

EM31Pro

Harmonic Equatorial Mount

USER MANUAL v2.0



EMCAN
www.emcanastro.com

Reading Tips

Reading Interpretation


Thank you for choosing EM31Pro Harmonic Equatorial Mount.

The manual is based on the factory default specifications. Therefore, some specifications or appearance of your instrument may be different. This manual is subject to change without prior notice.


The manual can still be used as a guide when there are differences in appearance or structure but no substantial differences in function or the use methods.

In order to ensure proper use of the equatorial instrument, please read this user manual carefully before starting to use

Symbol Description

 forbidden

 Important points









 Operation instruction

 **Blue stands for counterclockwise rotation**

 **Green stands for clockwise rotation**

Reading Tips

Security precautions

-  Please install and use the mount in strict accordance with the steps and precautions reminded in this manual, operators shall be responsible for any damage to the equipment or personal injury caused by improper operation.
-  The operating temperature of this equatorial mount ranges from -15°C to 40°C . Please use the equatorial mount reasonably under proper environmental conditions
-  After all devices are installed, check for the interference strictly and carefully. Collisions can cause damage to equipment components, causing the equatorial mount malfunction or affecting usage accuracy。 If any interference or other emergency situations are found, immediately unplug the power.
-  Please be careful when you carry, assemble or disassemble the main body and other heavy components and other equipments used on the mount . Or it may cause damage to the equipments or even personal injury.
-  Please be sure to place the whole equipments on solid and flat ground, Or the mount may fall over, which may cause damage to the equipment or even personal injury.
-  If there are children around when using, please pay attention to protecting their safety
-  Do not wipe the surface with corrosive liquid.
-  Unauthorized disassembly is strictly prohibited. If disassembled by oneself, the warranty is invalid.

Contents

Reading tips	p2-3
Product overview	
• Introduction	P5
• Specification	P6
• Packing accessories	P7
• Components of main body	P8
• Interface size	P9
• Optional fittings	P10-14
Standard usage process	
• Equatorial mode	P15-16
• Altazimuth mode	P17-18
Installation and commissioning	
• Pier extension and tripod installing	P19-27
• Latitude and azimuth adjustment	P28-31
• Dovetail installing	P32-33
• Altazimuth mode (side)	P34-39
• Altazimuth mode (top)	P40-52
• Cable connection	P53-56
• Mode option	P57
Installation of accessories	P58-59
Installation of battery	P60
Onstep quick start guide	
• Onstep guide	P61-68
• Handle controller instruction	P69-76
• Onstep connects to other devices	P77-79
Updating of firmware	P80-84
Warranty Statement	P85-86

Product Overview

Brief introduction

The EM31 Pro Harmonic Equatorial Mount is a lightweight equatorial mount that uses harmonic reducers. EM31 Pro Harmonic Equatorial Mount, with three modes of German equatorial mount, side altazimuth mount and top altazimuth mount, can meet the needs of both astrophotography and sky observation, especially in outdoor environments, its small size and lightweight design can provide astrophotographers and astronomical observers great convenience for carrying and using. Meanwhile, its complete set of fast installation and speed adjustment design system can help users enter the shooting and observation state faster.

Product Overview

Specification

1. Weight of the main body: approx. 4kg (without Dovetail & adapter)
 2. Payload: $\leq 15\text{kg}$ (without counterweight)
 $\leq 20\text{kg}$ (with counterweight)
- Note: payload calculated in the condition that the the distance between telescope's central axis and the base of dovetail saddle is less than 100mm
3. Latitude adjustment: $0^{\circ}\sim 90^{\circ}$ (micrometer adjustment $\pm 10^{\circ}$)
 4. Azimuth adjustment: $-8^{\circ}\sim +8^{\circ}$
 5. RA: harmonic reducer model 17 (reduction ratio 1:100)
 6. DEC: harmonic reducer model 17 (reduction ratio 1:100)
 7. Motor: 42 Closed-loop stepper motor
 8. Goto speed: max $6^{\circ}/\text{s}$
 9. Power port: DC5.5-2.1 (12v 5A)
 10. Power consumption: tracking 0.4A, Goto 0.7A
 11. Communication interface: usb2.0, wifi, Bluetooth
 12. dovetail: Vixen 75° & LOSMANDY 60° ; Arca(Optional)
 14. Home position: by bubble levels
 15. Mode: equatorial mode; Altazimuth mode (side & top)
 16. Hand controller: Wired hand controller



The payload is not exactly equal to the total weight of the equipment to be loaded. The effective weight that the equatorial instrument can bear is closely related to the center of gravity position of the entire equipment, and the equipment with a high center of gravity will correspondingly offset the load-bearing capacity of the equatorial instrument.

Before installing heavy equipment with a high center of gravity, please refer to the EM31Pro load formula to confirm whether it is overweight.

Product Overview

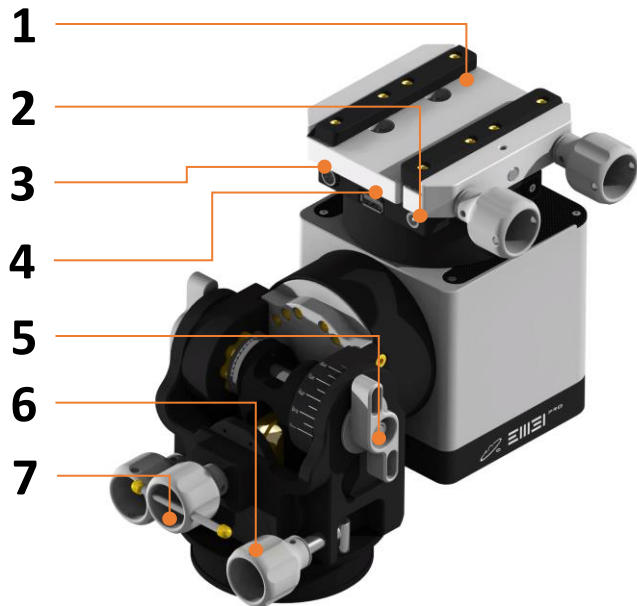
Packing & Accessories

The standard of the harmonic equatorial mount includes components and quantities as follows:

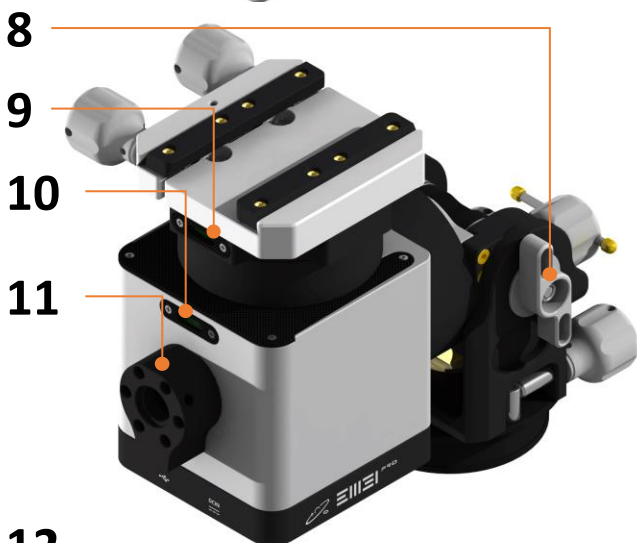
1	EM31 Pro body	1
2	Hand controller	1
3	dovetail (VIXEN & LOSMANDY)	1
4	Front multifunctional bracket	1
5	Adapter	1
6	0.5m USB2.0 cable	1
7	2m USB 2.0 cable	1
8	Soft bag	1

Product Overview

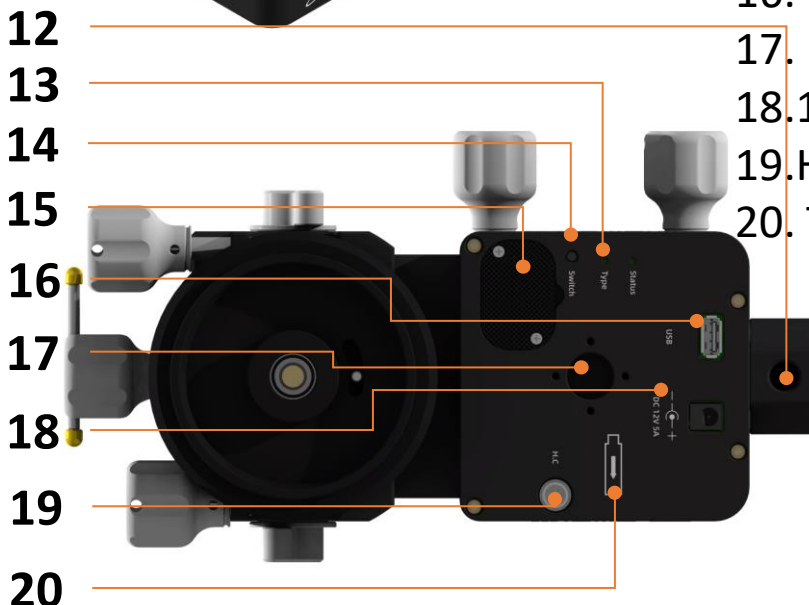
Components name



- 1. Dovetail
- 2. DEC 12v DC 5.5*2.1
- 3. DEC Hand controller port
- 4. DEC USB port (type A)
- 5. Main altitude locking knob
- 6. Azimuth adjustment knob
- 7. Altitude fine adjustment knob
- 8. Auxiliary altitude locking knob



- 9. Bubble level for DEC axis
- 10. Bubble level for RA axis
- 11. Multifunctional front support
- 12. Counterweight bar interface
- 13. Mode indicator light
- 14. Mode switching button
- 15. Battery cover plate
- 16. USB (type A)

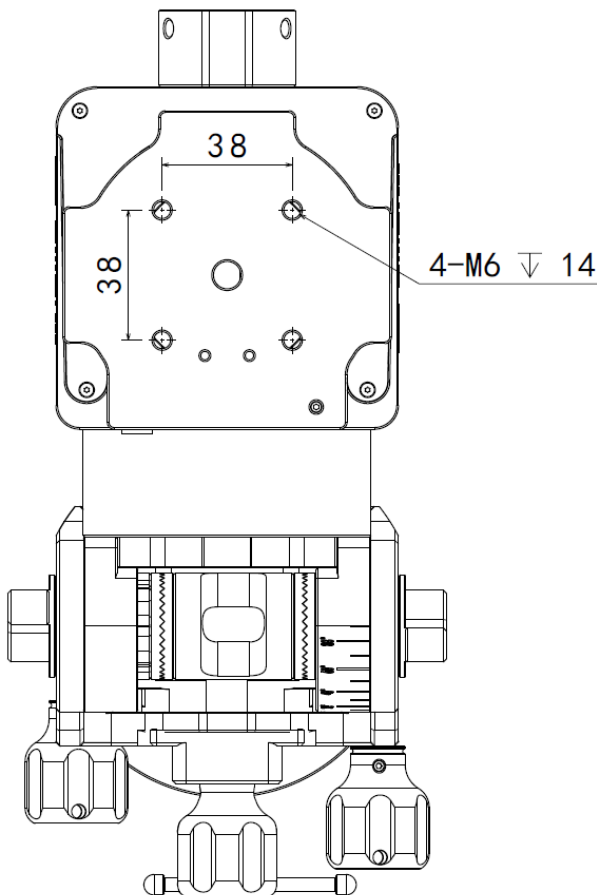


- 17. Ball head interface
- 18. 12v DC 5.5*2.1 power port
- 19. Hand controller port
- 20. Telescope directional mark

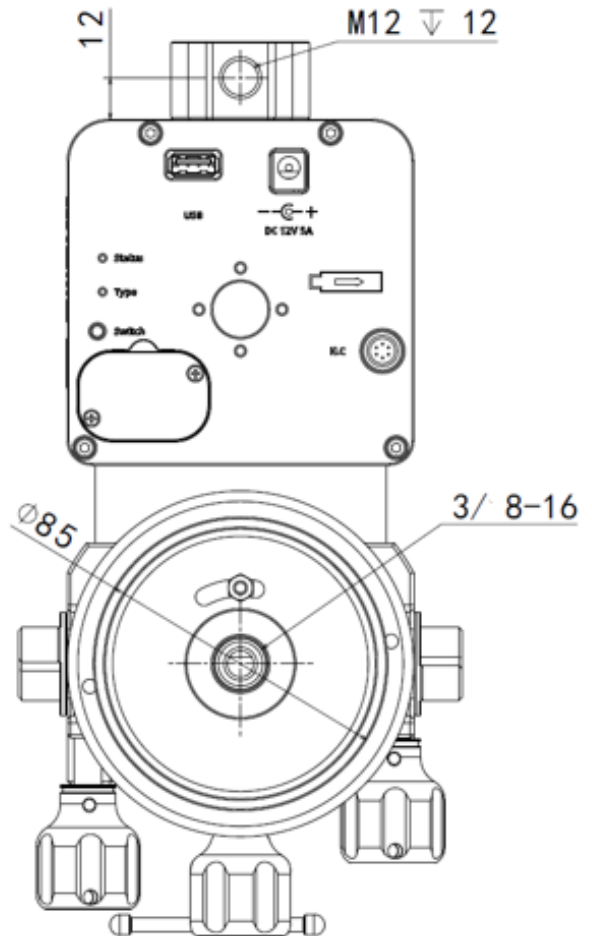
Product Overview

Interface size

The standard dovetail of EM31Pro can be replaced, and the installation dimensions of the dovetail are as follows:



EM31 supports counterweight bar with a diameter less than 20mm, and with length less than 300mm, the counterweight should be no more than 5kg



The screw thread length of the counterweight bar shall not exceed 12mm

Product Overview

Optional accessories:

EM TC44S Tripod



RP200 Extension rod



AD120 Horizontal adjuster



Parameters:

Tripod interface: 85mm	Locking method: three screws locked
Carbon fiber tube diameter: 44mm	Tube thickness: 2mm
Storage length:	620mm (EM-TC44S)
Unfolded height:	EM-TC44S 530mm
	EM-TC44L 720mm
	EM-TC44U 810mm
Weight:	EM-TC44S approx. 2.5kg
	EM-TC44L approx. 3.3kg
	EM-TC44U approx. 4.2kg

 This accessory needs to be purchased separately

Product Overview

Optional accessories:

EMH150 Fast-assembling pier extension



**Material: Aluminum(AL6061),
Stainless steel**

Size: H150mm dia110mm

Weight: 1.2kg



This accessory needs to be purchased separately

Product Overview

Optional accessories :

Top-mounted mode supporting bracket



Material:

**Aluminum(AL6061),Stainless steel,
Titanium alloy(counterweight bar)**

Size: L350mm

Weight: 1.8kg

Suitable for binocular telescopes



This accessory needs to be purchased separately

Product Overview

Optional accessories :

Ball head mount
adapter



Arca board strips

 This accessory needs to be purchased separately

Product Overview

Optional accessories :

Adapter for QHY
Pole master



Adaptor for Ipolar
(Only applicable to
specific version)



This accessory needs to be purchased separately

Standard Use Procedure

Use Procedure

Equatorial mount Mode

Install equipment

Set time and location

Set zero position

Polar alignment

Select target and Goto

Using Target Calibration

Come into use



The coordinates and time of the using site must be set correctly, and the zero position must be set correctly, otherwise it may cause target goto errors and even equipment collisions

Standard Use Procedure

Use Procedure

Zero position of Equatorial mount mode

The zero position of the German Equatorial mount is shown in the diagram below, and the telescope points to the North Pole

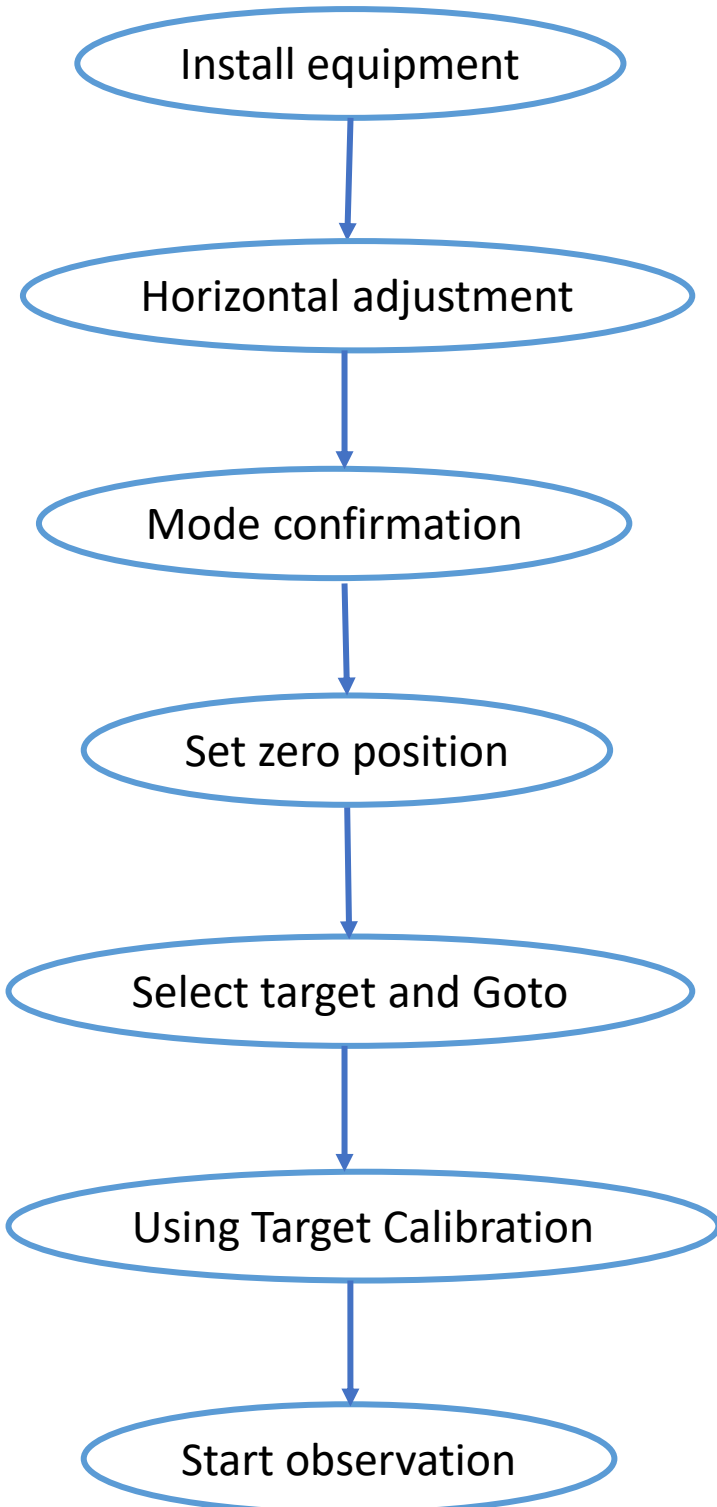


EM31 Pro can confirm the zero position of Equatorial mount through RA and DEC axis bubble level

Standard Use Procedure

Use Procedure

Altazimuth Mode (side & top)



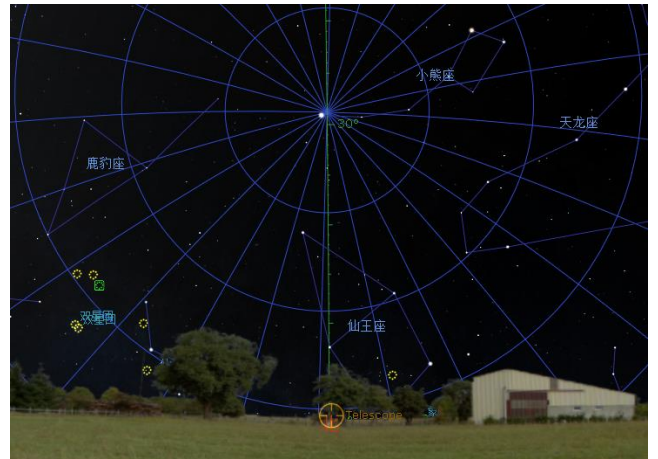
The coordinates and time of the observation site must be set correctly, and the zero position must be set correctly, otherwise it may cause target goto errors and even equipment collisions

Standard Use Procedure

Use Procedure

Zero position of Altazimuth Mode (side & top)

The zero position of the Altazimuth mode is shown in the diagram below, and the telescope points to the North Pole



The initial zero position can be confirmed through a mobile compass and level



Installation and Use

Installation of equatorial mount with pier extension and tripod

EM 31 Pro can be installed on non central axis photographic tripod with a bore diameter of 85 mm.

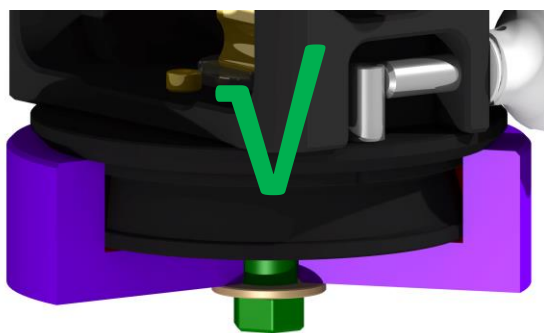
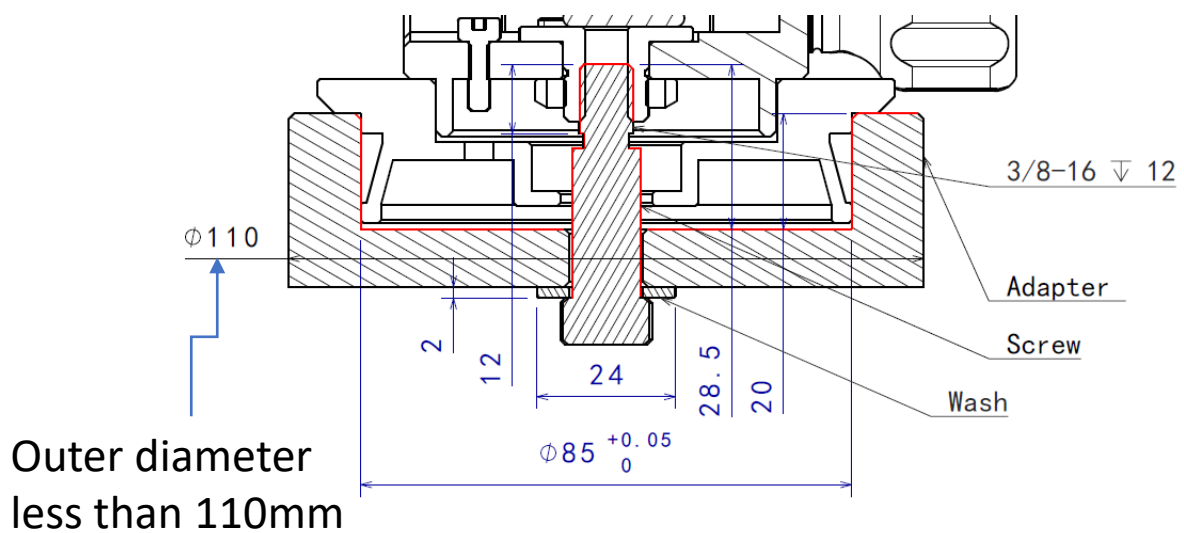


Installation and Use

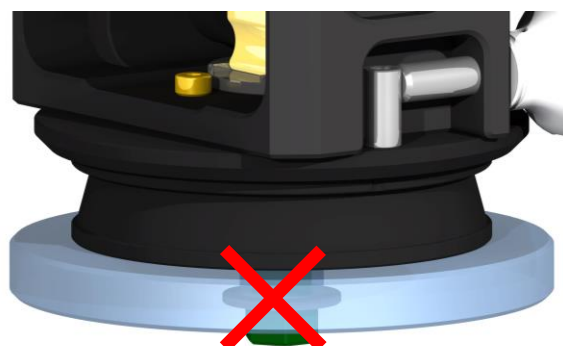
Installation of equatorial mount with pier extension and tripod

Standard accessories for other tripod mounting are not officially available. If users need to mount the equatorial instrument on other tripods, they need to design and process the adapter and mounting bolts by themselves.

