



## **iOptron<sup>®</sup> iMate Astronomy Control Box**

### **Instruction Manual**

**Product #8480**

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# 1. iOptron iMate Overview

The iMate is a single-board computer that features a powerful 64-bit ARM processor with Wi-Fi, preloaded KStars planetarium software, Ekos control and automation tool, and INDI drivers. This hardware-software combination will support the use of most current and future devices (cameras, focusers, filter wheels, etc.) allowing the user to choose a brand and model.

With 32Gb eMMC storage along with a slot for up to 64Gb TF (micro SD) memory, iMate has the ability to control and capture an entire automated imaging session. The iMate is cross-platform; use it with Windows, IOS, Linux, Android, etc.

## Features:

- Orange Pi 3 LTS with 64-bit ARM processor, 2GB LPDDR3 SDRAM and 32GB EMMC flash memory
- 1X USB3.0 and 2X USB2.0 ports
- 3X 12VDC outputs (2 programmable)
- Up to 64Gb high speed MicroSD card (class 10 or higher)
- Open Source Architecture
- Preloaded KStars/Ekos/INDI driver for mount, camera, focuser and other device control
- iPolarServer for iOS polar alignment
- Windows, MacOS, iOS, Linux, Android remote connection to iMate via WIFI network

## Shipping Contents:



- 1X iMate with WIFI antenna and dovetail mounting bar
- 1X 5521 0.5 meter 90° DC cable
- 1X 5521 1 meter DC cable
- 1X wire wrap

## Ports on the iMate:



- DC IN 12V: power input (5521, center positive) for iMate and 3X DC outputs
- USB2.0 and USB3.0: for mount and accessories connection. A USB hub also can be connected
- LAN: can be plugged into a network to obtain the date and time info
- DC1, DC2, DC3: 12V power outputs (5521, center positive). DC3 is always on, with 3A maximum current. DC1 and DC2 are programmable with 2A max. The default states are ON.
- TF card slot (next to RESET): for microSD card
- RESET: reset iMate

## Connect Device to the iMate:

Connect the mount to one of the USB port on the iMate. Connect other accessories, such as cameras, focuser, filter wheel, to other USB ports, directly or via a USB hub. Connect a 12V DC power supply to the iMate DC IN port (5.5/2.1mm plug, center positive). Power on the mount and iMate and you are ready to go!

Since iMate uses KStars and INDI Lab, it can connect any device that has an INDI driver.

A USB hub can be connected to the iMate if more USB ports are needed.

## 2. Connect a Mount to the iMate

After connecting a mount and accessories, such as a camera, to the iMate via USB port, one can connect to the iMate via iMate Wi-Fi network and Nomachine remote software/App.

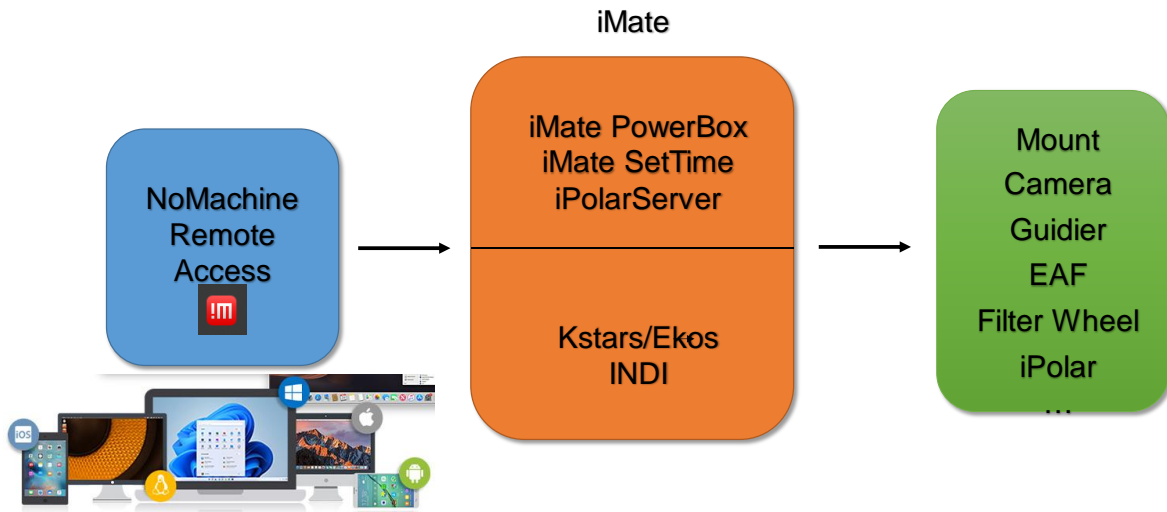


Figure 1. iMate remote access connection

### 2.1. Connect a Mount to iMate

We use a CEM70-NUC mount and a PlayerOne camera as the setup example.

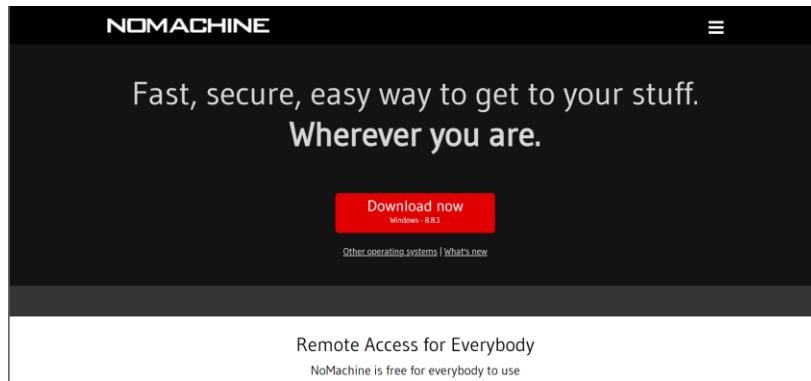
- (1) Use a USB cable to connect the CEM70-NUC USB port to one of the iMate USB port;
- (2) Connect camera to a USB port on the iMate or the CEM70-NUC;
- (3) Connect the mount AC adapter
- (4) Connect a 12V DC power (5.5/2.1mm, center positive plug) to iMate. You may also use the power output port from the mount
- (5) Turn both mount power and iMate power on. You should see a tiny green LED below the TF card slot.



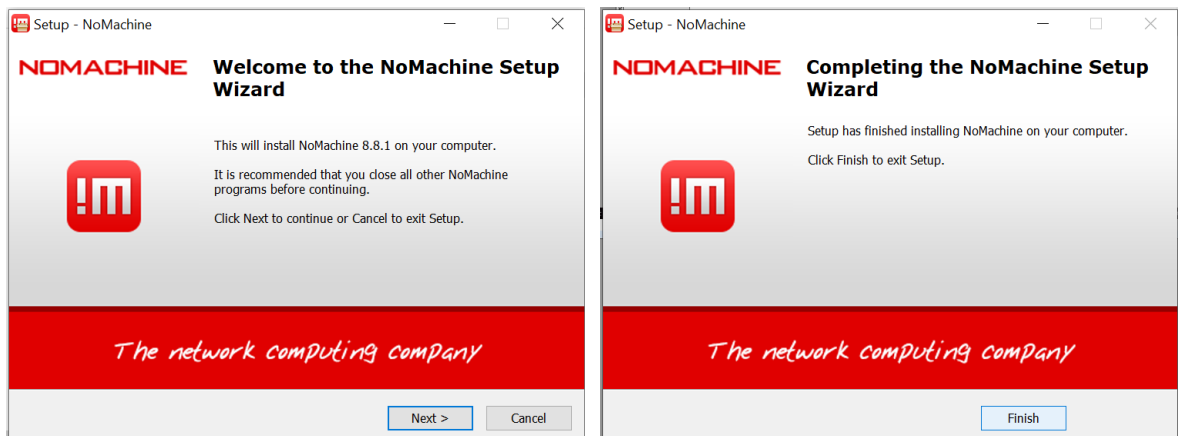
### 2.2. Initial Set Up iMate

If this is your first time to use the **iMate**, please follow the steps below for initial setup.

