

# Vixen

## Instruction Manual for **SX2-WL / SXD2-WL**

---



## Preface

### Thank you for your purchase of a Vixen SX2-WL / SXD2-WL equatorial mount..

The SX2 / SXD2 Mount is a motor-driven equatorial mount that is conscious of taking astrophotography. You readily enjoy automatic navigations of the mount for Go-To slewing and tracking with the provided Wireless Unit via a smartphone or a mobile tablet.

This instruction manual is prepared in common with the SX2-WL and SDX2-WL series of mounts and describes the functions and uses. You may occasionally find descriptions not relevant to your purchased model.

If you purchased the mount as a package together with an optical tube, read the instruction manual supplied with the optical tube in conjunction with this manual to make you use the product right and safely.



The contents described in this manual were the ones when the manual was written. Future update of the firmware on the Wireless Unit and app may include new functions not described here. In this case, you can check a newly added description released on Vixen's website. Besides, it is advisable to check if the firmware version of your mount is the latest on our website.



The power source for the mount is sold separately.

## Be sure to read the instructions below before use.












### Safety Precautions

The instruction manual will assist you in the safe and effective use of the product. Before using the mount, carefully read the safety precautions described below.








Legend	
 <b>Warning:</b>	If misused, it can cause severe injury or death.
 <b>Caution:</b>	Misuse can cause injury or damage to you or other property.

Legend	
 <b>Important:</b>	You must complete all of the steps in this manual.
 <b>Important:</b>	You must entirely execute the instructions in this manual.








### Warning

-  Never look directly at the sun with your naked eyes or through your telescope and finderscope.
-  Do not leave the optical tube uncapped in the daytime. Sunlight passing through the telescope or finderscope may cause a fire.
-  Do not use the product in a water-splash environment. This could damage the product and could result in electrical shock.
-  Do not attempt to disassemble or alter any part of the equipment not expressly described in this manual. This could damage the product and result in electric shock or may lead to injury.
-  Keep small caps, plastic bags, or plastic packing materials away from the children. These may cause choking or suffocation.
-  Stop operating the product immediately and unplug the power cord if it emits smoke or a strange smell. It could result in fire or electrical shock.
-  Do not allow liquids or foreign objects to enter the product. Unplug the power cord or switch the power cord off. It could result in fire or electrical shock.
-  Do not damage, alter, or place a heavy item on the power cord. It could result in fire or electrical shock.
-  The product includes heavy-weighted pieces such as the counterweight and the mount body. Be sure to handle these units carefully. Be careful not to drop the unit when lifting. It may cause damage or lead to injury.
-  Be sure to ventilate air while cleaning with volatile cleaner or spray can cleaner to avoid poisoning.
-  Do not use the volatile cleaner or spray can cleaner in the vicinity to fire. It could lead to catching fire.

### Caution

-  Do not leave the product inside a car in bright sunshine or hot places. Keep any strong heat radiation sources away from the product.
-  When cleaning, do not use organic solvents such as paint thinners or similar cleaners. It may cause deterioration.
-  Do not use the product in a wet environment. It may cause the product to malfunction or result in fire or electrical shock.
-  Remove the batteries from the battery compartment if you do not use the product for a long time.
-  For storage, keep in a dry place, where it is not exposed to the direct rays of the sun. If the product gets dew condensation, dry it well in a ventilated place before storage.
-  Avoid touching any lens surface directly with your hands. Blow off dust on lenses using a commercially available blower brush.
-  Prevent the product from being exposed to rain, water droplets, heavy dew, mud, or sands. If the product becomes dirty with general smears, wipe it using a gentle cloth that was dampened and squeezed firmly.

### Handling and Storage

-  Do not leave the product inside a car in bright sunshine or hot places. Keep any strong heat radiation sources away from the product.
-  When cleaning, do not use organic solvents such as paint thinners or similar cleaners. It may cause deterioration.
-  Do not use the product in a wet environment. It may cause the product to a malfunction or result in fire or electrical shock.
-  Remove the batteries from the battery compartment if you do not use the product for a long time.
-  For storage, keep in a dry place where the product is not exposed to direct rays of the sun. If the product gets dew condensation, dry it well in a ventilated place before storage.
-  Avoid touching any lens surface directly with your hands. Blow off dust on lenses using a commercially available blower brush.
-  Prevent the product from being exposed to rain, water droplets, heavy dew, mud, or sands. If the product becomes dirty with general smears, wipe it using a gentle cloth that was dampened and squeezed firmly.

## Table of Contents

<b>Preface</b>	<b>2</b>
Safety Precautions	2
Warning and Caution	2
Handling and Storage	2
<b>Before Use</b>	<b>4</b>
Checking the Package Contents	4
Basics of the Equatorial Mount	4
Name of Each Part	5
Startup Procedure	6
Installing the App	7
<b>Setting Up the Telescope</b>	<b>8</b>
Setting up the Tripod	8
Attaching the SXG Half Pillar	8
Setting up the Mount	9
Attaching the Optical Tube	11
Balancing the Telescope	12
<b>Using the Wireless Unit</b>	<b>15</b>
Connecting the Wireless Unit	15
Wireless Connection to the Smartphone with the Wireless Unit	17
Starting up the App	18
Preparation for GO-TO Slewing	20
<b>Guidance for Go-To Operation</b>	<b>20</b>
I.Locating the Mount	21
II.Setting Home Position	21
III.Alignment	22
IV.Go-To Slewing	24
<b>Application</b>	<b>25</b>
I. Firmware Update	25
II.Reset Button	25
III.How to Use the Polar Alignment Scope	26
Polar Alignment in the Northern Hemisphere	28
Polar Alignment in the Southern Hemisphere	34
About PF-L Assist App	39
Precise Polar Alignment (Drift Alignment)	40
Changing the Altitude Setting to Low or High	43
IV.Autoguider	44
<b>Appendix</b>	<b>45</b>
Product Specifications and Dimensions	46-48

## BEFORE USE

### Checking the Package Contents

A package of the SX2-WL/SXD2-WL contains the items below. Check if all the items are included. For usage of other products that are in conjunction with this unit, please refer to the manuals for those products.

#### Contents

① SX2-WL or SXD2-WL Equatorial Mount	1
② Counterweights - 1.9Kg for SX2-WL - 1.9Kg and 3.7Kg for SXD2-WL	1
③ Wireless Unit	1
④ Allen Wrenches, one each of 5mm and 1.27mm	1
⑤ Cigarette-lighter Plug Cord	1
⑥ Instruction Manual (This booklet)	1

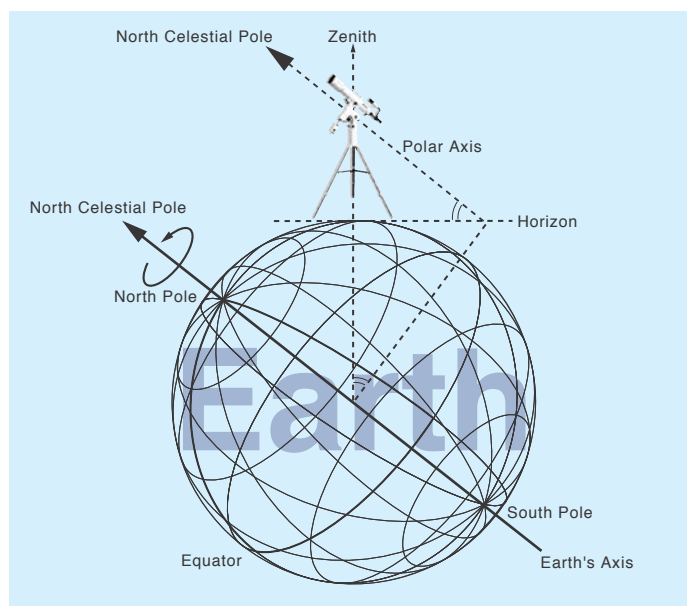
Note: Your Mount package may differ when you purchase it as a complete telescope package. A power supply unit is sold separately.



### Basics of the Equatorial Mount

#### What is an Equatorial Mount?

In the northern hemisphere, stars appear to turn around the polar star (the north celestial pole), making approximately one rotation per day. It is called diurnal motion and occurs because the earth turns on its axis once a day. The equatorial mount is a platform that is designed to rotate parallel to the earth's rotational axis.



### Basic Movements of the Equatorial Mount

**Every operation of this equatorial mount is electrically made using a smartphone (or a tablet) and a dedicated application.**

In the northern hemisphere, stars appear to turn around the polar star (the north celestial pole), making approximately one rotation per day. It is called diurnal motion and occurs because the earth turns on its axis once a day. The equatorial mount is a platform that is designed to rotate parallel to the earth's rotational axis.

**Note 1 :** Do not rotate the mount manually without loosening the R.A. and DEC clamp levers.

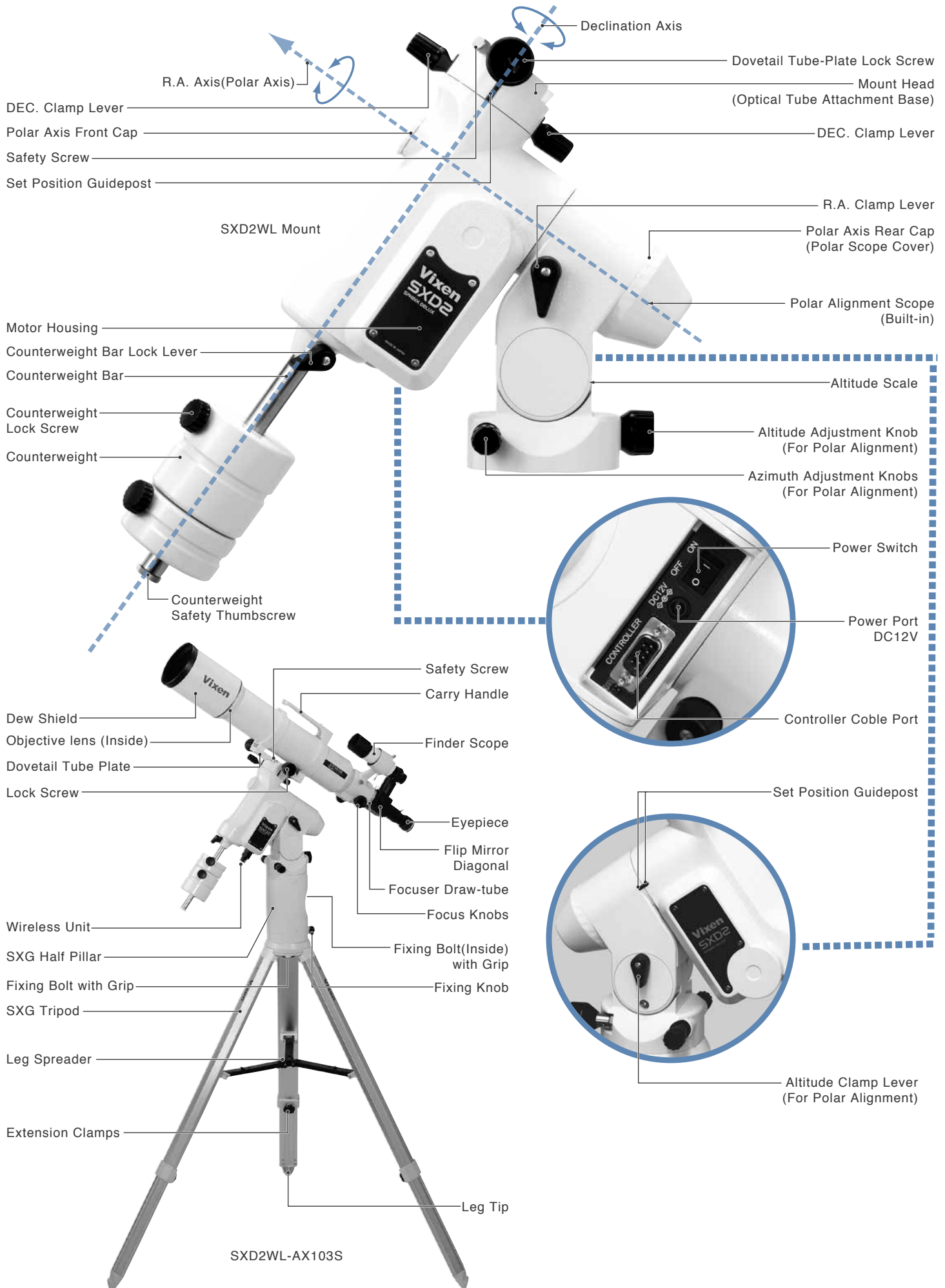
**Note 2 :** Do not bump the mount strongly as it may damage the gears and bearings inside. It may result in malfunction.

