EM31PRO
STRAIN WAVE MOUNT
USER MANUAL V2

EMCAN

www.emcanastro.com

Reading Tips

Reading Interpretation

Thank you for choosing EM31Pro Strain Wave Mount.

The manual is based on the factory default specifications. Therefore, some specifications or appearance of your mount 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 mount, 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

Observe in the direction indicated by the dashed arrow.

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.

⚠ Ensure the mount's time, coordinates, and home position are properly set before use. Incorrect settings can cause GOTO errors or equipment collisions.

⚠ After installation, carefully check for any interference. Collisions can damage components, causing malfunctions or accuracy issues. Unplug immediately if interference or emergencies occur.

⚠ Please be careful when you carry, assemble or disassemble the mount and other heavy components and other equipments used on the mount . Or it may cause damage to the equipments or even personal injury.

⚠ Please ensure the entire setup is placed on a stable, flat surface and confirm the tripod has enough capacity and support area to prevent tipping, which could cause equipment damage or personal injury.

⚠ If there are children around when using, please pay attention to protecting their safety

⚠ The operating temperature of this mount ranges from -15℃ to 40℃. Please use the mount reasonably under proper environmental conditions

⚠ Do not wipe the surface with corrosive liquid. Avoid water immersion and exposure to rain.

⊘ Unauthorized disassembly is strictly prohibited. Any self-disassembly will result in the warranty being voided.

Contents

Product Overview

Brief Introduction

The EM31Pro Stain Wave Mount uses **17+17 strain wave reducers**. It is a **lightweight** mount but with a **high payload** capacity and **high-precision**. The EM31Pro supports **three modes**: EQ mode, Alt/Az side mode and Alt/Az top mode.

Mode	Astrophotography	Visual - telescope	Visual- Binoculars
EQ Mode	All objects	Yes	——
Alt/Az Side	Planets,Sun,Moon	Yes	——
Alt/Az Top	Planets,Sun,Moon	Yes	Yes

The different modes cater to the needs of both astrophotographers and visual observers.
Its **compact and lightweight design** makes transportation to your photography or viewing location effortless.
The **innovative altitude adjustment mechanism** provides an exceptionally **smooth experience for polar alignment**
The **quick-installation system** simplifies setup, allowing you to begin observing or capturing images faster.
Thoughtful **cable management** ensures tidy wiring and prevents tangling.
The **ergonomic design** enhances user comfort.
Crafted with **precision and premium materials**, the mount combines durability and elegance.

At EMCAN, we are dedicated to delivering a seamless experience, exceeding the expectations of astronomy enthusiasts.

Product Overview

Specification

1. Weight of the main body： approx. 4kg (without Dovetail & adapters)
2. Payload： ≤15kg (without counterweight)
≤20kg (with counterweight)
Note: payload calculated in the condition that the telescope's center of gravity is 20cm from RA axis
3. Latitude adjustment： 0°~90°（fine adjustment +/-10°）
4. Azimuth adjustment： -8°~+8°
5. RA： 17 type 100:1 SWG+ Synchronous Belt (300:1 reduction ratio)
6.DEC: 17 type 100:1 SWG+ Synchronous Belt (300:1 reduction ratio)
7.Motor: 42 Closed-loop stepper motor (RA with Brake)
8.Goto speed： max 6°/s
9.Power port： DC5.5-2.1 12V 5A (Cable Management Support)
10.Power consumption： tracking 0.4A， Goto 0.7A
11.Communication interface： usb2.0， Wi-Fi， Bluetooth
12.Support: Asiair、ASCOM (NINA、PHD2)、 INDI、SkySafari
13.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 capacity is not exactly equal to the total weight of the equipment being mounted. The effective weight that the mount can support depends closely on the center of gravity of the entire setup. Equipment with a higher center of gravity will reduce the mount's load-bearing capacity accordingly.

Before installing heavy equipment with a high center of gravity, please refer to the EM31Pro load formula to ensure it does not exceed the weight limit.

Product Overview

Standard Packing

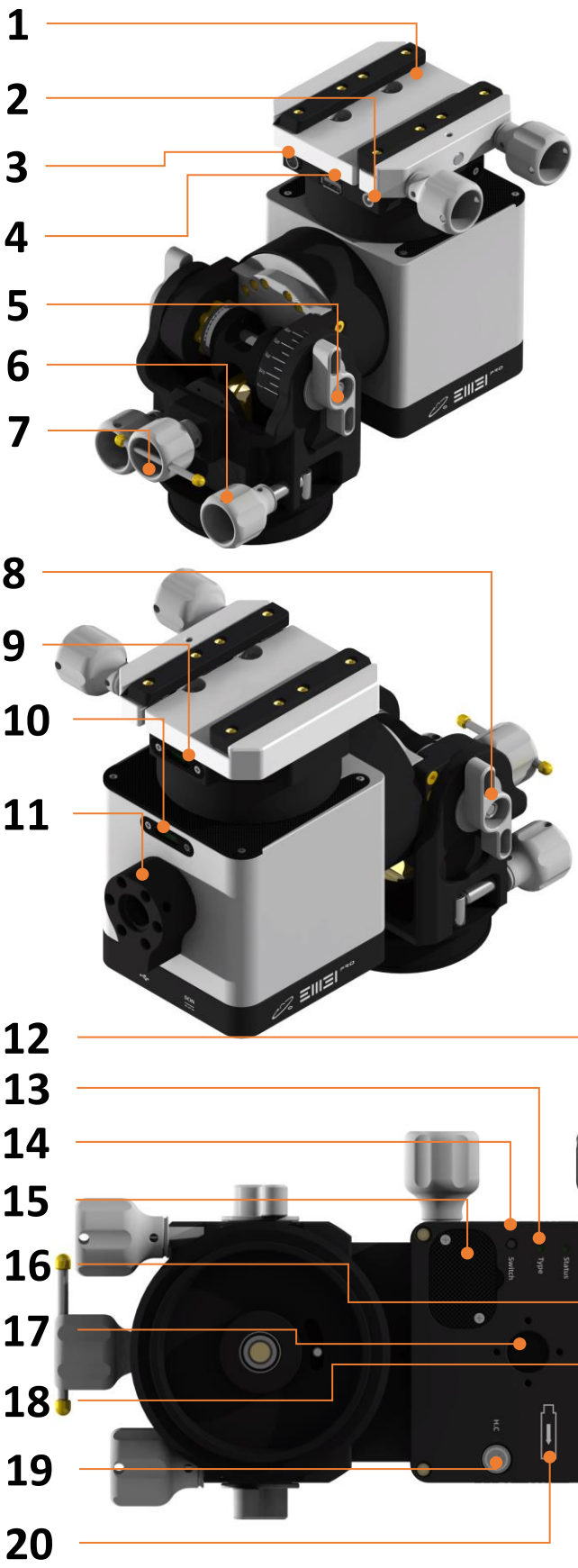





1	EM31 Pro Body	X1
2	Hand Controller	X1
3	Dovetail（VIXEN & LOSMANDY）	X1
4	Mounting Adapter	X1
5	0.5m USB2.0 Cable	X1
6	2m USB2.0 Cable	X1
7	Shockproof Soft Bag	X1

Product Overview

Components

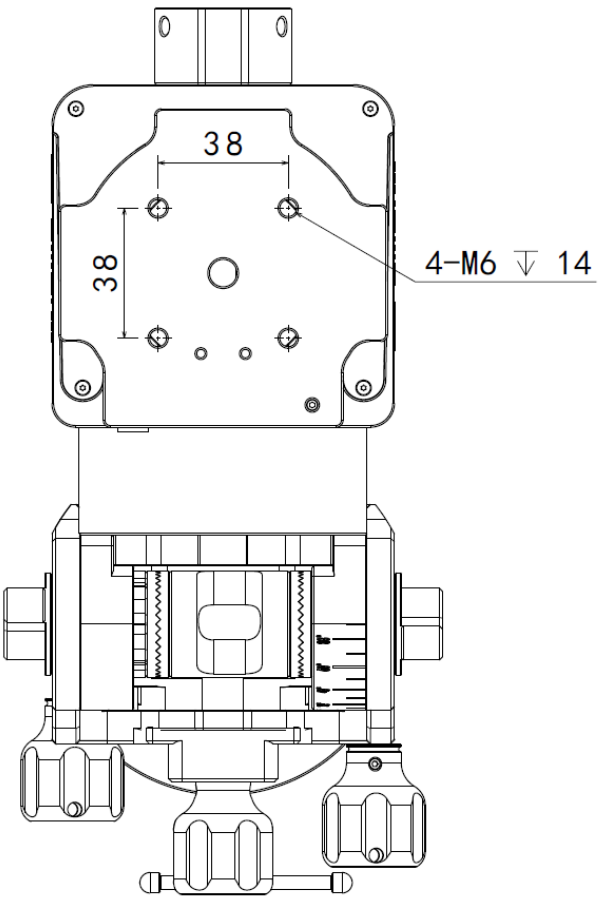


1.Dovetail
2. DEC 12v DC 5.5*2.1
3.DEC Hand controller port
4.DEC USB port （type A）
5.Main altitude locking knob
6. Azimuth adjustment knob
7. Altitude fine adjustment knob
8. Auxiliary altitude locking knob
9.Bubble level for DEC axis
10. Bubble level for RA axis
11. Multifunctional front support
12.Counterweight bar interface
13. Mode indicator light
14. Mode switching button
15. Battery cover plate
16. USB port （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

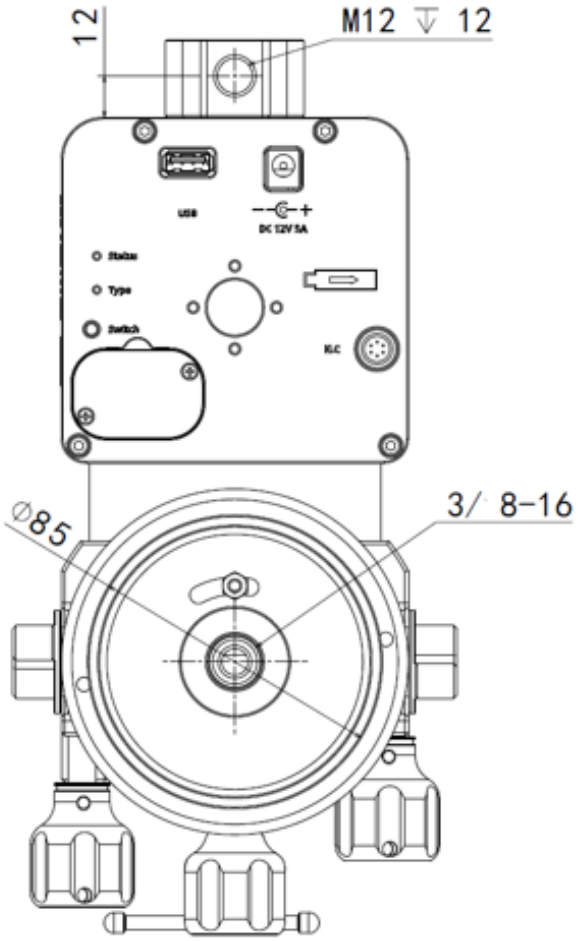
Interface Size

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



⚠

EM31Pro 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

TC44A (TC44S+AD120)

TC44L (TC44S+RP200)

TC44U (TC44S+AD120+RP200)

Parameters:	
Tripod interface: 85mm	Locking method: 3/8+three screws locked
Carbon fiber tube diameter: 44mm	Carbon fiber tube thickness: 2mm
Storage length:	EM-TC44S 620mm
	EM-TC44A 720mm
	EM-TC44L 850mm
	EM-TC44U 950mm

Size:	
Unfolded height:	EM-TC44S 530mm
	EM-TC44A 620mm
	EM-TC44L 720mm
	EM-TC44U 810mm
Weight:	EM-TC44S approx. 2.5kg
	EM-TC44A approx. 3.4kg
	EM-TC44L approx. 3.3kg
	EM-TC44U approx. 4.2kg

Supports stacking of up to two RP200 Extension Rods for greater height (TC44U+RP200:1010mm).

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：

EMH200 Fast-assembling pier extension

Material: Aluminum(AL6061),
Stainless steel
Size: H200mm dia110mm
Weight: 1.4kg

⚠ 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 Binoculars

⚠ 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

EQ Mode

SCP in the southern hemisphere.

Install equipment

↓

※ Set time and coordinates

⚠ Ensure that site coordinates, time, and home position are correctly set to avoid GOTO errors or equipment collisions.

↓

※※ Set home position

⚠ For OnStep, South latitude & East longitude (-); North latitude & West longitude (+); UTC: East of the prime meridian (-), West (+) Auto-sync recommended to avoid input errors.

↓

Polar alignment

↓

Select target and Goto

⚠ EM31Pro retains coordinates and time; no reset is needed if unchanged.

↓

Using Target Calibration

The mount uses last power-off position as home. Return to home before shutdown or reset next use. (If Park is enabled: execute park before shutdown. Next time, Unpark resumes operation, no need to reset Home.)

↓

Come into use

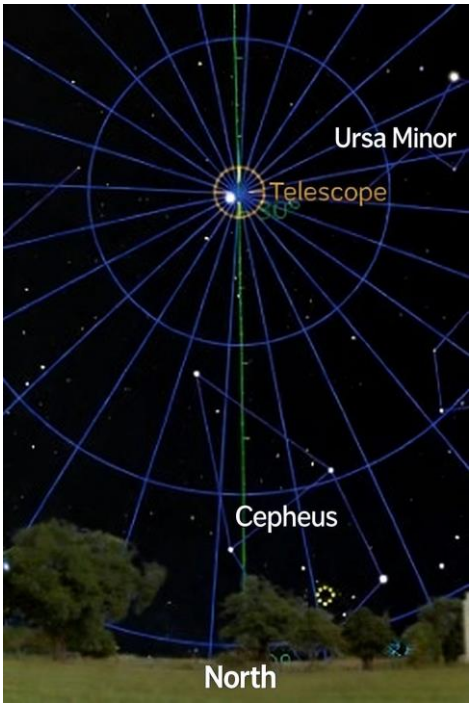
Standard Use Procedure

Use Procedure

Home position of EQ mode

The EQ mode home position is shown in the diagram below. This is the position the mount should be in before power-off, or should be reset manually after each power-on.

SCP in the southern hemisphere.



EM31Pro can confirm the EQ mode home position using the bubble levels on the RA and DEC axes.

Standard Use Procedure

Use Procedure

Altazimuth Mode (side & top)

Install equipment

↓

※ Set time and coordinates

↓

※ Horizontal adjustment

↓

※ Mode confirmation

↓

※※ Set home position

↓

Select target and Goto

↓

Using Target Calibration

↓

Start observation

⚠ Ensure that site coordinates, time, and home position are correctly set to avoid GOTO errors or equipment collisions.

For OnStep, South latitude & East longitude (-); North latitude & West longitude (+); UTC: East of the prime meridian (-), West (+) Auto-sync recommended to avoid input errors.

EM31Pro retains coordinates and time; no reset is needed if unchanged.

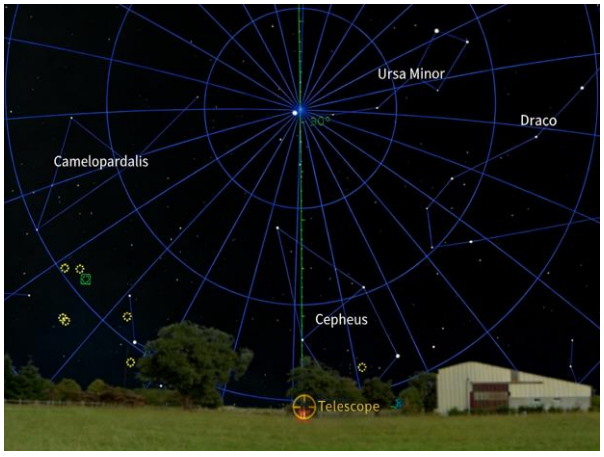
The mount uses last power-off position as home. Return to home before shutdown or reset next use. (If Park is enabled: execute park before shutdown. Next time, Unpark resumes operation, no need to reset Home.)

Standard Use Procedure

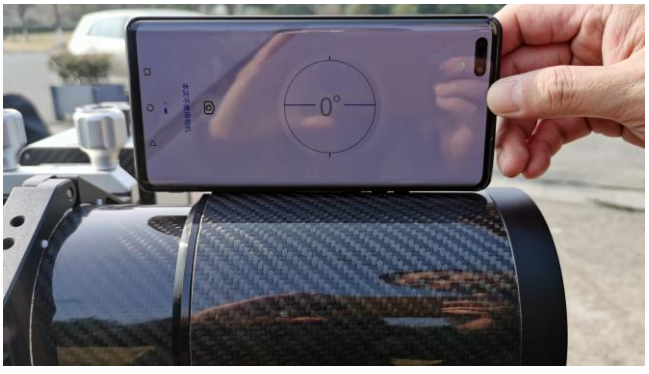
Use Procedure

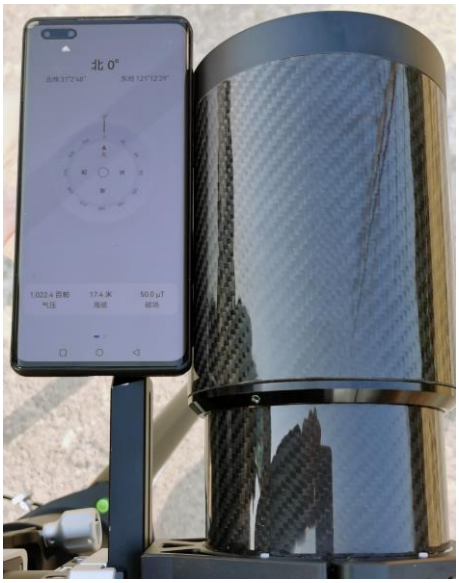
Home position of Altazimuth Mode (Side & Top)

In Alt-Az mode, the Home position should be level and pointing **north**, **both in the northern and southern hemisphere.**



The home position can be confirmed through a mobile compass and bubble levels





Installation and Use

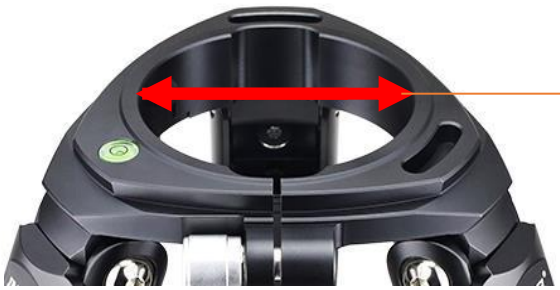
Installation of the mount with pier extension and tripod

EM 31 Pro can be mounted on center-column-free tripods with a bore diameter of 85 mm, such as RT90C, Gitzo5

⚠ **Size and style of the 3/8-16 locking screw should be proper.**

Locking knob

Locking knob



Diameter 85mm

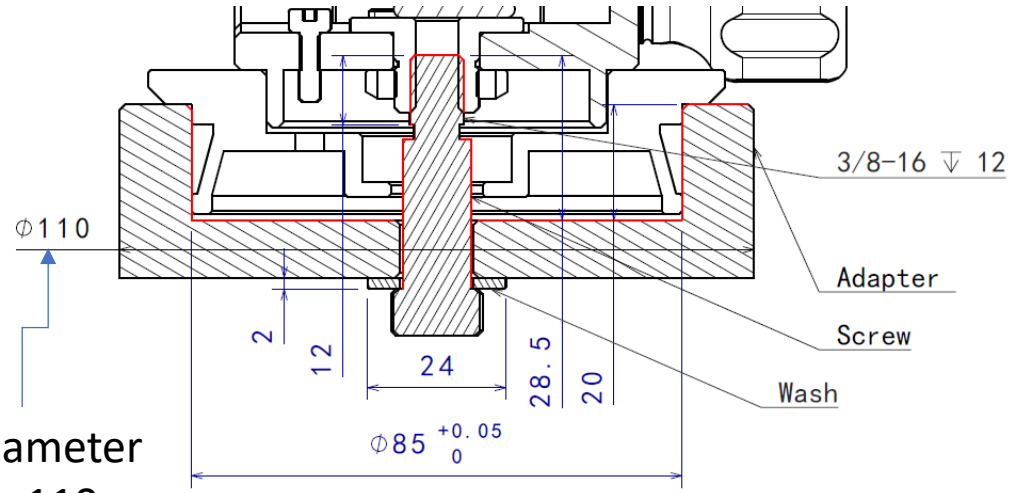
⚠ **Ensure that non-official tripods are compatible with the mount and securely attached, with no wobbling or movement, to avoid precision issues or potential equipment falls.**

Installation and Use

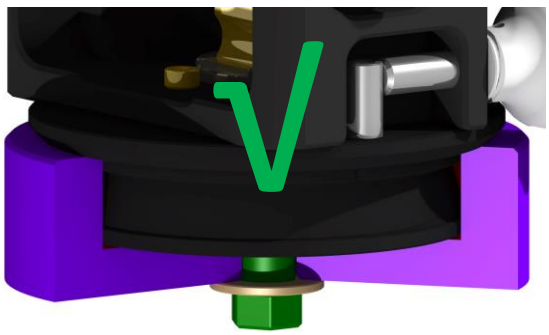
Installation of the mount with pier extension and tripod

The standard setup does not include accessories for mounting the EM31Pro on non-compatible tripods. Users who wish to install the mount on a different tripod will need to design and fabricate a custom adapter and appropriate mounting bolts.

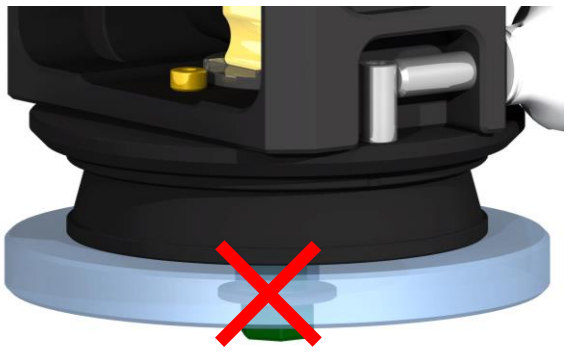
The dimensions should follow the chart below：



Outer diameter less than 110mm



Correct adapter structure

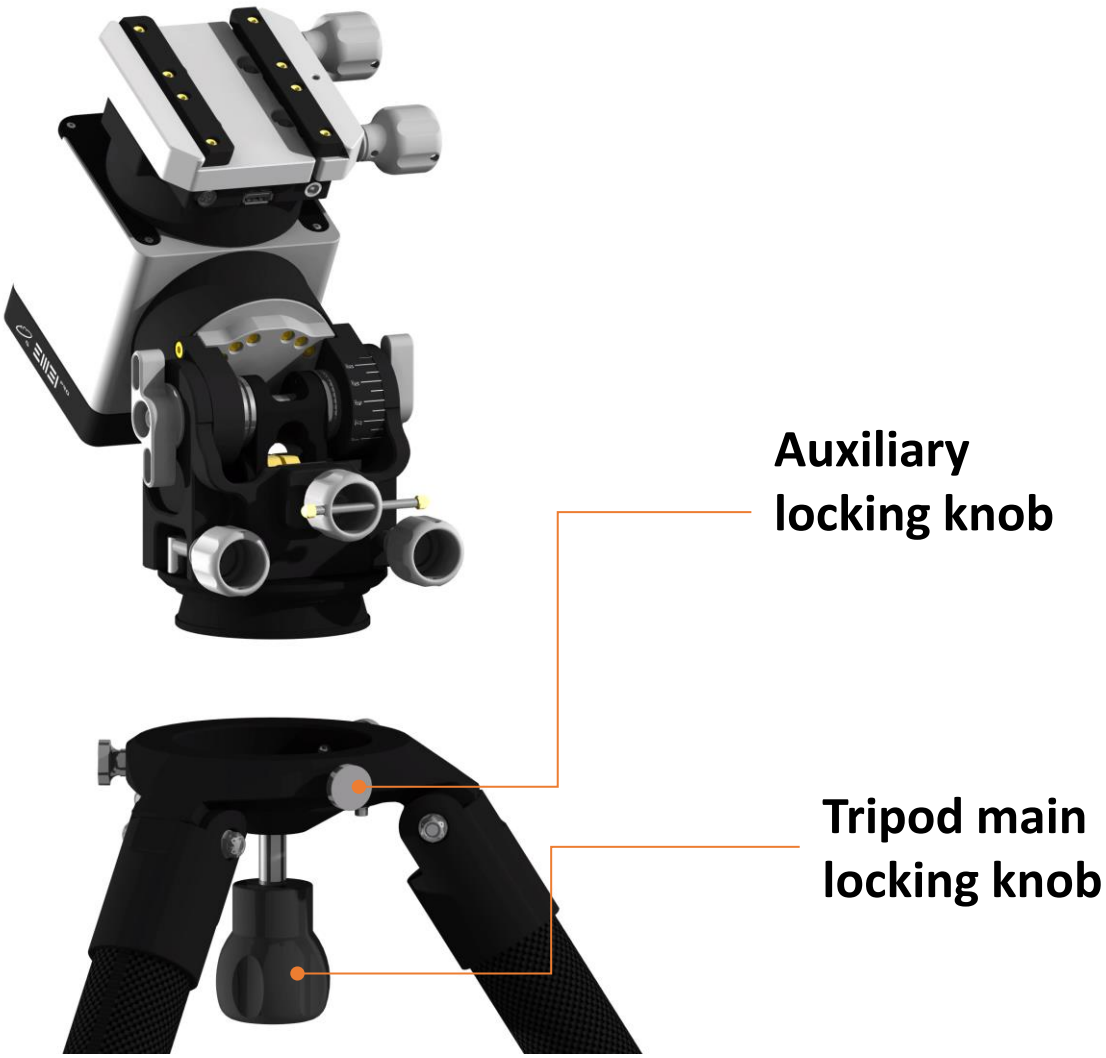


Incorrect adapter structure, it is prohibited to connect to the mount through only one plane

Installation and Use

Installation the mount with pier extension and tripod

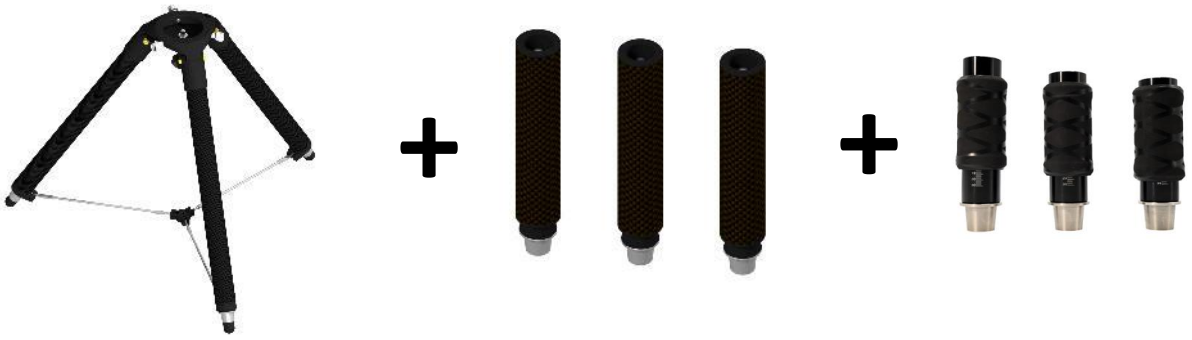
When using the EMTC44 tripod, the mount body can be directly attached to the tripod via the officially supplied mounting adapter and secured with the tripod's three knobs for a more reliable connection.



