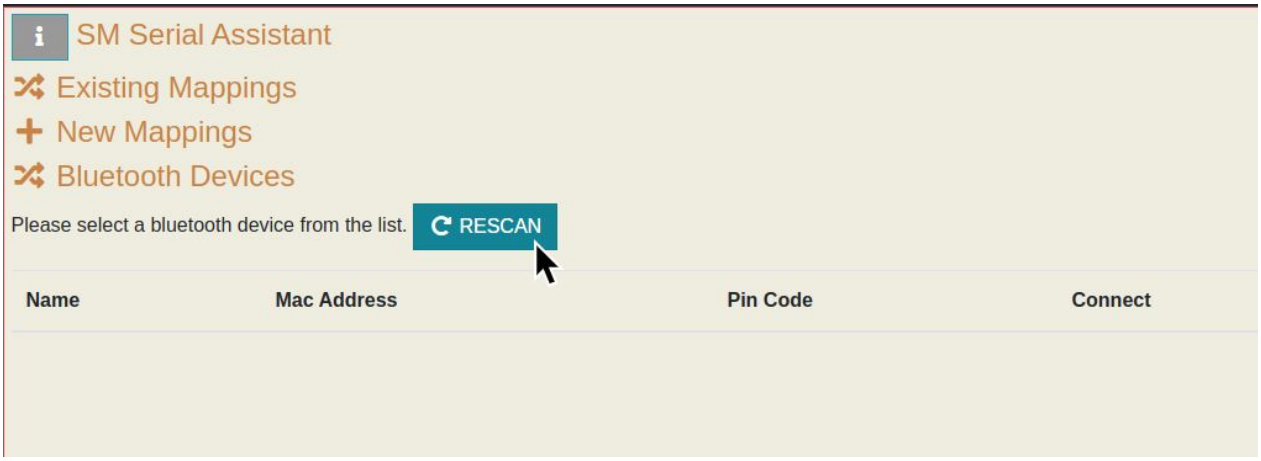
Add New Device button.



7. The Bluetooth Wizard will now scan for available bluetooth devices.



8. If the scanner does not find any devices, click on RESCAN.



9. If you find your device, enter the pin code and then click on the Connect button. (eg. Shoestring Astronomy HC-06's pin code is 1234, you can find the pin code number by finding the bluetooth device's documentation made by the manufacturer)

10. Wait a few seconds until a pop-up dialog shows up to confirm if the pairing and binding process was successful or not.

Unbinding a Bluetooth Device

To stop a device from being auto-binded on startup, go to the Bluetooth Wizard by following steps 1-4 and then click on Unbind Previous Device.

A confirmation dialog will be shown to you.

Manual Pairing

Bluetooth dongles are supported. Before you can start communicating with your device from StellarMate, you need to pair it. In order to pair the device, please log in to StellarMate OS either via Direct HDMI connection or via VNC Viewer in the StellarMate App.

After you pair your device, you should have a bluetooth ported assigned to it (e.g. **`/dev/rfcomm0`**). This is the port you should use in INDI when communicating with your device.

Connecting CCDs

StellarMate X supports a broad range of camers (CCD/CMOS). Find out if your camera is supported in the INDI Camera Portal.

StellarMate X includes 4 USB 3.0 ports, it natively supports USB 3.0 cameras using full bandwidth.

Cameras' power can be either external (AC) or internal (battery) or supplied by the USB bus connection. They can be either connected directly to StellarMate or to to an external USB hub.

> IMPORTANT
>
> Unreliable & Unstable Power is the primary cause for majority of camera issues. Ensure the camera is properly powered to avoid instabilities. StellarMate controller ships with a 3A 5v power adapter. StellarMate OS users should invest in a similar adapter.

The classes of cameras supported by StellarMate:

- CCD Cameras.
- CMOS Cameras.
- Web Cameras.

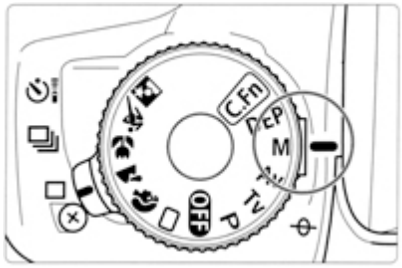
- DSLRs

StellarMate supports cameras with built-in Filter Wheels and ST4 port for pulse-guiding.

Connecting DSLRs

StellarMate supports DSLR cameras using the INDI GPhoto driver based on libgphto2 library. It includes supports for Canon, Nikon, Sony, Pentax and other DSLR cameras. To know if your specific model is supported, please check the DSLR Supported Cameras List. In order to use your camera with StellarMate, it must meet the following requirements:

- It must support USB. Connect a USB cable from the camera to StellarMate. WiFI cameras are not supported yet.
- It must support BULB/MANUAL mode where the shutter is controlled by an external program.



Tip: Some modern cameras do not have a Bulb (B) dial. You can set Bulb Mode by selecting Manual (M) dial and then change the exposure duration until you see BULB in the camera.

Tip

Some modern cameras do not have a Bulb (B) dial. You can set Bulb Mode by selecting Manual (M) dial and then change the exposure duration until you see BULB in the camera.

The shutter control can be either executed internally if supported by the camera, or externally via an external release cable (e.g. DSUSB). The INDI GPhoto driver documentation includes all the details on operating DSLR cameras.

The INDI driver requires the camera resolution and pixel size upon first connection. When the camera is first detected, StellarMate would look up the camera specifications and fill out the necessary information automatically. Please make sure this information is correct in the INDI Control Panel → Image Info Tab.

> Tip
>
> Pentax cameras are supported in INDI GPhoto driver and also in INDI Native Pentax driver. The native driver is experimental but offers more support to Pentax cameras. It's recommended to try both drivers to see which is more fit for your specific camera model.

Captured images are downloaded to StellarMate, and depending on the sensor size and the quality of the WiFi connection, it can take a few seconds for large frames to transfer. Live view video streaming is available on most models to aid in focusing the camera. Selected Canon cameras support focusing operations and can autofocus using the Ekos Focus module. Manual focus is available via Live View or Bahtinov Mask Assistant Tool.

Supported DSLRs

StellarMate supports a wide selection of DSLR cameras manufactured by popular brands like Canon, Nikon and several others. The following is a list of the most popular supported cameras.

Canon

Camera Model	Abilities	Comme
Canon Digital IXUS	Configuration	
Canon Digital IXUS 100 IS		
Canon Digital IXUS 110 IS		
Canon Digital IXUS 120 IS		
Canon Digital IXUS 130		
Canon Digital IXUS 132		
Canon Digital IXUS 180	Image Capture, Liveview, Configuration	
Canon Digital IXUS 185		
Canon Digital IXUS 255HS		
Canon Digital IXUS 30 (normal mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS 300	Image Capture, Liveview, Configuration	
Canon Digital IXUS 300 HS		
Canon Digital IXUS 330	Image Capture, Liveview, Configuration	
Canon Digital IXUS 40 (PTP mode)		
Canon Digital IXUS 400 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS 430 (PTP mode)	Image Capture, Liveview, Configuration	

Canon Digital IXUS 50 (PTP mode)		
Canon Digital IXUS 500 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS 55 (PTP mode)		
Canon Digital IXUS 60 (PTP mode)		
Canon Digital IXUS 65 (PTP mode)		
Canon Digital IXUS 70 (PTP mode)		
Canon Digital IXUS 700 (PTP mode)		
Canon Digital IXUS 75 (PTP mode)		
Canon Digital IXUS 750 (PTP mode)		
Canon Digital IXUS 80 IS		
Canon Digital IXUS 800 (PTP mode)		
Canon Digital IXUS 85 IS		
Canon Digital IXUS 850 IS (PTP mode)		
Canon Digital IXUS 860 IS		
Canon Digital IXUS 90 IS		
Canon Digital IXUS 900Ti (PTP mode)		
Canon Digital IXUS 95 IS		
Canon Digital IXUS 950 IS (PTP mode)		
Canon Digital IXUS 960 IS (PTP mode)		
Canon Digital IXUS 970 IS		
Canon Digital IXUS 980 IS		
Canon Digital IXUS 990 IS		
Canon Digital IXUS i (normal mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS i (PTP mode)		
Canon Digital IXUS i5 (normal mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS II (PTP mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS IIs (PTP mode)	Image Capture, Liveview, Configuration	

Canon Digital IXUS iZ (PTP mode)		
Canon Digital IXUS v	Image Capture, Liveview, Configuration	
Canon Digital IXUS v2	Image Capture, Liveview, Configuration	
Canon Digital IXUS v3 (normal mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS v3 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Digital IXUS Wireless (PTP mode)		
Canon Digital PowerShot SX730HS	Image Capture, Liveview, Configuration	
Canon Digital Rebel XT (normal mode)	Image Capture, Liveview, Configuration	
Canon Digital unknown 3	Image Capture, Liveview, Configuration	
Canon Elura 50 (normal mode)	Image Capture, Liveview, Configuration	
Canon Elura 50 (PTP mode)		
Canon Elura 65 (PTP mode)		
Canon EOS (WLAN)	Image Capture, Liveview, Configuration	Testing (B
Canon EOS 1000D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 100D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 10D	Image Capture, Liveview, Configuration	
Canon EOS 10D (PTP mode)		
Canon EOS 1100D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1200D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1300D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1500D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1D C	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1D Mark II (PTP mode)		
Canon EOS 1D Mark III (PTP mode)	Image Capture, Trigger Capture,	

	Configuration	
Canon EOS 1D Mark IV	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1D X	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1D X MarkII	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 1D X MarkIII	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 2000D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 200D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 20D (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS 20D (PTP mode)		
Canon EOS 250D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 300D (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS 300D (PTP mode)		
Canon EOS 30D (PTP mode)	Image Capture, Trigger Capture, Configuration	
Canon EOS 350D		
Canon EOS 350D (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS 350D (PTP mode)		
Canon EOS 4000D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 400D (PTP mode)	Image Capture, Trigger Capture, Configuration	
Canon EOS 40D (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 450D (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 500D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 50D	Image Capture, Trigger Capture, Liveview, Configuration	

Canon EOS 550D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 5D (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS 5D (PTP mode)		
Canon EOS 5D Mark II	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 5D Mark III	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 5D Mark IV	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 5DS	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 5DS R	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 600D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 60D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 650D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 6D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 6d Mark II	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 700D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 70D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 750D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 760D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 77D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 7D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 7D MarkII	Image Capture, Trigger Capture, Liveview,	

	Configuration	
Canon EOS 800D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 80D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS 90D	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS D30	Image Capture, Liveview, Configuration	
Canon EOS D60	Image Capture, Liveview, Configuration	
Canon EOS Digital Rebel (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS Digital Rebel (PTP mode)		
Canon EOS Digital Rebel XTi (PTP mode)	Image Capture, Trigger Capture, Configuration	
Canon EOS Kiss Digital (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS Kiss Digital (PTP mode)		
Canon EOS Kiss Digital N (normal mode)	Image Capture, Liveview, Configuration	
Canon EOS Kiss Digital X (PTP mode)	Image Capture, Trigger Capture, Configuration	
Canon EOS Kiss X2 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Kiss X3	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M		
Canon EOS M10	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M100	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M2	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M200	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M3	Image Capture, Trigger Capture, Liveview, Configuration	

Canon EOS M5	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M50	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M50m2	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M6	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS M6 Mark II	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS R	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS R5	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS R6	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Rebel T1i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Rebel T6	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Rebel T7i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Rebel T8i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS Rebel XSi (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Canon EOS RP	Image Capture, Trigger Capture, Liveview, Configuration	
Canon FV M1 (normal mode)	Image Capture, Liveview, Configuration	
Canon IXUS 125HS		
Canon IXUS 160		
Canon IXUS 165		
Canon IXUS 310IS		
Canon IXY 220 IS		
Canon IXY 3000 IS		
Canon IXY DIGITAL	Configuration	

Canon IXY DIGITAL 300	Image Capture, Liveview, Configuration	
Canon IXY Digital 40 (normal mode)	Image Capture, Liveview, Configuration	
Canon IXY Digital L2 (normal mode)	Image Capture, Liveview, Configuration	
Canon IXY DV M	Image Capture, Liveview, Configuration	
Canon IXY DV M2 (normal mode)	Image Capture, Liveview, Configuration	
Canon MV630i (normal mode)	Image Capture, Liveview, Configuration	
Canon MV650i (normal mode)	Image Capture, Liveview, Configuration	
Canon MV750i (PTP mode)		
Canon MVX 10i (normal mode)	Image Capture, Liveview, Configuration	
Canon MVX 3i (normal mode)	Image Capture, Liveview, Configuration	
Canon MVX100i	Image Capture, Liveview, Configuration	
Canon MVX150i (normal mode)	Image Capture, Liveview, Configuration	
Canon MVX25i (normal mode)	Image Capture, Liveview, Configuration	
Canon MVX2i	Image Capture, Liveview, Configuration	
Canon MVX3i (PTP mode)		
Canon Optura 10	Image Capture, Liveview, Configuration	
Canon Optura 20	Image Capture, Liveview, Configuration	
Canon Optura 20 (normal mode)	Image Capture, Liveview, Configuration	
Canon Optura 200 MC	Image Capture, Liveview, Configuration	
Canon Optura 300 (normal mode)	Image Capture, Liveview, Configuration	
Canon Optura 40 (normal mode)	Image Capture, Liveview, Configuration	
Canon Optura 600 (PTP mode)		
Canon Optura Xi (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A10	Image Capture, Liveview, Configuration	
Canon PowerShot A100	Image Capture, Liveview, Configuration	
Canon PowerShot A1000 IS		
Canon PowerShot A1100 IS		
Canon PowerShot A1300IS		
Canon PowerShot A1400		
Canon PowerShot A20	Image Capture, Liveview, Configuration	

Canon PowerShot A200	Image Capture, Liveview, Configuration	
Canon PowerShot A2000 IS		
Canon PowerShot A2100 IS		
Canon PowerShot A2200		
Canon PowerShot A2300IS		
Canon PowerShot A2400IS		
Canon PowerShot A2500		
Canon PowerShot A2600		
Canon PowerShot A30	Image Capture, Liveview, Configuration	
Canon PowerShot A300 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A3000 IS		
Canon PowerShot A310 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A3100 IS		
Canon PowerShot A3500IS		
Canon PowerShot A40	Image Capture, Liveview, Configuration	
Canon PowerShot A400 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A4000IS		
Canon PowerShot A410 (PTP mode)		
Canon PowerShot A420 (PTP mode)		
Canon PowerShot A430 (PTP mode)		
Canon PowerShot A450 (PTP mode)		
Canon PowerShot A460 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A470		
Canon PowerShot A480		
Canon Powershot A495		
Canon PowerShot A5	Configuration	
Canon PowerShot A5 Zoom	Configuration	
Canon PowerShot A50	Configuration	
Canon PowerShot A510 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A520 (PTP mode)	Image Capture, Liveview, Configuration	

Canon PowerShot A530 (PTP mode)		
Canon PowerShot A540 (PTP mode)		
Canon PowerShot A550 (PTP mode)		
Canon PowerShot A560 (PTP mode)		
Canon PowerShot A570 IS (PTP mode)		
Canon PowerShot A580		
Canon PowerShot A590 IS		
Canon PowerShot A60 (PTP)	Image Capture, Liveview, Configuration	
Canon PowerShot A610 (PTP mode)		
Canon PowerShot A620 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A630 (PTP mode)		
Canon PowerShot A640 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A650IS (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A70 (PTP)	Image Capture, Liveview, Configuration	
Canon PowerShot A700 (PTP mode)		
Canon PowerShot A710 IS (PTP mode)		
Canon PowerShot A720 IS (PTP mode)		
Canon PowerShot A75 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A80 (PTP)	Image Capture, Liveview, Configuration	
Canon PowerShot A800		
Canon PowerShot A810		
Canon PowerShot A85 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot A95 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot D10		
Canon PowerShot ELPH 350 HS		
Canon PowerShot Elph135		
Canon PowerShot Elph340HS		

Canon PowerShot G1	Image Capture, Liveview, Configuration	
Canon PowerShot G1 X		
Canon PowerShot G10	Image Capture, Liveview, Configuration	
Canon PowerShot G11		
Canon PowerShot G12		
Canon PowerShot G15		
Canon PowerShot G16		
Canon PowerShot G2	Image Capture, Liveview, Configuration	
Canon PowerShot G3 (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G3 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G3 X	Image Capture, Liveview, Configuration	
Canon PowerShot G5 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G5X	Image Capture, Liveview, Configuration	
Canon Powershot G6 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G7 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G7 X	Image Capture, Liveview, Configuration	
Canon PowerShot G7 X Mark II	Image Capture, Liveview, Configuration	
Canon PowerShot G9 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot G9 X Mark II	Image Capture, Liveview, Configuration	
Canon PowerShot IXY Digital L (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot Pro70	Configuration	
Canon PowerShot Pro90 IS	Image Capture, Liveview, Configuration	
Canon PowerShot S1 IS (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S10	Configuration	
Canon PowerShot S100		
Canon PowerShot S100 (2000)	Configuration	
Canon PowerShot S110 (2001)	Image Capture, Liveview, Configuration	
Canon PowerShot S110 (PTP Mode)		
Canon PowerShot S120		

Canon PowerShot S2 IS (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S20	Configuration	
Canon PowerShot S200	Image Capture, Liveview, Configuration	
Canon PowerShot S230 (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S230 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S3 IS (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S30	Image Capture, Liveview, Configuration	
Canon PowerShot S300	Image Capture, Liveview, Configuration	
Canon PowerShot S330	Image Capture, Liveview, Configuration	
Canon PowerShot S40	Image Capture, Liveview, Configuration	
Canon PowerShot S400 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S410 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S45 (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S45 (PTP mode)		
Canon PowerShot S5 IS (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S50 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S500 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Powershot S60 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Powershot S70 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S80 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot S95		
Canon PowerShot SD10 Digital ELPH (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot SD100 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot SD1000 (PTP mode)		
Canon PowerShot SD110 (PTP mode)	Image Capture, Liveview, Configuration	
Canon Powershot SD1100 IS		

Canon Powershot SD1200 IS		
Canon PowerShot SD1300 IS		
Canon PowerShot SD20 (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot SD200 (normal mode)	Image Capture, Liveview, Configuration	
Canon PowerShot SD40 (PTP mode)		
Canon PowerShot SD430 (PTP mode)		
Canon PowerShot SD450 (PTP mode)		
Canon PowerShot SD500 (PTP mode)	Image Capture, Liveview, Configuration	
Canon PowerShot SD600 (PTP mode)		
Canon PowerShot SD630 (PTP mode)		
Canon PowerShot SD700 (PTP mode)		
Canon PowerShot SD750 (PTP mode)		
Canon PowerShot SD770 IS		
Canon PowerShot SD780 IS		
Canon Powershot SD790 IS		
Canon PowerShot SD850 (PTP mode)		
Canon PowerShot SD880 IS		
Canon PowerShot SD900 (PTP mode)		
Canon PowerShot SD940 IS		
Canon PowerShot SD970 IS		
Canon PowerShot SD990		
Canon PowerShot SX10 IS		
Canon Powershot SX100 IS (PTP	Image Capture, Liveview, Configuration	

mode)		
Canon PowerShot SX110 IS	Image Capture, Liveview, Configuration	
Canon PowerShot SX120 IS		
Canon PowerShot SX130 IS		
Canon PowerShot SX150 IS		
Canon PowerShot SX160IS		
Canon PowerShot SX170 IS		
Canon PowerShot SX20 IS		
Canon PowerShot SX200 IS		
Canon PowerShot SX210 IS		
Canon PowerShot SX220HS		
Canon PowerShot SX230HS		
Canon PowerShot SX240HS		
Canon PowerShot SX260HS		
Canon PowerShot SX280HS		
Canon PowerShot SX40HS		
Canon PowerShot SX500IS		
Canon PowerShot SX510 HS		
Canon PowerShot SX520 HS		
Canon PowerShot SX530 HS	Image Capture, Liveview, Configuration	
Canon PowerShot SX540 HS	Image Capture, Liveview, Configuration	
Canon PowerShot SX600 HS	Image Capture, Liveview, Configuration	
Canon PowerShot SX60HS		
Canon PowerShot SX70 HS	Image Capture, Liveview, Configuration	
Canon PowerShot SX740 HS	Image Capture, Liveview, Configuration	
Canon PowerShot unknown 1	Image Capture, Liveview, Configuration	
Canon PowerShot unknown 2	Image Capture, Liveview, Configuration	
Canon Rebel T2i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon Rebel T3	Image Capture, Trigger Capture, Liveview,	

	Configuration	
Canon Rebel T3i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon Rebel T4i	Image Capture, Trigger Capture, Liveview, Configuration	
Canon SX 620HS	Image Capture, Liveview, Configuration	
Canon SX 720HS	Image Capture, Liveview, Configuration	
Canon ZR70MC (normal mode)	Image Capture, Liveview, Configuration	

Nikon

Camera Model	Abilities	Comment
Nikon 1 (WLAN)	Image Capture, Liveview, Configuration	Testing (Be
Nikon CoolPix 100	Image Capture, Liveview, Configuration	
Nikon Coolpix 2000 (PTP mode)		
Nikon Coolpix 2100 (PTP mode)		
Nikon CoolPix 2100 (Sierra Mode)	Image Capture, Liveview, Configuration	
Nikon Coolpix 2200 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 2200v1.1 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 2500 (PTP mode)		
Nikon CoolPix 2500 (Sierra Mode)	Image Capture, Liveview, Configuration	
Nikon CoolPix 300	Image Capture, Liveview, Configuration	
Nikon Coolpix 3100 (PTP mode)		
Nikon Coolpix 3200 (PTP mode)		
Nikon Coolpix 3500 (PTP mode)		
Nikon CoolPix 3500 (Sierra Mode)	Image Capture, Liveview, Configuration	
Nikon Coolpix 3700 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 4100 (PTP mode)	Image Capture, Configuration	
Nikon CoolPix 4100 (Sierra Mode)	Image Capture, Liveview, Configuration	
Nikon Coolpix 4200 (PTP mode)		
Nikon Coolpix 4300 (PTP mode)		
Nikon CoolPix 4300 (Sierra Mode)	Image Capture, Liveview, Configuration	