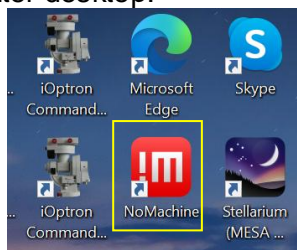
1. Download and install NoMachine for Windows, MacOS, Linux, iOS or Android. Here we use Windows as an example:
  - (1) Goto <https://www.nomachine.com> to download NoMachine



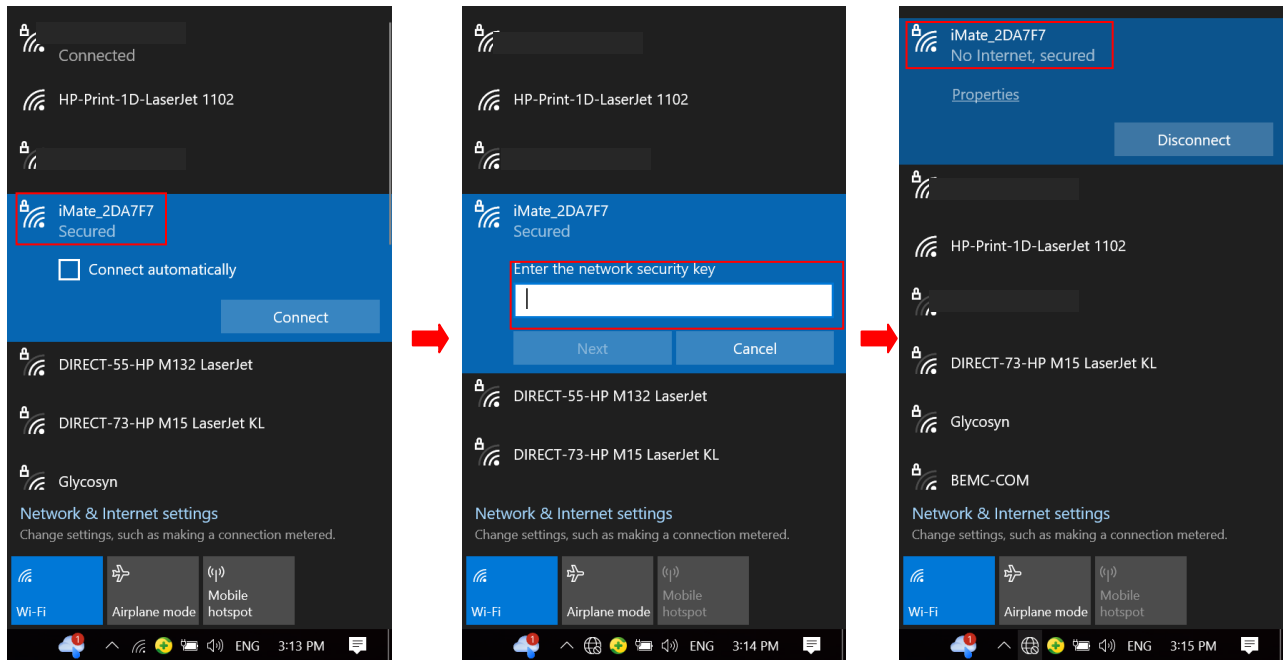
(2) Click on downloaded NoMachine to install the software



(3) A shortcut will be shown on your computer desktop.



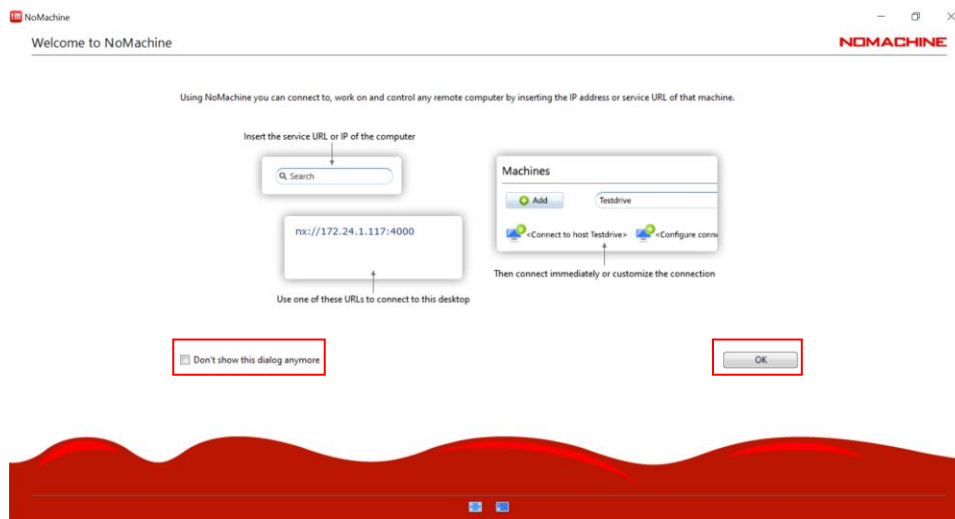
2. From your computer Wi-Fi network list, choose **iMate\_XXXXXX**. Enter password **12345678** to connect the computer to iMate Wi-Fi network.



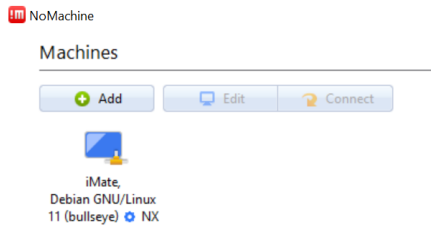
3. Click **NoMachine** shortcut to run the software



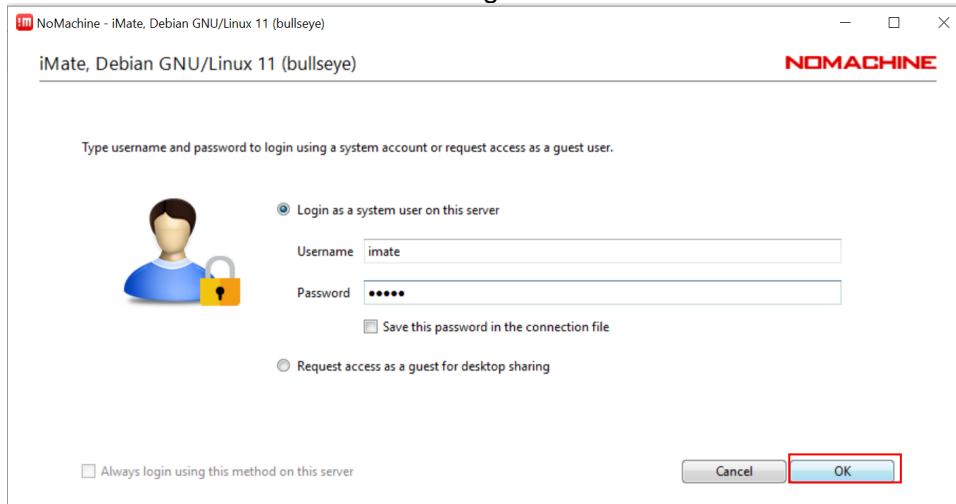
4. Click **OK** on welcome screens. You may also check the box before “**Don’t show this dialog anymore**” to skip this screen next time running the software.



5. If the mount is powered on, the “**iMate**” server will be appeared on the screen. Click on **iMate** icon, then click **OK** on next “Verify host identification” screen.



