RST-135E User's Guide

Preface

Thank you for choosing RainbowAstro's RST-135E. RainbowAstro is committed to producing high quality products.

This product is a harmonic-drive driven mount that allows you to observe objects with high precision GPS, home sensors, HUBO-i NaviCom, etc.

This manual is based on the factory default specifications. Therefore, some of the specifications of your product may be different. The contents of this manual are subject to change without prior notice.

To ensure your safety and prevent damage to the product, please read through this manual thoroughly before installing and using the product. Also keep it in a place that you can easily find for future reference.

Copyright

Warranty and A/S

A Warranty

Defective products resulting from the product itself or the production process will be repaired or replaced free of charge depending on the condition.

B Warranty period

The product guarantees quality for five year from date of purchase.

C Scope of responsibility

If defects are found in the product, we will either repair it immediately or replace it with a new one.

Damage caused by consumer responsibility, normal wear and tear, and minor defects that do not interfere with use are not covered by warranty or replacement even within the warranty period.

We will not be liable for any problems caused by the installation of parts purchased or manufactured separately by the customer.

D A/S

Please visit our company directly or send the product by courier after inquiry.

E Contact and address

Rainbow Robotics Co.

34122 10-19 Expo-ro 339beon-gil, Yuseong-gu, Daejeon, Korea

bjjeong@rainbow-robotics.com

Change history

Date	Version	Revision contents	Remarks
2021.04	1.0	Created	

Contents

1 Safety Precautions

This manual has been using the icons so that the user can easily recognize the safety precautions to define the precautions notation as follows:

⚠ warning	▪ Failure to follow the instructions given in this symbol may cause an accident and may cause injury to the user. The user must follow the instructions in the warning signs.
⚠ caution	▪ Failure to follow directions marked with this symbol may result in damage to the product. The user must follow the instructions in the caution signs.
⚠ direction	▪ This mark indicates what you must observe or note. The user must follow the instructions in the direction signs.

The safety precautions in this manual are intended to prevent accidents by properly providing the user with the possibility of personal injury or damage to the product when installing and using the product. Users must comply with the safety instructions provided in the manual to ensure their safety and safety of the equipment.

This chapter describes the safety precautions you should be aware of to protect your body and products when installing and using the product.

⚠ warning	▪ Do not touch the cable and power cord with wet hands. There is a risk of electric shock. ▪ Do not bend or force the wire when pulling the cable and power cord out of the outlet. It may cause electric shock or fire. ▪ When connecting the battery, be careful not to change the polarity of the plug inside plus and minus outside. ▪ Telescopes and cameras are heavy, so be careful not to drop them when transporting or installing.
⚠ caution	▪ If the product produces strange noises, burning scents or smoke, immediately unplug the power cord and contact us. ▪ Do not disassemble or modify the product. The product may be damaged. ▪ Do not apply strong shocks such as dropping or bumping the equipment. ▪ Do not install the equipment in an unstable place. Be sure to install on a flat surface. The equipment may fall down and become damaged. ▪ Be careful not to let children eat the pole master connection cover, fixing bolt, etc.
⚠ direction	▪ Users should read this manual thoroughly before installing or using the product.

2 Product overview

This product is a strain wave gear drive mount that can be used to observe the object with simple and precise using GPS receiver, home sensor and HUBO-i NaviCom hand controller.

This chapter describes the features, specifications and included items of the product.

- Features
- Specifications
- Included items

Features

Features of the product are as follows.

Super small size, light weight

- With a body weight of 3.4 kg, a 13.5 kg telescope can be mounted.
- No additional counter weight required for balance.
- It is a surprisingly small mount.

Strain wave gear drive

- The size is small, but it is strong.
- Almost no backlash (play in gears).

High Resolution Renishaw Encoder

- Built-in high-resolution encoders from Renishaw.
- Its periodic error is ±2.5arcsec.

High Performance DC Servo Motor

Using a Swiss high-performance DC servomotor, the mount can be driven at speeds up to 8degrees / second.

Full range altitude adjust

- You can adjust the altitude of the polar axis from 0 ° to 90 °.
- If you adjust the altitude of the polar axis to 90 °, you can use it as an alt-azimuth mount.

Home sensor

A home sensor is built in to find the mechanical reference point of the mount.