The dimensions need to follow the chart below :



Correct adapter structure

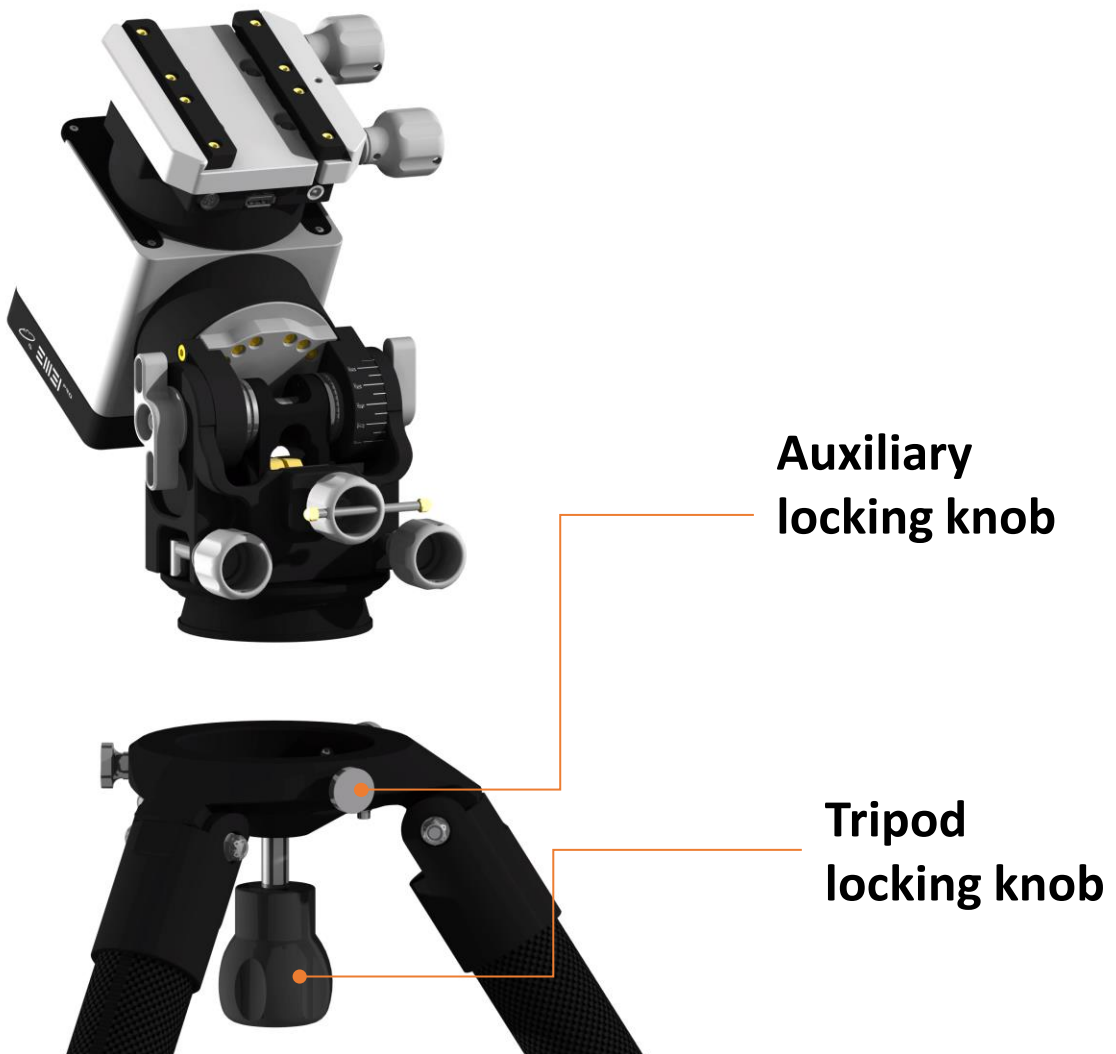


Incorrect adapter structure, it is prohibited to connect to the equatorial instrument through only one plane

Installation and Use

Installation of equatorial mount with pier extension and tripod

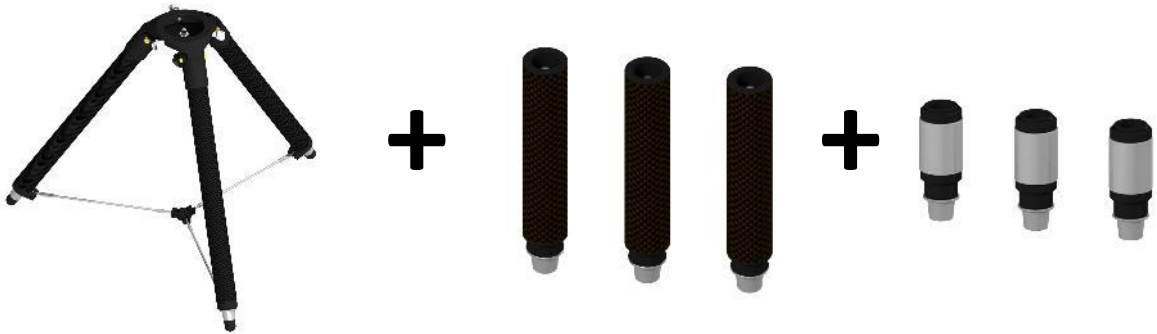
When using the EM TC44 tripod, the equatorial mount body can be directly installed on the tripod through the adapter, and locked by the three knobs of the tripod to achieve more reliable connection.



Installation and Use

Installation of equatorial mount with pier extension and tripod

EM TC44S is a high load tripod specially designed for harmonic equatorial mount, in order to improve the rigidity of the tripod, it is designed as a non-retractable structure, and the height and supporting area of the tripod are expanded by installing the heightening section.



Rotate clockwise to install the extension rod and horizontal adjuster



Installation and Use

Installation of equatorial mount with pier extension and tripod

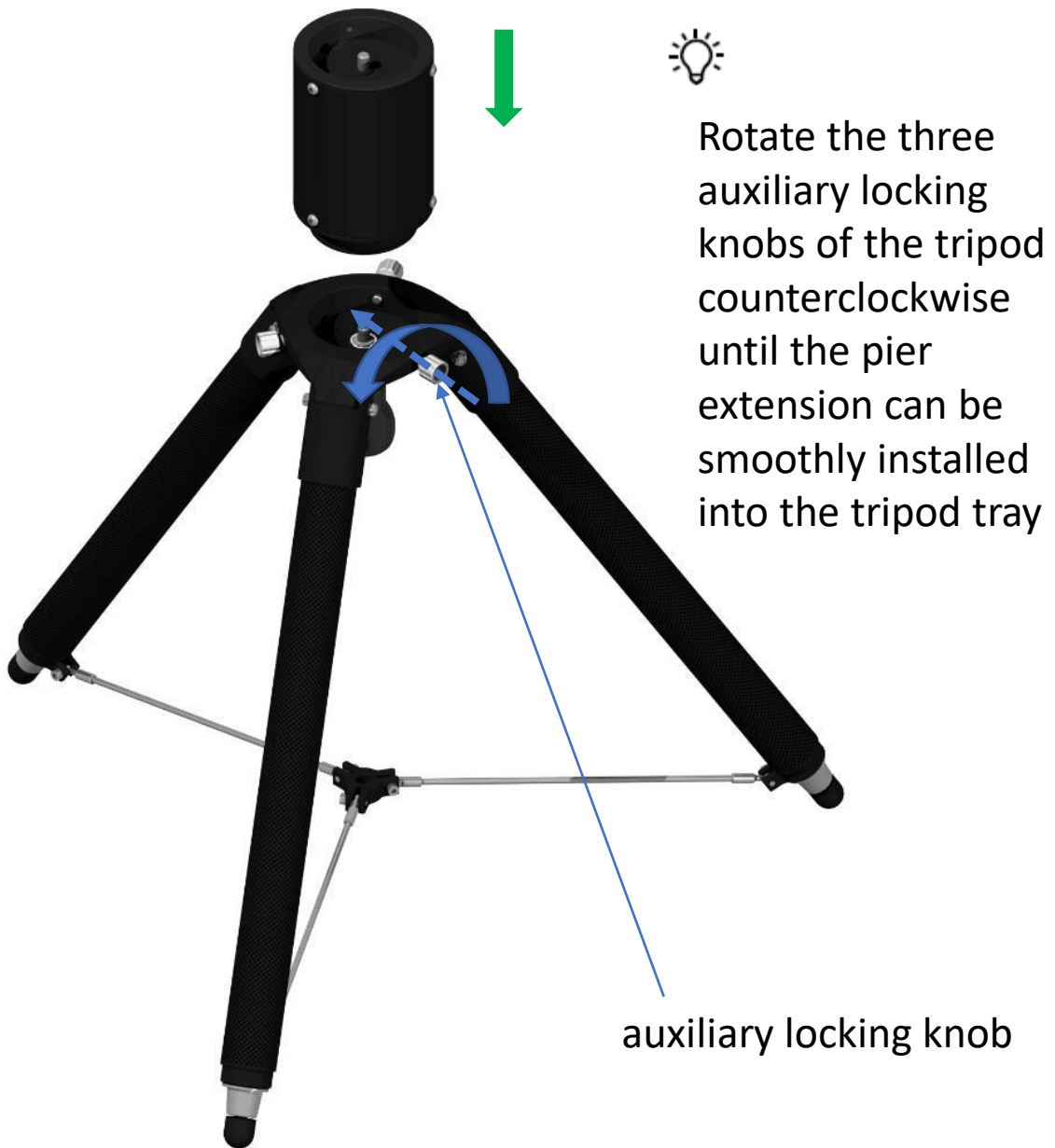
The harmonic equatorial mount is small in size. When a longer telescope is used, there is a problem of interference between the telescope and the tripod near the meridian. At this time, it is necessary to use the pier extension to avoid interference.



Installation and Use

Installation of equatorial mount with pier extension and tripod

Installation steps with the pier extension



Installation and Use

Installation of equatorial mount with pier extension and tripod

Installation steps with the pier extension



Gently Push up the main tripod locking knob and rotate it clockwise until the knob and pier extension cannot rotate relative to each other



Note that if this step is not performed correctly, the equatorial mount body and pier extension will not be separated properly when disassembling the equipment.



main locking knob

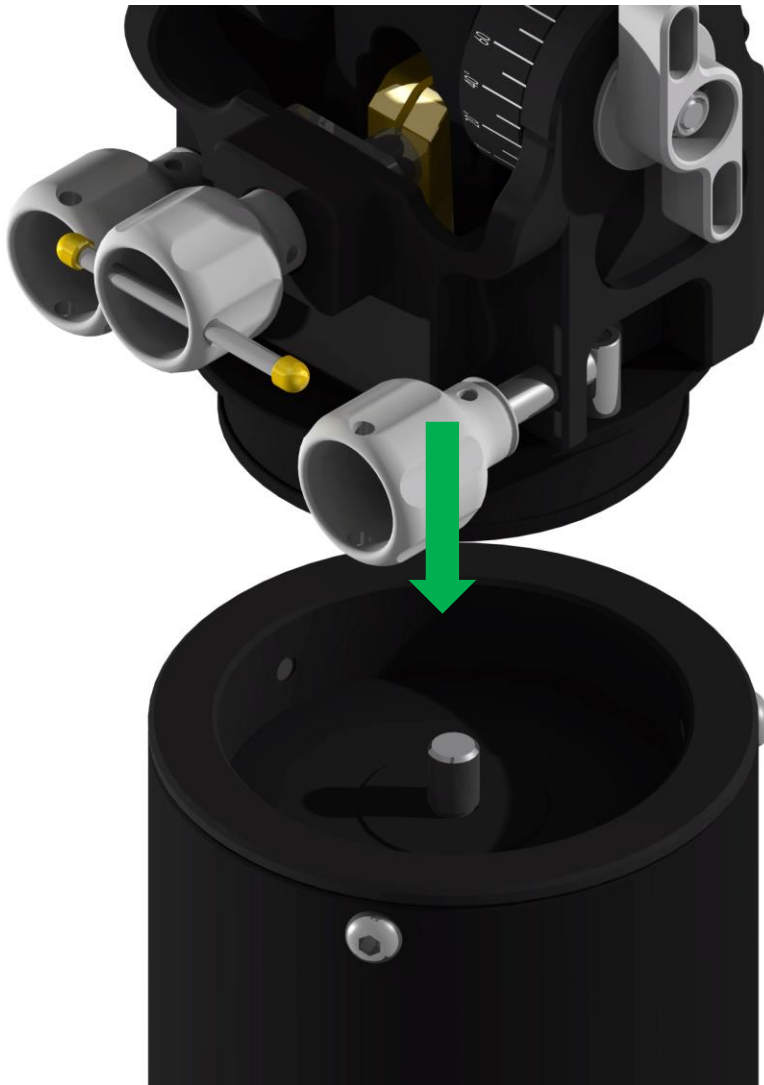
Installation and Use

Installation of equatorial mount with pier extension and tripod

Installation steps with the pier extension



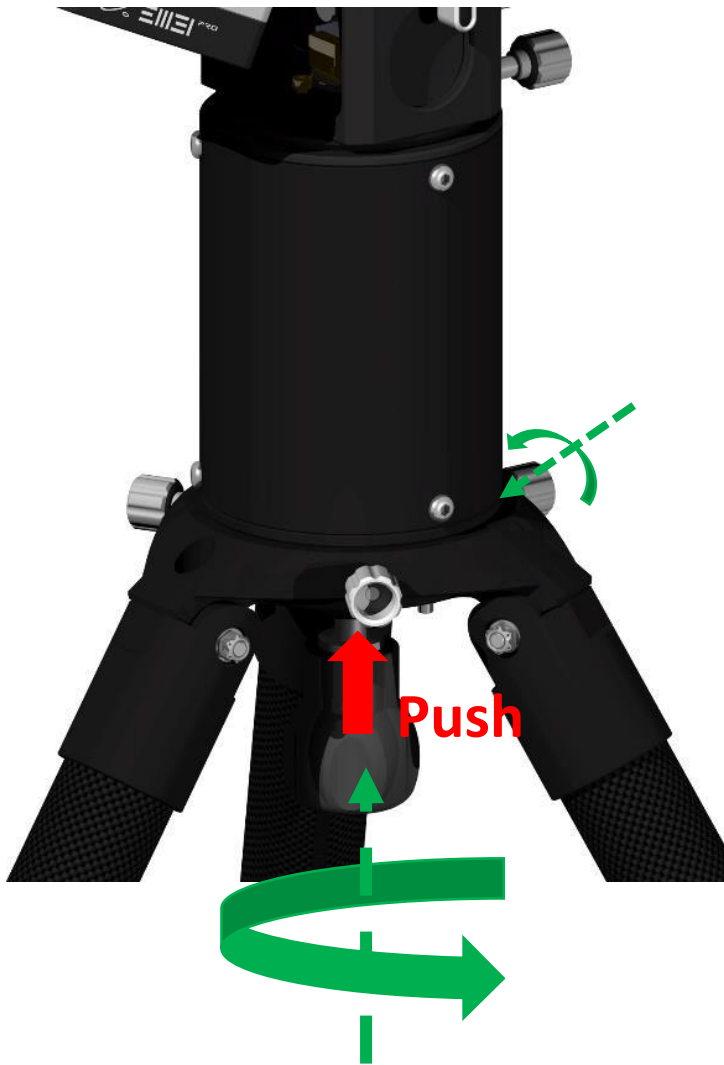
Place the equatorial mount body with the adapter into the pier extension



Installation and Use

Installation of equatorial mount with pier extension and tripod

Installation steps with the pier extension



Push up and continue to rotate the main tripod locking knob clockwise until it locks tightly

Rotate the three tripod auxiliary locking knobs clockwise until they lock securely

Up to now, the installation of the body, pier extension, and tripod is completed




To lock the body, push the main locking knob upwards with slight force first before clockwise rotating the knob

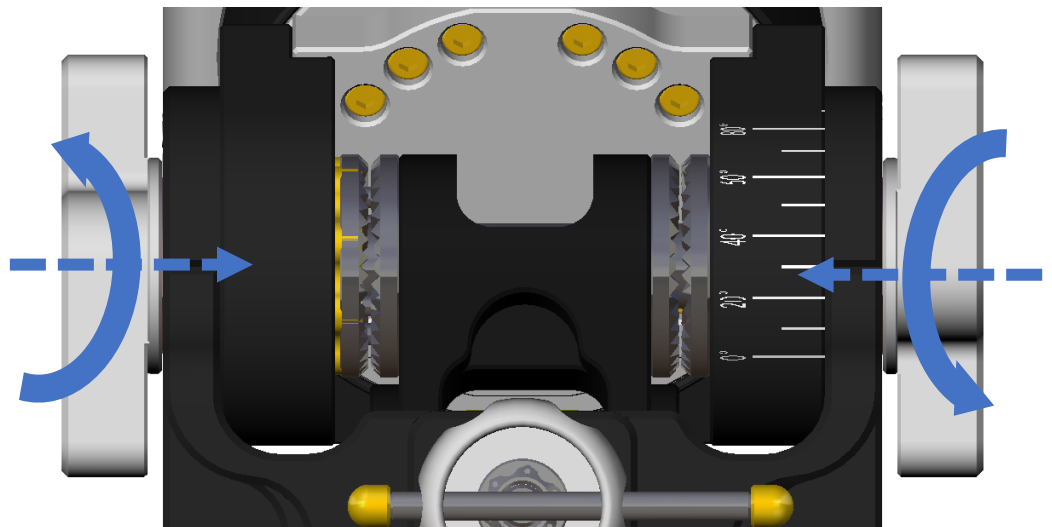



Installation and Use


Adjustment of altitude and azimuth angles of the German equatorial mount

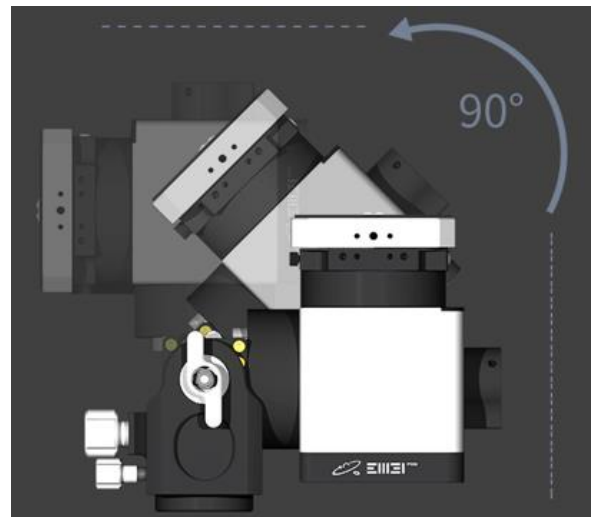
Altitude coarse adjustment


Rotate
counterclock
wise to
release the
auxiliary
altitude
locking knob



 Rotate the main altitude locking knob counterclockwise until the two pairs of flat gears are completely separated. At this point, the altitude angles can be freely adjusted

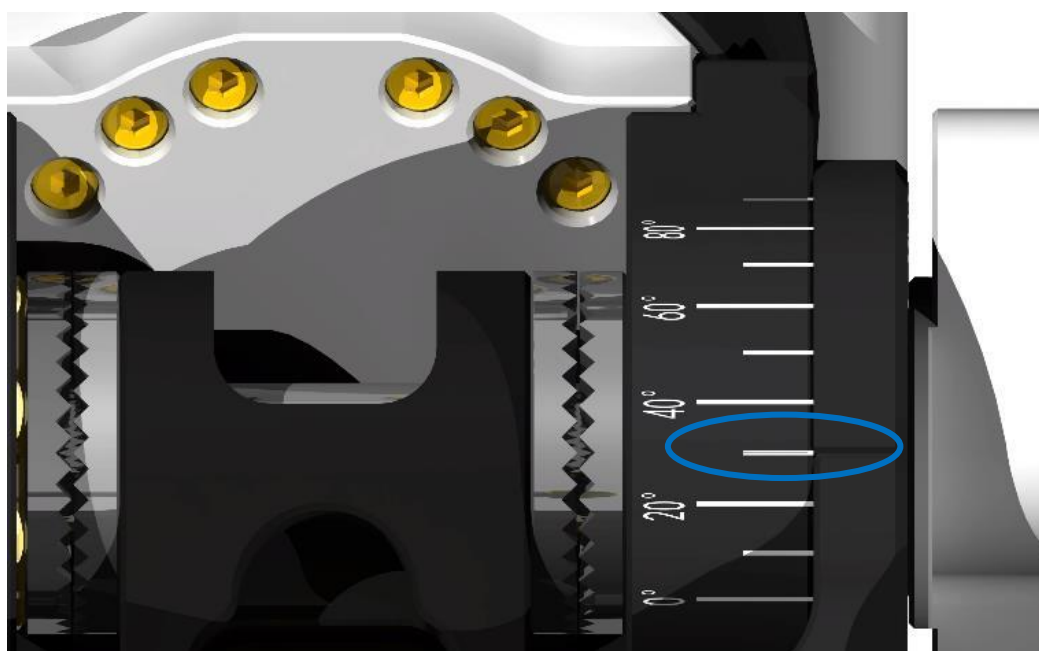
 **When the main altitude locking knob is loosened, the body will lose its support. During the coarse adjustment process, be sure that there is always a hand to support the body until the main altitude knob is locked again**



Installation and Use

Adjustment of altitude and azimuth angles of the German equatorial mount

Altitude coarse adjustment



💡 Refer to the altitude scale, adjust the altitude angle to the approximate local latitude position. (For example, if the local latitude is $31^{\circ}13'20''$, lock the altitude near 30°)



When the main altitude locking knob is loosened, the body will lose its support. During the coarse adjustment process, be sure that there is always a hand to support the body until the main altitude knob is locked again



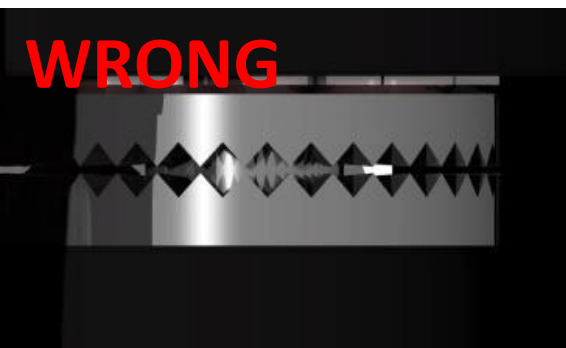
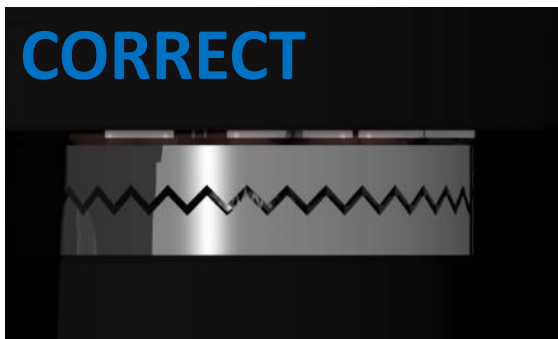
Roughly adjust the altitude angle at 10° intervals, such as 0° , 10° , 20° , 30° ... 90°