Nikon Coolpix 4500 (PTP mode)		
Nikon Coolpix 4600 (PTP mode)		
Nikon Coolpix 4600a (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 4800 (PTP mode)		
Nikon Coolpix 5000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 5200 (PTP mode)		
Nikon Coolpix 5400 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 5600 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 5700 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 5900 (PTP mode)	Image Capture, Configuration	
Nikon CoolPix 600		
Nikon CoolPix 700	Image Capture, Liveview, Configuration	
Nikon Coolpix 7600 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 7900 (PTP mode)	Image Capture, Configuration	
Nikon CoolPix 800	Image Capture, Liveview, Configuration	
Nikon Coolpix 8700 (PTP mode)		
Nikon CoolPix 880	Image Capture, Liveview, Configuration	
Nikon Coolpix 8800 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix 885 (PTP mode)		
Nikon CoolPix 900	Image Capture, Liveview, Configuration	
Nikon CoolPix 900S	Image Capture, Liveview, Configuration	
Nikon CoolPix 910	Image Capture, Liveview, Configuration	
Nikon Coolpix 9400 (PTP mode)	Image Capture, Configuration	
Nikon CoolPix 950	Image Capture, Liveview, Configuration	
Nikon CoolPix 950S	Image Capture, Liveview, Configuration	
Nikon CoolPix 990	Image Capture, Liveview, Configuration	
Nikon CoolPix 995	Image Capture, Liveview, Configuration	
Nikon Coolpix A (PTP mode)	Image Capture, Configuration	
Nikon Coolpix A900 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix AW100 (PTP mode)	Image Capture, Configuration	

Nikon Coolpix AW110 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix AW130 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix B500	Image Capture, Configuration	
Nikon Coolpix B700 (PTP mode)	Image Capture, Liveview, Configuration	
Nikon Coolpix L1 (PTP mode)		
Nikon Coolpix L10 (PTP mode)		
Nikon Coolpix L100 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L11 (PTP mode)		
Nikon Coolpix L110 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L12 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L120 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L16 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L19 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L20 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L23 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L27	Image Capture, Configuration	
Nikon Coolpix L340	Image Capture, Configuration	
Nikon Coolpix L4 (PTP mode)		
Nikon Coolpix L810 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L820 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix L840	Image Capture, Configuration	
Nikon Coolpix P1 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P100 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P1000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P2 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P300 (PTP mode)		
Nikon Coolpix P330 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P4 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P50 (PTP mode)		
Nikon Coolpix P500 (PTP mode)	Image Capture, Configuration	

Nikon Coolpix P5000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P510 (PTP mode)		
Nikon Coolpix P5100 (PTP mode)		
Nikon Coolpix P520 (PTP mode)		
Nikon Coolpix P60 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P6000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P7000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P7100 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P7700 (PTP mode)		
Nikon Coolpix P7800 (PTP mode)		
Nikon Coolpix P80 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P80 v1.1 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix P90 (PTP mode)		
Nikon Coolpix P900 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S01	Image Capture, Configuration	
Nikon Coolpix S02	Image Capture, Configuration	
Nikon Coolpix S2 (PTP mode)		
Nikon Coolpix S200 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S220 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S225 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S2500 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S2600 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S2700	Image Capture, Configuration	
Nikon Coolpix S2900	Image Capture, Configuration	
Nikon Coolpix S3000 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S3100 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S3200	Image Capture, Configuration	
Nikon Coolpix S3300 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S3600	Image Capture, Configuration	
Nikon Coolpix S3700	Image Capture, Configuration	

Nikon Coolpix S4 (PTP mode)		
Nikon Coolpix S4300 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S500 (PTP mode)		
Nikon Coolpix S5100 (PTP mode)		
Nikon Coolpix S6 (PTP mode)		
Nikon Coolpix S60 (PTP mode)		
Nikon Coolpix S6000 (PTP mode)		
Nikon Coolpix S620 (PTP mode)		
Nikon Coolpix S6300 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S6800	Image Capture, Configuration	
Nikon Coolpix S7c (PTP mode)		
Nikon Coolpix S8000 (PTP mode)		
Nikon Coolpix S8200		
Nikon Coolpix S9100 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S9500 (PTP mode)	Image Capture, Configuration	
Nikon Coolpix S9700	Image Capture, Liveview, Configuration	
Nikon Coolpix SQ (PTP mode)		
Nikon D100 (Sierra Mode)	Image Capture, Liveview, Configuration	
Nikon D2H SLR (PTP mode)		
Nikon D2Hs (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon D2X SLR (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon D3 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon D50 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D100 (PTP mode)		
Nikon DSC D200 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D2Xs (PTP mode)	Image Capture, Trigger Capture, Configuration	

Nikon DSC D300 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D3000 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D300s (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3100 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D3200	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3300	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3400	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3500	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3s (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D3x (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D4	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D40 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D40x (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D4s	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D500	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5000 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5100 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5200	Image Capture, Trigger Capture, Liveview, Configuration	

Nikon DSC D5300	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5500	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D5600	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D6	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D60 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D600	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D610	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D70 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D700 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D7000 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D70s (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D7100	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D7200	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D750	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D7500	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D780	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D80 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Nikon DSC D800	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D800E	Image Capture, Trigger Capture, Liveview, Configuration	

Nikon DSC D810	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D810A	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D850	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC D90 (PTP mode)	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSC Df	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon DSLR (WLAN)	Image Capture, Liveview, Configuration	Testing (Be
Nikon J1	Image Capture, Configuration	
Nikon J2	Image Capture, Configuration	
Nikon J3	Image Capture, Configuration	
Nikon J4	Image Capture, Configuration	
Nikon J5	Image Capture, Configuration	
Nikon KeyMission 170	Image Capture, Configuration	
Nikon KeyMission 360 (PTP mode)	Image Capture, Configuration	
Nikon P950	Image Capture, Liveview, Configuration	
Nikon S1	Image Capture, Configuration	
Nikon S2	Image Capture, Configuration	
Nikon V1	Image Capture, Configuration	
Nikon V2	Image Capture, Configuration	
Nikon V3	Image Capture, Configuration	
Nikon Z5	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Z50	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Z6	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Z6_2	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Z7	Image Capture, Trigger Capture, Liveview, Configuration	

Nikon Z7_2	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Z9	Image Capture, Trigger Capture, Liveview, Configuration	
Nikon Zfc	Image Capture, Trigger Capture, Liveview, Configuration	

Sony

Camera Model	Abilities	Comments
Sony Alpha-A3000		
Sony Alpha-A5000 (Control)	Image Capture, Trigger Capture, Configuration	
Sony Alpha-A5100 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A5100 (MTP)		
Sony Alpha-A6000 (Control)	Image Capture, Trigger Capture, Configuration	
Sony Alpha-A6000 (MTP)		
Sony Alpha-A6300 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A6300 (MTP)		
Sony Alpha-A6500		
Sony Alpha-A6500 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A6600 (MTP)		
Sony Alpha-A6600 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A68 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A68 (MTP)		
Sony Alpha-A7 (Control)	Image Capture, Trigger Capture, Configuration	
Sony Alpha-A7 III (MTP mode)		
Sony Alpha-A7 III (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7 IV (MTP mode)		
Sony Alpha-A7 IV (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	

Sony Alpha-A77 M2 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7III (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7r (Control)	Image Capture, Trigger Capture, Configuration	
Sony Alpha-A7r II (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7R III (MTP mode)		
Sony Alpha-A7r III (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7S (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A7S (MTP)		
Sony Alpha-A7S II (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A9 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-A99 M2 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-RX10M4 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony Alpha-RX1R II (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DCR-PC100		
Sony DSC RX0 II (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-A100 (PTP mode)		
Sony DSC-A7r IV (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-A7S III (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-A900 (PTP mode)	Image Capture, Trigger Capture, Configuration	
Sony DSC-F1		Experimenta
Sony DSC-F55		
Sony DSC-F707V (PTP mode)		

Sony DSC-F717 (PTP mode)		
Sony DSC-F828 (PTP mode)		
Sony DSC-H1 (PTP mode)		
Sony DSC-H2 (PTP mode)		
Sony DSC-H5 (PTP mode)		
Sony DSC-HX100V (PTP mode)		
Sony DSC-HX200V (PTP mode)		
Sony DSC-HX20V (PTP mode)		
Sony DSC-HX300 (PTP mode)		
Sony DSC-HX400V (MTP)		
Sony DSC-HX5V (PTP mode)		
Sony DSC-HX60V (MTP)		
Sony DSC-HX80		
Sony DSC-HX90V (MTP)		
Sony DSC-N2 (PTP mode)		
Sony DSC-P10 (PTP mode)		
Sony DSC-P100 (PTP mode)		
Sony DSC-P120 (PTP mode)		
Sony DSC-P200 (PTP mode)		
Sony DSC-P30 (PTP mode)		
Sony DSC-P31 (PTP mode)		
Sony DSC-P32 (PTP mode)		
Sony DSC-P41 (PTP mode)		
Sony DSC-P43 (PTP mode)		
Sony DSC-P5 (PTP mode)		
Sony DSC-P50 (PTP mode)		
Sony DSC-P51 (PTP mode)		
Sony DSC-P52 (PTP mode)		
Sony DSC-P71 (PTP mode)		
Sony DSC-P72 (PTP mode)		

Sony DSC-P73 (PTP mode)		
Sony DSC-P92 (PTP mode)		
Sony DSC-P93 (PTP mode)		
Sony DSC-QX30U	Liveview	
Sony DSC-R1 (PTP mode)		
Sony DSC-RX0 (MTP)		
Sony DSC-RX0 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-RX1 (PTP mode)		
Sony DSC-RX100 (PTP mode)		
Sony DSC-RX100M2		
Sony DSC-RX100M4	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-RX100M5 (Control)	Image Capture, Trigger Capture, Configuration	
Sony DSC-RX100M5A (MTP)		
Sony DSC-RX100M5A (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-RX100M6 (MTP)		
Sony DSC-RX100M6 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-RX100M7 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-RX100V (Control)	Image Capture, Trigger Capture, Configuration	
Sony DSC-RX10M3 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony DSC-S40 (PTP mode)		
Sony DSC-S60 (PTP mode)		
Sony DSC-S730 (PTP mode)		
Sony DSC-S75 (PTP mode)		
Sony DSC-S780 (PTP mode)		
Sony DSC-S85 (PTP mode)		
Sony DSC-T1 (PTP mode)		

Sony DSC-T10 (PTP mode)		
Sony DSC-T3 (PTP mode)		
Sony DSC-U10 (PTP mode)		
Sony DSC-U20 (PTP mode)		
Sony DSC-V1 (PTP mode)		
Sony DSC-W1 (PTP mode)		
Sony DSC-W12 (PTP mode)		
Sony DSC-W130 (PTP mode)		
Sony DSC-W200 (PTP mode)		
Sony DSC-W35 (PTP mode)		
Sony DSC-W510 (PTP mode)		
Sony DSC-W55 (PTP mode)		
Sony DSC-WX220 (MTP)		
Sony DSC-WX350 (MTP)		
Sony HDR-PJ260VE (PTP mode)		
Sony HDR-PJ710V (PTP mode)		
Sony ILCE-6400 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony ILCE-7C (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony ILCE-7M2 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony ILCE-7R M2 (MTP)		
Sony ILCE-7RM3A (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony ILCE-7RM4A (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony MSAC-SR1		
Sony MVC-CD300 (PTP mode)		
Sony MVC-CD500 (PTP mode)		
Sony NEX-3N (PTP mode)		
Sony NEX-5R		

Sony NEX-6		
Sony NEX-7 (PTP mode)		
Sony NEX5 (PTP mode)		
Sony PTP		
Sony RX100M3 (MTP)		
Sony SLT-A35 (PTP mode)		
Sony SLT-A350 (PTP mode)		
Sony SLT-A37		
Sony SLT-A55 (PTP mode)		
Sony SLT-A57		
Sony SLT-A58		
Sony SLT-A58 (Control)	Image Capture, Trigger Capture, Configuration	
Sony SLT-A65V (PTP mode)		
Sony SLT-A77V (PTP mode)		
Sony SLT-A99v		
Sony TRV-20E		
Sony UMC-R10C		
Sony ZV-1		
Sony ZV-1 (PC Control)	Image Capture, Trigger Capture, Liveview, Configuration	
Sony ZV-E10 (Control)	Image Capture, Trigger Capture, Liveview, Configuration	

Pentax

Camera Model	Abilities	Commen
Pentax K01	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K1	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K1 (PTP Mode)		
Pentax K100D	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K100DS	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K10D	Image Capture, Trigger Capture, Configuration	Testing (E

Pentax K200D	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K20D	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K3	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K3 (PTP Mode)		
Pentax K3 II (PTP Mode)		
Pentax K30	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K3II	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K50D	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K5D	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K5II	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K5IIs	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K70	Image Capture, Trigger Capture, Configuration	Testing (E
Pentax K70 (PTP Mode)		
Pentax Optio 33WR	Image Capture, Liveview, Configuration	
Pentax Optio 43WR		
Pentax Optio 450	Image Capture, Liveview, Configuration	
Pentax Optio W90		

Fujifilm

Camera Model	Abilities	Comments
Fuji Axia Eyeplate		Experimental
Fuji Axia Slimshot		Experimental
Fuji DS-7	Configuration	
Fuji DX-10	Configuration	
Fuji DX-5	Configuration	
Fuji DX-7	Configuration	
Fuji FinePix A330		
Fuji FinePix A610		
Fuji FinePix A800		
Fuji FinePix A820		

Fuji FinePix A920		
Fuji FinePix AV-150		
Fuji FinePix E900		
Fuji FinePix F100fd		
Fuji FinePix F20		
Fuji FinePix F200 EXR		
Fuji FinePix F30		
Fuji FinePix F31fd		
Fuji FinePix F40fd		
Fuji FinePix F50fd		
Fuji FinePix F60fd		
Fuji FinePix F70 EXR		
Fuji FinePix F80EXR		
Fuji FinePix H20EXR		
Fuji FinePix HS30EXR		
Fuji FinePix JX370		
Fuji FinePix S1000fd		
Fuji FinePix S100fs		
Fuji FinePix S1500		
Fuji FinePix S1800		
Fuji FinePix S2000HD		
Fuji FinePix S2500HD		
Fuji FinePix S2950		
Fuji FinePix S2980		
Fuji FinePix S4300		
Fuji FinePix S4850		
Fuji FinePix S5700		
Fuji FinePix S5800		
Fuji FinePix S6500fd		
Fuji FinePix S7000		

Fuji FinePix S8600		
Fuji FinePix S9500		
Fuji FinePix SL1000		
Fuji FinePix T200		
Fuji FinePix X-E1		
Fuji FinePix X-S1		
Fuji FinePix X10		
Fuji FinePix X20		
Fuji FinePix XF1		
Fuji FinePix Z100fd		
Fuji FinePix Z35		
Fuji FinePix Z700EXR		
Fuji Fujifilm A220		
Fuji Fujifilm GFX 100S	Image Capture, Liveview, Configuration	
Fuji Fujifilm GFX 100S (2nd)	Image Capture, Liveview, Configuration	
Fuji Fujifilm GFX100	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-A2		
Fuji Fujifilm X-A5		
Fuji Fujifilm X-E2		
Fuji Fujifilm X-E3	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-E4		
Fuji Fujifilm X-H1	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-M1		
Fuji Fujifilm X-Pro2	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-Pro3	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-S10	Liveview	
Fuji Fujifilm X-T1	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-T10		
Fuji Fujifilm X-T2	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-T20		

Fuji Fujifilm X-T3	Image Capture, Liveview, Configuration	
Fuji Fujifilm X-T30	Liveview	
Fuji Fujifilm X-T4	Image Capture, Liveview, Configuration	
Fuji Fujifilm X100F		
Fuji Fujifilm X100V	Liveview	
Fuji Fujifilm X30		
Fuji Fujifilm X70		
Fuji GFX 50 R	Image Capture, Liveview, Configuration	
Fuji GFX 50 S	Image Capture, Liveview, Configuration	
Fuji IX-1	Image Capture, Liveview	
Fuji MX-1200	Configuration	
Fuji MX-1700	Configuration	
Fuji MX-2700	Configuration	
Fuji MX-2900	Configuration	
Fuji MX-500	Configuration	
Fuji MX-600	Configuration	
Fuji MX-700	Configuration	
Fuji S5 Pro	Image Capture, Configuration	
Fuji X (WLAN)	Image Capture, Liveview, Configuration	Experimental
FujiFilm @xia ix-100	Image Capture	

Troubleshooting

In case the camera fails to connect or capture, please make sure of the following:

- Make sure the battery in the camera is full.
- Make sure the SD card in the camera has enough space.
- Make sure camera is set to Bulb/Manual mode. You might need to rotate the dial to Bulb or Manual and then adjust camera settings to enable BULB mode.
- Turn off any power-saving feature of the camera that might cause it to hibernate or sleep. Some cameras support adjustable inactivity timers before automatically turning off. Set such timers to 15 minutes or more.
- Try a different USB cable.

- Try a different USB port.
- Turn off Noise Reduction settings in the camera.
- Turn off mirror lock in the camera settings.

Connecting Mounts

StellarMate supports a broad range of mounts. For a mount to be connected it must satisfy the minimum requirements

- It must be a GOTO mount.
- It must have a serial, USB, Bluetooth, Wired, or Wireless interface to an extermal device or computer.

The documentation for each mount, including supported connection methods, are included in the mount-specific documentation on the INDI devices portal.

Mounts

Mounts

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Celestron

Before connecting to your mount

1. Ensure the mount firmware is the latest as provided by your manufacturer.
2. Ensure mount has proper and suffcient power to operate. This is often a primary source of issues connecting to mounts.
3. Read the mount manual and learn about the mount startup or Home Position. This is the mechanical position the mount must be in before you turn on the power to the mount. This basically falls under three categories:
   - Equatorial Mount: Telescope should be looking at the Celestial Pole (Polaris for the Northern Hemisphere) with counter-weights down.
   - Alt-Az Mount: Telescope should parallel to the ground looking exactly North (for Northern Hemisphere) or South (for Southern hemisphere).
   - Alt-Az Mount on Wedge: Telescope should be looking at Celestial Equator due South (for Northern Hemisphere) or Celestial Equator Due North (for Southern hemisphere).
4. Decide on how you will connect to the mount. Is it using a cable to the handset? or cable directly to the mount? WiFi? Bluetooth?
5. If connecting over WiFi, then ensure the device where you are running the INDI driver (e.g. Raspberry PI4) is on the same network as your mount so they can communicate with each other. Such mounts can be configured to run in two modes:
   - Mount Wireless Hotspot Mode : The mount hotspot acts as the router and you can connect your devices to the mount's own network (e.g. your Raspberry PI and iPad).
   - Mount Wireless Station Mode: The mount joins an existing WiFi network (e.g. your home WiFi network or StellarMate hotspot). The IP address assigned to the mount is determined by your router. It is best to know the IP address assigned to the mount so that you can enter it in the IP address field in the driver Connection tab. However, this is

not strictly necessary since the driver can automatically scan the local network for mounts, albeit this operation may take a few minutes to complete whereas if the IP address is known beforehand then the connection is immediate.

Selecting the correct driver

Selecting the appropiate driver for your mount usually depends on two factors:

- Mount model.
- Connection method (AUX Port, PC Port, Handset, WiFI, ..etc).

Mount	Driver	Connection Method
• Advanced AVX • CGEM / CGEM II • CGX / CGX-L • CPC / CPC Deluxe • Nexstar • Evolution	• Celestron GPS • Celestron CPC • Celestron Nexstar • Celestron AVX • Celestron CGX	• Older Nexstar HCs come wi Serial-to-USB adapter cable f • Modern Nexstar HCs come w you can connect directly vi device (no serial to USB adapt
• Advanced AVX WiFi • CGEM / CGEM II WiFi • CGX / CGX-L WiFi • Evolution WiFi	• Celestron AUX • Celestron WiFi • Evolution WiFi • Evolution WiFi Wedge • CGEM II WiFi • CGX WiFi • Advanced VX WiFi	WiFi (No handset is required).
• Advanced AVX • CGEM / CGEM II • CGX / CGX-L • CPC	• Celestron AUX	Wired AUX or PC Port (located o scope).

SkyWatcher

All SkyWatcher & Orion Mounts, including EQMod driver.

Before connecting to your mount

1. Ensure the mount firmware is the latest as provided by your manufacturer.
2. Ensure mount has proper and suffcient power to operate. This is often a primary source of issues connecting to mounts.
3. Read the mount manual and learn about the mount startup or Home Position. This is the mechanical position the mount must be in before you turn on the power to the mount. This basically falls under two categories:
    1. Equatorial Mount: Telescope should be looking at the Celestial Pole (Polaris

for the Northern Hemisphere) with counter-weights down.

2. Alt-Az Mount: Telescope should parallel to the ground looking exactly North (for Northern Hemisphere) or South (for Southern hemisphere).

4. Decide on how you will connect to the mount. Is it using a cable to the handset? or cable directly to the mount? WiFi? Bluetooth?
5. If connecting over WiFi, then ensure the device where you are running the INDI driver (e.g. Raspberry PI4) is on the same network as your mount so they can communicate with each other. Such mounts can be configured to run in two modes:
    1. Mount Wireless Hotspot Mode: The mount hotspot acts as the router and you can connect your devices to the mount's own network (e.g. your Raspberry PI and iPad).
    2. Mount Wireless Station Mode: The mount joins an existing WiFi network (e.g. your home WiFi network or StellarMate hotspot). The IP address assigned to the mount is determined by your router. It is best to know the IP address assigned to the mount so that you can enter it in the IP address field in the driver Connection tab. However, this is not strictly necessary since the driver can automatically scan the local network for mounts, albeit this operation may take a few minutes to complete whereas if the IP address is known beforehand then the connection is immediate.

Selecting the correct driver

Selecting the appropiate driver for your mount usually depends on two factors:

- Mount model.
- Connection method (Cable, WiFI, Bluetooth..etc).

