



iOptron[®] 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 KStarts/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 USB2.0: 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

📳 Setup - NoMachine	– 🗆 X	🔚 Setup - NoMachine	– 🗆 X
NOMACHINE	Welcome to the NoMachine Setup Wizard	NOMACHINE	Completing the NoMachine Setup Wizard
	This will install NoMachine 8.8.1 on your computer. It is recommended that you close all other NoMachine programs before continuing. Click Next to continue or Cancel to exit Setup.		Setup has finished installing NoMachine on your computer. Click Finish to exit Setup.
The net	work computing company	The net	work computing company
	Next > Cancel		Finish

(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.

ti lasara ta MaMad	27	NICHAOCHINI
Nelcome to NoMacr	line	NUMALHIN
	Using NoMachine you can connect to, work on and control any reme	sote computer by inserting the IP address or service URL of that machine.
	Insert the service URL or IP of the computer	
	Q Search	Machines
		Add Turbling
		THE TRANSPORT
	nx://172.24.1.117:4000	Connect to host Testdrive> Configure conversion
		These connect immediately or curtomize the connection
		Then contract minimumetery or contornate the contraction
	Use one of these URLs to connect to this der	aktop
	Don't show this dialog anymore	ОК
	and the second se	

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

III NoMachine - iMate, Debian GNU/Linux 11	(bullseye)			- 🗆 X
iMate, Debian GNU/Linux 1	1 (bullseye)			ACHINE
Type username and password to I	ogin using a syst	tem account or request access as a guest user.		
	Login as a :	system user on this server		
	Username	imate		
•	Password	••••		
		Save this password in the connection file		
	Request ac	cess as a guest for desktop sharing		
Always login using this metho	d on this server		Cancel	К

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.

III NoMachine - iMate, Debian GNU/Linux 11 (bullseye)	- 🗆 X
iMate, Debian GNU/Linux 11 (bullseye)	NOMACHINE
Show the menu by clicking on the edge of the window Or do the same by p	rressing CTRL+ ALT+0
Change the screen settings using the icons below	
Don't show this dialog anymore	ОК

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

Applications : 🐥 KStars						Fri 8 Se	ep. 15:2	2 !!!	20	4)	imate
\$	KStars				and the second second				+	-	• ×
<u>File Time Pointing View Tools</u> Data Obser	vation <u>S</u> ettings <u>H</u> elp										
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What's Interestin	ng C	trl+W									
XPlanet Solar Sy	stem Simulator C	trl+X									
Script <u>B</u> uilder	C	trl+B			100						
Solar System	C	trl+Y				•					
Ekos		trl+K									
Jupiter's Moons	C	trl+j									
• Elags					100						

11. Create an Profile by click on "+"

🛄 NoMachine - iMate, Debian GNU/Linux 11 (k	pullseye)	— — ×
🚛 Applications 🗄 😤 KStars		🕙 🛛 Fri 8 Sep. 15:23 I 🖬 🔎 🚯 🏟 imate
6	Ekos — KStars	* ×
8 🔳 🖨		
1. Select Profile	2. Start & Stop Ekos	3. Connect & Disconnect Devices
Profile: Simulators		Logs Connect Disconnect
Capture	Idle 🔵 🛚	lount Idle 🔘
		LA: DE: LZ: AL:

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

Name: CEM	70-NUC	✓ <u>A</u> uto Co	onnect		VP	ort Selector 🗌 Site Inf
Mode: 💿	Local C Remote Host:	localhost			Po	ort: 7624
Guiding: Int	ternal • Host:	localhost			Po	ort:
INDI Web	Manager	S Web	Manager JNDI Hub	Qs	an Po	ort: 8624
Mount:		▼ Filter:		▼ Au	x 1:	
Mount:		 Filter: 		▼ Au	x 1:	*
Camera 1:		* AO:	-	* Au	x 2:	*
Camera 2:		Dome:		▼ Au	x 3:	*
Focuser:		• Weather:		* Au	x 4: -	*
Pamata	driver@bost:port_driver@b	ost @bost-por	t.@host.driver			Scripts