GPS

The built-in high-performance GPS receiver receives signals from 12 GPS satellites and gives precise location information. Precise latitude, longitude and time input increase the precision of pointing and increase user convenience. In addition, the sensitivity is high using the SiRF Star IV method and it takes less than 1 minute to receive satellite signals.

HUBO-i NaviCom

HUBO-i NaviCom is a 32-bit Microcomputer specialized in Astro-Navigation as a hand controller for mounts. It has a total of 22,000 astronomical information data including 9440 stars, 13,300 deep sky, and solar system planets.

N-Star Alignment

HUBO-i's N-Star Alignment algorithm performs complex nonlinear computations to find six misalignment parameters. Typically, the pointing accuracy after N-Star Alignment is less than 2 arcmin.

Virtual alt-azimuth mode

HUBO-i NaviCom supports virtual alt-aimuth mode. When the mount is mechanically equatorial, you can make it move like an alt-azimuth mount through inverse kinematics calculations. The two axes of the mount automatically rotate simultaneously, allowing you to control the mounts horizontally and vertically.

Polar alignment error compensation tracking function

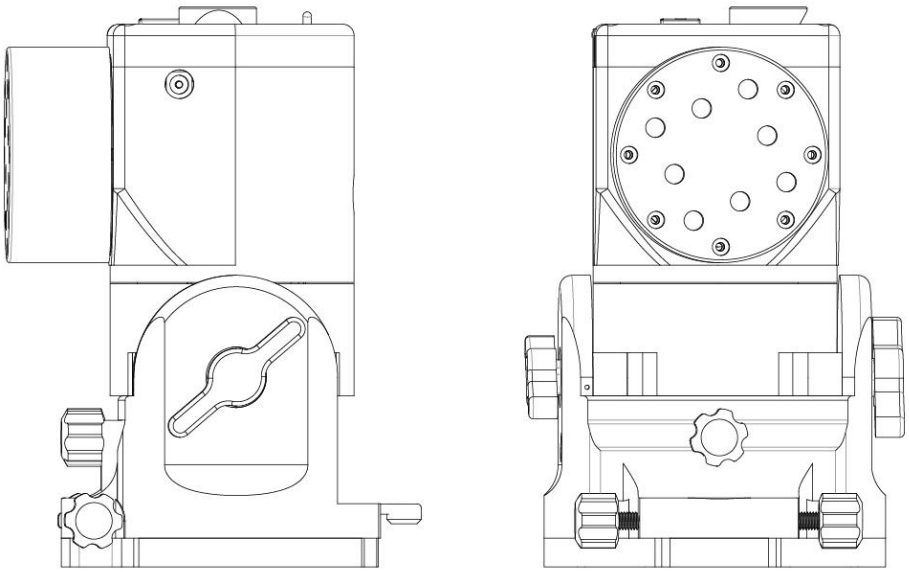
Even if the polar axis does not match correctly, it can track precisely by calculating the amount of polar error in real time and rotating the declination axis together.

Self-diagnosis

In order to protect the product from serious malfunctions, it monitors the motor load, encoder error, and motor / board temperature in real time to cut off the power and warn.

Specifications

The specifications of the product are as follows.



Drawing 2-1 Specifications

Table 2-1 Specifications

Item	Explanation
Type	German Equatorial, Alt-Azi Mount
Load Capacity	13.5kg (30lb)
Gear	Strain wave gear
Maximum slew speed	6 degrees / second (12V input) 8 degrees / second (16V input)
Latitude range	0° ~ 90°
Goto interface	HUBO-i hand controller, PC(ASCOM driver)
Input voltage	DC 12~16V
Power consumption	Tracking-0.2A(@16V), Slew -3A(@16V)

Item	Explanation
Motors	Swiss Made DC motor
Size	145mm x 130mm x 200mm
Weight of mount	3.4kg (7.3lb)