Mount	Driver	Connection Meth
• HEQ5 • EQ6 \ EQ6R Pro • AZ-EQ5 \ AZ-EQ6 Pro • EQ8 \ EQ8 Pro • EQ3 Pro EQM-35 Pro • Orion Sirrius \ Orion, Atlas	EQMod Mount	EQDirect Cable
• HEQ5 • EQ6 \ EQ6R Pro • AZ-EQ5 \ AZ-EQ6 Pro • EQ8 \ EQ8 Pro • EQ3 Pro EQM-35 Pro	EQMod Mount	Bluetooth

• Orion Sirrius \ Orion, Atlas		
• HEQ5 • EQ6 \ EQ6R Pro • AZ-EQ5 \ AZ-EQ6 Pro • EQ8 \ EQ8 Pro • EQ3 Pro EQM-35 Pro • Orion Sirrius \ Orion, Atlas	EQMod Mount	Synscan Wifi Adap
• AZ-GTi WiFi (With Equatorial Wedge)	AZ-GTi Equatorial WiFi	WiFi
AZ-GTi Wired	• Equatorial Wedge: EQMod Mount • Alt-Az: SkyWatcher Alt-Az	WIRED cable from USB
•AZ-GTi (Alt-Az) •All SkyWatcher Dobsonian GOTOs •All Orion Dobsonian GOTOs	SkyWatcher Alt-Az WiFi	WiFi (Native) or Sy
•Any SkyWatcher/Orion with Synscan Handset (HC)	Synscan	• Older Synsca RJ11 plug. You adapter c PC/Device. • Modern Synsc USB Type-B connect direct your device adapter is requ
•SkyWatcher Virtuso	SkyWatcher Virtuso	WiFi
•SkyWatcher Star Adventurer 2i Pro	SkyWatcher Star Adventurer 2i WiFi	WiFi
•SkyWatcher Star Adventurer 2i Pro	SkyWatcher Star Adventurer 2i WiFi	USB
•SkyWatcher Star Adventurer	SkyWatcher Star Adventurer	NA

Mount Connection Guide

In order to know what connections your mount supports, check the following table:

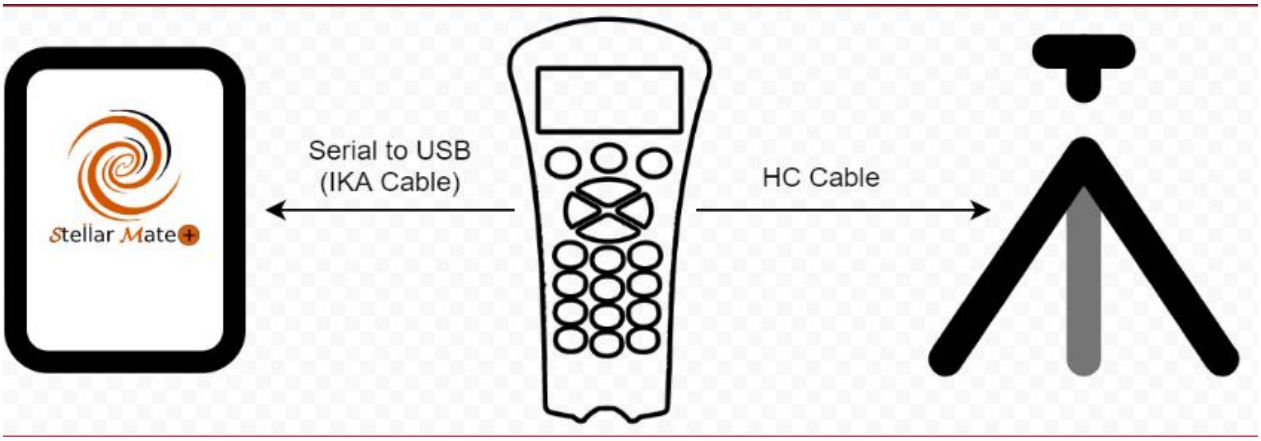
Manufacturer	HC	Direct	WiFi	Ethernet	Bluetooth	Comment
Meade	Yes	NA	Yes*	NA	NA	WiFi requires external Stella WiFi Adapter
Celestron	Yes	NA	Yes*	NA	NA*	1. Native WiFi support for Evolution Mounts using INDI Celestro require SkyPortal WiFi Module.

						2. Handsets before 2016 with RJ11 port require StellarMate Handset have mini USB port that can be connected directly to St
SkyWatcher / Orion	Yes	Yes	Yes*	NA	Yes*	1. Direct connection via StellarMate cables is the best option mount via INDI EQMod driver. 2. Connecting to Synscan handset is possible but offers limited 3. Some WiFi mounts (e.g. AZ-GTi) offers direct WiFi commu mounts require external dongle. 4. Bluetooth communication supported with external bluetooth d
iOptron	Yes	Yes*	Yes*	NA	NA	1. Most mounts are connected from handset to StellarMate via IP 2. Some newer mounts (e.g. CEM70g) support direct connection 3. Native WiFi mounts are supported.
Astrophysics	Yes	NA	NA	NA	NA	
Omegon	Yes	NA	NA	NA	NA	
Vixen	Yes	NA	NA	Yes	NA	
10Micron	Yes	NA	NA	Yes	NA	
Avalon	Yes	NA	NA		NA	
Paramount	NA	NA	NA	Yes*	NA	StellarMate can control Paramount only via TheSkyX TCP Se driver must connect to TheSkyX server to drive the mount. Bot must be on the same network.
PMC-8	Yes	NA	Yes	Yes	NA	
Losmandy G11	Yes	NA	NA	NA	NA	
Explore Scientific EXOS2	Yes	NA	Yes	Yes	NA	
Explore Scientific iEXOS100	Yes	NA	Yes	Yes	NA	
Losmandy Gemini	Yes	NA	NA	Yes	NA	
Temma Takahashi	Yes	NA	NA	Yes	NA	
TeenAstro	Yes	NA	NA	Yes	NA	Ethernet connection is supported (Firmware > v1.1)
SkyWatcher Virtuso	Yes	NA	NA	NA	NA	
SkySensor2000 PC	Yes	NA	NA	NA	NA	
Pulsar2	Yes	NA	NA	NA	NA	
AOK SkyWalker	NA	NA	Yes	Yes	NA	
OnStep	Yes	Yes	Yes	Yes	Yes	
Rainbow RS-125	Yes	NA	NA	NA	NA	
ArgoNavis	Yes	NA	NA	NA	NA	
Digital Setting Circle	Yes	NA	NA	NA	NA	

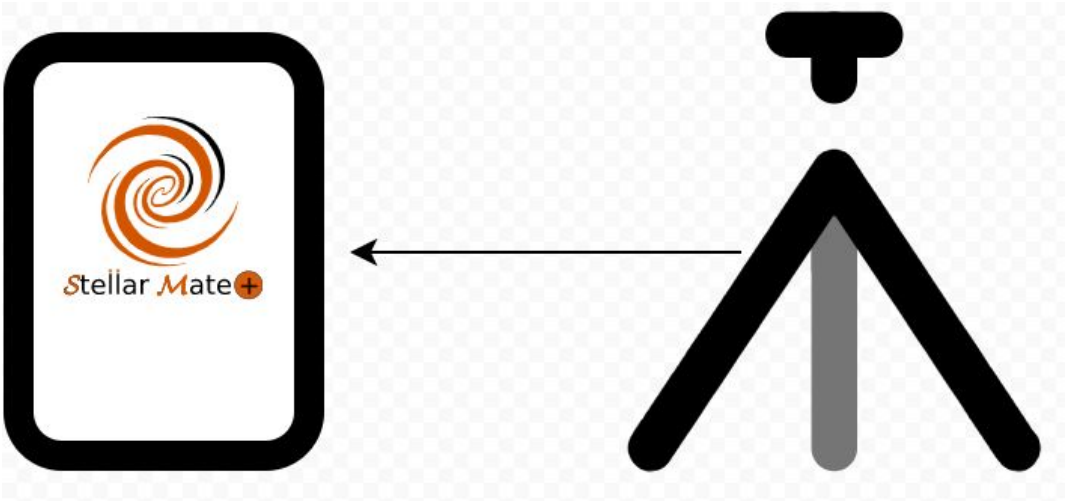
Methods of Connection

The following diagrams illustrates the methods of connection:

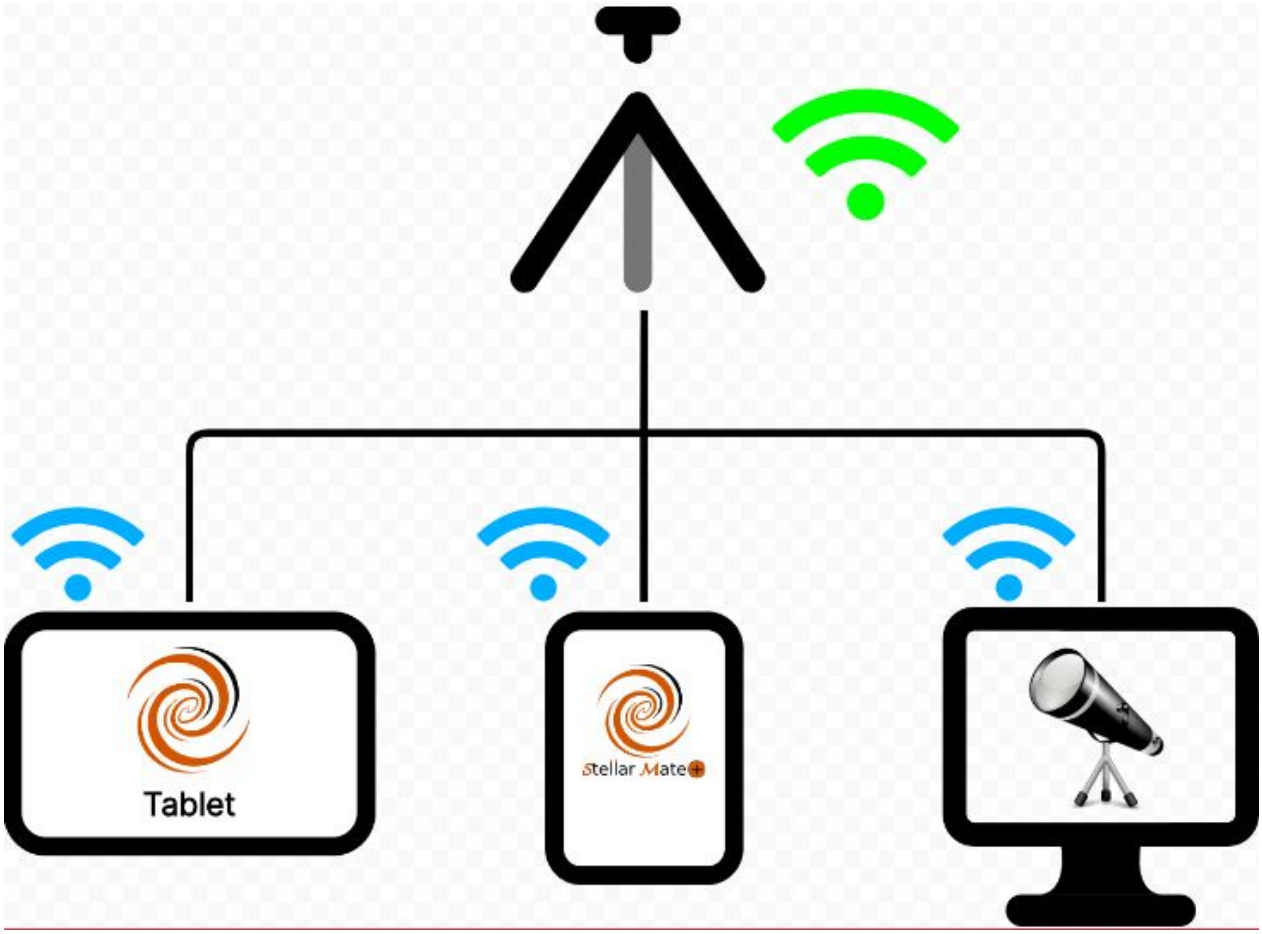
- HC (HandSet Controller)



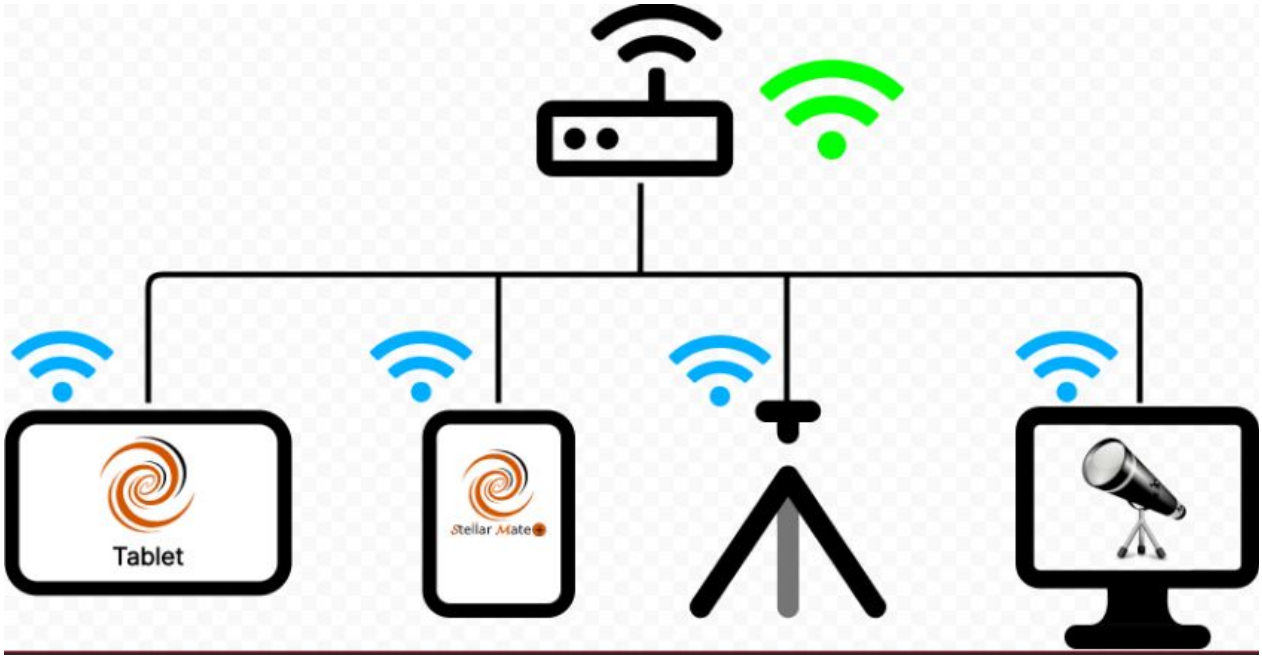
- Direct



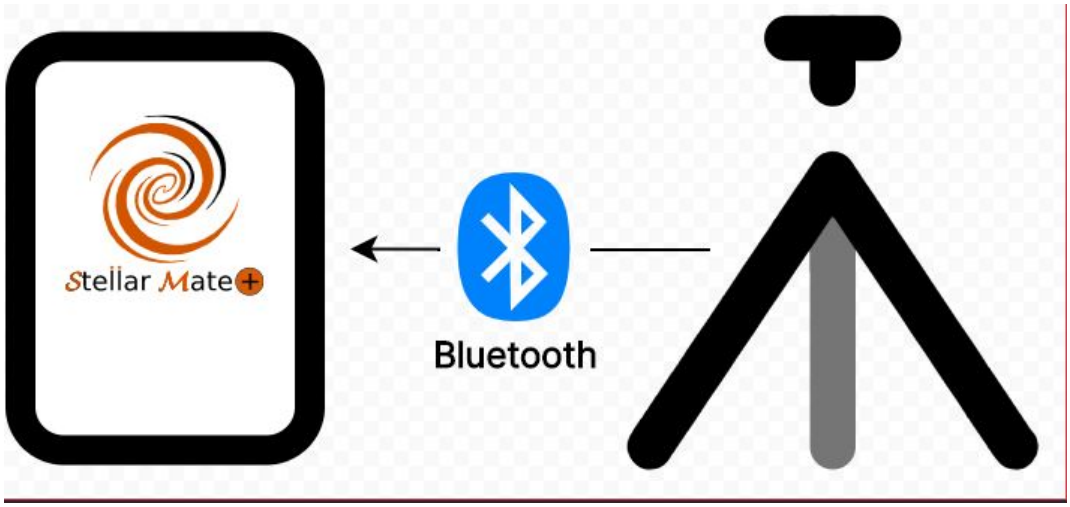
- WiFi
    1. HotSpot mode



2. WiFi Infrastructure



- Bluetooth



Serial to USB

IMPORTANT

In order to connect your mount via Serial to USB, you need to get a mount-specific Serial to USB cable, which can be bought from Ikarus Technologies.

Most mounts provide an RS232 port (usually located in the handset). An RS232 to USB cable is required in order connect the mount to StellarMate. StellarMate is equipped with 4 USB ports. However, it is highly recommended to use an external powered USB Hub as it can reliably support power to your equipment.

WARNING

Most problems in operating your equipment with StellarMate are related first and foremost to power problems. Therefore, please invest in reliable power supply for all your equipment!

For many Mounts & Focusers that use RS232 connectors, you need to purchase a Serial-To-USB adapter suitable for your Mount/Focuser model from the manufacturer. When you plug in your Serial-To-USB devices, they are assigned a specific port under StellarMate (e.g. `/dev/ttyUSB0`). However, this port is not static. That is, next time you plug in the same device on another session, it might get assigned another port (e.g. `/dev/ttyUSB1`). Since INDI drivers require the port name to communicate with the device, this could lead to communication issues. With the help of StellarMate Serial Port Assistant (Web or Ekos versions), you can assign permanent designations for your devices so that they always get the same port whenever they are connected

Wired Network

Some mounts support wired networked connection via a dedicated Ethernet port. Depending on the mount manufacturer, the mount can be either connected directly via an

Ethernet cable (StellarMate to Mount direct), or the mount can be connected to a wired router where it can be accessed over the network. Consult the mount manual to find which mode it supports and what is the default IP address and port of the mount once it is connected to the network.

- Direct Ethernet: When connecting a Direct ethernet cable without a router in between, an automatic IPv4 address is created. The automatic IP address is usually in the form of 169.254.XXX.XXX. In order for StellarMate to communicate with the mount, the exact IP address and port must be specified in the INDI Control Panel. StellarMate can also be configured to any IP address manually in order to communicate with whatever IP schema used by the mount.

- Ethernet LAN: If the mount can be connected to a router, it should be able to obtain an IP address automatically from the router. Access your router configuration page and find the IP address assigned to the mount. Use this IP address in the INDI Control Panel in order to establish communication with it. The port number should be listed in your mount manual.

Wireless Connection

Wireless mounts are usually connected either directly (via mount own Hotspot) or they can be configured in Infrastructure Mode where they can join an existing WiFi network.

- Mount HotSpot: When connecting a mount hotspot, make sure that all devices including the laptop, tablet, StellarMate..etc are all connected to the mount hotspot. This is to ensure that all the devices are on the same network talking to each other. You cannot have half the devices on a different network. Once the devices join the mount HotSpot network, they should be assigned their own IP addresses. Use the mount hotspot IP address in INDI Control Panel in order to establish communication with the mount. The port number should be listed in your mount manual.

- Mount Infrastructure: Some Wireless mount can be configured in Infrastructure Mode. This is the mode where the mount does not start its own hotspot but insteads joins an existing WiFi network. Make sure all the relevant devices (StellarMate, Laptop, Tablet..etc) are all joined to the same WiFi network so that they can talk to each other. Find out the mount IP address and enter it in INDI Control Panel in order to establish communication with the mount. The port number should be listed in your mount manual.

Connecting Focusers

StellarMate supports a broad range of focusers from professional focusers to DYI types. Most focusers fall in the following two categories:

- Absolute/Relative Focusers: Absolute focusers are usually stepper motors that can go to a specific step that is remembered across power cycles. This is the recommened type to use since Auto Focus operations are reliable with this type of focuser.

- DC Focusers: DC Focusers are open loop simple motors in which the program can control the speed and direction of the focuser, but not its exact position. These exist in cheap focusers and DSLR cameras. It is generally recommended to avoid such focusers.

To check if your focuser is supported, please visit the INDI Focuser Portal. Check the documentation for your focuser before you operate it for the first time.

Serial to USB

Most equipment is connected via USB. StellarMate is equipment with 4 USB ports. However, it is highly recommended to use an external powered USB Hub as it can reliably support power to your equipment.

WARNING

Most problems in operating your equipment with StellarMate are related first and foremost to power problems. Therefore, please invest in reliable power supply for all your equipment!

For many Focusers that use RS232 connectors, you need to purchase a Serial-To-USB adapter suitable for your Focuser model from the manufacturer. When you plug in your Serial-To-USB devices, they are assigned a specific port under StellarMate (e.g. `/dev/ttyUSB0`). However, this port is not static. That is, next time you plug in the same device on another session, it might get assigned another port (e.g. `/dev/ttyUSB1`). Since INDI drivers require the port name to communicate with the device, this could lead to communication issues. With the help of StellarMate Serial Port Assistant, you can assign permanent designations for your devices so that they always get the same port whenever they are connected.

Connecting Filter Wheels

StellarMate supports a broad range of filter wheels. Most filter wheels fall in the following two categories:

- Standalone: The filter wheel operates independently from any other device and has its own USB connection to StellarMate/PC. The filter wheel is operated from a dedicated INDI driver.
- Internal: Several camera models ship with an internal Color Filter Wheel (CFW) and therefore operating the filter wheel happens in the INDI camera driver. The INDI control panel would include an additional Filter tab whereas the filter slots and corresponding designations can be updated.

To check if your filter wheel is supported, please visit the INDI Filter Wheel Portal. Check the documentation for your filter wheel before you operate it for the first time.

USB & Serial to USB

Most equipment is connected via USB. StellarMate is equipment with 4 USB ports. However, it is highly recommended to use an external powered USB Hub as it can reliably support power to your equipment.

WARNING

Most problems in operating your equipment with StellarMate are related first and

foremost to power problems. Therefore, please invest in reliable power supply for all your equipment!