Installation and Use

Adjustment of altitude and azimuth angles of the German equatorial mount

Altitude coarse adjustment

- ⚡ Rotate the main altitude locking knob clockwise at the rough latitude position until the flat gear engages again. Rotate the auxiliary altitude locking knob clockwise to complete coarse adjustment of the altitude angle



Note that the flat gear must engage correctly, as shown in the left diagram. Incorrect engagement may cause the equipment to slip



When the main altitude locking knob is loosened, the body will lose its support. During the coarse adjustment process, be sure that there is always a hand to support the body until the main altitude knob is locked again

Altitude angle coarse adjustment completed



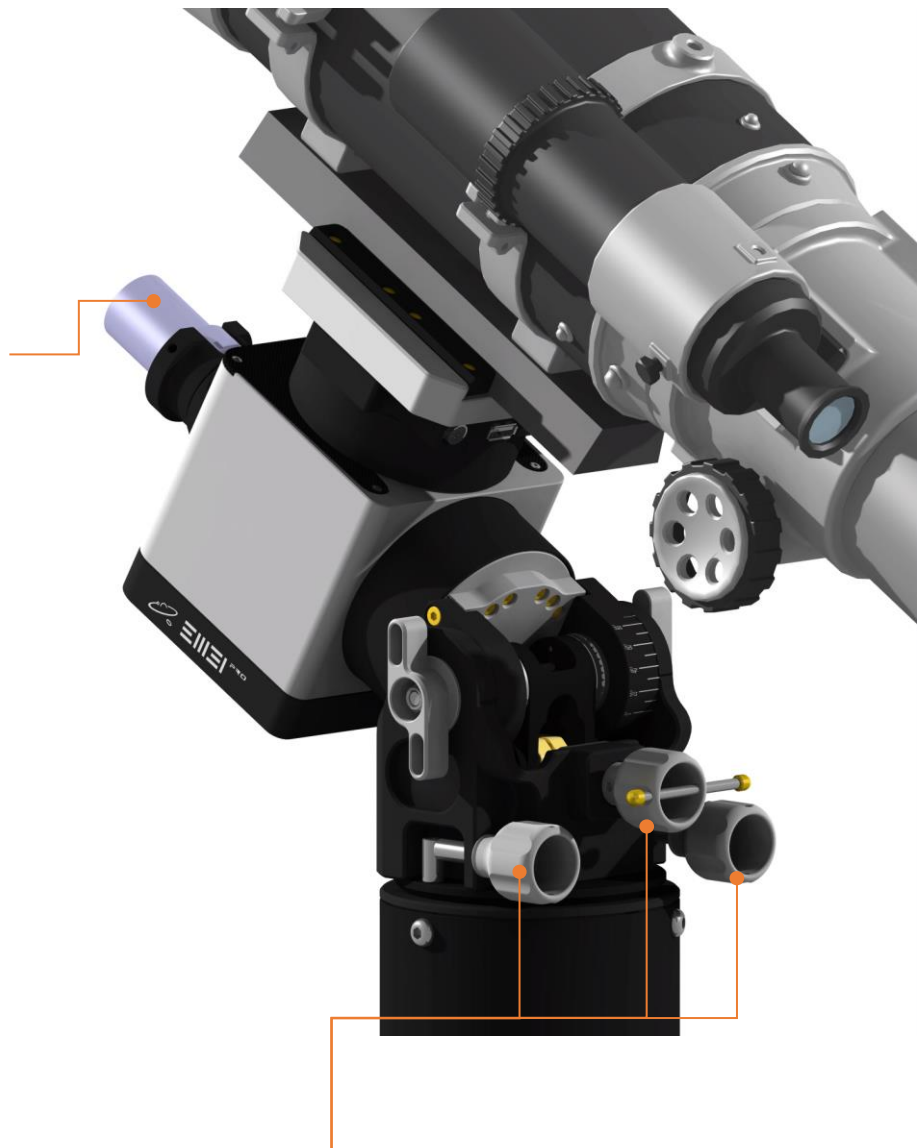
Installation and Use

Adjustment of altitude and azimuth angles of the German equatorial mount

Precise alignment of polar axis

1. For Astrophotography, polar calibration can be completed through plate solving
2. EM31 Pro supports the installation of Pole master or Ipolar to complete polar calibration

Adapter for
electronic
polar
alignment
scope



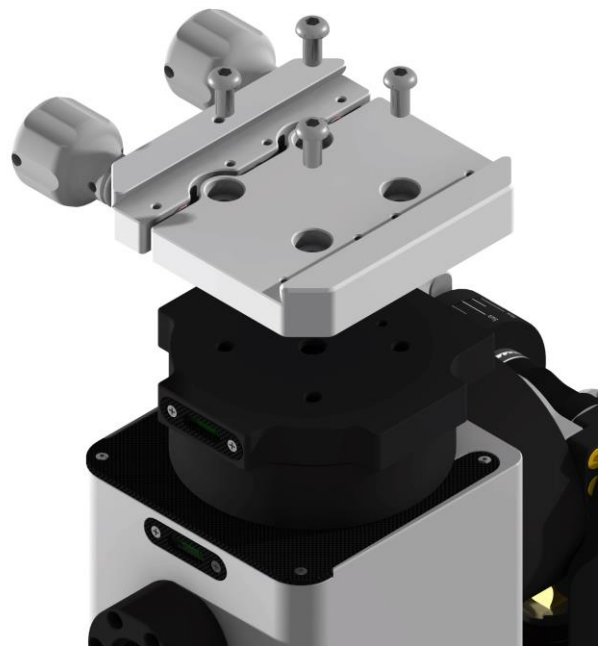
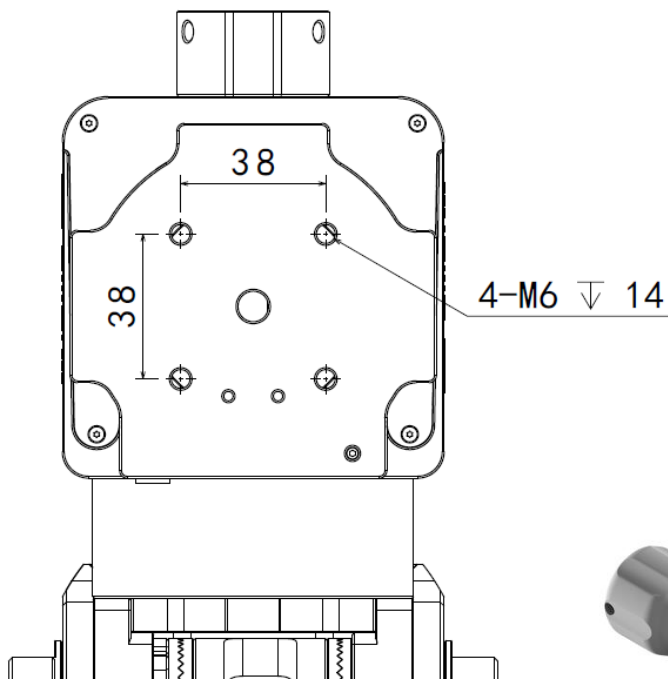
After all equipment installation is completed, precise calibration of the polar axis is completed by rotating the azimuth adjustment knob and altitude fine adjustment knob

Accessory Installation

Installation of dovetail

Dovetail

The interface on EM31 Pro DEC top plate is suitable for installation with most dovetails, users can replace the dovetail according to their needs



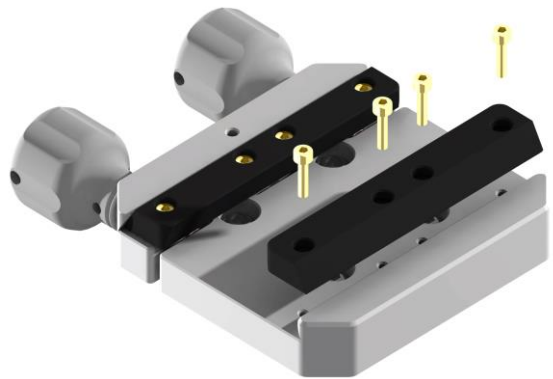
Accessory Installation

Installation of dovetail

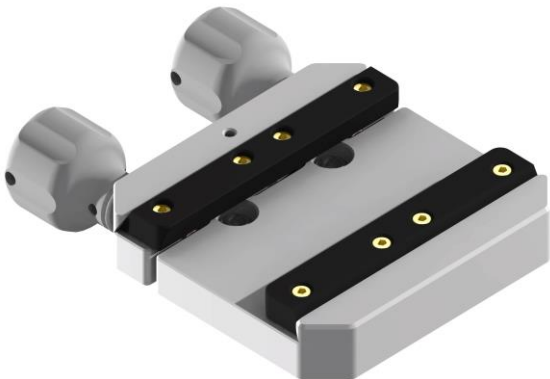
Dovetail

EM31 Pro has a dovetail of LOSMANDY 60°. Vixen 75° and Arca specifications can be achieved by installing the dovetail strips.

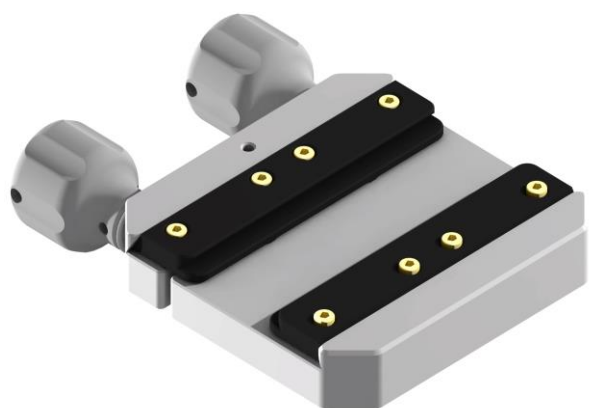
LOSMANDY



VIXEN



ARCA



Installation and Use

Altazimuth mount

Structure Switching

The installation method of EM31 Pro pier extension and tripod in altazimuth mode is the same as that of German equatorial mount. It is necessary to adjust the altitude angle to 90 degree, and the adjustment method is same as that of the German equatorial mount.



Installation and Use

Altazimuth mount

Installation of telescope



Confirm that the installation direction of the telescope is consistent with the direction marked on the bottom of the body



Installation and Use

Altazimuth mount

Horizontal calibration

The prerequisite for achieving accurate goto and stable tracking in altazimuth mode is that the azimuth rotation axis is perpendicular to the ground. EM31 Pro can confirm the status through the RA axis horizontal bubble

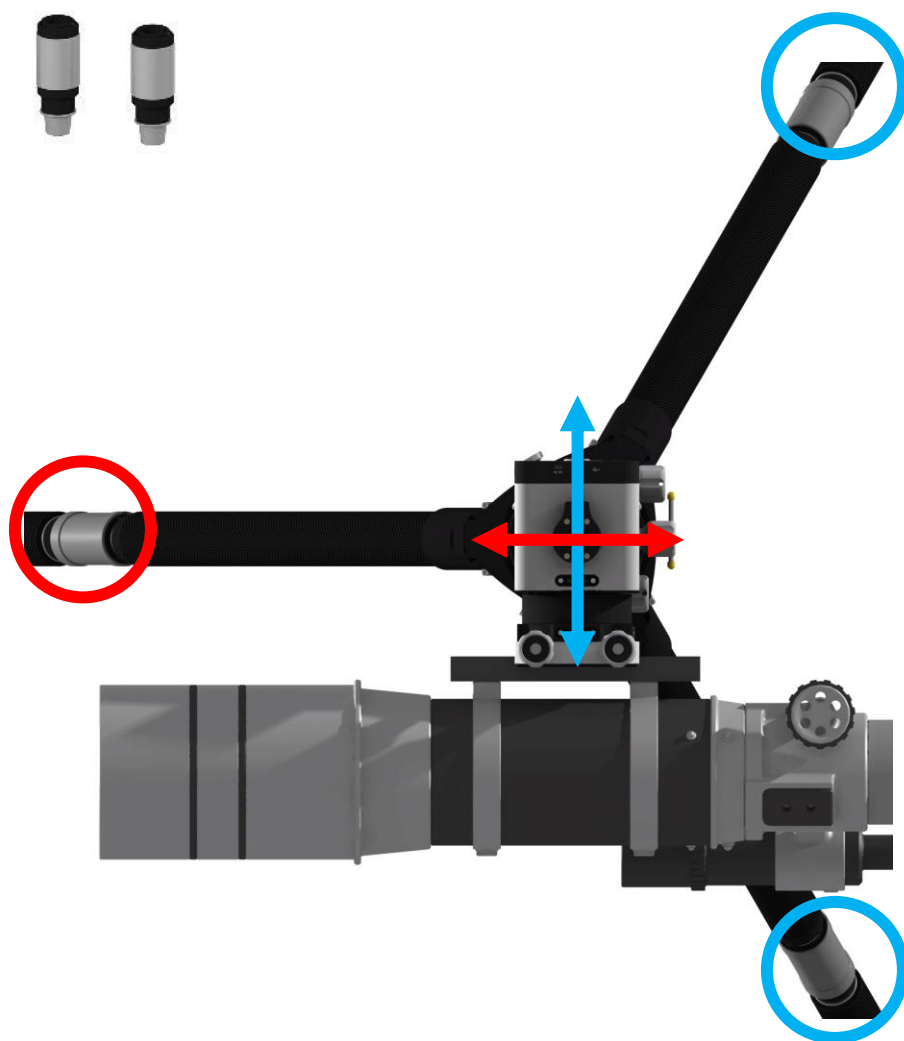



Installation and Use

Altazimuth mount

Horizontal calibration

When using the AD120 horizontal adjuster, the horizontal state can be adjusted by adjusting the horizontal adjusters



 All equipment need to be installed before starting to adjust the horizontal state

Installation and Use

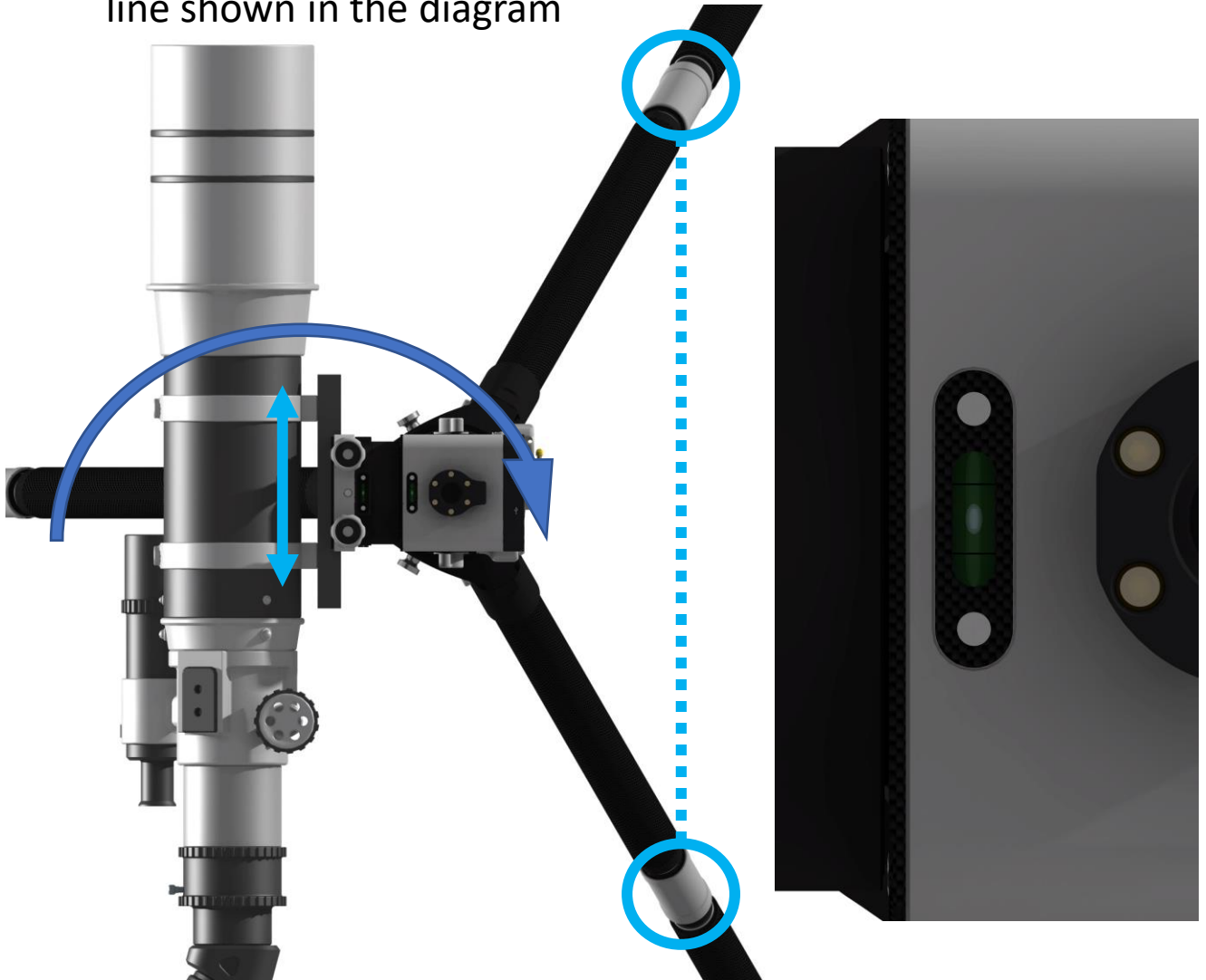
Altazimuth mount

Horizontal calibration

Obtain accurate horizontal state

💡 Power on the equatorial mount and manually rotate the RA axis to make the horizontal bubble parallel to the blue horizontal adjuster line shown in the diagram

💡 Adjust the two horizontal adjusters inside the blue circles until the horizontal bubble is centered



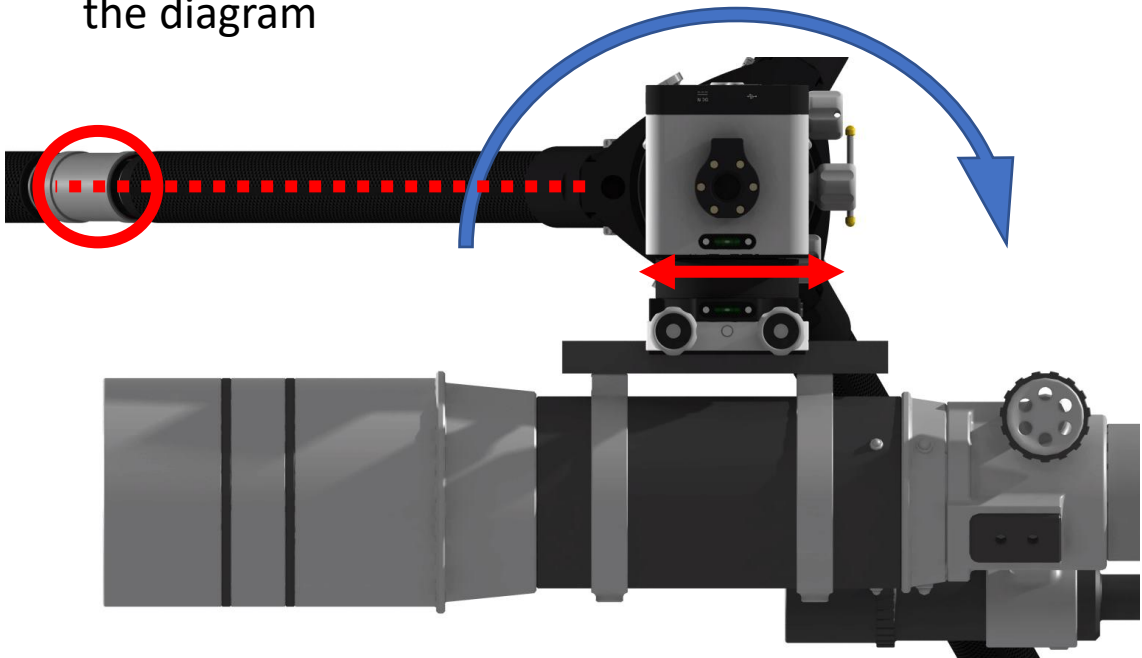
Installation and Use

Altazimuth mount

Horizontal calibration

Obtain accurate horizontal state

- 💡 Power on the equatorial mount and manually rotate the RA axis so that the horizontal bubble is parallel to the red dashed line in the diagram



- 💡 Adjust the horizontal adjuster inside the red circle until the horizontal bubble is centered, and then the horizontal adjustment is completed



Installation and Use

Altazimuth mount-top mode

Structure Switching

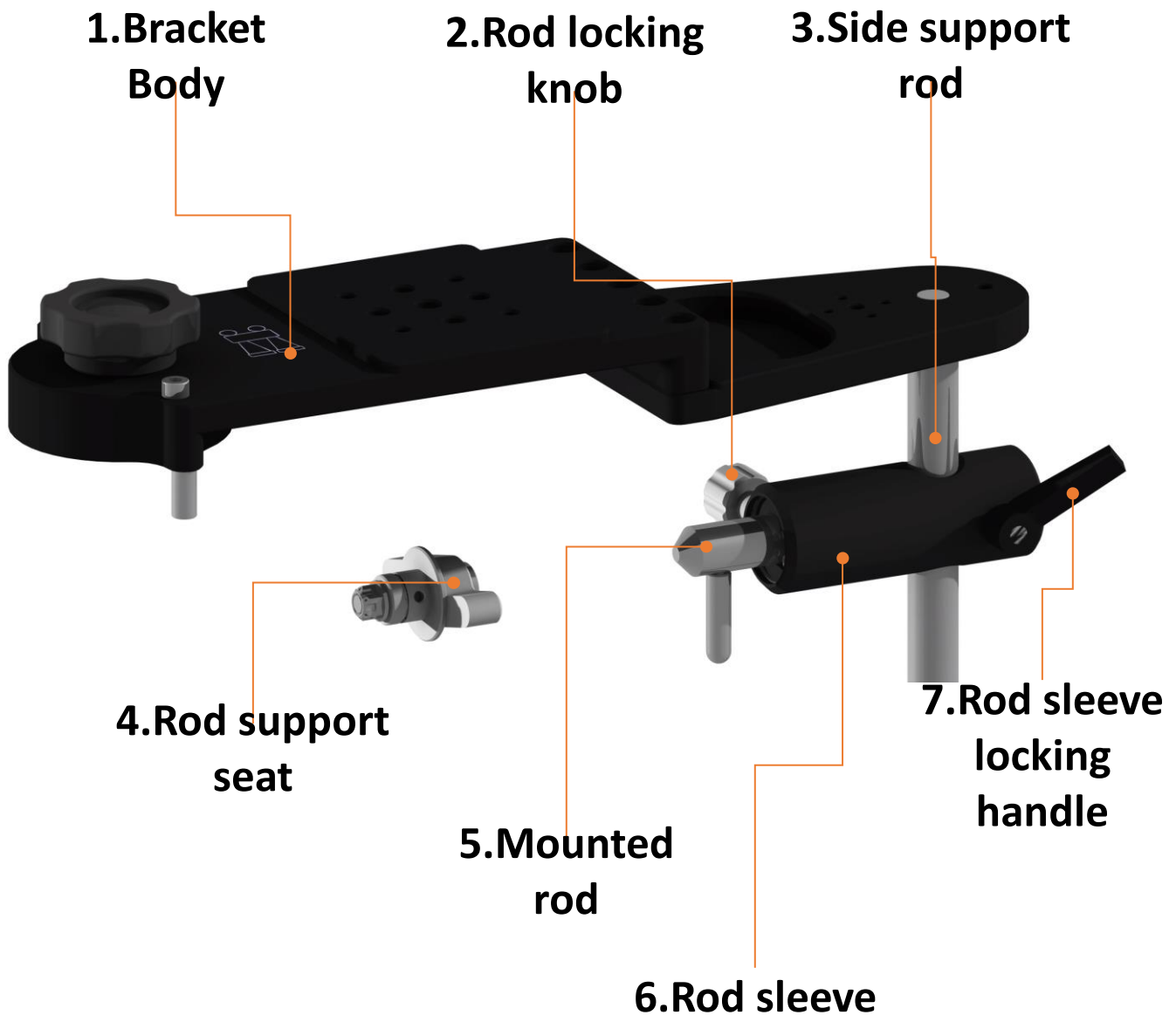
EM31 Pro can switch to altazimuth mount top mode by installing a supporting bracket on top