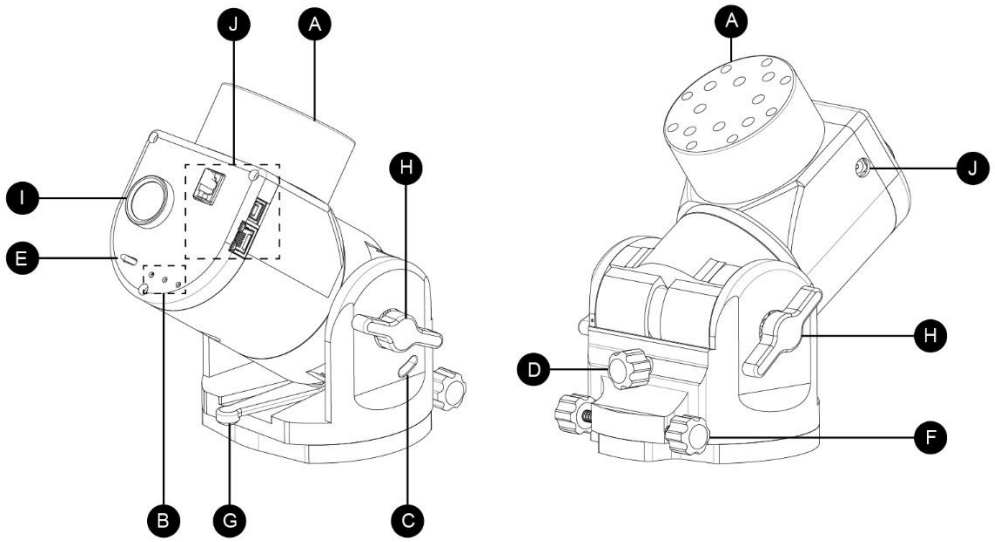
Included Items

The included items and quantities of the product are as follows.

Table 2-2 Included items name and quantity

Number	Name	Quantity
A	RST-135E mount	1
B	Hand Controller	1
C	Cable for Hand Controller	1
D	USB Cable	1
E	Power cable (2.1mm x 5.5mm DC)	1
F	Adapter for camera tripod (3/8"tap)	1
G	Adapter for PoleMaster	1
H	Soft case for mount	1
I	4mm Hex Wrench	1

The names of the parts of the mount are as follows.



Drawing 2-2 Mount parts

Table 2-3 Mount parts name

Number	Name	Number	Name
A	Declination top plate	H	Altitude locking knobs
B	Status LED	I	PoleMaster connector
C	Altitude range select bolt hole	J	Cable connector
D	Altitude fine adjustment knob		
E	Power switch		
F	Azimuth fine adjustment knob		
G	Azimuth locking knob		

Detailed description of each part of the mount is as follows.

A Declination top plate

The part where the telescope will be installed. Refer to 'Declination top plate' (p.31) for a detailed description of the bolt tab spacing and dimensions.

B Status LED

The status LED indicates the status of the mount as follows.

Table 2-4 Status LED Indication Description

Name	Status	Description
POWER	On	Power on state
	Off	Power off state
Status	Blinking	Normal
	Not blinking	Abnormal
Tracking	Blinking	Tracking on state
	Off	Tracking off state

C Altitude range select bolt hole

The hole accessible to the bolt that selects the altitude range for polar alignment of the mount. Use to adjust the altitude to a large range.

D Altitude fine adjustment knob

The knob that finely adjusts the altitude for polar alignment.

E Power switch

You can turn the mount on or off.

F Azimuth fine adjustment knob

Knobs that finely adjusts the azimuth for polar alignment.

G Azimuth locking knob

The knob locks the azimuth axis of the mount polar axis.

H Altitude locking knobs

The knobs that lock the altitude of the mount polar axis..

I PoleMaster connector

You can connect a pole master, which is a device that helps polar alignment on the mount.

J Cable connector

You can connect power, hand controller, auto guide cable, and computer USB cable to the mount.

3 Installation and use

This chapter describes how to install and use the mounts and components.

- Pier (tripod) installation
- Change altitude range for polar alignment
- Altitude fine adjustment for polar alignment
- Azimuth adjustment for polar alignment
- Telescope installation
- Connect cables

Pier (tripod) installation

The pier(tripod) is a device that supports the mount.

⚠ warning	▪ Telescopes and cameras are heavy, so be careful not to drop them when transporting or installing them.
⚠ caution	▪ Do not apply strong shocks such as dropping or bumping the equipment. ▪ Do not install the equipment in an unstable place. Be sure to install on a flat surface. The equipment may fall down and become damaged.

Preparations

The following preparations are necessary to install the pier(tripod).

Table 3-1 Preparations

number	name	quantity	Remarks
1	Pier(Tripod)	-	

How to install

To install a mount on a pier:

A Place the pier on a hard and flat surface.

B Connect the pier adapter to the bottom of the mount.

C Place the mount on top of the pier.