The mount has clamp levers that allow you to freely rotate the RA and DEC bodies to set it up quickly for the home position or let the mount store in a case compactly. You have to loosen the clamp levers to protect the inner gear train for storage and when you transport it. Be sure to tighten the clamp levers when you use the mount by the Wireless Unit.



## BEFORE USE

### SXD2WL Mount Components



## BEFORE USE

### Startup Procedure

#### I. Installing the App

Install the STAR BOOK Wireless app on your smartphone. Refer to the instructions provided for the smartphone on how to install the app.

P7



#### II. Setting up the Telescope

Set up the telescope according to the instruction manual provided for your telescope.

P8~14



#### III. Connecting the Wireless Unit

Attach the wireless unit to the equatorial mount.

P15~16



#### IV. Wireless Connection to the Smartphone with the Wireless Unit

Connect between the wireless unit and the smartphone with a radio connection. To connect, refer to the instructions provided for the smartphone.

P17



#### V. Starting up the App

Tap the icon of STAR BOOK Wireless on the screen to start up the app. Confirm the fundamental operation of the app.

P18~19



#### VI. Preparation for GO-TO Slewing

Now you are ready to control your telescope via the smartphone with the STAR BOOK Wireless app. Enjoy your astronomical observation!

P20

## BEFORE USE

### Installing the APP

You need to prepare a smartphone and a dedicated app named 'STAR BOOK Wireless' to control Vixen equatorial mounts.

**Applicable Mount: SX2, SXD2, SXD2-PFL, SXP, SXP-PFL, SXP2, AXJ (non-encoder equipped), AXD2, AXD**

### Downloading the App

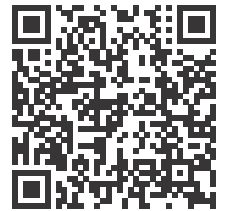
Install the STAR BOOK Wireless app on your smartphone. Refer to the instructions provided for the smartphone on how to install the app.



# STAR BOOK WIRELESS

The free download STAR BOOK Wireless app is available for iPhone and Android.

Visit our website at <https://vixen.co.jp>



iOS® and App Store® are trademarks of Apple Inc.

Google Play and the Google Play logo are trademarks of Google LLC.

## SETTING UP THE TELESCOPE

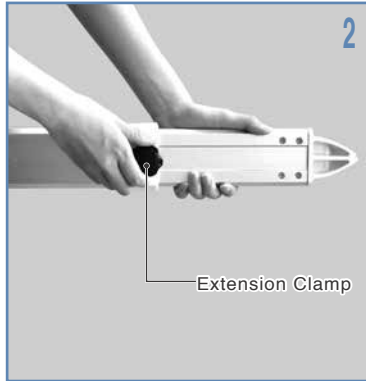
### Setting up the Telescope / The SXD2-WL mount is shown here by way of an example.

Read the instruction manual provided for your telescope in addition to this manual.  
You may occasionally find descriptions not relevant to the product you purchased.

### Setting up the Tripod

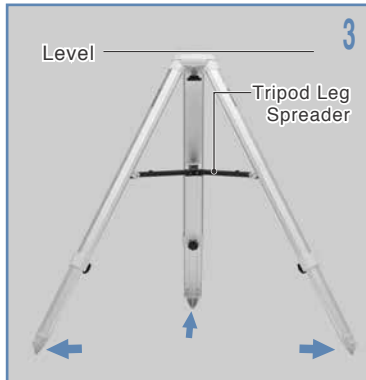
The tripod is sold separately unless you purchase a complete telescope package.

- 1** Place the tripod on level ground to make the telescope stable during observation. Pull the tripod legs apart until the leg spreader is fully extended.

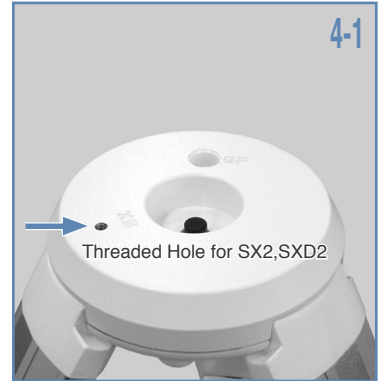


- 2** Loosen the extension clamp on the tripod leg so that the leg can be adjusted in length.

- 3** Tighten the extension clamp to hold the leg securely in place.

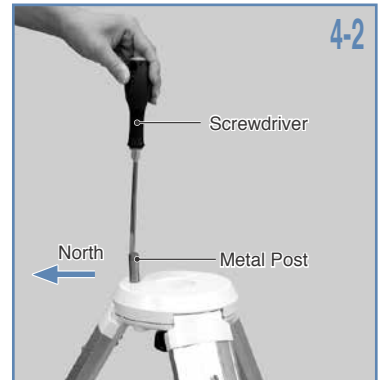


- 4** Attach the metal post on the tripod head. Thread the metal post into the hole as marked SX and tighten it with a screwdriver (Fig. 4-1).



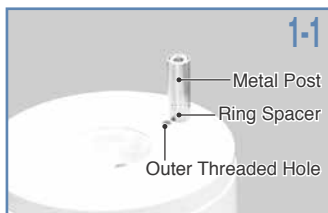
**Note:** Be sure to screw down the metal post until the end of the thread firmly.

Position the tripod so that the metal post comes to north.



### Attaching the SXG Half Pillar

- 1** Put the ring spacer through the thread part of the metal post. Attach the metal post on the head of the half pillar (Fig. 1-1).



**Note:** There are two threaded holes on the head of the half pillar. Thread the metal post into the outer threaded hole and tighten it with the supplied Allen wrench.

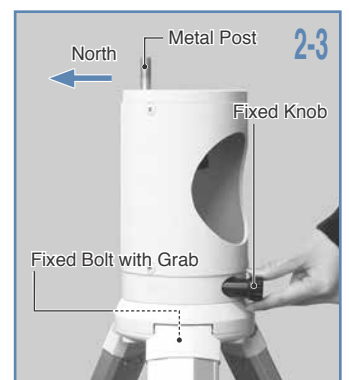
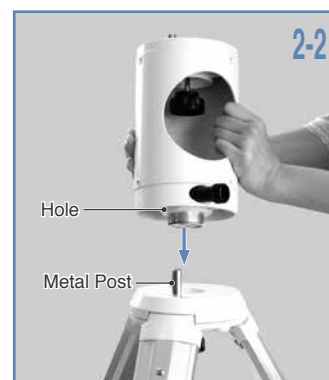


- 2** Loosen the fixing knob on the lower part of the half pillar in advance and attach the half pillar on the tripod head (Fig. 2-1). Place the half pillar over the tripod so that the metal post on the tripod head comes underneath the hollow for the fixing knob on the half pillar.

Attach the half pillar on the tripod head so that the center projection on the bottom of the half pillar fits the center hollow on the tripod head neatly (Fig. 2-2).

Tighten the fixing knob on the lower part and the fixing bolt beneath tripod head to fix the half pillar securely (Fig. 2-3).

Place the tripod so that the metal post on the SXG Half Pillar faces north.



## SETTING UP THE TELESCOPE

### Setting up the Mount

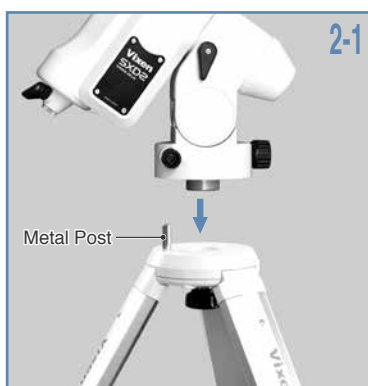
**⚠ Be sure to handle the mount body carefully as it is a heavy-weighted item.**

#### Setting up the Mount (without the SXG Half Pillar)

- 1 Loosen the azimuth adjustment screws in advance by turning the azimuth adjustment knobs on the base part of the mount.



- 2 Position the mount so that the metal post on the tripod head comes between the tips of the two azimuth adjustment screws on the mount base (Fig. 2-1).



Attach the mount on the tripod and tighten the fixing bolt underneath the tripod head to secure it in place (Fig. 2-2).



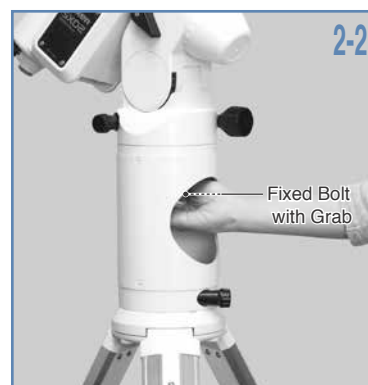
- 3 Tighten the azimuth adjustment screws on the mount base so that the two azimuth adjustment knobs are set equally.



#### Setting up the Mount (with the SXG Half Pillar)

- 1 Loosen the azimuth adjustment screws in advance by turning the azimuth adjustment knobs on the base part of the mount.

- 2 Position the mount so that the metal post on the head of the half pillar comes between the tips of the two azimuth adjustment screws on the mount base.



- 3 Tighten the azimuth adjustment screws on the mount base so that the two azimuth adjustment knobs are set equally. Tighten the fixing bolt underneath the tripod head securely.



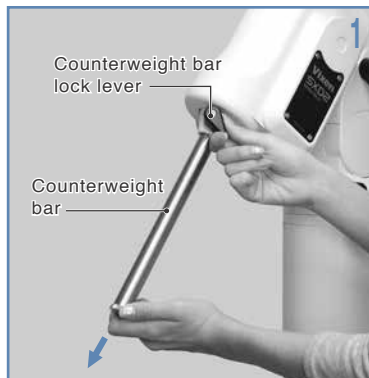
## SETTING UP THE TELESCOPE

### Setting up the Mount / Attaching the Counterweight

You may balance the mount with only the counterweight bar without a counterweight if you attach a light-weighted optical tube.

**⚠ Be sure to handle the counterweights carefully as it is a heavy-weighted item.**

- 1** Loosen the counterweight bar lock lever to draw out the counterweight bar. Tighten the counterweight bar lock lever with the bar extended fully.