6. Enter “*imate*” as both Username and Password to Login on to the iMate Server

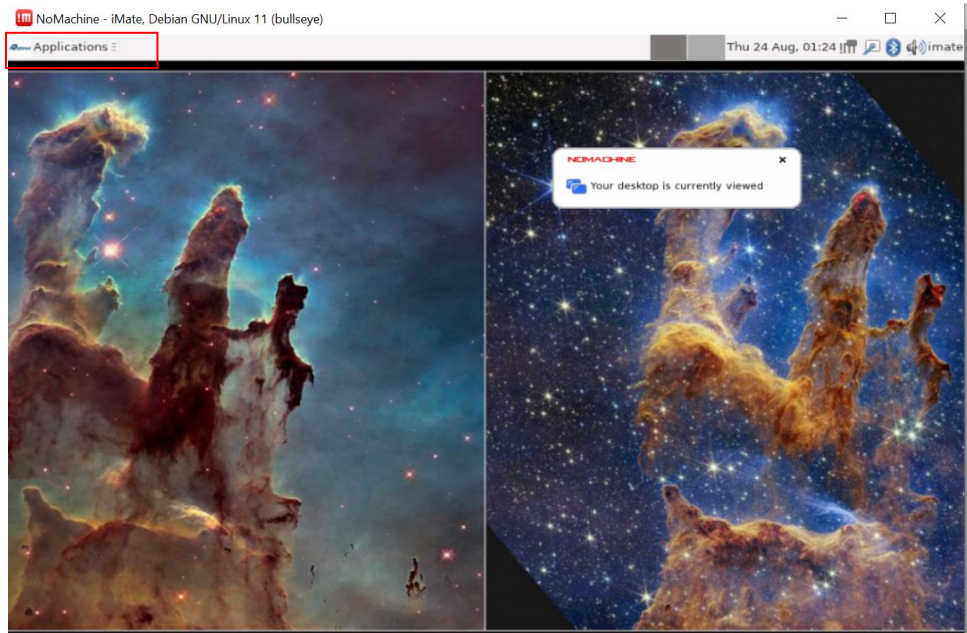


7. Click **OKs** to pass the help screens. You may also check the box before “**Don’t show this dialog anymore**” to skip this screen next time running the software.

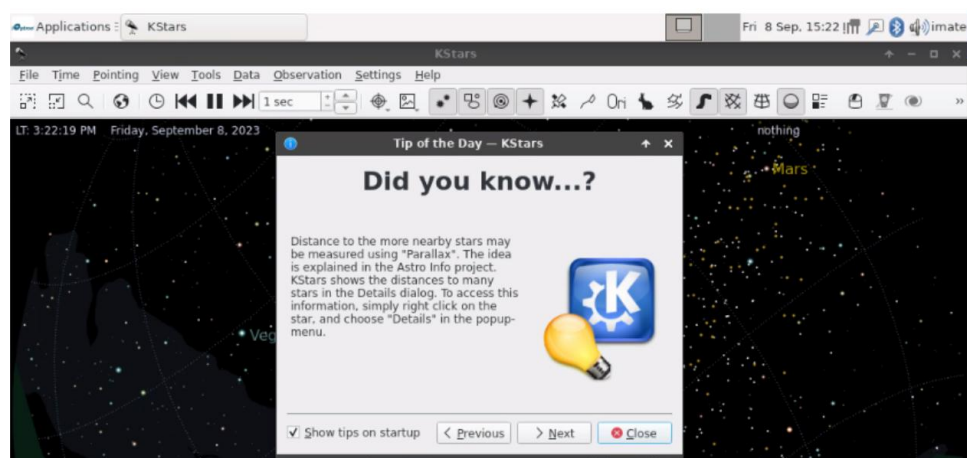
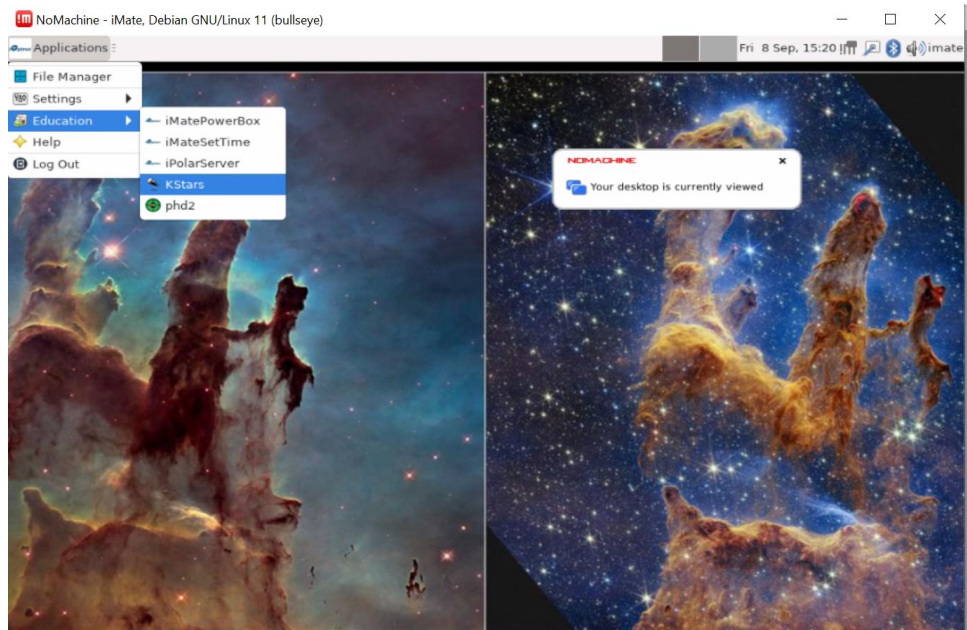


8. Now the NoMachine will load the software from the iMate. Resize the Windows to adjust for better display. Click on **iOptron Applications** bar on top left corner

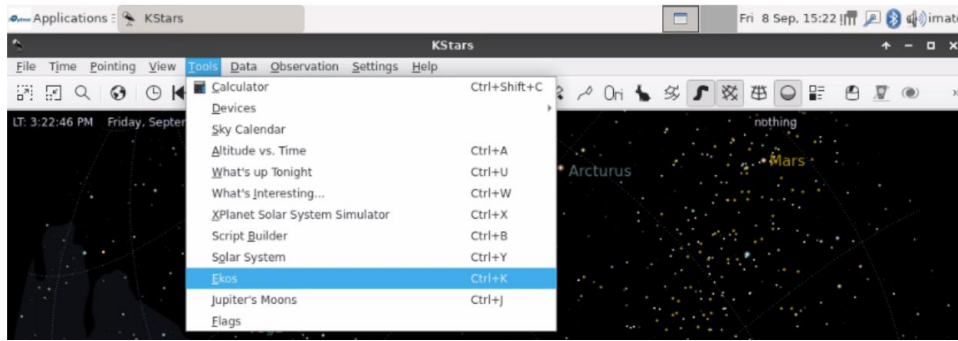




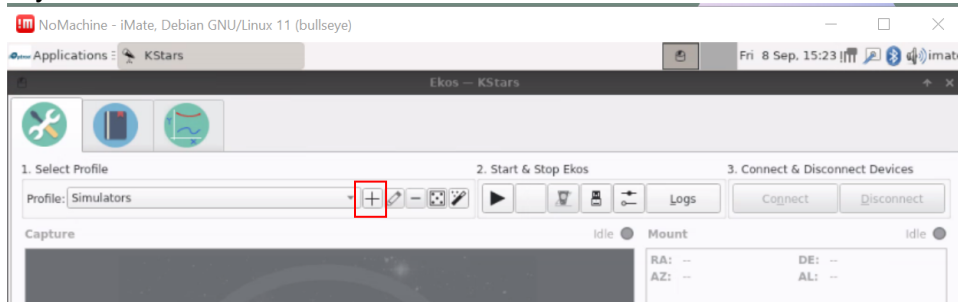
9. From pull down menu to select **Education** => **KStars**. **Close** the tip after the KStars finished loading.