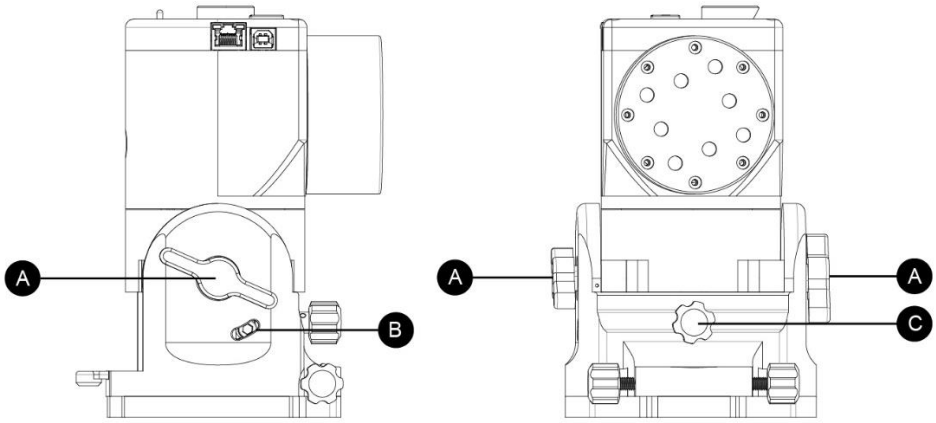
D Lock the pier adapter fixing bolts to secure the mount.

direction	For more information about pier, please visit the RainbowAstro web page (http://www.rainbowastro.com).

Altitude range select

You can change the altitude range of the mount.

⚠ caution	▪ To prevent damage to the telescope(OTA), remove the telescope from the mount and change the altitude range. ▪ When you release the altitude range select bolt, turn only one turn.
⚠ direction	▪ Since the mount polar axis is set at an altitude of 90 degrees, change the altitude range and use it. ▪ It is easy to loosen the altitude range select bolt by loosening the altitude fine adjustment knob fully counterclockwise.



Drawing 3-1 Altitude range select parts

Table 3-2 Altitude range select parts name

Number	Name	Number	Name
A	Altitude locking knobs	C	Altitude fine adjustment knob
B	Altitude range select bolt hole		

Preparations

The following preparations are necessary to adjust the altitude for polar alignment.

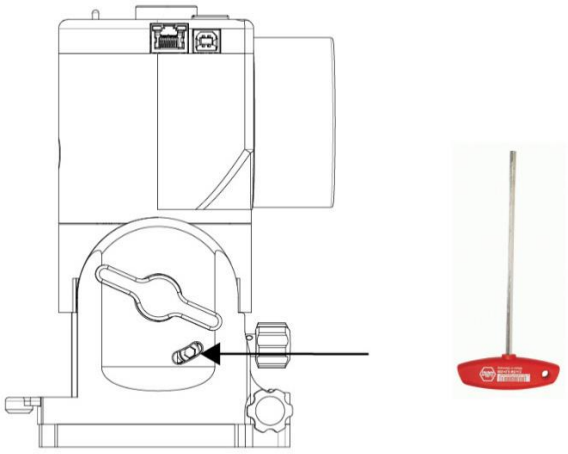
Table 3-3 Preparation

Number	Name	Quantity	Remarks
1	4mm hex wrench	1	

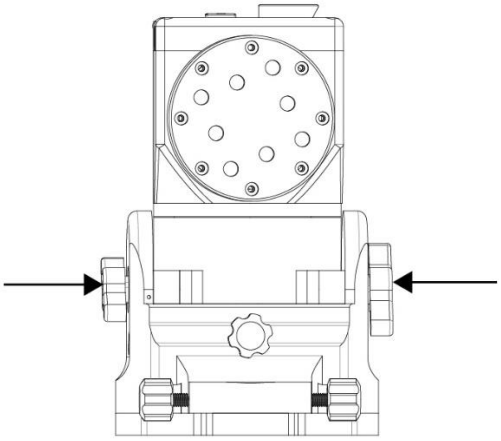
How to use

Here's how to change the altitude range select:

A Use a 4mm hex wrench to loosen the bolts in the altitude range select bolt hole.