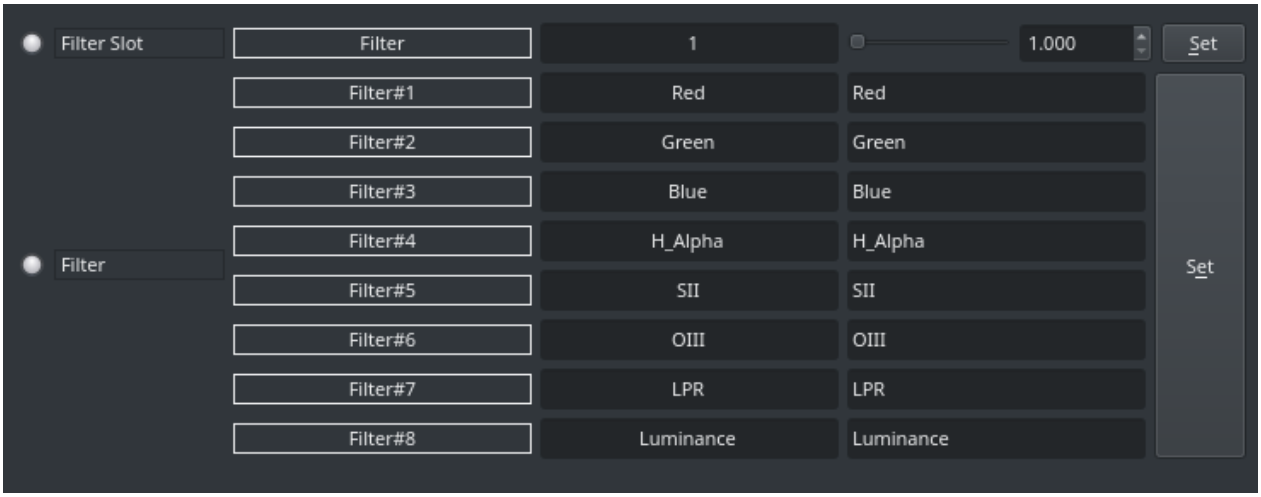
Some filter wheels are connected to USB as regular USB devices while others are connected as Serial-To-USB devices. For the latter case, you need to purchase a Serial-To-USB adapter suitable for your filter wheel model from the manufacturer. When you plug in your Serial-To-USB devices, they are assigned a specific port under StellarMate (e.g. `/dev/ttyUSB0`). However, this port is not static. That is, next time you plug in the same device on another session, it might get assigned another port (e.g. `/dev/ttyUSB1`). Since INDI drivers require the port name to communicate with the device, this could lead to communication issues. With the help of StellarMate Serial Port Assistant, you can assign permanent designations for your devices so that they always get the same port whenever they are connected.

If your Filter Wheel mode does not uses a Serial-To-USB chip, you will not see any settings for serial Port settings in the driver and can therefore connect directly.

Operating Filter Wheel

Filter Wheels are relatively simply devices. There are two primary controls for most filter wheel drivers:

- Filter Slot: This is the current active slot of the filter wheel. It starts from 1 to the maximum number of slots available. To change the filter, simply change the slot number.
- Filter Names: On first connection, filter names (e.g. Red) are generated by the driver. Change the filter names to reflect the actual installed filter using the Capture Module in Ekos (KStars).



Time & Location

In order to ensure smooth and accurate operation of the astrophotography workflow, both time and location information must be precise across all devices in the system. Therefore, the time and location on StellarMate must be in sync with the time and location on all connected devices, especially mounts.

StellarMate Plus Controller is equipped with a Real Time Clock (RTC). This ensures that

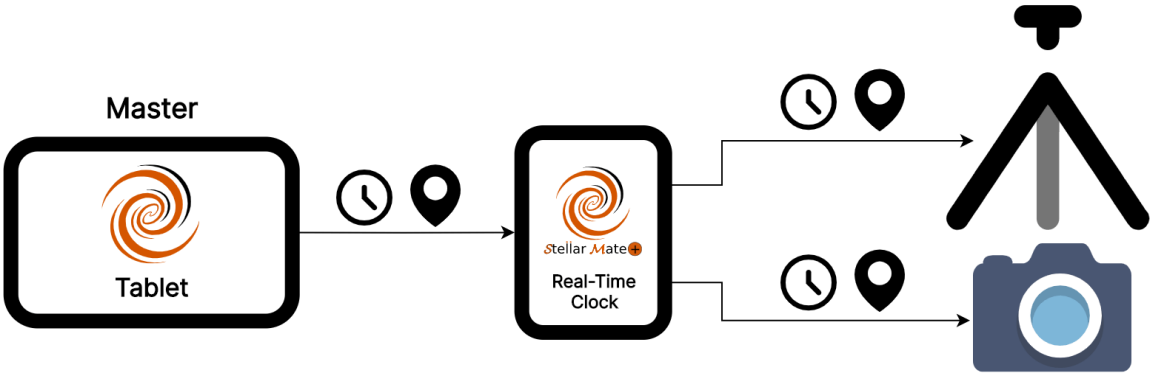
the internal clock keeps ticking even when the power is switched off. When SM Plus is powered on, it reads the time from the onboard RTC. While this value might drift off by a few seconds over time, it is critical to minimize any large errors that otherwise would accumulate over time unchecked.

Note

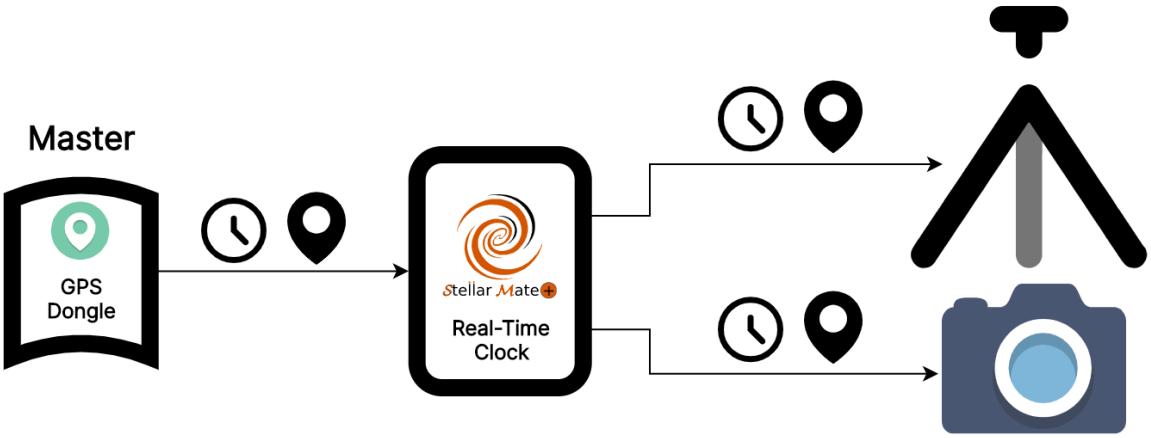
For users who installed StellarMate OS on their own Raspberry PI4 SBCs, it's recommended to invest in installing an DS3231 RTC module or use a GPS dongle.

While the RTC provides acceptable time tracking, it does not offer location information. Therefore, GPS is the recommended solution in the long term. The following are the supported GPS sources:

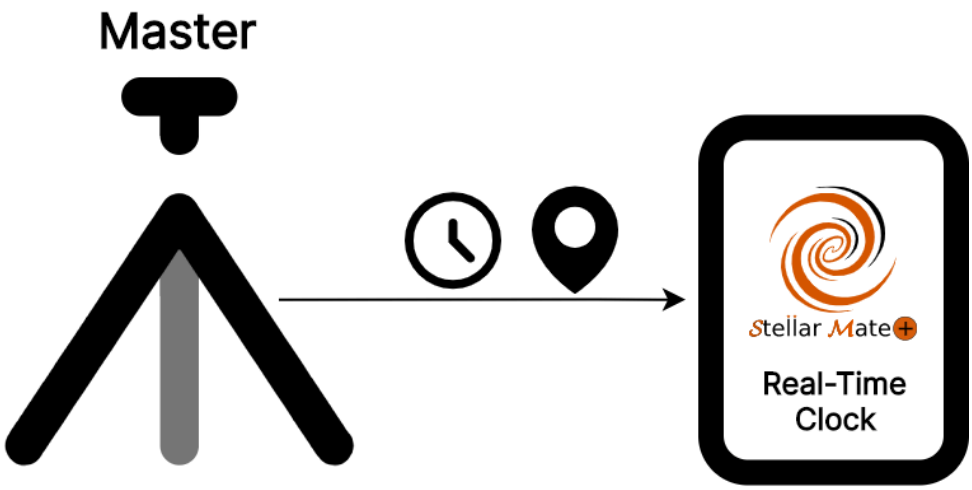
- Tablet/Mobile GPS: The StellarMate App relays the tablet/mobile time and location information to StellarMate. Everytime the SM App is connected to SM Plus, it automatically synchronizes both time and location information accordingly.



- External GPS Dongle: SM Plus supports a number of dedicated external GPS dongles connected via USB. Once connected, select the GPSD driver in your equipment profile in order to utilize the GPS.

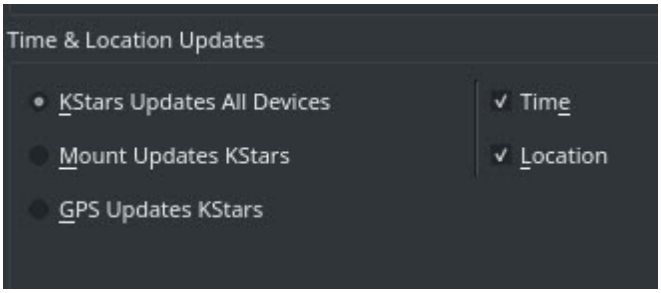


- Mount with GPS: Some mount have internal or external GPS adapters. These adapters cannot be connected directly to StellarMate, they are used to update the time and location on the mount handset. You can select Mount as the source of data if desired.



Every time the StellarMate Mobile App is connected to StellarMate, it syncs both time and location information from the tablet/phone GPS. If the SM App is not used (for example, when using Ekos on a PC/Mac), then StellarMate relies primarily on RTC as the time source.

In KStars, it is possible to specify the Time Source. Click on Settings → Configure KStars → INDI.



By default, KStars is the source of all time and location information. The KStars time depends on the system time for StellarMate, and therefore depends on the RTC. If StellarMate is connected to the internet, the system would also synchronize the time to online time servers and synchronize the RTC clock accordingly. Now both the internet time and RTC clock are again in sync to account for any drifts that might build up in the RTC.

After connecting the SM App to StellarMate, the KStars' location is updated to the tablet/mobile GPS location. You can also change the KStars location from Settings → Geographic and then select or add a new location.

Tip

You can use StellarMate App to quickly synchronize StellarMate Plus time and location. The time and location are automatically set whenever the App communicates with StellarMate. Afterwards, you may continue to use the SM App, or use Ekos to setup your astrophotography workflow.

Therefore, in KStars, the time and location information MASTER source can be selected

from the following sources:

- KStars Updates All Devices: KStars time and location is the primary source and all connected devices (mounts..etc) are synchronized to KStars time and location. When using SM App, it's recommended to leave this option as is.

- Mount Updates KStars: The mount time and location are used to update KStars time and location. Some mounts are equipped with internal or external GPS, KStars does NOT connect to these mount-specific GPS dongles. Instead, KStars communicates with the mount via the Handset/WiFi to query time and location information and then uses them as the source.

- GPS Updates KStars: When using a dedicated externa GPS dongle, select this option to ensure the GPS dongle is the master source for both time and location. When Ekos detects a GPS device, it will prompt the user to switch to it as the master time & location source.

Therefore, you must select which source is the most accurate and reliable for time & location information. By default, KStars is the master source for time and location data.

WARNING

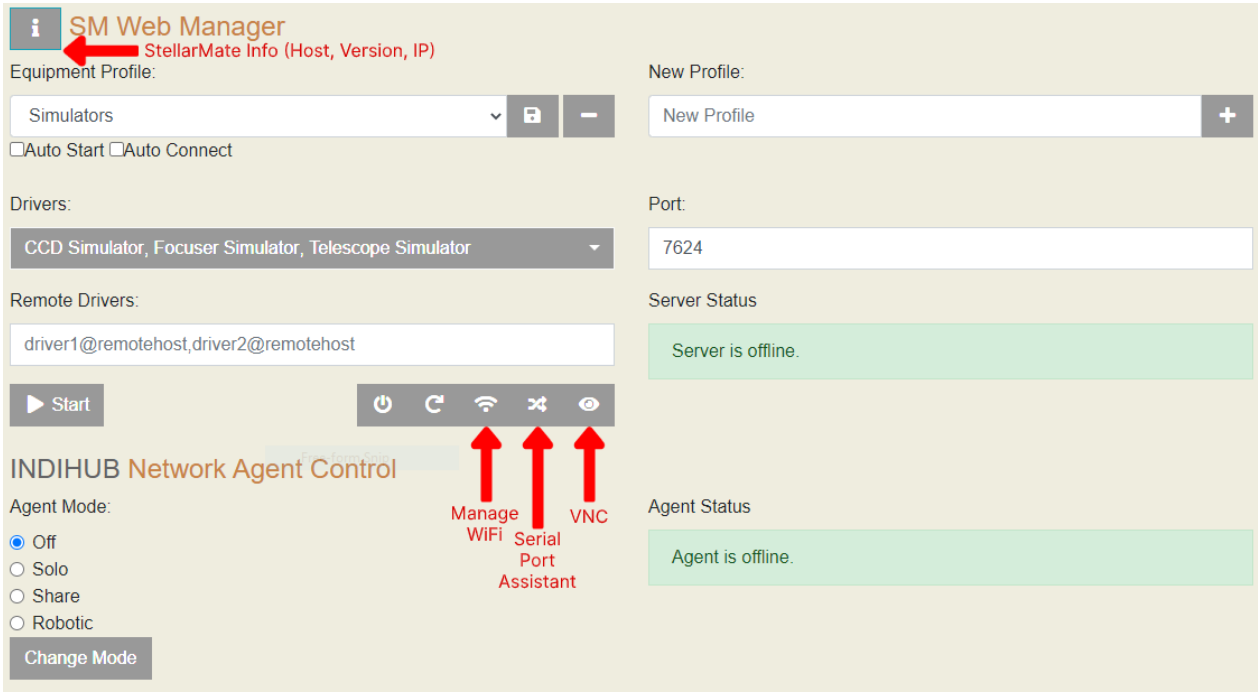
Turn off DST / Daylight Saving settings in the handset as this could interfere with correct time settings.

Web Manager

StellarMate Web Manager is a simple Web Application to manage INDI server and control StellarMate. It is accessible as long as there is a network connection (WiFi/Ethernet/Hotspot) between you and StellarMate. For example, if you are in inside the house with a PC/Mac/Tablet, you could use your browser to remotely manage StellarMate drivers.

It supports multiple driver profiles along with optional custom remote drivers. It can be used to start INDI server locally, and also to connect or chain to remote INDI servers. You can use it to Restart or Shutdown the unit, and to connect to VNC frontend from the web. Furthermore, the Web Manager provides a RESTful API where you can issue simple calls to start and stop INDI services over the network.

With the Web Manager, you can access StellarMate Serial Port Assistant and VNC. Furthermore, you can also restart and shutdown INDI from the interface.



By default, StellarMate is shipped with the Simulator profile. It is composed of the following drivers:

- Telescope Simulator
- CCD Simulator
- Focuser Simulator

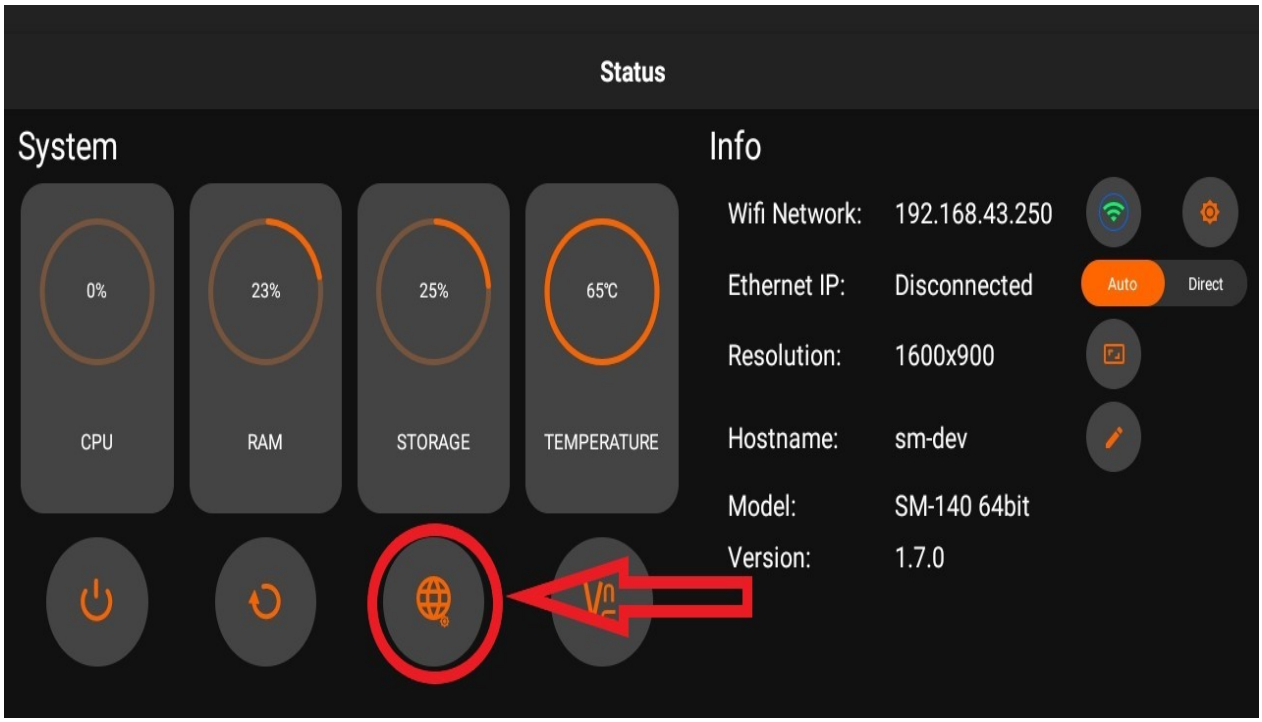
You can run the Simulator profile to test the simulators and connect to them from any client.

Web Manager URL

You can access the Web Manager from any browser at this url:

`http://stellarmate.local:8624`

Furthermore, it can be access in the StellarMate App by going to the device tab and click on Web Manager button.



> **Note**
>
> Interacting with the StellarMate Web Manager is usually not necessary since both Ekos and the StellarMate App can operate the equipment profiles directly. The Web Manager is useful when you are not using the StellarMate App and need to remotely manager the drivers directly.

Device Information

The device information button brings up an information popup to show the following information:

- StellarMate Unit name.
- StellarMate Unit model.
- StellarMate OS Version.
- List of IP addresses: Connection to StellarMate is usually done via its hostname, however, you can connect directly via IP address.

Adding New Profile

Before you add a new profile, you need to identify which drivers you need for your equipment. You can browse all available devices in the INDI Devices page, or you can simply scroll through the list of available drivers in the Driver selection dropdown. To add a new profile:

1. Enter the device name
2. Click the Plus button
3. Once the new device is added, select the appropriate drivers from the list. Please note

that you may need to run some drivers from the Auxiliary class in the following situations:

- Joystick: If you plan to use a joystick with your mount, select the Joystick driver from the auxiliary list.
- SkySafari: To monitor and control your mount from SkySafari, select the SkySafari driver from the auxiliary list.
- WatchDog: This driver is required for secure remote operation of observations. In the case of communication loss, you can configure the driver to perform a safe shutdown of your observatory.

4. Click the Save button to save your profile.
5. Click Start to start INDI server. If all goes OK, you should see a message in the notification area.

Removing Profile

To remove an equipment profile, press the Minus sign next to it. Please note this operation is permanent.

Auto Start

If you want to automatically start a particular equipment profile whenever StellarMate is powered on, check the AutoStart checkbox.

Auto Connect

In addition to Auto Starting an equipment profile, you can also connect all equipment which is equivalent to pressing the connect button for all the drivers. The connection command is usually sent 2 seconds after starting the profile. To enable auto connection, check the Auto Connect checkbox.

Starting & Stopping Server

Click Start to establish the INDI server. The list of active drivers running should be displayed in the info box. Once the server is established, you can connect to StellarMate from any INDI client.

Note

If you are using Ekos, you do not need to manually start/stop drivers in the web manager. Simple check INDI Web Manager checkbox in Ekos Profile Editor, and Ekos manages starting/stopping INDI drivers transparently.

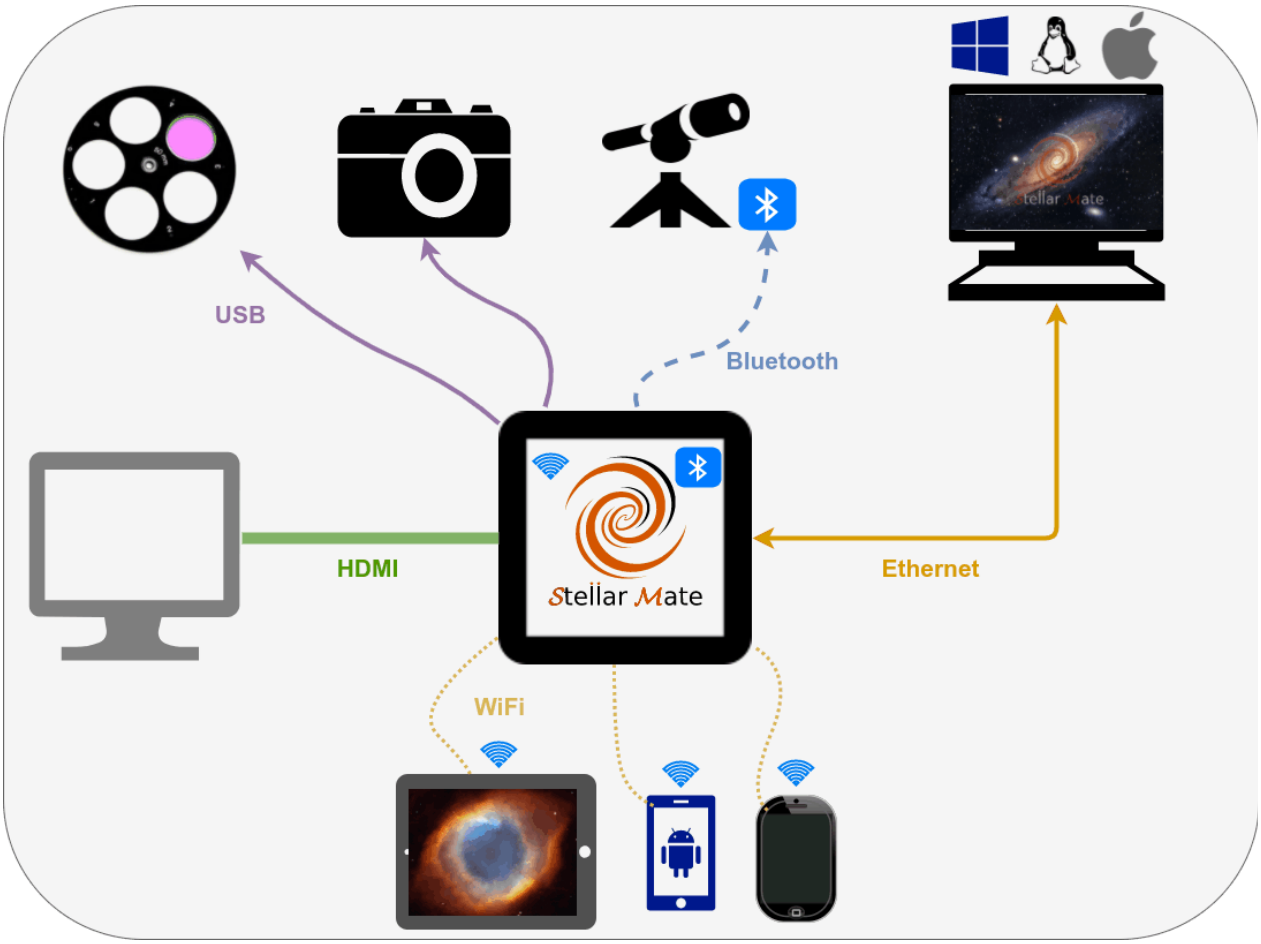
Serial Port Assistant

StellarMate supports a broad range of astronomical equipment including Mounts, DSLRs, CCDs, Focusers, Filter Wheels, Domes, Weather Stations, and other Auxiliary devices. For a complete list, please check INDI Devices Page.

