RAINBOW ASTRO

RST-135E

Hubo-I Handcontroller

User Manual

Preface

Thank you for choosing RainbowAstro's products. RainbowAstro is committed to producing high quality products.

This is a hand controller for the RainbowAstro mount. It is a 32-bit micro-computer specialized in Celestial navigation. It has a total of 22,000 astronomical data including 9440 stars, 13,300 deep sky, and solar system planets.

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 is easy for you to browse for reference at any time.

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Information in this manual is subject to change without notice. For more information on revising the manual, please visit Rainbow Robotics' website (http://www.rainbowastro.com).

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.

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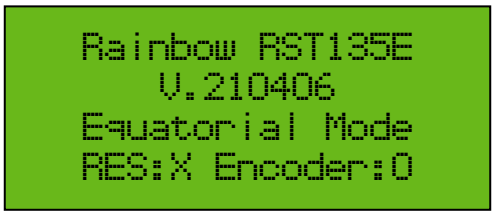
bjjeong@rainbow-robotics.com

Manual usage rules

The manual usage rules specify the special symbols, rules, and abbreviations used in the manual.

In this manual, the following manual rules are defined for your convenience.

Table 1-1 Manual Conventions

Mark	Explanation
❶ ❷ ❸	Used to display the names of the items in the image.
Bold key	Used to display each key of the product.
Rainbow RST135E	It is used to display the menu that appears on the product's display window.
	Used to display the product's display window.

Abbreviations used in this manual are as follows.

Abbreviation	Explanation
RA	Right Ascension
Dec	Declination
Alt	Altitude
Azi	Azimuth

Revision history

Date	Version	Contents	Remarks
2021.04	1.0	Created	
2021.06	1.2	Added polar alignment assist	

RAINBOW ASTRO

Contents

1 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:

⚠ 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.

⚠ caution	▪ 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. ▪ 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.

⚠ direction	Users should read this manual thoroughly before installing or using the product.

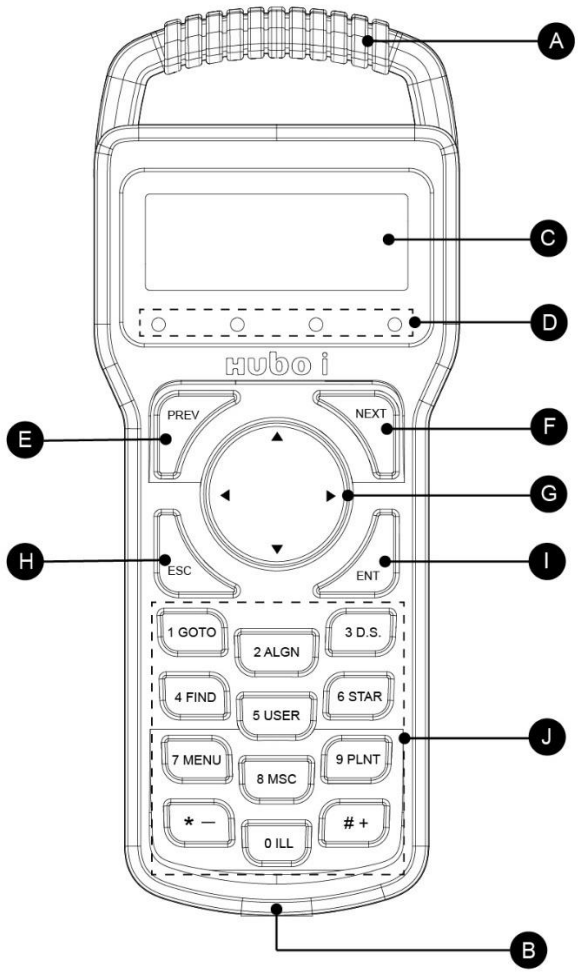
2 Product overview

This is a hand controller for the RainbowAstro mount. It is a 32-bit micro-computer specialized in celestial navigation. It has a total of 22,000 astronomical data including 9440 stars, 13,300 deep sky, and solar system planets.

This chapter explains each part's name and function, mode, database, warning notice and precautions.

Part Names and Functions

The appearance and name of each parts are as follows.



Drawing 2-1 Product appearance

Table 2-1 Part name

Number	Name	Number	Name
A	Handle	F	**NEXT** key
B	Cable connection	G	Arrow key
C	Display window	H	**ESC** key

Number	Name	Number	Name
D	LED	I	**ENT.** key
E	**PREV** key	J	Number key

Features of each part

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

A Handle

The handle is fixed to the body.

B Cable connections

This is where you plug in the cable to connect the mount and the product.

C Display window

This screen displays various information for controlling the mount.

D LED

It is the LED that displays the manual operation drive speed of the mount.

E **PREV** key

Moves to the previous screen.

F **NEXT** key

Moves to the next screen.

G ▲, ▼, ◀, ▶ Arrow key

It has the following functions.

- ✡ Manually operate the mount.
- ✡ Move menu
- ✡ Move the cursor

H **ESC** key

It has the following functions.

- Stop GOTO on mount
- Go to previous menu
- Cancel operation

I **ENT.** key

When the key is pressed for a short time, the following functions are performed.

- Select
- Confirm

When push and hold for 1 second, the following functions are displayed.

- EDIT mode
- SYNC

J Number Key

It functions differently depending on the mode of the product. For details on each mode, refer to 'Mode (p.8)'.

- **EDIT** mode: input a number
- **OBJECT** mode: 1 Press the **GOTO** key to goto
- **MAIN** mode: Function for each key

Number key function

The functions of the numeric keys are as follows.

Key	Function
1 GOTO	GOTO
2 ALGN	Settings related to tracking
3 D.S.	Access to deep sky information
4 FIND	Search nearby objects
5 USER	User enters astronomical coordinates
6 STAR	Access to star information
7 MENU	Show settings menu
8 MSC	Other function settings
9 PLNT	Access to planet information
10 ILL.	Toggle back LED (Long press Homing)
*** -**	Reduced drive speed of mount
# +	Increase drive speed of mount

Mode

There are 4 modes as below.

- Main mode
- Object mode
- Menu mode
- Edit mode

Main mode

Main mode refers to the main screen that appears on the display window when the product is turned on and displays basic information about the product.

How to enter

Main mode is the main screen that appears when the product is turned on.

How to use

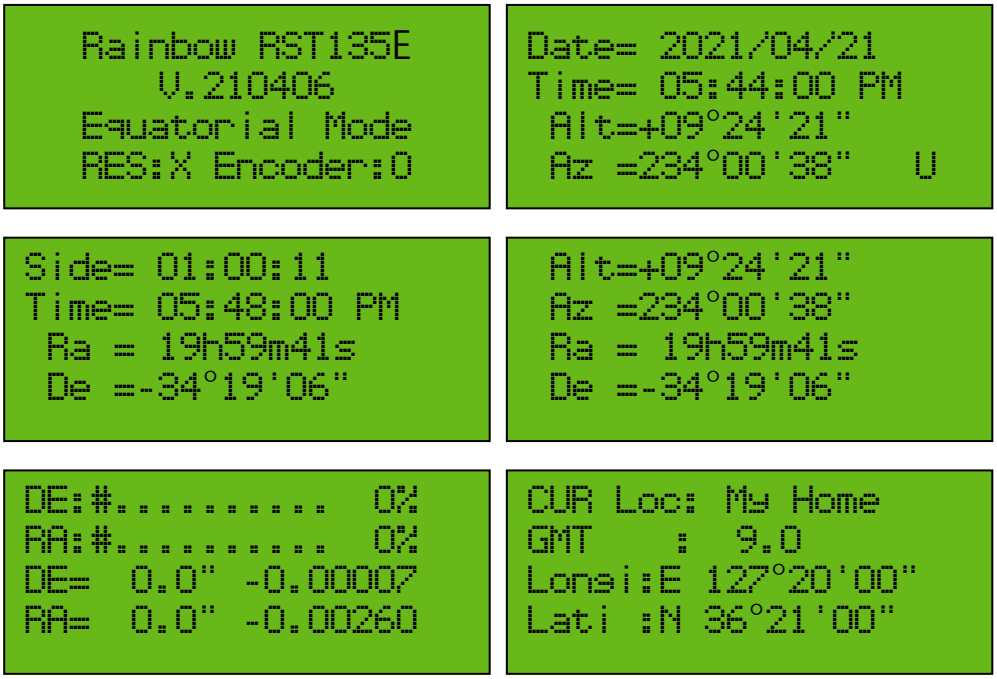
How to use in main mode is as follows.

Table 2-2 How to use in main mode

Key	Explanation
PREV, **NEXT** key	Move between screens.
▲, ▼, ◀, ▶ key	Manually control the mount.
ENT. key	Press and hold to move to MENU mode.
Number key	Move to the menu corresponding to each numeric key.

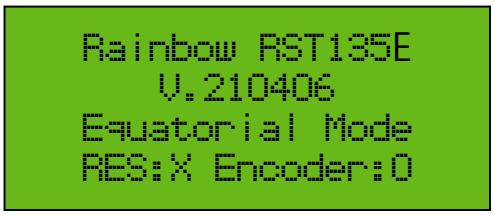
Screen Layout

In the Main mode, you can move to the **PREV** and **NEXT** keys as follows.



Drawing 2-2 Main mode screen

The first screen and a description of each item are as follows.



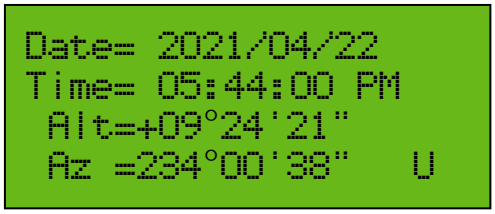
Drawing 2-3 First screen

Table 2-3 Explanation of each item on the first screen

Items	Explanation
Rainbow RST135E	Displays the model name of the mount.
V.210406	Displays the firmware version.
Equatorial Mode	Displays the mount type. ▪ Equatorial Mode: Equatorial mount mode ▪ Alt-Azimuth Mode: Alt-Azimuth mount mode

Items	Explanation
	▪ Equatorial Fork: Equatorial Fork mount mode For a detailed description of each mode, see 'equatorial / alt-azimuth mode (p.89)'.
Res:X	It displays the Alignment data save state. ▪ X: Alignment data save disabled ▪ O: Alignment data save enabled For details, refer to 'Saving alignment data' (p.54).
Encoder:O	Indicates whether the high resolution encoder is enabled or not. ▪ X: High resolution encoder disabled ▪ O: High resolution encoder is enabled For details, refer to 'High Resolution Encoder Settings (p.86)'.

The details of each item on the second screen are as follows.



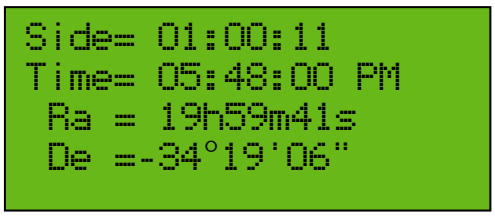
Drawing 2-4 Second screen

Table 2-4 Explanation of each item on the second screen

Items	Explanation
Date= 2021/04/22	Displays the current date.
Time= 05:44:00 PM	Displays the current time.
Alt=+09°24'21"	Displays the altitude at which the telescope is heading.
Az =234°00'38"	Displays the azimuth at which the telescope is heading.

Items	Explanation
U	It shows the signal coming through the guide port. Guide signals via ASCOM or Indi are not displayed. ▪ U: Dec+ signal ▪ D: Dec- signal ▪ L: Ra- signal ▪ R: Ra+ signal ▪ None: No auto guide Most auto guide signals come in for a very short time and are difficult to see.

The details of each item on the third screen are as follows.

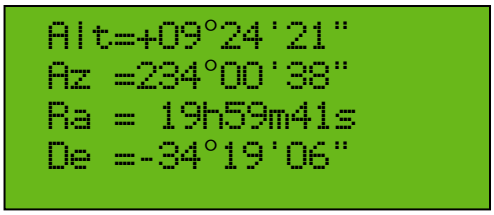


Drawing 2-5 Third screen

Table 2-5 Explanation of each item on the third screen

Items	Explanation
Side= 01:00:11	It displays the current sidereal time.
Time= 05:48:00 PM	Displays the current time.
Ra = 19h59m41s	Displays the right ascension the telescope is pointing at.
De =-34°19'06"	Displays the declination the telescope is pointing at.

The details of each item on the fourth screen are as follows.

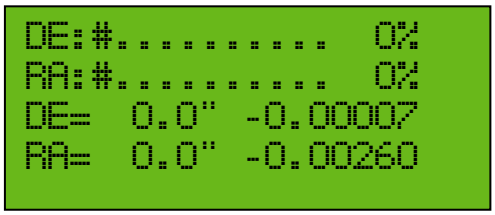


Drawing 2-6 Fourth screen

Table 2-6 Explanation of each item on the fourth screen

Items	Explanation
Alt=-09°24'21"	Displays the altitude at which the telescope is heading.
Az =234°00'38"	Displays the azimuth at which the telescope is heading.
Ra = 19h59m41s	Displays the right ascension the telescope is pointing at.
De =-34°19'06"	Displays the declination the telescope is pointing at.

The details of each item on the fifth screen are as follows.



Drawing 2-7 Fifth screen

Table 2-7 Explanation of each item on the fifth screen

Items	Explanation
DE:#.......... 0%	Displays the motor current consumption of the declination axis.
RA:#.......... 0%	Displays the motor current consumption of the right ascension axis.
DE= 0.0" -0.00007	Displays tracking error and tracking speed of declination axis.
RA= 0.0" -0.00260	Displays tracking error and tracking speed of right ascension axis.

The details of each item on the sixth screen are as follows.

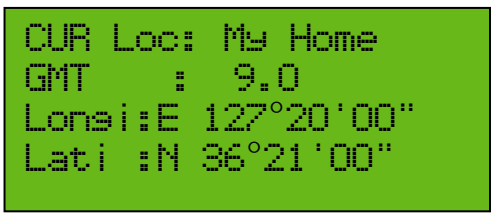


그림 2-8 Sixth screen

표 2-8 Explanation of each item on the sixth screen

Items	Explanation
CUR Loc: My Home	The name of the currently selected location.
GMT : 9.0	The currently set UTC offset.
Longi:E 127°20'00"	The longitude of the currently set location.

Items	Explanation
Lati :N 36°21'00"	The latitude of the currently set location.

Object mode

Object mode is a screen that displays the information of the observation target.

How to enter

In main mode, press the following number keys to enter object mode.