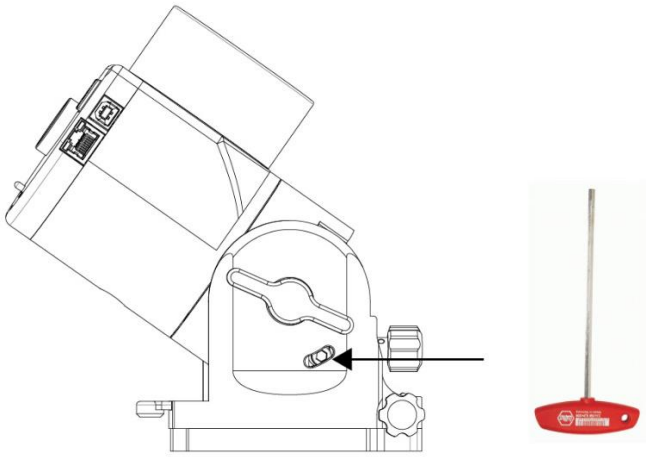
B Release the Altitude locking knobs to allow the right ascension axis to move.



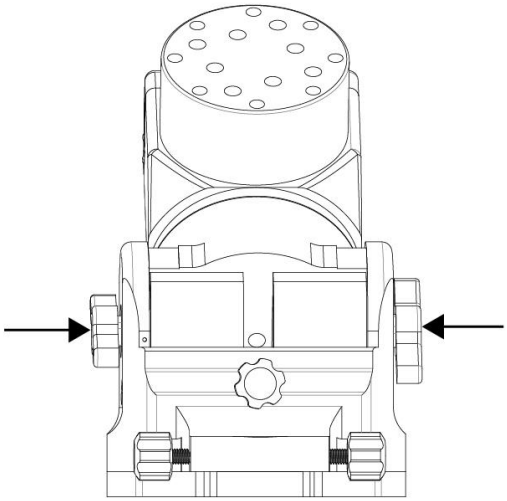
Altitude locking knobs

C Tilt the right ascention axis to adjust the mount polar axis to the desired altitude.

D Use a 4 mm hex wrench to lock the bolts in the altitude range select bolt hole..



E Lock the altitude locking knobs.



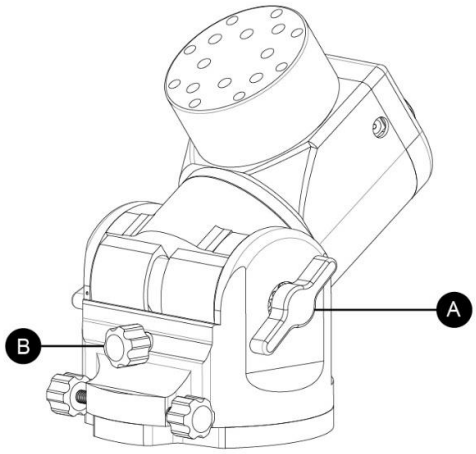
Altitude locking knobs

Altitude fine adjustment

The altitude fine adjustment knob allows you to fine-tune the altitude from + 0 ° to + 10 °.

⚠ direction	▪ Altitude locking knobs must be loosen before fine-tuning the altitude.

⚠ caution	▪ Altitude Fine adjustment knob can be damaged by turning it with excessive force.



Drawing 3-2 Altitude Fine adjustment

Table 3-4 Altitude Fine adjustment parts

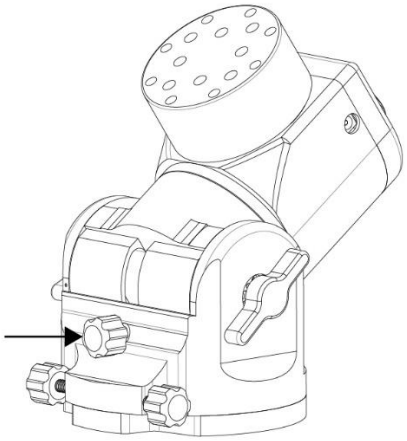
Number	Name	Number	Name
A	Altitude locking knobs	B	Altitude fine adjustment knob

How to use

Here's how to fine adjustment the altitude:

A Release the altitude locking knob.