StellarMate Equipment video

All equipment must be powered before you connect them to StellarMate. Most astronomical devices can be connected to StellarMate via the following methods:

- USB. This includes Serial-To-USB devices.
- Bluetooth
- Network: Wired or Wireless



USB

Most equipment is connected via USB. StellarMate is equipment with 4 USB ports. However, it is highly recommended to use an external powered USB Hub as it can reliably support power to your equipment.

WARNING

Most problems in operating your equipment with StellarMate are related first and foremost to power problems. Therefore, please invest in reliable power supply for all your equipment!

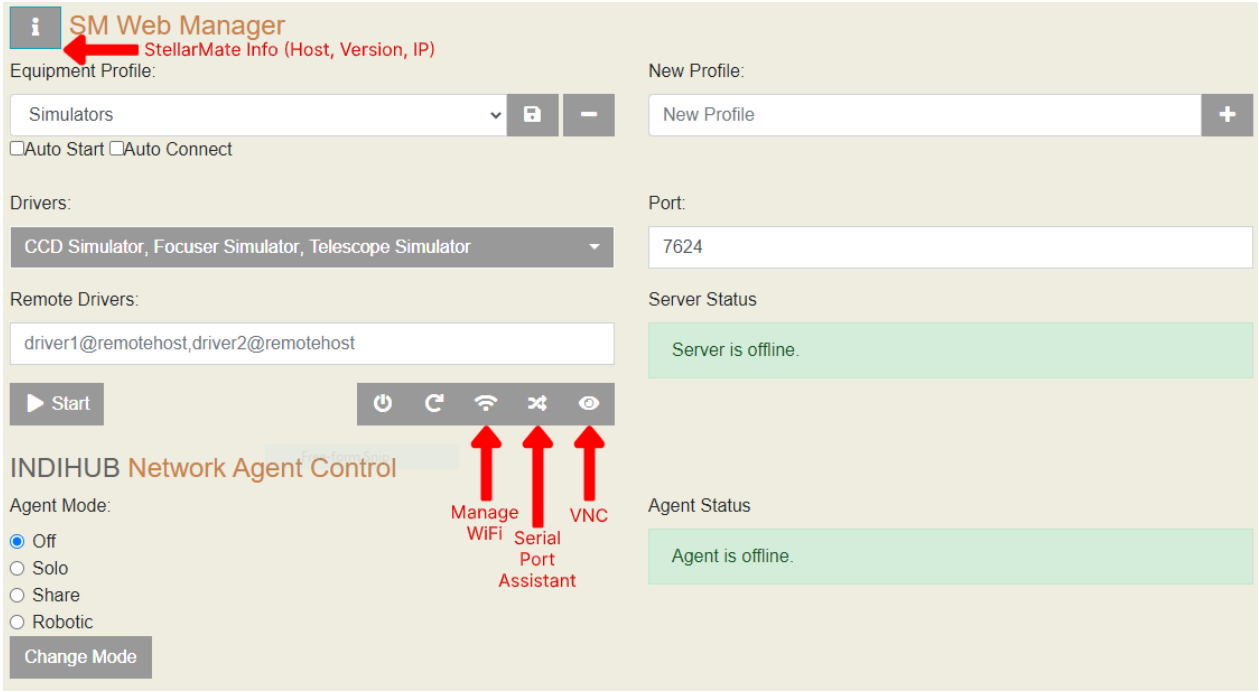
For many Mounts & Focusers that use RS232 connectors, you need to purchase a Serial-To-USB adapter suitable for your Focuser model from the manufacturer. When you plug in your Serial-To-USB devices, they are assigned a specific port under StellarMate

(e.g. `/dev/ttyUSB0`). However, this port is not static. That is, next time you plug in the same device on another session, it might get assigned another port (e.g. `/dev/ttyUSB1`). Since INDI drivers require the port name to communicate with the device, this could lead to communication issues. With the help of StellarMate Serial Port Assistant, you can assign permanent designations for your devices so that they always get the same port whenever they are connected.

Network

Some devices can be connected to over the network (TCP/IP). For such devices, the only requirement is that the device is available on the same subnet as StellarMate. To connect to a networked device, you need its IP address (or hostname) and its port.

StellarMate Serial Assistant



Serial Port Assistant ensures that your serial device designations are saved permanently. When you plug your mount, it is assigned a random port (e.g. `COM2` or `/dev/ttyUSB1`). This port is required in order for INDI to communicate with your mount. Using the assistant, you can assign a permanent ID to your device (e.g. `/dev/mount`). Therefore, every time you plug in your device, it is always assigned a designated port that INDI uses to communicate with the device.

To use the Serial Port Assistant, go to StellarMate Web Manager either from StellarMate App or from any browser and click on the Serial Port Assistant Icon at the bottom right. Simply follow the instructions in the step-by-step guided wizard to assign permanent designations to your Serial-To-USB devices.

Video Tutorial: https://www.youtube.com/watch?v=VQHUaO5Hmi0

Note

StellarMate Serial Assistant is only applicable to Serial-To-USB devices, for regular USB devices, do not use it.

StellarMate Control Panel

IMPORTANT

In order to open the StellarMate Control Panel you need to be connected to the same network as your StellarMate.
If StellarMate is in hotspot mode, you can connect to it by going to your computer/laptop WiFi settings and connecting to the SSID `stellarmate` with the password `stellar@mate`

Do not open StellarMate Control Panel from StellarMate itself, it is meant to be opened from your computer/laptop.

StellarMate Control Panel is a web application for StellarMate OS. It provides any functions such as displaying the connection status of the controller, backup and restore, network and factory reset, etc.

Status Bar

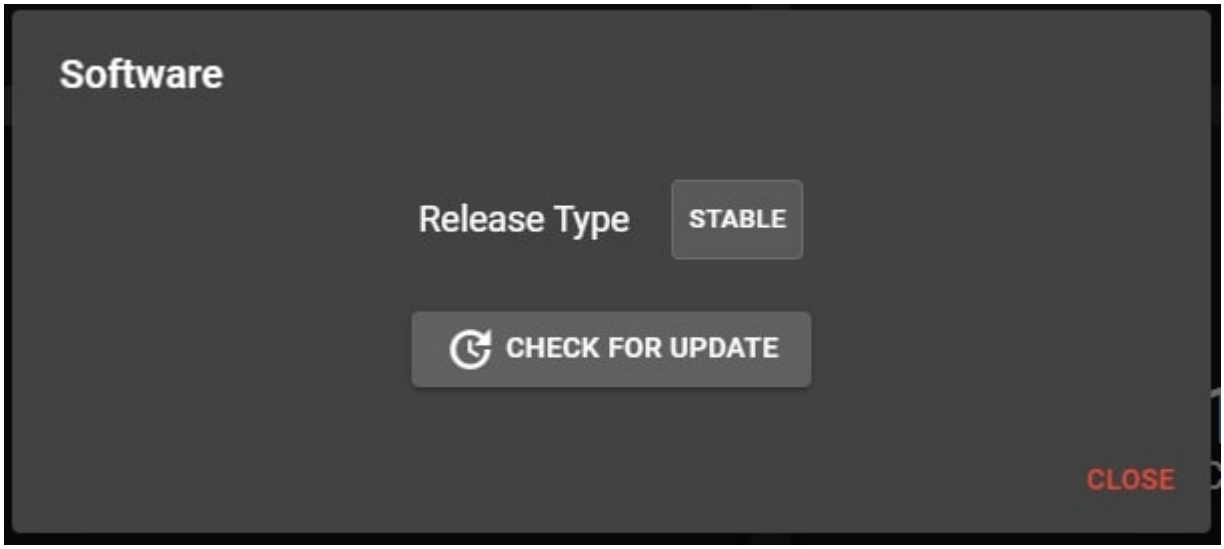
The Status Bar is available on every page on the top-right corner as it is informative to the user and has some shortcuts.

The Status Bar has the following features:

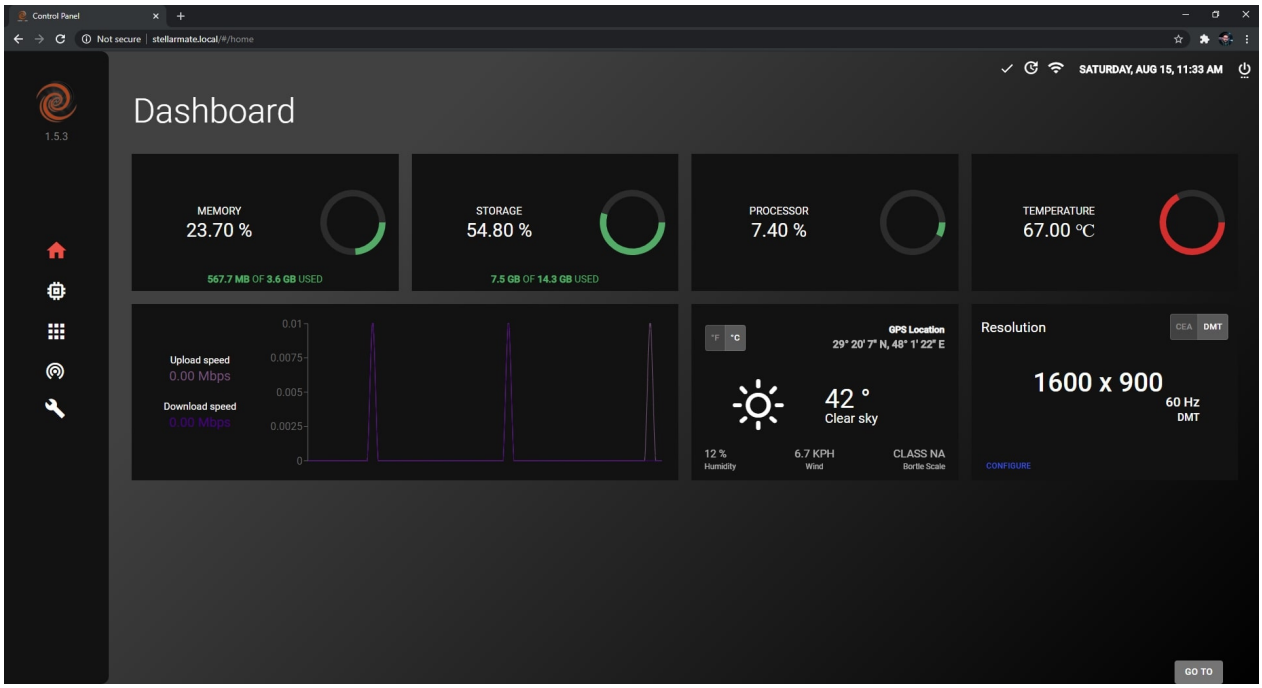
- Shows the connection status
- Shortcut to update StellarMate OS build
- Shows the type of connection to StellarMate (Hotspot, WIFi or ethernet)
- Shows the Date and Time
- Allows shutting down or restarting StellarMate

If the connection is spotty and keeps getting disconnected, the status bar will inform you by showing a yellow exclamation icon.

To update using the status bar, click on the update icon and a dialog will pop-up, allowing you to check for an update and install it.



Dashboard



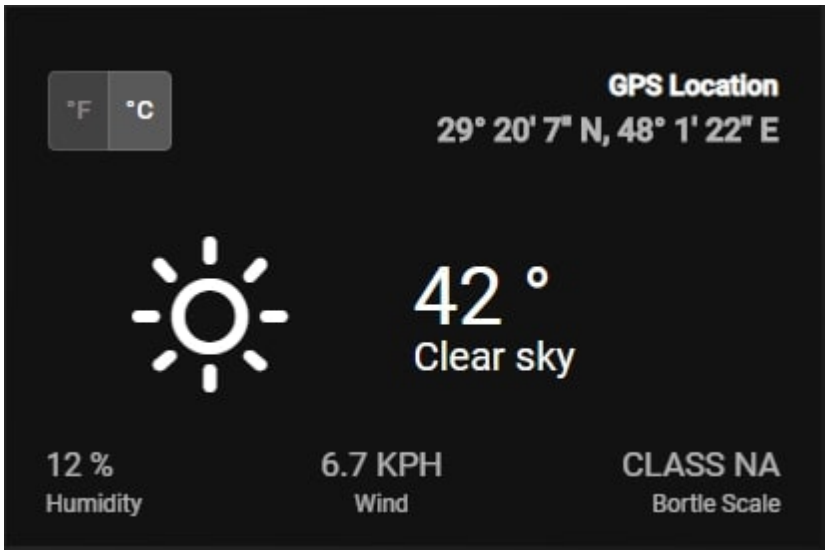
The home page of the StellarMate Control Panel is the Dashboard, which shows the

following information:

1. RAM Usage
2. Storage Usage
3. CPU Usage
4. Device Temperature
5. Network Graph
6. Weather and Location Information
7. Screen Resolution

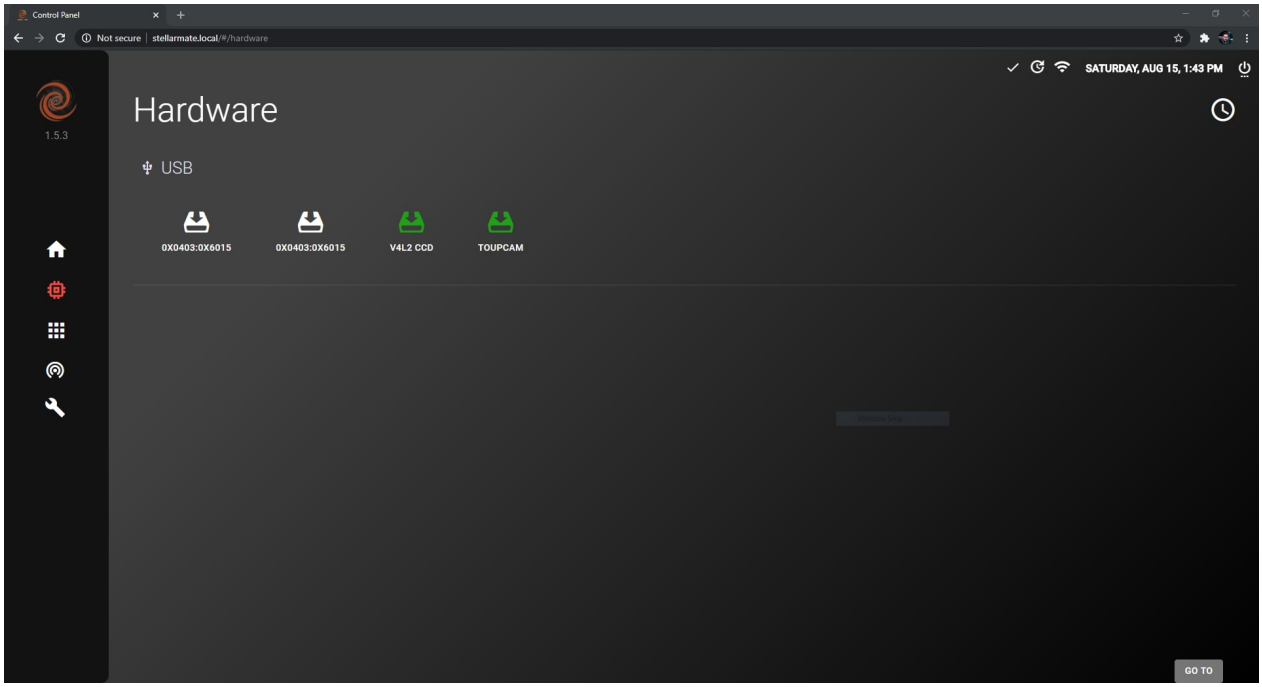
Weather Units

Weather units can be toggled from Metric to Imperial and vice-versa.

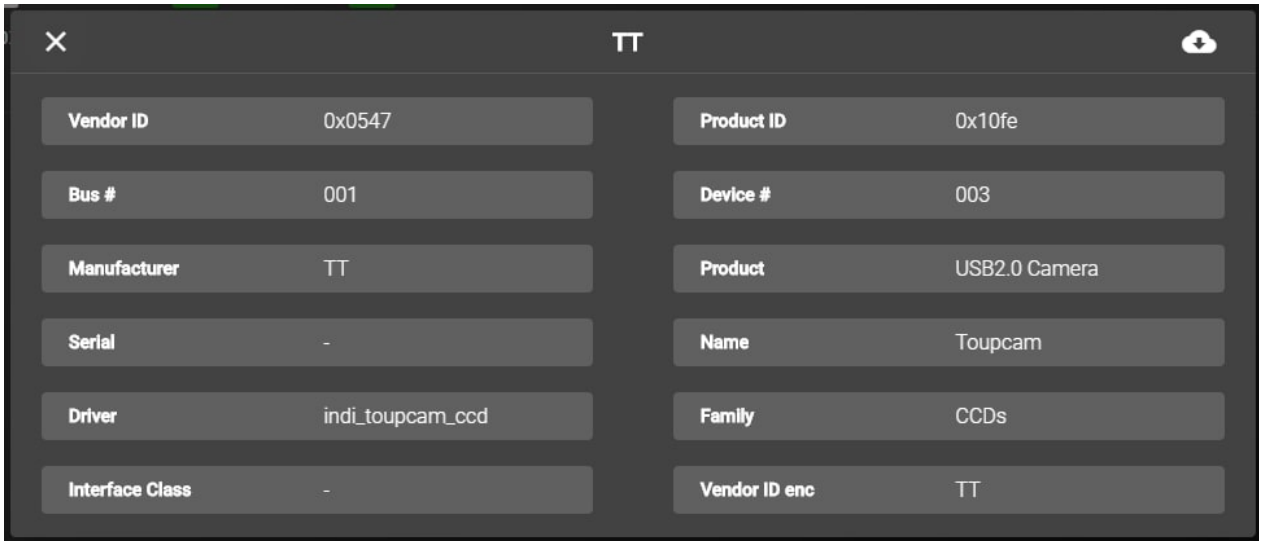


Hardware

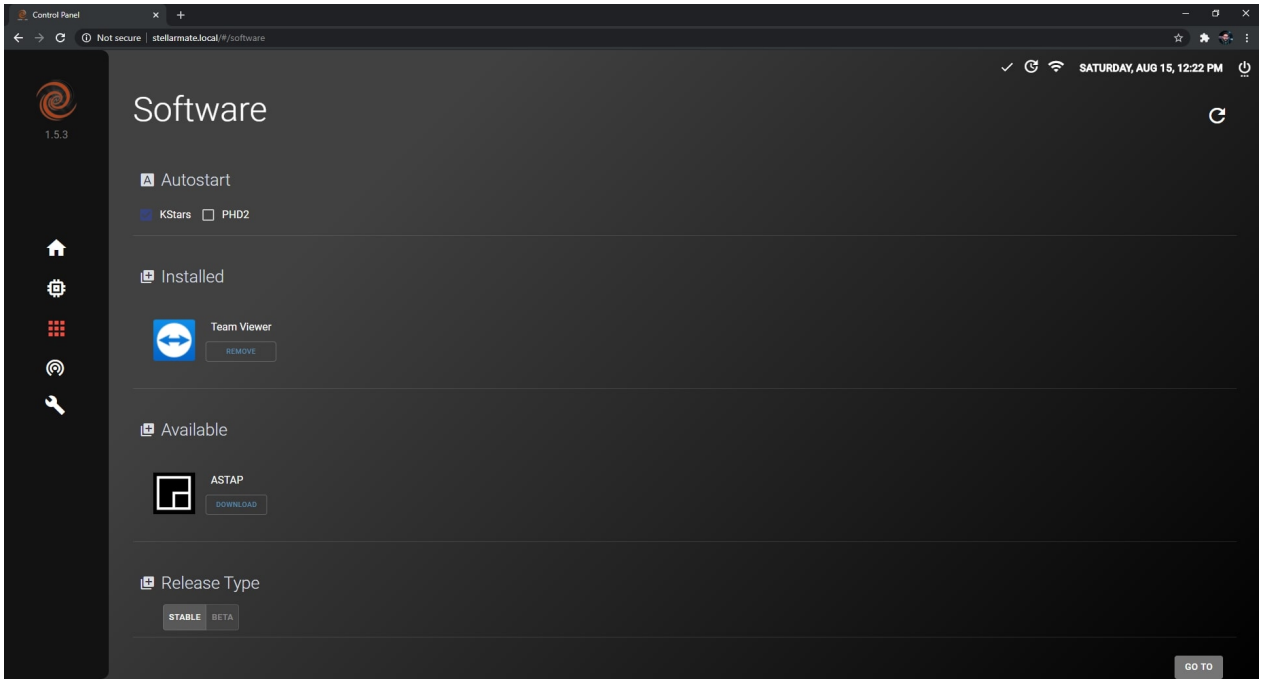
In this page, you can see all the hardware devices that are connected to StellarMate.



Clicking on a device will show its information, which can be downloaded by clicking on the Download button (cloud icon) on the top-right.



Software



Auto Start

In the software center it is possible to toggle Auto Start for KStars and/or PHD2. If toggled on, it allows KStars and/or PHD2 to start-up with StellarMate OS.

Installed

Installed applications appear in this section and you can remove/uninstall them by clicking on the remove button.

Available

Applications that are available for download appear in this section and you can install them by following these steps:

1. Click on Download
2. Wait for download to complete
3. Click on Install

The application should now be installed on your StellarMate.