Installation and Use

Altazimuth mount-top mode

top mode supporting bracket structure



Installation and Use

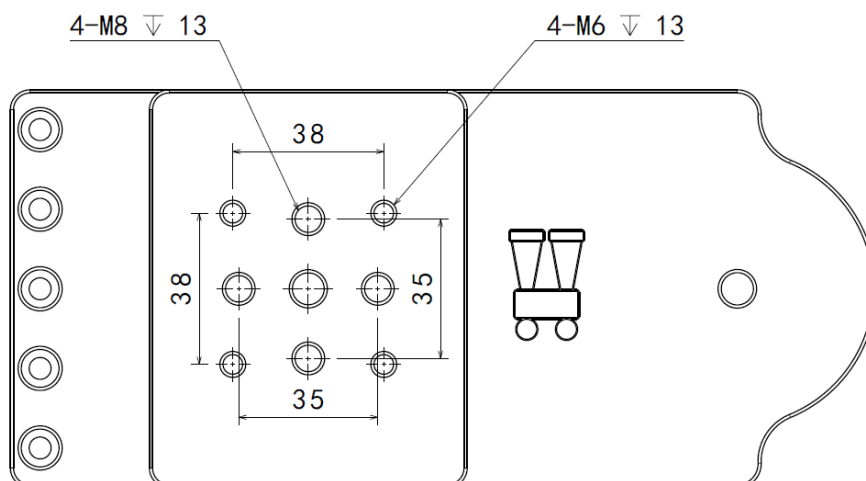
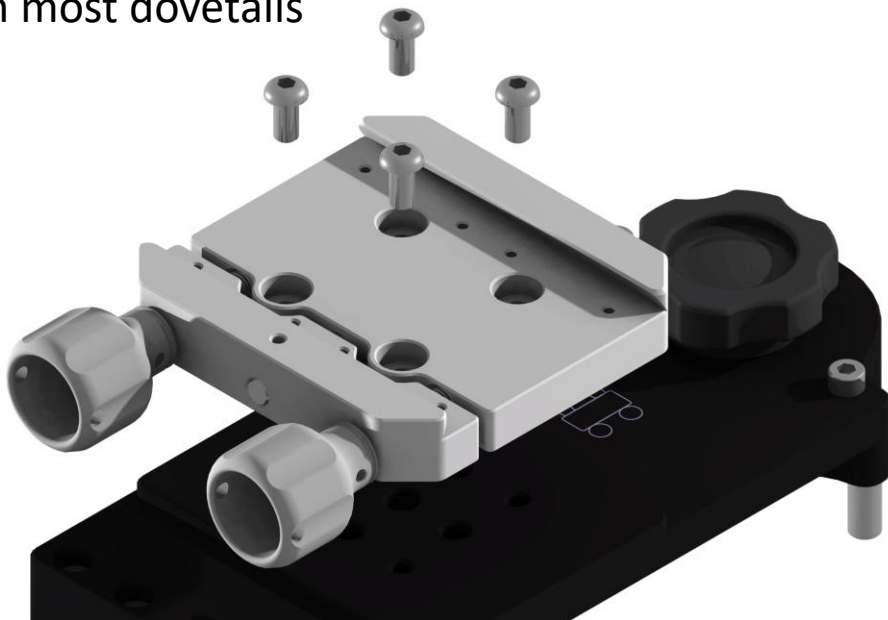
Altazimuth mount-top mode

Structure Switching

The supporting bracket interface is suitable for installation with most dovetails



Note the installation direction of the dovetail slot knob, as illustrated



The top mode supporting bracket does not come with a dovetail, you can use the dovetail on the body or choose your own.

Installation and Use

Altazimuth mount-top mode

Structure Switching

- 💡 Replace the dovetail on the equatorial mount body with an supporting bracket connecting adapter and adjust the altitude angle to 0 degrees



Installation and Use

Altazimuth mount-top mode

Structure Switching



Invert the body of the Equatorial mount and install it with the pier extension and tripod in the same way as in the German Equatorial mount mode

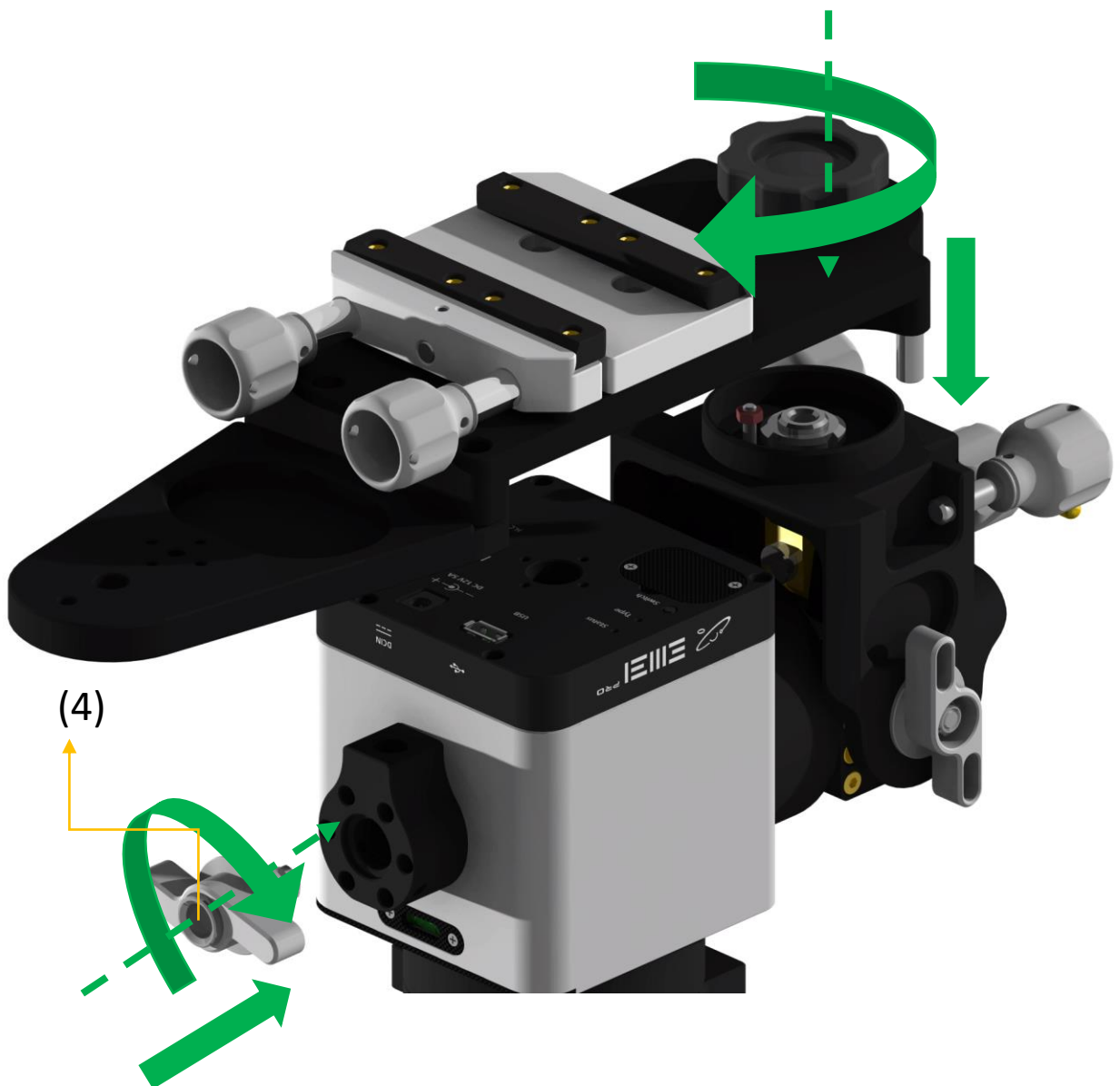


Installation and Use

Altazimuth mount-top mode

Structure Switching

- 💡 Insert the supporting bracket into the equatorial mount body base and rotate the knob clockwise until it locks, and rotate the Rob support seat(4) clockwise until it reaches the bottom but do not lock it tightly

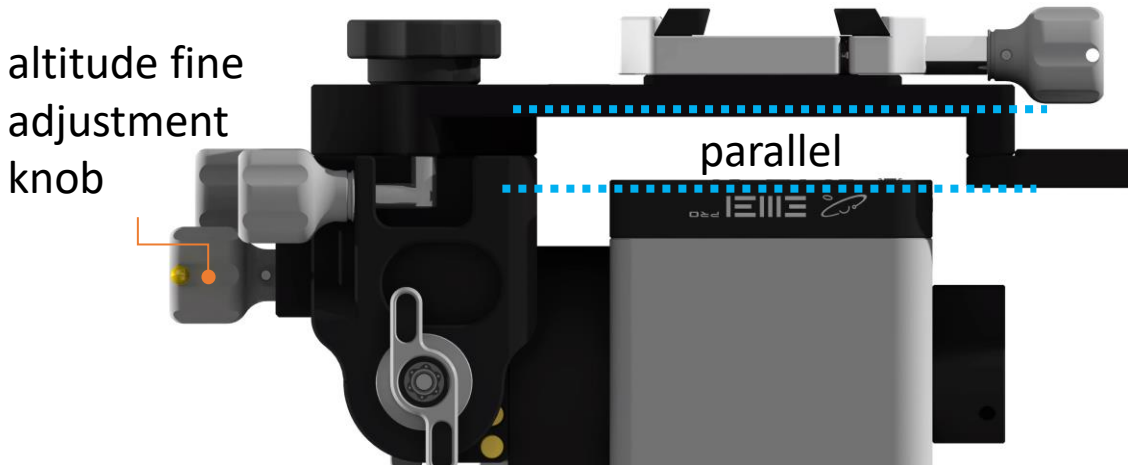


Installation and Use

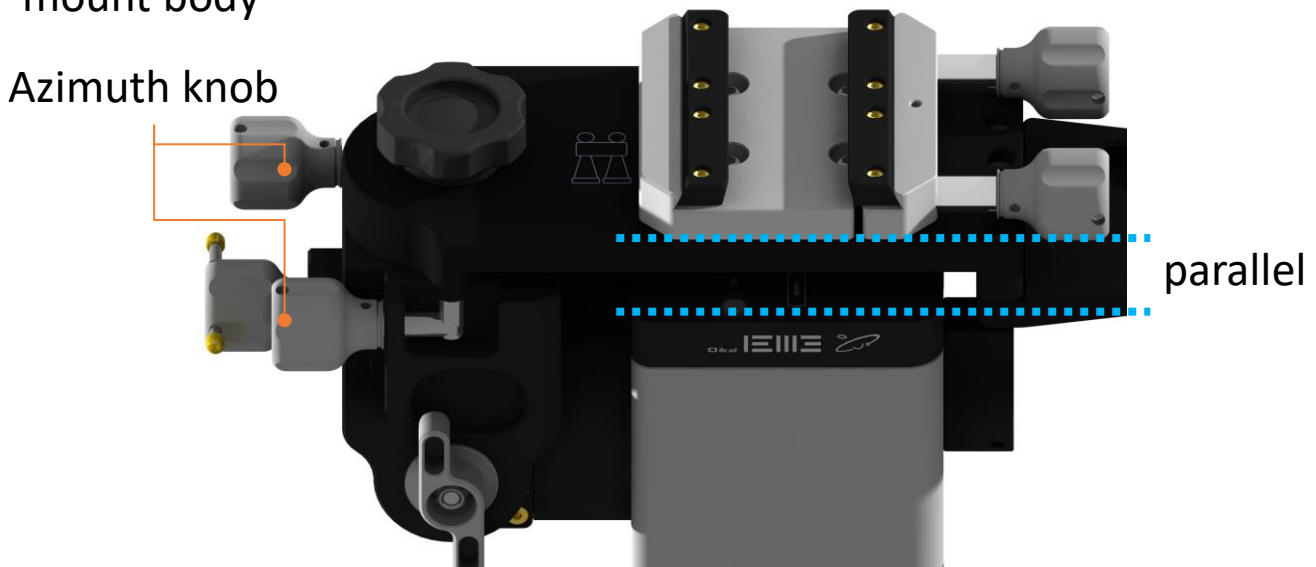
Altazimuth mount-top mode

Structure Switching

- Adjust the altitude fine adjustment knob so that the lower edge of the upper mounting bracket is parallel to the edge of the bottom shell of the equatorial mount body



- Adjust the azimuth knob so that the side edge of the upper bracket is parallel to the edge of the bottom cover of the mount body



- ⚠ Boundary parallelism can be judged by adjusting the perspective observation

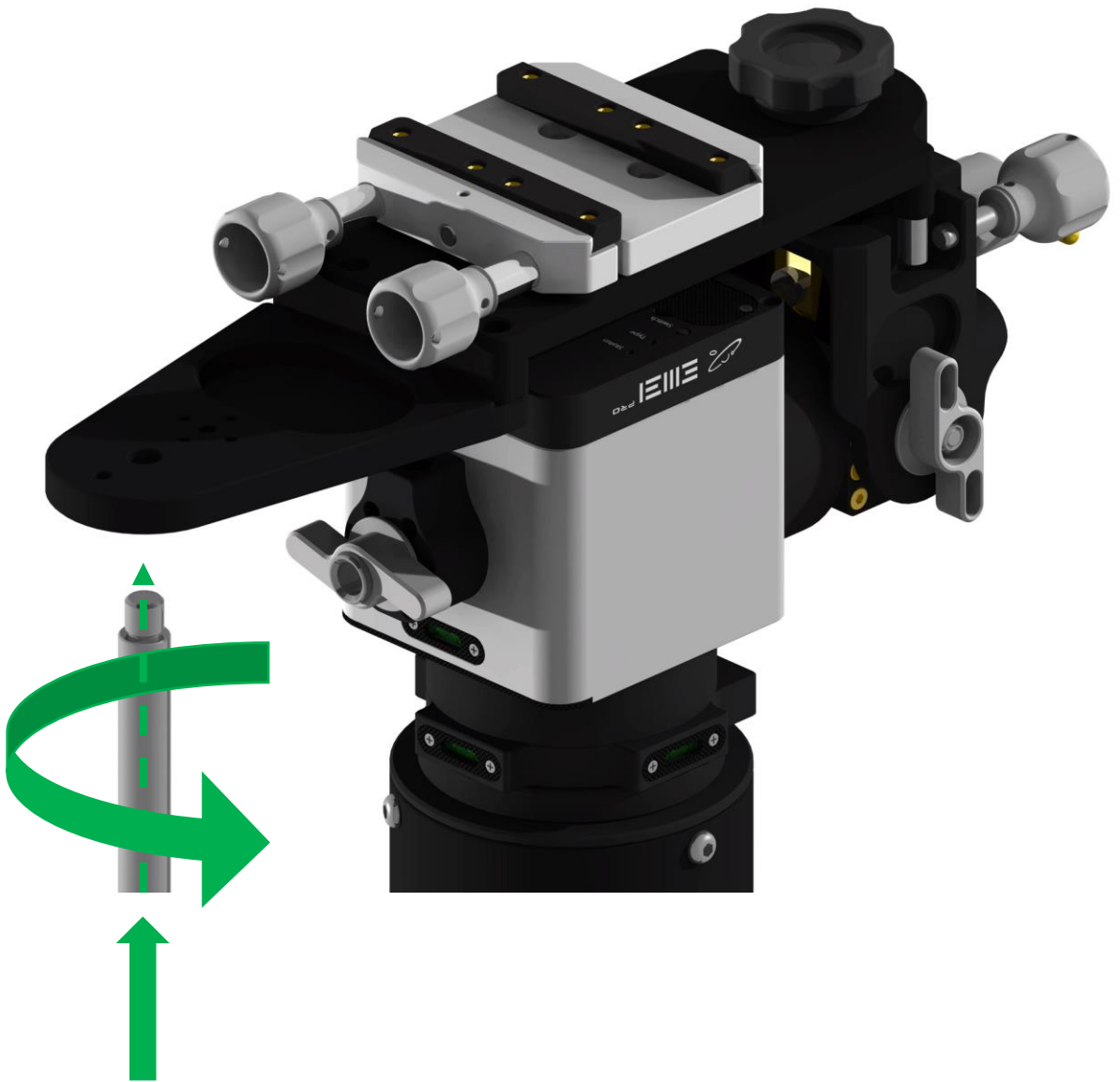
Installation and Use

Altazimuth mount-top mode

Structure Switching



Clockwise into the Side support rod



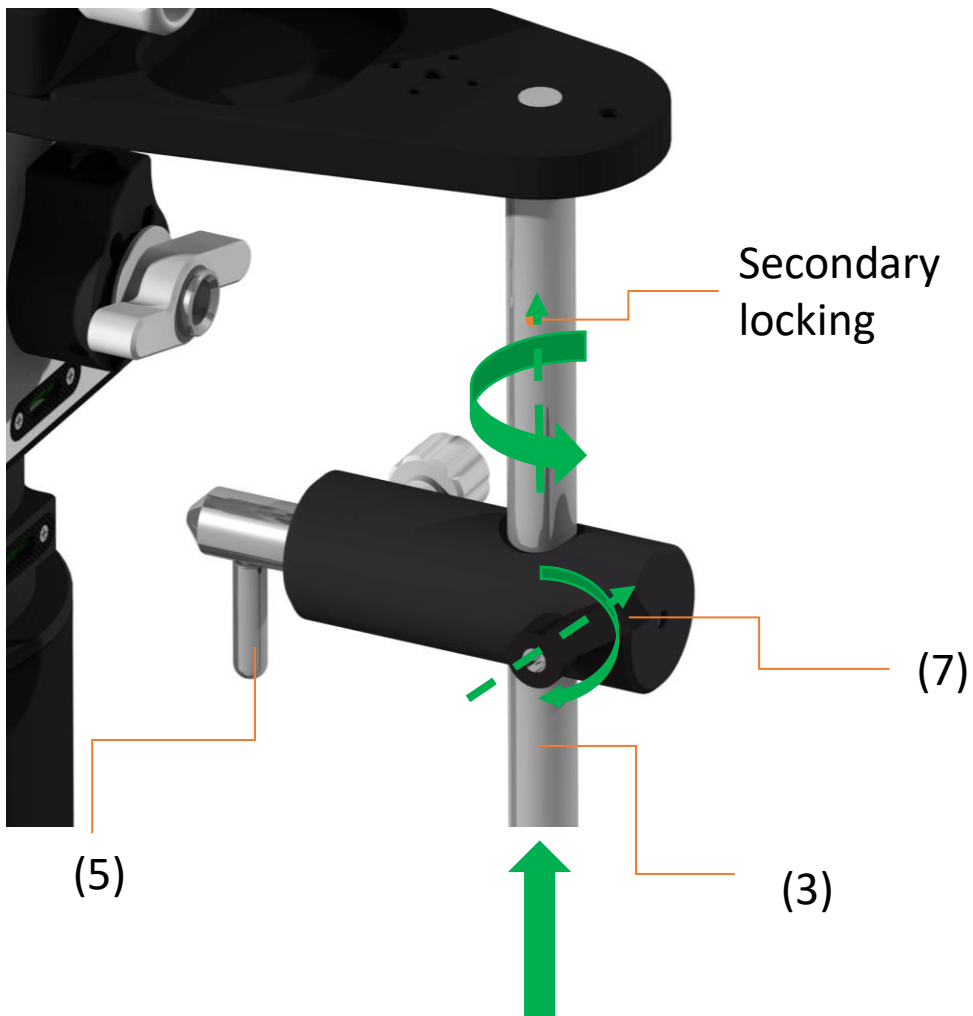
Installation and Use

Altazimuth mount-top mode

Structure Switching



Turn the Mounted rod(5) into the Side support rod(3), and rotate the Rod sleeve locking handle(7) clockwise to lock it. After locking, hold the Mounted rod(5) tightly and rotate it clockwise to lock the Side support rod(3) again



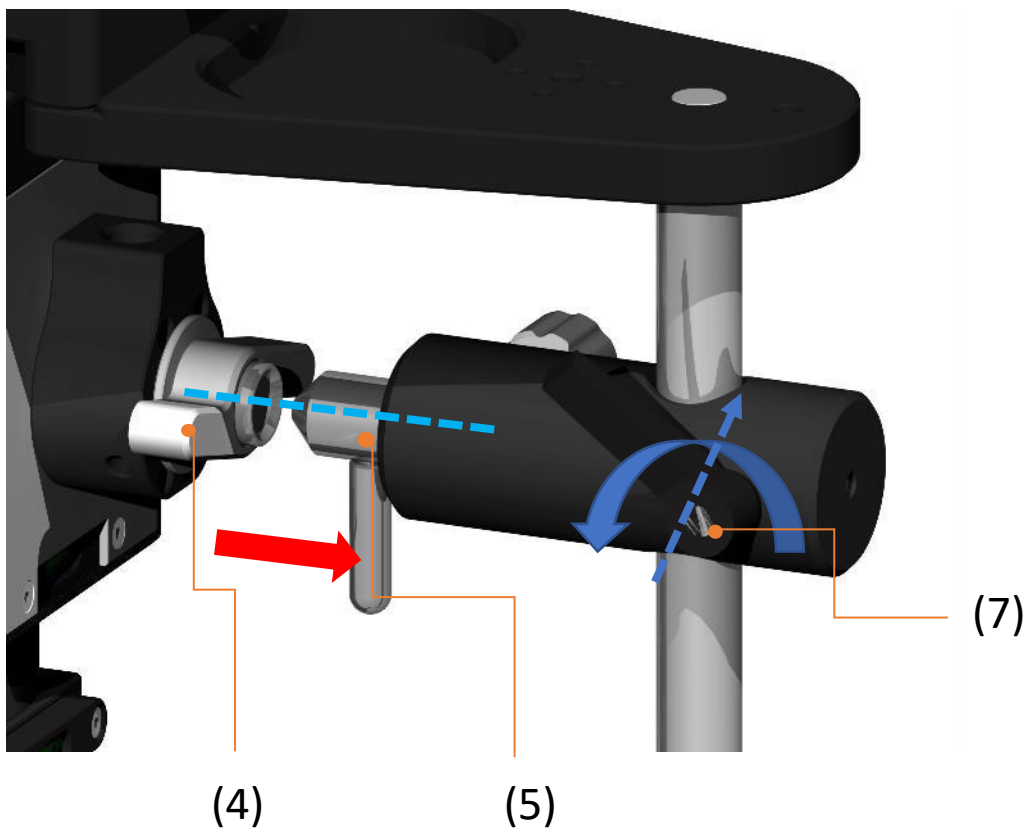
Installation and Use

Altazimuth mount-top mode

Structure Switching



Loosen the Rod sleeve locking handle(7) counterclockwise and press the Mounted rod(5), while aligning the Mounted rod(5) with the Rod support seat(4) and releasing the Mounted rod(5)