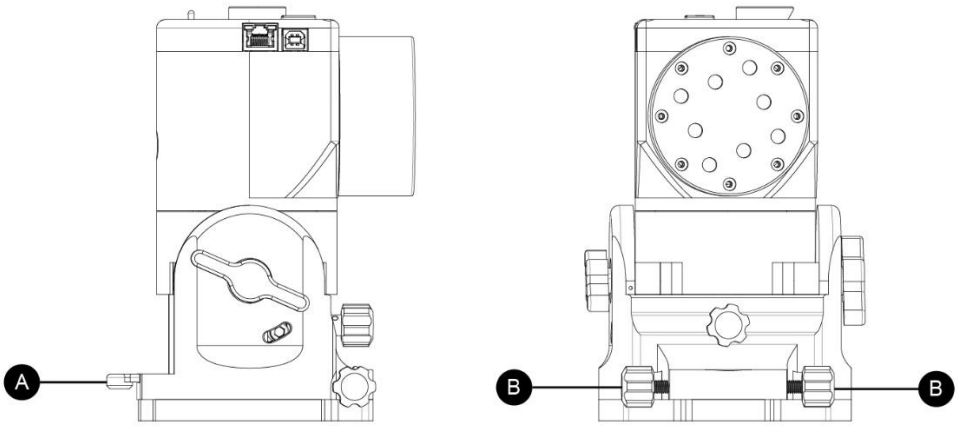
B Turn the altitude fine adjustment knob to adjust the altitude.



C Lock the altitude locking knobs.

Azimuth fine adjustment

Azimuth locking knob and azimuth fine adjustment knob are used to adjust the azimuth of the mount.



Drawing 3-3 Azimuth fine adjustment

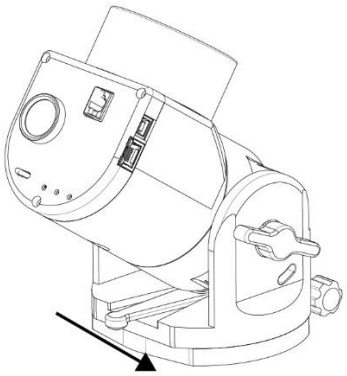
Talbe 3-5 azimuth fine adjustment parts

Number	Name	Number	Name
A	Azimuth locking knob	B	Azimuth fine adjustment knob

How to use

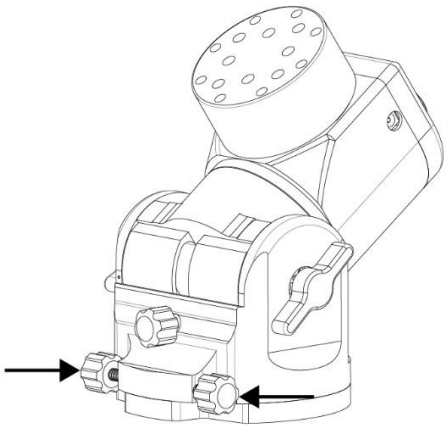
Here's how to adjust the azimuth of the mount:

A Loosen the azimuth locking knob.



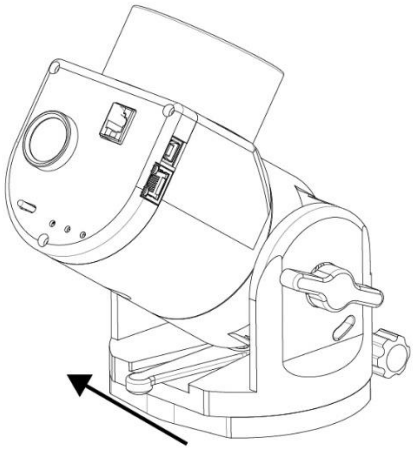
B Loosen the azimuth fine adjustment knob in the direction you want to rotate the mount.

- To rotate left, loosen the left azimuth fine adjustment knob..
- To rotate right, loosen the right azimuth fine adjustment knob..



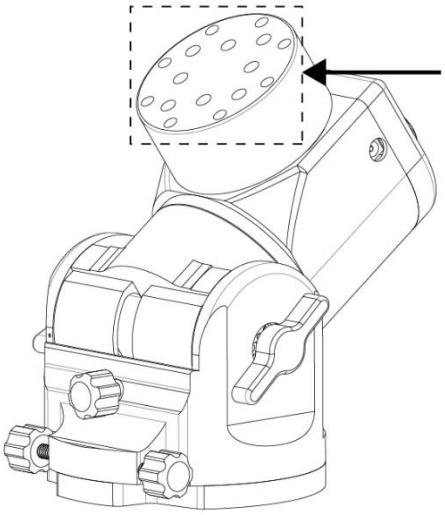
C Lock the azimuth fine adjustment knob on the other side.