Installation and Use

Installation of the mount with pier extension and tripod

The EMTC44S is a high-load tripod specifically designed for astronomical applications. Its rigidity is enhanced by a non-retractable structure crafted from 44mm/2mm carbon fiber tubes. Additionally, the tripod's height and support area can be extended using the heightening section.

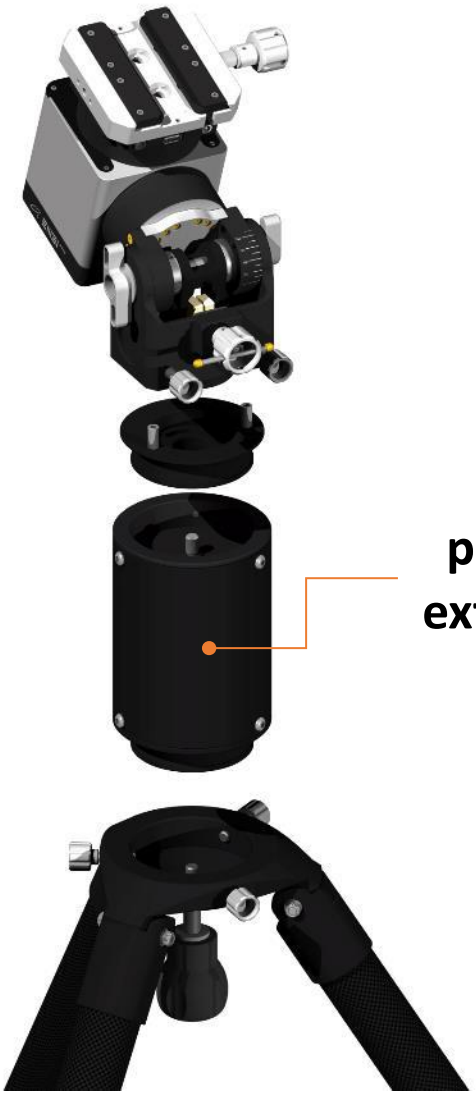


Rotate clockwise to install the extension rod and horizontal adjuster

Installation and Use

Installation of the mount with pier extension and tripod

The strain wave mount is compact, and when using a longer telescope, there is a risk of collision between the telescope and the tripod, especially near the zenith or the meridian. In this case, a pier extension is needed to avoid collisions.

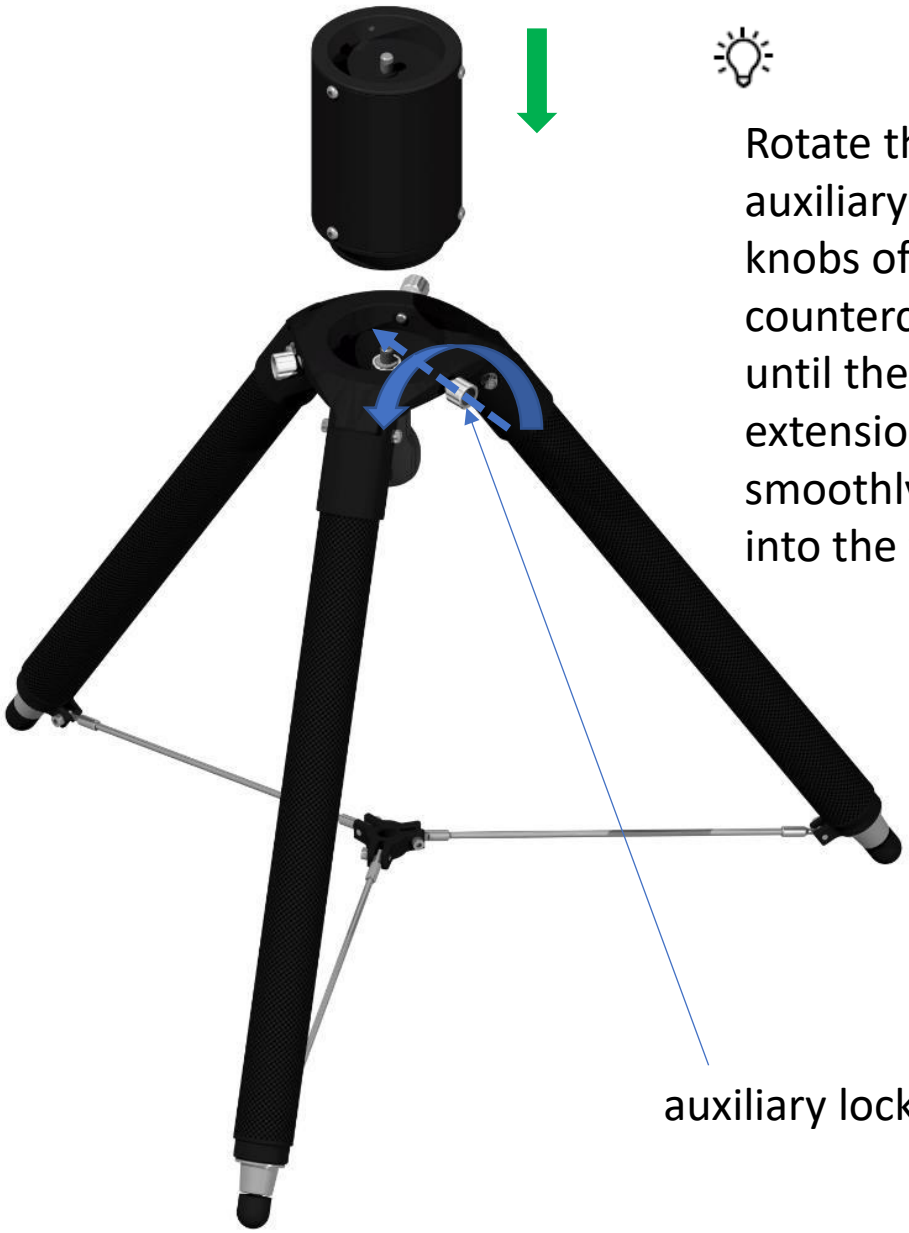


pier extension

Installation and Use

Installation of the mount with pier extension and tripod

Installation steps with the pier extension



Rotate the three auxiliary locking knobs of the tripod counterclockwise until the pier extension can be smoothly installed into the tripod tray

auxiliary locking knob

Installation and Use

Installation of the mount with pier extension and tripod

Installation steps with the pier extension

Main locking knob

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

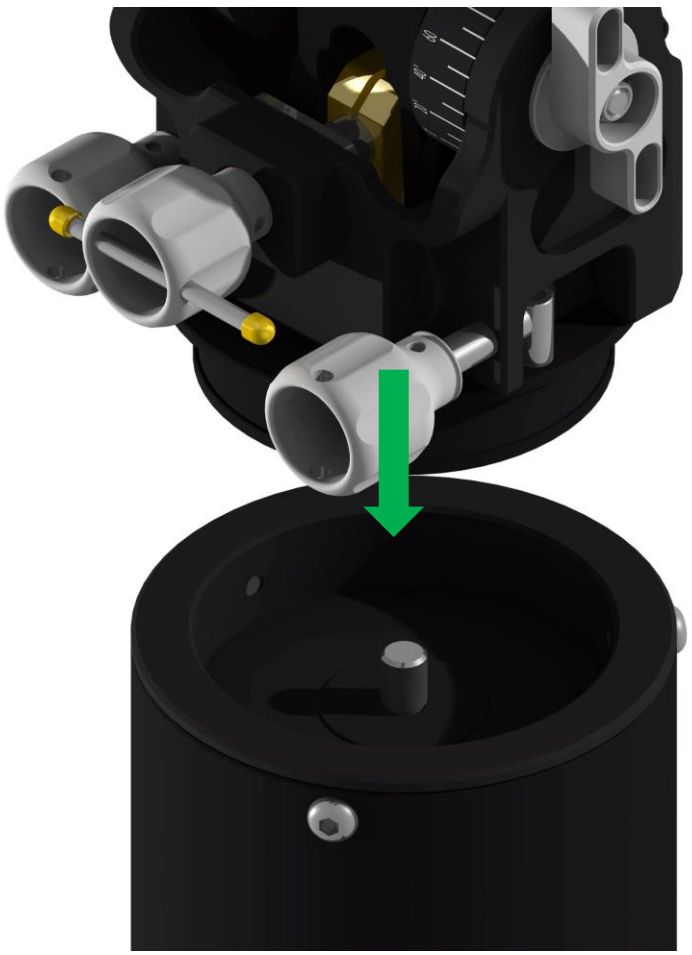
Note that if this step is not performed correctly, the mount body and pier extension may not be separated properly when disassembling the equipment.

Installation and Use

Installation of the mount with pier extension and tripod

Installation steps with the pier extension

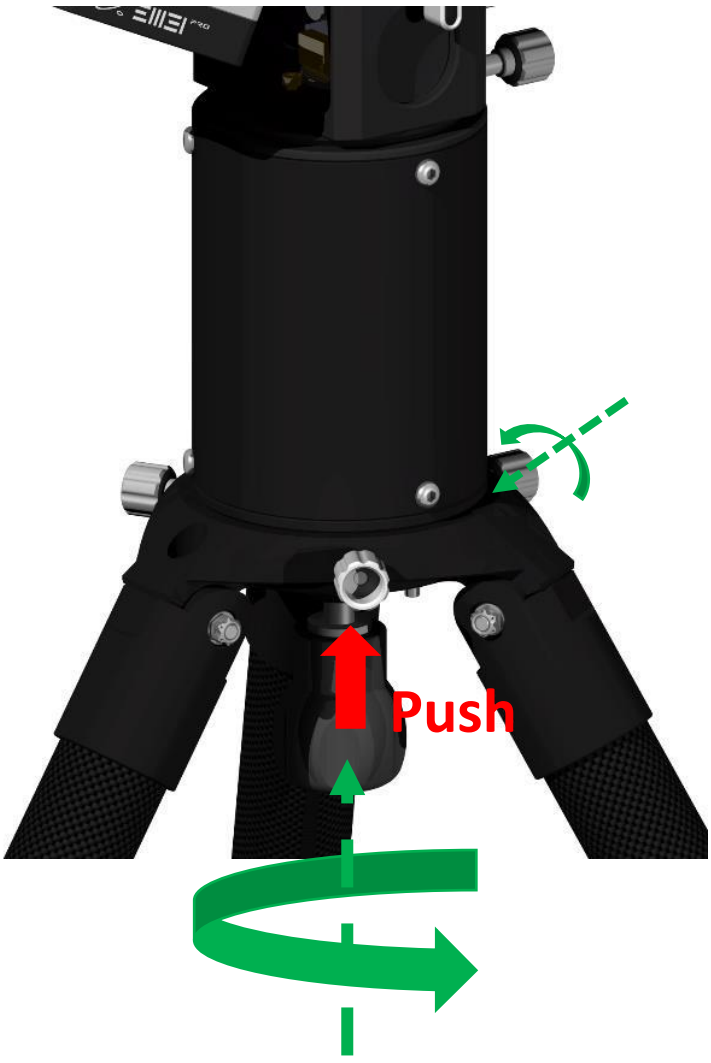
Place the mount body with the mounting adapter into the pier extension



Installation and Use

Installation of the mount with pier extension and tripod

Installation steps with the pier extension



Push upward and continue rotating the main tripod locking knob clockwise until it is tightly secured.

Next, rotate the three auxiliary tripod locking knobs clockwise until they are firmly locked.

At this point, the installation of the mount body, pier extension, and tripod is complete

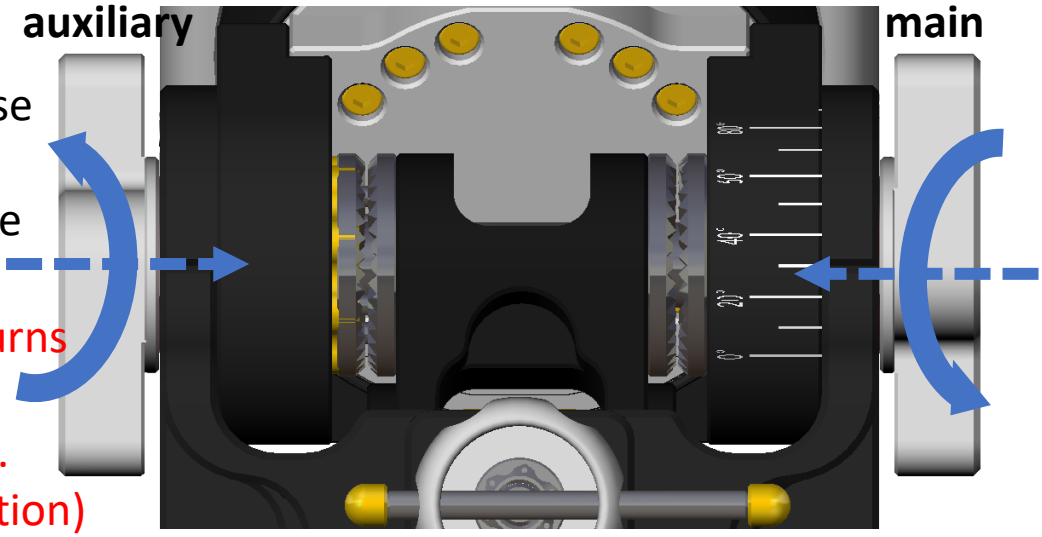
To lock the mount body, first push the main locking knob upward with slight force, then rotate the knob clockwise to secure it.

Installation and Use

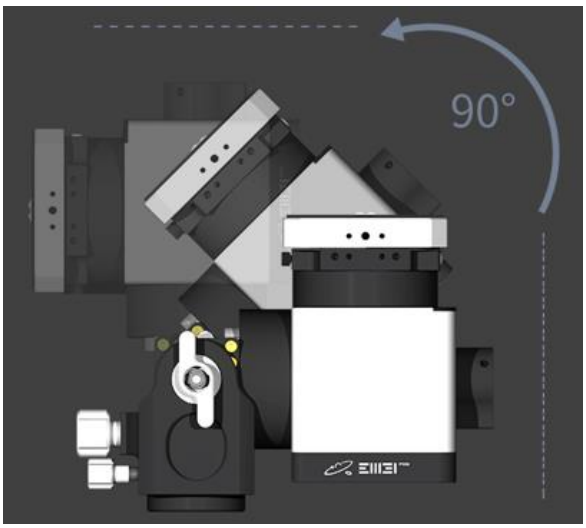
Adjustment of altitude and azimuth angles of the equatorial mode

Altitude coarse adjustment

Step1.Rotate counterclockwise to release the auxiliary altitude locking knob (Rotate 1–1.5 turns or until slight loosening is felt. Avoid over-rotation)



Step2.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

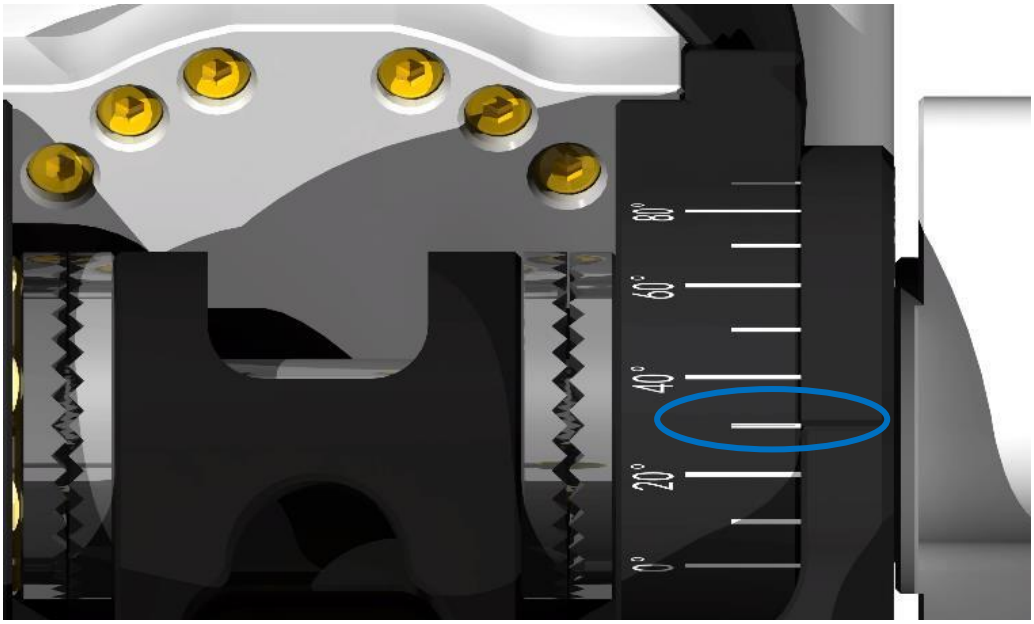


When the main altitude locking knob is loosened, the mount loses its support. During the coarse adjustment process, ensure that the mount is always supported by hand until the main altitude locking knob is securely tightened again.

Installation and Use

Adjustment of altitude and azimuth angles of the equatorial mode

Altitude coarse adjustment



Refer to the altitude scale and adjust the altitude angle to approximately match the local latitude. (For example, if the local latitude is 31°13'20", set and lock the altitude near 30°

⚠ **When the main altitude locking knob is loosened, the mount loses its support. During the coarse adjustment process, ensure that the mount is always supported by hand until the main altitude locking knob is securely tightened again.**

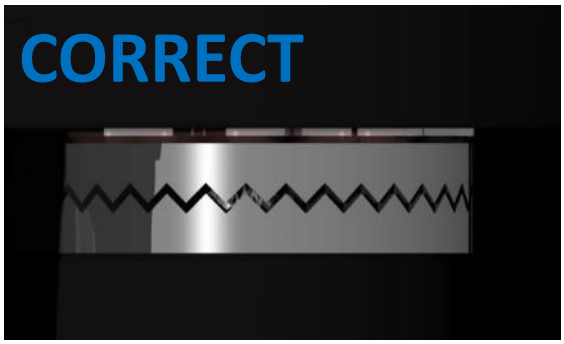
⚠ Roughly adjust the altitude angle at 10 ° intervals, such as 0 ° 10 °, 20 °, 30 °... 90 °

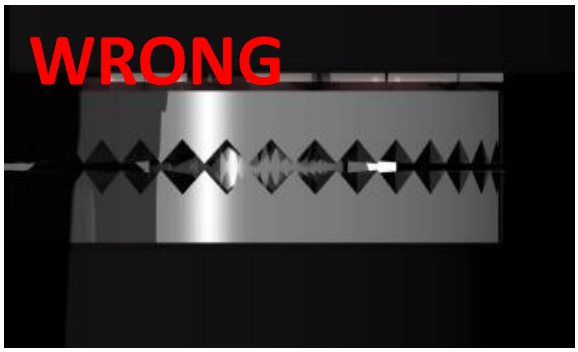
Installation and Use

Adjustment of altitude and azimuth angles of the equatorial mode

Altitude coarse adjustment

Rotate the main altitude locking knob clockwise at the approximate latitude position until the flat gear engages. Then, rotate the auxiliary altitude locking knob clockwise to complete coarse adjustment of the altitude angle





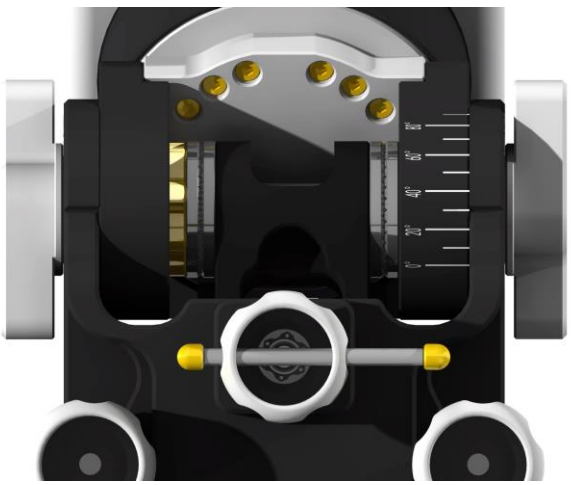
⚠

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 mount loses its support. During the coarse adjustment process, ensure that the mount is always supported by hand until the main altitude locking knob is securely tightened again.

Altitude angle coarse adjustment completed



Installation and Use

Adjustment of altitude and azimuth angles of the equatorial mode

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

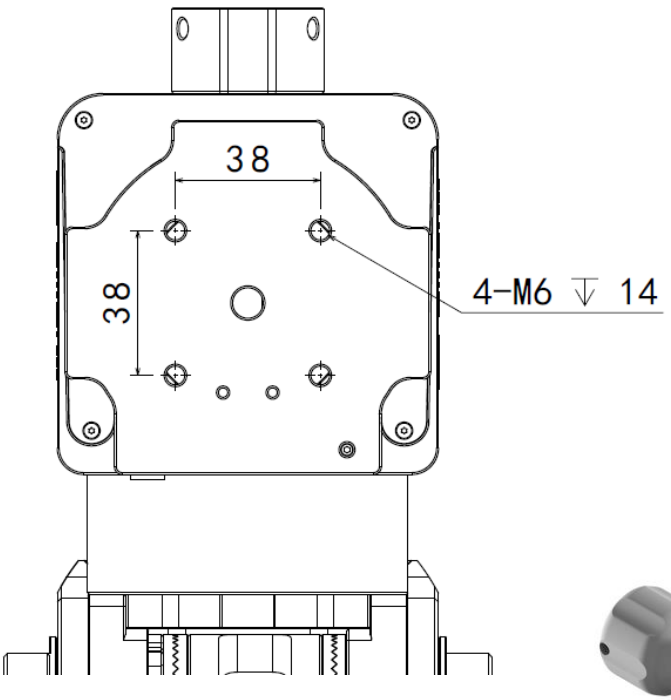
Once all equipment is installed, precise polar alignment can be achieved by rotating the azimuth adjustment knobs and altitude fine adjustment knob

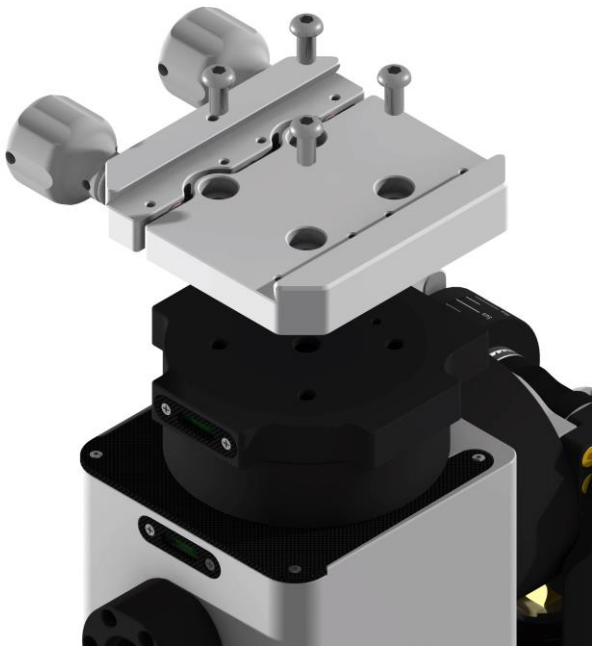
Accessory Installation

Installation of dovetail

Dovetail

The interface on the EM31Pro DEC top plate is compatible with most dovetails, allowing users to replace the dovetail as needed.