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

Name: CEM	70-NUC	✓ Auto Connect
Mode: 💿	1	calhost
Guiding: In	 HOBYM Losmandy 	calhost
INDI Web	 Meade Omegen 	🕙 <u>W</u> eb Manage
Select Device	 i OnStep i Onstep 	
Mount:	Pegasus Astro Rainbow Astro	Filter:
Camera 1:	 Simulator SkyWatcher 	AO:
Camera 2:	 Software Bisque Takabashi 	Dome:
Focuser:	TeenAstro Vixon	Weather:
Remote:	 VIXEN ZWO iOptron GotoNova 8400 Kit iOptron AZ Pro iOptron CEM120 	,@host:port,@host
	iOptron CEM25 iOptron CEM26 iOptron CEM40 iOptron CEM60	Sequence
	iOptron GEM28 iOpti Label: iOptron (iOptron HAE29 iOptron HAE43	CEM70 – Driver: iOp
	iOptron HAE69	
etts, U	iOptron HAZ46	

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.

Name: CEM	70-NUC	✓ <u>A</u> uto Co	nnect			✓ Port	Selector 🗌 Site In
Node: 💿	Local O Remote Host:	localhost				Port:	7624
Suiding: Int	ternal 👻 Host:	localhost				Port:	
INDI Web	Manager	🕑 Web	Manager	INDI Hub	Q Scan	Port:	8624
Camera 1:	PlayerOne Camera 1	 AO: 			 Aux 1: Aux 2: 		
Camera 1:	PlayerOne Camera 1	▼ AO:			* Aux 2:		
Camera 2:	-	Dome:			* Aux 3:		
Focuser:	**	• Weather:			• Aux 4:		
Remote:	driver@host.port.driver@ho	st.@host:por	t.@host.drive	r			Scripts

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.

2 🕨 🖉 🖥 🗟	Logs	Co <u>n</u> nect	Disconnect	
	Idle 🔘	Mount	Idle	•
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14. Click on Tripod sign to bring up the Mount Control of the Primary Train.

Applications : 🐥 KStars		🖲 🛛 Fri 8 Sep, 15:29 🕅 🔎 🛞 🕼 imate
		* ×
🛞 🔳 🖨 🖸		
1. Select Profile	2. Start & Stop Ekos	3. Connect & Disconnect Devices
Profile: HAE69B	-+0-27 🔳 🗶 🛎 💳	Logs Connect Disconnect

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

Applications = 😤 KStars			9	Fri	8 Sep. 15:29 !📅 🔎	👂 🦚 imate
8	Ekos	- HAE69B Profile — KStars				* ×
😵 🔳 🖨 🖸 🤇						
Train: Primary *	0			T	Mount Control	
Coordinates			Tracking			
RA 14h 33m 02s	DEC 32° 04'	00"				
AZ 270° 00' 50"	ALT 89° 57'	19"		ON	OFF	
HA +00h 00m 13s	LST 14h 33m	15s	Unparked			
Mount Control — KStars 🛧 🗙	DEC 32° 04'	00"	nocking			
	ALT 89° 57'	19"		ON	OPE	
	LST 14h 33m	38s	Unparked			
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		and and a second s		Pa <u>r</u> k	UnPark	
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		Eurge all configuration	Min. Alt:			0
Reverse Up/Down Left/Right			Max. Alt:			
PA: 14h 33m 23s AZ: 270° 00' 50			Enable	Alt Limits		
DE: 32° 04' 00" AL: 89° 57' 19"		00:00:00	Max. HA (h	ours):	2.0	0
HA: +00h 00m 13zA: 00° 02' 41"			Enable	HA Limits		15
Target: Click Fin 🭳						
RA: HH:MM:SS						
DE: DD:MM:SS						
Type: 🕥 RA/DE 🔵 AZ/AL 🔵 HA/DE						
Epoch: O JNow O J2000						
GOTO SYNC						
PARK UNPARK						Options
Status: Idle						Clear

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*.