- **3 D.S.** key: Access to deep sky database
- **6 STAR** key: Access to star database
- **8 MSC** key: Access to parking location, user defined celestial coordinates, satellite information
- **9 PLNT** key: Access to planet database

How to use

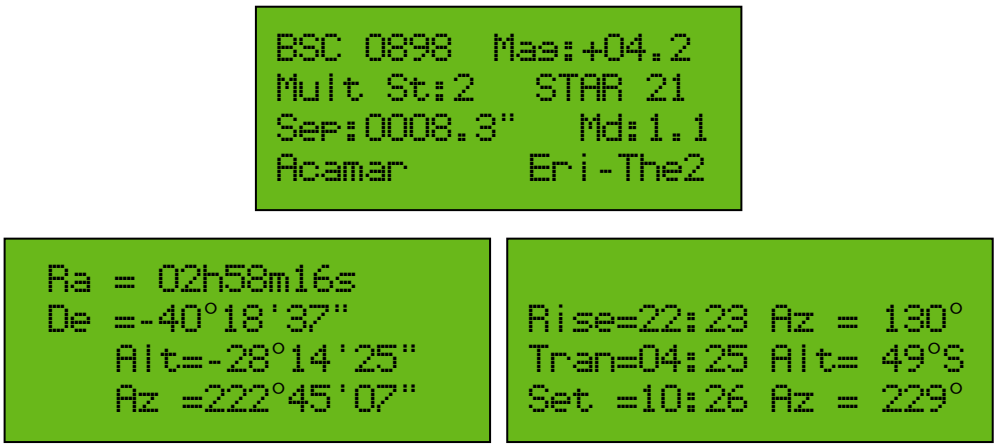
How to use in object mode is as follows.

Table 2-9 How to use in object mode

Key	Explanation
PREV, **NEXT** key	Move between screens.
▲, ▼, ◀, ▶ key	Manually control the mount.
1 GOTO key	Automatically pointing targets.

Screen Layout

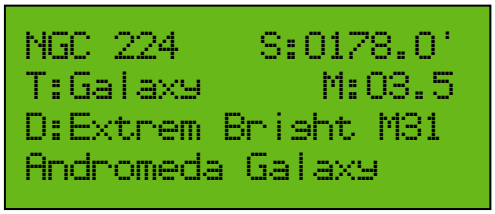
The screens you can see in object mode are as follows. Use the PREV and NEXT keys to move between screens.



Drawing 2-9 Object mode screen

The first screen in object mode differs depending on whether you have access to Deep Sky, a star, or a planet.

The first screen of Deep Sky (nebula, cluster, galaxy, etc.) information and the description of each item are as follows.



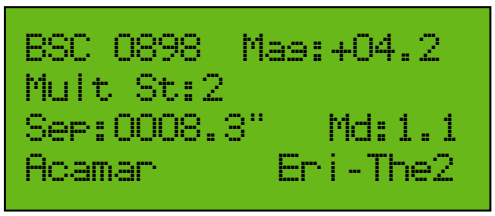
Drawing 2-10 First screen (deep sky)

Table 2-10 Explanation of each item on the first screen (deep sky)

Items	Explanation
NGC 224	Displays the NGC number.
S:0178.0	Displays the apparent size.
T:Galaxy	Displays the type.
M:03.5	Displays the apparent magnitude.
D:Extrem Bright	Displays features.

Items	Explanation
M31	Displays the messier number. If there is no messier number, it will not be displayed.
Andromeda Galaxy	The name is displayed.

The first screen of the star information and the description of each item are as follows.

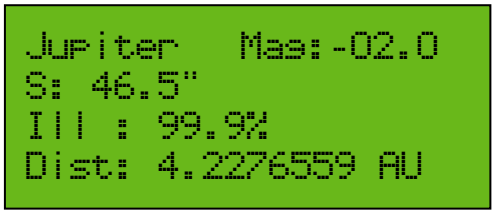


Drawing 2-11 First screen (star)

Table 2-11 Explanation of each item on the first screen (star)

Items	Explanation
BSC 0898	The BSC (Bright Star Catalog) number is displayed.
Mag:+04.2	Displays the apparent magnitude.
Mult St:2	If double star, the number of stars is displayed. If it is not double star, it is not displayed.
Sep:0008.3"	The angular distance between double stars is displayed. It is not displayed if it is not double star.
Md:1.1	The difference in magnitude between double stars is displayed.
Acamar	The name of the star is displayed.
Eri-The2	Bayer nomenclature is displayed (constellation name, Greek).

The first screen of the planet information and the description of each item are as follows.

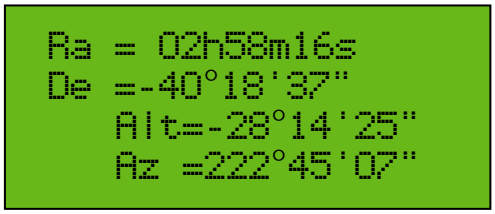


Drawing 2-12 First screen (planet)

Table 2-12 Explanation of each item on the first screen (planet)

Items	Explanation
Jupiter	The planet name is displayed.
Mag:-02.0	Displays the apparent magnitude.
S: 46.5"	Displays the apparent size.
Ill : 99.9%	The phase is displayed.
Dist: 4.2276559 AU	The distance from the earth is displayed.

The description of each item on the second screen is as follows.

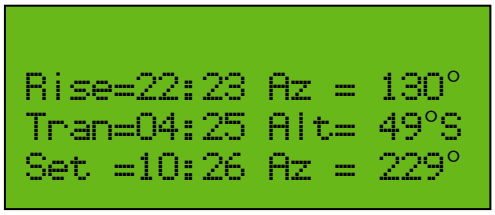


Drawing 2-13 Second screen

Table 2-13 Explanation of each item on the second screen

Items	Explanation
Ra = 02h58m16s	Display the right ascension of the target.
De =-40°18'37"	Displays the declination of the target.
Alt=-28°14'25"	Displays the current altitude of the target.
Az =222°45'07"	Displays the current azimuth of the target.

The description of each item on the third screen is as follows.



Drawing 2-14 Third screen

Table 2-14 Explanation of each item on the third screen

Items	Explanation
Rise=22:23	Displays the time at which the target rises.
Az = 130°	Displays the azimuth when the target raises.
Tran=04:25	Displays the time at which the target transits meridian.
Alt= 49°S	Displays the altitude at which the target transits meridian.
Set =10:26	Displays the time at which the target sets.
Az = 229°	Displays the azimuth when the target sets.

Menu mode

Menu mode is a screen that displays the setup menu of the product.

How to enter

In Menu mode, press **ENT.** Press and hold the key to enter.

How to use

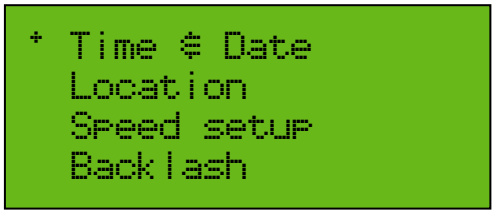
How to use in menu mode is as follows.

Table 2-15 How to use in menu mode

Key	Explanation
▲, ▼ key	Navigate to the menu you want to select.
ESC key	Go to the top menu.
ENT. key	Select the menu. Press and hold again to enter Edit mode.

Screen Layout

The screen of menu mode and each item are as follows.



Drawing 2-15 Menu mode screen

Table 2-16 Explanation of each item on the screen (menu mode)

Items	Explanation
*	Displays the position of the cursor.
Time & Date	Set the current date and time.
Location	Select the observation site.
Speed setup	Sets the drive speed of the mount.
Backlash	Reduces gear backlash by software.
Auto Res. Auto Res. On	Save the alignment data.
Align angle	Check the information calculated through the alignment process.
Tracking mode	Change the tracking speed.
Mount setup	Change to equatorial, alt-aimuth, fork equatorial mode.

Items	Explanation
	Set the home offset.
Versions	Check the firmware version, database version, and serial number.

Edit mode

In Edit mode, you can modify the setting value.

How to enter

Edit mode is automatically entered if you need to enter a value. Alternatively, after selecting the menu to change the setting value, press and hold the **ENT.** key to enter.

How to use

How to use in edit mode is as follows.

Table 2-17 How to use in edit mode

Key	Explanation
▲, ▼, ◀, ▶ key	Move the cursor.
ESC key	Cancels the input and exits Edit mode.
ENT. Key	Saves the input and exits Edit mode.
Number key	Input a number.
* **-** key, **#** + key	Input +, -.

Screen Layout

The screen of edit mode and each item are as follows.

Drawing 2-16 Edit mode screen

Table 2-18 Explanation of each item on the screen (edit mode)

Items	Explanation
#	Displays the position of the cursor. Blinks in Edit mode, where information can be modified.

Database

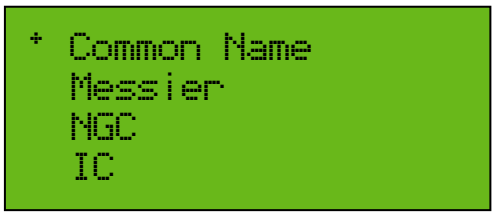
The information contained in this product is as follows.

- Eight solar system planets, Moon, Sun
- 9,440 stars information
- 7,300 NGC catalog information
- 6,800 IC catalog information
- 110 Messier catalog information

Deep sky object (D.S)

The deep sky object information is searched by pressing the **3 D.S.** key in Main mode.

The screen of Deep sky object and the description of each item are as follows.



Drawing 2-17 Screen of Deep sky object

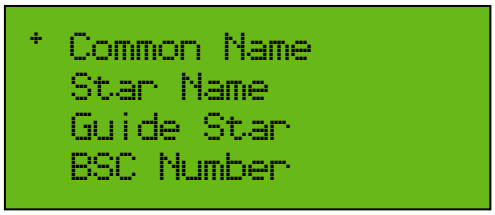
Table 2-19 Explanation of each item on the screen (Deep sky object)

Items	Explanation
*	Displays the position of the cursor.
Common Name	Search by alphabetically sorted names.
Messier	Search by Messier number.
NGC	Search by NGC number.
IC	Search by IC number.

Star(STAR)

The star information is searched in Main mode by pressing the **6 STAR** key.

The screen of the star and the description of each item are as follows.



Drawing 2-18 Screen of star

Table 2-20 Explanation of each item on the screen (Star)

Items	Explanation
*	Displays the position of the cursor.
Common Name	Search by alphabetically sorted names.
Star Name	Alphabetically search for stars named by Bayer designation.
Guide Star	Alphabetically search for stars with an apparent magnitude of 2 or higher.
BSC Number	Search by BSC number.
SAO Number	Search by SAO number.
HR Number	Search by HR number.
Alisn Star	Search for stars with an apparent magnitude of 3 or more in azimuthal order.

Planet(PLNT)

The planet information is searched by pressing the **9 PLNT** key in Main mode.

The screen of the planet and the description of each item are as follows.

Drawing 2-19 Screen of planet

Table 2-21 Explanation of each item on the screen (Planet)

Items	Explanation
*	Displays the position of the cursor.
Sun	Search for information about the sun.
Mercury	Search for information about the mercury.
Venus	Search for information about the venus.
Mars	Search for information about the mars.
Jupiter	Search for information about the jupiter.
Saturn	Search for information about the saturn.
Uranus	Search for information about uranus.
Neptune	Search for information about neptune.
Pluto	Search for information about pluto.
Moon	Search for information about moon.

Menu structure

The menu structure of this product is as follows.

Table 2-22 Menu structure

1st Level	2nd Level	3rd Level	4th Level	Mode
ENT. key Long press	Time & Date			Edit
	Location			Edit
	Speed setup	Slew speed		Edit
		Acc		Edit
	Auto Res. / Auto Res. On	Toggle		
	Align angle			
	Tracking mode			Edit
	Mount setup	Offset Set		
		Mount Confis.		Edit
		OEC mode set		Edit
	Versions			
1 GOTO key	ESC/ENTER	Mode Reverse		
2 ALGN key	Drift Correct. On / Drift Correct. Off	Toggle		
	Tracking Off / Tracking On	Toggle		
3 D.S. key	Common Name	List of objects		Object
	Messier	Enter number		Object
	NGC	Enter number		Object
	IC	Enter number		Object

1st Level	2nd Level	3rd Level	4th Level	Mode
4 FIND key	Distance	List of objects		Object
	Magnitude	List of objects		Object
	EDIT mode			Object
5 USER key	List of objects			
6 STAR key	Common Name	List of objects		Object
	Star Name	List of constellations	List of numbers	Object
	Guide Star	Enter number		Object
	BSC Number	Enter number		Object
	SAO Number	Enter number		Object
	HR Number	Enter number		Object
	Alias Star	List of objects		Object
7 MENU key	Drive	Toggle		
	Communication			
	Back light	Press arrows		
	Contrast	Press arrows		
	Reticle Ill.	Press arrows		
	Limit	Enter values		Edit
	Voltage & Temp			
	GPS			
8 MSC key	Parking	List of positions		Edit
				Object
	User Define	List of objects		Edit
				Object

1st Level	2nd Level	3rd Level	4th Level	Mode
	Satellites	List of objects		
	Eclipse Mode			
9 PLNT key	List of Planets			Object
0 ILL. Key	Toggle			
0 ILL. key Long press	Homing			

3 Observation preparation

This product is connected to the mount using a cable.

This chapter explains what you need to know or prepare before using the product to observe.

Basic usage

Describes the basic usage of the product you should know when preparing your observations.

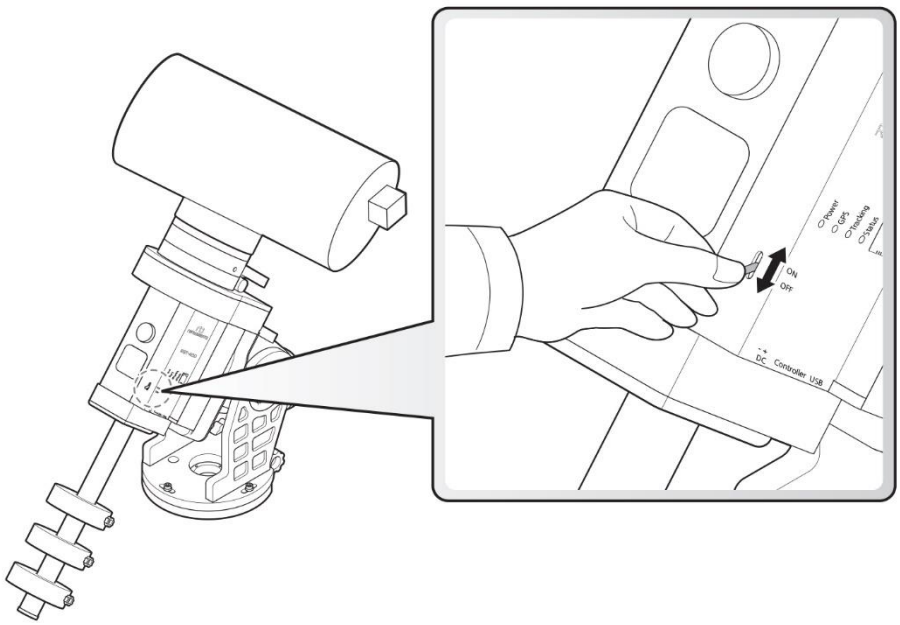
Power on

To turn on this product, follow the steps below.