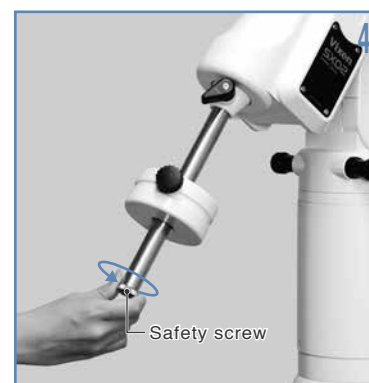
- 2** Remove the safety screw on the end of the bar. Loosen the lock screw on the side of a counterweight and put it through the bar.



- 3** Attach the counterweight to the bar so that the lock screw on the counterweight goes to the upper side of the bar as shown in the figure.



- 4** Tighten the counterweight lock screw and replace the safety screw. Securely tighten the safety screw.



## SETTING UP THE TELESCOPE

### Setting up the Mount / Attaching the Optical Tube

An optical tube which is equipped with a Dovetail tube plate or Dovetail slide bar can be attached to the mount.

Example: AX103S, SD115S, or VC200L optical tube



**⚠ Take care not to drop the optical tube as it could damage the equipment or lead to injury.**

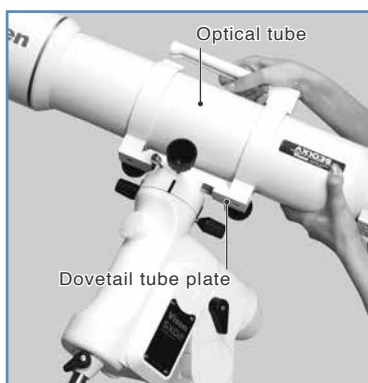
Pay close attention to the security of the optical tube and do not loosen the lock knob too much.

#### The AX103 shown as an example.

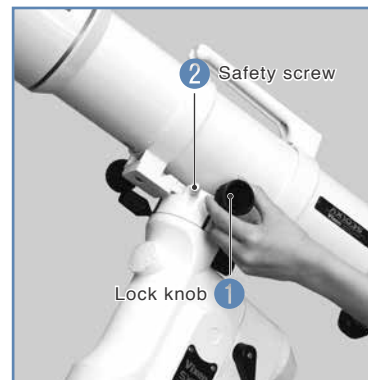
- 1 Loosen the tube plate lock knob and safety screw on the mount head fully so that space is available to insert the Dovetail tube plate-mounted optical tube.



- 2 Attach the Dovetail tube plate-mounted optical tube to the depressed platform of the mount head.



- 3 Tighten the tube plate lock knob securely while supporting the optical tube by hand. First, tighten the lock knob onto the dovetail tube plate centering notch until it is snug. Then, tighten the safety screw.





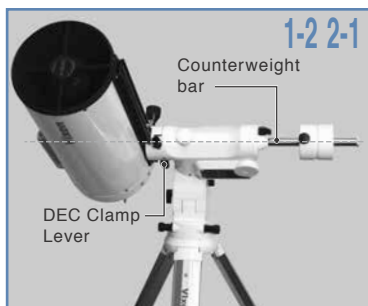
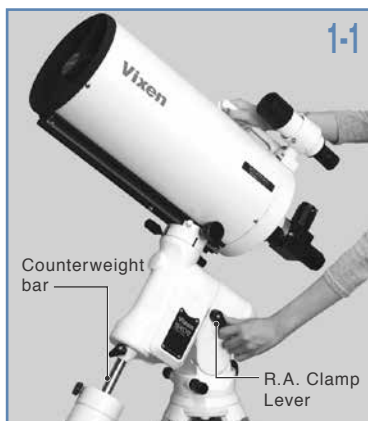
## SETTING UP THE TELESCOPE

### Balancing the Telescope in Declination (DEC)

#### Optical Tube with Dovetail Slide Bar

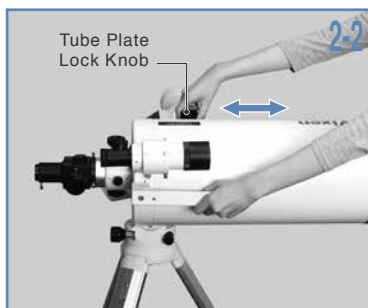
- 1 Loosen the R.A. clamp while holding the optical tube or counterweight bar (Fig.1-1) and turn the optical tube until the DEC axis comes to horizontal (Fig. 1-2). Tighten the R.A. clamp lever to keep it in the horizontal position.

Be sure to securely support the optical tube or counterweight bar while loosening the clamp levers.



- 2 Next, loosen the DEC clamp lever while holding the optical tube by hand. Release the optical tube slowly to see if it remains stationary.

If the optical tube starts turning as you release it, you will need to shift the optical tube until it is in the balancing.

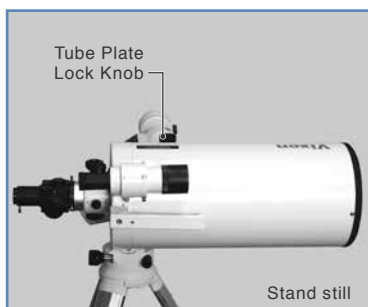


#### ⓘ Caution

Do not loosen the tube plate lock knob too much in the balancing. It could cause the optical tube to fall and damage it.

- 3 Slightly loosen the tube plate lock knob and slide the optical tube either forward or backward until it remains stationary. Tighten the tube plate lock knob securely to hold the optical tube in place.

- 4 Tighten the DEC clamp lever to finish the adjustments.

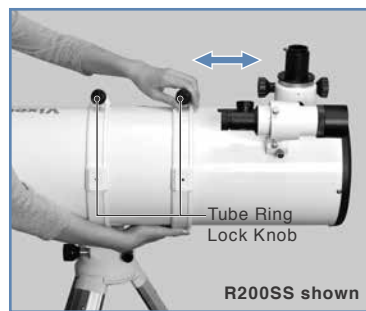
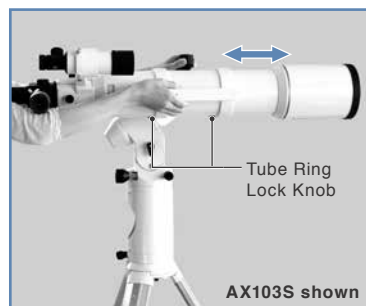


#### Optical Tube with Tube Rings

- 1 Loosen the R.A. clamp while holding the optical tube or counterweight bar (Fig.1-1) and turn the optical tube until the DEC axis comes to horizontal (Fig. 1-2). Tighten the R.A. clamp lever to keep it in the horizontal position.

- 2 Next, loosen the DEC clamp lever while holding the optical tube by hand. Release the optical tube slowly to see if it remains stationary.

If the optical tube starts turning as you release it, you will need to shift the optical tube until it is in the balancing.



#### ⓘ Caution

Do not loosen the tube ring lock knobs on the tube rings too much in the balancing. It could cause the optical tube to fall and damage it.

- 3 Loosen the tube ring lock knobs and slide the optical tube either forward or backward until it remains stationary. Tighten the tube ring lock knobs securely to hold the optical tube in place.

- 4 Tighten the DEC clamp lever to finish the adjustments.

An optional Universal dovetail plate or Accessory plate DX may be recommendable if it is hard to balance the telescope.

## SETTING UP THE TELESCOPE

### Balancing the Telescope in Right Ascension (R.A.)

1 Loosen the R.A. clamp lever while holding the counterweight bar and turn the optical tube until the DEC axis comes to horizontal.

2 Release the counterweight bar slowly to see if the optical tube remains stationary. If the optical tube starts turning as you release the counterweight bar, you will need to shift the counterweight on the bar until the Declination body is in the balancing.

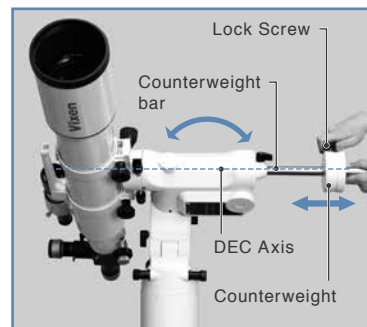
You are unable to balance the optical tube in R.A. when you attach an optical tube weighing less than 1.3kg to the SXD2-WL (1.2kg to the SX2-WL) mount.

Loosen the lock knob on the counterweight and slide the counterweight slowly to the point at which the Declination body remains stationary.

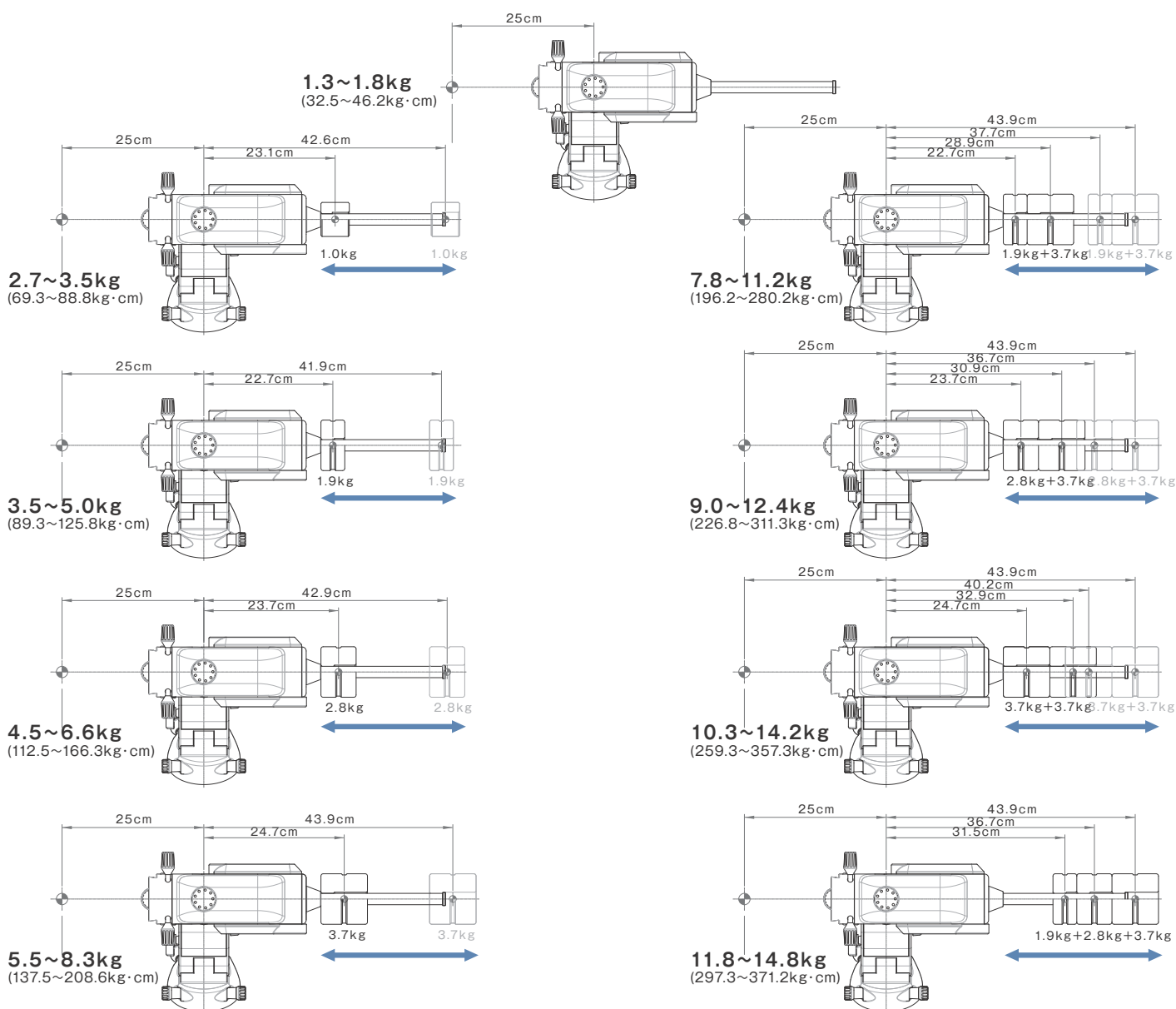
3 Tighten the lock knob on the counterweight securely to hold in place.