D Lock the azimuth locking knob.



Install telescope(OTA)

⚠ warning	▪ Telescopes and cameras are heavy, so be careful not to drop them when transporting or installing them.
⚠ caution	▪ The load capacity of the mount is 13.5 kg. Overloading the weight can cause damage to the product. ▪ After installing the telescope, do not turn off the power while the right ascension axis is rotating left / right. The right ascension axis rotates in the direction of gravity and the telescope can hit the mount and peer. ▪ The depth of the bolt tab on the declination top plate is 10 mm. Using bolts that are too long may damage the product.
⚠ direction	▪ Install the telescope according to the installation orientation shown on the declination top plate.



Drawing 3-4 telescope installation

Preparations

Preparing for telescope installation and balance is as follows.

Table 3-4 Preparations

Number	Name	Quantity	Remarks
1	Telescope	-	
2	6mm hex wrench	1	

How to install

To install telescope:

A Install a saddle or tube ring on the declination top plate of the mount.

B Install a telescope in the saddle or tube ring.

⚠ direction	▪ Please pay attention to the installation direction of the telescope. ▪ In the northern hemisphere, the mount homing location is west. ▪ In the southern hemisphere, the mount homing location is east.

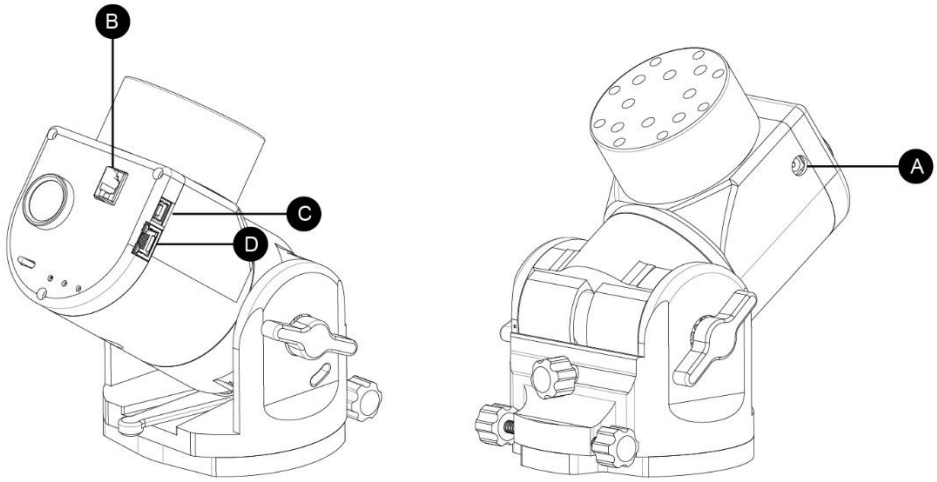
Cable connection

The cables connecting to the mount. These cables connect the power of the mount, the hand controller, the CCD camera for auto guiding, and can be connected to the computer via USB if necessary.

⚠ warning	▪ Do not touch the cable and power cord with wet hands. There is a risk of electric shock. ▪ Do not bend or force the wire when pulling the cable and power cord out of the outlet. It may cause electric shock or fire. ▪ The power source of the mount is DC 12 ~ 16V. When connecting the battery, be careful not to change the polarity of the plug inside plus and minus outside.

⚠ direction	Be careful not to connect the cable for auto guiding to the hand controller connection.

Describes the location and function of the connections for each cable connected to the mount.



Drawing 3-2 Cable connection

Drawing 3-7 Cable usage

Number	Name	Usage
A	Power connection	Connect power and mount.
B	Auto guiding cable connection	Connect the auto guiding cable to the mount.
C	USB connection	Connect the computer to the mount.
D	Hand controller connection	Connect hand controller and mount.