A Release the right ascension and declination clamps to direct the telescope to the initial position.
The initial position of the telescope is:

Equatorial mode, Northern Hemisphere – West (ALT 0 deg, AZI 270 deg)
Equatorial mode, Southern Hemisphere – East (ALT 0 deg, AZI 90 deg)
Alt-azimuth mode, Northern Hemisphere – South (ALT 0 deg, AZI 180 deg)
Alt-azimuth mode, Southern Hemisphere – North (ALT 0 deg, AZI 0 deg)

B Turn on the mount power switch.



Manual control

You can manually drive the right ascension and declination axes of the mount using the arrow keys of this product.

Manual control is required in the following situations.

- ✡ Alignment
- ✡ When you need other manual control

direction	You can only control it manually in Main mode and Object mode.

Manual control keys and explanation of each key are as follows.

Table 3-1 Manual control keys and explanation of each key

Key	Explanation
▲, ▼ key	Manually control the declination (altitude) axis of the mount.
◀, ▶ key	Manually control the right ascension (azimuth) axis of the mount.
* - key, # + key	Select the drive speed of the mount. The current driving speed can be checked with the LED at the bottom of the display screen. ▪ First LED: Guide Speed ▪ Second LED: Speed 1 ▪ Third LED: Speed 2 ▪ Fourth LED: Speed 3(Maximum speed)

Back side LED(ILL)

This product provides a flashlight function for your convenience.

Press the **0 ILL.** key in Main mode to turn on the high-intensity LED on the back of the product.

Initial setting

Describes the basic setup you should know before observing.

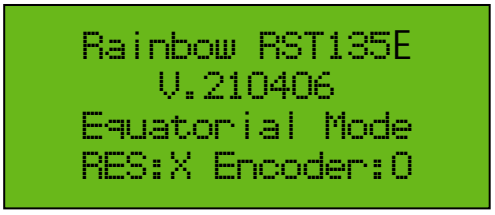
GPS

When the mount is turned on, the built-in high-performance GPS receiver receives signals from up to 12 GPS satellites and automatically receives the current position.

It will take about one minute to receive your current location, and GPS information will not be received indoors. If you do not receive GPS information outdoors, there is a factor that interferes with the GPS signal. Enter the location and time (Date & Time) manually.

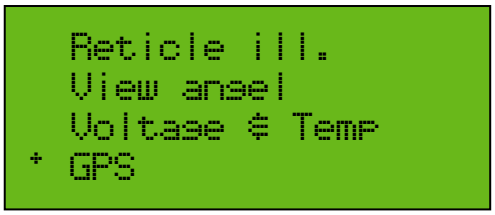
To check received GPS information, follow the steps below.

1 In Main mode, press the **7 MENU** key.

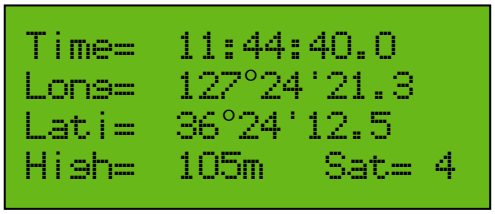


2 Use the ▲ and ▼ arrow keys to move to the GPS menu.

3 Press the **ENT.** key to select the GPS menu.

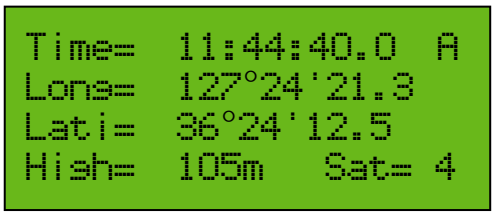


4 When a GPS signal is received, the time, latitude and longitude are displayed on the screen. If latitude and longitude are not displayed, the satellite signal has not yet been received.



5 Press and hold **ENT.** Key.

6 GPS data is automatically entered into the product's time and location information and A is displayed in the upper right corner of the display window.

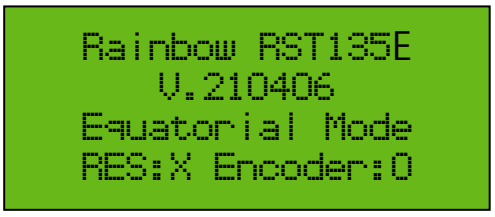


Time setting (Time & Date)

For precise pointing, the exact time must be entered.

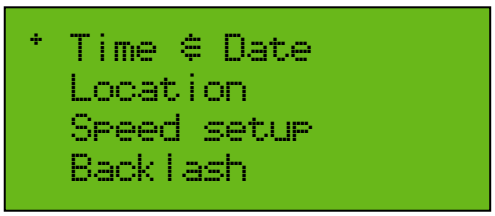
Here's how to set the current date and time:

1 In Main mode, press and hold **ENT.** Key.



2 Use the ▲ and ▼ arrow keys to move to the Time & Date menu.

3 Press the **ENT.** key to select the Time & Date menu.



4 The current date and time are displayed in the display window.

5 Press and hold **ENT.** key to enter Edit mode.

6 Please enter the current date and time.

7 Press the **ENT.** key to save the entered value.

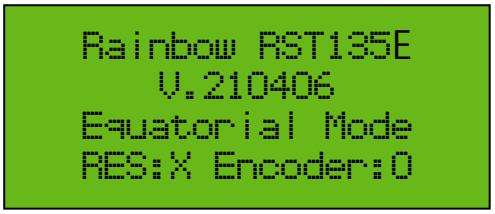
direction	If the GPS receiver automatically receives the time information, skip the time setting operation.

Location Setting (Location)

Accurate pointing requires accurate latitude and longitude.

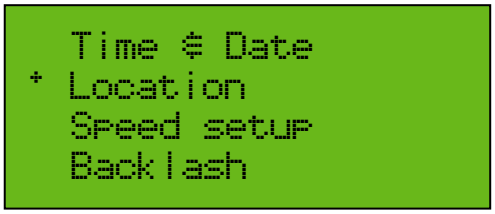
To set Location information:

1 In Main mode, press and hold **ENT.** Key.



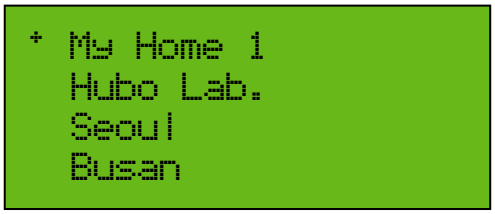
2 Use the ▲ and ▼ arrow keys to move to the Location menu.

3 Press the **ENT.** key to select the Location menu.



4 Use ▲ or ▼ arrows to move to the location you want to select.

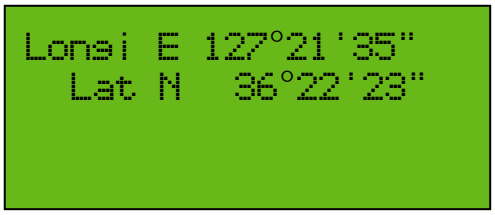
5 Press **ENT.** to select location.



6 Press and hold **ENT.** key to enter Edit mode.

7 Enter latitude and longitude values.

8 Press the **ENT.** key to save the entered value.

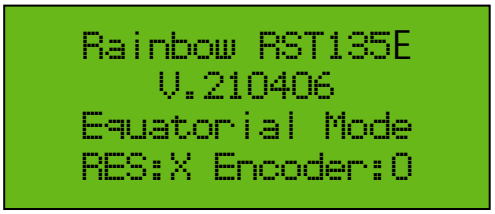


direction	If your GPS receiver automatically receives your current location, skip setting location.

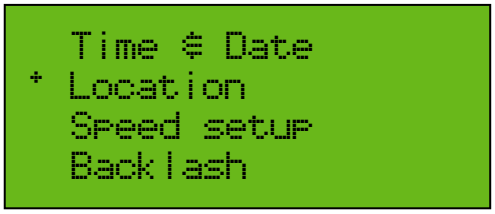
The location name can be modified by the user.

Here's how to edit the location name:

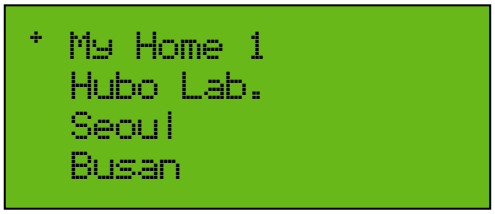
1. In Main mode, press and hold **ENT.** Key.



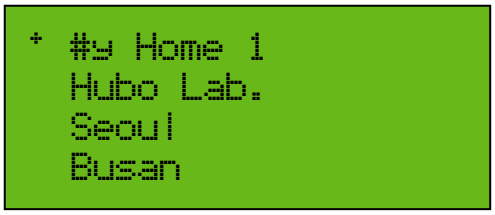
2. Use the ▲ and ▼ arrow keys to move to the `Location` menu.
3. Press the **ENT.** key to select the `Location` menu.



4. Use ▲ or ▼ arrows to move to the location you want to select.
5. Press and hold **ENT.** key to enter Edit mode.



6. Use the ▲, ▼, ◀, ▶ arrow keys to modify the location name.
7. Press **ENT.** to save the modified location name.



Set the tracking mode (Tracking Off / Tracking On)

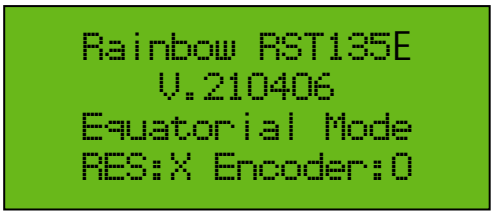
The tracking mode changes automatically according to the pointing target as follows.

- GOTO to on earth object (Altitude, azimuth): Tracking off
- GOTO to celestial object (Right ascension, declination): Tracking On

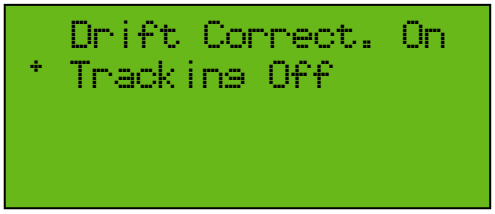
direction	The default setting for the mount is tracking off mode.

To set the tracking mode:

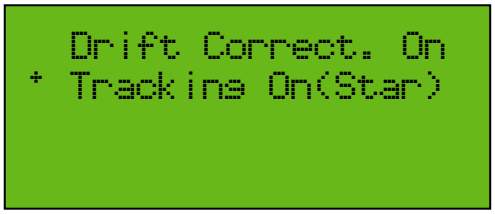
1 In Main mode, press **2 ALGN** Key.



2 Use the ▲ and ▼ arrow keys to move to the `Tracking Off` menu.



3 Press the **ENT.** key to select `Tracking Off` or `Tracking On (Star)`.



direction	If you are using the GOTO function, you can skip setting the tracking mode.

Polar error compensation tracking function (Drift Correct. On / Drift Correct. Off)

Here's how to track a celestial object:

- Polar error compensation tracking (Drift Correct. On)
- Normal tracking (Drift Correct. Off)

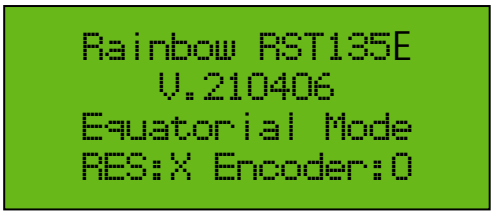
In the Drift Correct. Off mode, only the motor of the right ascension axis is driven when tracking the target.

In Drift Correct. On mode, the motors of the right ascension axis and the declination axis are driven together when tracking the target. In this mode, the declination axis motor is driven together with the error value calculated in the alignment process to increase the tracking accuracy.

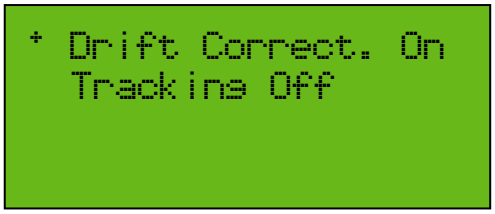
⚠ direction	The default setting for the mount is Drift Correct. On mode.

To set the polar error compensation tracking mode:

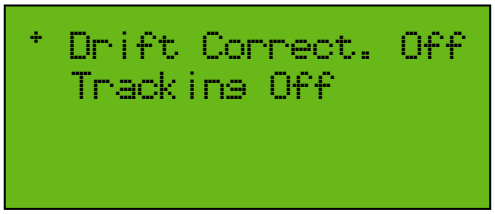
1 In Main mode, press **2 ALGN** Key.



2 Use the ▲ and ▼ arrow keys to move to the `Drift Correct. On` or `Drift Correct. Off` menu.



3 Press **ENT.** Key to select `Drift Correct. On` or `Drift Correct. Off`.



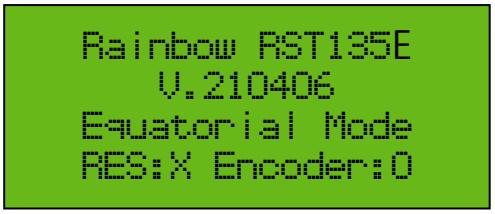
Communication (USB/WiFi)

You can select the communication method or check the WiFi information.

Select USB or WiFi

To select USB mode or WiFi mode:

1. In Main mode, press the **7 MENU** key.



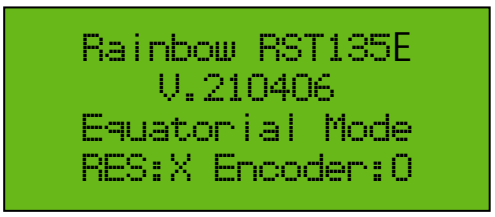
2. Use the ▲ and ▼ keys to move to the `Communication` menu.
3. Press the **ENT.** key to select the `Communication` menu.