4 Tighten the R.A. clamp lever to finish the adjustments.

Do not slide the counterweight too much in the balancing. It could cause the optical tube to get damaged or lead to injury.

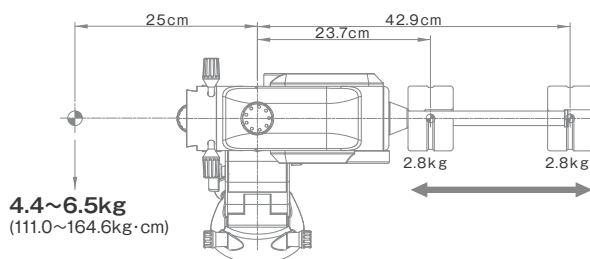
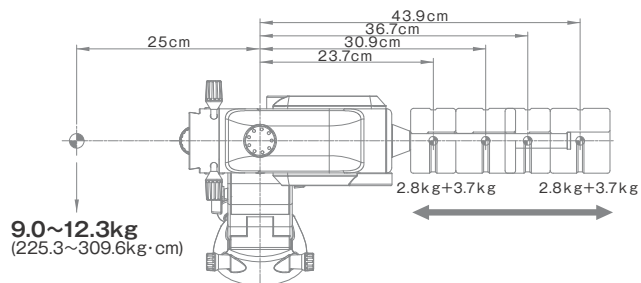
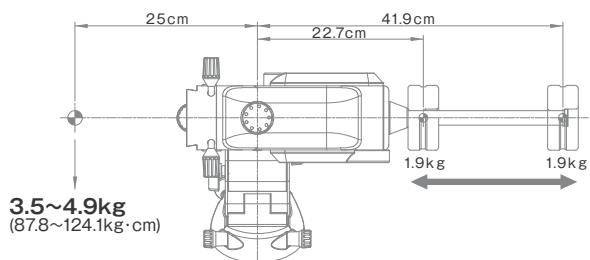
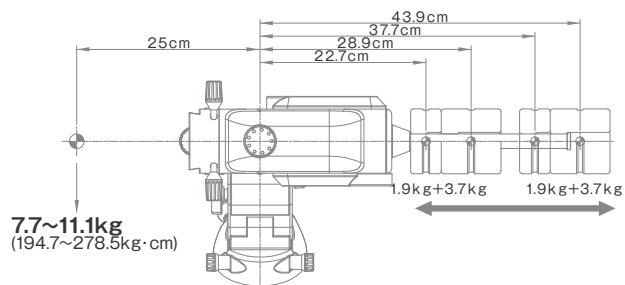
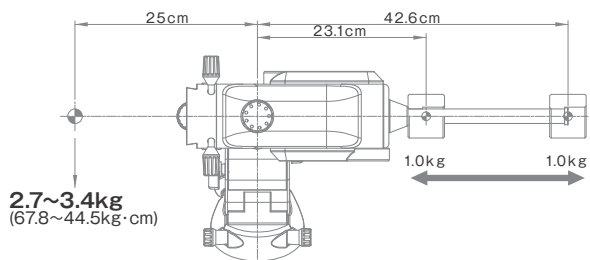
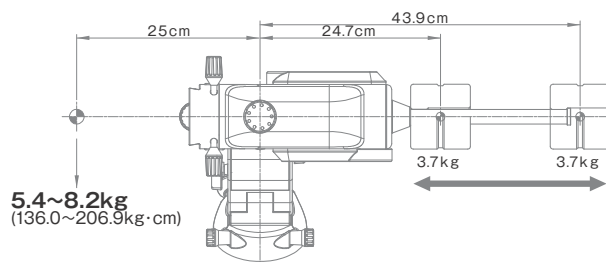
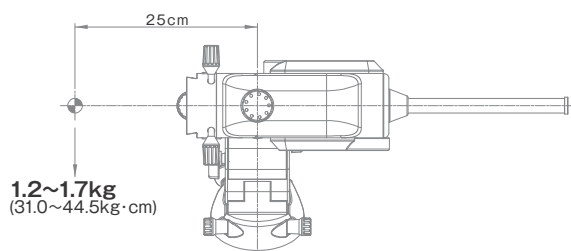


### Tips on Proper Balancing (SXD2-WL)



## SETTING UP THE TELESCOPE

### Tips on Proper Balancing (SX2-WL)



## USING THE WIRELESS UNIT

### Connecting the Wireless Unit

- 1 Attach the Wireless Unit to the controller cable port on the equatorial mount. Plug the Wireless Unit so that the orientation of the connection can be matched to each other. Plug it to into end securely.



Be sure to attach the Wireless Unit first before connecting the power cord. The Wireless Unit may break if you put on it while the equatorial mount is powered. It avoids a mishap at the setting up in the dark environment where it may be hard to check the position of the power switch visibly.



- 2 Fix the Wireless Unit securely by tightening the screws accompanied.

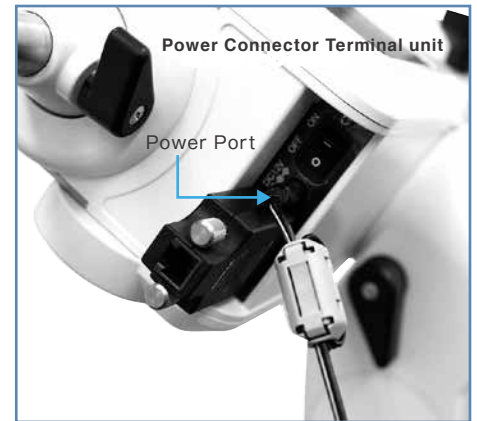
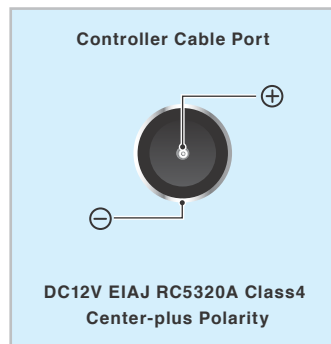


## USING THE WIRELESS UNIT

### Connecting the Power Cord

The power source is sold separately. We recommend using an optional AC Adapter 12V 3A or Cigarette-lighter plug cord that is usable for commercially available portable batteries.

Make sure that the power switch is turned OFF and plug the power cord into the power port on the equatorial mount.





### ① About handling of the power cord and power source.

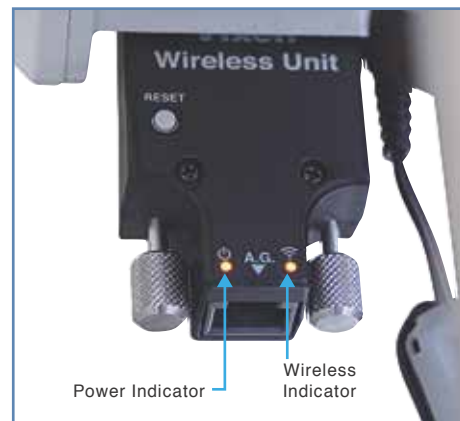
- ⌚ Avoid pulling or bending a part of the power cable adjacent to the connector. It may cause a wire to snap.
- ⌚ Do not use the power cord with it is bound.
- ⌚ If you use an equipped battery in a car as the power source, do not start up the engine. It may cause a malfunction of the mount due to unwanted electrical noise.
- ① When you unplug the power cable, be sure to hold the connector part and pull it straight. Unplugging carelessly by grabbing the cable part may cause the wire to snap.
- ① When you use a car battery, avoid the battery dying.

## USING THE WIRELESS UNIT

### Wireless Connection between the Smartphone and the Wireless Unit

- 1 A smartphone that runs iOS is used in this manual by way of example.

Power the equatorial mount. Both the power and wireless indicators   on the Wireless Unit are turned ON in red light after a few seconds.



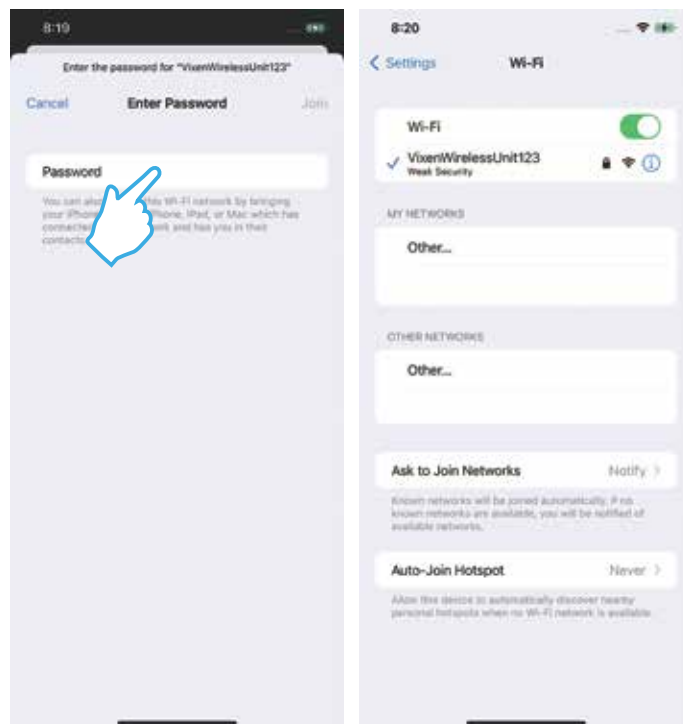
- 2 Open the screen of the wireless LAN connection on the smartphone and choose SSID.

Tap the Vixen Wireless Unit XXXX (XXXX are arbitrary numbers) on the screen.



- 3 Tapping the SSID will proceed to the screen of entering a password.

Enter the initial password "1234567890" set at Vixen's factory. (The name of the SSID and the password are changeable arbitrarily.)




- 4 When you complete the connection successfully, the wireless indicator on the Wireless Unit will turn to blue light. If it remains in red light, it is a failure in connection. Start the procedure from (2) again.