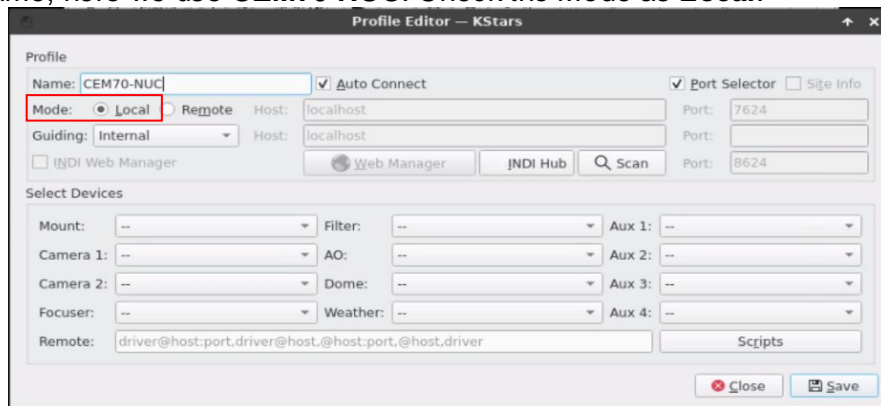
10. Select **Tools=>Ekos**



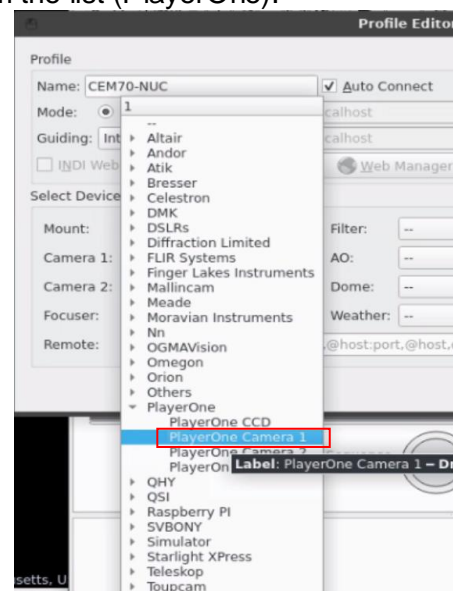
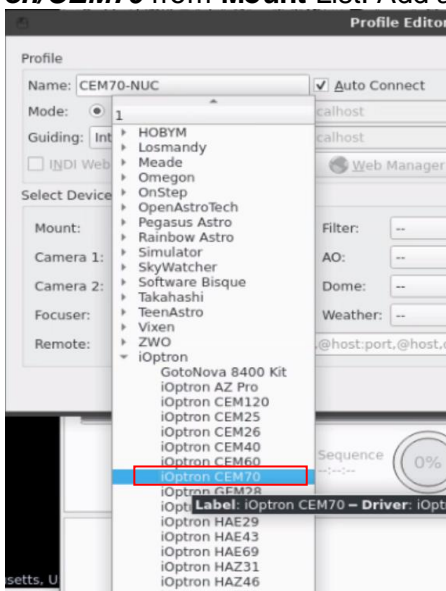
11. Create an Profile by click on “+”



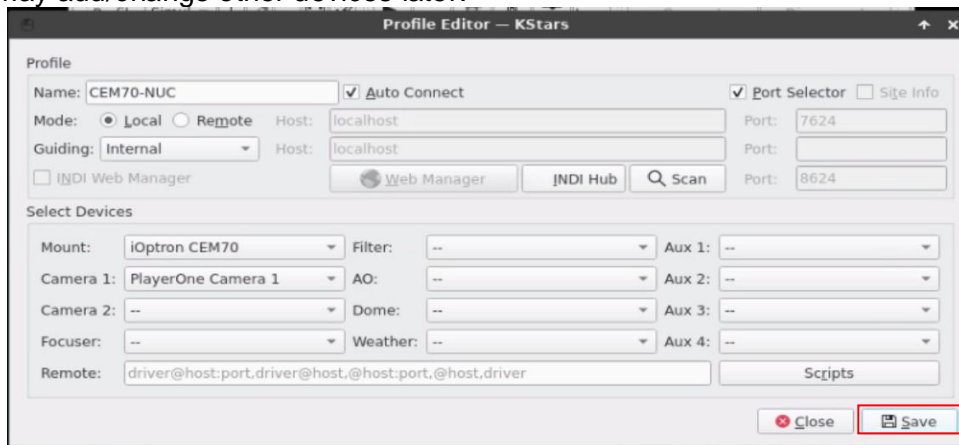
12. Enter the Profile Name, here we use **CEM70-NUC**. Check the Mode as **Local**.



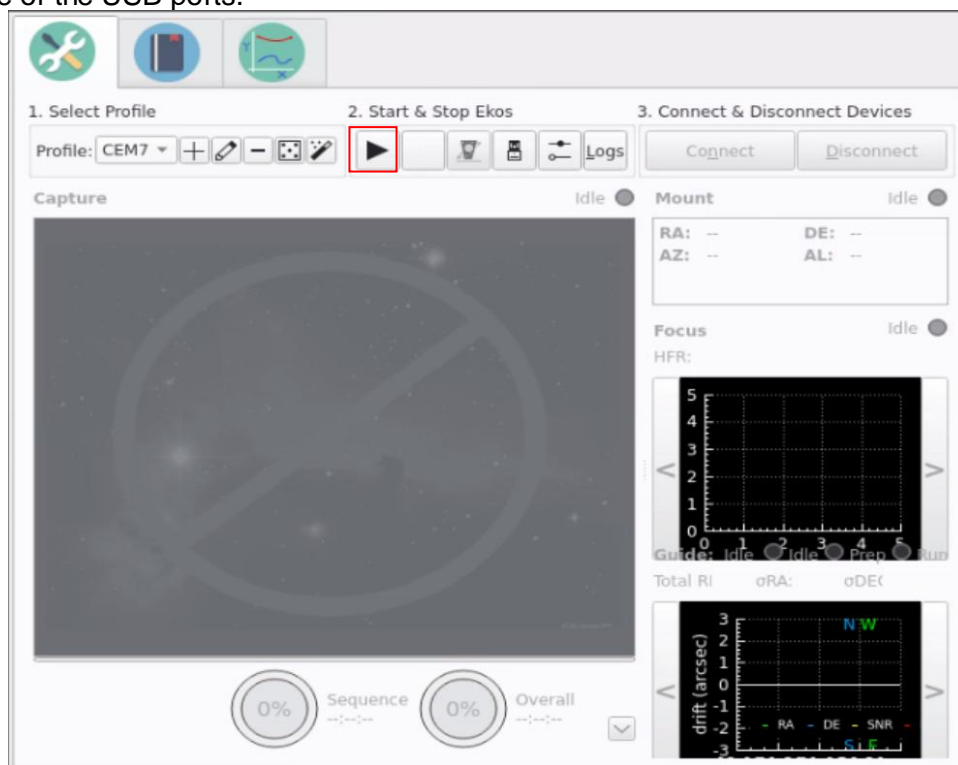
Select **iOptron/CEM70** from **Mount** List. Add a camera from the list (PlayerOne).



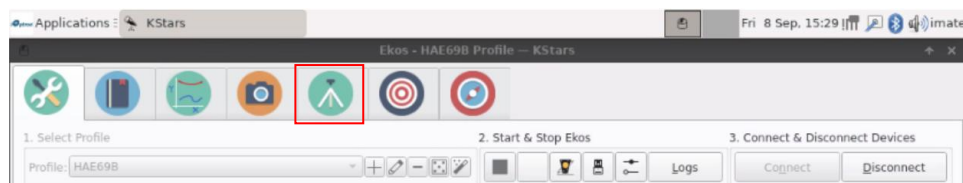
You have to add at least one camera here; even you do not have the camera attached. Click **Save** to save the profile. You may add/change other devices later.