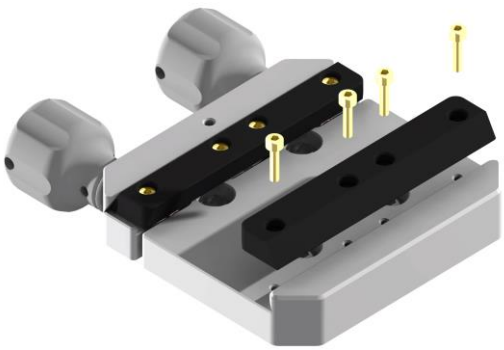
Accessory Installation

Installation of dovetail

Dovetail

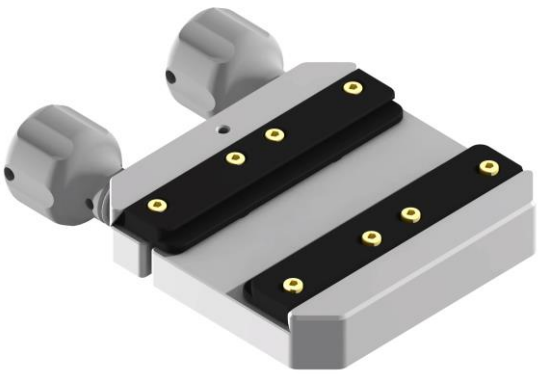
The EM31Pro comes with standard LOSMANDY 60° and Vixen 75° dovetail compatibility. Arca specifications can be achieved by installing the dovetail Acra strips (optional)

LOSMANDY



VIXEN

ARCA(optional)



Installation and Use

Altazimuth Mode

Structure Switching

The installation method for the EM31Pro pier extension and tripod in altazimuth mode is identical to that in equatorial mode. Adjust the altitude angle to 90 degrees using the same procedure as in equatorial mode.

Installation and Use

Altazimuth mode

Installation of telescope

Confirm that the installation direction of the telescope is consistent with the direction marked on the bottom of the body. **Installing the telescope in reverse can result in GOTO errors and may even lead to collisions that could damage the equipment.**

Installation and Use

Altazimuth Mode

Horizontal calibration

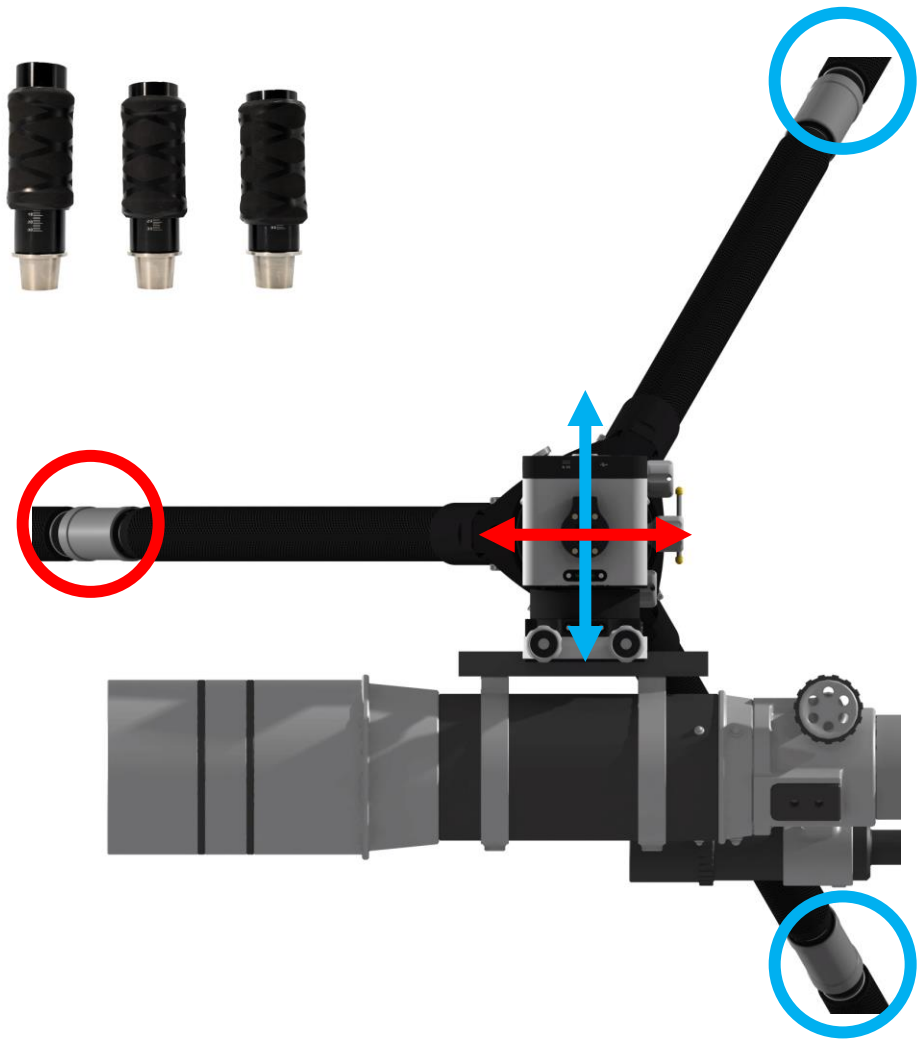
Accurate GOTO and stable tracking in altazimuth mode require the azimuth rotation axis to be perpendicular to the ground. The EM31Pro allows users to confirm this alignment using the horizontal bubble on the RA axis.

Installation and Use

Altazimuth Mode

Horizontal calibration

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



⚠ All equipment need to be installed before starting to adjust the level state

Installation and Use

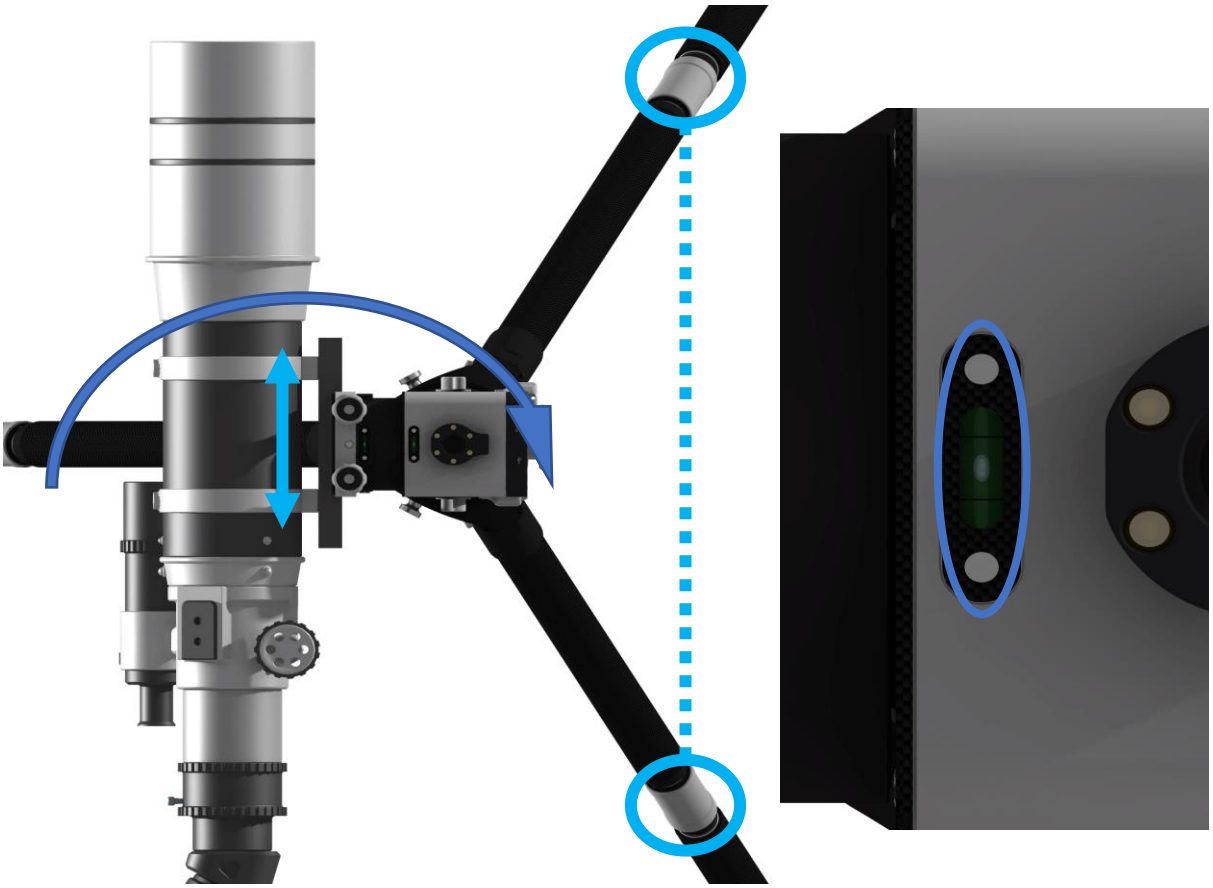
Altazimuth Mode

Horizontal calibration

Obtain accurate horizontal state

Power on the mount and manually rotate the RA axis until the horizontal bubble is 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



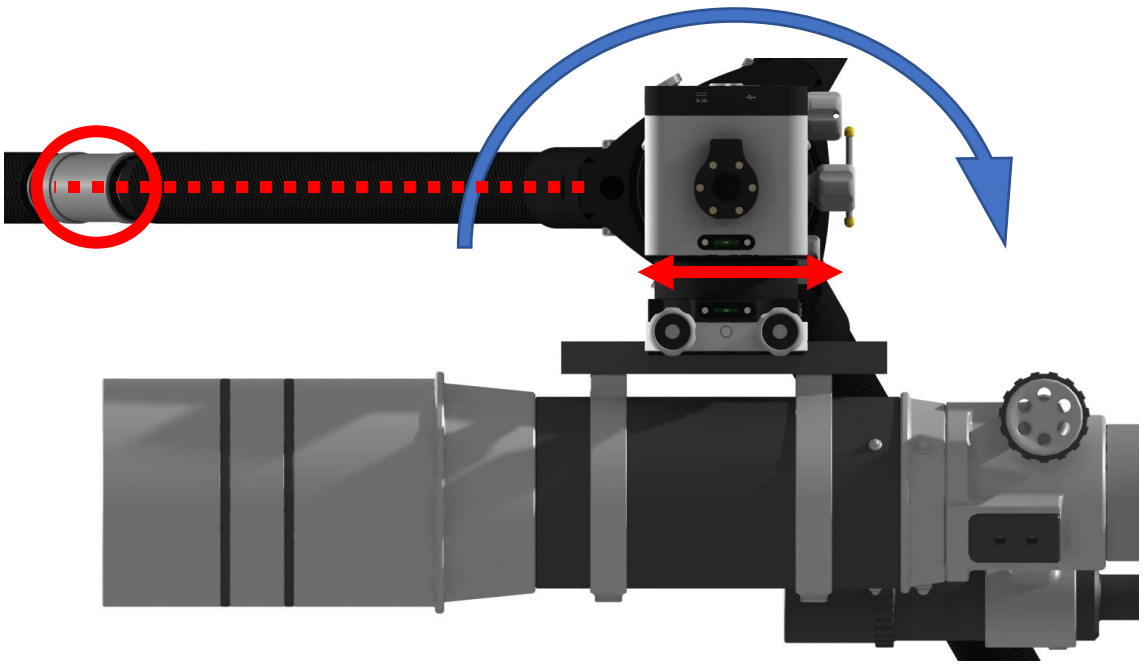
Installation and Use

Altazimuth Mode

Horizontal calibration

Obtain accurate horizontal state

Manually rotate the RA axis until the horizontal bubble aligns with the red dashed line in the diagram.



Adjust the horizontal adjuster inside the red circle until the horizontal bubble is centered, indicating that the horizontal adjustment is complete.

Installation and Use

Altazimuth Mode-Top mounting

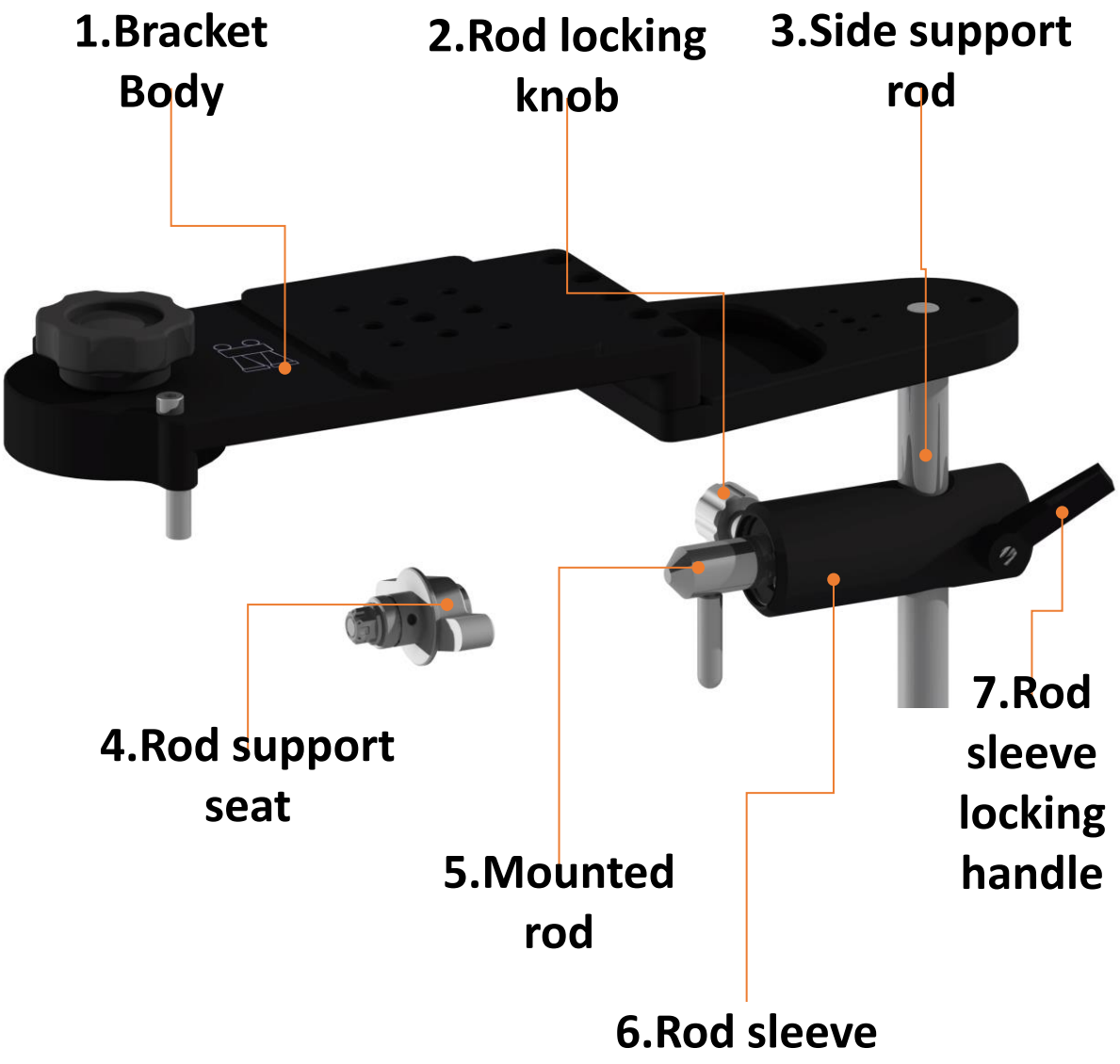
Structure Switching

EM31 Pro can achieve the altazimuth top mode by installing a supporting bracket on top

Installation and Use

Altazimuth Mode-Top mounting

Top mode supporting bracket structure



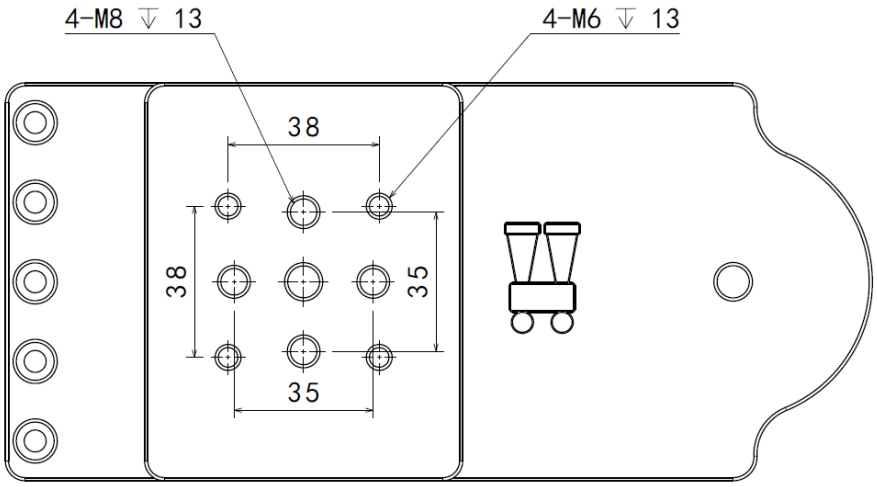
Installation and Use

Altazimuth Mode-Top mounting

Structure Switching

The supporting bracket interface is compatible with most dovetails.

⚠ Pay attention to the installation direction of the dovetail knobs, as shown in the diagram.



⚠ The top mode supporting bracket does not come with a dovetail, you can use the dovetail on the EM31Pro body or choose your own.

Installation and Use

Altazimuth Mode-Top mounting

Structure Switching

Replace the dovetail on the mount body with a supporting bracket connecting adapter and adjust the altitude angle to 0 degrees

Installation and Use

Altazimuth Mode-Top mounting

Structure Switching

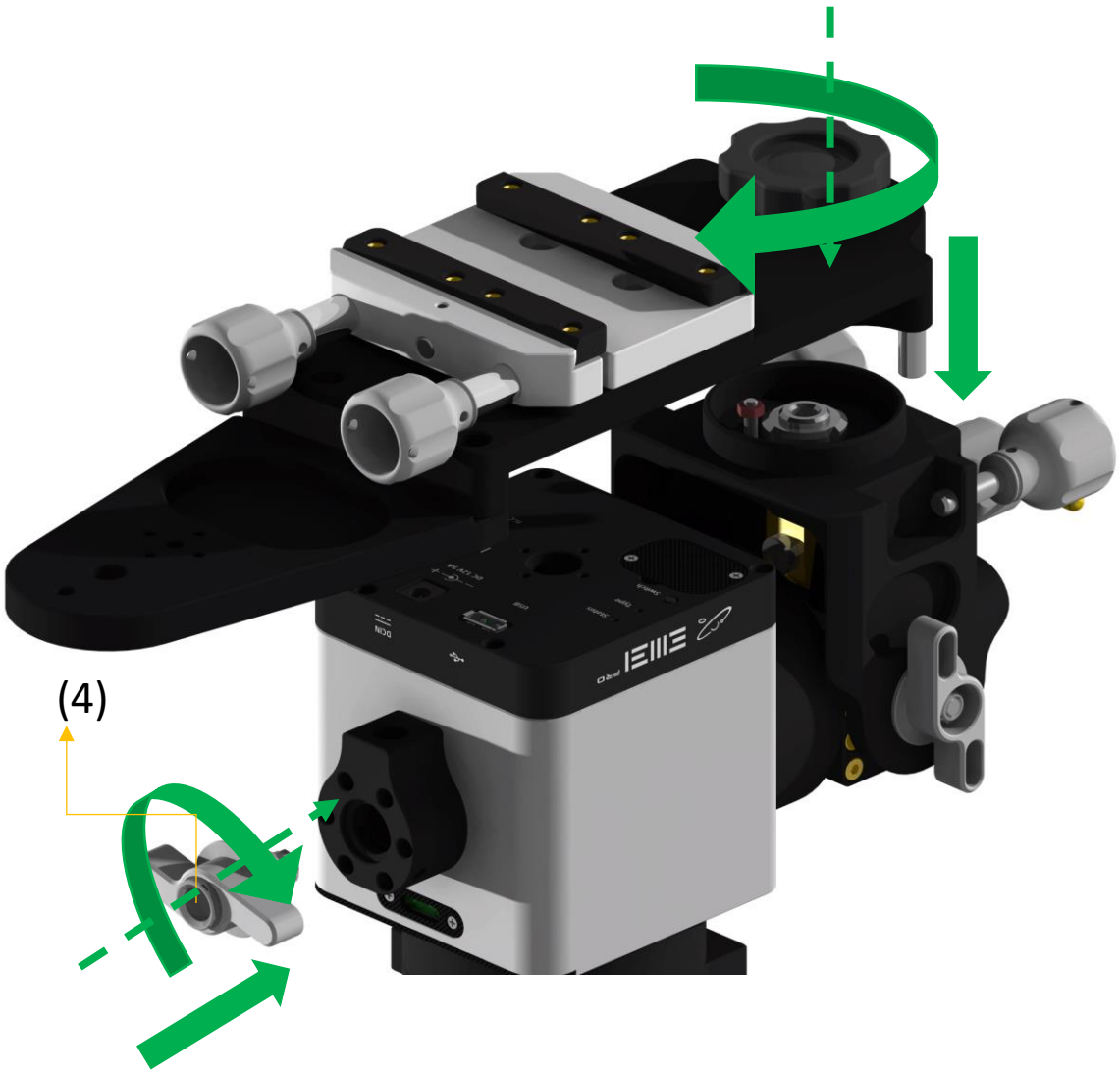
Invert the mount body and install it with the pier extension and tripod, following the same steps as in Equatorial mode.

Installation and Use

Altazimuth Mode-Top Mounting

Structure Switching

Insert the supporting bracket into the mount body base and rotate the knob clockwise until it is locked. Then, rotate the Rob support seat(4) clockwise until it reaches the bottom but do not lock it tightly

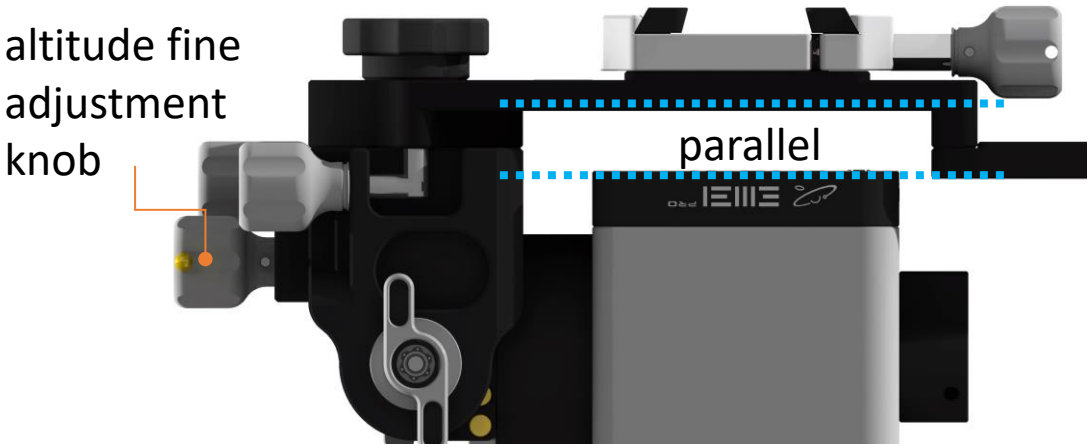


Installation and Use

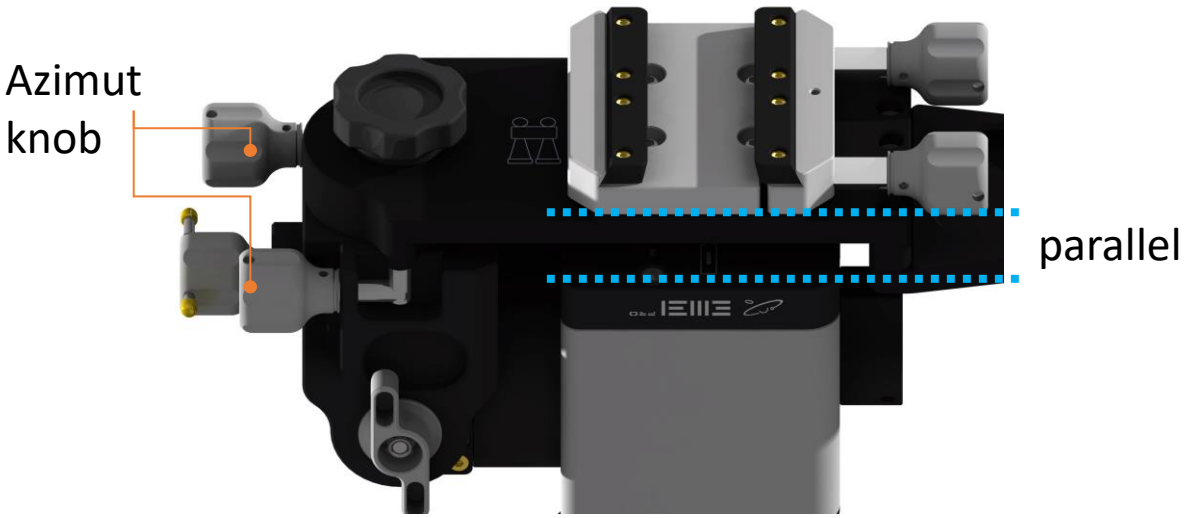
Altazimuth Mode-Top Mounting

Structure Switching

Adjust the altitude fine adjustment knob until the lower edge of the top-mount bracket is parallel to the edge of the mount body's base.