## USING THE WIRELESS UNIT

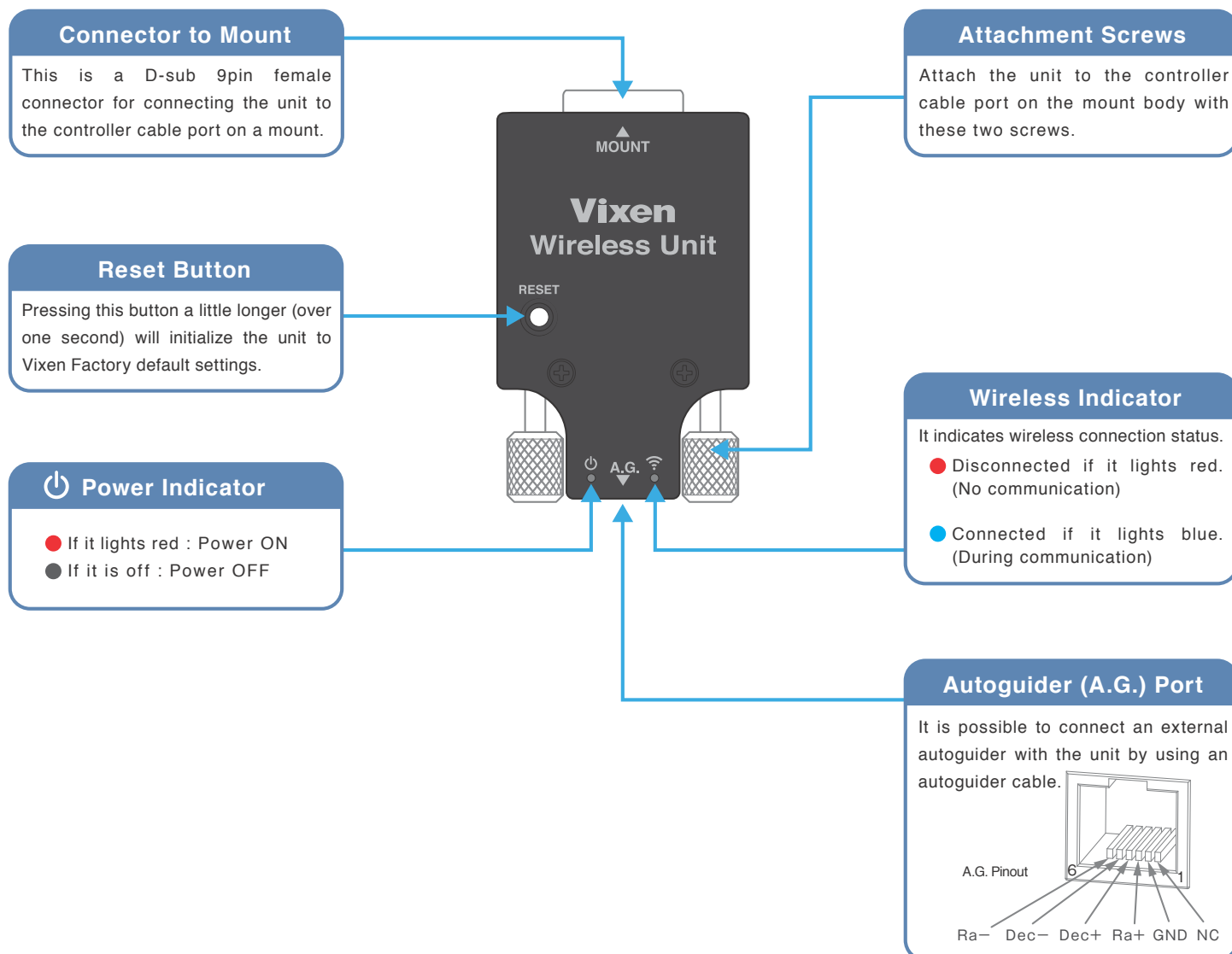
### Starting up the App

Confirm the blue light of the wireless indicator, and tap the icon  "STAR BOOK Wireless" on the smartphone. Now, you are ready to use the STAR BOOK Wireless.



### Basic Operation 1 / Menus on the Screen

#### Wireless Unit Components Guide





## USING THE WIRELESS UNIT

### Menus and Displays on the Screen

You operate the telescope controller and commands by tapping and swiping the screen with a finger.

Note: The display and layout of the icons/menus shown are as of the time when Vixen produced this manual. It may change according to the update of the app. The contents may differ depending on the version you use.

#### Display Mode

##### SCOPE MODE

The telescope is linked with the star chart. The telescope follows in the same direction as you swipe the star chart.

##### CHART MODE

The star chart operates independently from the telescope scope mode. The star chart is swiped with a finger for directional scrolling. Pinching in or out with two fingers will enlarge or reduce the star chart. You can choose any target on the star chart screen using these finger gestures.

#### Circles

##### Target Marker (Red)

The red circle marker points to the location of an object you have chosen as a target.

##### Target Circles (Green)

The double circle in green indicate the direction that includes the center of your telescope's field of view and its adjacent area.

##### Target Circles (White)

The double circles in white indicate the direction that includes the center of the star chart and its adjacent area.

#### Select Object

The moon, planets, deep-sky objects, and stars can be chosen by name or object number from the menus.

#### Setup Icon

Tapping this icon will call up the menus to determine or change various settings, such as the mode of the star chart displayed, the direction of scrolling/swiping the star chart, SSID/password, and so on.

#### Align

It shows the number of objects acquired for alignment.

#### Zoom Slider Bar

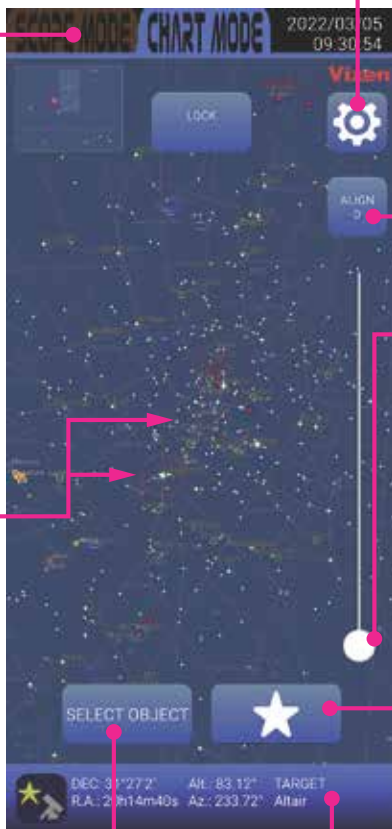
Magnifying the star chart allows you to make fine adjustments. The swipe motion of the star chart becomes slower as you zoom in on the star chart by sliding up the button on the slide bar.

#### ★ Sign

Tapping this icon will call up well-known celestial objects located within the outer target circle in the center of the screen (and the center of the star chart). Tap an object you selected to point the telescope to it. The ★ sign will turn to ★<< during the Go-To slewing.

#### Target Object Information

The direction of your telescope and the location in coordinates are displayed. The telescope icon on the left indicates the status of the telescope movement (tracked, stopped, and so on).



### Basic Operation 2 / Moving the Telescope

In the SCOPE MODE, swiping the star chart will move the telescope in the same direction according to the orientation of the star chart. You can zoom in and out the star map on the screen with the zoom slider bar.

The motion direction by a swipe can be chosen from AltAZ or RADEC.



Setup Icon



Zoom Slider



## USING THE WIRELESS UNIT

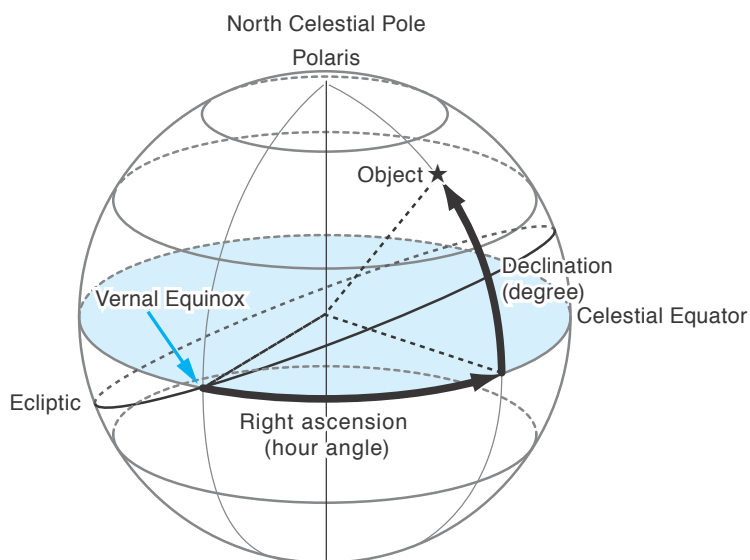
### Preparation for GO-TO Slewing

#### Automatic Slewing to Celestial Objects




The celestial go-to navigation system stores the coordinates of vast numbers of celestial objects as the database and it allows you to find your desired celestial object of interest automatically. The moon and bright planets are found readily in the night sky as you can locate their positions with ease. However, less bright planets, nebulae, and star clusters are dim and mostly invisible with the unaided eye. Even if you know where these dim and blurred objects are in the night sky, it often takes time and effort to look for them. The automatic Go-To slewing function will assist you in locating celestial objects easily and quickly.

#### The principle of Go-To Slewing

It appears that the positions of stars relative to each other in the sky are all but fixed due to their extremely long distances from us on the earth. Because of this, the star's position on celestial sphere can be measured on star maps using celestial coordinates. The right ascension of the celestial sphere corresponds to latitude, and the declination corresponds to altitude on the geographic maps. It is applied for locating celestial objects in the sky, the same as your car navigation system.

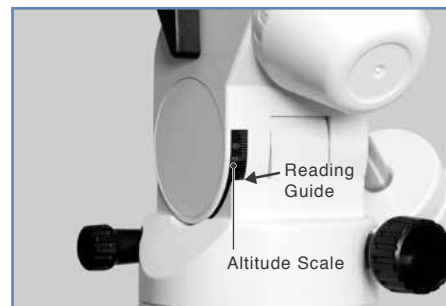
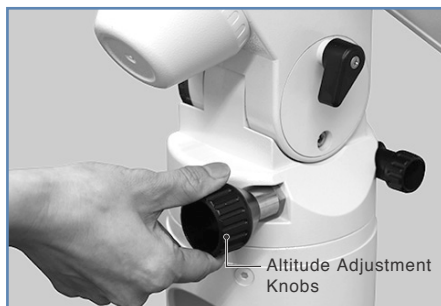


### Guidance for Go-To Operation

<b>I. Locating the Mount</b>	Point the mount toward the north celestial pole in the northern hemisphere (the south in the southern hemisphere) so that the R.A. axis on the mount is parallel with the axis of the celestial sphere in your observing location.	<b>P21</b>
		
<b>II. Setting Home Position</b>	Loosen the clamp levers on the R.A. and DEC axes and move the telescope to the home position by hand. Point the optical tube to the due west horizon in the northern hemisphere (the due east horizon in the southern hemisphere) to fix it in the home position.	<b>P21</b>
		
<b>III. Alignment</b>	You select bright stars from the list stored in the database to align their positions with the telescope. The more alignment stars you select, the more centrally located the target objects will be in your telescope's field of view.	<b>P22~24</b>
		
<b>IV. Go-To Slewing</b>	You choose your target on the screen of the STAR BOOK Wireless app to start your observing session. Enjoy your observing!	<b>P24</b>

## I. Locating the Mount

After setting up the telescope, locate the mount so that its R.A. axis points toward the north celestial pole if you use the telescope in the northern hemisphere. Unless you intend to take lengthy astrophotography, you do not need to align the R.A. axis precisely to the celestial pole. A rough setting will work well for visual observation.



When turning the altitude adjustment knob for changing tilts, loosen the altitude clamp lever first. When turning the azimuth adjustment knobs to change directions, loosening the screw on one side will allow you to tighten the screw on the other side.