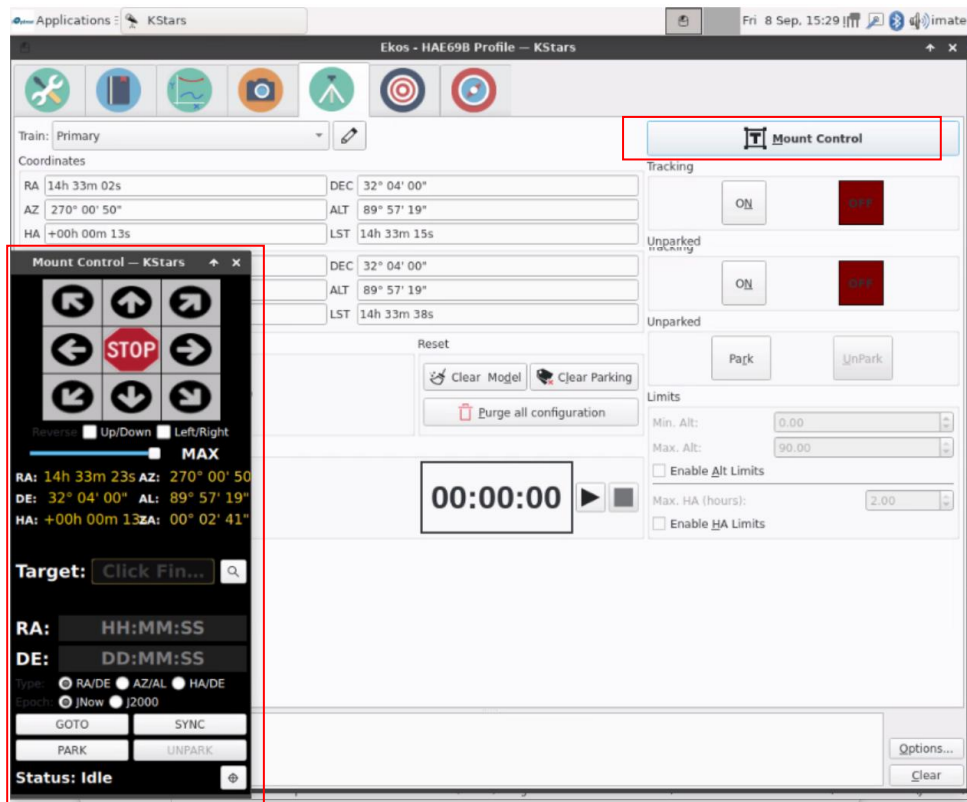
13. Click **Arrow** button to start the **Ekos**. It should connect to the CEM70-NUC and the camera, if it is connected to one of the USB ports.



14. Click on Tripod sign to bring up the Mount Control of the Primary Train.

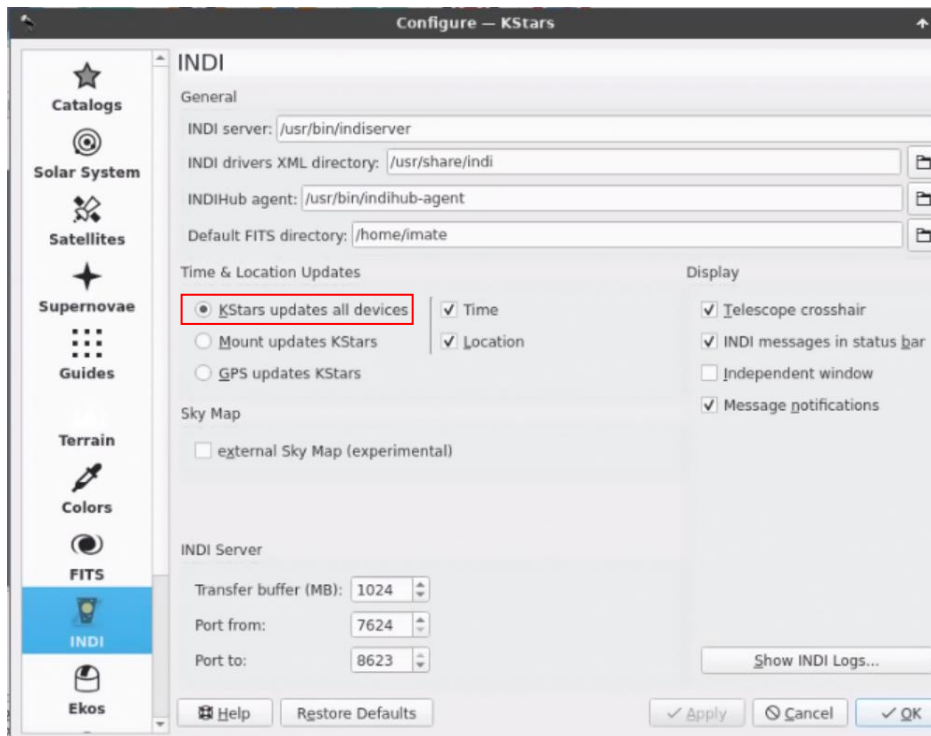


15. Click on Mount Control button to bring up the control pad. Now you can slew the mount.



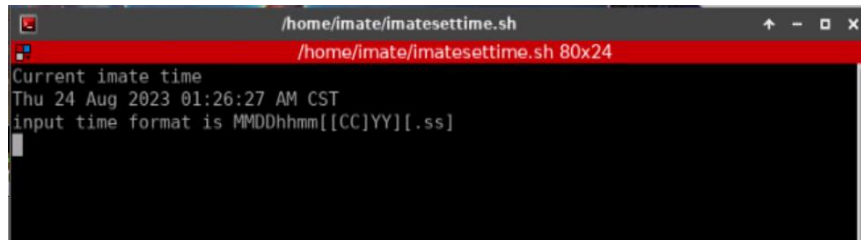
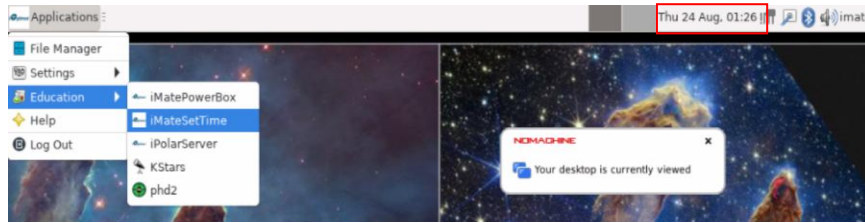
### 2.3. Operation the Mount via an iMate and KStars/Ekos

The initial settings, such as time, site and initial position, are the basics to ensure a telescope mount having a good GOTO accuracy. The default is **KStars updates all devices**.



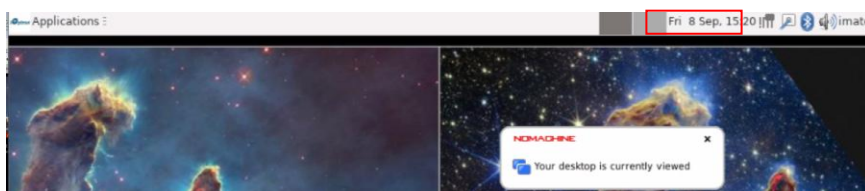
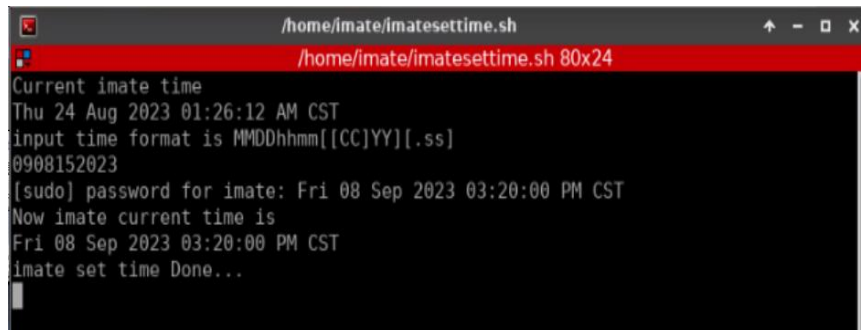
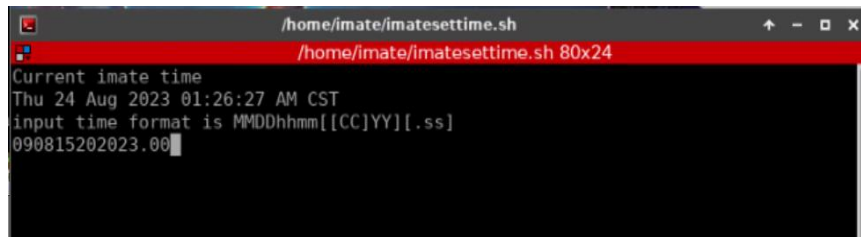
### 2.3.1. Set up iMate Time