Adjust the azimuth knob until the side edge of the top-mount bracket is parallel to the edge of the mount body's base.



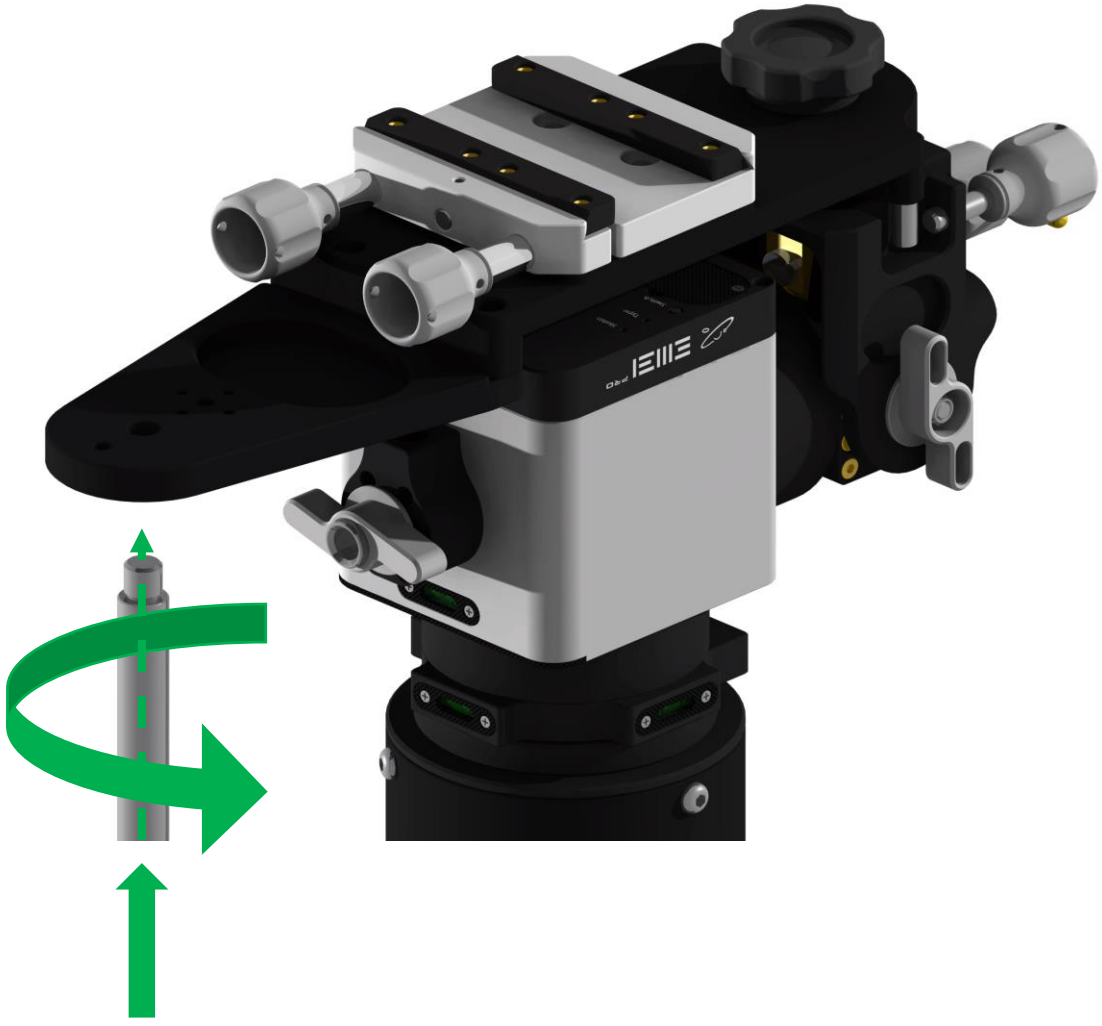
Parallel alignment of the edges can be determined by adjusting the viewing angle.

Installation and Use

Altazimuth Mode-Top mounting

Structure Switching

Clockwise into the Side support rod

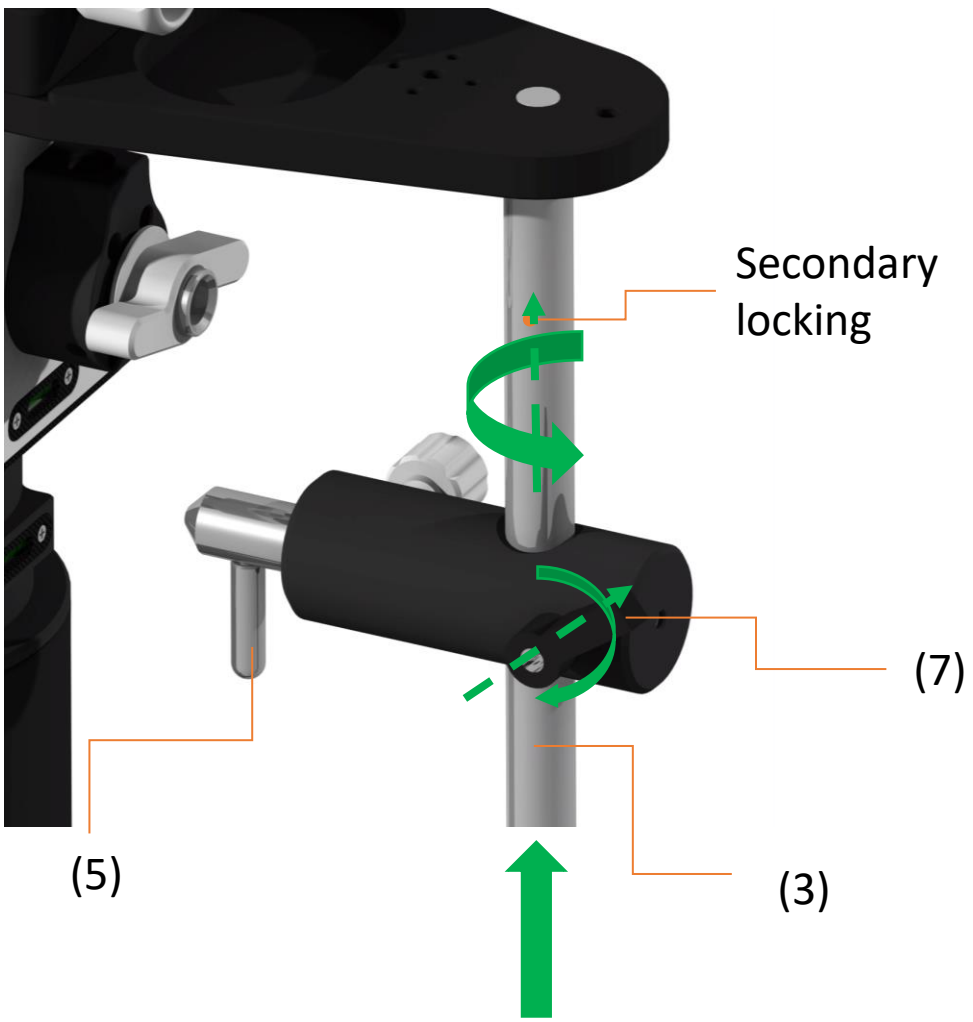


Installation and Use

Altazimuth Mode-Top mounting

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

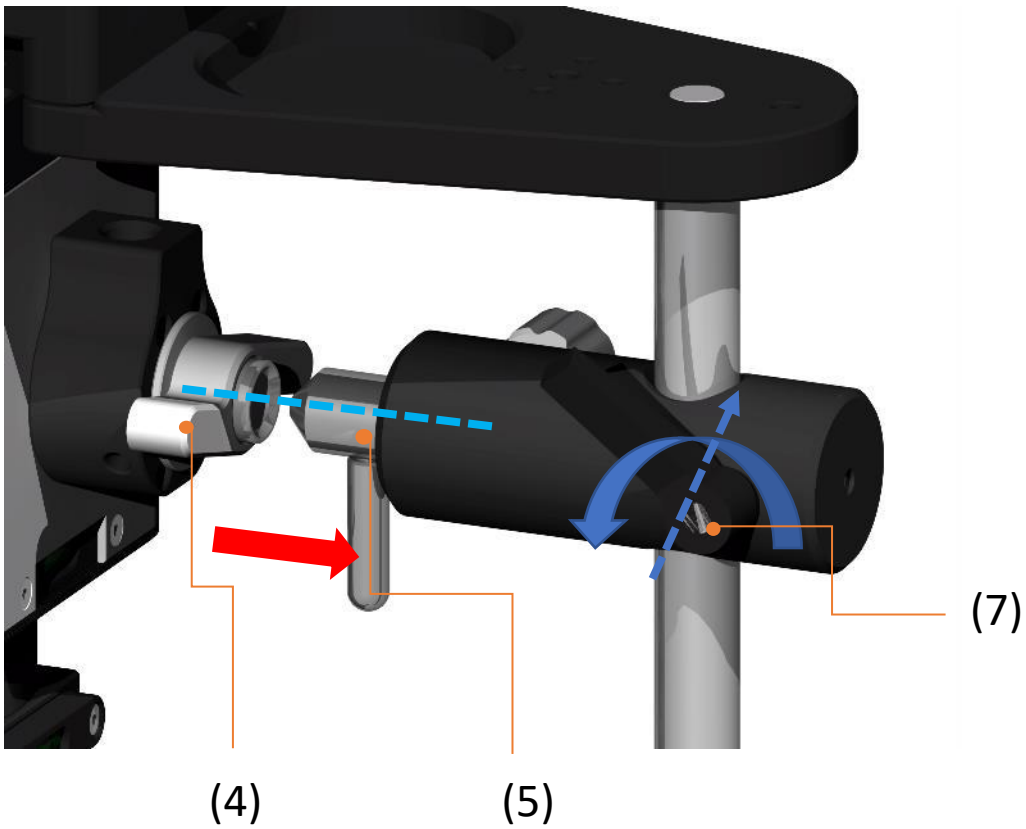


Installation and Use

Altazimuth Mode-Top mounting

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)

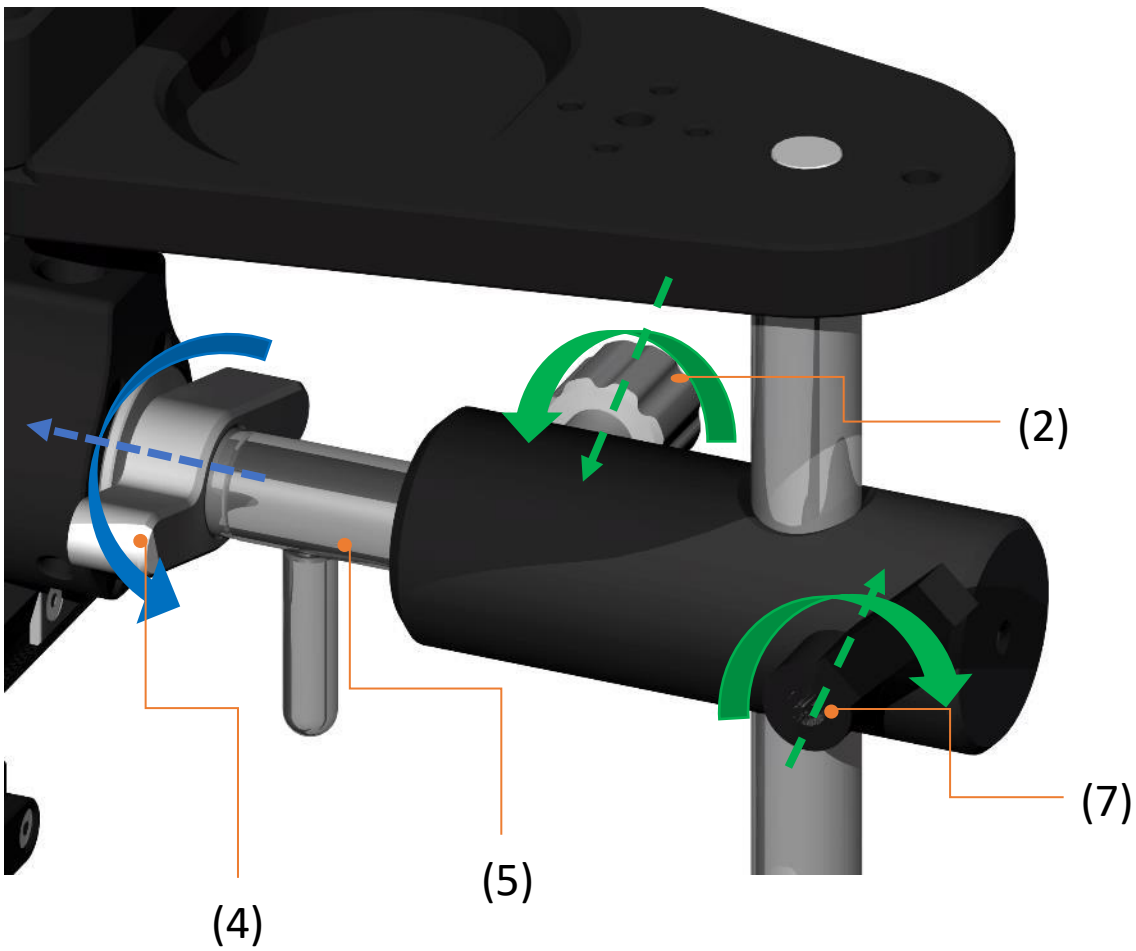


Installation and Use

Altazimuth Mode-Top mounting

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

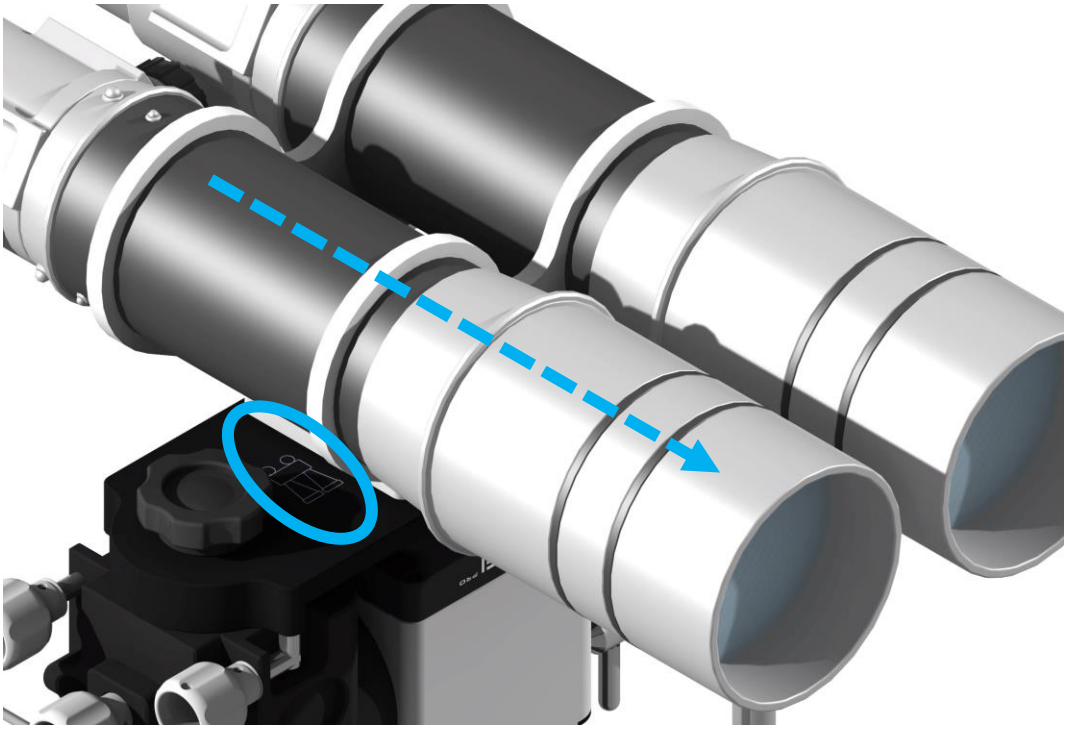


Installation and Use

Altazimuth Mode-Top mounting

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, **Installing the telescope in reverse can result in GOTO errors and may even lead to collisions that could damage the equipment.**

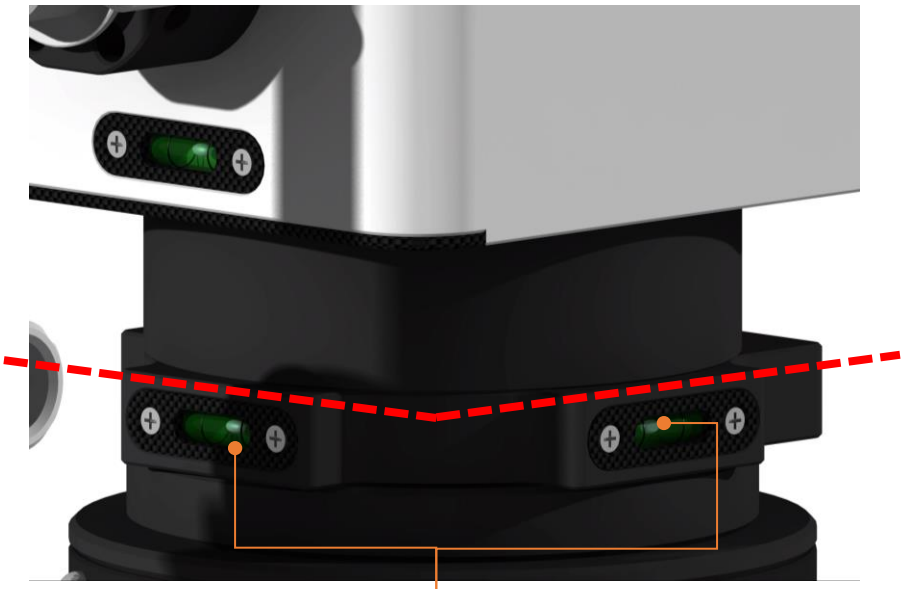


Installation and Use

Altazimuth Mode-Top mounting

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



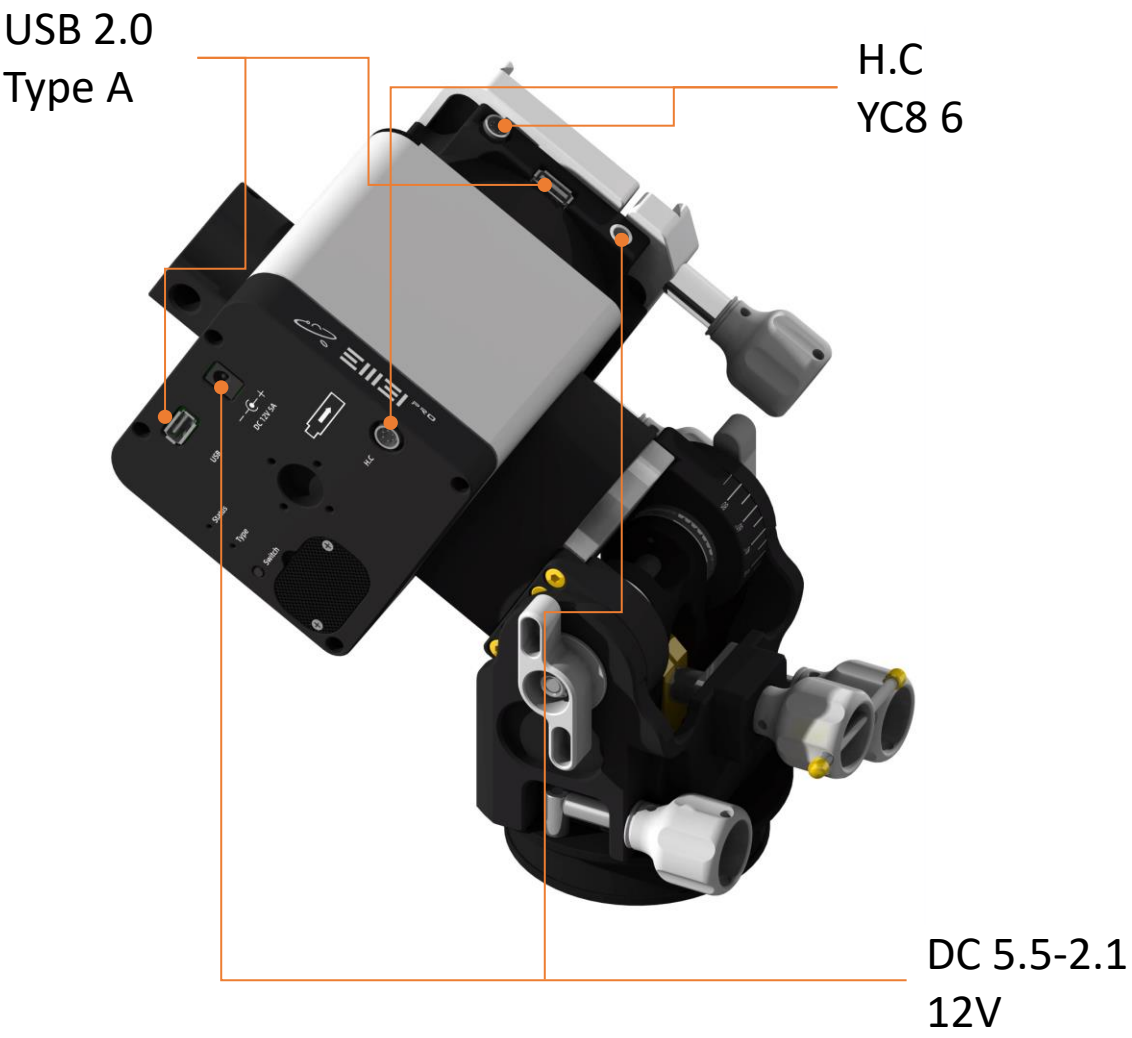
DEC axis level bubble

Complete the horizontal adjustment by adjusting the horizontal adjuster installed on the tripod, using the same method as in the side-mounted Alt-Az mode.

Installation and Use

Cable Connection

EM31 Pro has two sets of cable ports, located on the base of the mount and on the DEC rotation axis, both with identical functions.



Do not connect two power sources simultaneously.
Do not connect two hand controllers simultaneously.
Do not connect two astronomical control devices simultaneously (such as any PC, astronomy box, or Mini PC).

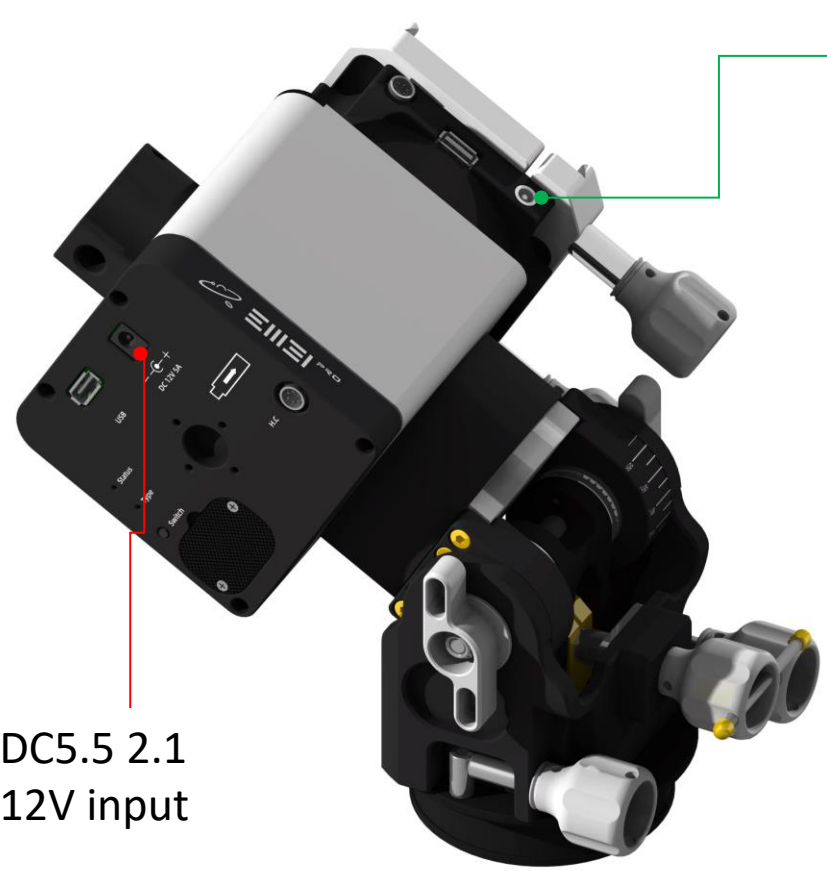
Installation and Use

Cable Connection

Power connection method

EM31Pro features two DC 12V ports. Either port can serve as a power input, while the other can be used as a power output to supply power to other astronomical devices.