	Configure -	– KStars	
	f INDI General		
(Q)	INDI server: /usr/bin/indiserver		
Solar System	INDI drivers XML directory: /usr/share/ind	6	
*2	INDIHub agent: /usr/bin/indihub-agent		
Satellites	Default FITS directory: /home/imate		
+	Time & Location Updates	Display	
Supernovae	● KStars updates all devices	ae ✓ <u>T</u> elescope crosshair	
	○ Mount updates KStars	ation INDI messages in stat	tus <u>b</u> a
Guides	O GPS updates KStars	Independent window	
	Sky Map	✓ Message notifications	í.
Terrain	external Sky Map (experimental)		
Ø			
Colors			
۲	INDI Server		
FITS	Transfer buffer (MB): 1024		
2	Port from: 7624		
INDI	Port to: 9623	Show INDL Logs	
9	1012 U.	grow INDI Logs	
Ekos	Restore Defaults	✓ Apply ◎ Cancel	~ 01

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 MMDDhhmmYYY.00 or MMDDhhmmYY. Here we entered 090815202023.00, 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.

	0,	Aptress A	Appl	catio	ons E	21	(Stars														
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	E	<u>F</u> ile	Tį	ne	Point	ing	View	Tools	<u>D</u> ata	Obse	rvation	<u>S</u> e	tting	s <u>H</u>	elp						
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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.

Main	Control Cont	nection	Options	Motion Control	Site Management	Mount Info	Meridian Behavior	
•	Connection		Connect	Disconnect				
\odot	On Set		Track	Slew	Sync			
0	Eq. Coordinate	s	RA (hh	:mm:ss)	4:33:16	0:00:0	00	Γ
			DEC (de	d:mm:ss)	89:59:01	0:00:0	00	
$^{\circ}$	Abort Motion		Abort					
•	Track Mode		Sidereal 👻					
0	Tracking		On	off				
•	Track Rates		RA (ar	csecs/s)	15.041067	15.0410	067	
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		DEC (d	d:mm:ss)	90:00:00	0:00:0	00
0	Abort Motion	Abort				
•	Track Mode	Sidereal *				
0	Tracking	On	off			
•	Track Rates	RA (ar	csecs/s)	15.041067	15.0410	067
		DE (ar	rcsecs/s)	0.000000	0.00000	00
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23-0 23-0 23-0 23-0	38-01T15:41:30: [INFO] 38-01T15:40:15: [INFO] 38-01T15:40:15: [INFO] 08-01T15:40:15: [INFO]	Searching fo Observer loc Site location Device confi	r home position ation updated: Latit updated to Lat 42:2 guration applied.	ude 42:21:24.0 (42.3 1:24 - Long -71:03:2	86) Longitude - 4	71:03:24.0 (-71.06)

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, Palar 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.

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	e/ima	tepo	werbox.s	h		
				/hon	ne/im	nate/i	imat	epowert	ox.sh	80x24	
PowerBox 0	Port	1(pin	7)	status							
PowerBox 1	Port	2(pin	12)	status							
				press	any	key		return	main	menu	

Enter 0 to Exit iMatePowerBox program.

2.4.2. iPolarServer

- 1. Download NoMachine and iPolar App from iOS store. We recommender iPad for better viewing.
- 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.

3. Launch the iPolar App.

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

Connect		
Not connected		
Settings		
Confirm Position 1		
Exposure Time		
250 ms		

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.

RAW image 🏾 🔍		Take Dark Frame
Latitude +00.000 Longitude +000.00	Degree Doo Degree	
Use Current Locat	ion	Back to Main

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

RAW image	€ ●		Take Dark Frame
Latitude Longitude	42.4313 -71.2521	Degree Degree	
Use Curre	ent Location		Back to Main

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.

DAW/imaga		
RAW Image		Take Dark Frame
Latitude42.4313Longitude-71.2521	Degree Degree	
Use Current Location		Back to Main
Cottingo		
Only 0 stars detected, Please adjust pointing of the camera, or increase exposure time to let at least 4 stars to be recognized.	A A A	
Confirm Position 1 Exposure Time 0.1 ms		

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 <u>support@ioptron.com</u> 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.

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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 <u>www.ioptron.com</u> 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.