Release Type

You can switch between the Stable and Beta releases. The Stable release -as the name suggests- is stable, has the main features of StellarMate OS and does not contain show-stopping bugs. The Beta release is not very stable, and it has drivers and new features such as incomplete drivers for unsupported devices. The new features might've not been tested completely and can sometimes be buggy since there might be show-stopping bugs which were not caught by StellarMate developers.

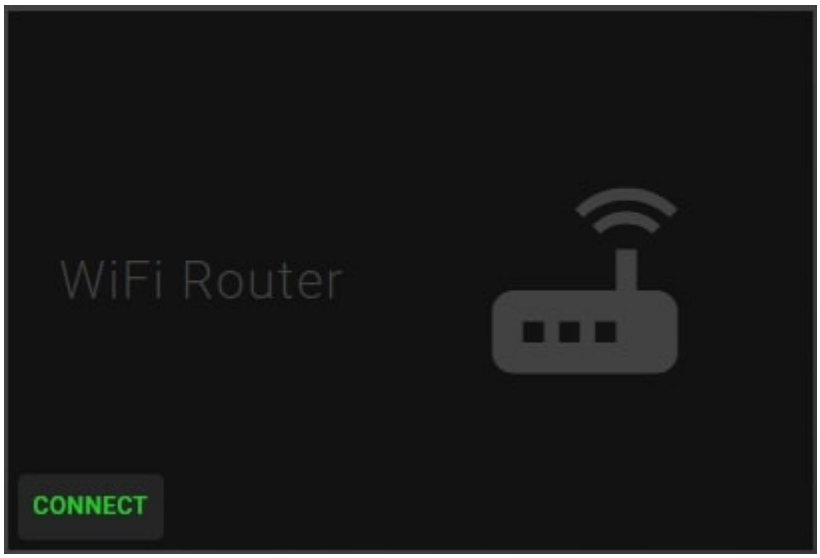
Network

Wireless

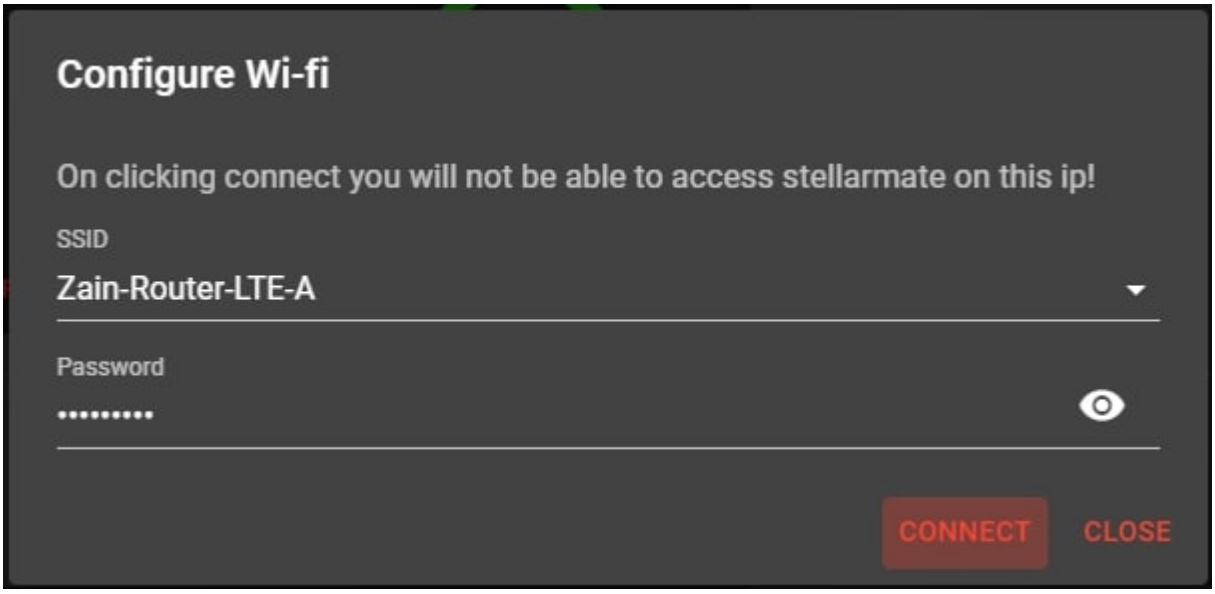
You can connect to StellarMate through a WiFi Router or the broadcasted HotSpot network.

To connect to StellarMate through a WiFi Router, you have to connect StellarMate to the WiFi Router first by following these steps:

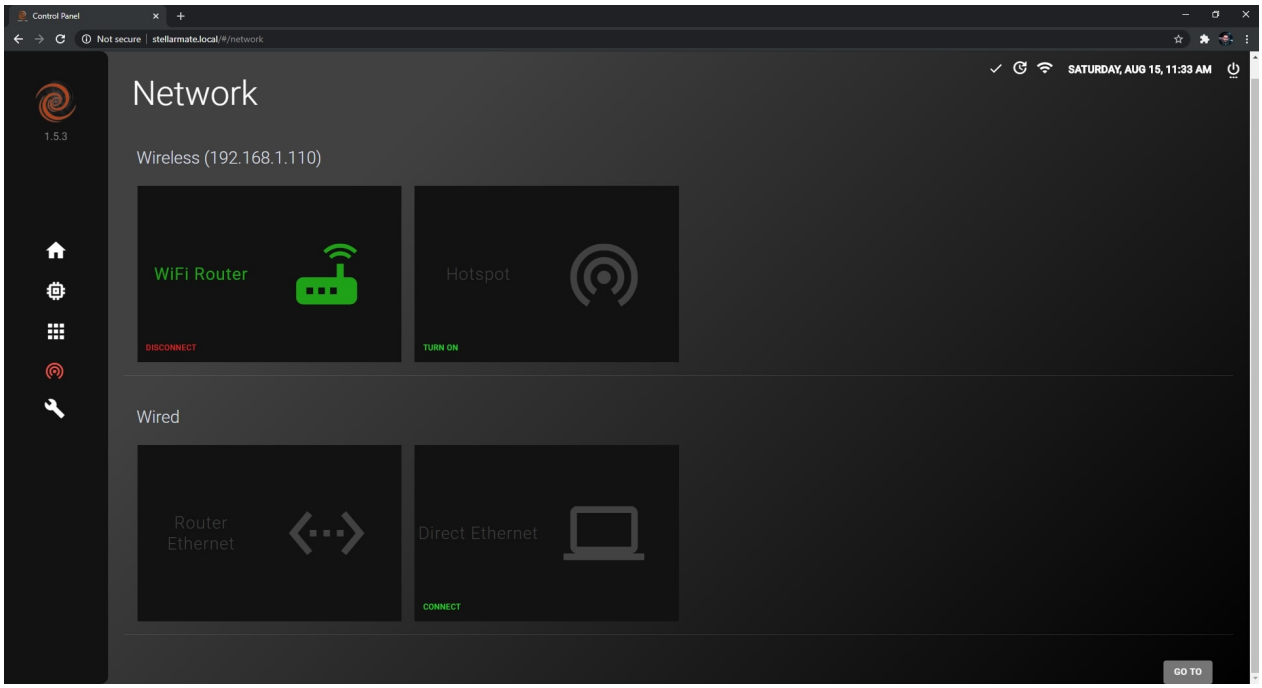
1. Click on Connect on the WiFi Router card



2. Select your WiFi Router network connection and then put in the password if there is one, then click on Connect.



3. Connect to the same WiFi network on your computer/laptop and then refresh the page, the network page should look like the image below.



W

You can always switch back to HotSpot mode whenever you want by clicking on the Turn On button under HotSpot.

Wired

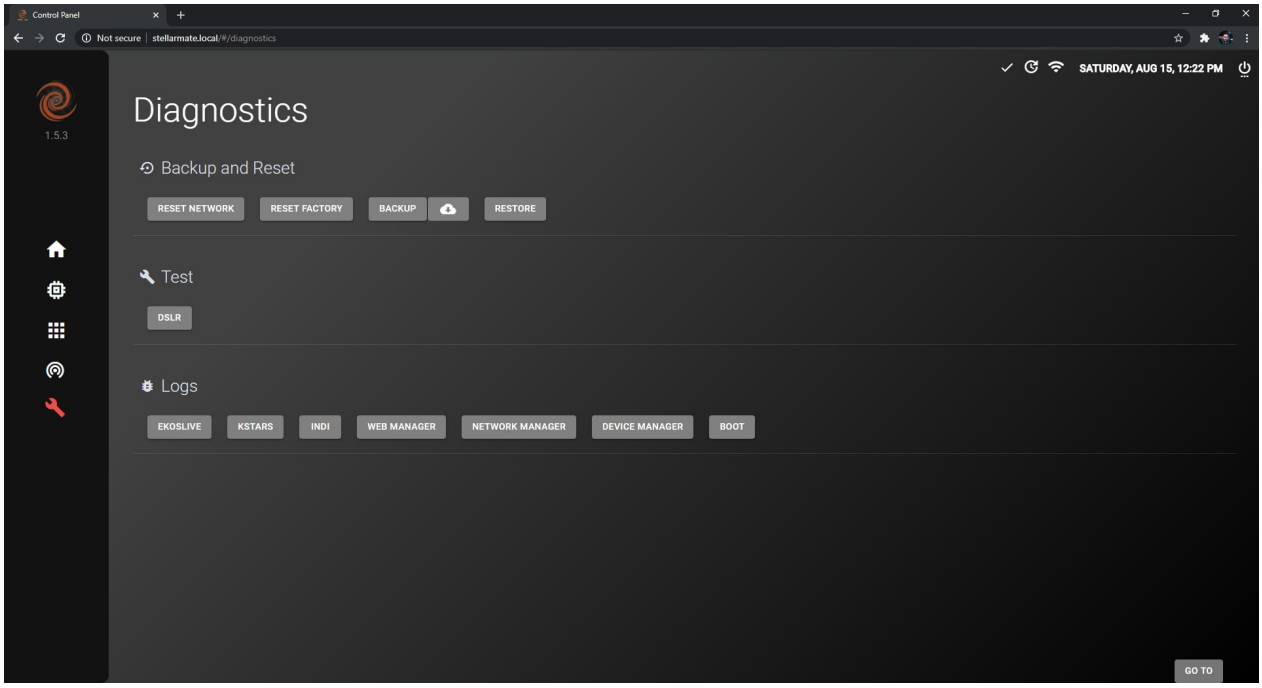
StellarMate can be connected through Router Ethernet or Direct Ethernet

To connect to StellarMate through Router Ethernet, just connected an Ethernet cable to StellarMate and connected the other end to your Router.

Now connect to the same network on your computer and refresh the page.

To connect to StellarMate through Direct Ethernet, follow the video tutorial on this page.

Diagnostics



The Diagnostics page contains Backup and Reset functions as well as many important information to help StellarMate developers fix any issues that StellarMate users face.

Backup and Reset

This section provides the user with the ability to:

- Reset Network: In case you face any persistent problems with the network settings, you can reset all network settings to default by clicking on the Network Reset button. Any WiFi networks or manual network settings will now be discarded. StellarMate must be restart for this change to take effect.

- Reset Factory: In case StellarMate is experiencing unresolved instablities, it is possible to restore it to Factory Settings by click on the the Factory Reset button. After the confirmation dialog, you need to enter StellarMate password (default: smate). The controller name is reset to stellarmate. It must be restarted afterwards.

- Backup: StellarMate settings can be backed up to a file to help in restoring any settings when either flashing a new StellarMate OS or in case in restoration of damaged SD card. The settings include all KStars and INDI settings which includes the profiles and driver-specific options. This creates a backup compressed file that can be used later to restore your StellarMate configuration.

- Restore: StellarMate settings can be restored through a backup file generated by the backup function.

Test

Test your hardware devices such as DSLR. This will tell you if your DSLR is working correctly with StellarMate or not.

Logs

In order to check the logs, you can
Extract logs for diagnosing an error or an issue that has happened during usage of StellarMate.
This can be used by StellarMate developers to help fix the issue. StellarMate support may ask you to attach logs in your support ticket if they need to investigate the issue.

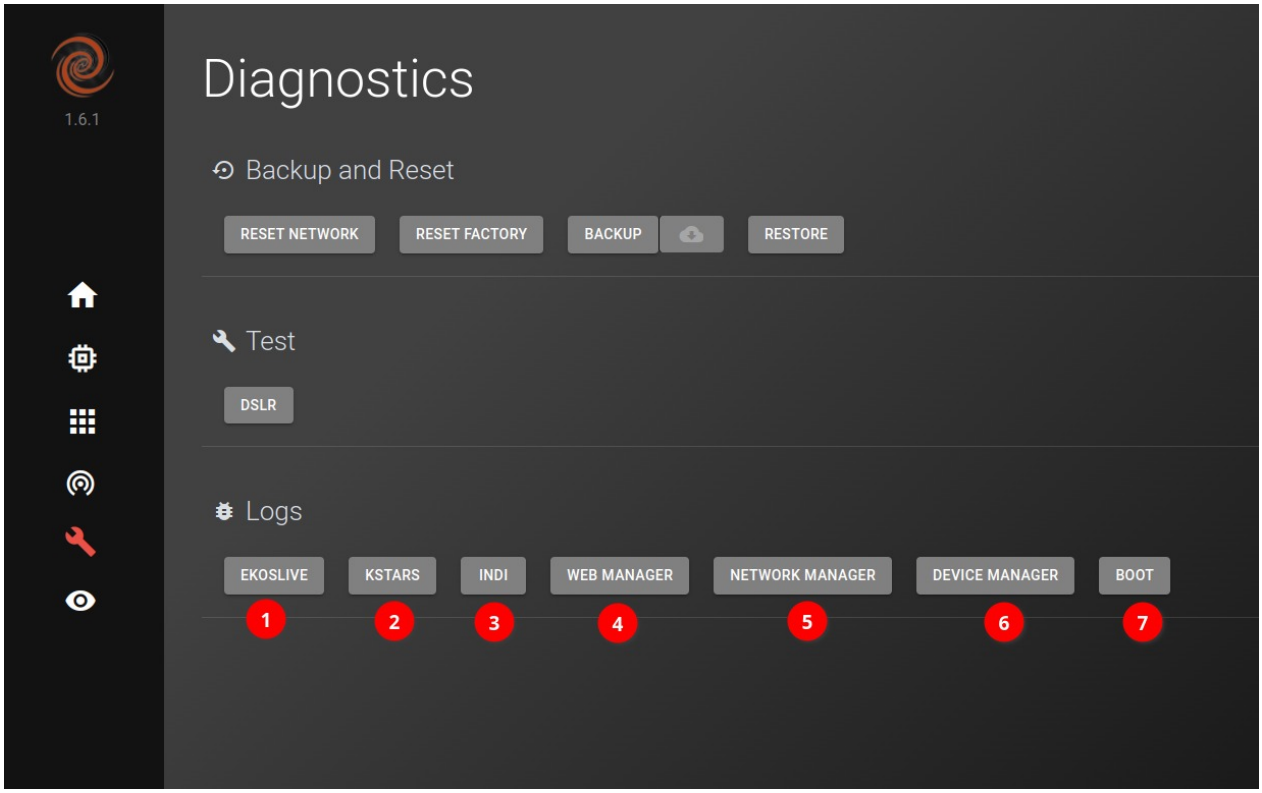
Backup and Restore Process

This is an instructional guide for the Backup and Restore process.
It will be explained step by step in this section of the manual.

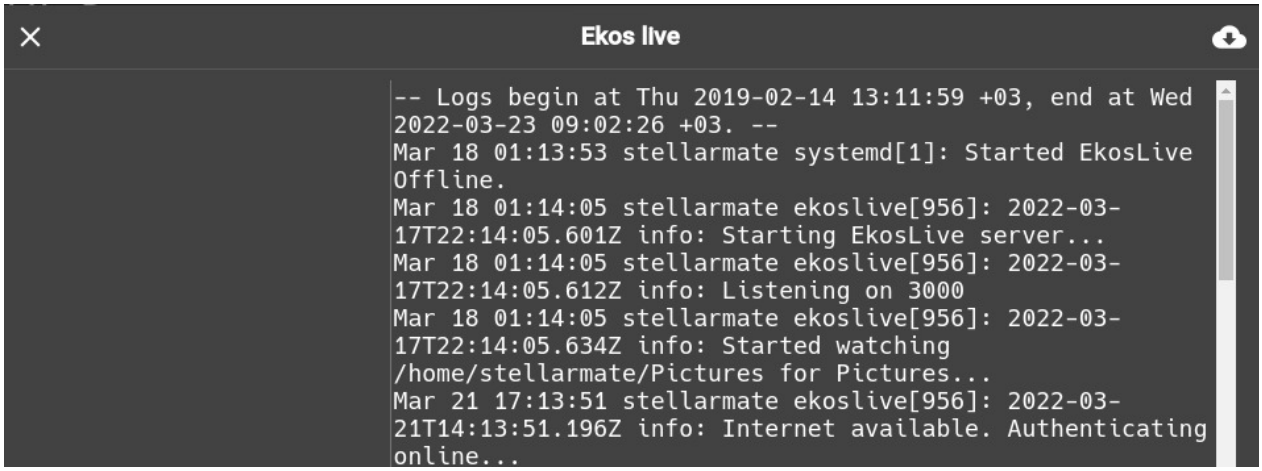
Backing up StellarMate configuration

In order to backup your StellarMate configuration, please follow these steps:

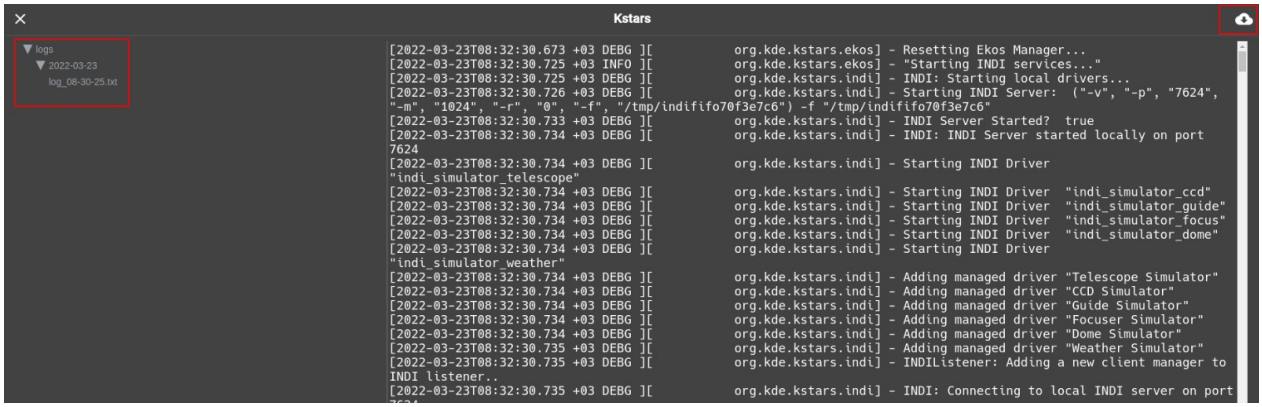
1. Click on the **Backup** button.

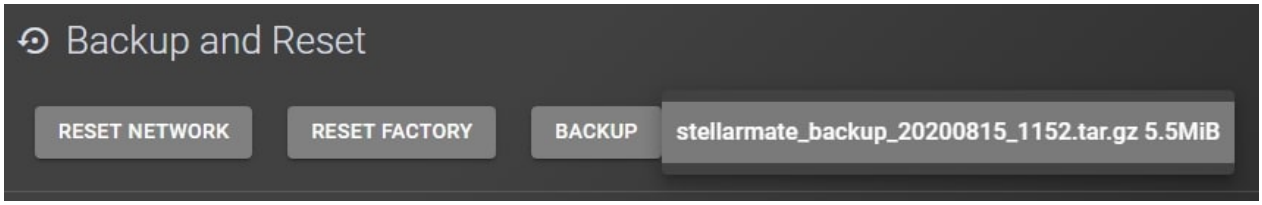


2. Wait for the Backup process to generate a backup file, this might take long if you have lots of images.

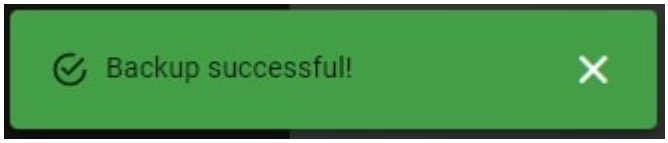


3. Click on the Download button (cloud icon) and select the backup file that has been generated.





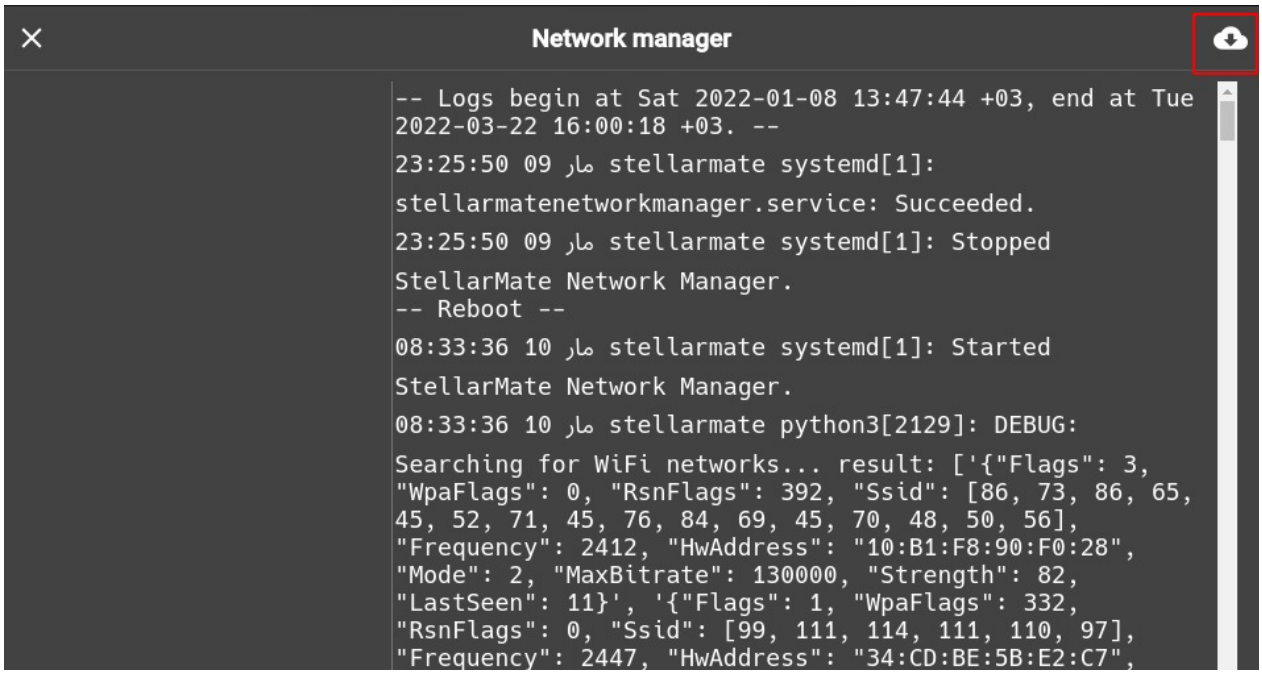
4. You should get a Backup Successful message. You should You now have a backup file on your computer that you can use later to restore your StellarMate configuration.