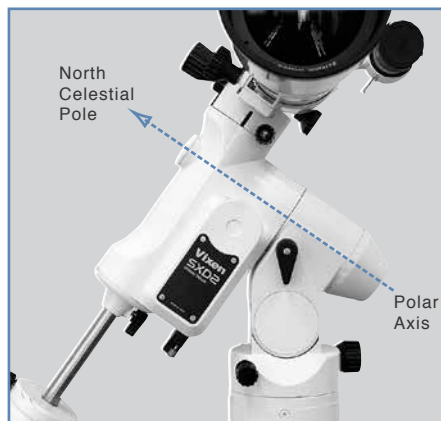
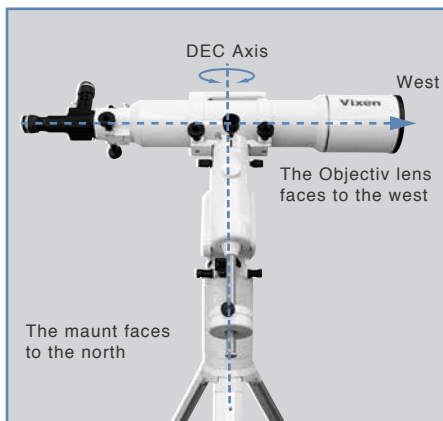
When you use the telescope in the southern hemisphere, locate the mount so that the R.A. axis points toward the south celestial pole. And you set the mount's elevation to be the latitude of your observing site.

## II. Setting Home Position

Loosen the R.A. and DEC clamp levers on the mount and position the telescope's optical tube by hand to point it to the west and level. It is possible to slew the telescope by utilizing the STAR BOOK Wireless app on a smartphone.

The STAR BOOK Wireless app works to match the position at which the telescope points with the celestial coordinates memorized in the app based on information on the location, date, and time saved by the smartphone. It implies that you have finished the first alignment at this stage. Because of this, you will probably be able to point the telescope toward the direction of a celestial object you desire to see with it next. (If the home position is accurate, the target object can be caught at least somewhere in the field of view of your finderscope.)

Refer to the drawings below on how the telescope is set at the home position.



When you fix the position of the optical tube, tighten the R.A. and DEC clamp levers on the mount. After this, do not touch the clamp levers until you finish your observation.

The home position is the first positioning of your telescope to decide on a successful Go-To slewing. We recommend that you set the home position as accurately as possible.

### III. Alignment

Alignment is to match the information for the position acquired from the celestial coordinates with the location of the stars you see actually on a one-on-one basis.

Because the first alignment obtained from the home position is less accurate, your automatic go-to slewing may not work precisely.

The process for acquisition of alignment is called "alignment" in this manual. The acquired alignments are counted with the number as one point, two points, and so forth.

#### Starting the Alignment

1 Start a STAR BOOK Wireless app on the screen of your smartphone. The message "Point the optical tube to the west so that it can be level" appears on the screen after a short while. Put the telescope in the home position. If you use the mount with the same settings you used during your last observing session, choose the Use Last Mount Setting button. This option is not feasible when you use the mount the first time and when you have moved the telescope. Tap **NEXT** to proceed.

If you need to adjust the initial settings in detail, tap the Initial Setting button to open the menu. You can always call up the initial setting menu by tapping the Setup icon while you display the star charts.

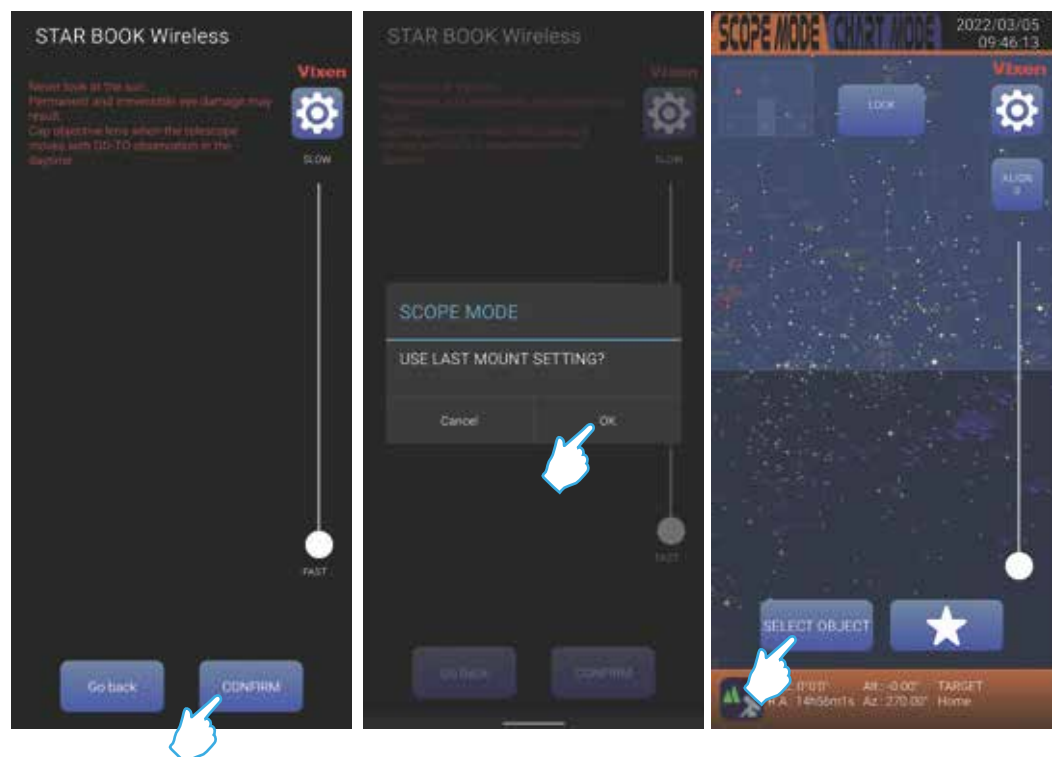
If you download the data for comets through the Internet, you are requested to start with the Initial Setting button.

If you tap the Next or the Use Last Mount Setting button, the solar warning notice will appear on the screen.



Tap **CONFIRM** and choose **OK** on the screen to proceed to the star chart with the SCOPE mode. The star chart where the circles at the center of the screen are directed due west is displayed.

Then, tap **SELECT OBJECT** on the screen to open the menu used for alignments.

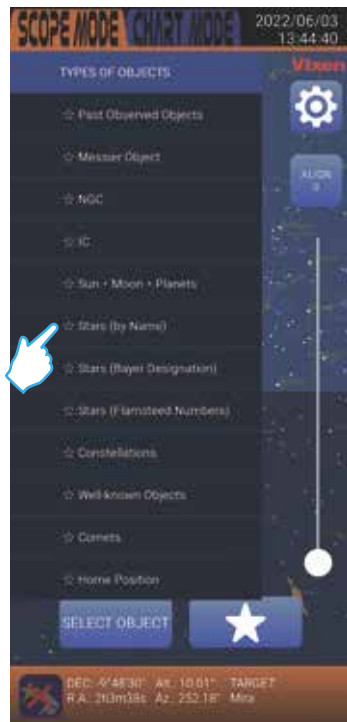


**Note:** If the Use Last Mount Setting is chosen, the center circles on the star chart may show you in a different direction.

### III. Alignment

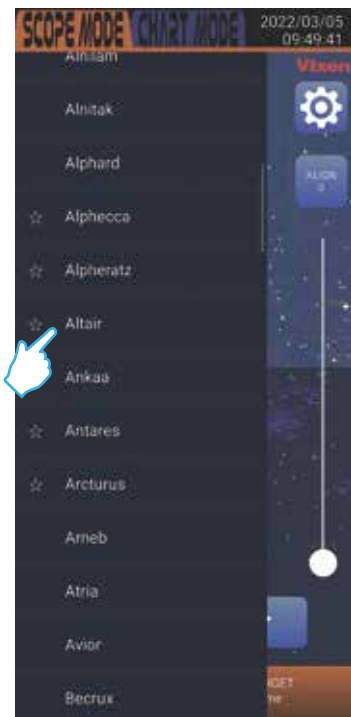
- 2 Types of Objects list appears on the screen, and choose an object you use for the acquisition of alignment.

Selecting a fixed star is recommendable as the accuracy for the alignment becomes better than other celestial objects. The Fixed Star is chosen in the menu by way of example here.

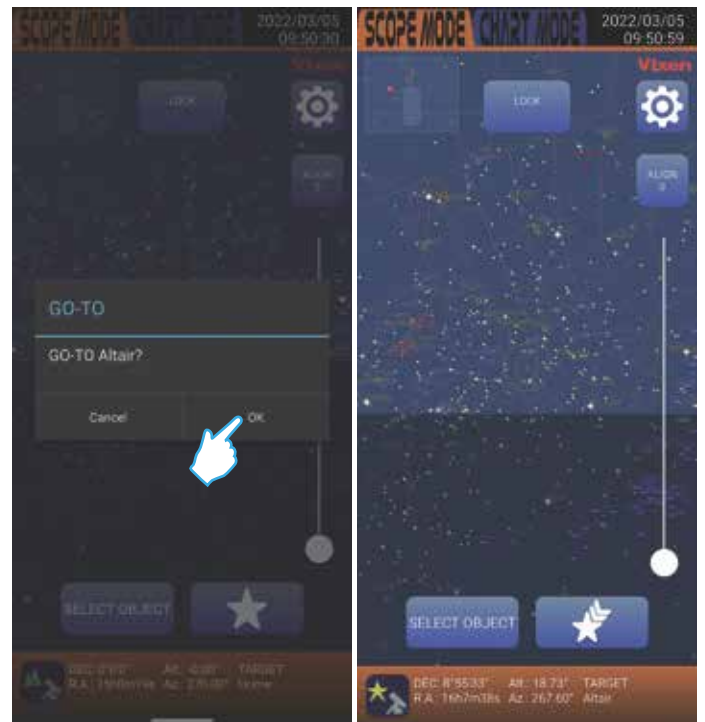


- 3 The names of the fixed stars appear in the menu. You choose Altair here as an example for the alignment and tap on it.

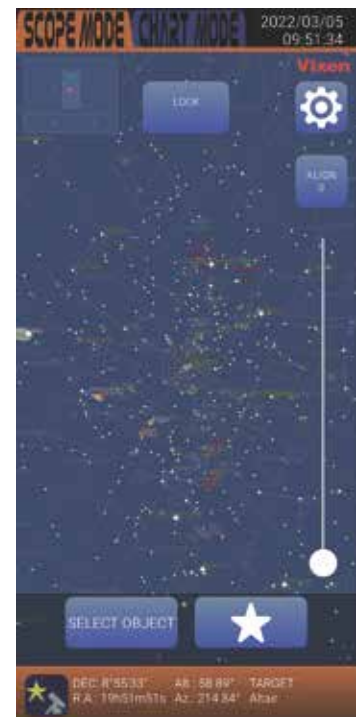
The fixed stars you use for alignments should be selected from stars you know names and locations in the night sky. Stars marked with ☆ are seen above the horizon and are available for alignments. You are unable to choose stars below the horizon.



- 4 The dialog box appears to confirm if you are ready to slew the telescope to Altair. Then, tap GO-TO to start the automatic slewing. The telescope starts moving toward the target. Coordinates in R.A. and DEC of Altair are displayed on the bottom of the screen.