For astrophotography, it is recommended to use the port on the base of the mount as the power input and the DEC axis port as the output.



Do not connect two power sources simultaneously. The load on the output port must not exceed 12V 5A.

When powering only the mount, it is recommended to use a DC 12V 2A power supply or higher. When powering other devices as well, use a DC 12V 5A power supply or higher.

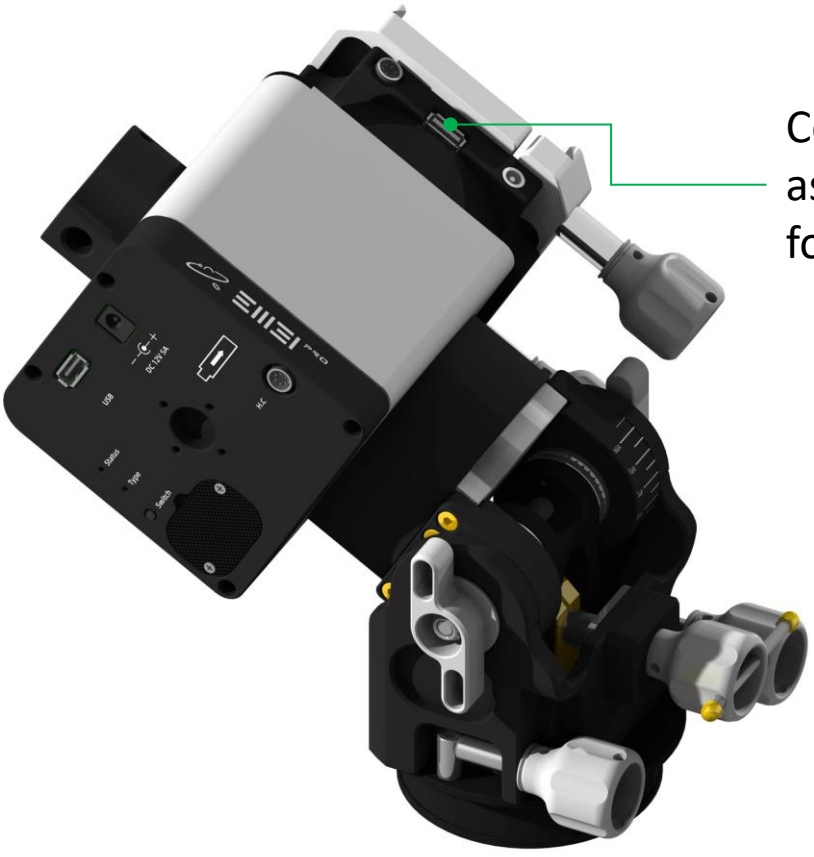
Installation and Use

Cable Connection

USB cable connection method

EM31 Pro has two USB ports, each capable of connecting the mount to a control device (such as a PC, astronomy box, Mini PC).

For astrophotography, it is recommended to connect the astronomy box or PC to the DEC axis port . This allows the USB and power output cables to rotate in sync with the telescope, effectively preventing cable tangling.



Connection of an astronomy box or PC for astrophotography

Prohibit connecting devices other than PCs, Astro Boxes, and Mini PC...

Do not connect the mount through any USB hub.

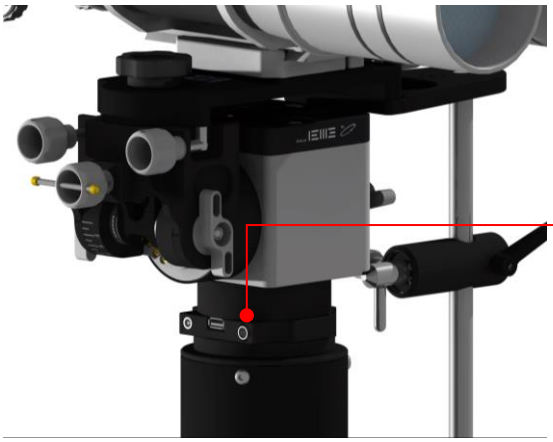
Installation and Use

Cable Connection

Handle connection

EM31 Pro has two handle controller ports, each capable of connecting the handle controller

Handle connected to the bottom of the mount in EQ and Alt/Az side modes.



Handle connected to DEC axis cable management in Alt/Az top mode

Prohibit connecting two handle controllers simultaneously
Do not plug and unplug the handle controller while the mount is powered on

Installation and Use

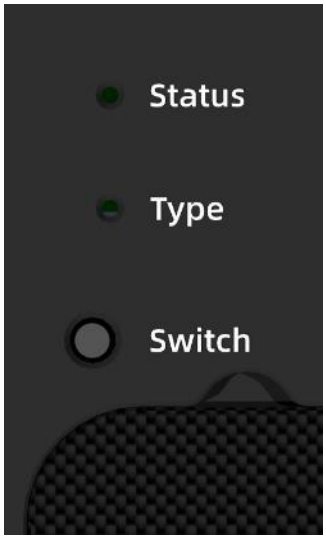
Mode Selection

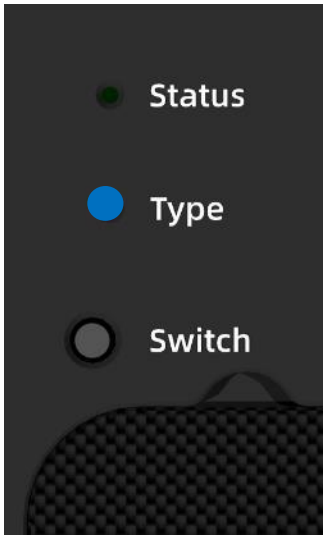
EM31 Pro mode selection indicated by the “Type” light，**Blue is Altazimuth side-mounted mode**，**Red is Altazimuth top-mounted mode,** **Light out for Equatorial mode**

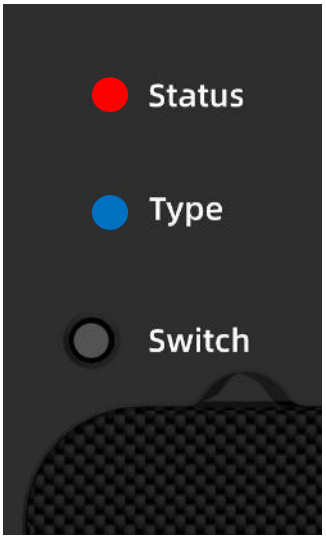
Wait for 5 seconds when the mount is powered on, and enter mode switching after the Status light flashes off

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







⚠ Mode switch must be done within **10 seconds** after entering the mode switch state. If no action, the system enters **EQ mode** and cannot switch. To switch again, power off/on and repeat the procedure.

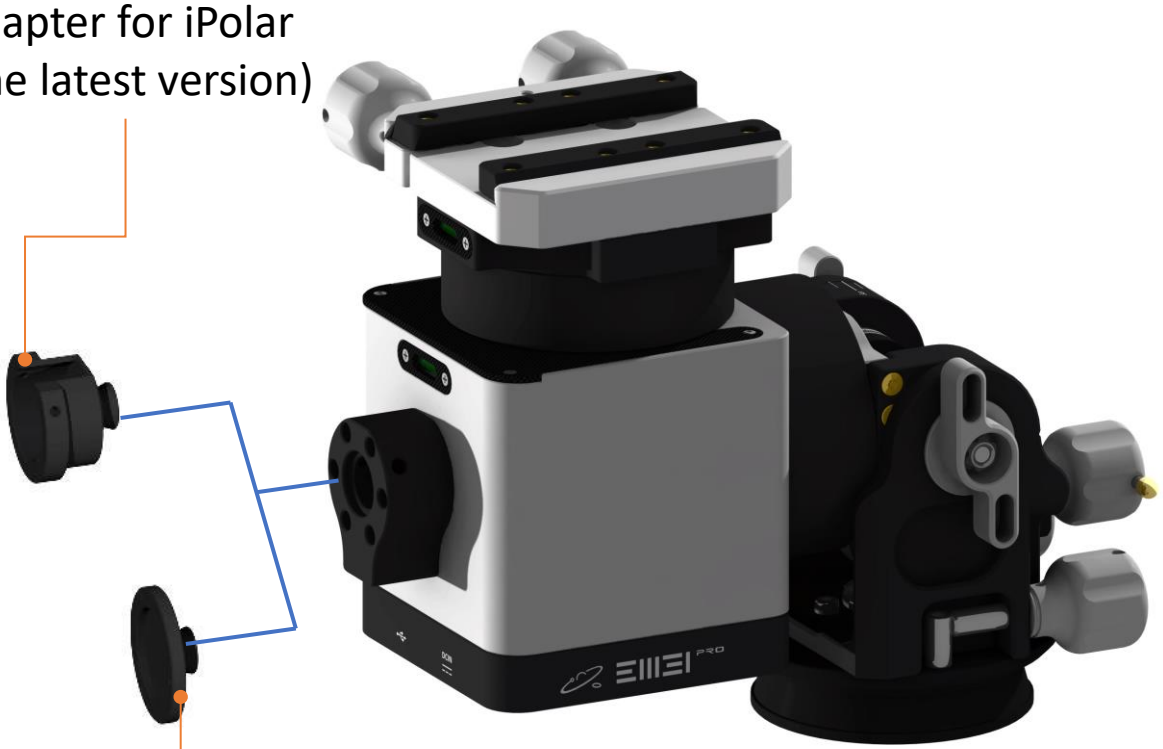
⚠ When the mount is in operation, the Status light will remain on and will start flashing once tracking is activated.

Accessory Installation

Adapter for electronic polar alignment scope

The electronic polar scope can be connected to EM31Pro via an adapter (optional accessory).

Adapter for iPolar
(the latest version)



Adapter for QHY Pole Master

Accessory Installation

Ball head adapter

EM31 Pro can mount a DSLR through the ball head adapter (optional), allowing for wide-field astrophotography while capturing astronomical images.

Battery Installation

Install and replace the battery

Battery replacement

Battery model CR1220

The battery stores the time and location coordinates. It is recommended to replace it every 12 to 18 months.

Do not replace the battery while powered on

OnStep Quick Start Guide

OnStep Guide

Android users can set and control the mount through OnStep APP or webpage

⚠ **IOS system cannot use APP, webpage is workable**

Connect to the web via WiFi:

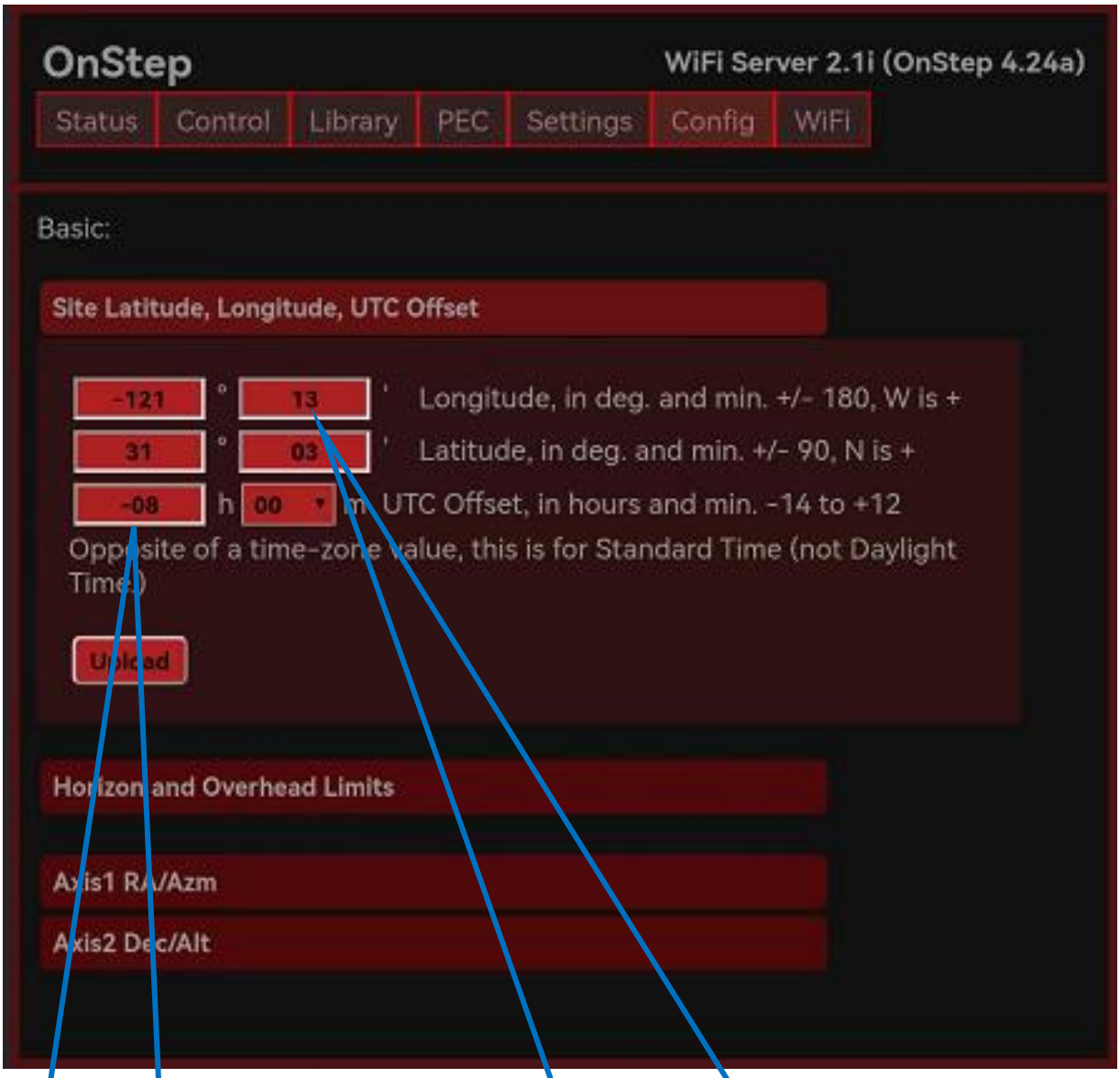
Search for WIFI hotspot OnStep connection through PC or mobile phone, password: password

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

OnStep Quick Start Guide

OnStep Guide

For the first use or when using the mount at a new location, set the mount's latitude and longitude coordinates and local time (can be synced via NINA or Asiair)

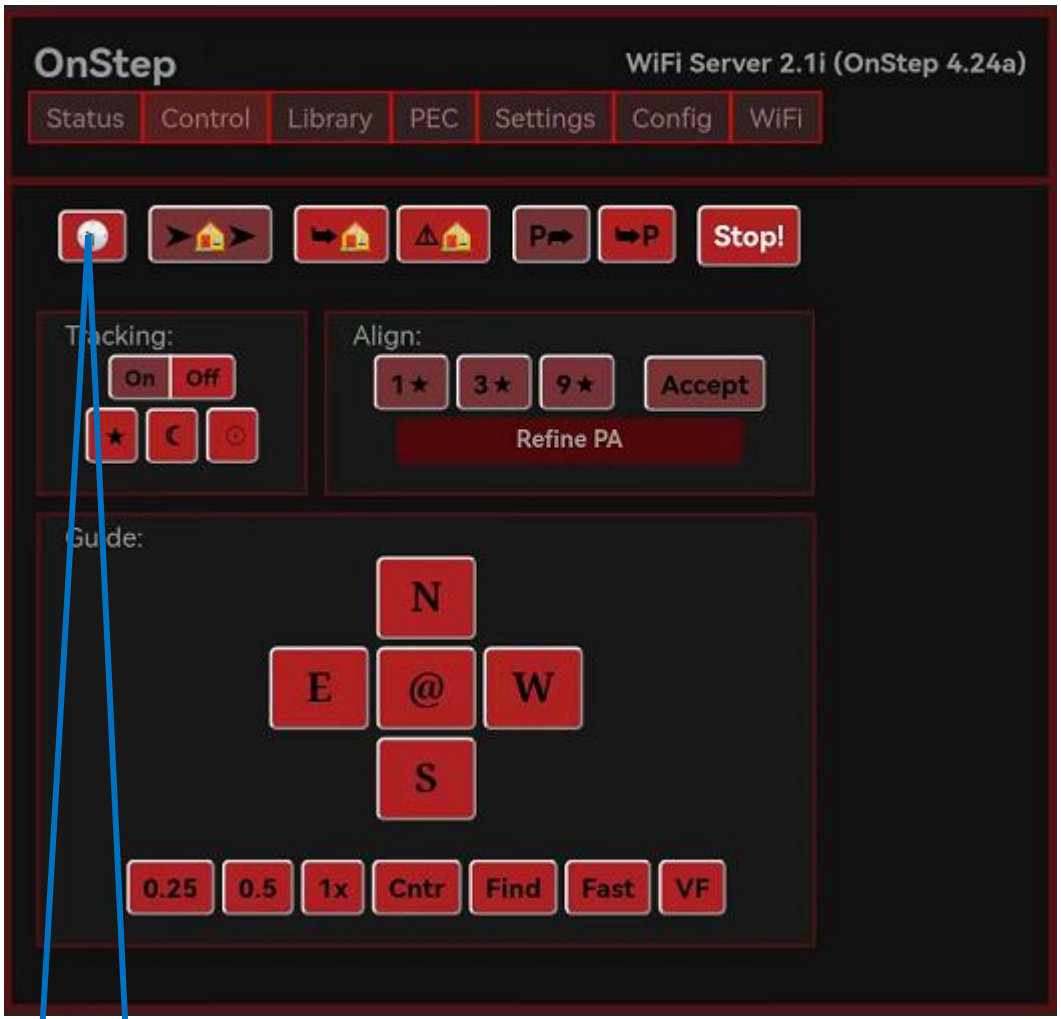


⚠ In the OnStep system, east longitude is (-), west longitude is (+), north latitude is (+), and south latitude is (-). For UTC, east of the prime meridian is (-), and west is (+).

OnStep Quick Start Guide

OnStep Guide

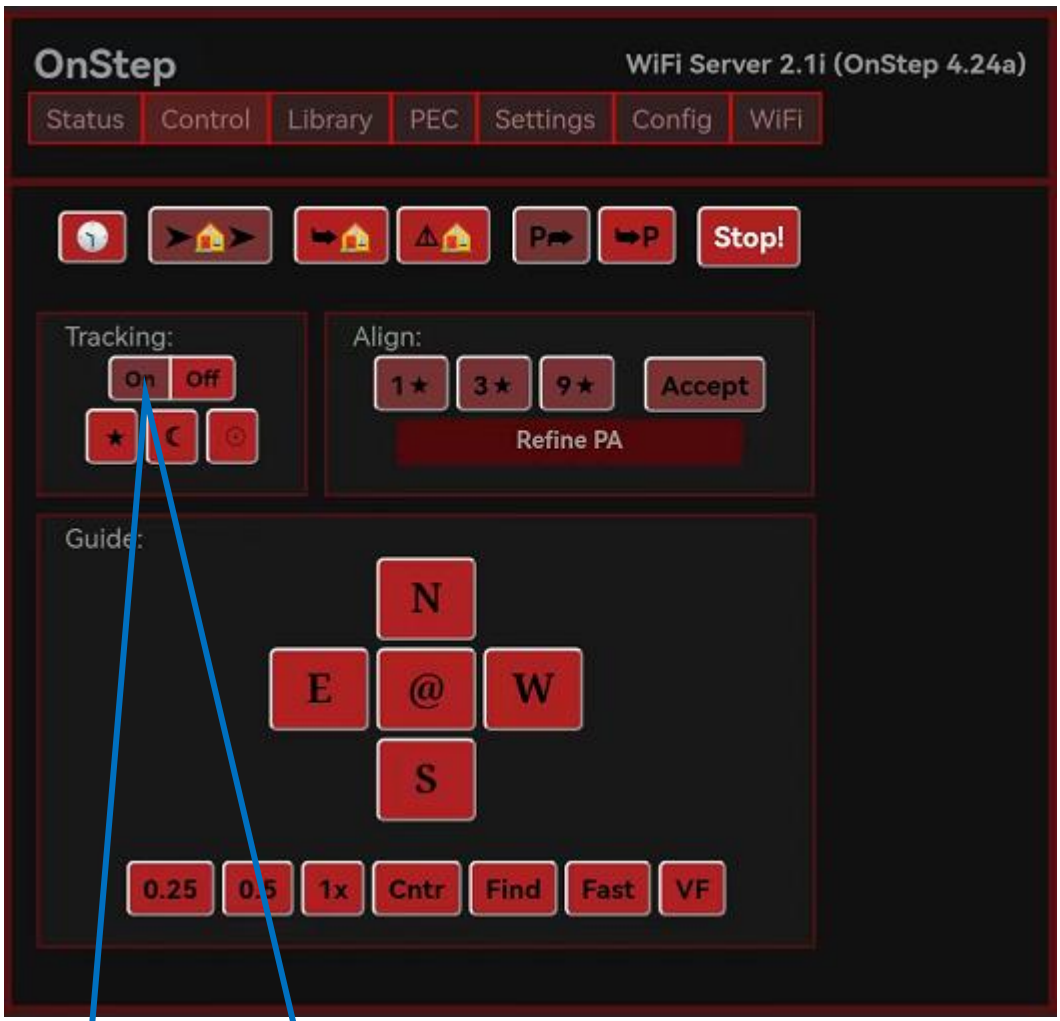
Set Time



OnStep Quick Start Guide

OnStep Guide

Start Tracking



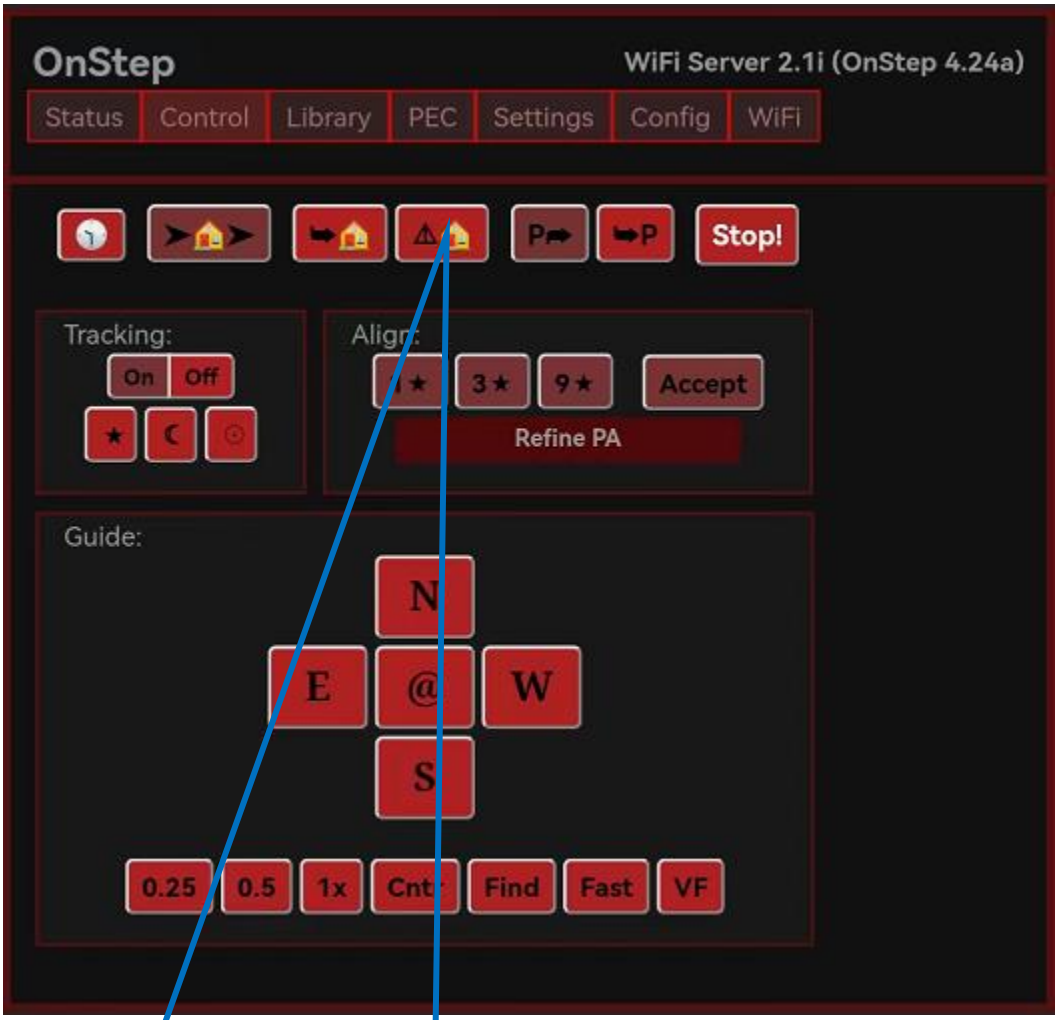
Turn on Tracking, and the rotation of the mount can be controlled by operating the direction keys.