Installation and Use

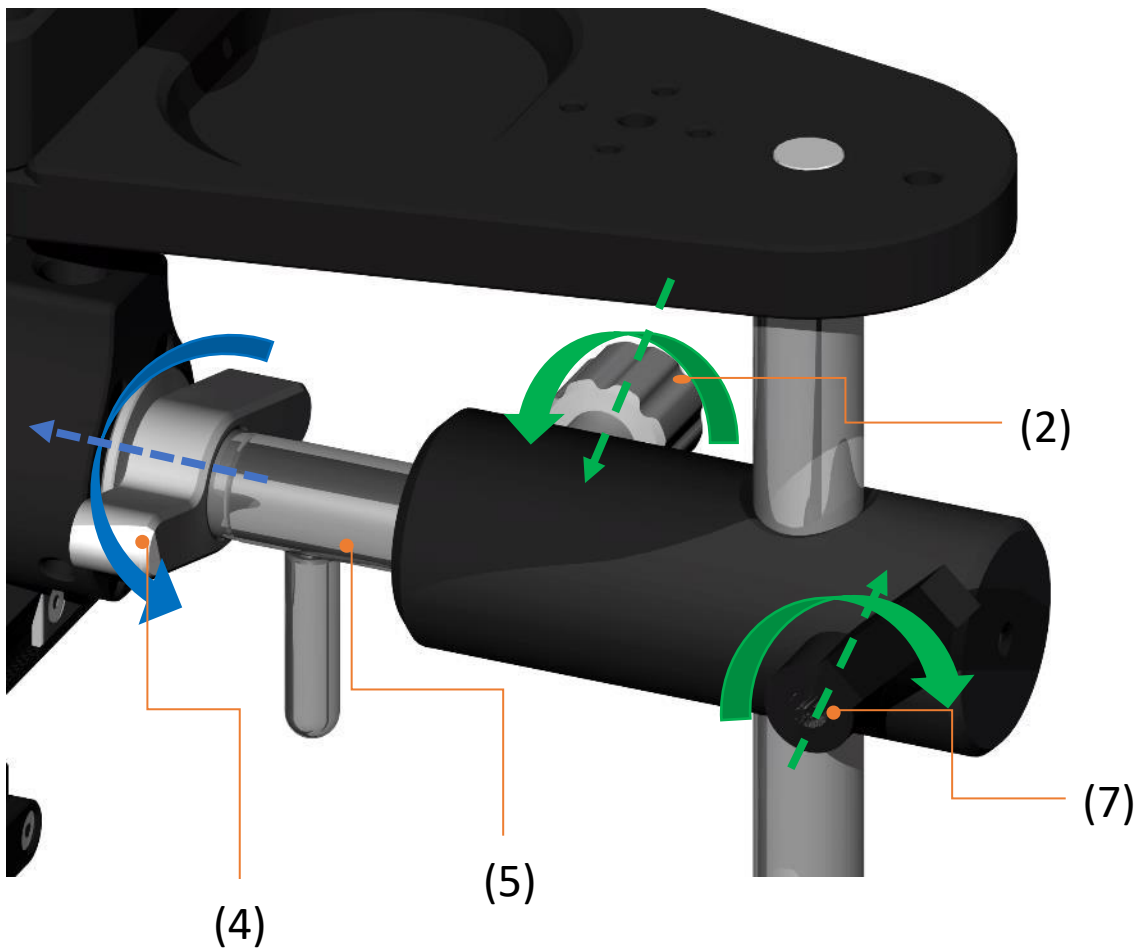
Altazimuth mount-top mode

Structure Switching



Rotate the Rod sleeve locking handle(7) and Rod locking knob(2) clockwise

Rotate Rod support seat(4) counterclockwise half a turn to one turn to fully lock the Mounted rod(5) and complete the installation of the top mode supporting bracket



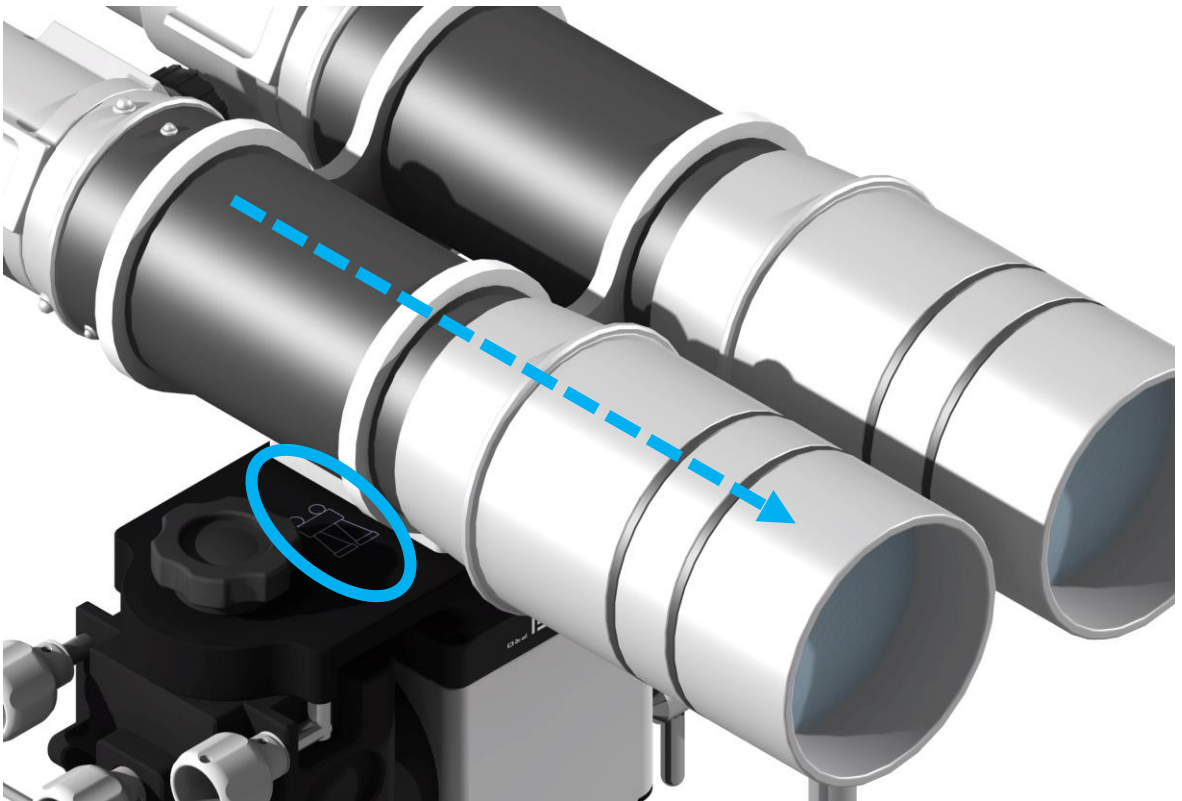
Installation and Use

Altazimuth mount-top mode

Telescope installation



Install the telescope into the upper dovetail, ensuring that the installation direction of the telescope is consistent with the direction marked on the top mode supporting bracket

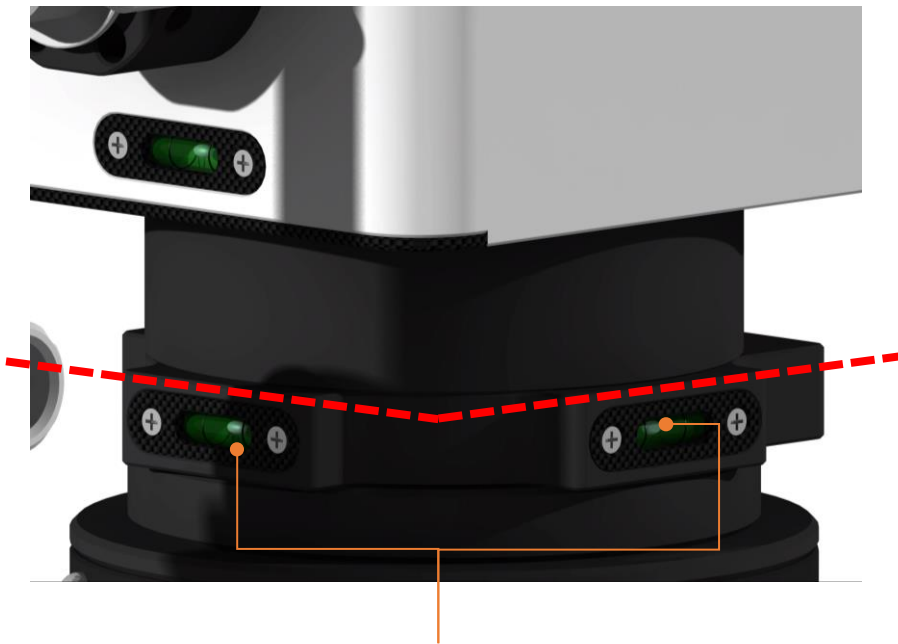


Installation and Use

Altazimuth mount-top mode

Level adjustment

The top mode is Altazimuth mode, it is necessary to adjust the horizontal state. Accurate horizontal state can be obtained through horizontal bubbles on the DEC axis



DEC axis level bubble



Complete the horizontal adjustment by adjusting the horizontal adjuster installed on the tripod, using the same method in the same way as the Altazimuth side mounted mode



Installation and Use

Cable connection

Cable connection

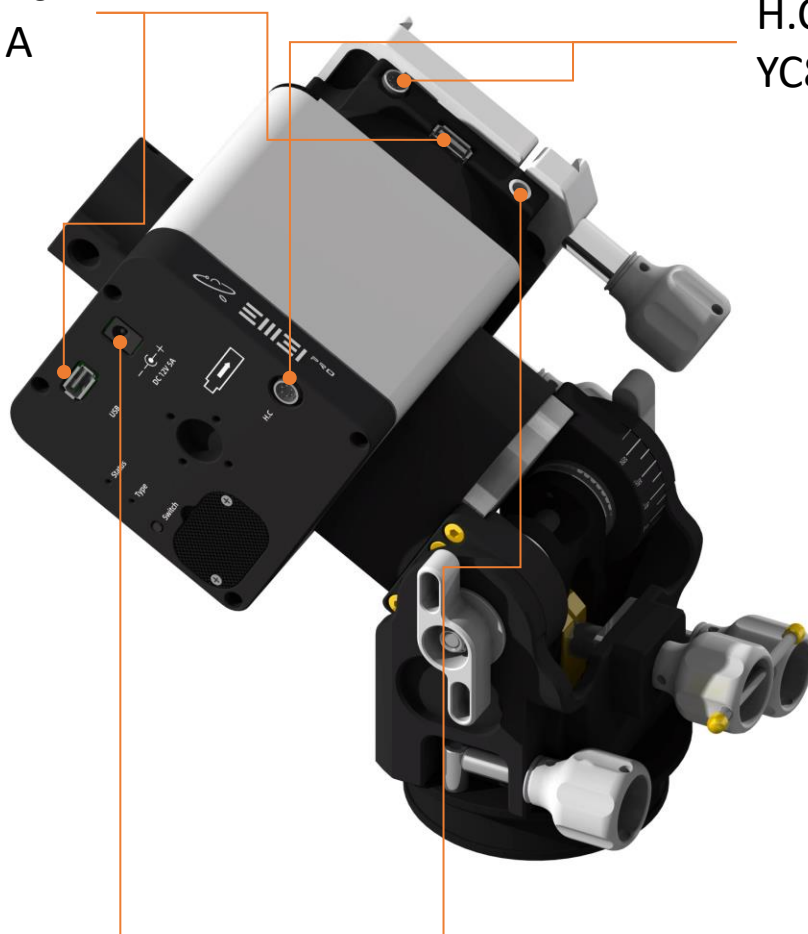
EM31 Pro has two sets of cable connections, one on the bottom of the body, the other on the DEC rotation axis, both are identical in function

USB 2.0

Type A

H.C

YC8 6



DC 12V

5.5-2.1

- ⊘ Prohibit simultaneous connection of two power sources
- Prohibit simultaneous access to two controllers
- Prohibit simultaneous access to two astronomical controller (any PC, astronomical box, mini PC)

Installation and Use

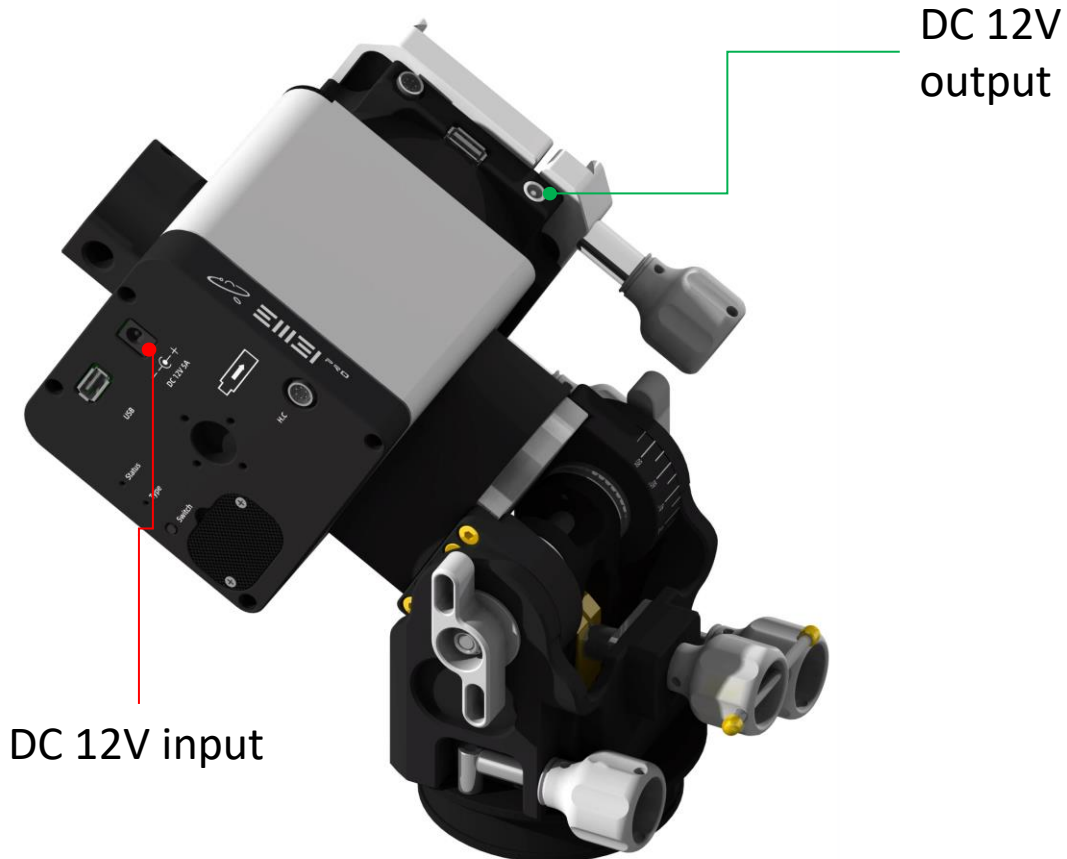
Cable connection

Power connection method

There are two DC 12v connector in the body of EM31 Pro
Any connector can be used as a power input, and the other connector can be used as a power output to supply power to other astronomical devices.



For astrophotography, it is recommended to use the bottom connector of the body as the power input and the DEC axis connector as the output connector



⊘ Prohibit simultaneous access to two power supplies, the output connector device load shall not exceed 12v 5A

⚠ When only the equatorial mount is used, it is recommended to use DC 12V 2A or more power supply. When other equipment is used, it is recommended to use DC 12V 5A or more power supply. The power output interface can provide 5A stable current.

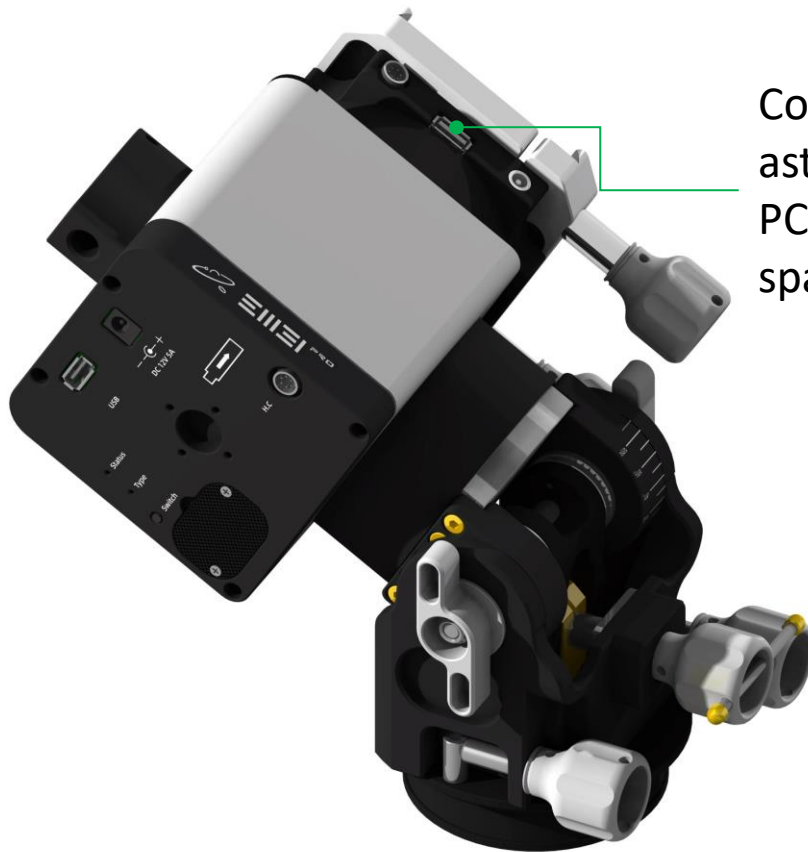
Installation and Use

Cable connection

USB cable connection method

EM31 Pro has two USB interfaces, each of which can be connected to the equatorial mount and the host computer (PC, astronomical box, mini PC).

💡 For astrophotography, it is recommended to use the DEC axis interface to connect the astronomical box or PC. At this point, the USB and power output cables can rotate synchronously with the telescope, effectively preventing cable entanglement



Connection of astronomical box or PC when deep space photography

-
- ⊘ Prohibit connecting devices other than PCs, Astro Boxes, and Astro Industrial Controls. Prohibit connecting the equatorial mount through any USB hub

Installation and Use

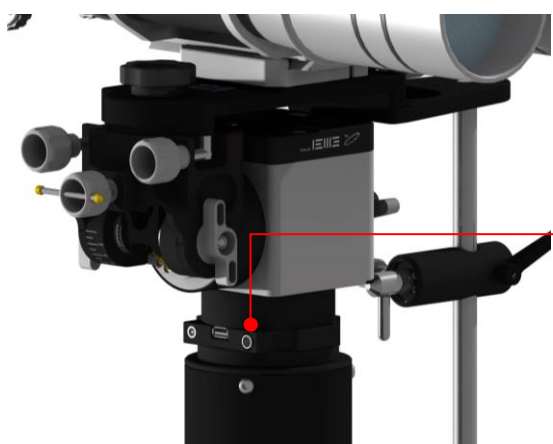
Cable connection

Handle connection

EM31 Pro has two USB interfaces, each of which can be connected to the equatorial mount and the host computer (PC, astronomical box, mini PC).



Handle connected to body bottom in the modes of German equatorial mount and Altazimuth mount



Handle connected to DEC axis cable management in Altazimuth top mode

-
- ⊘ **Prohibit connecting two handle controllers simultaneously**
Prohibit the plugging and unplugging of the handle controller in the charged state of the equatorial mount

Installation and Use

Mode selection

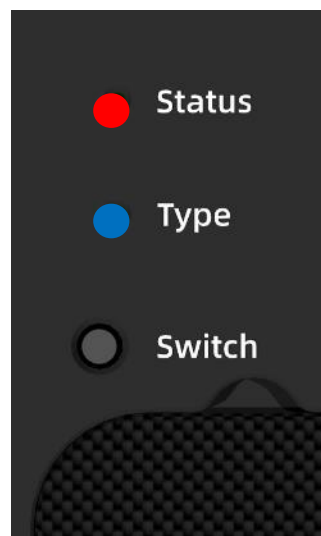
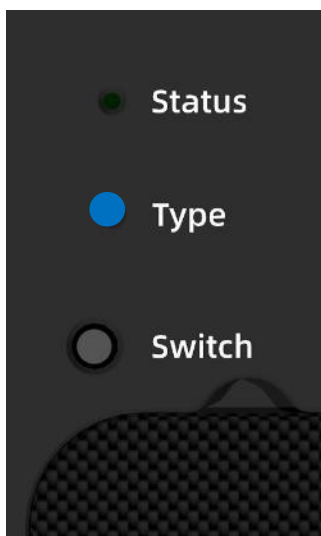
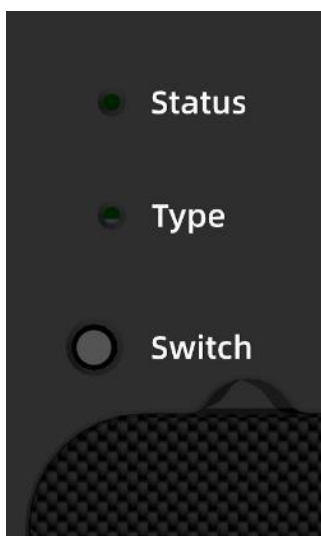
Mode selection

EM31 Pro mode selection indicated by the “Type” light , **Blue is Altazimuth Mount side mode** , **Red is Altazimuth Mount top mode**, **Light out for German equatorial mount**

Wait for 5 seconds when the Equatorial mount is powered on, and enter mode switching after the Status light flashes off

By clicking the Switch button, the Type light will begin to change, blue-red-off, and the Type light will be switched once per key press, which can be switched cyclically.

After confirming the required mode, wait for 10 seconds, the Status light will remain on after flashing, and the mode switch is complete



⚠ When the mount is in operation, the Status light will be on constantly and will start flashing when tracking is turned on

Accessory Installation

Adapter Mount for electronic polar alignment scope

The electronic polar scope can be connected to EM31Pro via an adapter mount.