4. Use ▲, ▼ keys to move to the mode you want to select.
5. Press the **ENT.** key to select the mode.

Check WiFi information

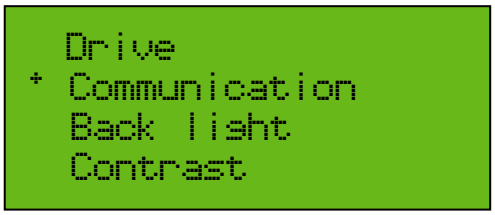
To check WiFi information:

1 In Main mode, press the **7 MENU** key.



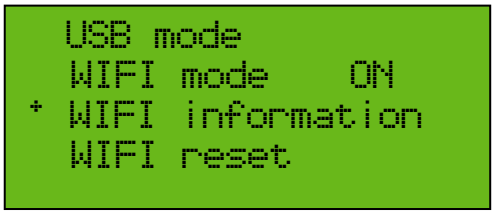
2 Use the ▲ and ▼ keys to move to the `Communication` menu.

3 Press the **ENT.** key to select the `Communication` menu.

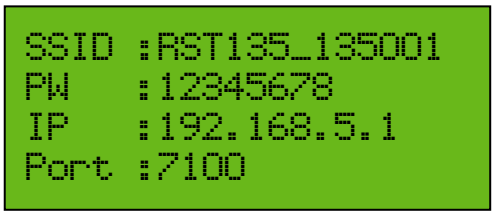


4 Use ▲, ▼ keys to move to the `WIFI information` menu.

5 Press the **ENT.** key to select the menu.



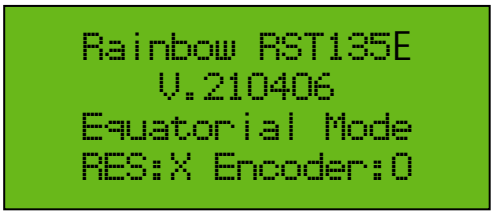
6 It shows SSID, Password, IP, port.



PROTOCOL

Protocol change for using Sky Safari:

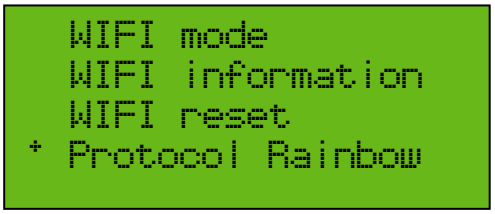
1 In Main mode, press the **7 MENU** key.



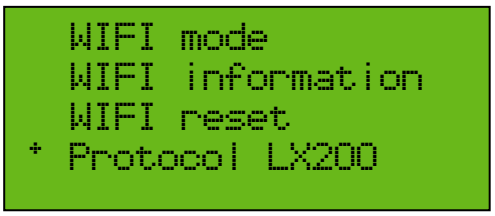
2 Use the ▲ and ▼ keys to move to the `Communication` menu.

3 Press the **ENT.** key to select the `Communication` menu.

4 Use ▲, ▼ keys to move to the `Protocol Rainbow` menu.



5 Press the **ENT.** key to change to the `Protocol LX200` mode.



Alert notification

If an alert notification occurs while using the mount, the corresponding message is displayed in the product's display window.

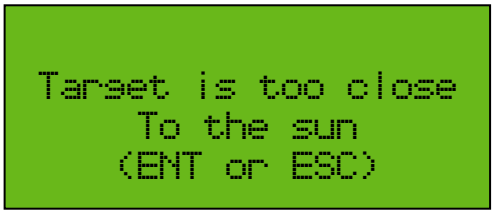
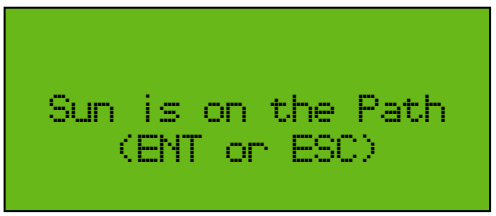
The types of alert notifications are:

- Sun alert
- GOTO Limit Notice
- Motor warning

Sun alert

When there is a possibility of the sun coming into the sight of the telescope, the sun warning alert will be displayed.

Table 3-2 Sun warning alert message

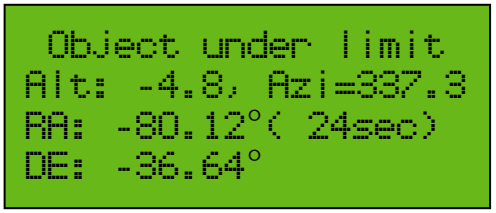
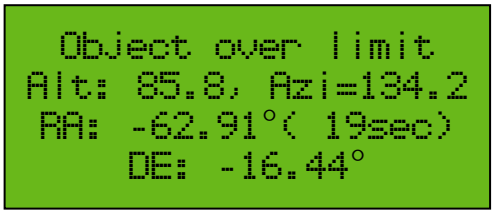
▪ Targets are too close to the sun	
▪ If the sun is close to the path the mount is heading to	

If it is safe, press the **ENT.** key to continue the operation.

GOTO Limit Notice

A notification message is displayed when the pointing object is out of the set limit.

Table 3-3 GOTO limit notification message

▪ If the target is lower than the minimum value	
▪ If the target is higher than the maximum value	

For details, refer to 'Limit setting' (p.76).

Motor warning

Motor warning is displayed when the motor is over loaded or the motor temperature becomes too high.

Table 3-4 Motor Alert Notification Message

▪ If the telescope strikes a pier or tripod	DE motor JAM!!! DE motor over Temp RA motor JAM!!! RA motor over Temp
▪ When the encoder signal of the motor is abnormal	DE encoder fail RA encoder fail

When a motor warning notification occurs, the mount will turn off the power so that the motor in that axis no longer operates.

After checking the following items, turn the power of the mount off and on again.

✡ Weight of mounted equipment

✡ Collision of a telescope with a tripod(pier)

✡ Pulling of cable etc.

Homing

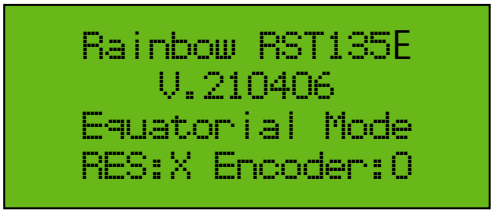
Homing is to find the reference position mechanically.

The mount can be precisely homed by using the sensor to locate the reference position.

Homing is useful for remote observatory. This is because even if power is unexpectedly turned off during remote observation, homing process ensures GOTO accuracy.

The homing process is as follows.

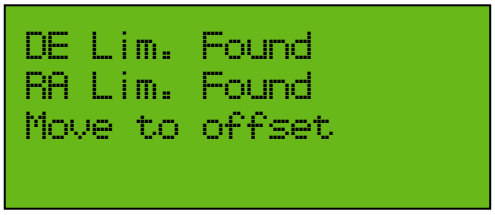
1 In Main mode, press and hold the **0 ILL** key.



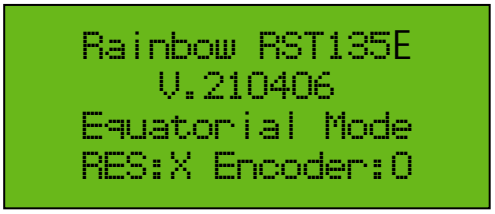
2 The declination axis of the mount automatically rotates and finds Home.

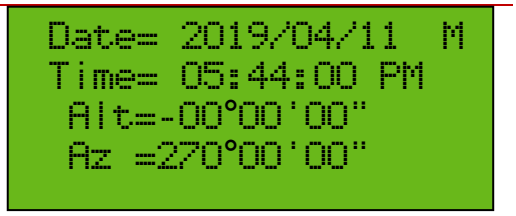
3 The right ascension axis of the mount automatically rotates and finds Home.

4 The declination and right ascension axes of the mount rotate slightly at the same time.



5 The current position is automatically reset to the initial position.





⚠ caution	For your safety, the Home search range is limited to 90 degrees.

⚠ direction	▪ If homing fails, retry. ▪ Be sure to park at an altitude of 0 degrees, azimuth 270 degrees before powering off the mount. (In the southern hemisphere, altitude 0 degrees, azimuth 90 degrees)

4 GOTO

This product has a GOTO function that automatically points the target.

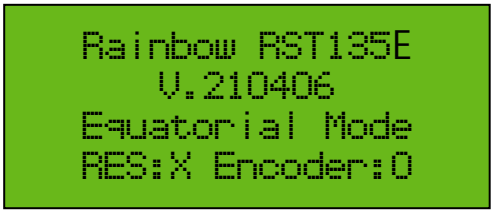
This chapter describes the Alignment, FIND function and Parking related to the GOTO function.

GOTO

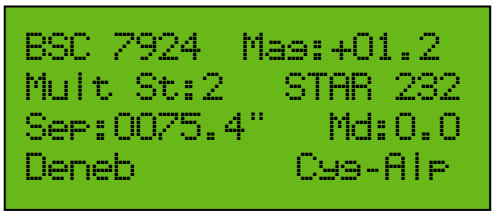
GOTO is a function that automatically points the mount to the target.

Here's how to do a GOTO:

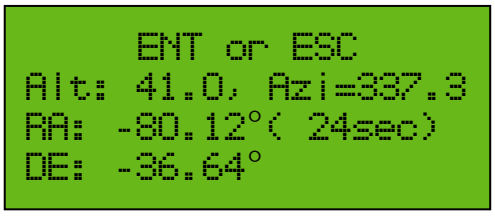
1. In Main mode, press the key corresponding to the information you want to access. (**3 D.S.** key, **6 STAR** key, **8 MSC** key, **9 PLNT** key)



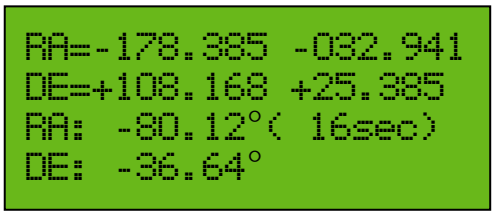
2. Press the **ENT.** key to select the target you want to GOTO.
3. Press the **1 GOTO** key to GOTO the selected target.



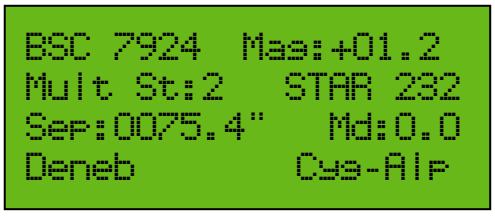
4. Displays the time required for GOTO and the angle at which the two axes rotate.
5. Press the **ENT.** key.



6. The remaining angle and time are displayed as the mount starts moving.



7. When the GOTO is completed, the information of the target is displayed again.



direction

- GOTO is available in Object mode.
- Alignment is required for precise GOTO. For a detailed explanation of Alignment, see 'Alignment' (p.52).

Alignment

Alignment is to repeat the process of GOTO and sync with star. Through this process, mount learns and finds the error value.

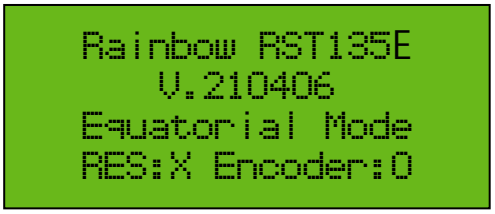
After completing the alignment process, correct the following items.

- Polar align error – altitude
- Polar align error – azimuth
- Telescope declination error
- Telescope right ascension error
- Mechanical error 1
- Mechanical error 2

direction	We recommend the following for precise GOTO. ▪ Please Alignment 5 stars. ▪ Please use a high magnification eyepiece with built-in reticle. Or use camera (CCD) and screen crosshair.

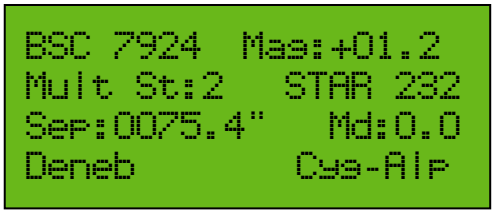
Here's how to do an alignment:

1 In Main mode, press **6 STAR** key for GOTO to star. Please refer to 'Database' (p.21) and 'GOTO' (p.49) for a detailed explanation of how to GOTO to star.



2 After GOTO, use the ▲, ▼, ◀, ▶ keys to center the object in the telescope field of view.

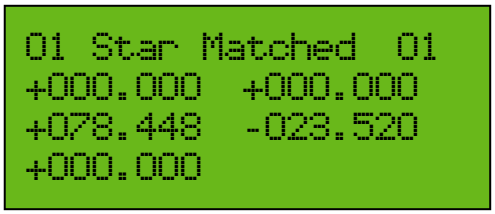
3 If the target is located at the center, press and hold the **ENT.** key.

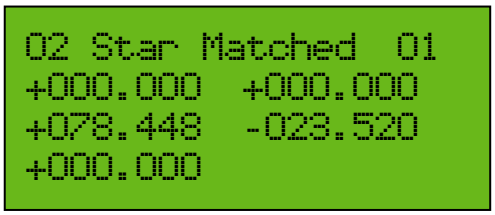


4 Press the **NEXT** key to confirm.

5 When the alignment is completed normally, the completed number is displayed in the upper left corner.

6 Repeat the above procedure four times or more for each different star for a precise GOTO.

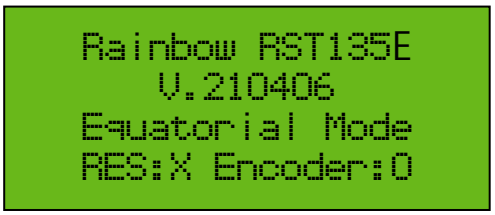




Check alignment data (Align angle)

Here's how to check the information calculated through the alignment process:

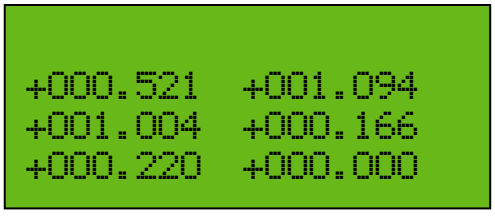
1 In Main mode, press and hold **ENT.** key.



2 Use the ▲ and ▼ arrow keys to move to the `Align angle` menu.

3 Press the **ENT.** key to select the `Align angle` menu.

4 The calculated information is displayed in the Alignment process.

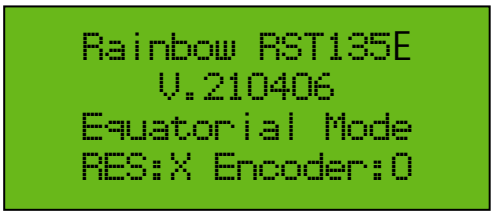


Saving alignment data (Auto Res.)

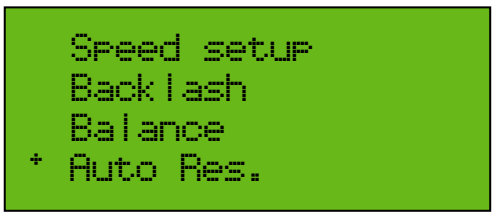
Auto Resume is a function that stores the alignment data and saves the angle that it was pointing to even if the mount is turned off.