- 5 As soon as the Go-To slewing finishes, the smartphone rings or vibrates to let you know. At this stage, you may not always succeed in putting the target (Altair) into the telescope's field of view, although the telescope points toward the target. You center the target in the field of view with the following procedures.



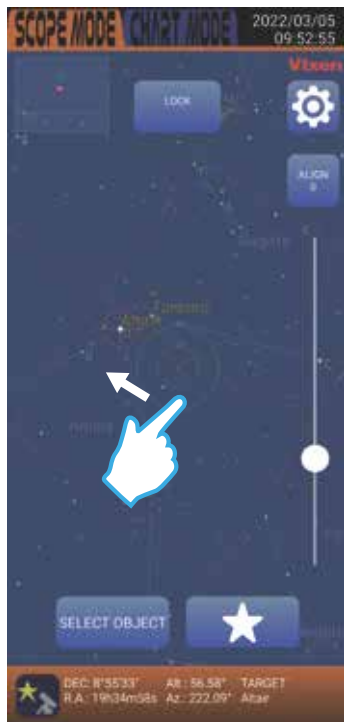


### III. Alignment

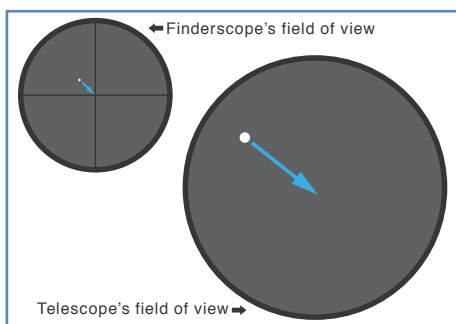
**5-1** The motion of the telescope links with the motion of a swipe on the screen's star chart. While looking through the telescope, bring Altair into the center of the field of view. Magnifying the star chart with the zoom slider will slow the motion of the telescope and thus allows you to make fine adjustments for corrections.

Note: Altair will be away from the center circles on the smartphone's screen as you move the telescope to look for Altair in the field of view. It is caused by a discrepancy between the actual location of Altair seen and the position of the same star in the app's database memorized.

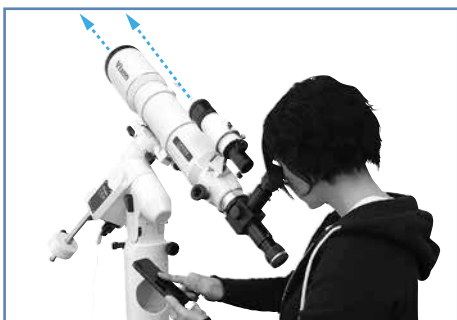
As soon as the alignment star is acquired, the discrepancy will be ceased.



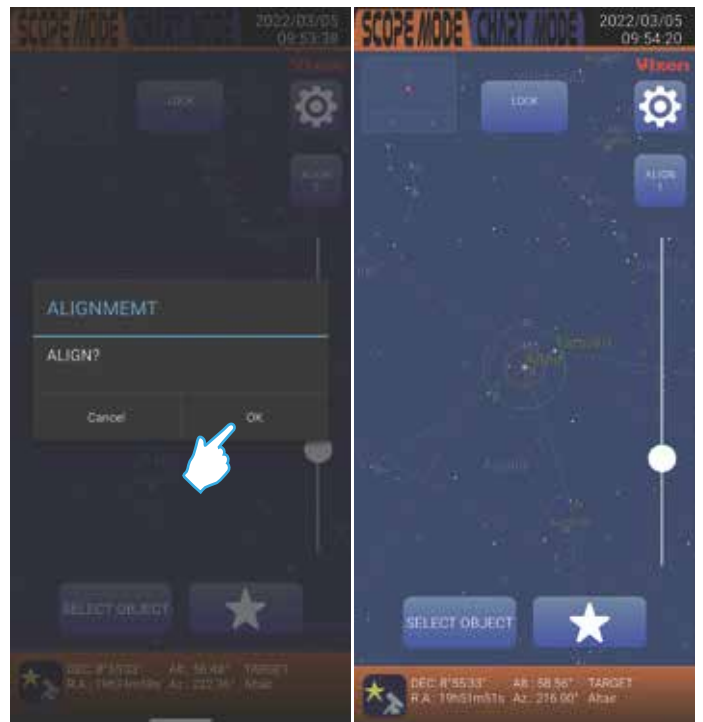
**5-2** Centering Altair in the field of view of the finderscope first and following the same star with the telescope's field of view next will make the corrections easier.



After you bring Altair into the center of the finderscope's field of view, center the same star in the field of view of the telescope by using an eyepiece with low magnification. Then, you change to an eyepiece with high magnification to center the target more accurately.



**5-3** After you enter Altair into the center of the field of view, tap **ALIGN X** (X is an arbitrary number) on the screen. The dialog box appears and confirms the alignment with Altair. Choose **OK** by tapping it. The first alignment has been completed. The target Altair comes to the center in the center circles on the star chart. The star chart on the screen turns to the SCOPE mode.



**6** It is necessary to choose several alignment stars to increase the pointing accuracy of your Go-To slewing. Repeat the procedures from (2) to (5) with different alignment stars. Aligning with stars of three or more will work practically.

### IV. GO-TO Slewing

You can enjoy the Go-To slewing using menus of celestial objects from the Types of Objects list after you make alignments with several stars. The target objects are tracked automatically and thus stay in the field of view. (Besides the diurnal motion of stars, it also allows you to track planets and comets that have their peculiar orbital elements.)

## APPLICATION

### I. Firmware Update

Updating the app should be executed by the instructions on your smartphone for updating. The update may be done automatically depending on the setting on the smartphone. For details, read the manuals for your smartphone.

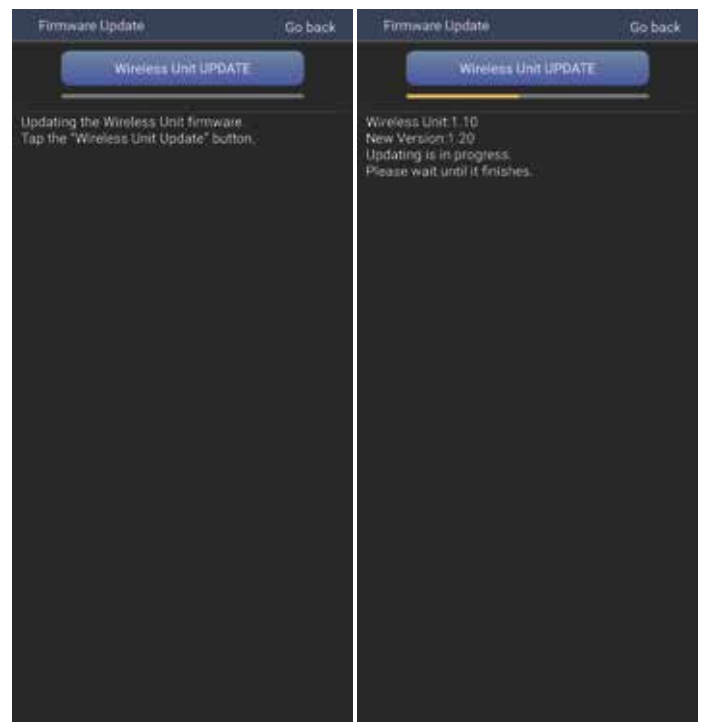
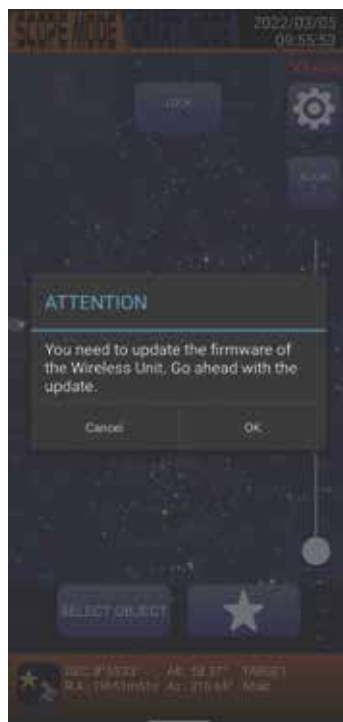
Procedures for the firmware update.

- 1 Make sure that the smartphone is fully charged. Disconnecting during the update may result in failure.
- 2 Confirm that the power indicator on the Wireless Unit is lit in blue just after you turn ON the power of the equatorial mount. Then start the STAR BOOK Wireless app.

If the app includes an updated firmware version, the dialog box prompting a firmware update will appear on the screen. Tap **Wireless Unit UPDATE** to advance to the next screen.

The firmware update appears on the screen, and you tap **OK**. The firmware update starts. (It may take about 5 minutes at the most to finish although it depends on connection environments.)

It is advisable to put the Wireless Unit adjacent to the smartphone during the update. Do not turn OFF the power of the mount Wireless Unit-connected.



### II. Reset Button

You can initialize the Wireless Unit to return to the settings at the factory. Be aware that the wireless connection settings (SSID/password) are initialized, too. (The firmware has no initialization.)

Pressing the reset button for one second or longer will make the power and wireless indicators blink two times simultaneously. The Wireless Unit will be in the initial state and complete the reset.

If you used the Wireless Unit in the initial state without changing the password, the wireless connection might restart automatically as soon as you complete the reset.





## APPLICATION

### III. How to Use the Polar Alignment Scope

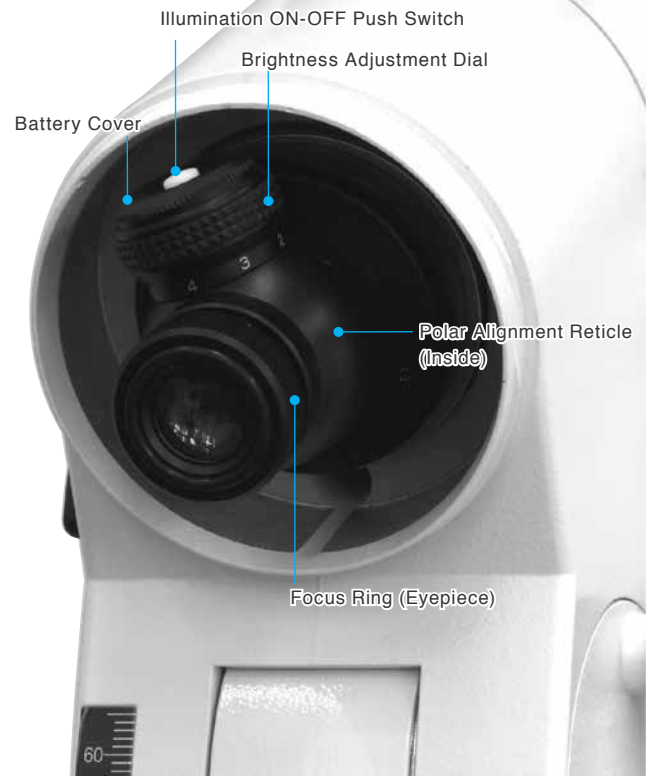
#### What is a Polar Alignment Scope?

The polar alignment scope is a small telescope equipped parallel to the R.A. axis of an equatorial mount so that it can precisely point to the north (or south) celestial pole. Accurate polar alignment is essential for successful long exposure astrophotography of deep-sky objects with the equatorial mount. You check the longitude and latitude of your observing place with a GPS or a map in advance before the polar alignment. The polar alignment scope allows you to accurately align the mount to the celestial pole at three arc minutes or less.