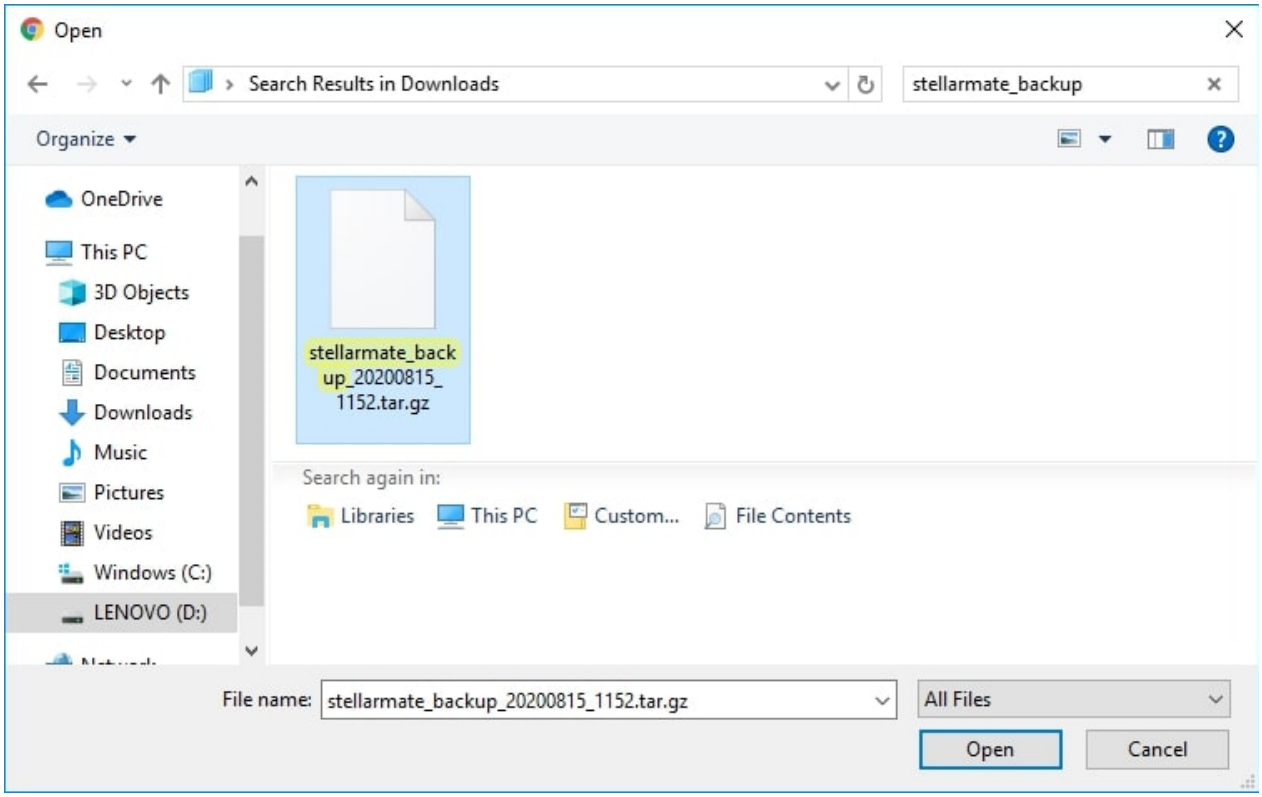
Restoring StellarMate configuration

In order to restore your StellarMate configuration, please follow these steps:

1. Click on the Restore button.

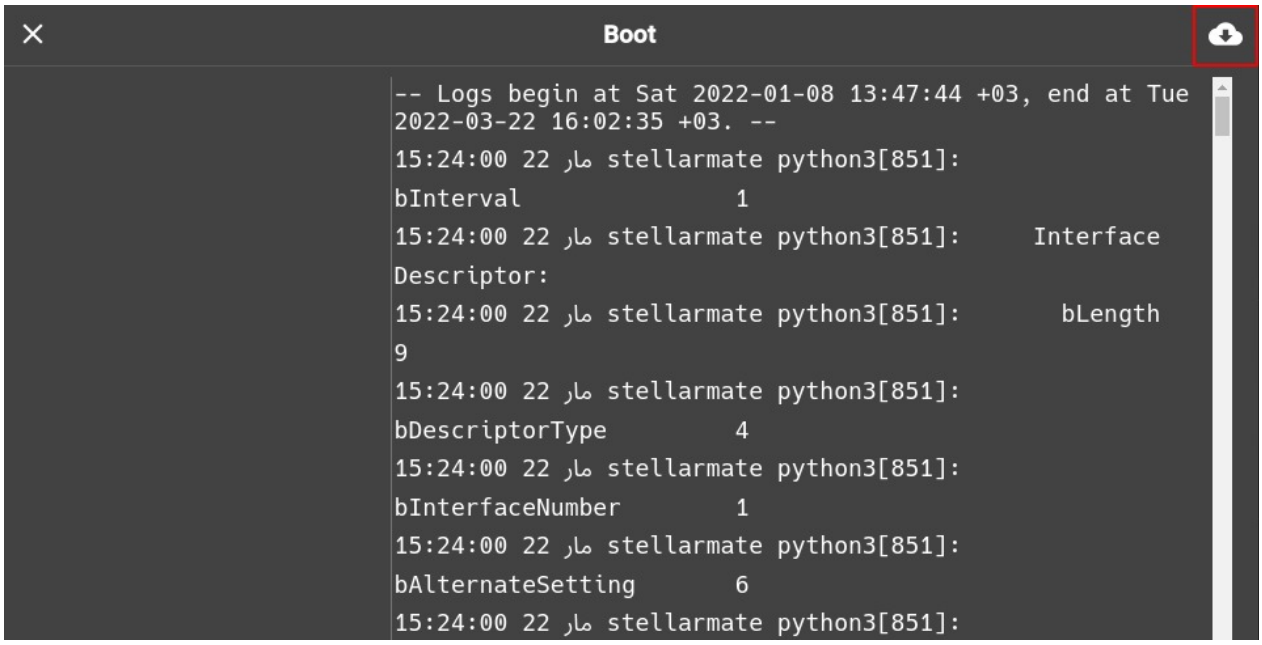


2. Select your backup file and click on Open.



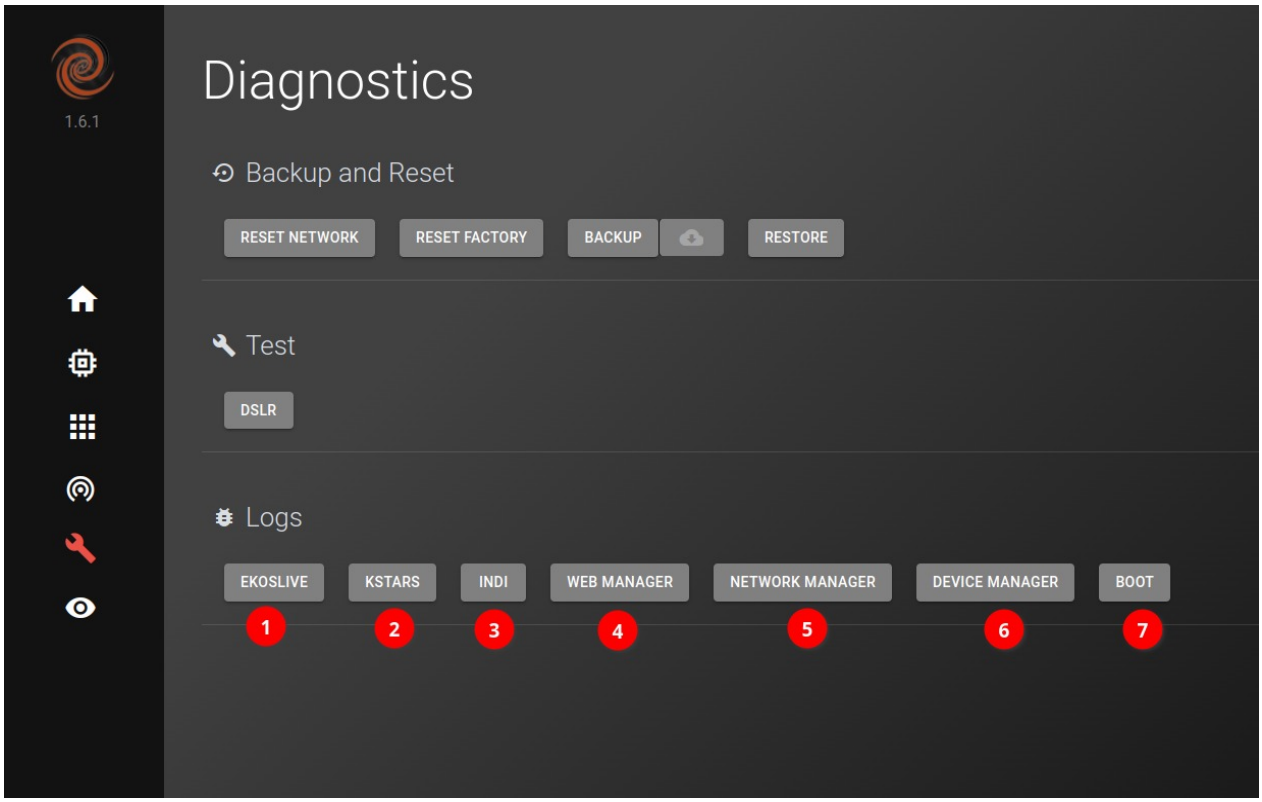
3. Wait for the upload process to complete.

4. You should get a Upload Successful message, which means that the restore was successful.



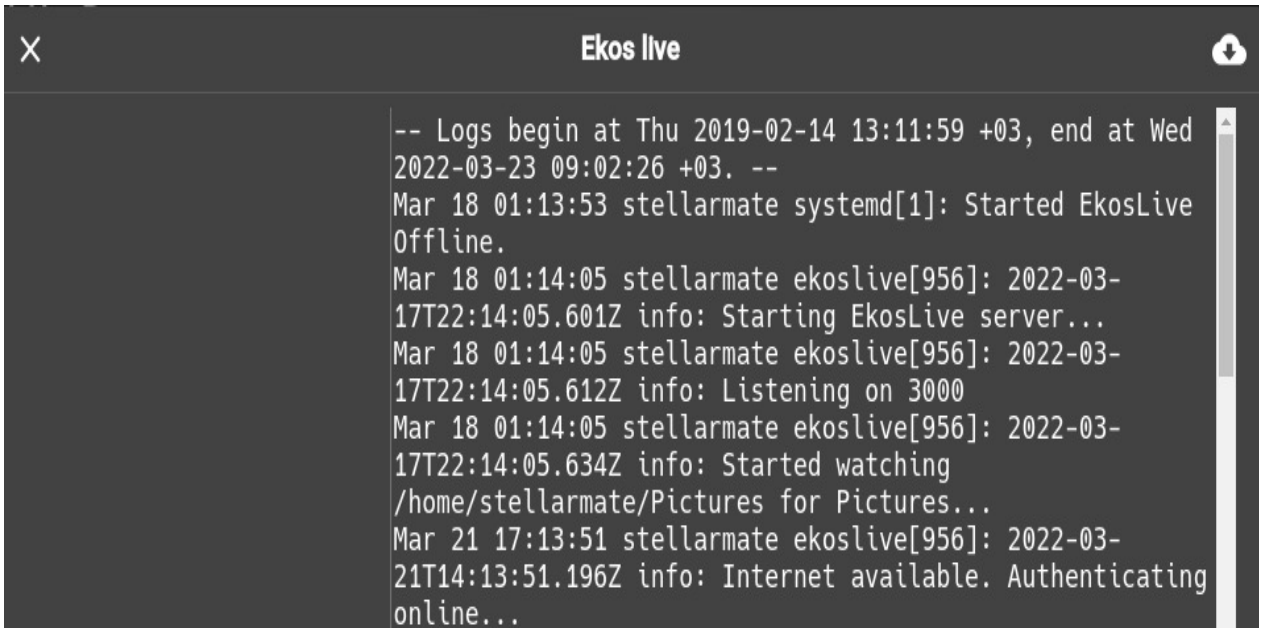
Logs

EkosLive logs should be sent to the Stellar Mate support when there are issues about EkosLive being down or for issues with Live Stacking.
This is an instructional guide for how to View or Extract Logs.
It will be explained step by step in this section of the manual.



Logs can be viewed and also download from the Icon on top-right side.

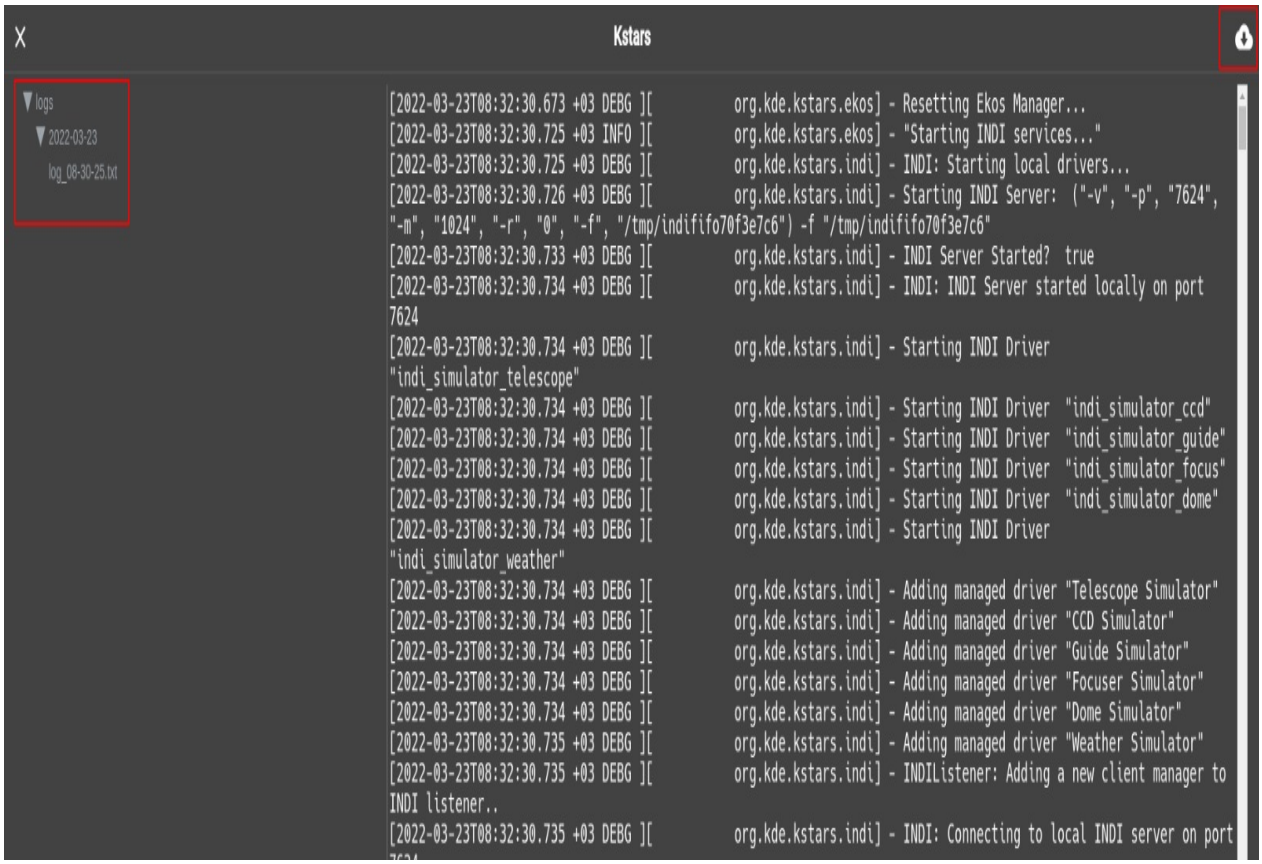
1. EkosLive



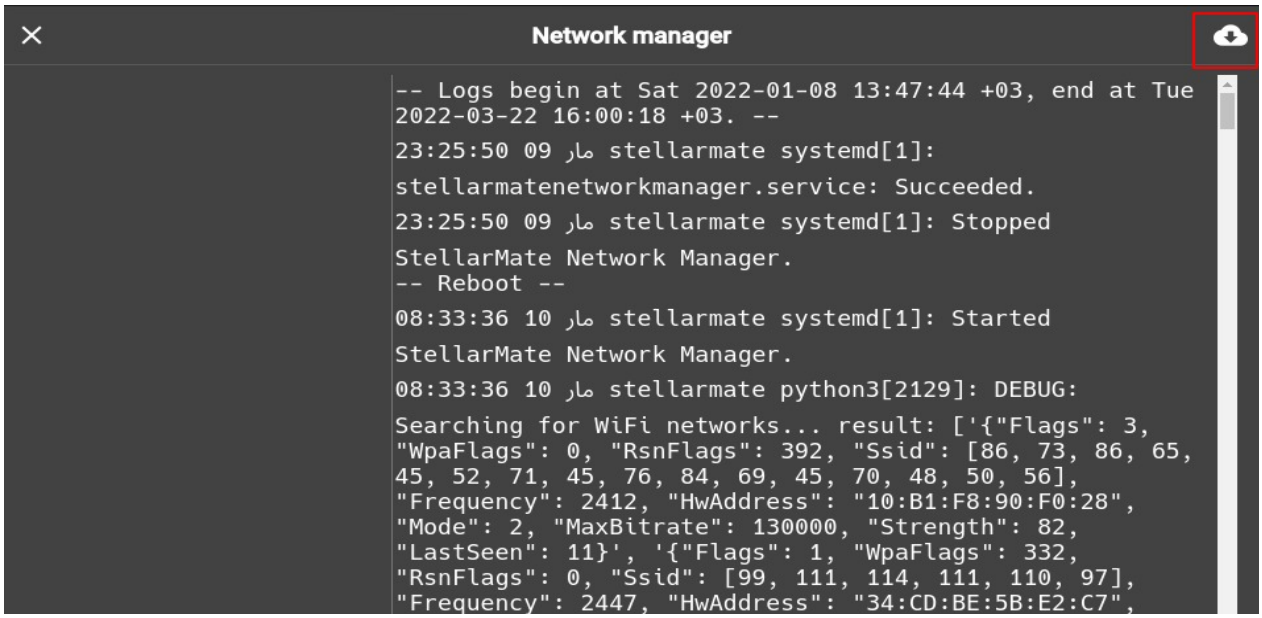
2. KStars & INDI:

You can view the logs for kstars and INDI as well. On the left side, you can see different files for each day

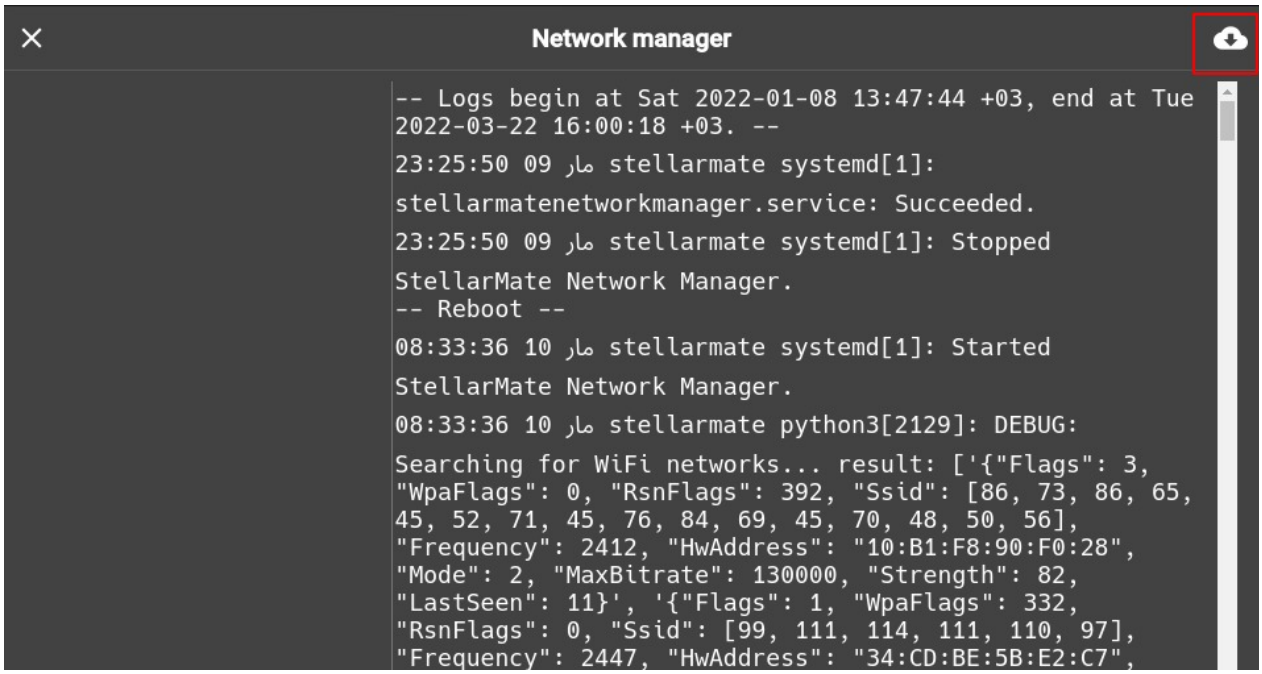
Note: You can also watch the Video on how to enable logging in Kstars from the link given below:
https://www.indilib.org/individuals/logs-howto.html