To save the alignment data:

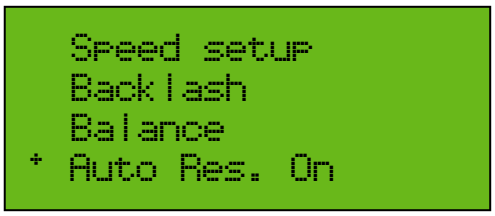
1. In Main mode, press and hold **ENT.** key.



2. Use the ▲ and ▼ arrow keys to move to the `Auto Res.` menu.
3. Press **ENT.** key.



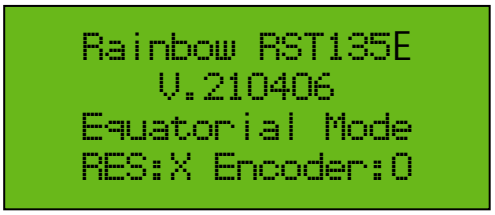
4. It changes to `Auto Res. On`.



Delete Alignment data

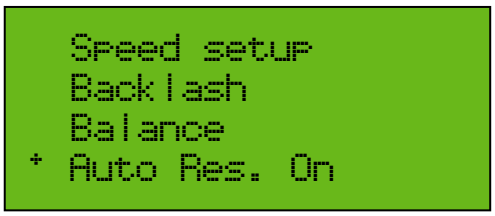
To delete the alignment data:

1 In Main mode, press and hold **ENT.** key.



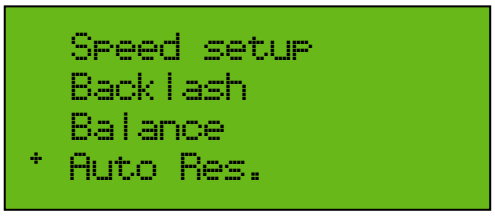
2 Use the ▲ and ▼ arrow keys to move to `Auto Res. On` menu.

3 Press **ENT.** Key.



4 It changes to `Auto Res.`

5 Turn off and on the mount power.



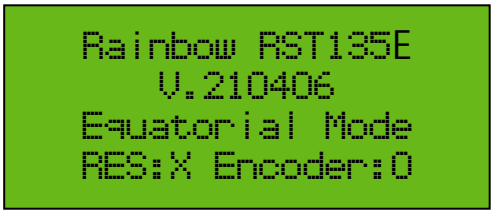
Search nearby objects (Find)

Finding nearby objects is a useful feature for identifying objects in the sky that you do not know.

This function is used to find targets near the current telescope pointing.

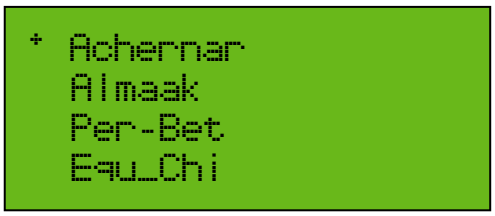
Here's how to find nearby objects:

1. Press the **4 FIND** key in Main mode.



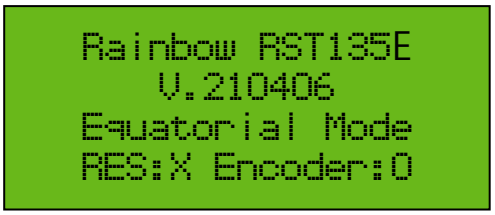
2. Use ▲, ▼ keys to move to the menu you want to select.
3. Press the **ENT.** key to select the menu.

4. Use the ▲ and ▼ keys to move to the target you want to find.
5. Press the **ENT.** key to select the target.



To set the search range, brightness range and type, follow the procedure below.

1. Press the **4 FIND** key in Main mode.

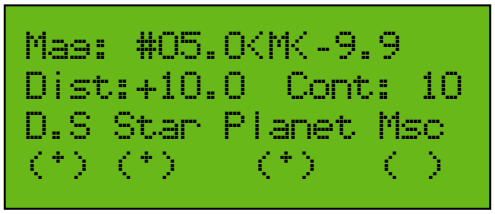


2. Press and hold **ENT.** Key.

3 Use numeric keys, * – keys, # + keys to enter values.

4 Use the * –key, #+ keys to enable or disable the D.S, Star, Planet, and Msc entries.

5 Press the **ENT.** key to complete the setting.



Parking

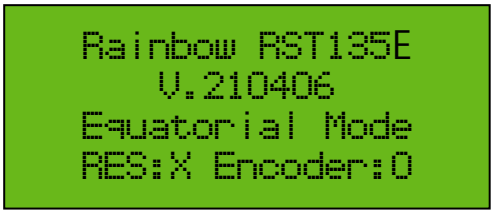
Parking is to move the mount at the pre-saved angle after you have finished using the mount. Parking also stops tracking.

The default has the following values according to the location of the observer and the setting of the mount.
Equatorial Mode, Northern Hemisphere - West(AZI 270 deg, ALT 0 deg)
Equator Mode, Southern Hemisphere - East(AZI 90 deg, ALT 0 deg)
Alt-Azi mode, Northern Hemisphere -South(AZI 180 deg, ALT 0 deg)
Alt-Azi mode, Southern hemisphere - North(AZI 0 deg, ALT 0 deg)

Polar Axis means the direction of the polar axis. It can be used when aligning the polar axis with ASIAIR, SharpCap, StellarMate, etc.
Northern Hemisphere - North (AZI 0 deg)
Southern Hemisphere - South (AZI 180 deg)

Here's how to parking.

1 In Main mode, press the **8 MSC** key.

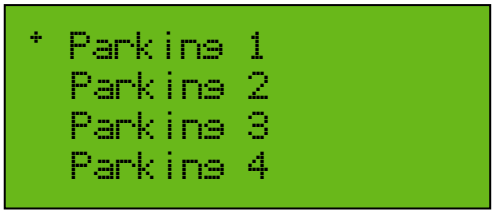


2 Use the ▲ and ▼ keys to move to the Parking menu.

3 Press the **ENT.** key to select the Parking menu.

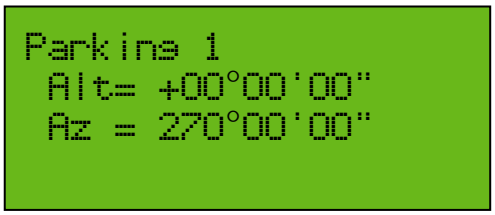
4 The Parking list appears.

5 Use the ▲ and ▼ keys to select the parking position.



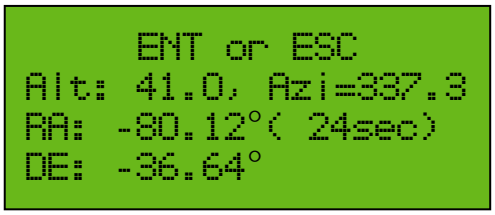
6 Parking position information is displayed on the screen.

7 Press the **1 GOTO** key.

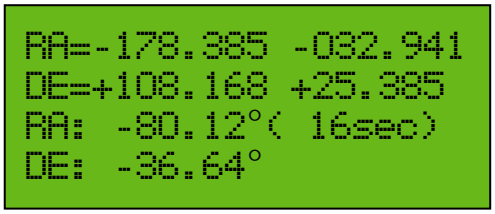


8 Displays the time required for parking and the angle which the two axes rotate

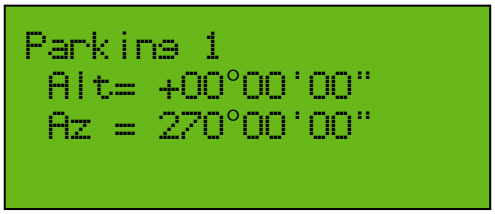
9 Press **ENT.** Key.



10 The remaining angle and time are displayed as the mount starts moving



11 When the parking is completed, the information of the parking position is displayed again.



⚠ direction	Be sure to park before you turn off the mount.

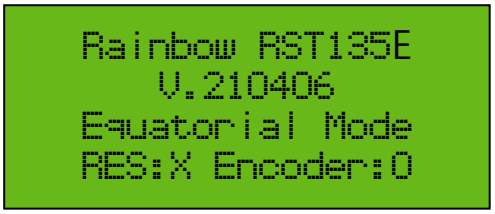
5 Input data

This section describes how to input, save, delete, and reset the data of the location, parking position, astronomical coordinates, and favorites.

Location

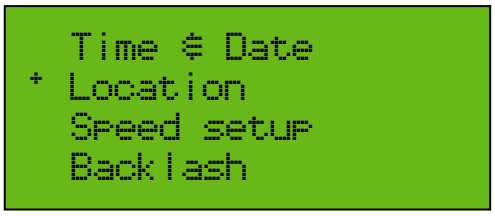
Here's how to enter the location information when you are not using GPS.

1 In Main mode, press and hold **ENT.** Key.



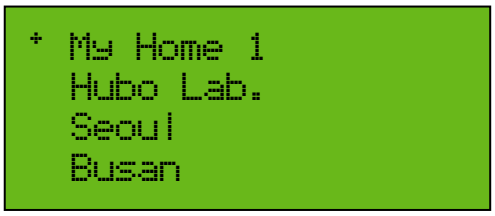
2 Use the ▲ and ▼ keys to move to the Location menu.

3 Press the **ENT.** key to select the Location menu.



4 Use the ▲ and ▼ keys to move to the location you want select.

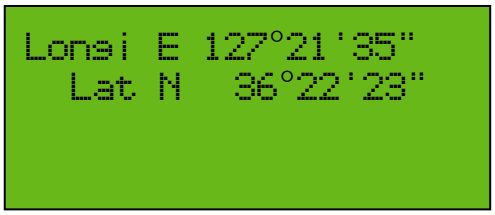
5 Press **ENT.** to select location.



6 Press and hold **ENT.** key to enter Edit mode.

7 Input latitude and longitude values.

8 Press the **ENT.** key to save the value.



⚠ direction

For more information on location input, refer to 'Locaction Setting' (p.36).

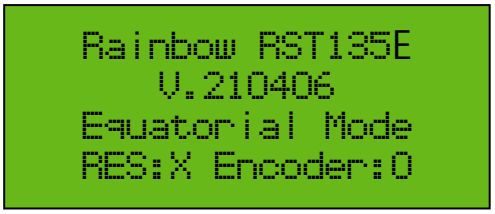
Parking position

Describes how to input and save parking position and reset stored position.

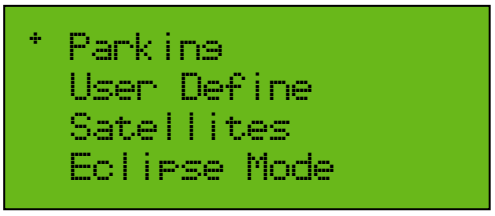
Enter parking position

Here's how to enter parking position manually:

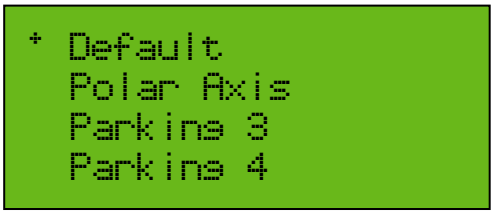
1. In Main mode, press the **8 MSC** key.



2. Use the ▲ and ▼ keys to move to the `Parking` menu.
3. Press the **ENT.** key to select the `Parking` menu.

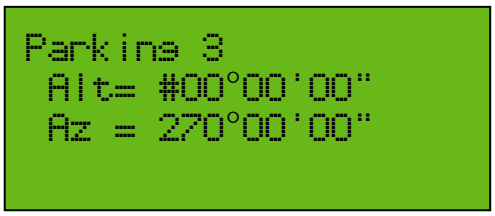


4. A list of parking positions appears.
5. Use the ▲, ▼ direction keys to move to the Parking position you want to select.
6. Press and hold **ENT.** key



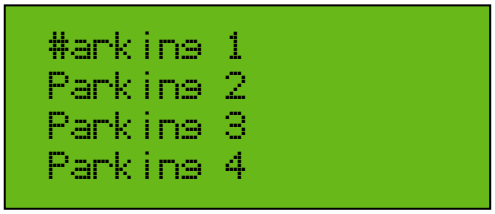
7. Use the ▲ and ▼ keys to move to the `Edit` menu.
8. Press the **ENT.** key to select the `Edit` menu.

9. Enter altitude and azimuth.
10. Press the **ENT.** key to complete the input.



11 Use the ▲ and ▼ keys to enter the parking name.

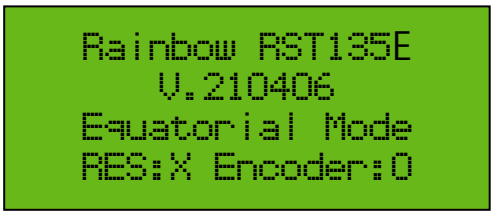
12 Press the ENT key to save the entered value.



Save current position to parking position

To store the current mount point as parking position:

1 In Main mode, press the **8 MSC** key.



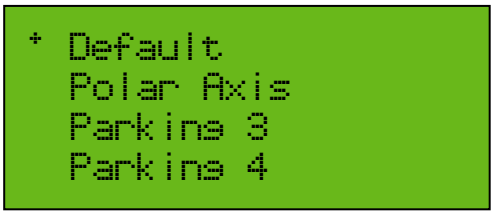
2 Use the ▲ and ▼ keys to move to the `Parking` menu.

3 Press the `ENT.` key to select the `Parking` menu.

4 A list of parking positions appears.

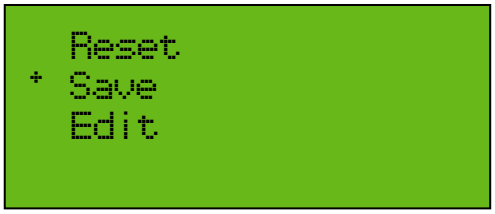
5 Use the ▲, ▼ direction keys to move to the Parking position you want to select.

6 Press and hold **ENT.** key



7 Use the ▲ and ▼ keys to move to the `Save` menu.

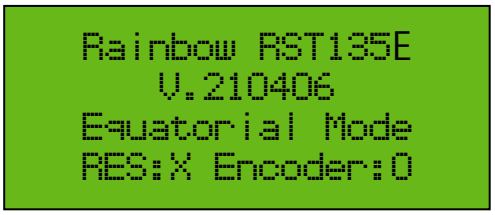
8 Press the **ENT.** key to select the `Save` menu.