Adapter mount
for Ipolar(the
latest version)

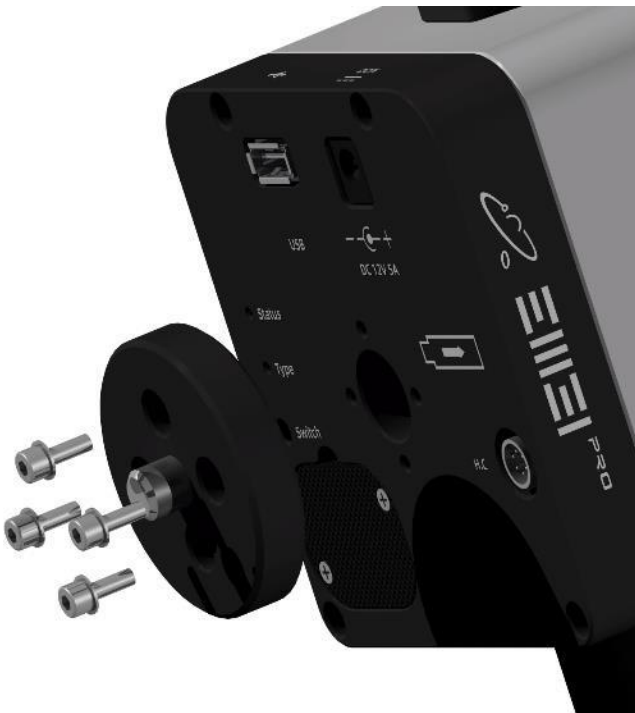


Adapter mount for
QHY Pole Master

Accessory Installation

Ball head mount

EM31 Pro can install a DSLR gimbal through the Ball head mount



3/8 16 bolts

Battery Installation

Install and replace the battery

Battery replacement



Battery model CR1220

⊘ **Do not replace batteries while powered on**

Onstep Quick Start Guide


Onstep guide

Users can set and control the Equatorial mount through Android Onstep APP or webpage

IOS system cannot use APP, webpage is workable

Search for WIFI hotspot Onstep connection through PC or mobile phone, password: password

Enter "192.168.0.1:9999" or "192.168.0.1" into the browser



OnStep WiFi Server 2.1i (OnStep 4.24a)

Status Control Library PEC Settings Config WiFi

Site:
7/30/22 04:44:59 UT (web browser)
1/01/00 00:04:27 UT (06:44:19 LST)
Long. = +000*00, Lat. = +00*00

Coordinates:
Current: $\alpha=18:44:24$, $\delta=+89^{\circ}26:29$
Target : $\alpha=00:00:00$, $\delta=+00^{\circ}00:00$
Pier Side=**None** (meridian flips **On**)

Polar Alignment:
→ 0" ▲ 0" (Mount relative to NCP)

Operations:
Parking: **Not Parked (At Home)**
Tracking: **Off**
Tracking Rate: 0.000Hz
Maximum slew speed: 1.5°/s

State:
Last General (Background) Error: **None**
Workload: 5%
Wireless signal strength: 31dBm (100%)

Onstep Quick Start Guide

Onstep guide

- 💡 When using the Equatorial mount for the first time or changing the address, you need to set the longitude and latitude coordinates and local time of the Equatorial mount (can be synchronized through NINA or the Asiair)

OnStep WiFi Server 2.1i (OnStep 4.24a)

Status Control Library PEC Settings Config WiFi

Basic:

Site Latitude, Longitude, UTC Offset

-121 ° 13 ' Longitude, in deg. and min. +/- 180, W is +

31 ° 03 ' Latitude, in deg. and min. +/- 90, N is +

-08 h 00 m UTC Offset, in hours and min. -14 to +12
Opposite of a time-zone value, this is for Standard Time (not Daylight Time.)

Upload

Horizon and Overhead Limits

Axis1 RA/Alt

Axis2 Dec/Alt

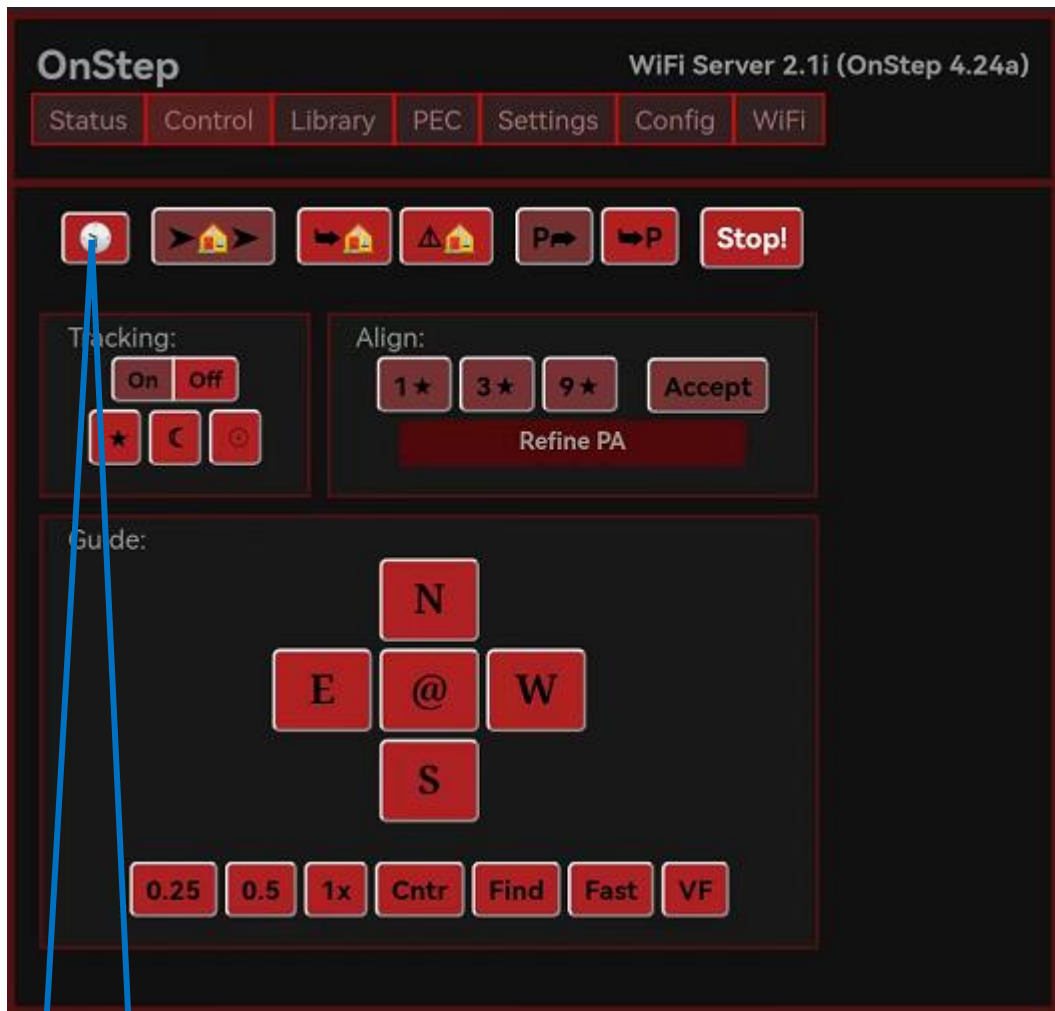
Set the equation of time

Latitude and longitude coordinates

Onstep Quick Start Guide

Onstep guide

set time

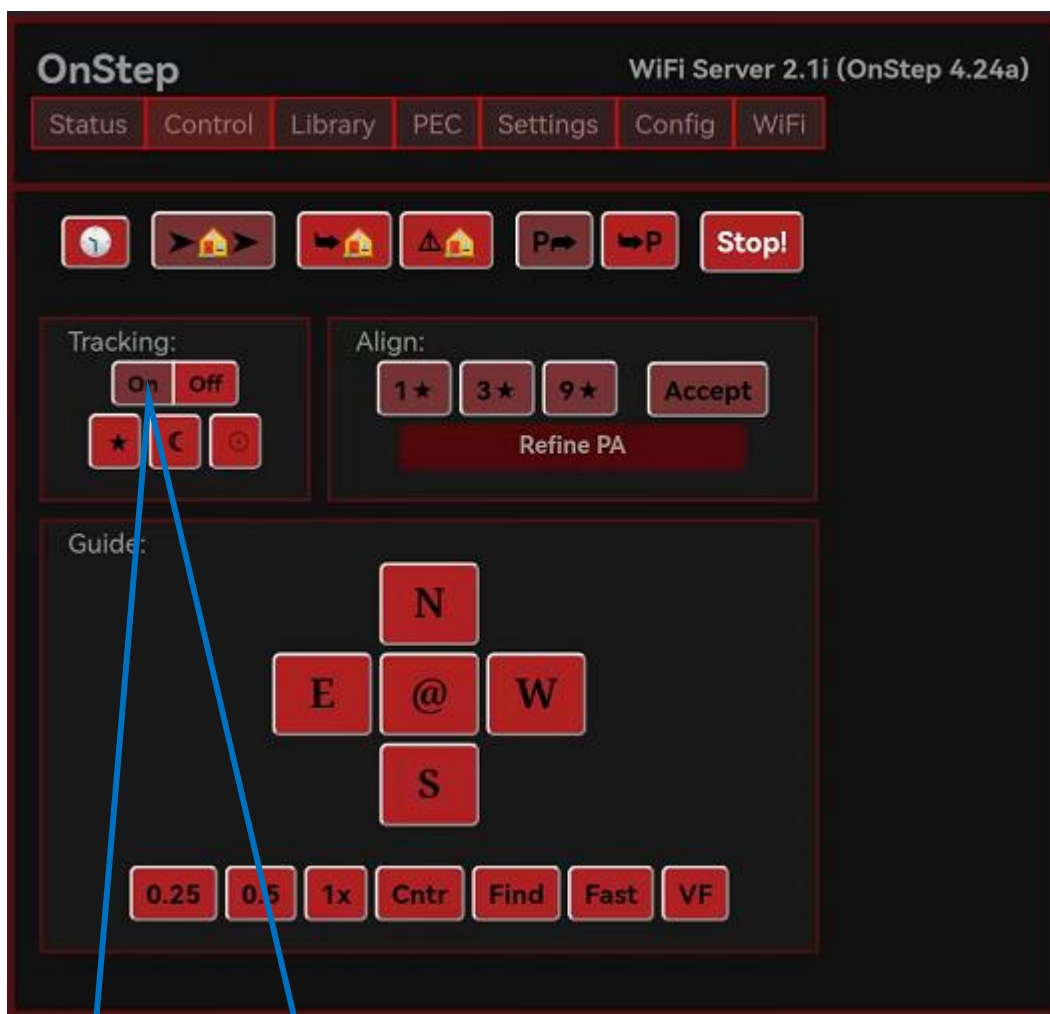


set time

Onstep Quick Start Guide

Onstep guide

Start Tracking




Turn on Tracking, and the rotation of the equatorial mount can be controlled by operating the direction keys.

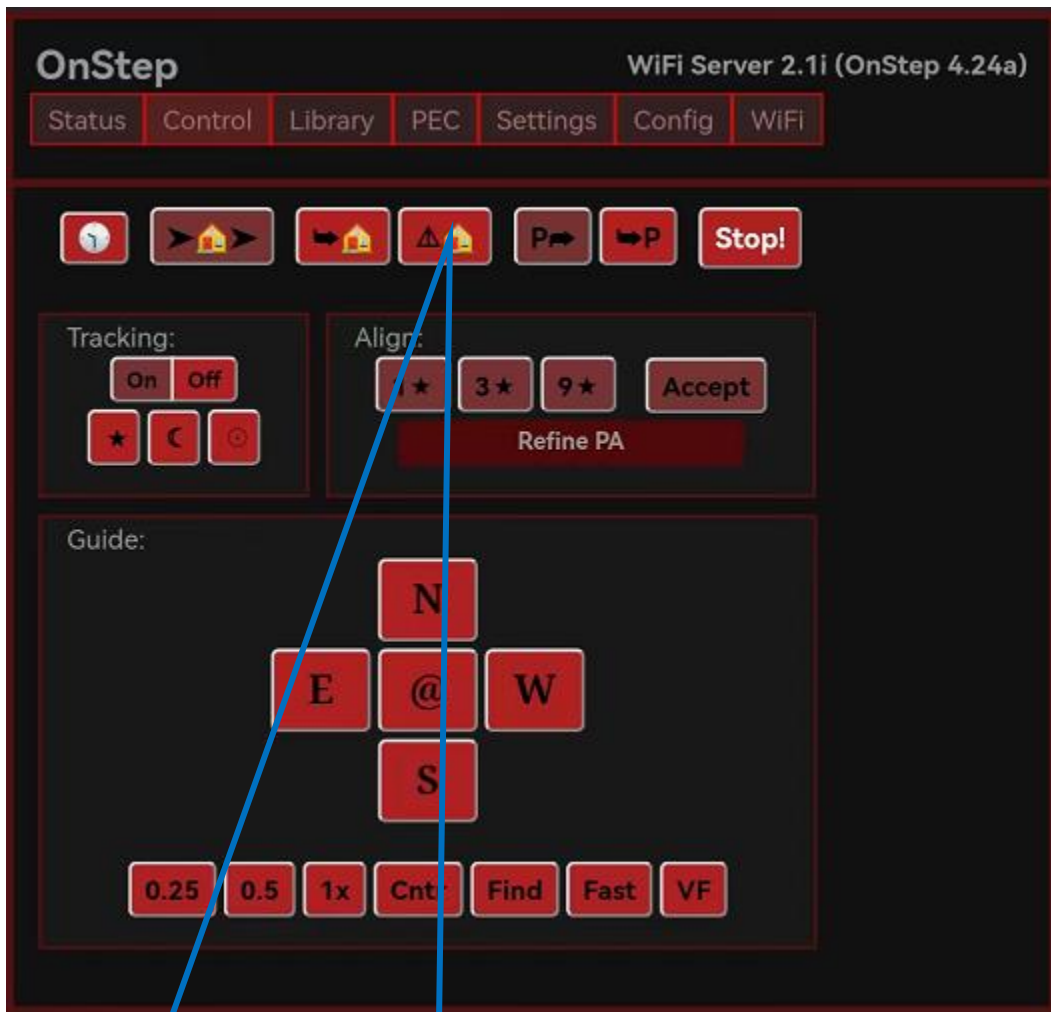


Onstep system option, gray indicates ON status

Onstep Quick Start Guide

Onstep guide

 **The physical zero position is different in the three modes of EM31 pro, so it needs to be set before using the equipment**



After the tracking is enabled, manually control the Equatorial mount to rotate to the zero position, and click the “at home” key to remember the zero position of the mount.

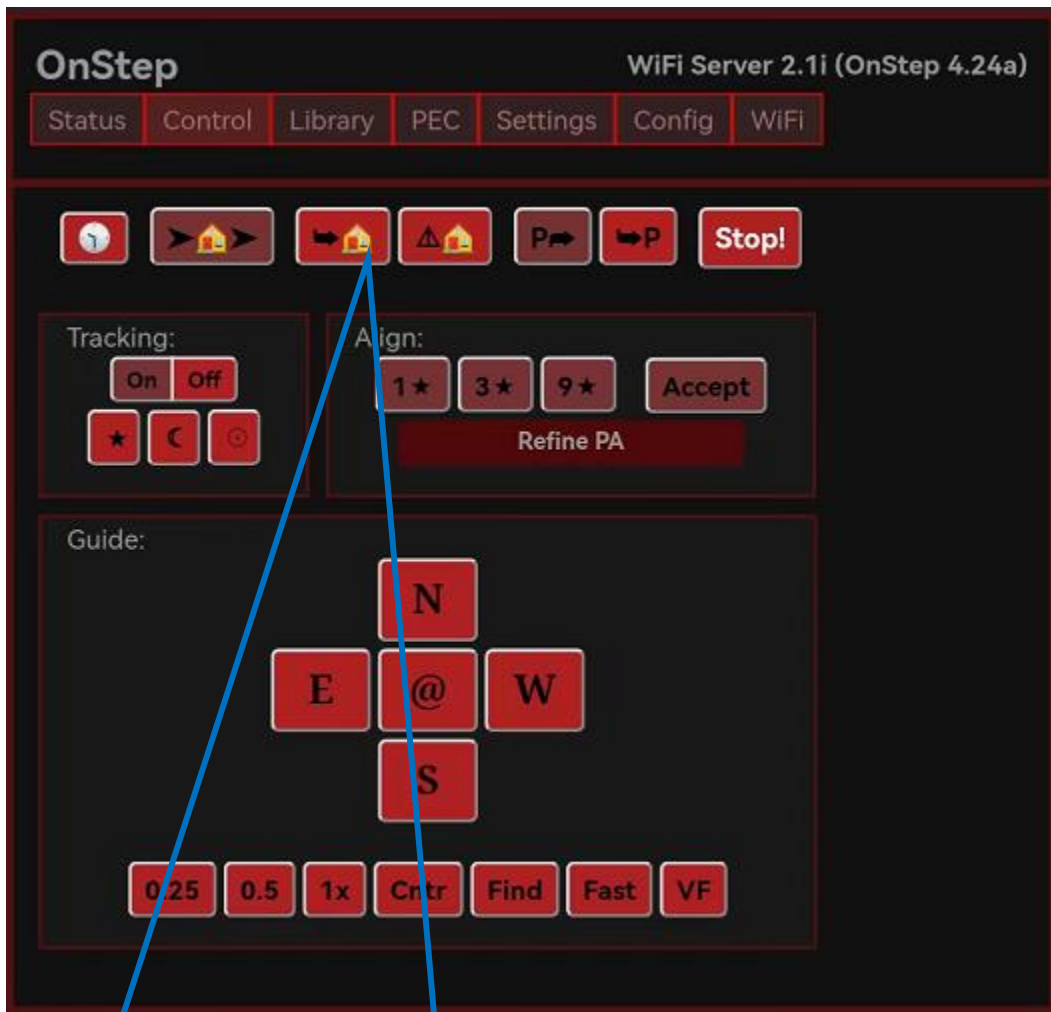


Note: After setting the zero position, the Equatorial mount returns to Untracking status, and you need to click Tracking On again to start tracking

Onstep Quick Start Guide

Onstep guide

The physical zero position is different in the three modes of EM31 pro, so it needs to be set before using the equipment



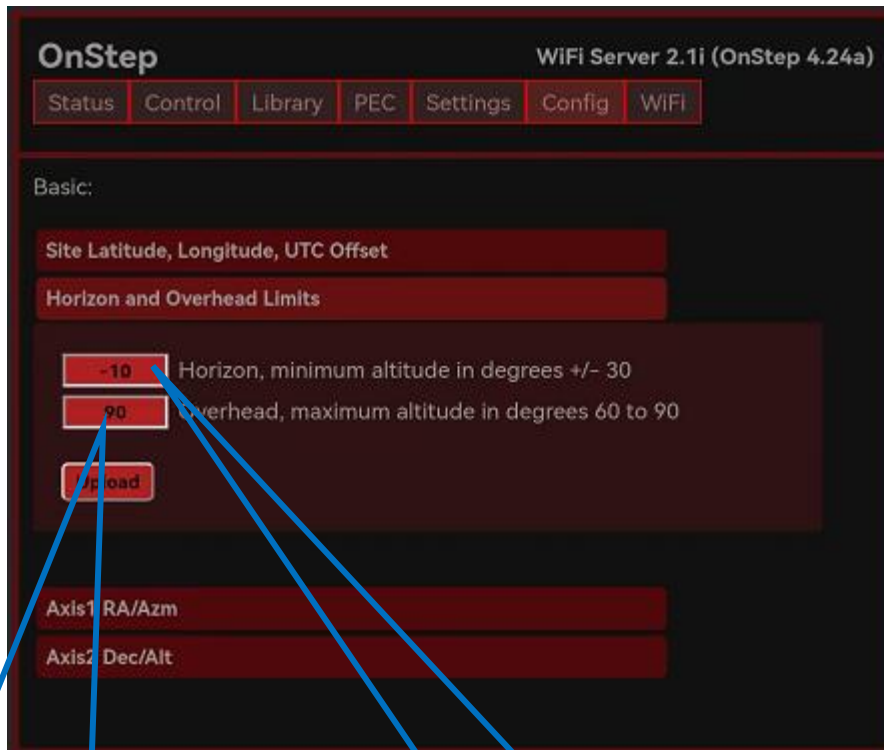
Click the “go home” button to make the mount return to the set zero position.

⚠ Note:, After powering off and powering on the mount again, the power-on-position will be zero by default. So it is necessary to reset the correct zero position. Alternatively, it is recommended to click the “go home” button to return the mount to the set zero position after each shooting is completed in order to avoid setting it again in the next use

Onstep Quick Start Guide

Onstep guide

Limit position setting



German Equatorial mount mode, DEC axis rotation limit

altitude angle limit in Altazimuth mode



Note : When the manual operation of the mount rotation exceeds the set limit, the mount will stop rotating, press the key again, the mount will only move a small angle.

Once the Goto target exceeds the limit, Goto will stop.

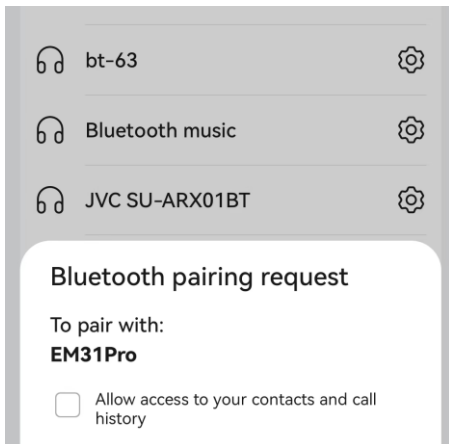
The limit position is related to the time, latitude and longitude coordinates and zero position setting of the mount.