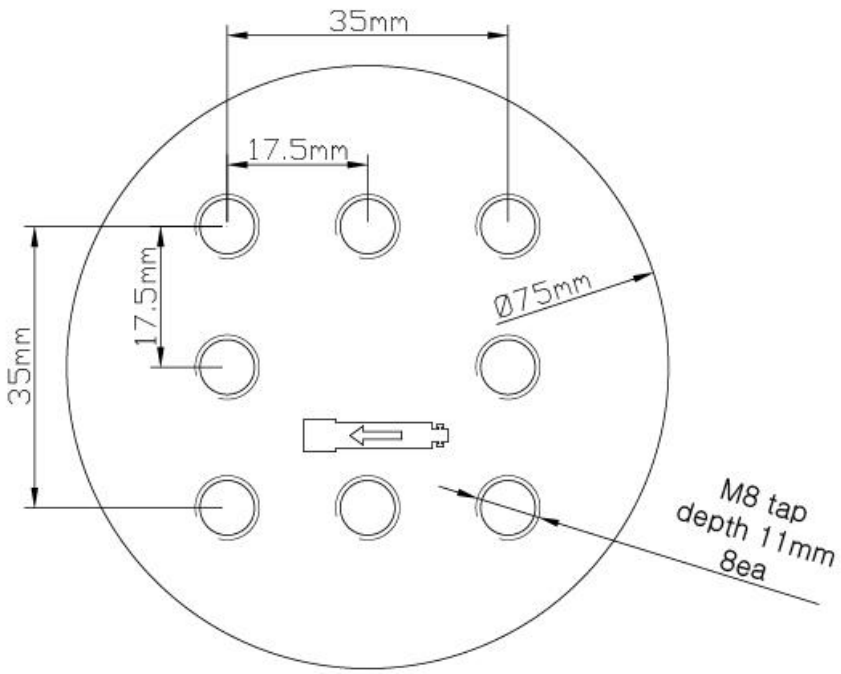
4 Reference drawing

This chapter shows a drawing of the connection part of the mount.

- Declination top plate
- Mount bottom

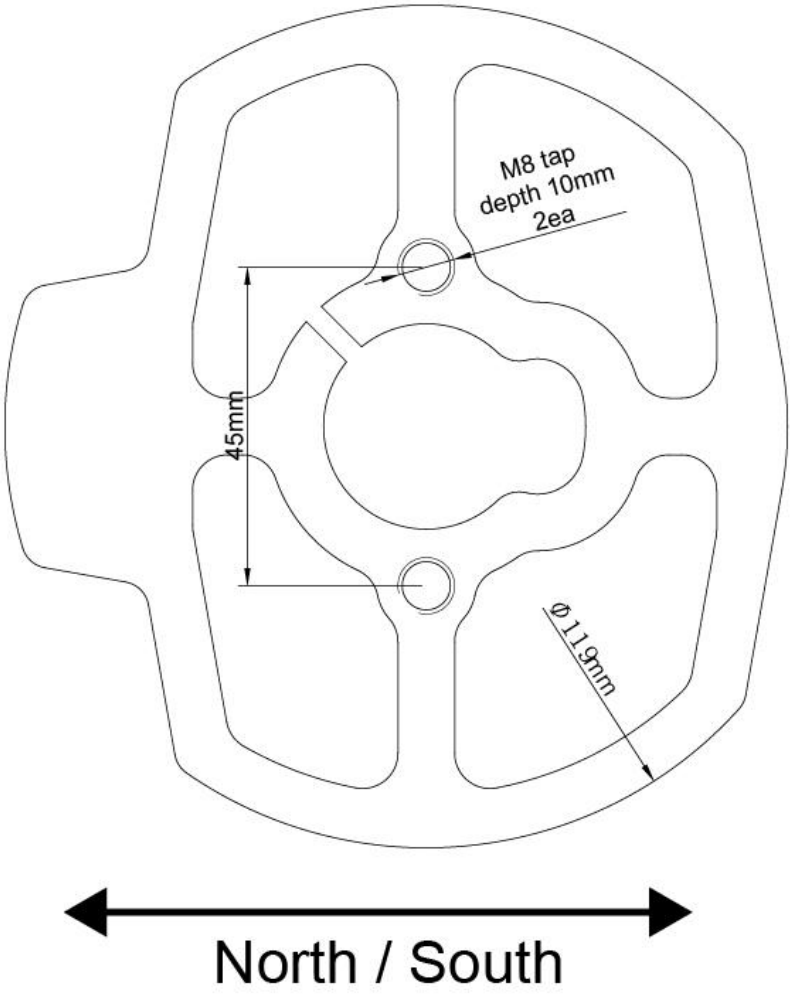
More detailed drawings can be downloaded from www.rainbowastro.com.

Declination top plate



Drawing 4-1 Declination top plate

Mount bottom



Drawing 4-2 Mount bottom