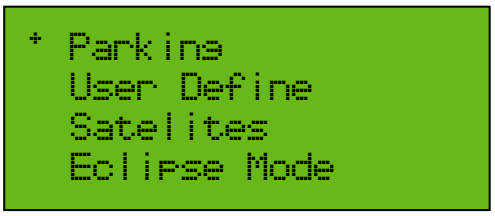
Parking position reset

To reset the parking position, follow the steps below.

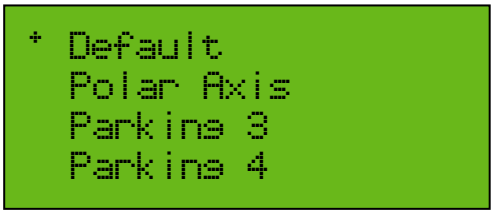
1. In Main mode, press the **8 MSC** key.



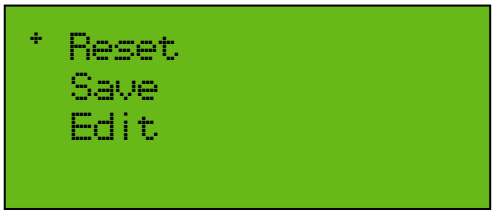
2. Use the ▲ and ▼ keys to move to the `Parking` menu.
3. Press the **ENT.** key to select the `Parking` menu.



4. A list of parking positions appears.
5. Use the ▲, ▼ direction keys to move to the Parking position you want to select.



6. Press and hold **ENT.** key
7. Use the ▲ and ▼ keys to move to the `Reset` menu.
8. Press the **ENT.** key to select the `Reset` menu.



User input celestial coordinates (User Define)

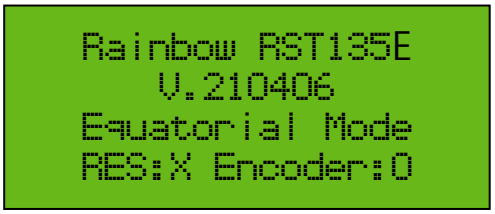
Describes how the user enters and saves new astronomical coordinate information and how to reset the stored information.

⚠ direction	The type of value stored depends on the tracking mode of the mount. ▪ Tracking Off: Save as altitude, azimuth ▪ Tracking On: Save as right ascension, declination

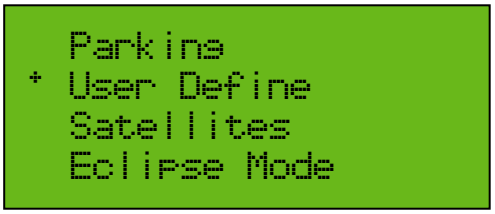
Enter user define

Here's how you can manually enter new celestial coordinates.

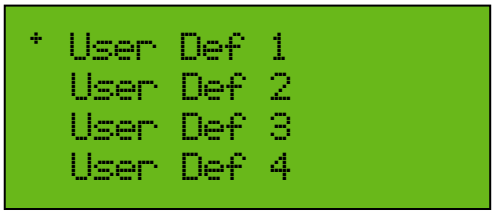
1. In Main mode, press the **8 MSC** key.



2. Use the ▲ and ▼ keys to move to the `User Define` menu.
3. Press the **ENT.** key to select the `User Define` menu.

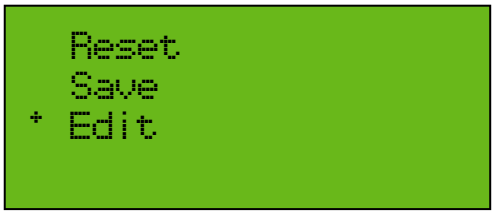


4. The User Define object list appears.
5. Use the ▲ and ▼ keys to move to the User Define object you want to select.
6. Press and hold **ENT.** key



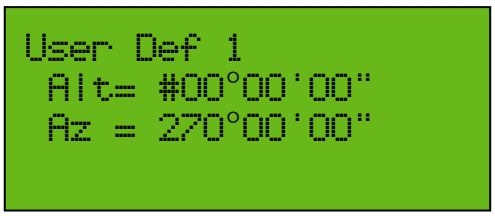
7 Use the ▲ and ▼ keys to move to the `Edit` menu.

8 Press the **ENT.** key to select the `Edit` menu.



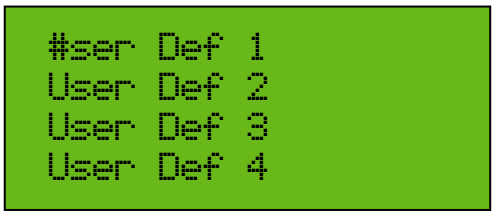
9 Enter the altitude and azimuth.

10 Press the **ENT.** key to complete the input.



11 Use the ▲ and ▼ keys to change the User Define name.

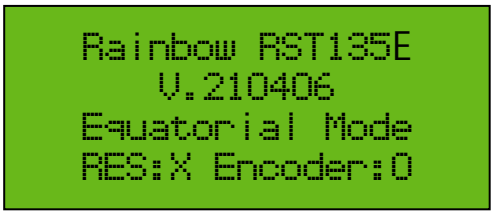
12 Press the **ENT.** key to save the entered value.



Save current position to user define

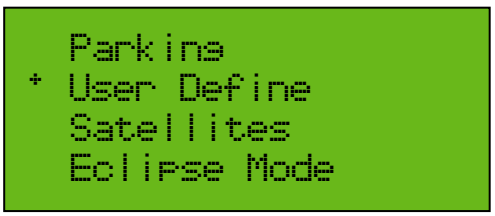
Here's how to save where your current mount is heading:

1 In Main mode, press the **8 MSC** key.



2 Use the ▲ and ▼ keys to move to `the User Define` menu.

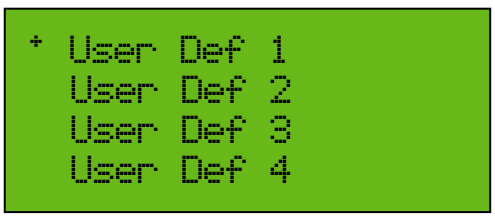
3 Press the **ENT.** key to select the `User Define` menu.



4 The User Define object list appears.

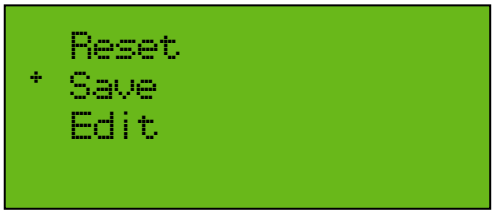
5 Use ▲, ▼ keys to move to the `User Define` to save.

6 Press and hold **ENT.** key



7 Use the ▲ and ▼ keys to move to the Save menu.

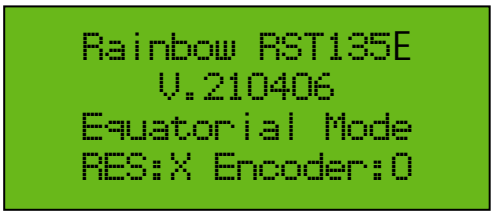
8 Press the **ENT.** key to select the `Save` menu.



Reset user define

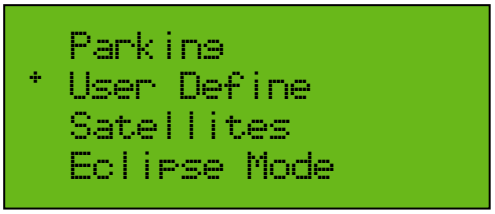
To reset user define:

1 In Main mode, press the **8 MSC** key.

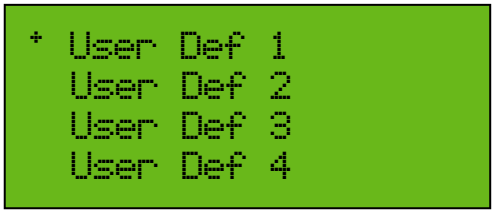


2 Use the ▲ and ▼ keys to move to `the User Define` menu.

3 Press the **ENT.** key to select the `User Define` menu.



4 The User Define object list appears.

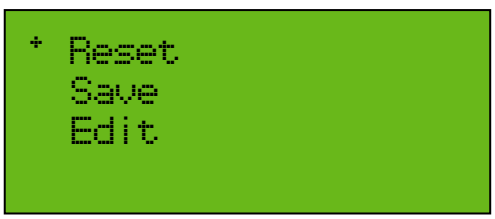


5 Use the ▲ and ▼ keys to move to the User Define you want to reset.

6 Press and hold **ENT.** key

7 Use the ▲ and ▼ keys to move to the `Reset` menu.

8 Press the **ENT.** key to select the `Reset` menu.



direction

The initial values are as follows.

- Ra = 12h00m00s

	▪ Dec= +00°00'00"

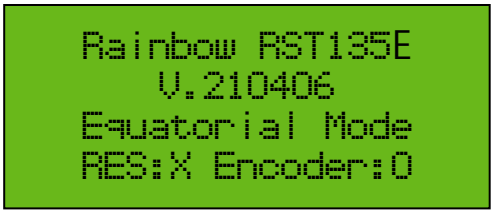
Favorites (User Object)

Describes how to add or delete favorites as a way to quickly and easily find what you are viewing frequently.

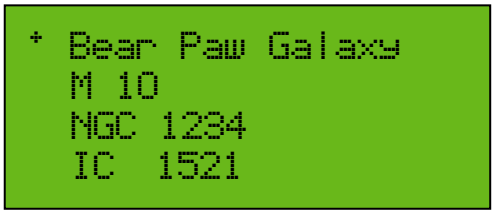
Add to Favorites

To add a Favorites:

1. In Main mode, press the **5 User** key.



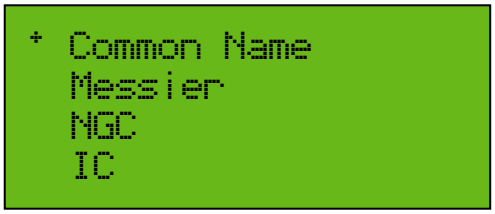
2. Press and hold **ENT.** key



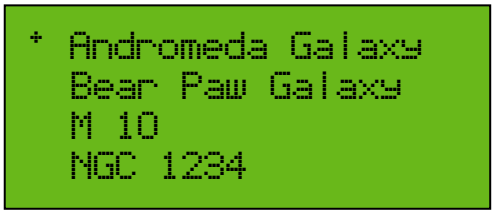
3. Use the ▲ and ▼ keys to move to the Add menu.
4. Press the **ENT.** key to select the Add menu.

5. Press the keys (**3 D.S.**, **6 STAR**, **9 PLNT**) for the target you want to bookmark.

6. This is the screen that appears when the **3 D.S.** key is selected.
7. Use the ▲ and ▼ keys and the **ENT.** key to select the target you want to add.



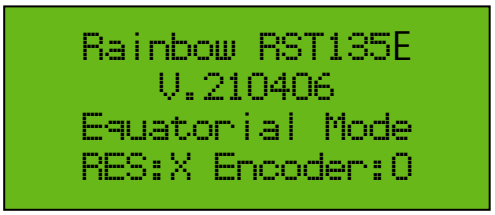
8 This is the screen with the selected target added.



Delete favorites

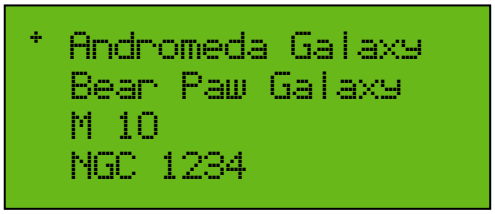
To delete a bookmark:

1 In Main mode, press the **5 User** key.



2 Use the ▲ and ▼ keys to move to the object you want to delete.

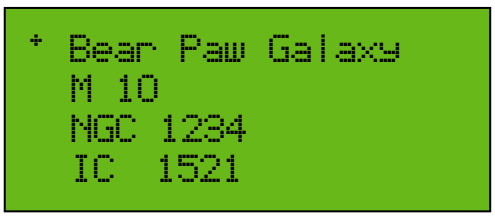
3 Press and hold **ENT.** key



4 Use the ▲ and ▼ keys to move to the `Delete` menu.

5 Press the **ENT.** key to select the `Delete` menu.

6 The selected object is deleted.



6 Settings

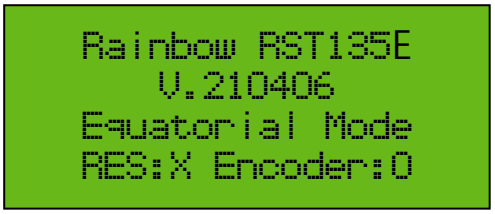
This chapter describes the following various settings.

- Speed setup
- Limit setting
- Check electronic equipment status
- Backlash compensation
- Change tracking speed
- Display window settings
- Polar scope light control
- PEC setting

Speed setup

To set the drive speed of the mount, follow the steps below.

1 In Main mode, press and hold **ENT.** Key.



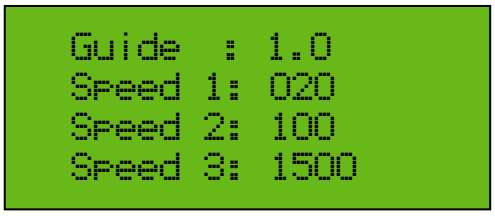
2 Use the ▲ and ▼ keys to move to the `Speed setup` menu.

3 Press the **ENT.** key to select the `Speed setup` menu.

4 Use the ▲ and ▼ keys to move to the `Slew setup` menu.

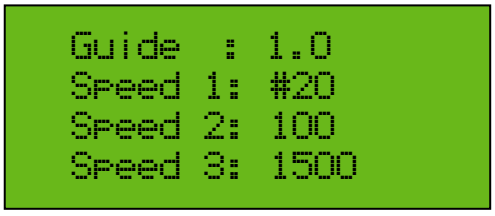
5 Press the **ENT.** key to select the `Slew setup` menu.

6 Press and hold **ENT.** key to enter Edit mode.



7 Use the ◀, ▶ keys and number keys to enter the value.

8 Press the **ENT.** key to save the entered value.



direction

- The drive acceleration is set in the same way as the drive speed setting by selecting the `ACC.` menu.
- Drive acceleration can be set for each drive speed.

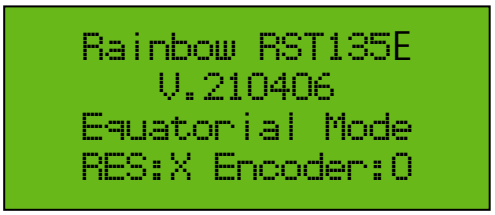
Limit setting(Limit)

Setting the drive limit will automatically stop the tracking of the mount at the set point.

If you attempt to GOTO out of the set limit, a warning message will be output.