⚠ **OnStep system option, gray indicates ON status**

OnStep Quick Start Guide

OnStep Guide

⚠ **The home position differs in the three modes of EM31Pro, so it should be set before using the mount**



After enabling tracking, manually rotate the mount to the home position, and click the “At Home” button to save the home position of the mount.

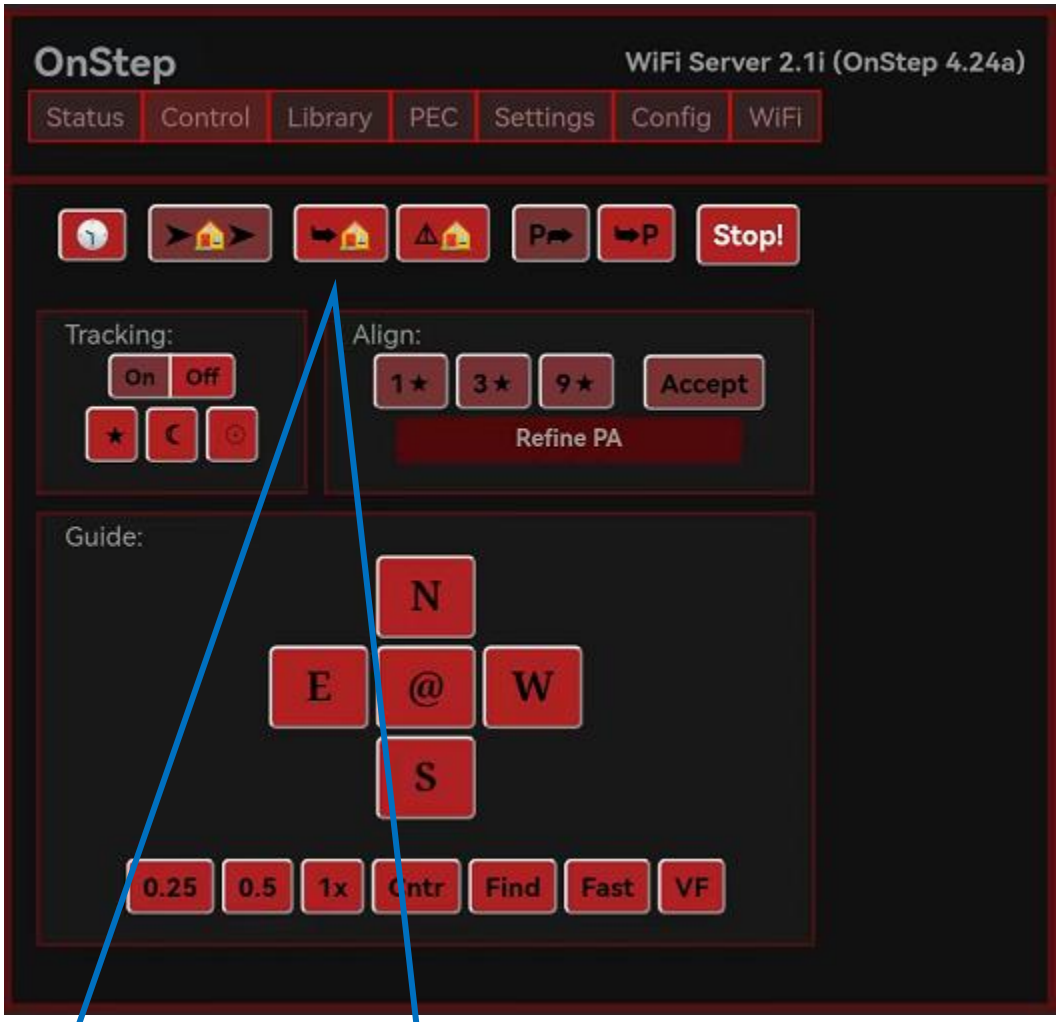
⚠

Note: After setting the home position, the mount will return to the “Untracking” state. Click “Tracking ON” again to enable tracking

OnStep Quick Start Guide

OnStep Guide

⚠ **The home position is different in the three modes of EM31pro, so it should be set before using the mount**



Click “Go Home” button to return mount to the home position.

⚠ After powering off and on, the mount defaults to the power-on position as the home position. For accuracy, always reset the home position before each use. Alternatively, you can click the 'Go Home' button to return the mount to the home position before powering off, or, if using control software, configure the plan to execute the 'Go Home' command automatically after each session to avoid the need for a manual reset next time.

OnStep Quick Start Guide

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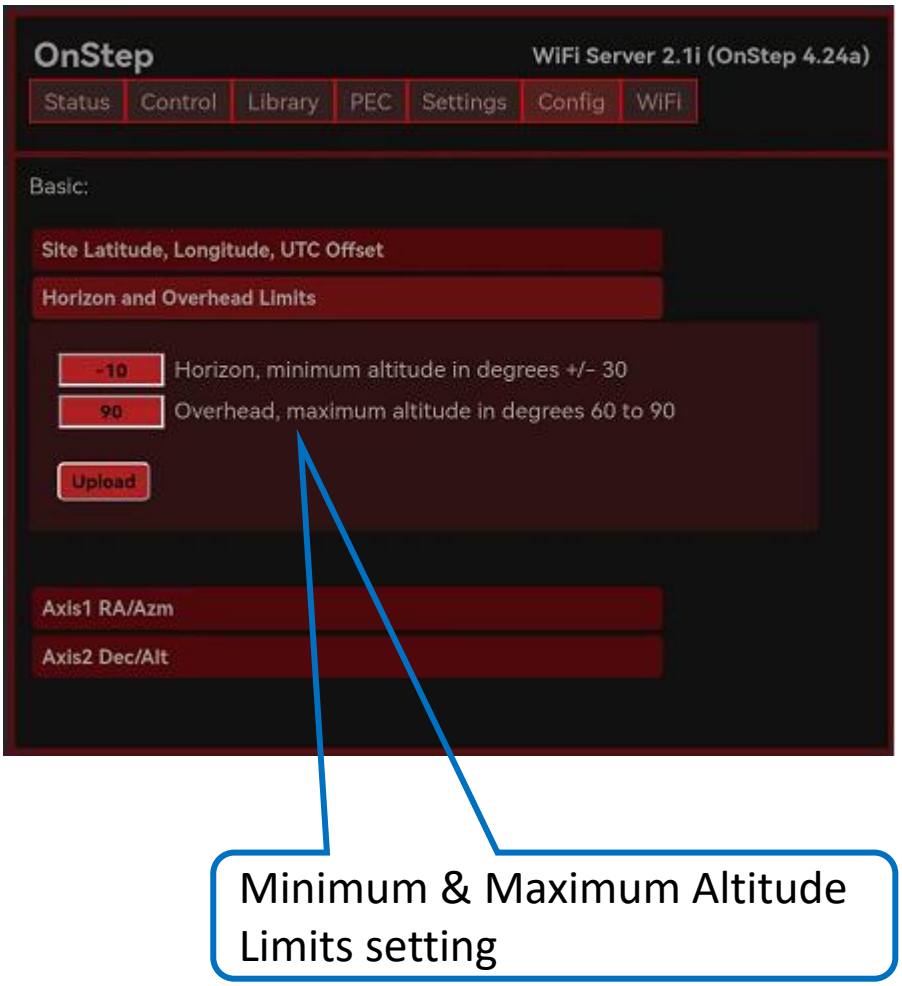
Limit position setting



Minimum & Maximum Altitude Limits setting

⚠

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 home position setting of the mount.

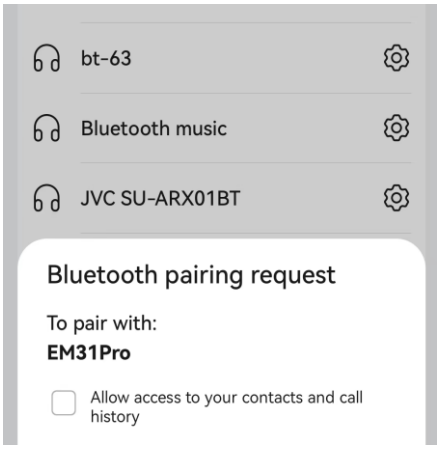
OnStep Quick Start Guide

OnStep Guide

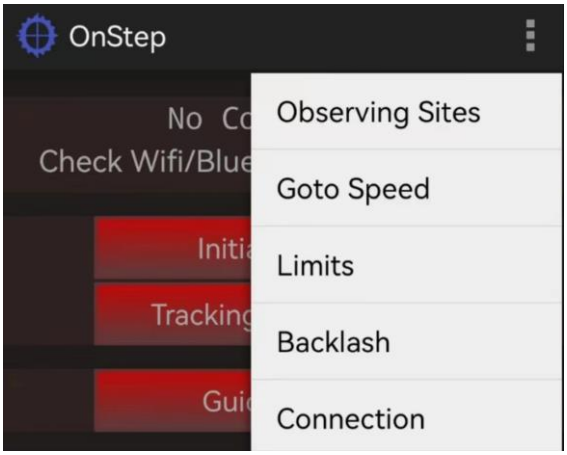
Connect to the Android app via Bluetooth.

(app only supports Android system, Apple system needs to be set through the webpage)

①Matching Bluetooth



②Select Connection in the APP



③Choose Bluetooth

④Complete connection

The first connection may be very slow. Please allow some time for the process to complete.

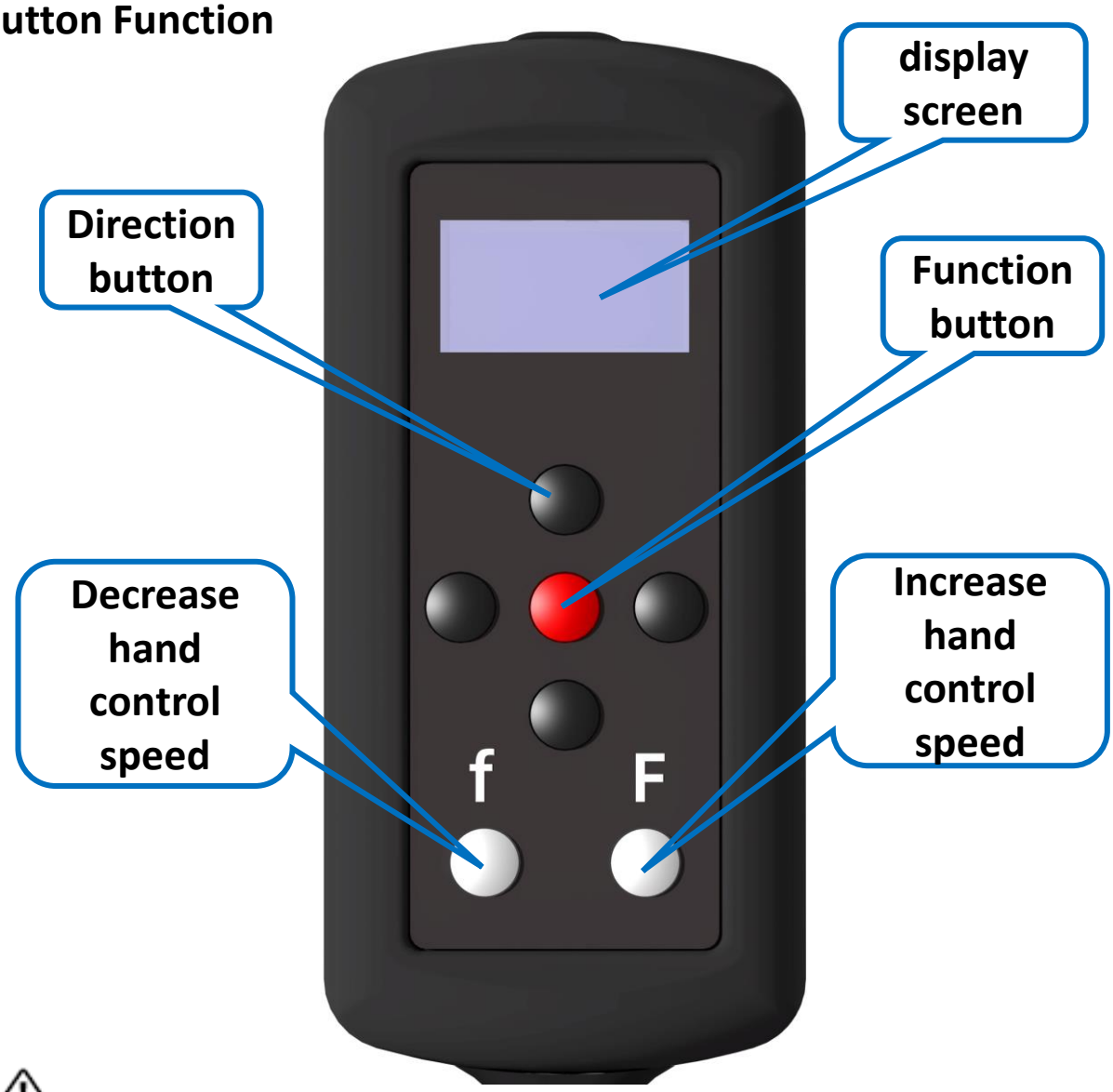
OnStep Quick Start Guide

OnStep Guide

EM31 Pro Hand Controller

⚠ **Keep the hand controller connected to the mount even when not in use, or inquire about firmware options to disable its function.**

Button Function



⚠ **For safety, the hand controller defaults to a low speed (20X) upon startup. Press 'F' to increase the speed.**

OnStep Quick Start Guide

OnStep Guide

EM31 Pro Hand Controller

Button Function

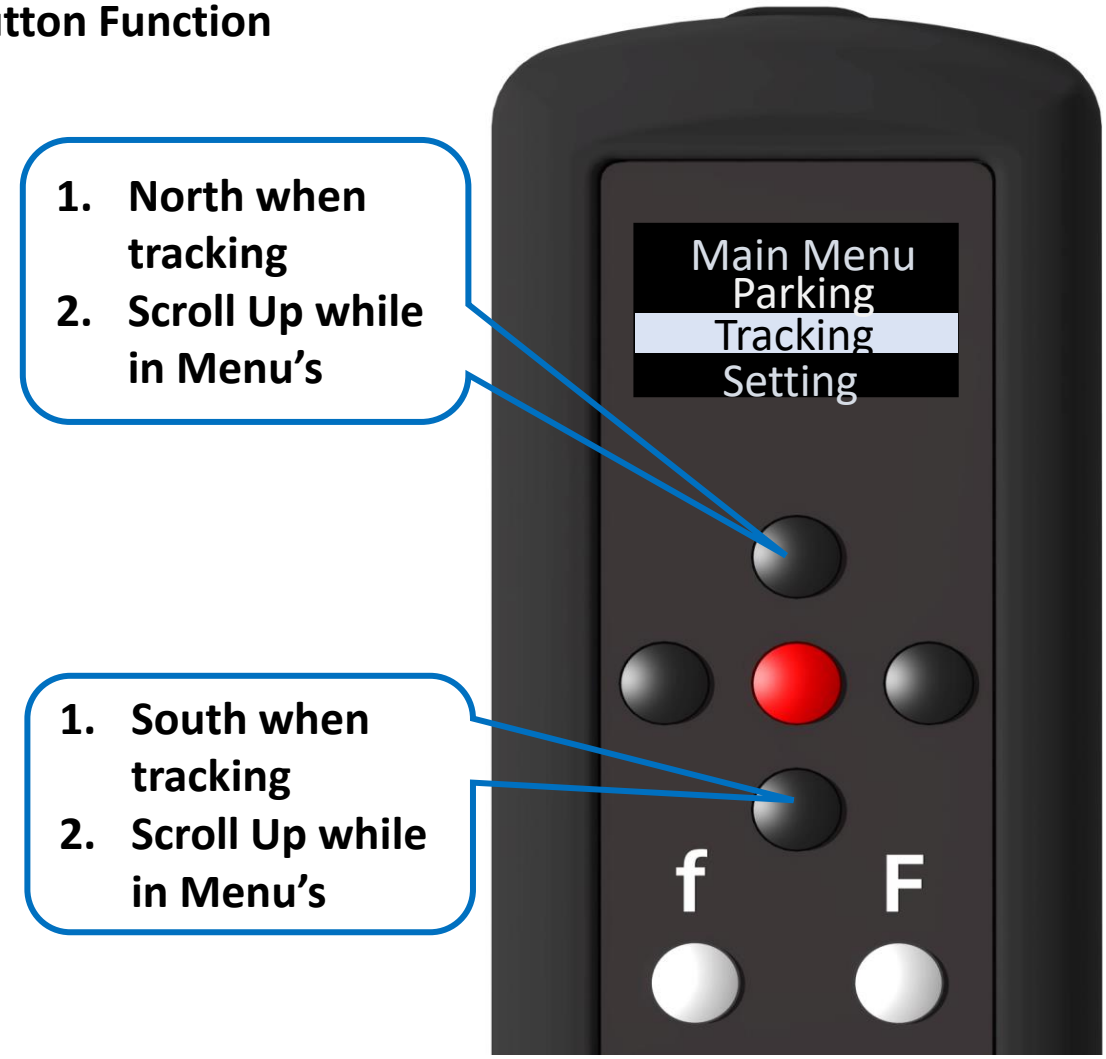
1.**Short Press = switching display information**
2. Long Press = entering Main Menu
3. Double Click = Feature Menu

OnStep Quick Start Guide

OnStep Guide

EM31 Pro Hand Controller

Button Function



N and S Button Note

Near the celestial pole, the N and S buttons may behave unexpectedly. This is normal. The system always tries to move North when you press the N button. If it can't, it will move South until you release the button.

Tip: This behavior is expected near the pole and will make more sense with practice. In the Southern Hemisphere, this will be reversed.

OnStep Quick Start Guide

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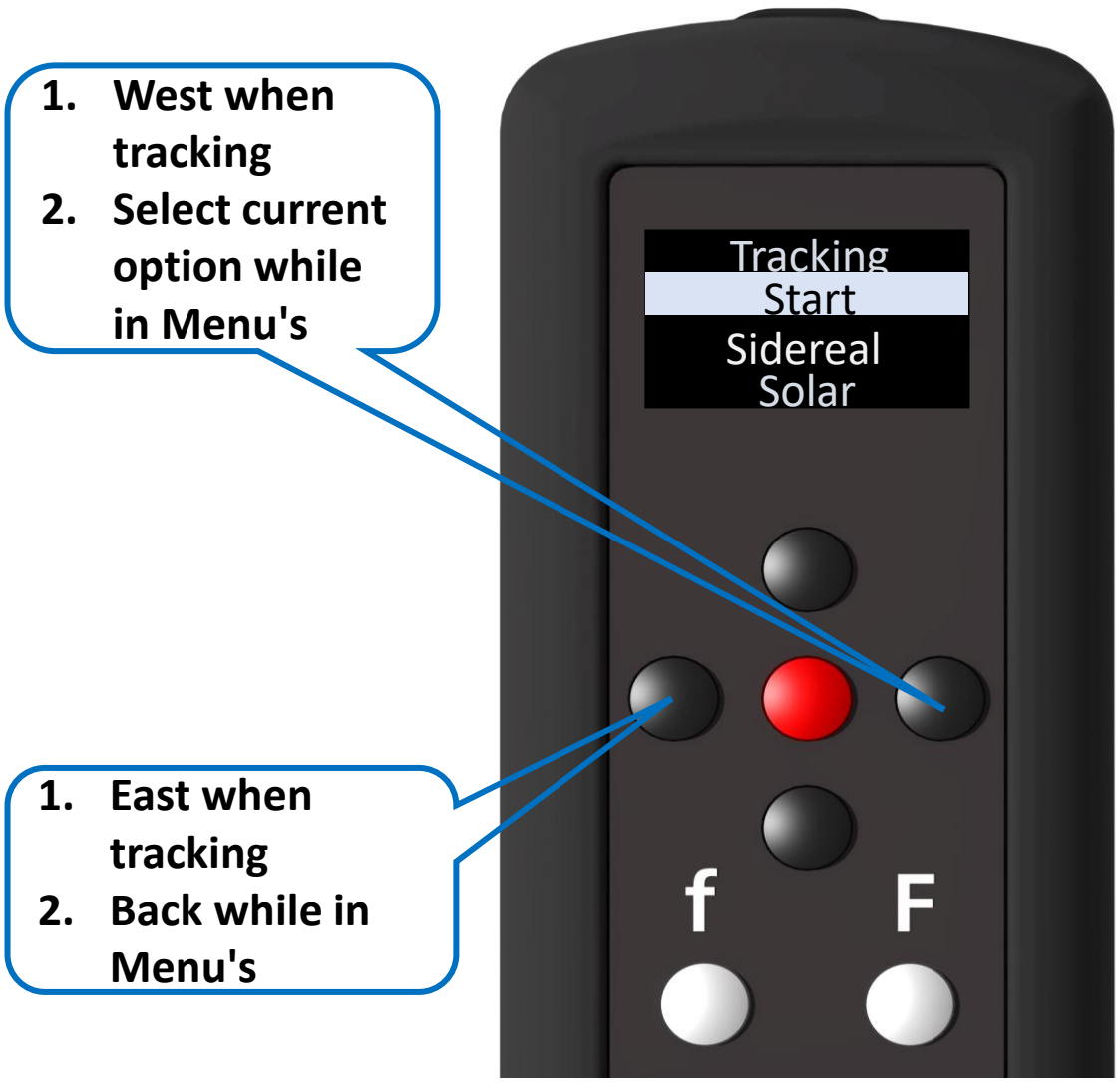
EM31 Pro Hand Controller

Button Function



Refer to the OnStep website for detailed menus and usage instructions. https://onstep.groups.io/g/main/wiki/28605

OnStep Quick Start Guide

OnStep Guide

Common status icons for the Hand 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 Hand 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