Connect the iMate. The initial time shown here is 8/24/2023 01:26. From **iOptron Applications** pull down menu to select **Education =>iMateSetTime**. This will bring up the imatesettime screen.



Enter the time in the format MMDDhhmmYYYY.00 or MMDDhhmmYY. Here we entered 0908152023.00, or 0908152023 for Sept 8, 2023, 15:20. Click **Enter** from your keyboard to confirm.

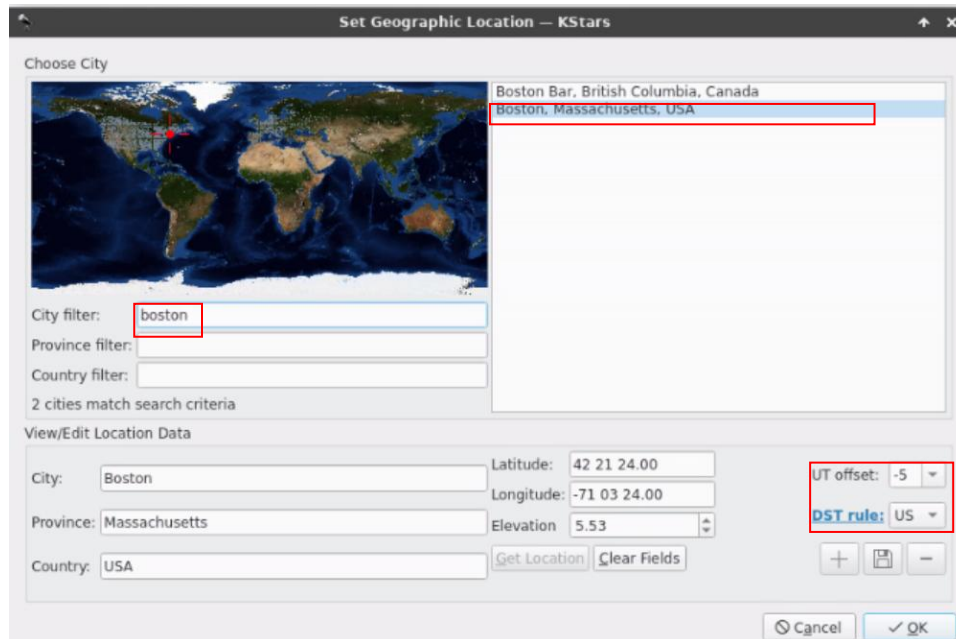
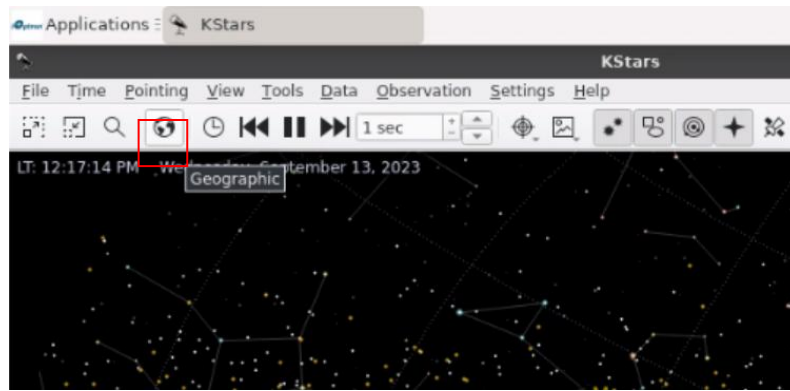
**The iMate time won't be kept when the mount is power off.**




### 2.3.2. Set up iMate Site Info (GPS location)

From **KStars** main screen, click on **Geographic (global)** button to set geographic location. Enter **"Boston"** in **City filter** and select **"Boston, Massachusetts, USA"**. Choose correct UTC offset, which is -5 hours, and DST rules, which is US. Click OK to save it. You may also manually enter

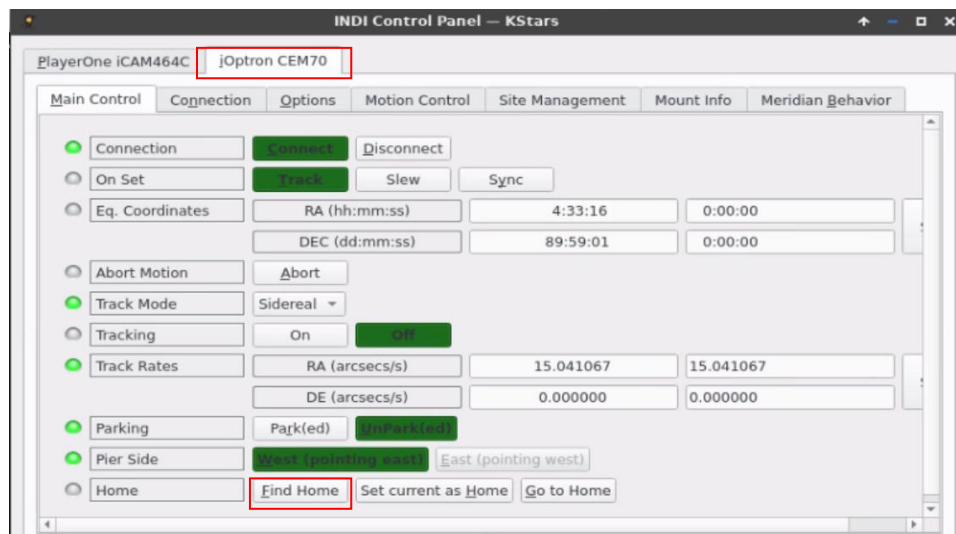
The location info will be kept in the KStar.