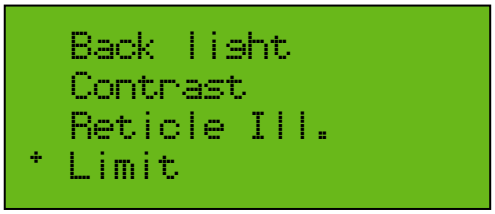
Here's how to set the mount's limit:

1 In Main mode, press the **7 MENU** key.

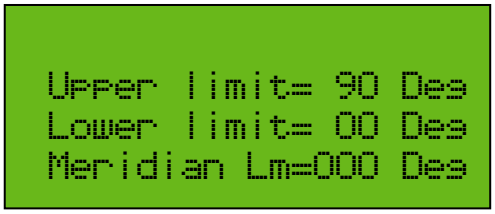


2 Use the ▲ and ▼ keys to move to the `Limit` menu.

3 Press the **ENT.** key to select the `Limit` menu.

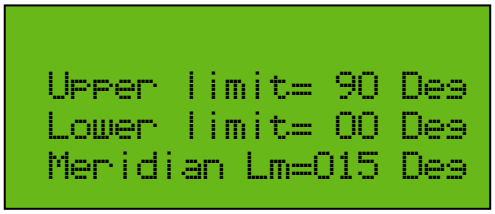


4 Press and hold **ENT.** key to enter Edit mode.



5 Use the ◀, ▶ keys and number keys to enter the value.

6 Press the **ENT.** key to save the entered value.



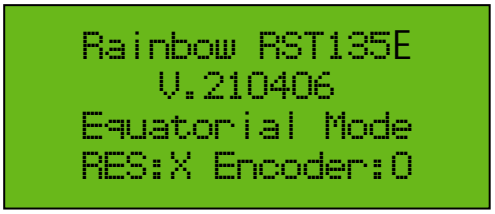
⚠ direction	The drive limit setting items are as follows. ▪ Upper limit: Altitude upper limit (GOTO, tracking) ▪ Lower limit: Altitude lower limit(GOTO, tracking) ▪ Meridian Lm: Meridian limit(tracking) If Meridian Lm is 0, tracking stops when the object passes through meridian. If the Meridian Lm is 15, the object will move 15 degrees beyond meridian and stop tracking.

⚠ caution	When setting the limit, be careful that the telescope or other equipment does not hit the tripod(pier).

Check electronic equipment status (Voltage & Temp)

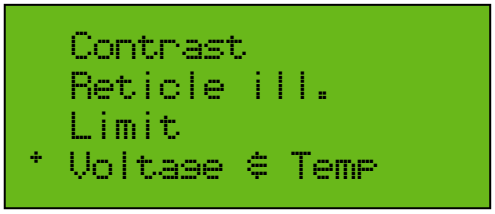
How to check the temperature of electronic board, temperature of motor, input voltage is as follows.

1 In Main mode, press the **7 MENU** key.

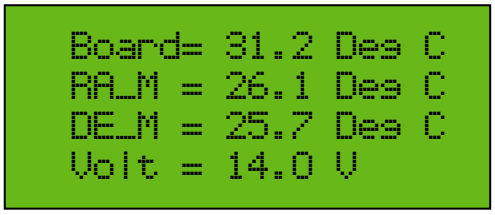


2 Use the ▲ and ▼ keys to move to the Voltage & Temp menu.

3 Press the **ENT.** key to select the Voltage & Temp menu.



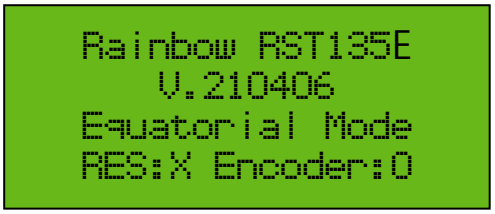
4 Check the information.



Backlash compensation (Backlash)

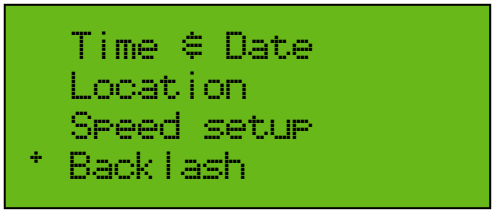
Here's how to reduce backlash in software.

1 In Main mode, press and hold **ENT.** Key.

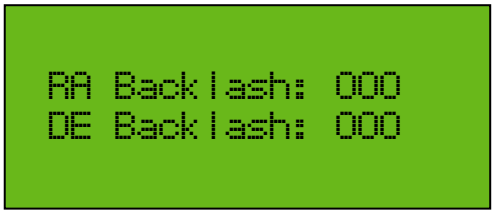


2 Use the ▲ and ▼ keys to move to the Backlash menu.

3 Press the **ENT.** key to select the Backlash menu.

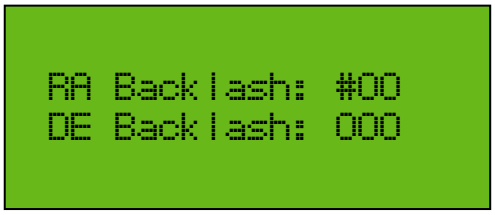


4 Press and hold **ENT.** key to enter Edit mode.



5 Use the ◀, ▶ keys and number keys to enter the value.

6 Press the **ENT.** key to save the entered value.



⚠ direction

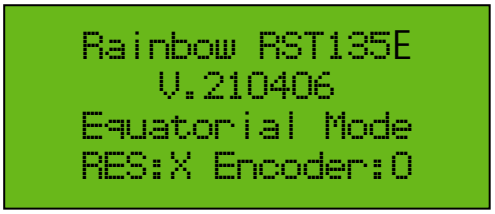
Do not use Backlash compensation when taking pictures.

When using the Autoguide, the mount can overshoot and the tracking accuracy may decrease accordingly.

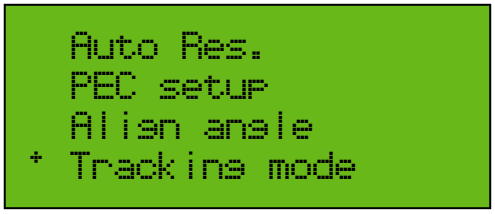
Change tracking speed (Tracking mode)

To set the tracking speed to the speed of the star, sun, and moon:

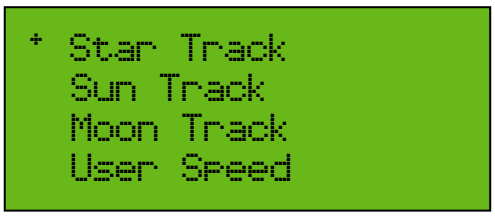
1. In Main mode, press and hold **ENT.** Key.



2. Use the ▲ and ▼ keys to move to the `Tracking mode` menu.
3. Press the **ENT.** key to select the `Tracking mode` menu.



4. Use the ▲, ▼ direction keys to move to the tracking mode you want to select.

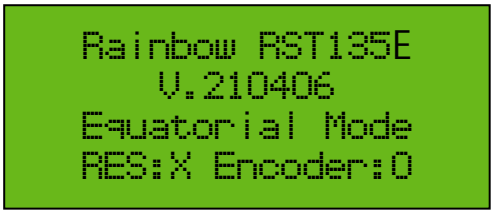


⚠ direction	When using the GOTO function, do not change the tracking speed. It automatically changes to the speed that suits the target.

Display window settings (Back light)

How to adjust the brightness of the display window are as follows:

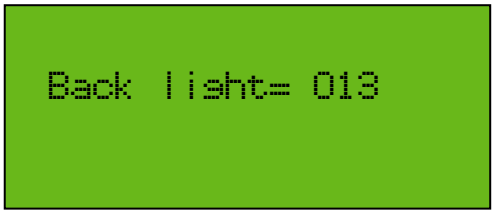
1 In Main mode, press the **7 MENU** key.



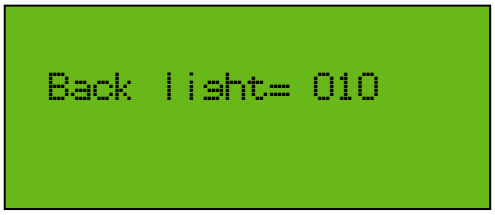
2 Use the ▲ and ▼ keys to move to the `Back light` menu.

3 Press the **ENT.** key to select the `Back light` menu.

4 Use the ◀, ▶ keys to adjust the value (0 ~ 13).



5 Press the **ENT.** key to save the entered value.



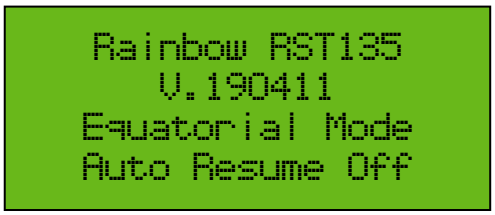
direction	Adjust the contrast by selecting the `Contrast` menu and adjusting it in the same way as the brightness adjustment (0 ~ 20).

Polar alignment assist

This function tells you the amount and direction you need to turn the mount's altitude find adjustment knob and azimuth find adjustment knob for polar alignment. This is an auxiliary function to use when you do not have an electronic polar telescope or polar alignment software, or when the Polaris is not visible. This function may not be accurate as it is affected by the precision of star alignment and the mechanical play of the fine adjustment knob.

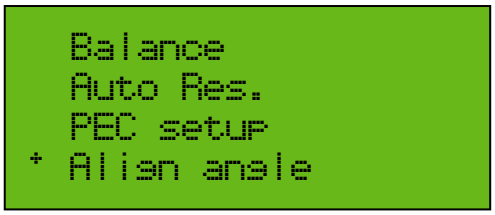
After aligning 3 or more stars, this function is activated. (5 star alignment is recommended.) Among products shipped before April 2020, the amount of rotation of the fine adjustment knob is not correct for products that have not upgraded the polar axis adjustment part. In this case, please rotate about half the amount of rotation indicated on the screen.

1 In Main mode, press and hold **ENT.** key.

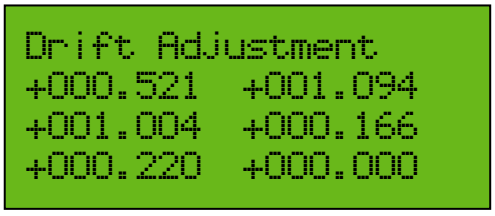


2 Use the ▲ and ▼ arrow keys to move to the `Align angle` menu.

3 Press the **ENT.** key to select the `Align angle` menu.

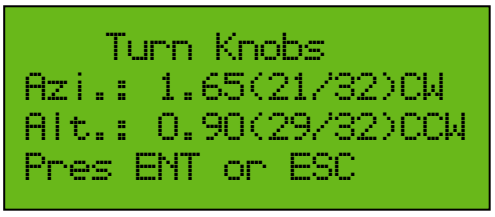


4 The calculated information is displayed in the Alignment process.



5 Press the ENT. Key to enter the screen of the polar alignment assist function.

6 Turn the fine adjustment knob of the mount in the amount and direction indicated on the screen and press the **ENT.** key to apply. If you want to



cancel the function, press the **ESC** key.

⚠ direction	CW means clockwise and CCW means counterclockwise. "1.65" means 1.65 turns. Numbers in parentheses are decimal values expressed as fractional values. The direction of Azi. is applied to the right azimuth find adjustment knob. Turn the left knob the same amount in the opposite direction.

7 Change mount type

There are two ways to use this product as an alt-azimuth mount.

The first is to mechanically change the altitude of the mount to 90 degrees and then set it to alt-azimuth mode.

The second is to use the inverse kinematics calculation by setting the virtual alt-azimuth mode in the equatorial state mechanically.

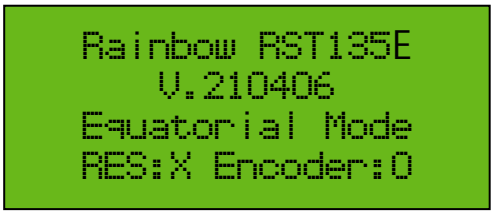
This chapter describes how to set mounts to equatorial or alt-azimuth mounts.

Equatorial/alt-azimuth mode (Mount setup)

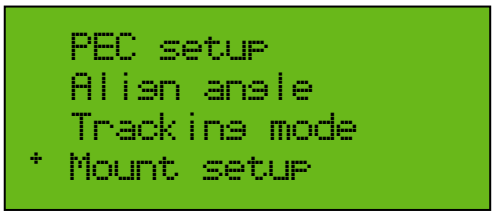
The mount can be used by setting alt-azimuth mode after mechanically changing altitude to 90 degrees.

To select equatorial or alt-azimuth mode:

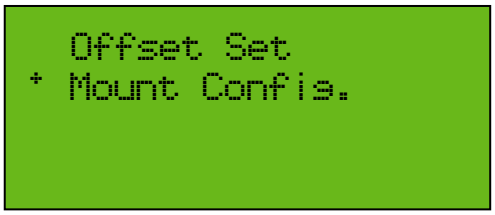
1. In Main mode, press and hold **ENT.** Key.



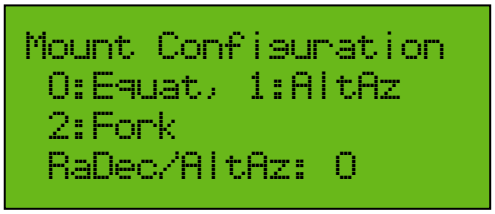
2. Use the ▲ and ▼ keys to move to the Mount setup menu.
3. Press the **ENT.** key to select the Mount setup menu.



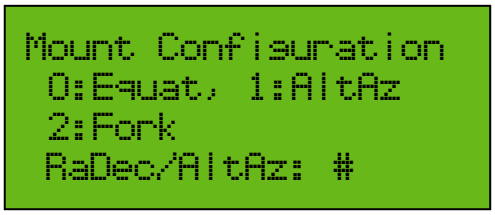
4. Use the ▲ and ▼ keys to move to the Mount Confis. menu.
5. Press the **ENT.** key to select the Mount Confis. menu.



6. Press and hold **ENT.** key to enter Edit mode.



7. Use the number keys to enter the setting value. (0: equatorial mode / 1: alt-azimuth mode/ 2: fork equatorial mode).
8. Press the **ENT.** key to save the entered value.



⚠ direction	After you change the mount type, you must power off and on the mount. In alt-azimuth mode, the mount's initial position is south (altitude 0 degrees, azimuth 180 degrees).