Onstep Quick Start Guide

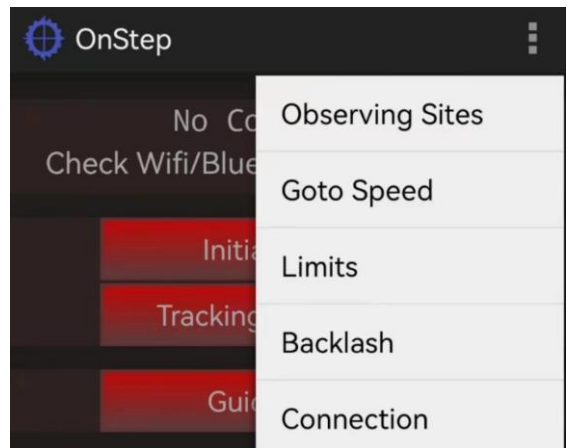
Onstep guide

The above operation can be connected through the mobile phone APP (app only supports Android system, Apple system needs to be set through the webpage)

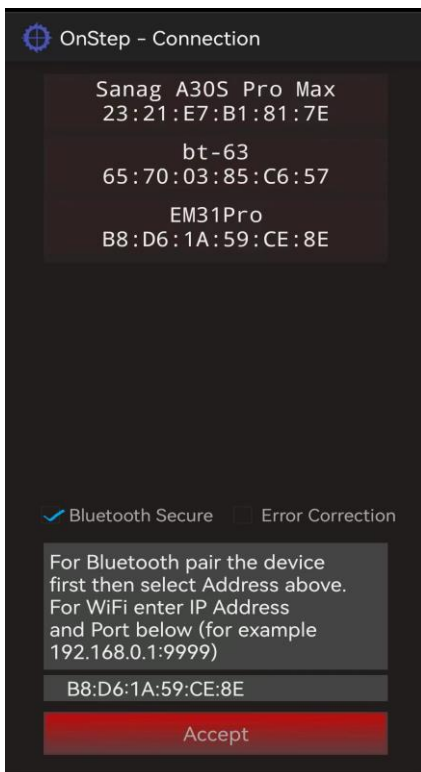
Matching Bluetooth



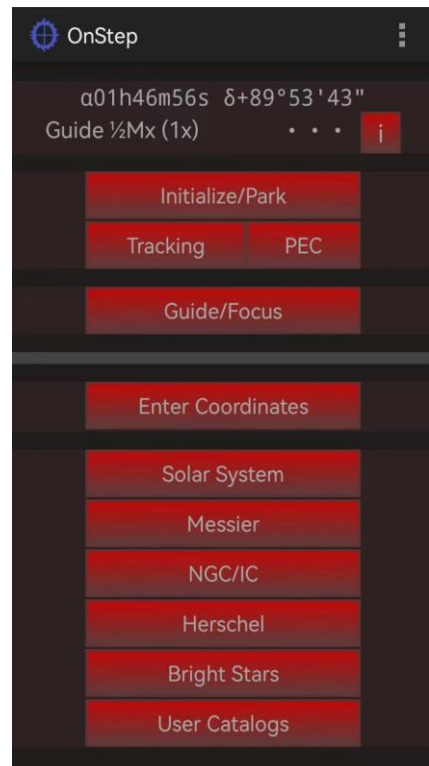
Select Connection in the APP



Choose Bluetooth



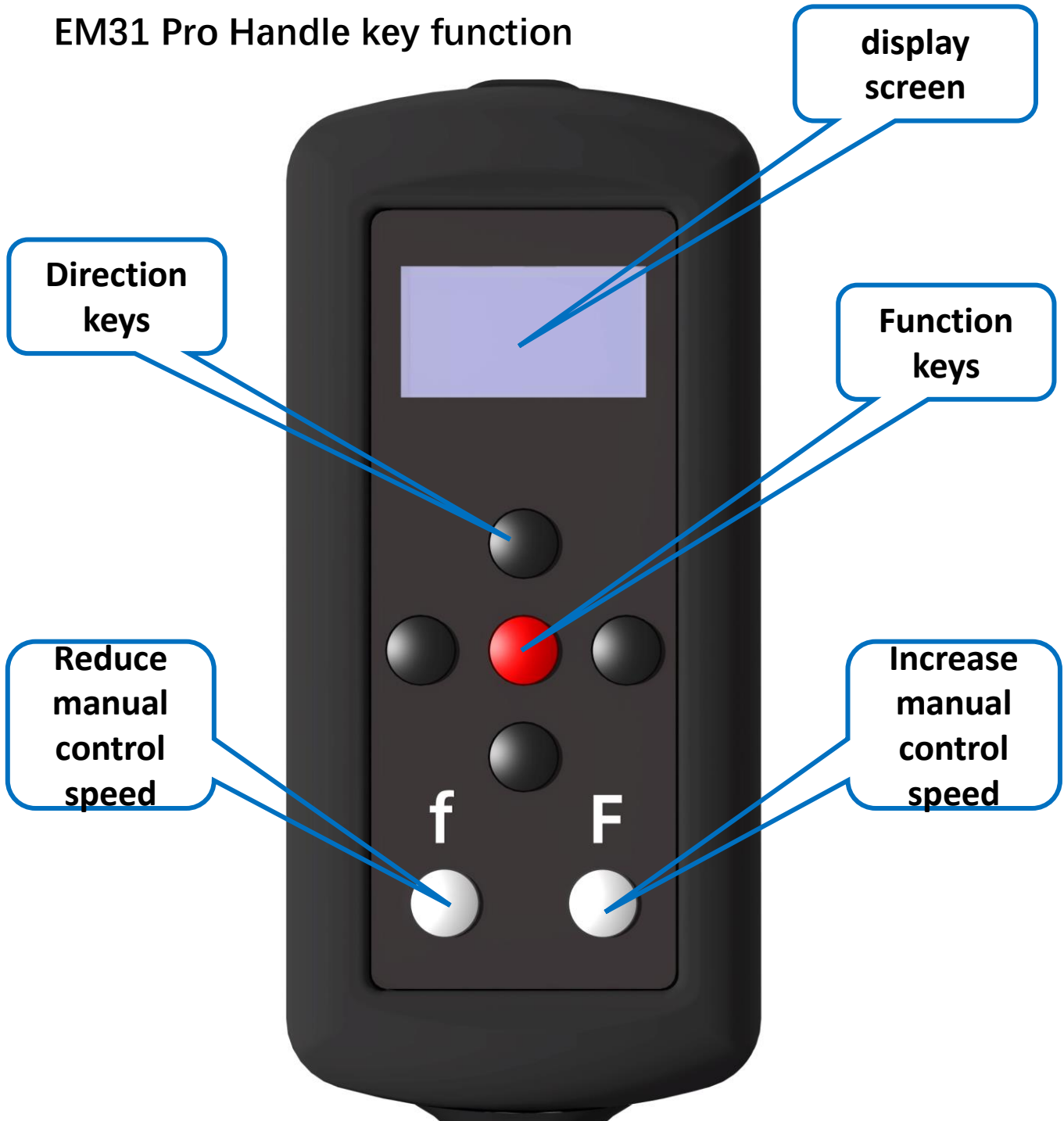
Complete connection



Onstep Quick Start Guide

Onstep guide

EM31 Pro Handle key function



Onstep Quick Start Guide

Onstep guide

EM31 Pro Handle key function



1. Short Press = switching display information
2. Long Press = entering Main Menu
3. Double Click = Feature Menu

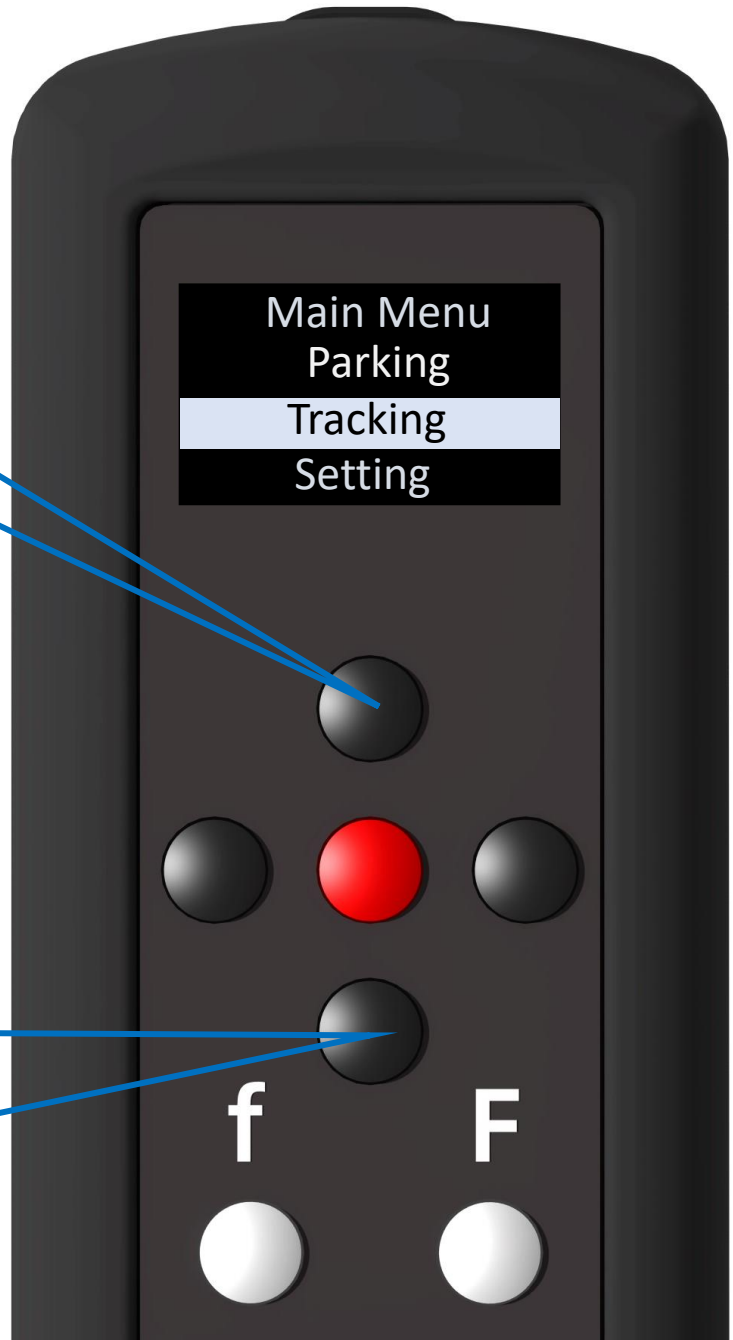
Onstep Quick Start Guide

Onstep guide

EM31 Pro Handle key function

1. Moving North when tracking
2. Scroll Up the Menu

1. Moving South when tracking
2. Scroll Down the Menu



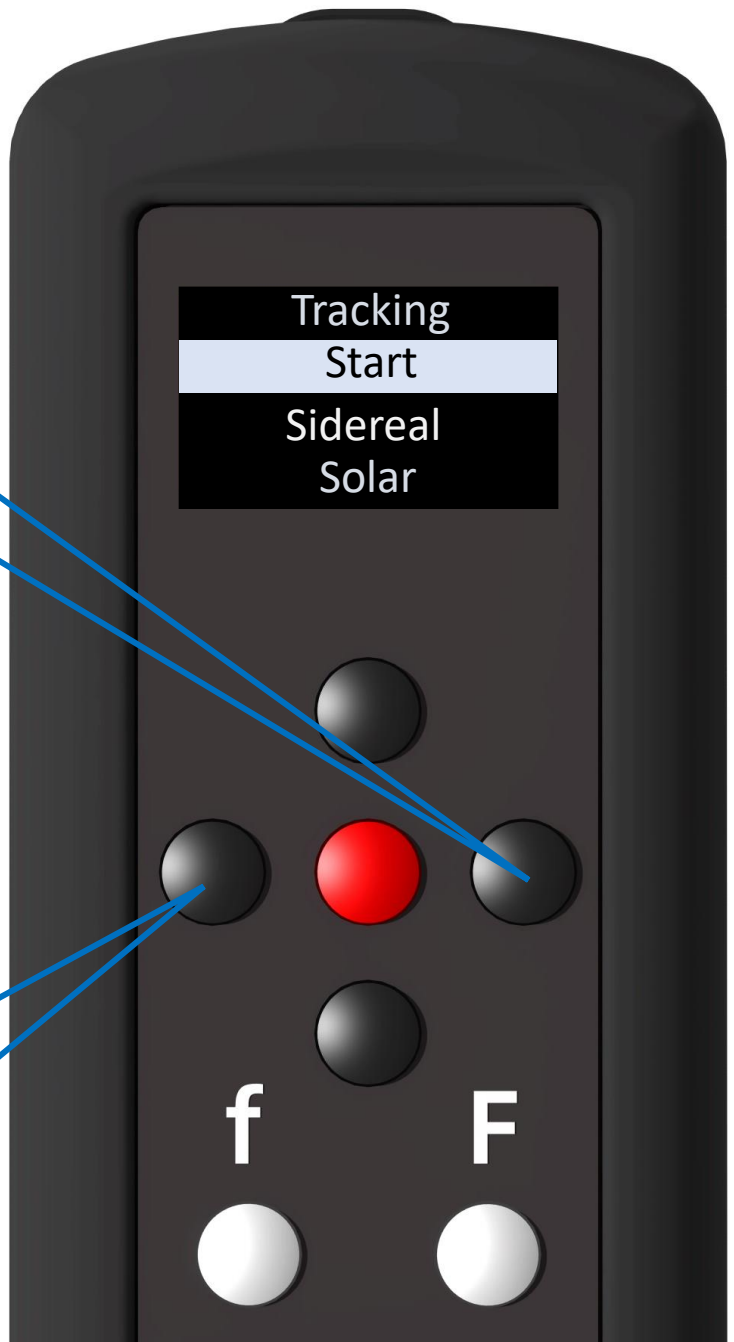
Onstep Quick Start Guide

Onstep guide

EM31 Pro Handle key function

1. Moving west when tracking
2. Select current option while in Menu's

1. Moving east when tracking
2. Back while in Menu's



Onstep Quick Start Guide

Onstep guide

Common status icons for the handle controller



Alignment Star #1



Alignment Star #2 (#3 thru #8 not shown)



Alignment Star #9 (last possible)



Telescope is at home position. Tracking is OFF



Unknown error. Tracking has stopped



Telescope position exceeds user defined Meridian limit. Tracking has stopped



Telescope position exceeds user defined RA limits "Under Pole". Tracking has stopped



Telescope position exceeds user defined Azimuth limits. Tracking has stopped



Telescope position exceeds user defined Declination limit. Tracking has stopped



Telescope limit sensed. Tracking has stopped



Telescope position exceeds user defined Horizon or Overhead limit. Tracking has stopped



Motor fault. Tracking has stopped



East side of pier. Declination is between 90 and -90



West side of pier. Declination is between 180 and 90 or -90 and -180



PEC, paused

Onstep Quick Start Guide

Onstep guide

Common status icons for the handle controller



PEC, recording



PEC, playing



Telescope is slewing



Lunar Tracking rate is selected



Solar Tracking rate is selected



King Tracking rate is selected



Sidereal Tracking rate is selected



Sidereal Tracking, refraction compensated (RA-axis only)



Sidereal Tracking, refraction compensated (Dual-axis)



Sidereal Tracking, refraction and pointing model compensated (Full)



Sidereal Tracking, refraction and pointing model compensated (Full, Dual-axis)



Tracking is OFF



Telescope is guiding



Park failure



Telescope is slewing to park position

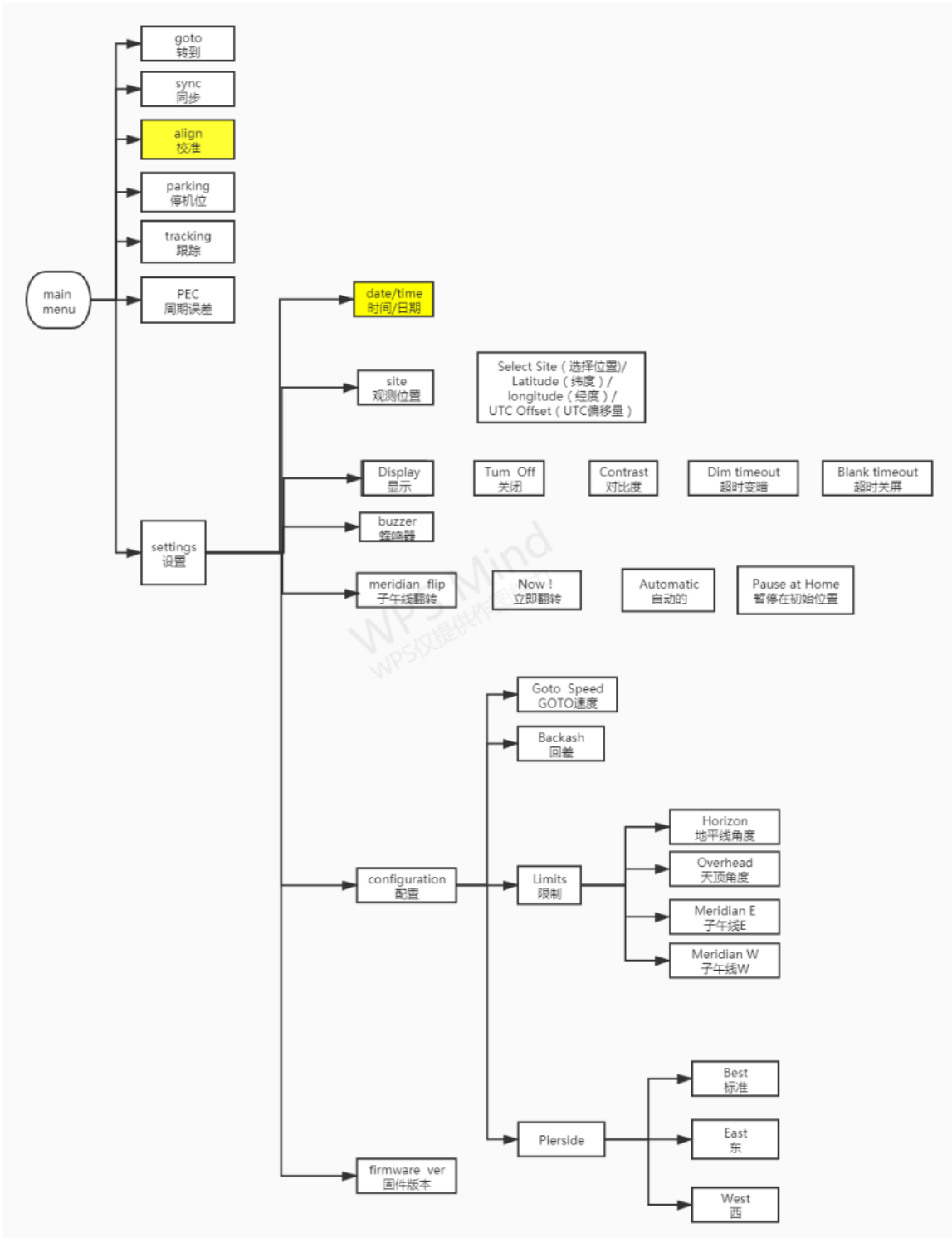


Telescope is parked

Onstep Quick Start Guide

Onstep guide

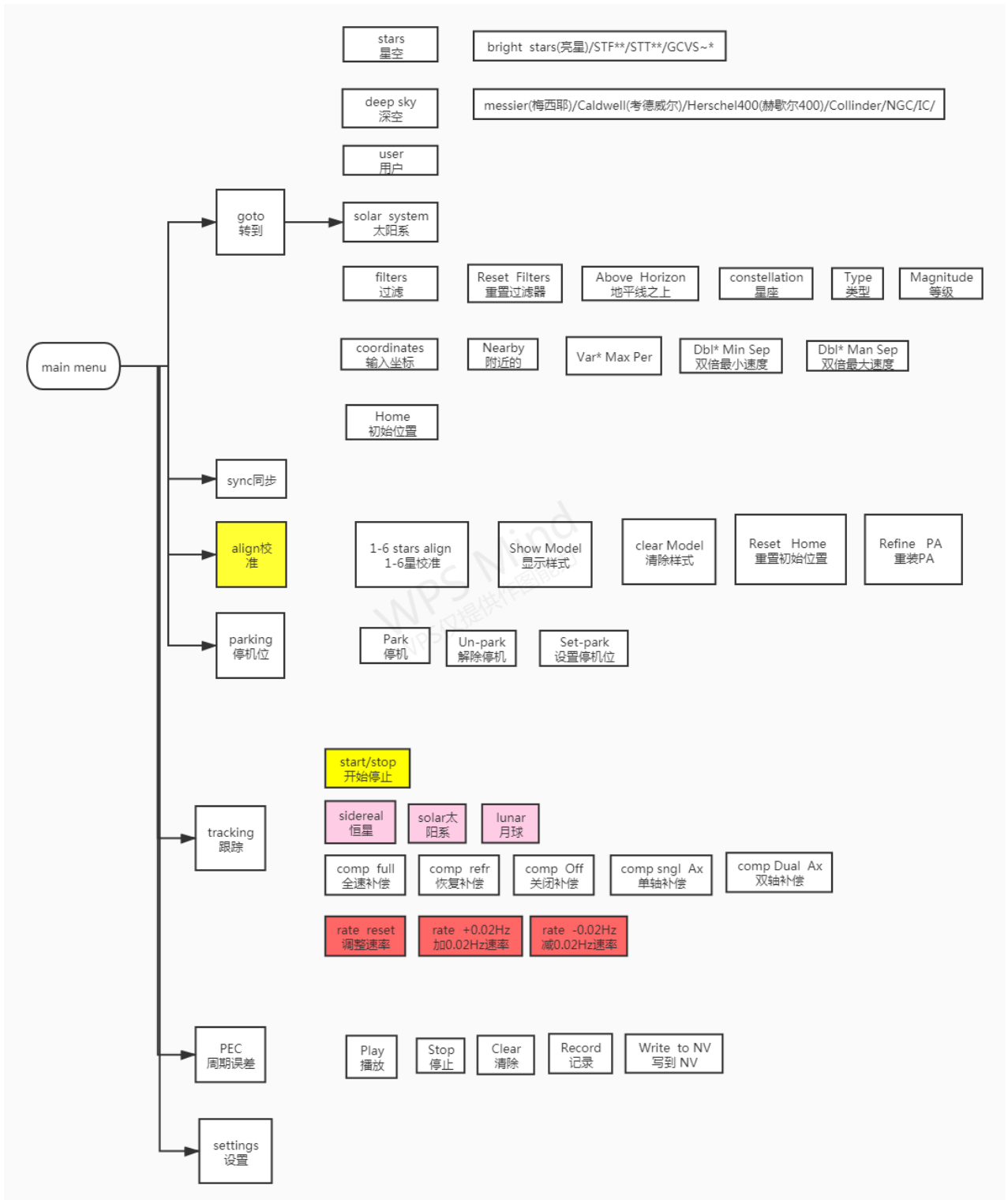
Handle menu structure diagram



Onstep Quick Start Guide

Onstep guide

Handle menu structure diagram

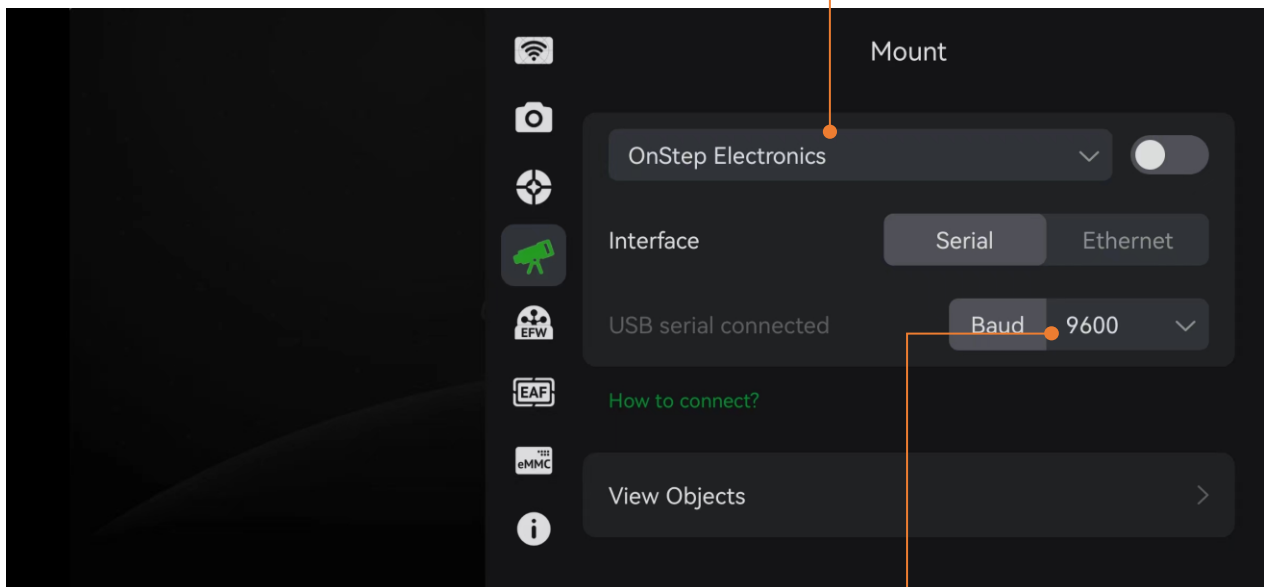


Onstep Quick Start Guide

Onstep guide

Onstep and ASI AIR connection

Equatorial mount selects
"OnStep Electronics"