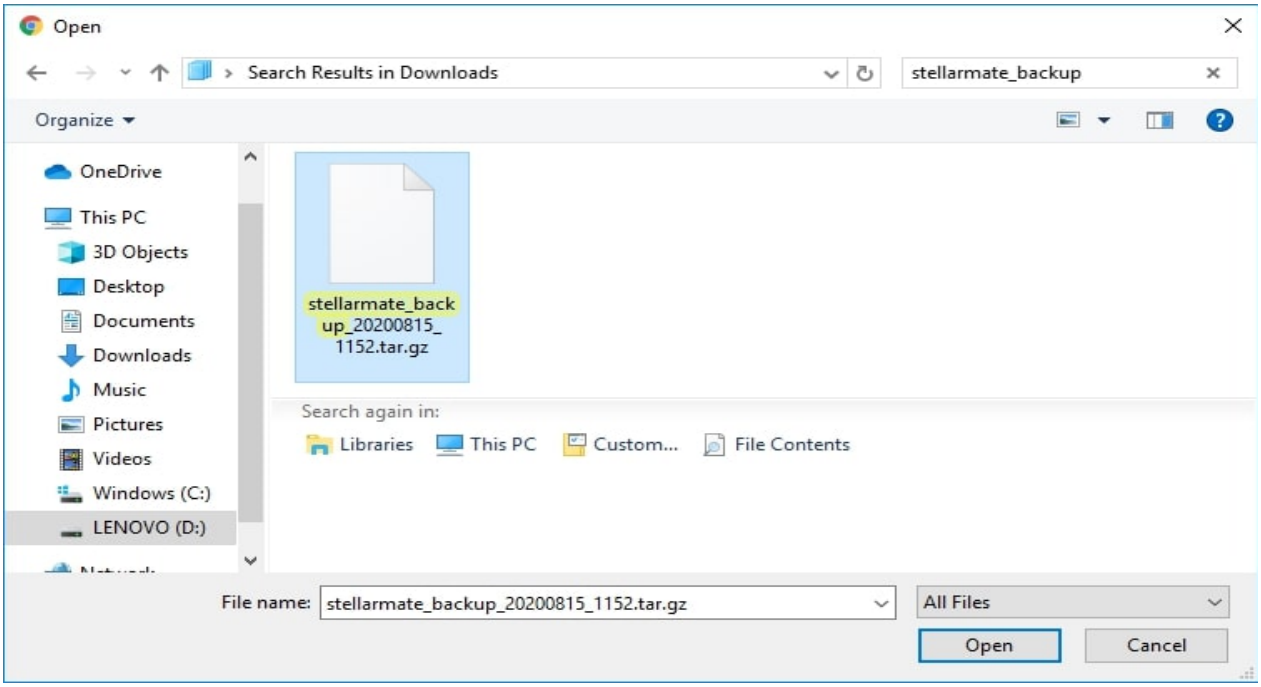
4. Web Manager



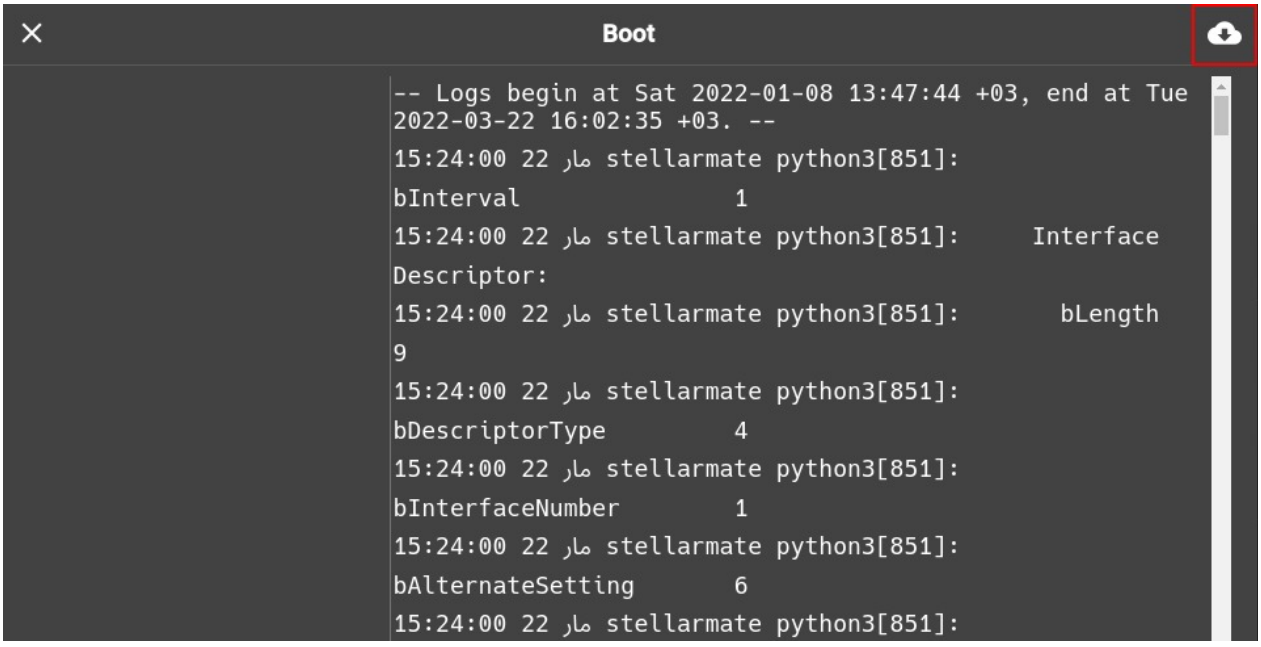
5. Network Manager:



6. Device Manager:



7. Boot:



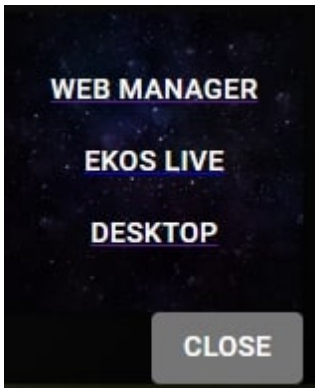
Goto

In every page of the StellarMate Control Panel, there is a GOTO button on the bottom-right corner.

Clicking on GOTO opens up a menu that allows you to navigate to 3 different areas.

- Web Manager
- Ekos Live

- Desktop (VNC)



EkosLive

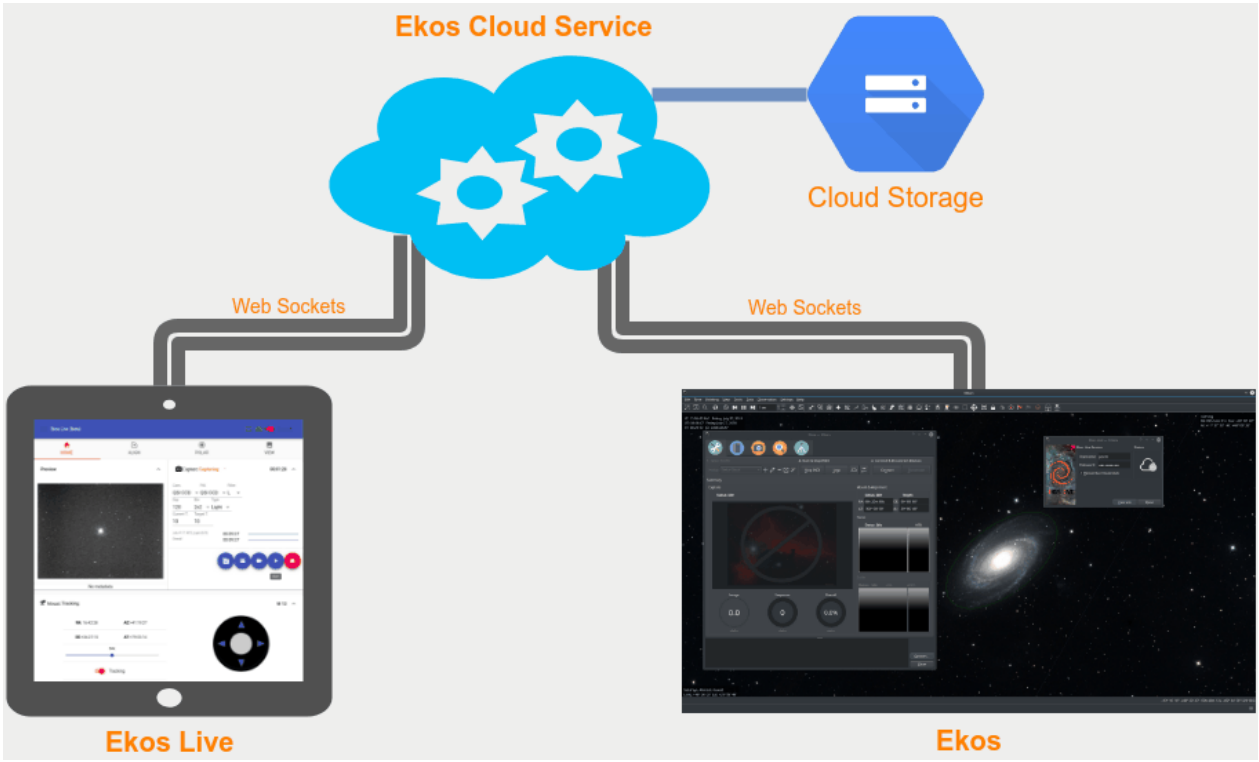
EkosLive is an online Real Time cloud-based Web Application to remotely control your equipment from anywhere and at any time. Get notifications about the imaging progress, watch a live video feed of planets, align your mount, and auto-focus, auto-guide from one central location. Use it on your phone, tablet, or computer.

The interface is designed to be flexible on whatever platform you prefer. If you're mobile, you can get the best results by using it on your tablet.

Video Tutorial: https://www.youtube.com/watch?v=bc6P9OjYmI0

How does it work?

EkosLive requires an internet connection. A fast and high bandwidth internet connection is recommended since image transfer depends on your internet speed. A low-bandwidth internet for device control is sufficient.



Cloud Storage is available for EkosLive Pro users. Captured images (not preview) may be saved to the cloud as lossless compressed FITS images (.fits.gz). Users can view the cloud images and utilize an advanced metadata system to search and categorize their images.

Supported Browsers

EkosLive is compatible with many modern browsers on desktop & mobile. However, we highly recommend using Google Chrome on all platforms to get the best experience.

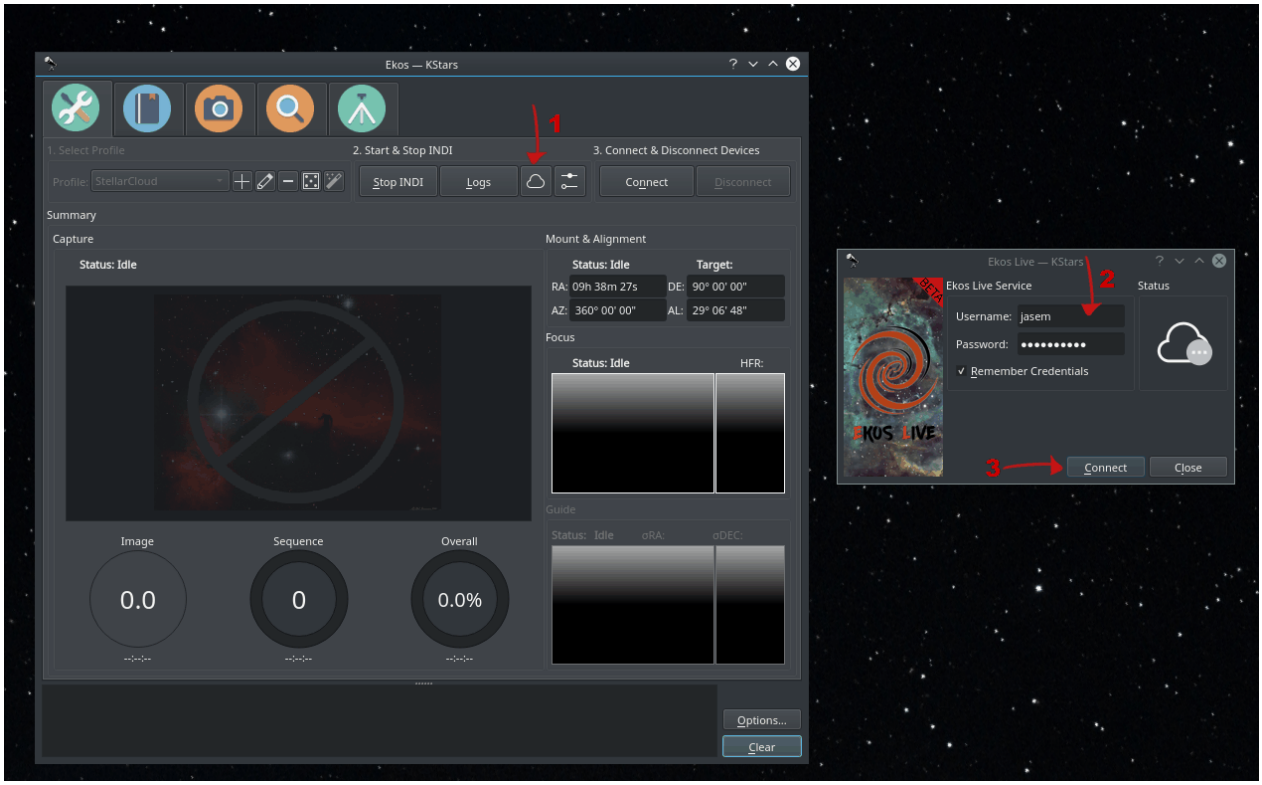
Firefox is unfortunately not supported at the moment since it does not support dual websocket technology that is employed in EkosLive.

Getting Started

After you subscribe to EkosLive (Basic or Pro plans), you will be redirected to the EkosLive URL at https://live.stellarmate.com. Bookmark this URL for easy access in the future.

Connecting Ekos to the Cloud

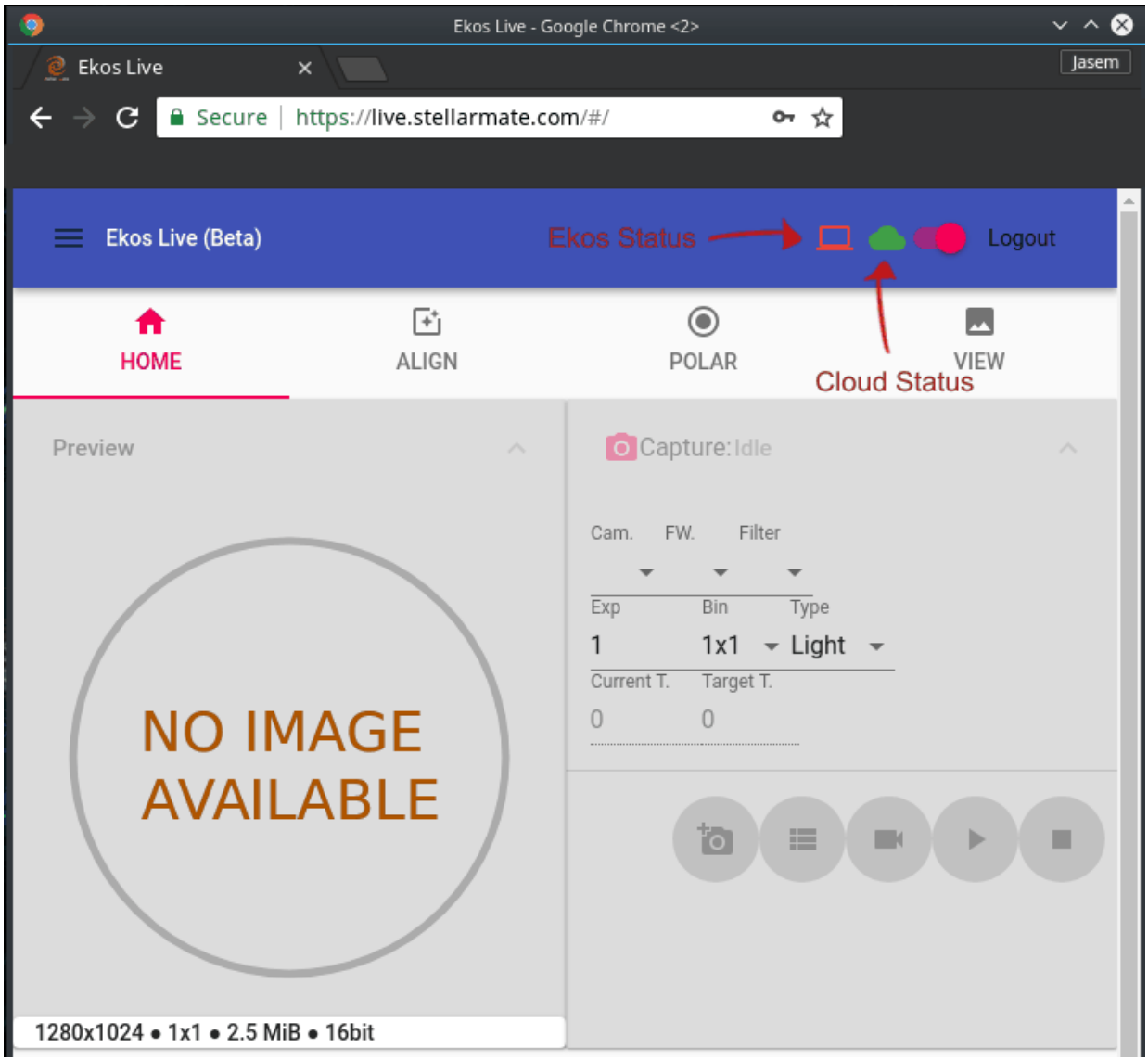
Before you can use EkosLive Web Application, Ekos must be connected to the cloud. You can find the Ekos cloud icon on the main screen as illustrated below:



After successful authentication, the EkosLive cloud icon should turn Green. Now you are ready to use EkosLive Web Application.

Using EkosLive Web Application

Go to the EkosLive URL and login with your username & password. After login, the EkosLive Home screen should be displayed:



In the main toolbar, the following controls/icons are visible:

- Main Menu : Click here to access the following:
  - Profiles: Start/Stop Ekos Profiles
  - Settings: Change EkosLive Settings such as notifications, sounds, and theme.
- Ekos Status Icon: When Ekos is connected to your equipment, this icon should turn . When no profile is active and Ekos is not connected to your equipment, this icon should turn .
- Cloud Status Icon: This icon should remain as long as you are connected to the internet. If it turns , check your internet connection.

If no Ekos Profile was started before connecting to EkosLive, the Ekos Status Icon should be Red. You can either start the Ekos Profile directly in Ekos, or by clicking the Menu, and then selecting Profiles, and then selecting which profile to start. Once the Ekos Profile is

active, you can start using EkosLive controls.

EkosLive FAQ

Questions on EkosLive Real-Time Web Application for Observatory Control & Monitoring.

1. What is Ekos Live?
2. Is EkosLive a replacement for Ekos?
3. Is EkosLive free?
4. Is EkosLive Secure?
5. Can I access EkosLive Web App from multiple browsers/phones?
6. How do I access EkosLive?
7. Do I need to purchase StellarMate to use EkosLive?

1. What is Ekos Live?

Ekos Live is a real-time web application that can be run from any browser. It allows you to control many aspects of Ekos right from the browser. It is built around material-ui from Google, so it is very friendly for mobiles & tablets on any platform.

It supports capture, focus, guiding, alignment, and polar assistant tools. Furthermore, it can save your images directly to the cloud where they are stored along with a rich metadata system that enables easy search for images in the future. You can define your own tags to uniquely identifies images of interest.

Turn on sound notifications on to get audible alerts on tasks such as when an image is captured and so on. It supports multiple themes (Normal, Dark, and Night) to suit your seeing preferences.

2. Is EkosLive a replacement for Ekos?

No. EkosLive is a complementary tool to Ekos. It actually requires Ekos in the background. The benefit of EkosLive is that you can access it at any time you have internet access. There is no need to use TeamViewer or 3rd party solutions to log in remotely to your PC to check the observatory status. All of this can be done easily and securely with EkosLive. Since it was designed with mobile in mind, you'll find its user interface particularily suited for tablets and phones.

3. Is EkosLive free?

Yes! We offer two tiers of EkosLive subscriptions:

EkosLive Basic: Free.

EkosLive Pro: $4.99/Month subscription.

The EkosLive Pro version differs from Basic in that you get unlimited bandwidth to upload and view images in addition to cloud storage & video streaming capabilities. But the basic version of EkosLive is already quite powerful and can perform Capture, Alignment, Focusing, and Guiding!

4. Is EkosLive Secure?

Absolutely! EkosLive transmits all traffic over SSL and WSL (for Secure Websockets) using industry-proven encryption at both ends. Your data is securely stored where you are the only party that can download and view them. No data is shared with any 3rd party.

5. Can I access EkosLive Web App from multiple browsers/phones?

No. Currently, only one connection is permitted to EkosLive. If you try to login from another login, you will be logged out from your current location.

6. How do I access EkosLive?

You can access EkosLive from this address https://live.stellarmate.com.

7. Do I need to purchase StellarMate to use EkosLive?

No, StellarMate is not required. You just need KStars/Ekos to use EkosLive.

Using GPS

Time and Location settings are critical to the proper operation of StellarMate. This is even more apparent if you're on the go with a mobile setup. For a fixed-observatory, the only factor you have to worry about synchronizing is time. On the other hand, a mobile setup requires both location and time settings to be accurate.

The time & location settings are not only used for KStars, but also to synchronize the mount and any other devices with time & location dependencies. For example, some weather drivers depend on location to query and retrieve information about the current weather.

Selecting a GPS Dongle

Any U-Blox based GPS USB dongle would work with StellarMate. Here are a few from Amazon:

1. Diymall Vk-172
2. Stratux Vk-162
3. USB GPS Receiver

Most of these dongles need to be outdoor to receive any satellite signals. They can be connected to any USB slot in StellarMate.

Configuring GPS in StellarMate

After plugging the USB dongle for the first time, you need to do the following:

1. Use StellarMate Serial Port Assistant tool assign a permanent designation to the USB dongle.
2. Configure KStars to mark GPS as the primary source for Location & Time updates.

3. Create an Equipment profile with the GPSD driver selected in one of the Aux. dropdowns.

The following is a video tutorial that covers all the steps above:

https://www.youtube.com/watch?v=TXE5NFC6Vs8

Support

We are proud to offer top-notch support to our customers. Please make sure to check out first the Frequently Asked Questions. To report any issues with StellarMate or Ekos, please submit a ticket and our support team should get back to you as soon as possible. Please make sure to submit the relevant logs to aid in diagnosing and resolving the issue efficiently.