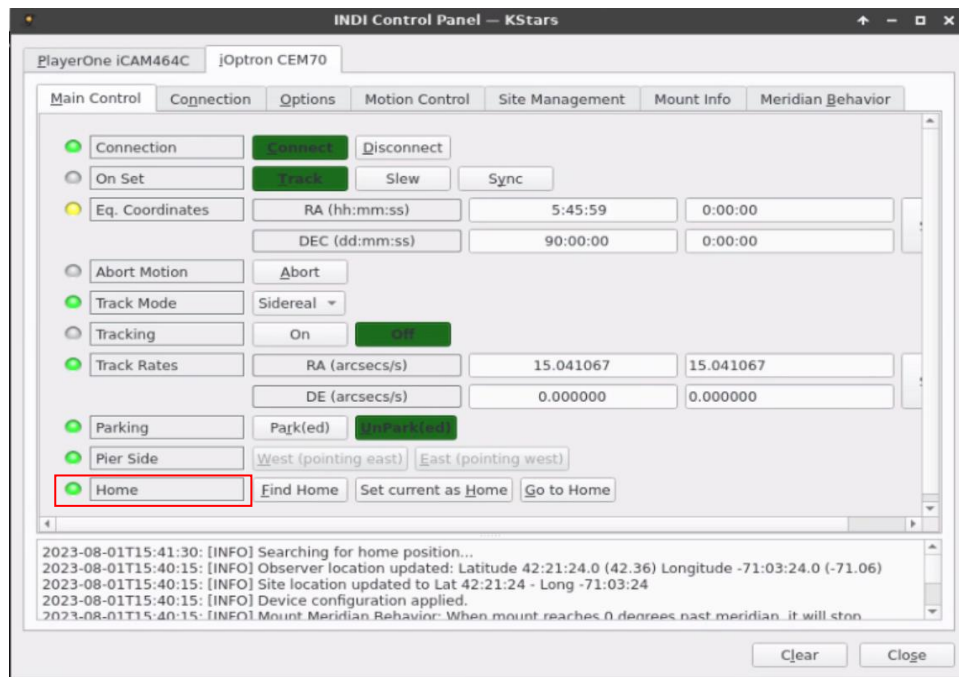


### 2.3.3. Set Up Zero Position

From KStars, select Tools=>Ekos. Click **Arrow** button to start the **Ekos**. This will bring up the **INDI Control Panel**. It will show all connected devices. This panel can be activated by clicking on INDI icon .

Click on Find Home from iOptron CEM70. The mount will perform Searhing Zero Position and return to Zero Position. The **Home** status will turn to green.





### 2.3.4. Add Other Devices

Please refer to full KStars/Ekos User Manual for more details.

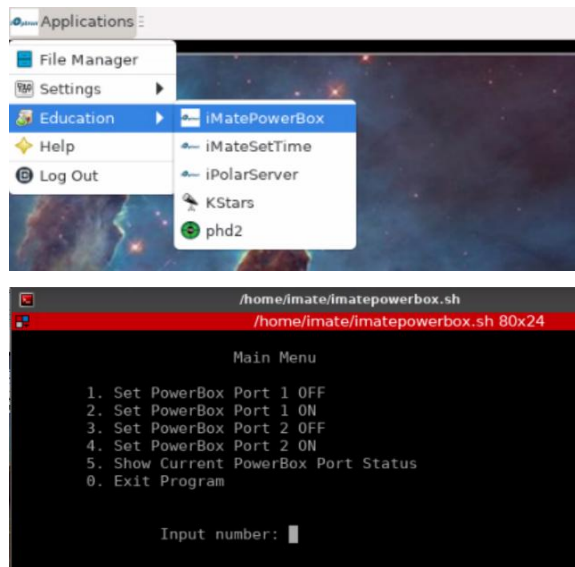
### 2.3.5. Polar Alignment

One may use external iPolar, Polar Alignment routine in KStars/Ekos, or a third party software for polar alignment.

## 2.4. Other iMate Functions

### 2.4.1. iMate DC Power Output Control

iMate has three (3) DC12V outputs. DC3 is always on. DC2 and DC1 can be programmed ON/OFF. From **iOptron Applications** pull down menu to select **Education => iMatePowerBox**. This will bring up the imatepowerbox screen.



Enter 5 to check the DC1 and DC2 status. "1" is ON and "0" is OFF.

```
/home/imate/imatepowerbox.sh
/home/imate/imatepowerbox.sh 80x24
PowerBox Port 1(pin 7) status
1
PowerBox Port 2(pin 12) status
1
press any key to return main menu
```

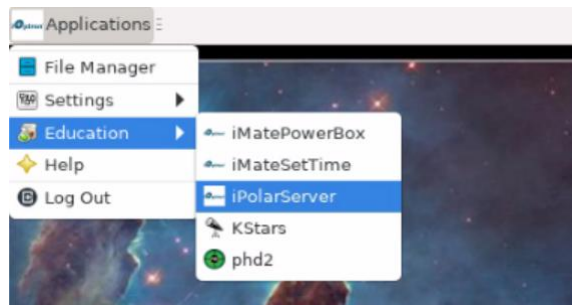
Enter 1 or 2 to turn DC1 power OFF/ON. Enter 3 or 4 to turn DC2 power OFF/ON. Here "1" is entered and the power box DC1 is turned off.

```
/home/imate/imatepowerbox.sh
/home/imate/imatepowerbox.sh 80x24
PowerBox Port 1(pin 7) status
0
PowerBox Port 2(pin 12) status
1
press any key to return main menu
```

Enter 0 to Exit iMatePowerBox program.

### 2.4.2. iPolarServer

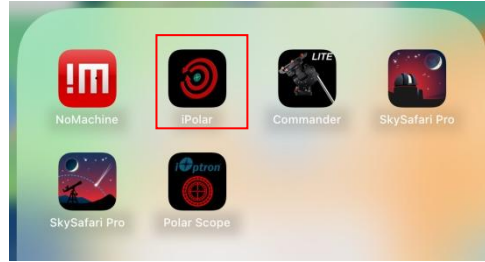
1. Download NoMachine and iPolar App from iOS store. We recommend iPad for better viewing.
2. Plug your iPolar into one of the iMate USB port. From **iOptron Applications** pull down menu to select **Education => iPolarServer**. The iMate will connect to iPolar camera. If it failed to connect, please check iPolar Server Version, which should be 1.09 or later.



```
/home/imate/ipolar/publish/iPolarServer
/home/imate/ipolar/publish/iPolarServer 80x24
iPolar server 1.09 running under Linux
Connecting to camera ...
Found iPolar on camera 1
Local IP: 172.24.1.1
Server ready. Waiting for a connection...
[ WARN:0@i0.431] global /home/orangepi/ioptron/emgucv/opencv/modules/videoio/src/cap_v4l.cpp (1013) tryIoctl VIDE0I0(V4L2:/dev/video1): select() timeout.
Houston, we have a problem! No data received from camera!
Camera disconnected.
Connecting to camera ...
Found iPolar on camera 1
Camera connected
Camera initialized
Current Exposure Index:6
```



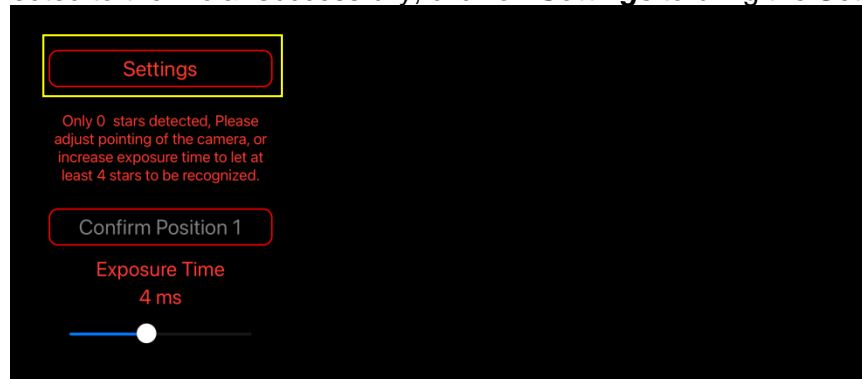
3. Launch the iPolar App.



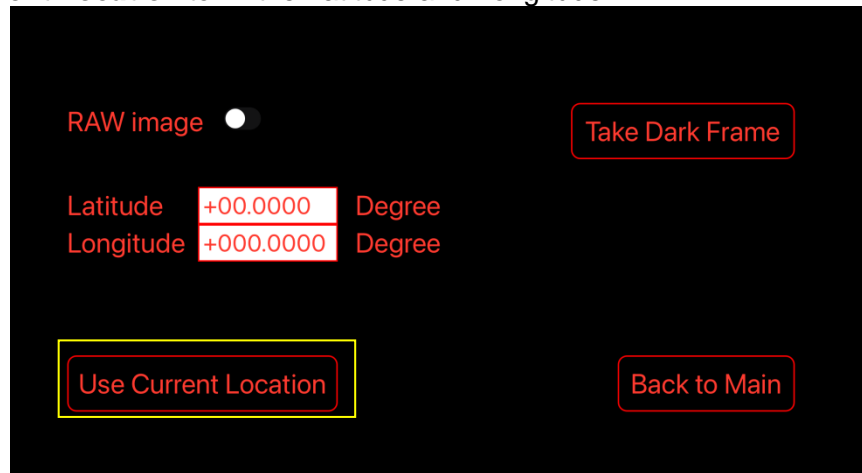
4. Click on **Connect** to connect the iPolar to the App.