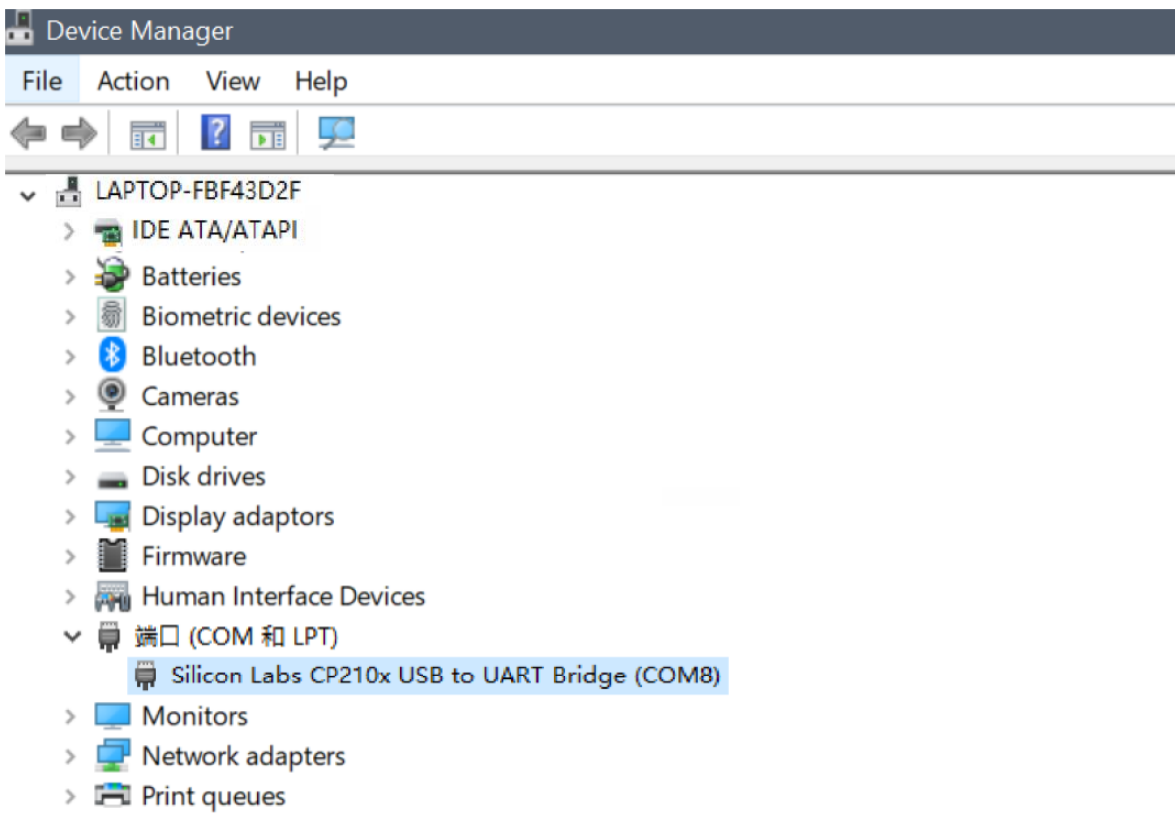
Serial port baud rate 9600

Onstep Quick Start Guide

Onstep guide

Onstep and PC connection

Installing the mount serial port driver cp2102,
Confirm that the mount serial port connection is normal in
Windows Device Manager



Install ASCOM platform



Install Onstep ASCOM driver

Onstep Quick Start Guide

Onstep guide

Onstep and PC connection

Select the correct serial port (check the correct port number in Device Manager) and connect the mount

OnStep Telescope Setup

3.7 OnStep

Port: COM5 IP Address: 192.168.0.1:9999

Retry Timeout (3000ms):

Currently connected to: OnStep 4.25a Enable Serial Port DTR Control Use Error Correction Protocol

Site Information

Latitude (N is +): +31*02:59

Longitude (W is +): -121*13:00

Elevation (m): 0

UTC Offset (opposite of a): -8

NOTE: OnStep never uses Daylight Savings Time internally, so all time related values are based on Standard Time.

Date/Time

Date: 12/17/21

Standard Time: 09:37:30

Time (UTC): 01:37:30

Time (LST): 15:26:01

Set Date/Time on Connect:

Optics

Aperture (m): 0

Aperture Area (m²): 0

Focal Length (m): 0

Limits

Horizon: -10 (deg)

Overhead: 90 (deg)

Meridian E: 8 (deg)

Meridian W: 8 (deg)

Max. Goto Rate

31.25 us

(6 deg/sec)

Backlash

RA/Azm: 0 (arc-sec)

Dec/Alt: 0 (arc-sec)

Trace on OK Cancel

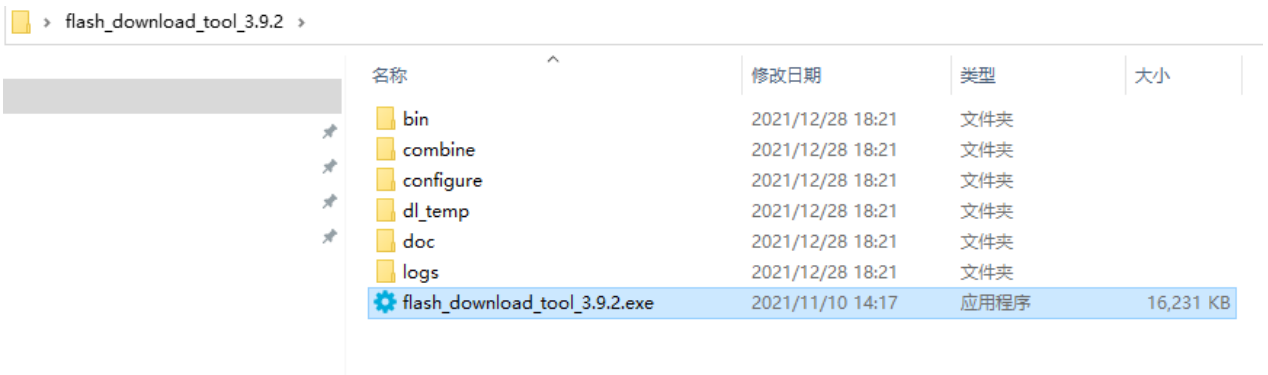
Firmware Update

Firmware update

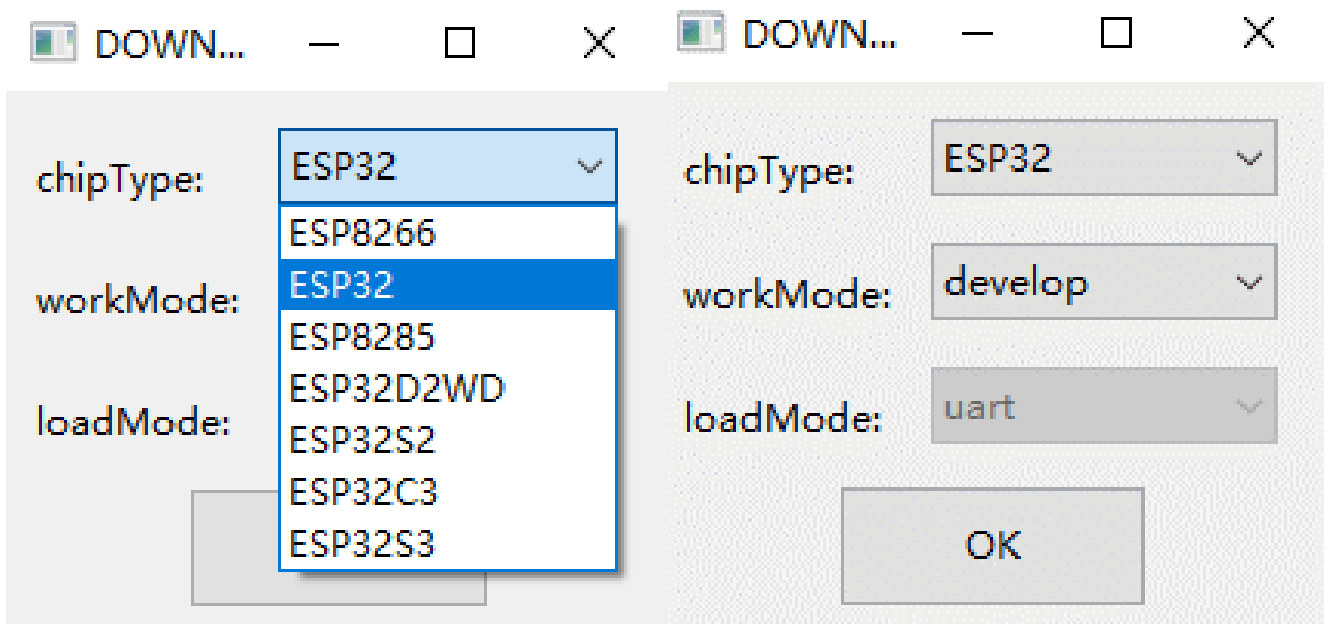
Connect the 12v power supply for the equatorial mount and power on

Use the USB cable to connect the equatorial mount and PC (test is windows 10 system)

Open the firmware programming software



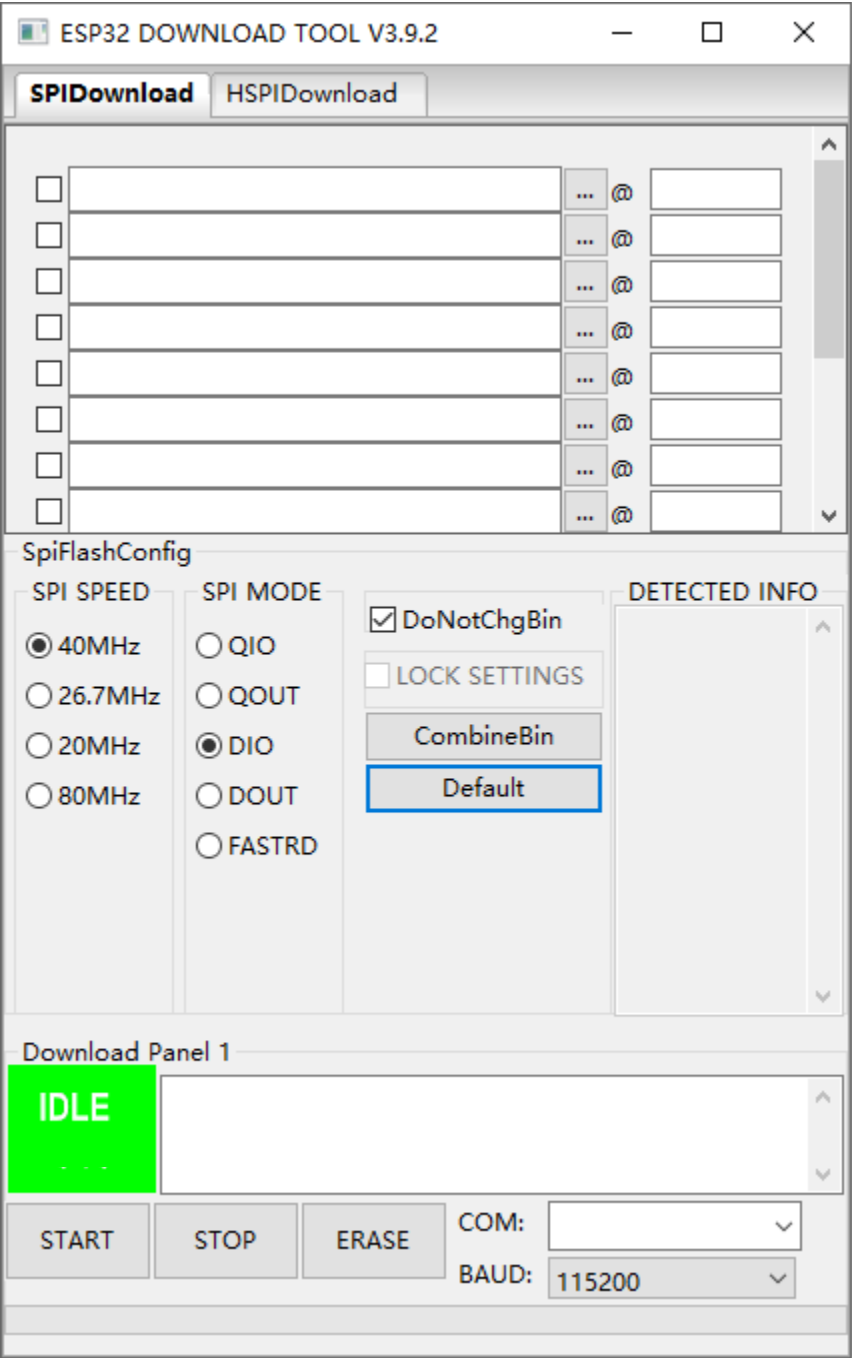
Select ESP2 and develop and confirm



Firmware Update

Firmware update

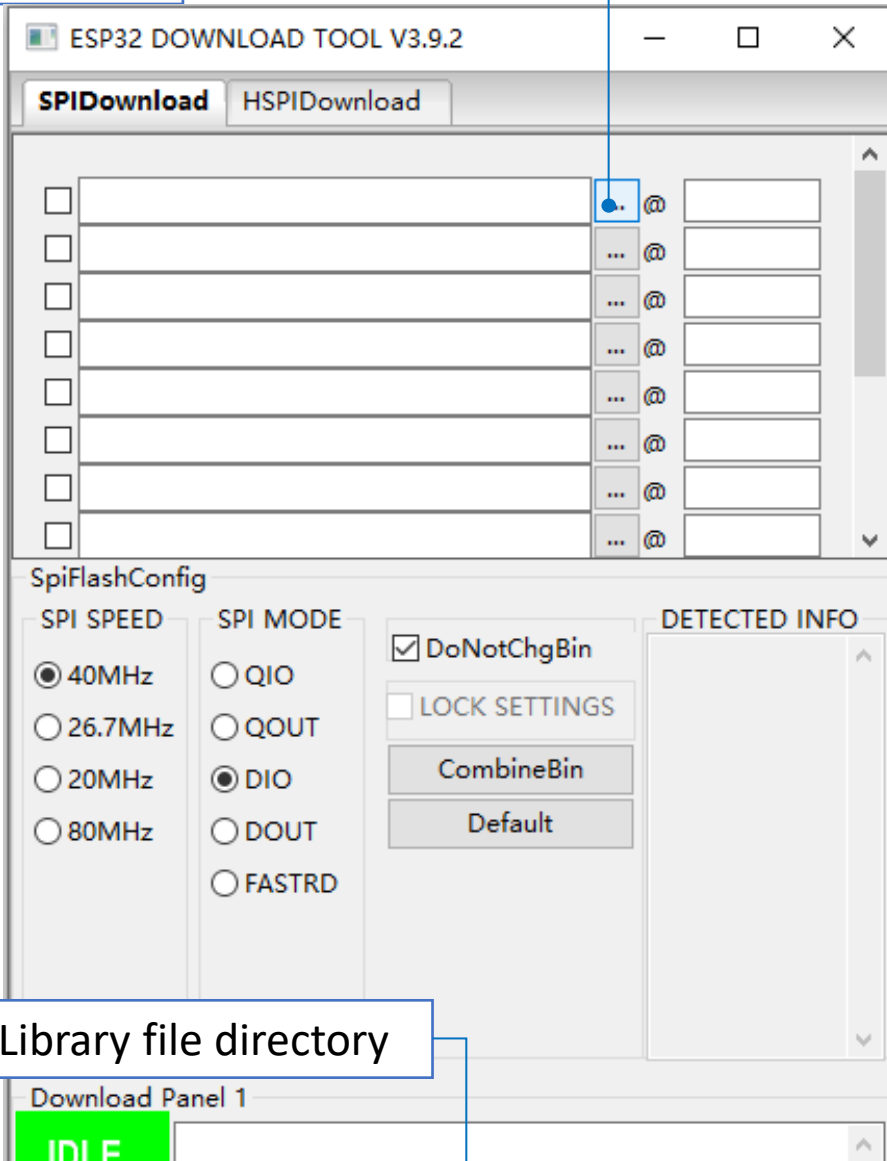
Upload interface



Firmware Update

Firmware update

Open Library File



Library file directory

This PC > Desktop > flash_download_tool_3.9.2 > combine

Name	Date modified	Type	Size
EM31onstep211228.bin	2021/12/27 20:56	BIN 文件	1,035 KB

Firmware Update

Firmware update

The screenshot shows the ESP32 Download Tool V3.9.2 interface. The 'SPIDownload' tab is active. A file path 'C:\Users\dedeliao\Desktop\flash_downlo' is selected in the file list, with a green box around it and a 'Tick' annotation. The '0x00' value is entered in the adjacent field, with an 'Enter 0x00' annotation. The 'SpiFlashConfig' section shows 'SPI SPEED' set to 40MHz and 'SPI MODE' set to DIO. The 'Download Panel 1' shows 'IDLE 等待'. The 'START' button is highlighted with a blue box and an annotation: 'Click START to start uploading after the interface is set up'. The 'COM' port is set to 'COM5' and 'BAUD' is set to '115200', with an annotation: 'Select serial port'.

Tick

Enter 0x00

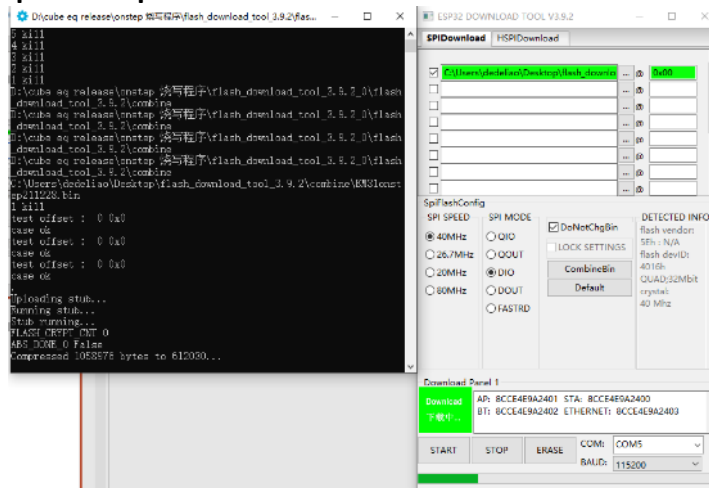
Click START to start uploading after the interface is set up

Select serial port

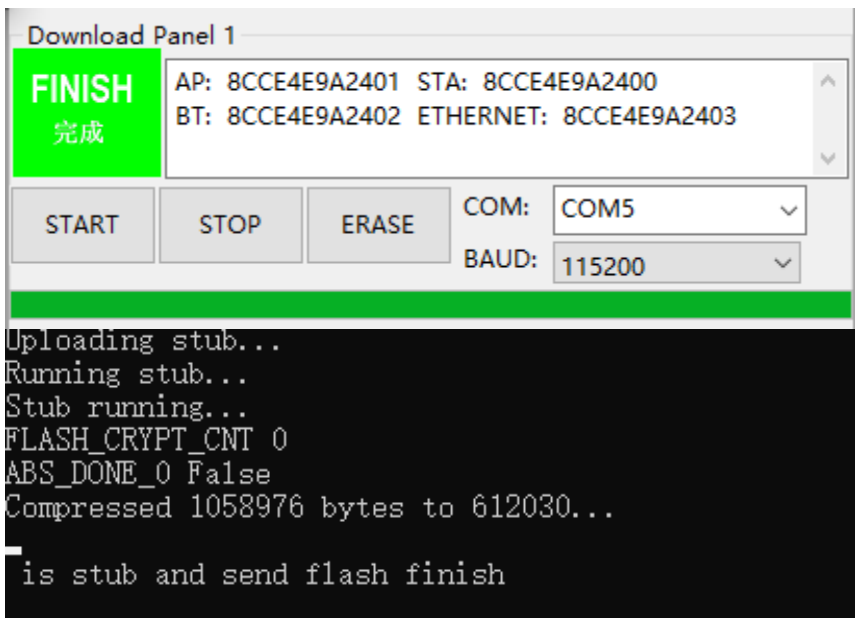
Firmware Update

Firmware update

Start the upload process



The upload program is complete, and the status bar on the left shows “is stub and send flash finish”



After the firmware update is completed, disconnect all power connections (including the 12V power supply and USB cable) to disconnect the equatorial mount, and then turn on the power after 6s, the equatorial mount will enter into normal working status.

Warranty Statement

Warranty

Thank you for purchasing the EM31Pro Harmonic Equatorial Mount. To ensure you have the best experience with our product, we provide a two-year warranty service for the EM31Pro Harmonic Equatorial Mount. Below are the specific warranty terms and conditions:

Warranty Period

This product is covered by a two-year warranty starting from the date of purchase.

Warranty Coverage

During the warranty period, if the product exhibits any material or workmanship defects under normal use, we will provide free repair or replacement services. This includes, but is not limited to:

- Motor failure
- Control board failure
- Mechanical structure damage

Warranty Exclusions

The warranty does not cover the following situations:

- 1. Human-induced damage:** Including but not limited to damage caused by dropping, impact, submersion, excessive use, etc.
- 2. Unauthorized repair or modification:** If the product has been repaired or modified by an unauthorized service provider, the warranty will be void.
- 3. Accidents or natural disasters:** Including but not limited to fire, earthquake, flood, lightning, etc.

Warranty Statement

Warranty

4. Normal wear and tear: Such as normal wear and tear, scratches on the exterior, etc.

Warranty Service Procedure

1.Contact Customer Service: If your product requires repair, please first contact the after-sales service of the purchase channel or directly contact our customer service center. Provide a detailed description of the fault.

2.Fault Diagnosis: We will conduct a preliminary diagnosis of the reported fault via email. If further inspection is needed, we will guide you to send the product to the designated repair center.

3.Repair or Replacement: Once the product is confirmed to be within the warranty conditions, we will provide free repair services. If the product cannot be repaired, we will replace it with the same model or an equivalent product of the same value.

4.Return Shipping: The repaired or replaced product will be shipped back to you via courier.

Important Notes

- Before sending the product, please ensure it is properly packaged to avoid further damage during transit.
- When shipping, include a description of the fault.

If you have any questions or need further assistance, please feel free to contact our customer service team. We are dedicated to serving you.

Customer Service Email: support@easeastro.com

Thank you for your understanding and support

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 9.5cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.