Normal/Virtual alt-azimuth mode (Drive mode)

The mount can be driven in two modes:

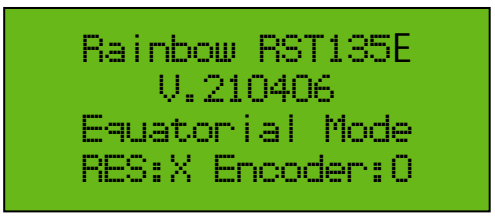
- Normal mode (Motor Mode): Common equatorial mount
- Virtual alt-azimuth (AltAz Mode): Mechanically equatorial but moving like an alt-azimuth mount

Mounts can be used as alt-azimuth mounts through inverse kinematics calculations by setting virtual alt-azimuth mode in equatorial mode.

⚠ direction	This feature is not supported when Polar error compensation tracking function (Drift Correct) is turned off.

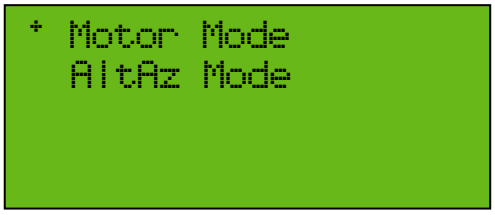
To select normal mode or virtual alt-azimuth mode:

1. In Main mode, press the **7 MENU** key.



2. Use the ▲ and ▼ keys to move to the Drive menu.
3. Press the **ENT.** key to select the Drive menu.

4. Use ▲, ▼ keys to move to the mode you want to select.
5. Press the **ENT.** key to select the mode.



In each mode, the ▲, ▼, ◀, ▶ keys operate as follows.

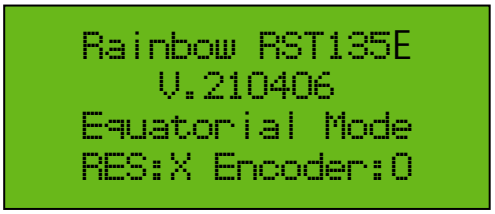
Mode	Arrow Key	Description
Motor Mode (Normal mode)	◀, ▶	Move in right ascension direction.
	▲, ▼	Move in declination direction.
AltAz Mode (Virtual alt-azimuth mode)	◀, ▶	Move horizontally.
	▲, ▼	Move vertically.

High resolution encoder settings

The high resolution encoder function can be turned on or off. High-resolution encoders are always enabled by default, and even if the encoder function is turned off in this menu, it will be turned back to active when the mount is rebooted.

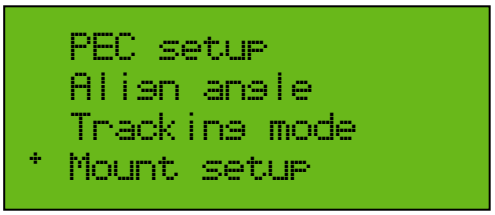
You can turn off the encoder function and use it in a use environment outside the encoder's operating range, such as at low temperatures.

1 In Main mode, press and hold **ENT.** Key.



2 Use the ▲ and ▼ keys to move to the `Mount setup`.

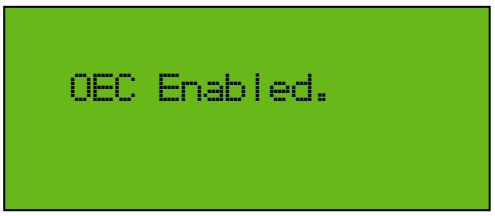
3 Press the **ENT.** key to select the `Mount setup` menu.



4 Use the ▲ and ▼ keys to move to the `OEC mode set`.

5 Press the **ENT.** key to select the `OEC mode set` menu.

6 Pressing the ENT. key toggles between `OEC Enabled.` and `OEC Disabled.`



8 Etc

In addition to this product, this chapter describes the following:

- Auto guide
- Connect with PC
- Firmware update

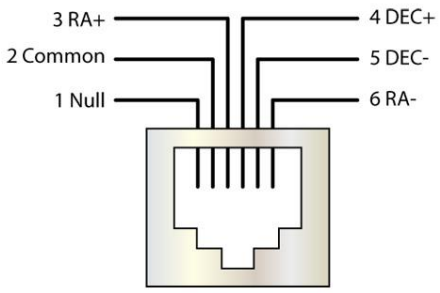
Auto guide

The auto guide uses a CCD camera to correct the tracking error of the mount.

The cause of the tracking error is as follows.

- Polar alignment error
- Mount-specific periodic error
- Poor seeing
- Distortion of optical system etc.

The cameras used in the auto guide differ in the pin arrangement of the auto guide terminals for each manufacturer. Therefore, it must be used after confirmation.



Drawing 8-1 Auto guide rerminal pin arrangement

⚠ **caution**	If the auto guide pin arrangement between the camera and the mount does not match, the auto guide may not work or the mount may malfunction.

Connect with PC

You can connect the mount to your PC for control and status monitoring.

The items to install or check to connect the mount and PC are as follows.

- Ascom Driver
- USB system driver
- Com port

Ascom Driver

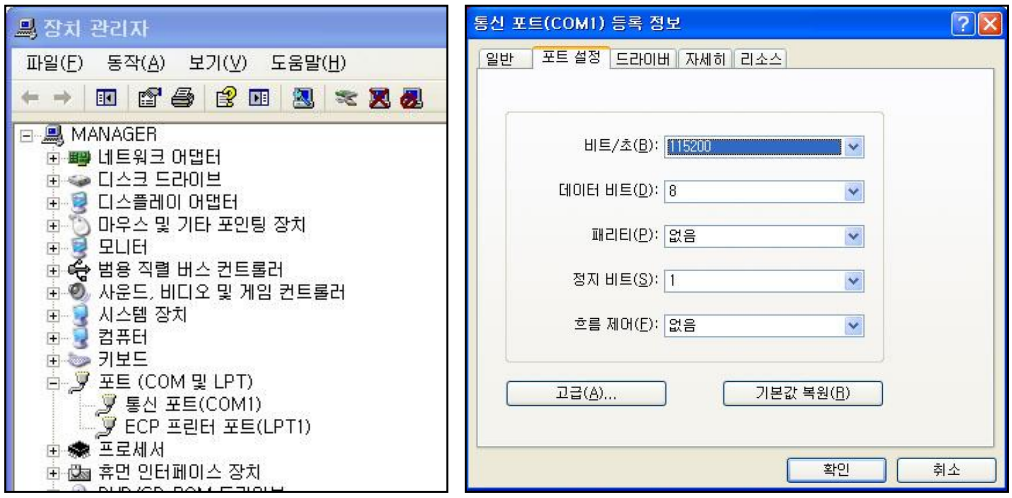
Ascom Driver can be downloaded from the Download〉 Software menu of our homepage (http://www.rainbowastro.com).

USB system driver

The USB system driver is automatically installed. If the USB system driver does not install automatically, please download and install USB to Serial Driver file from the Download〉 Software menu on our homepage.

Com port

After installing the required items, you need to make sure that the communication port (COM) is properly installed. Communication ports can be found in Control Panel〉 Device Manager〉 Ports (COM and LPT).



Drawing 8-2 Check communication port (COM) information

Firmware update

Users can update the firmware through our homepage (http://www.rainbowastro.com).

⚠ direction	RainbowAstro is constantly providing firmware updates to enhance the program's completeness and add user-friendly features.

To update the firmware:

A Download the firmware downloader and the latest firmware from our website (http://www.rainbowastro.com).

B Use a USB cable to connect the mount to the PC.

C Power on the mount while pressing **NEXT** key and **PREV** key.

D The GPS LED and Tracking LED of the mount blink at the same time and `Download Mode` is displayed on the display window.

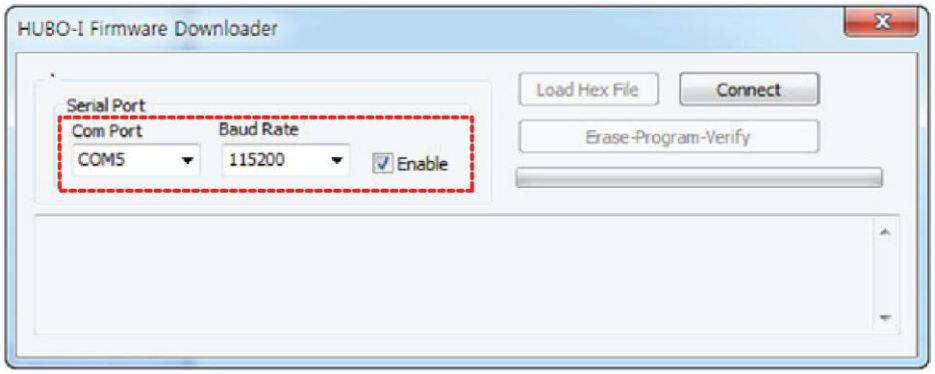
E Run the downloaded HUBOi_Firmware_Downloader.exe.

F Select **COM Port** and check **Baud Rate**. The Baud Rate is 115200.

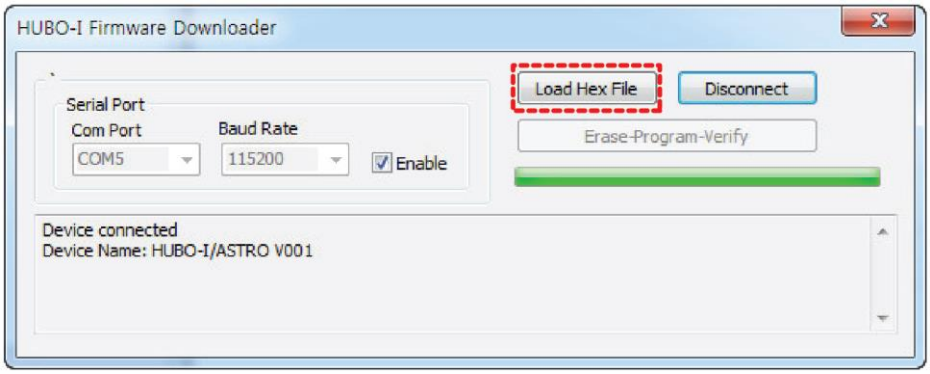
⚠ direction	For details on the communication port (COM), refer to 'Connect with PC' (p.97).

G Click the **Connect** button.

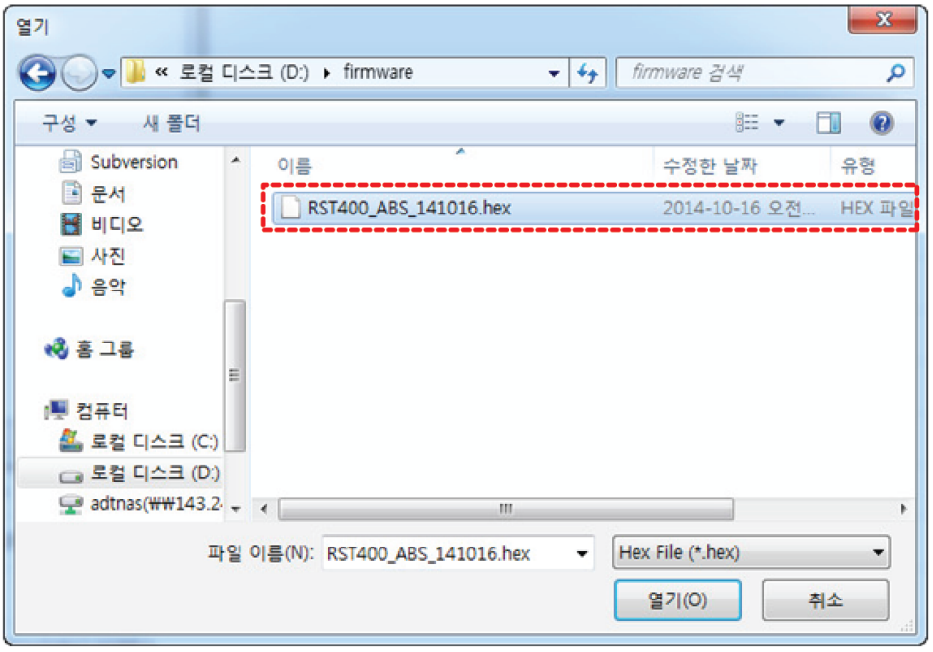
H Make sure the mount is connected to the PC. If the mount is not connected to the PC, check the Com Port and Baud Rate.



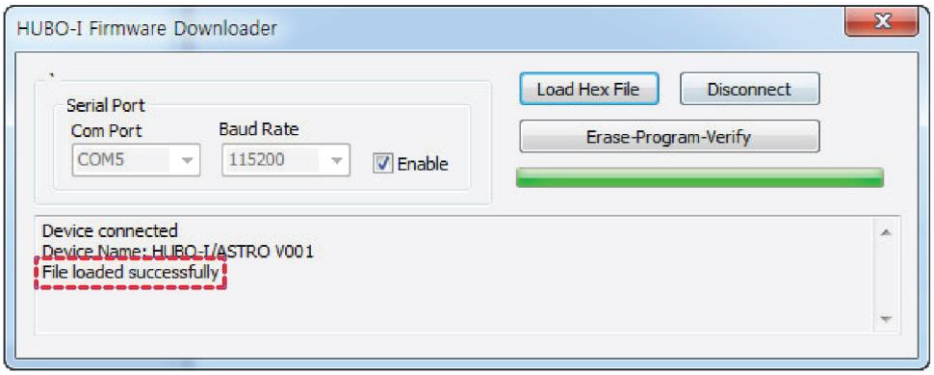
I Click the **Load Hex File** button.



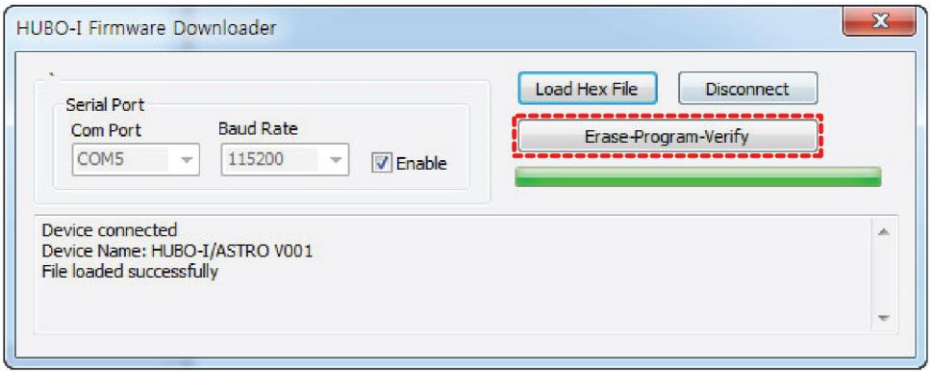
J Please select the downloaded firmware file.



K Make sure the firmware is loaded.



L Click the **Erase-Program-Verify** button to update the firmware.



direction	Do not power off the mount until the update is complete.

M When the firmware update is finished, power off the mount and turn it on.