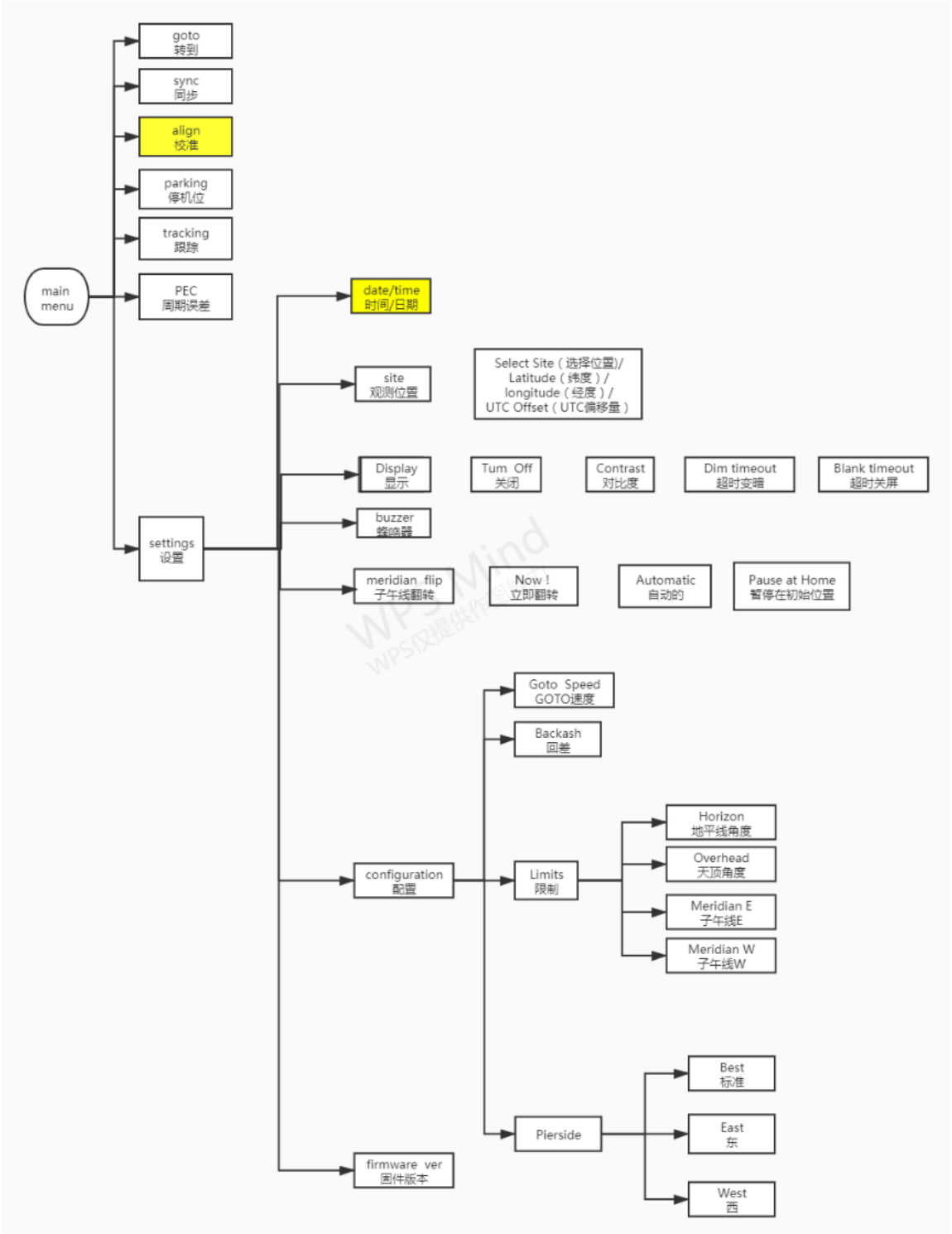
 Telescope is slewing to park position

 Telescope is parked

OnStep Quick Start Guide

OnStep Guide

Hand Controller menu structure diagram



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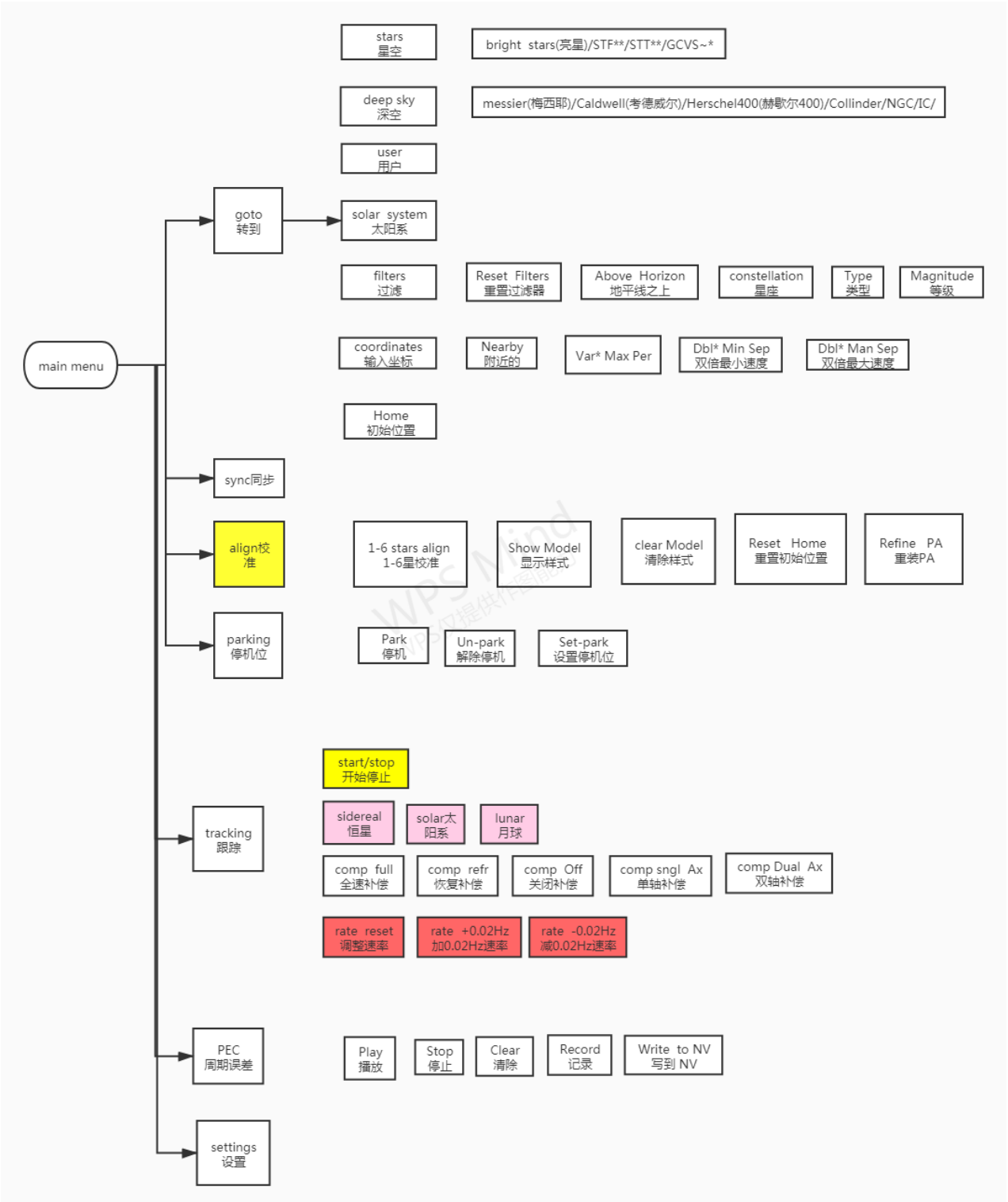
Hand Controller menu structure diagram



OnStep Quick Start Guide

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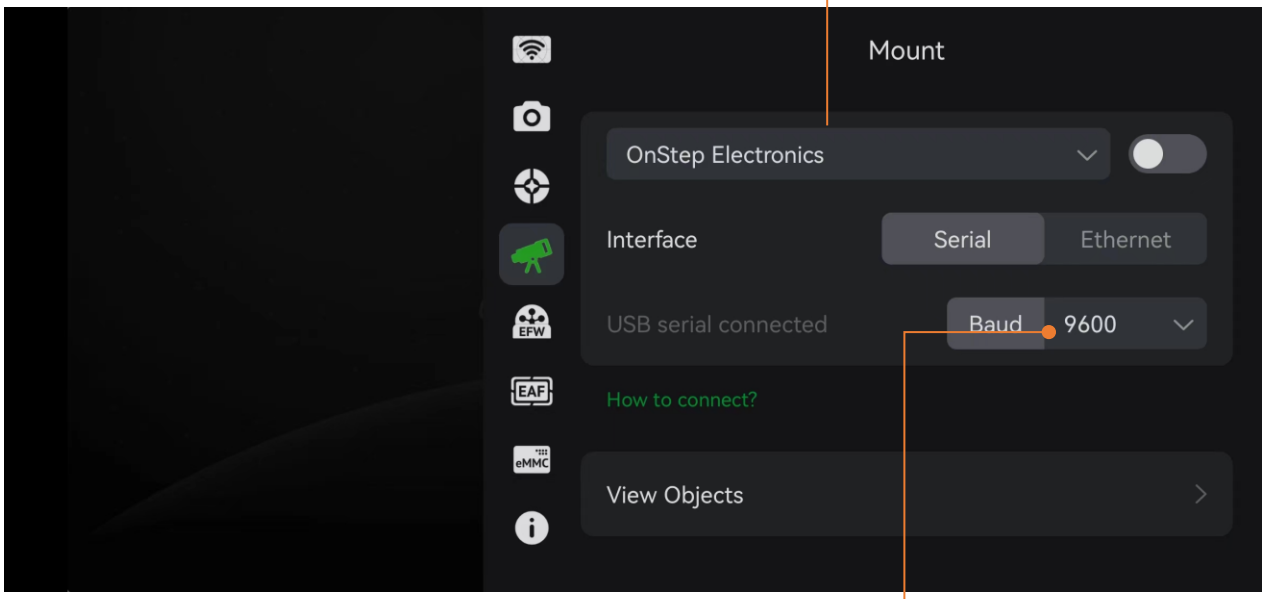
OnStep and ASIAIR connection

Mount selects “OnStep Electronics”



Serial port baud rate 9600

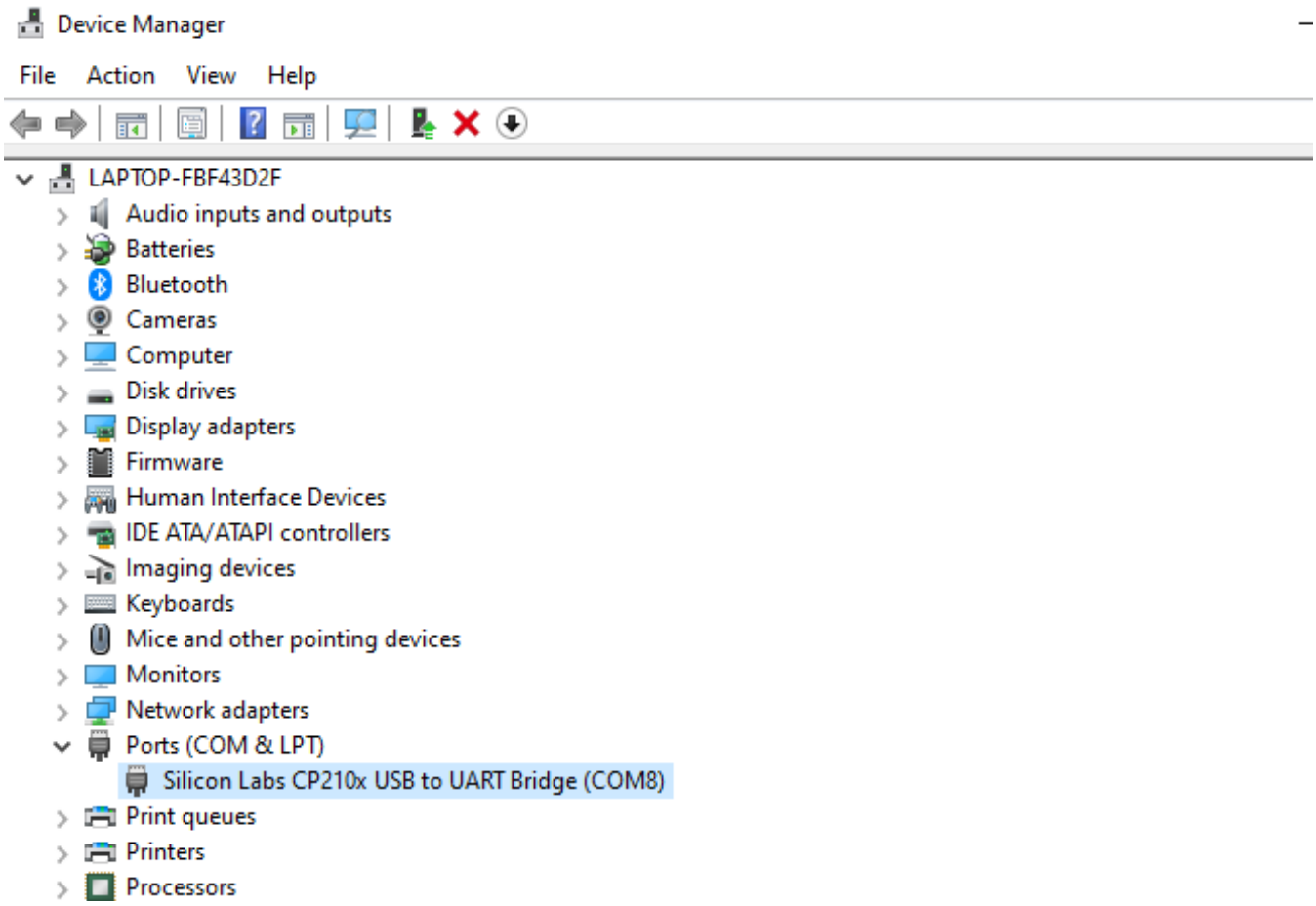
OnStep Quick Start Guide

OnStep Guide

OnStep and PC connection

Step ① Installing the mount serial port driver cp2102

Confirm that the mount serial port connection is normal in Windows Device Manager



Step ② Install ASCOM platform

https://www.ascom-standards.org/

Step ③ Install OnStep ASCOM driver

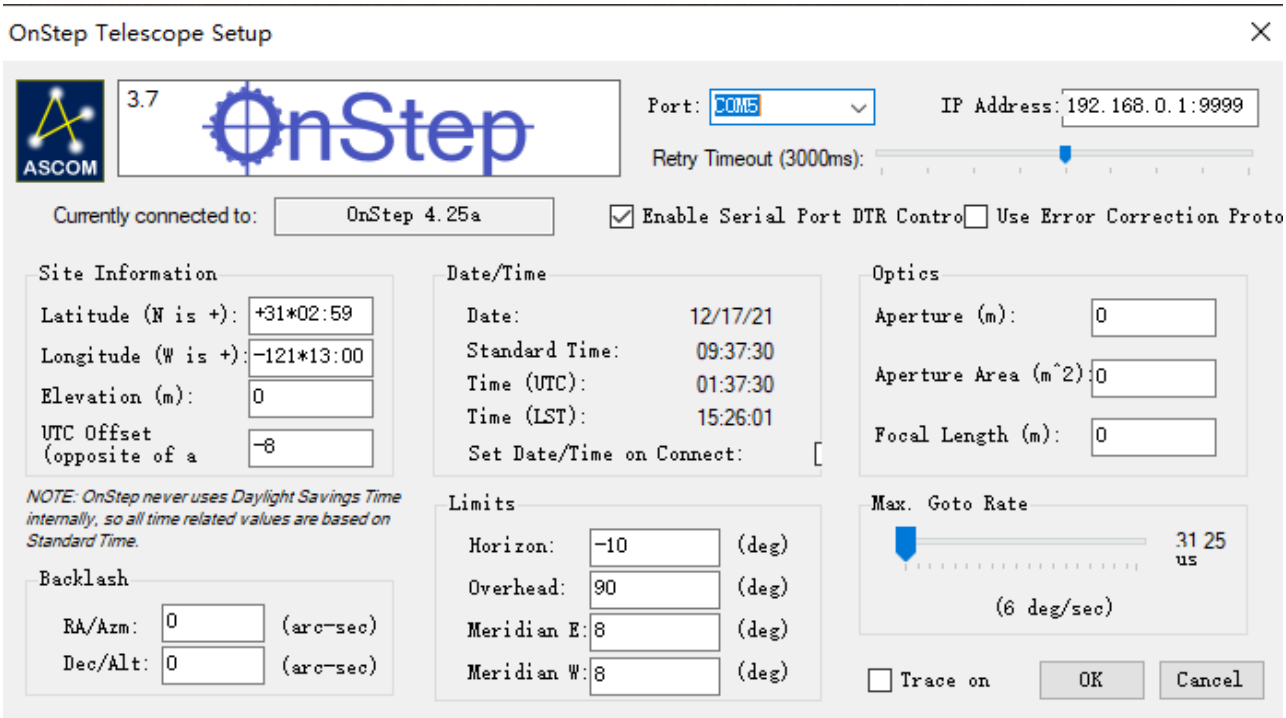
http://stellarjourney.com/main/onstep-ascom-driver-software/

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



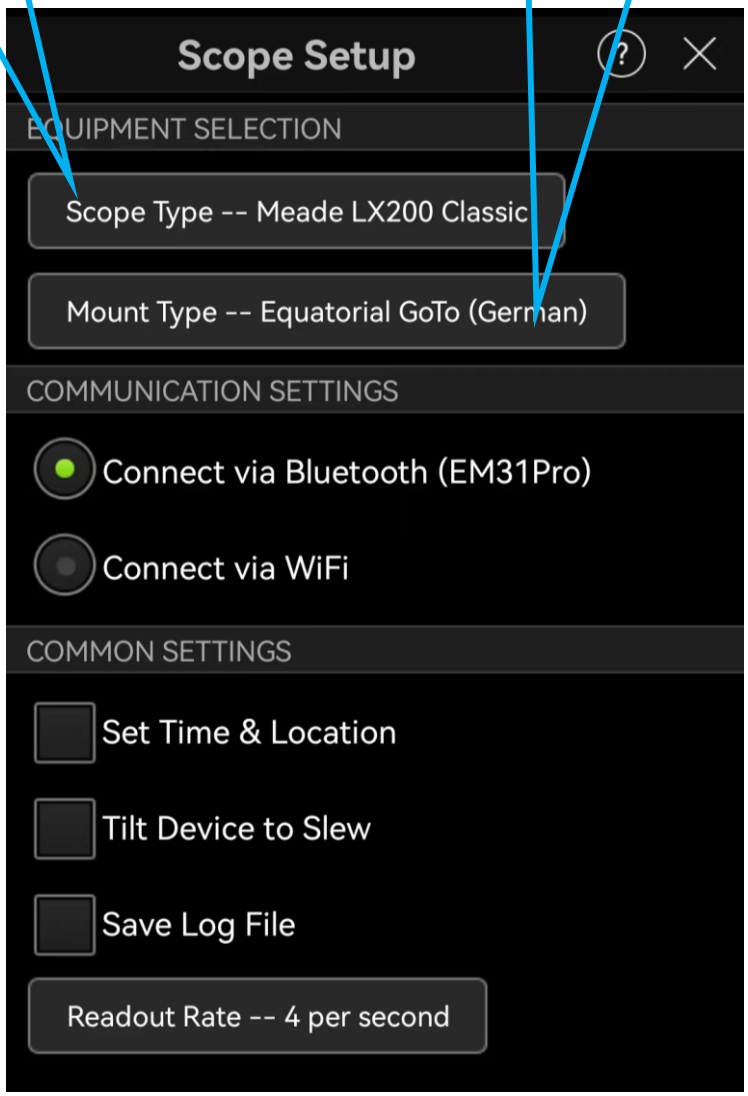
OnStep Quick Start Guide

OnStep Guide

SkySafari Connection

Scope Type: Meade LX200 Classic

Mount Type: Choose Equatorial or Alt-Az depending on EM31Pro mode.



⚠ **Note:**

Selecting to synchronize time and location information will slow down the mount connection startup, adding approximately 30 seconds, please wait patiently.

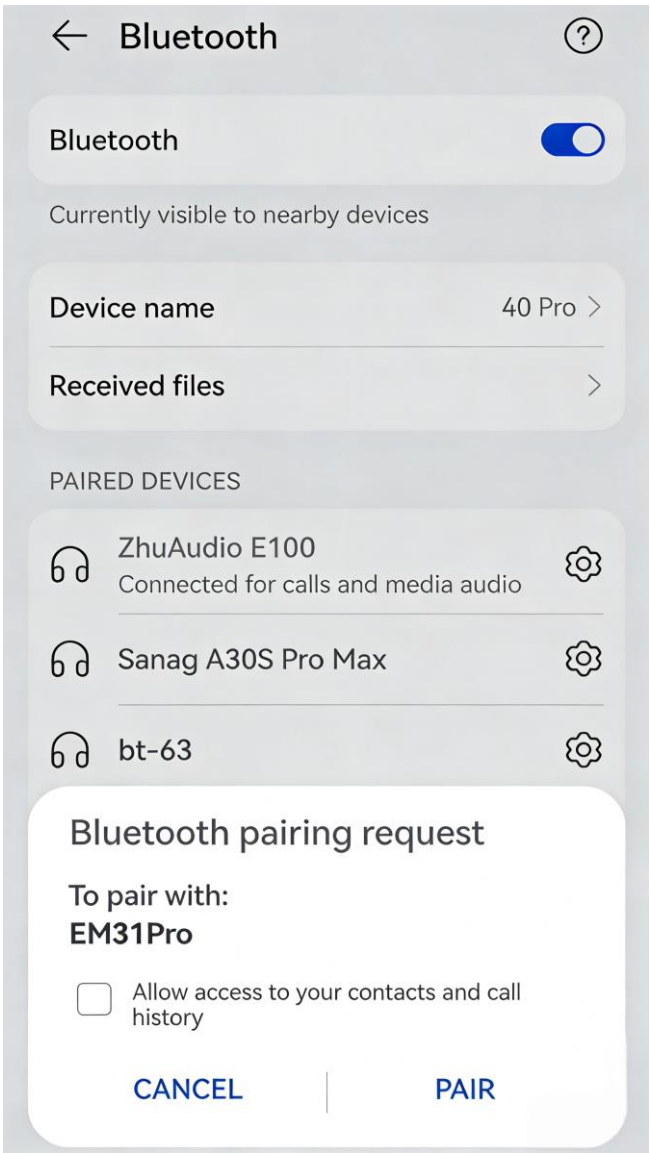
OnStep Quick Start Guide

OnStep Guide

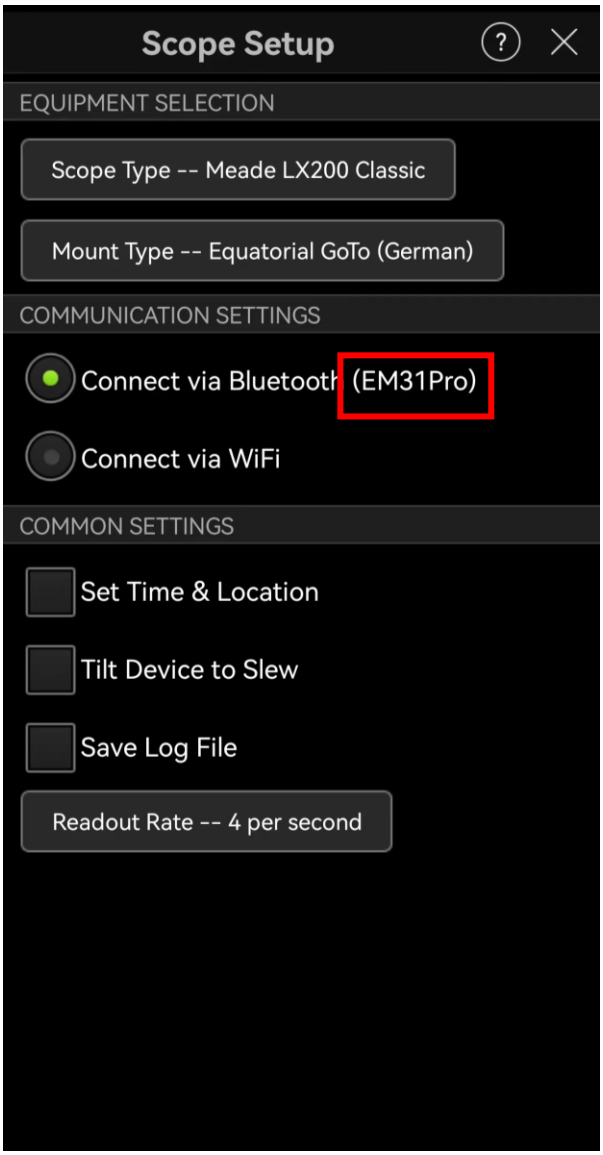
SkySafari Connection

1. Via Bluetooth (Android only)

Pair with EM31Pro via Bluetooth.



Bluetooth settings, select EM31Pro.



⚠ **Note:**

Using Bluetooth to connect to EM31Pro will take around 40–60 seconds to initiate the mount connection.