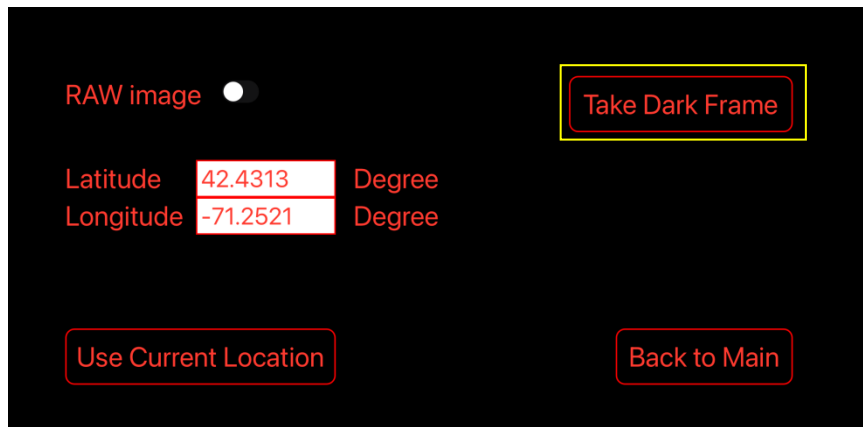
5. After the App connected to the iPolar successfully, click on **Settings** to bring the Setting screen.



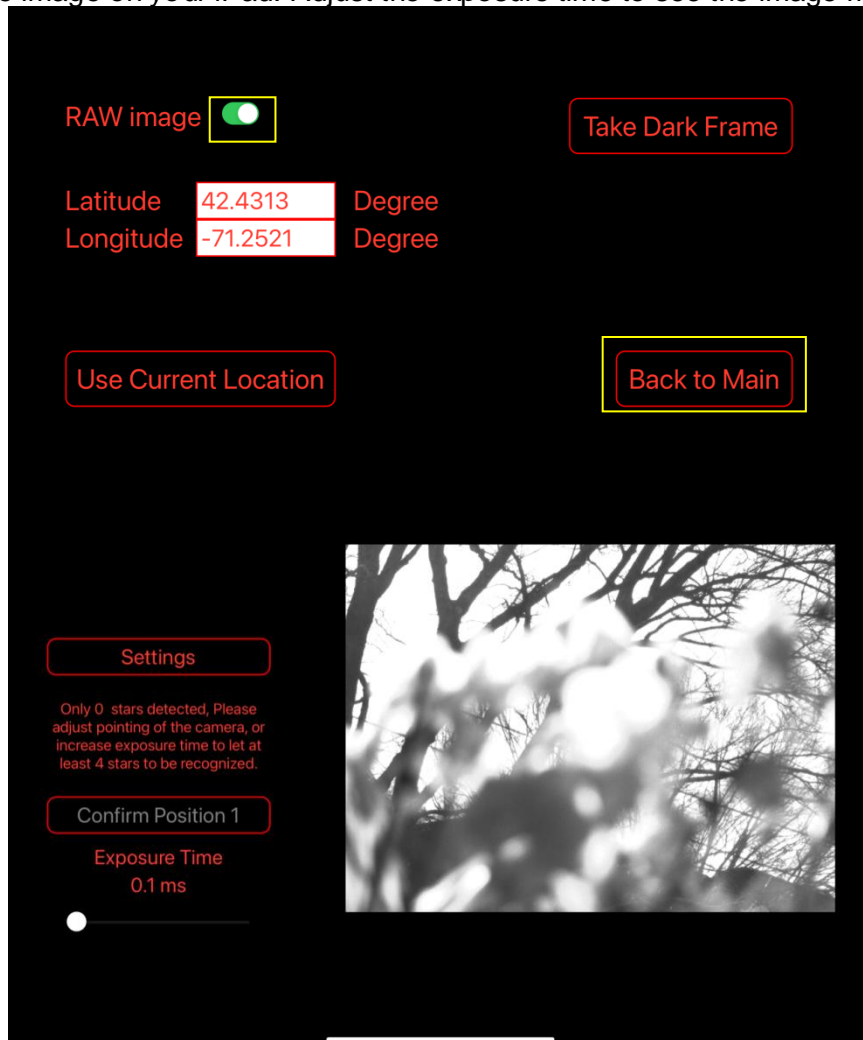
Click on **Use Current Location** to fill the Latitude and Longitude.



You may perform **Take Dark Frame** here with the iPolar covered.



6. Check the **RAW image** and click **Back to Main**. If the camera is facing to a distant object during daytime, you should see the image on your iPad. Adjust the exposure time to see the image more clearly.



7. For polar alignment during the night time, follow the on screen instruction to perform the Polar alignment.

### 2.4.3. Advanced Applications of the iMate

Since iMate is uses Open Source Architecture and KStars/Ekos, one can easily find applications support from KStars website. There are also a lot of YouTube tutoring videos available on line on how to use KStars/Ekos.

## 3. Customer Servicing

### 3.1. iOptron Customer Service

If you have any question concerning your mount, please contact the iOptron Customer Service Department. It is strongly suggested to send technical questions to [support@ioptron.com](mailto:support@ioptron.com) for prompt response.

If the mount requires factory servicing or repairing, e-mail to iOptron Customer Service Department first to receive an RMA# before returning the mount to the factory. Please provide details as to the nature of the problem as well as your name, address, e-mail address, purchase info and daytime telephone number. We have found that most problems can be resolved by e-mails or telephone calls. So please contact iOptron first to avoid unnecessarily returning the mount for repair.

### 3.2. Product End of Life Disposal Instructions



This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service or the product representative.

## IOPTRON ONE YEAR TELESCOPE, MOUNT, AND CONTROLLER WARRANTY

A. iOptron warrants your telescope, mount, or controller to be free from defects in materials and workmanship for one year. iOptron will repair or replace such product or part which, upon inspection by iOptron, is found to be defective in materials or workmanship. As a condition to the obligation of iOptron to repair or replace such product, the product must be returned to iOptron together with proof-of-purchase satisfactory to iOptron.

B. The Proper Return Merchant Authorization Number must be obtained from iOptron in advance of return. Contact iOptron at support@ioptron.com to receive the RMA number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement stating the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of iOptron.

The customer shall be responsible for all costs of transportation and insurance, both to and from the factory of iOptron, and shall be required to prepay such costs.

iOptron shall use reasonable efforts to repair or replace any telescope, mount, or controller covered by this warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, iOptron shall notify the customer accordingly. iOptron reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void and of no force of effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

IOPTRON DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HERE. THE SOLE OBLIGATION OF IOPTRON UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HERE. IOPTRON EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY IOPTRON PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF ONE YEAR FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

iOptron reserves the right to modify or discontinue, without prior notice to you, any model or style telescope.

If warranty problems arise, or if you need assistance in using your telescope, mount, or controller contact:

iOptron Corporation  
Customer Service Department  
6E Gill Street  
Woburn, MA 01801  
[www.ioptron.com](http://www.ioptron.com)  
support@ioptron.com

NOTE: This warranty is valid to U.S.A. and Canadian customers who have purchased this product from an authorized iOptron dealer in the U.S.A. or Canada or directly from iOptron. Warranty outside the U.S.A. and Canada is valid only to customers who purchased from an iOptron Distributor or Authorized iOptron Dealer in the specific country. Please contact them for any warranty.