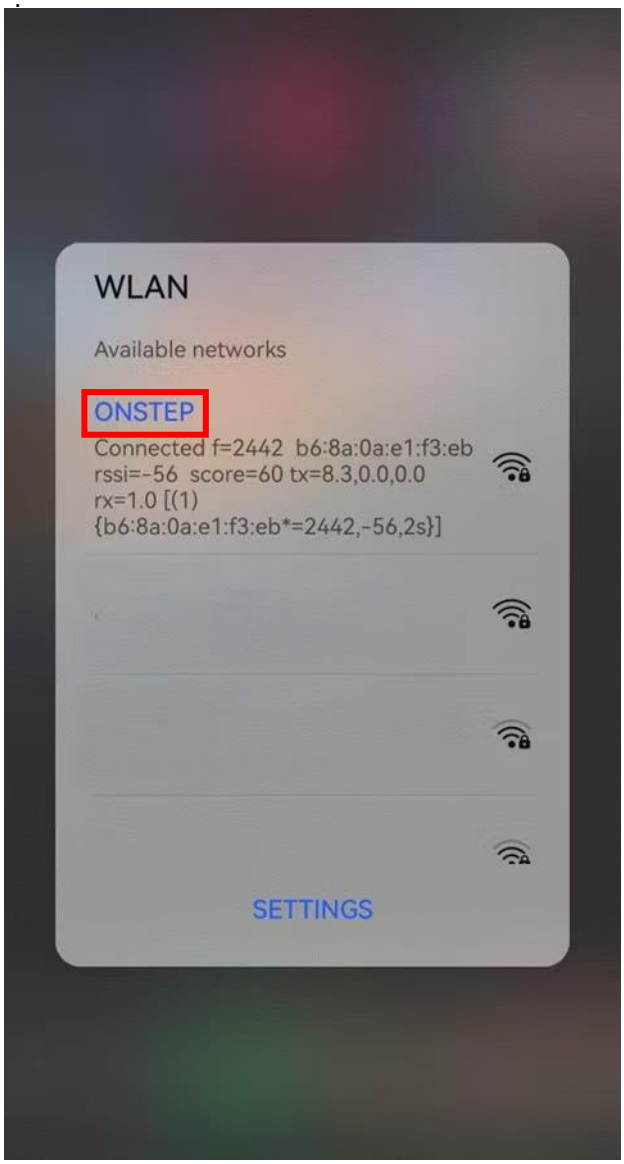
OnStep Quick Start Guide

OnStep Guide

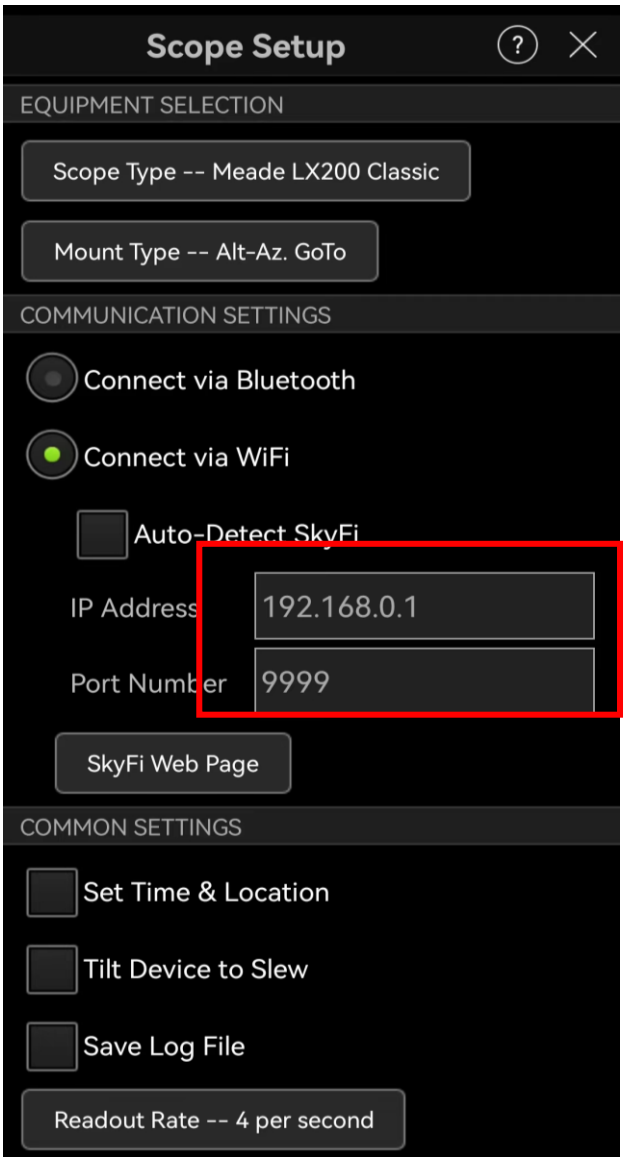
SkySafari Connection

2. Via Wi-Fi (Android + Apple)

Connect to the mount's Wi-Fi hotspot.



Enter the following details:
IP: 192.168.0.1 Port: 9999 or 9998.



Firmware Update

Firmware Update

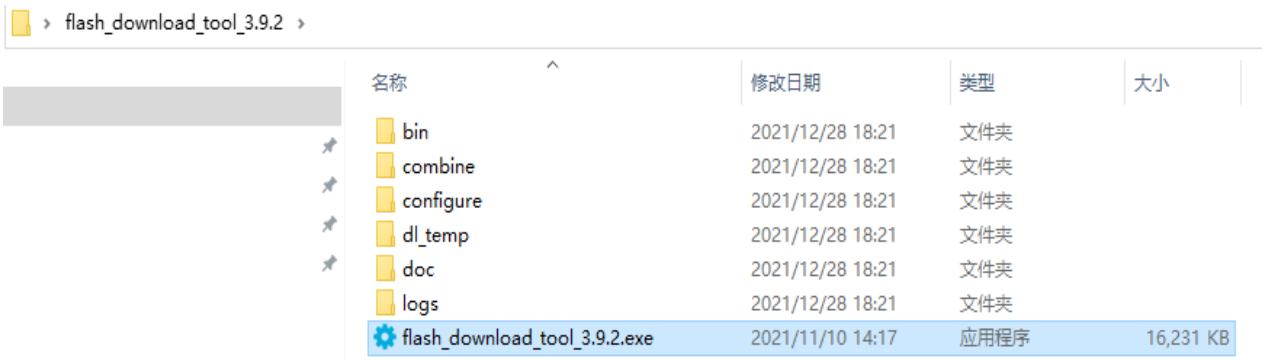
(Demonstrated using Windows 10)

① Connect the device to the PC

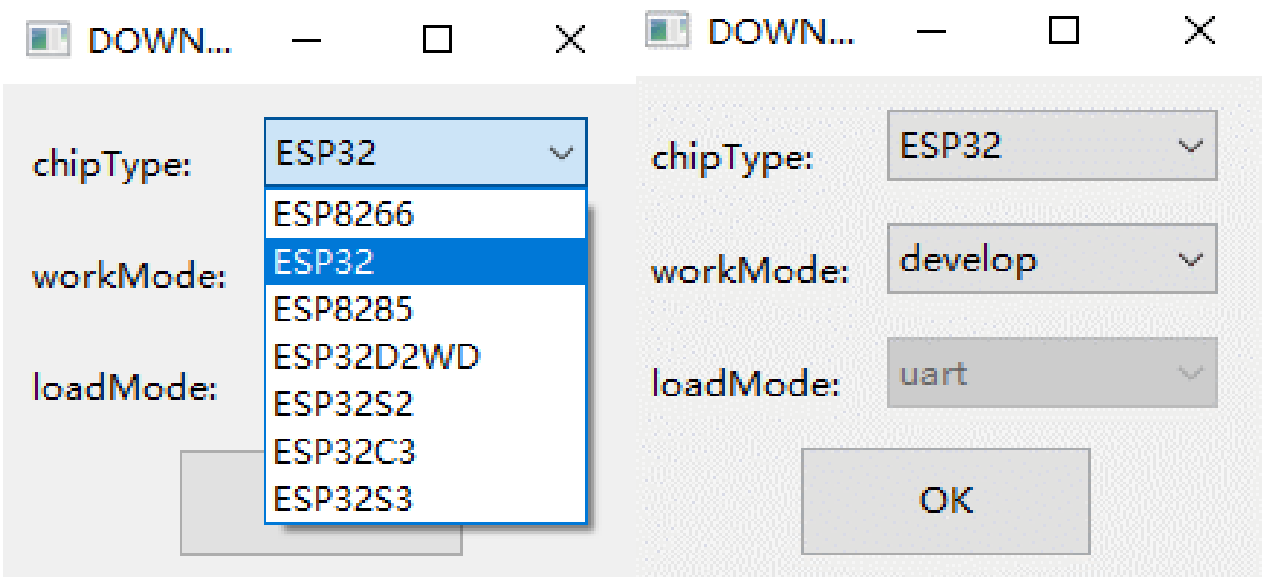
- If updating the Mount: Connect the mount to the PC via USB. If the PC's USB port provides insufficient power, please connect a 12V power supply to the mount.
- If updating the Hand controller: Simply connect the hand controller to the PC via USB. No need to connect the mount.

⚠ **Note:** The mount and hand controller use separate firmware files and do not require simultaneous updates.

② Open the firmware flashing software.



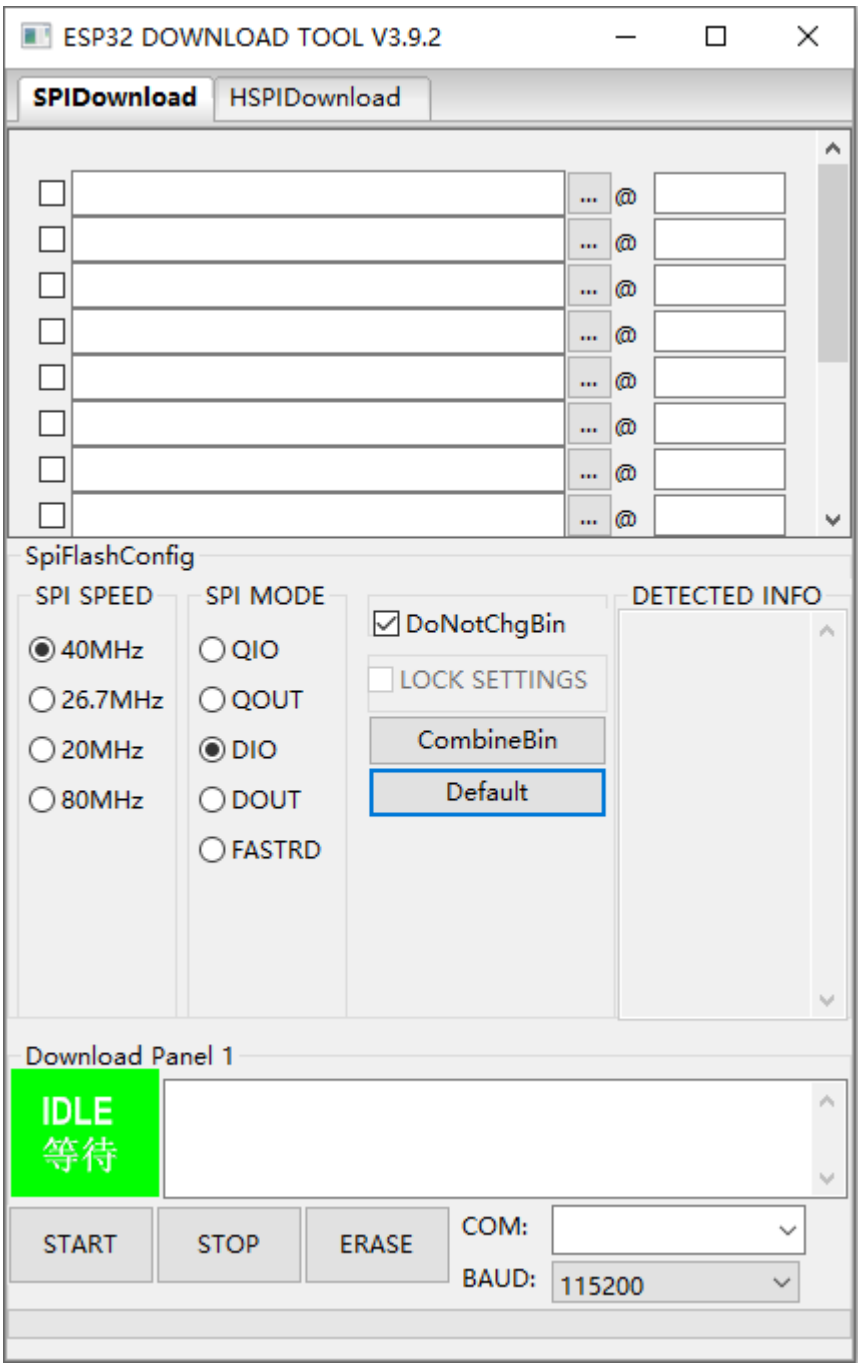
③ Select “ESP32” and “develop” and confirm



Firmware Update

Firmware Update

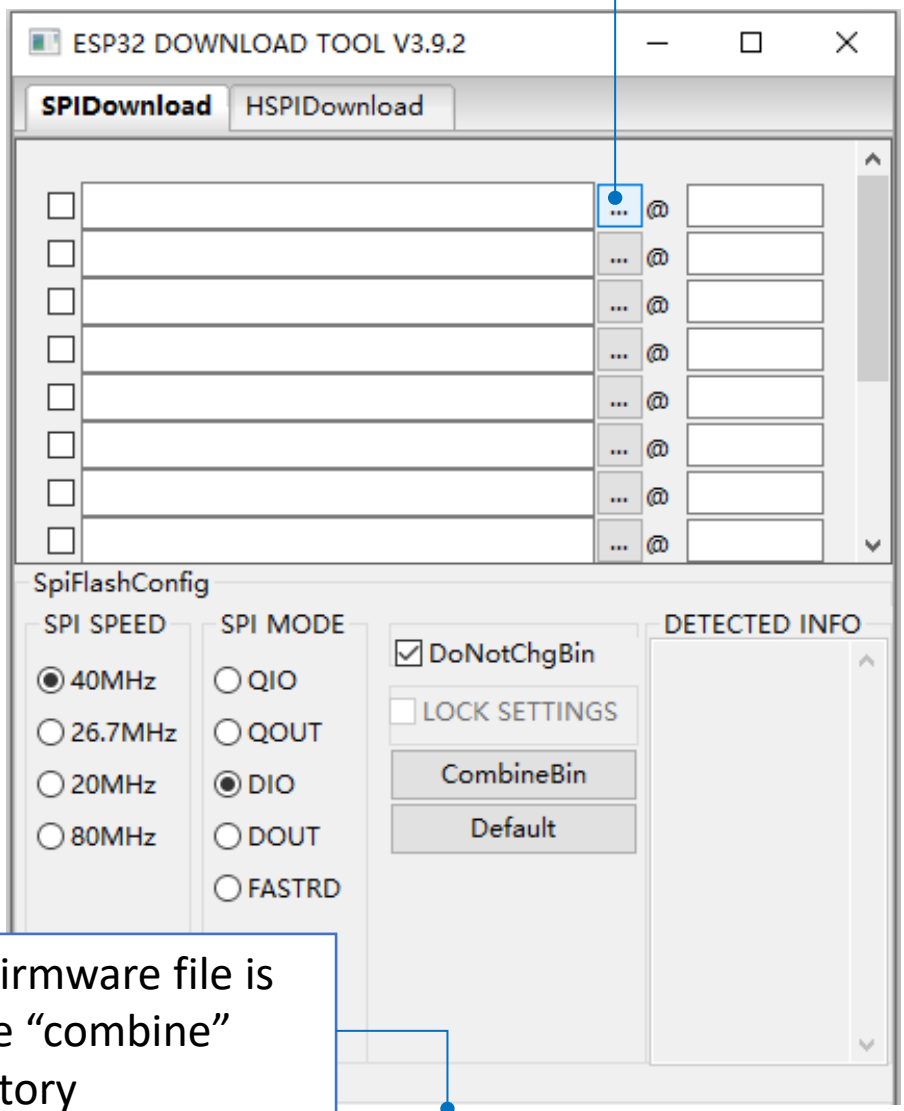
Firmware flashing software interface.



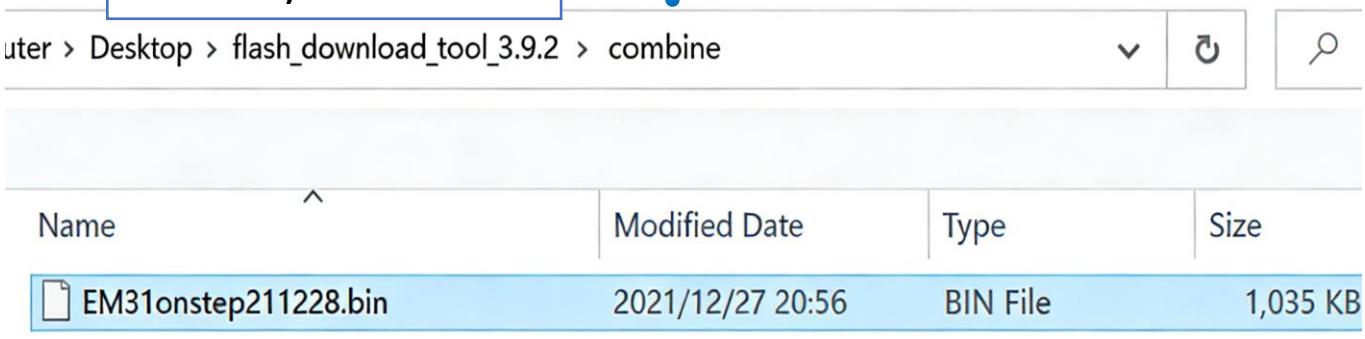
Firmware Update

Firmware Update

④ **Open Firmware File**



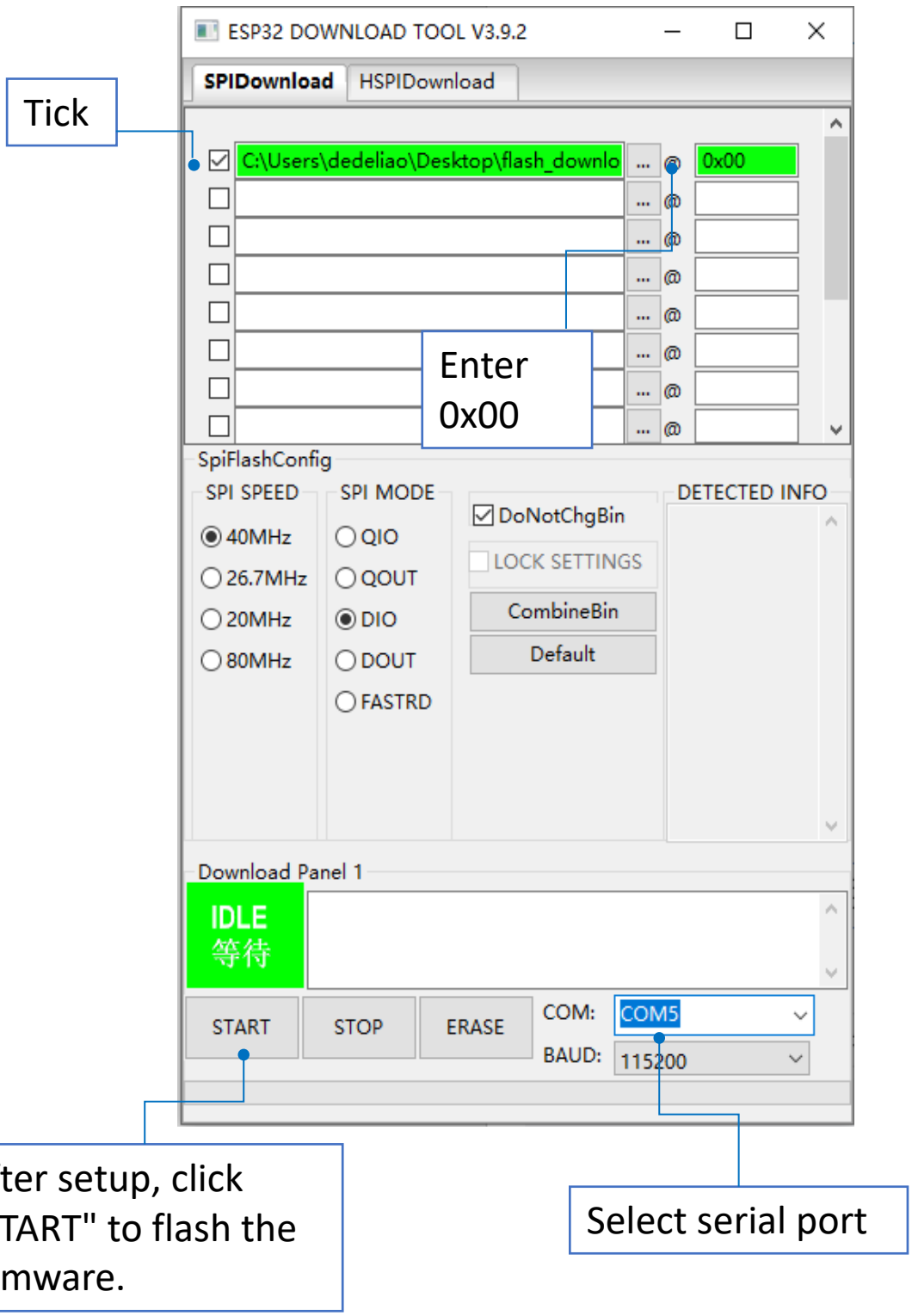
The firmware file is in the “combine” directory



Firmware Update

Firmware Update

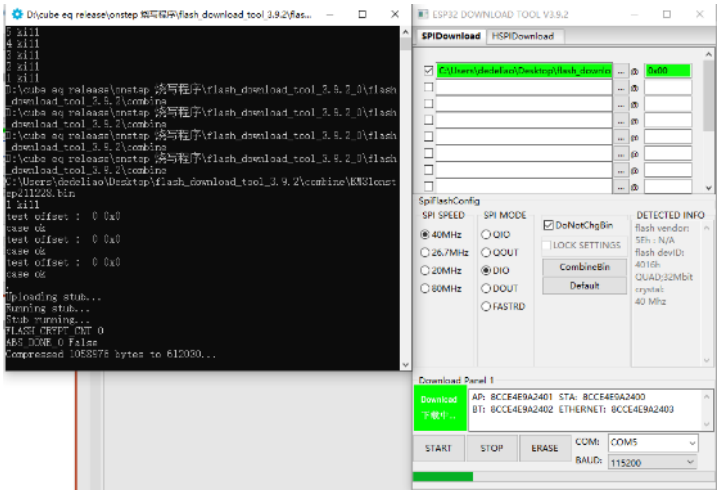
⑤ Set parameters as shown in the figure below



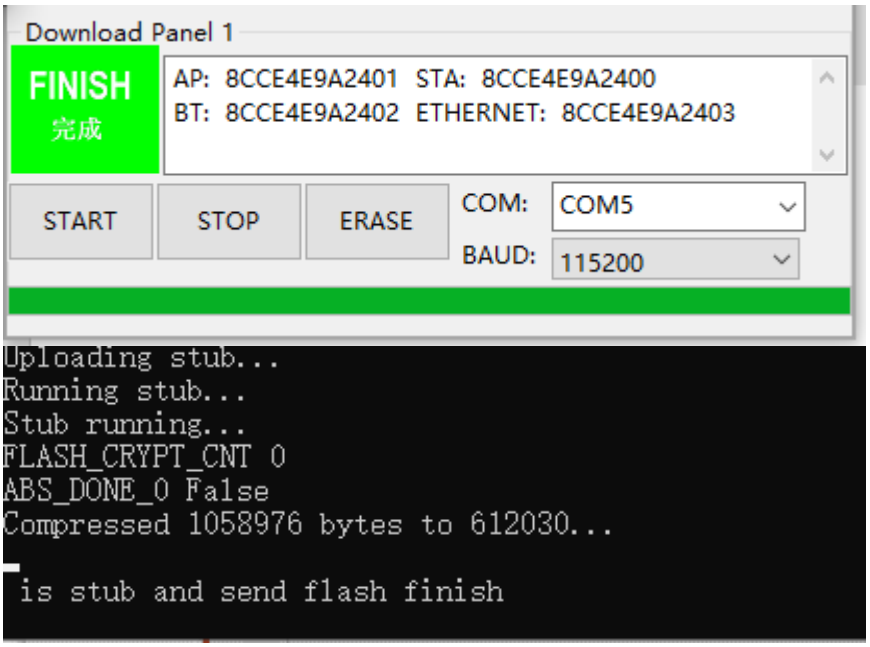
Firmware Update

Firmware Update

Firmware flashing begins.



Flashing complete, status bar shows "is stub and send flash finish.



⑦After the firmware update, disconnect all connections (including the 12V power supply and USB cable) for 6 seconds, then reconnect the power to resume normal operation.

⚠ Note: After the firmware update, some existing settings, such as GOTO speed, may be changed. Please check and reset them as needed before using the mount.

Warranty Statement

Warranty

Thank you for purchasing the EM31Pro Strain Wave Mount. To ensure you have the best experience with our product, we provide a two-year warranty service for the EM31Pro. 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

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.

Appendix

FCC Compliance & Warning

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.

Appendix

FCC Compliance & Warning

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

Appendix

EM31Pro Tutorial Videos

To help you get started and operate the EM31Pro effectively, we have prepared a series of instructional videos. You can find detailed guides via the links below:

EM31Pro Installation
Learn how to properly install the EM31Pro and ensure stable operation.
https://www.youtube.com/watch?v=KfCiDCdeQ50

EM31Pro Altitude Adjustment
A guide to adjusting the altitude for different observation needs.
https://youtu.be/oWRaSYimG0c

EM31Pro EQ Mode Home Position Setup
Quickly learn how to set up the home position in EQ mode.
https://www.youtube.com/watch?v=81gaRCINgCw&t=51s

EM31Pro Mode Switching
Step-by-step instructions on switching between different modes, including EQ and Alt-Az modes.
https://youtu.be/K9rK1uqSFIQ

Appendix

EM31Pro Tutorial Videos

To help you get started and operate the EM31Pro effectively, we have prepared a series of instructional videos. You can find detailed guides via the links below:

EM31Pro Side-Mounted Alt-Az Mode and Home Position Setup
Learn how to configure the side-mounted Alt-Az mode and set the home position.
https://youtu.be/uJGSUqnAcHc

EM31Pro Top-Mounted Alt-Az Mode
Demonstrates how to set up the top-mounted Alt-Az mode.
https://youtu.be/I4pH3T3Topw

EM31Pro Tripod (TC44)
An overview of the tripod, step-by-step assembly guide, and various configuration options for different needs.
https://www.youtube.com/watch?v=xt3OhjC8vtE

⚠

Before operating, please ensure you have read the full manual carefully and follow the steps shown in the tutorial videos for optimal performance and safety.
For further assistance or technical support, feel free to reach out to us anytime.