#### Note:

- Inaccurate polar alignment could result in trailed stars and field rotation in the outcome of your imaging.
- It is not possible to tilt the mount over 70 degrees in both hemispheres to use it.

#### Name of Each Part



#### Legend on the Polar Alignment Reticle

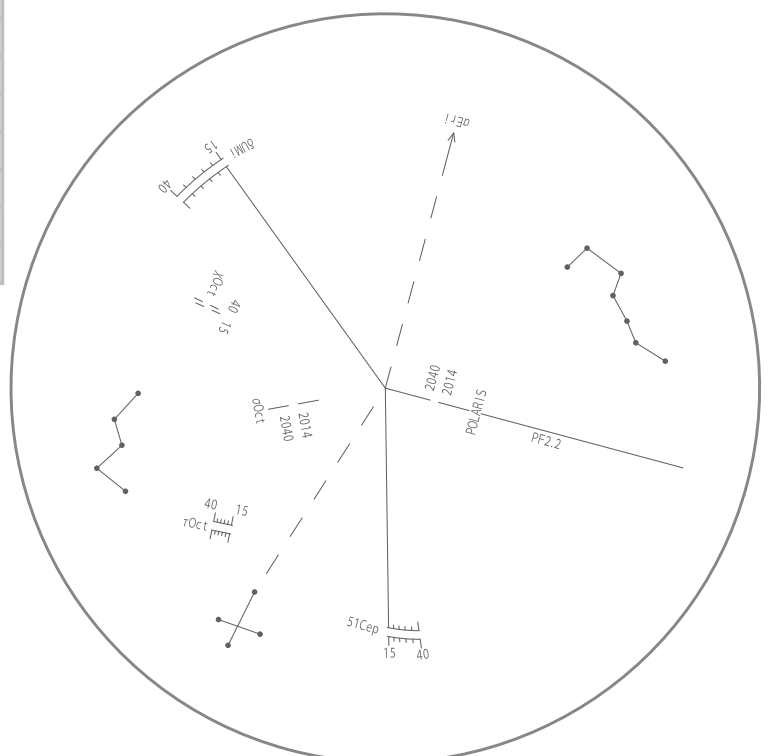
	Name	Constellation
In the Northern Hemisphere	POLARIS	Little Bear
	$\delta$ UMi	Little Bear
	$\epsilon$ Cep	Cepheus
	Useful guiding stars and constellations	
	"W" shape	Cassiopeia
In the Southern Hemisphere	Big Dipper	Big Bear
	$\sigma$ Oct	Octans
	$\tau$ Oct	Octans
	$\chi$ Oct	Octans
	Useful guiding stars and constellations	
	Southern Cross	Crux
	$\alpha$ Eri	Eridanus

#### Meaning of numbers

15 – the year 2015

40 – the year 2040

The position scales on the reticle are 5-year increments.



## APPLICATION

### Components Guide

#### Illumination ON and OFF

There is a push switch on the top of the brightness adjustment dial of the polar alignment scope. Depressing the push switch will illuminate the polar alignment reticle in red light. The red light becomes dimmer gradually after a certain interval of the illumination (about one or two minutes) and turns off automatically.



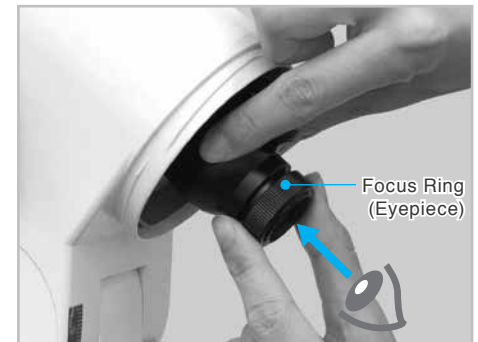
#### Adjusting the Brightness

The brightness of the red-illuminated reticle is varied in eight steps by turning the brightness adjustment dial on the polar alignment scope.



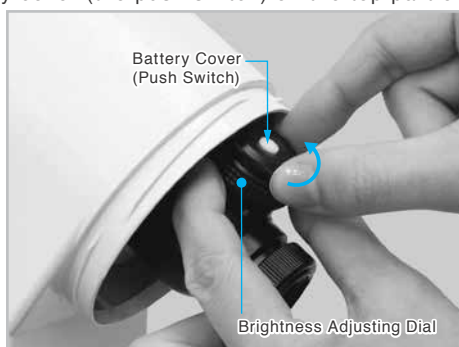
#### Focusing on the Polar Alignment Reticle

You focus on the polar alignment reticle by turning the eyepiece part of the polar alignment scope. While holding the polar alignment scope's body with one hand, turn the eyepiece part with the other hand.



#### Replacing the Battery

- 1 While holding the brightness adjustment dial with one hand, remove the battery cover (the push switch) on the top part of the brightness adjustment dial by turning it counterclockwise with the other hand.



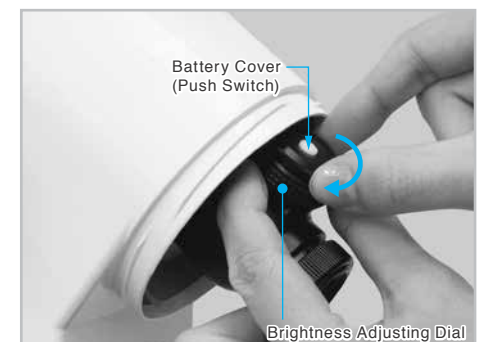
- 2 Tilt the battery compartment on the polar alignment scope downward so that the old battery can fall out from the battery compartment, as shown in the figure.



Turn the battery compartment upward and insert a fresh battery in the battery compartment. The bottom of the battery compartment is the plus-polarity.



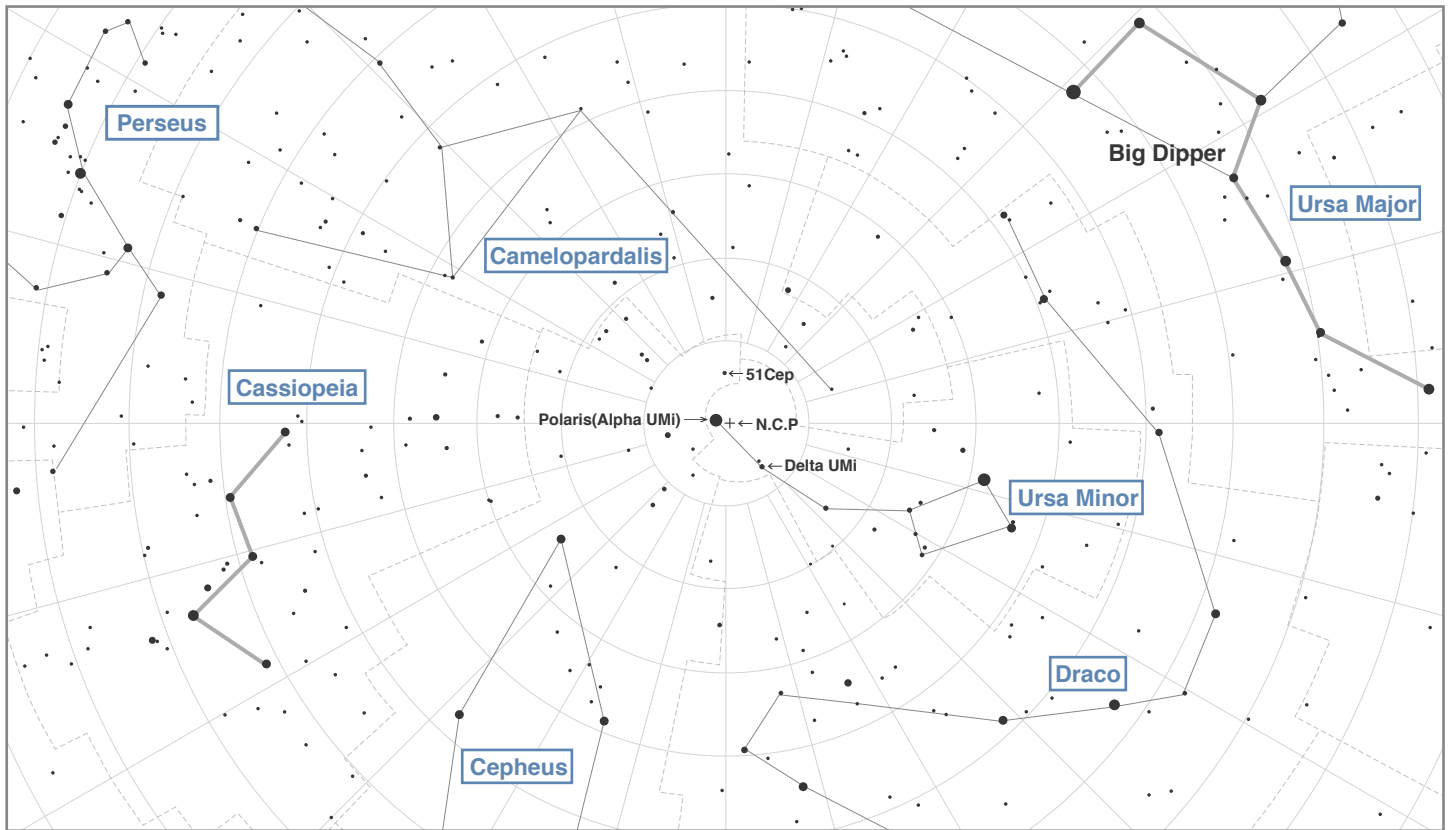
- 4 Replace the battery cover in place. Check if the illumination is lit by turning on the switch.



## APPLICATION

### Polar Alignment in the Northern Hemisphere

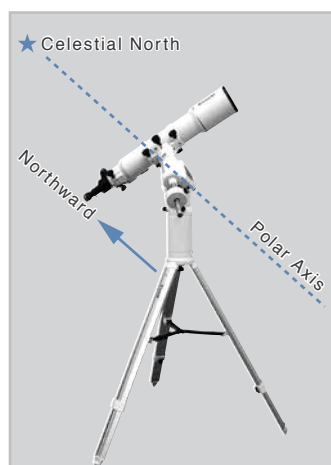
You align the equatorial mount to the north celestial pole (N.C.P.) in the northern hemisphere. The polar alignment scope utilizes 3 stars of Polaris, Delta Umi, and 51 Cep near the North Pole. Positions of the above stars are plotted on the polar alignment reticle. To locate the N.C.P., you match the three stars on the reticle with the three stars of the same seen in the polar alignment scope. Patterns of the Big Dipper and Cassiopeia are engraved on the reticle to use them as a guidepost for the N.C.P..



- 1 Check your observing site with a compass, a GPS or a map in advance to confirm that Polaris and the Big Dipper or Cassiopeia are seen from your observing location on the date of your observation.

The constellations the Big Dipper (part of Ursa Major) and Cassiopeia are near Polaris. You can find Polaris if you know the positions of these groups of stars. The Big Dipper and Cassiopeia are constellations seen in Spring and Autumn, respectively.

- 2 Set up the telescope on flat and hard ground where you see Polaris in the sky. A rough setting with a compass for pointing your telescope's equatorial mount at Polaris will work sufficiently for observing celestial objects visually.



- 3 Remove both the front polar axis cap on the declination body and the rear cap on the polar axis body.



## APPLICATION

- 4 Turn on the power switch of the mount and advance the initial settings until the telescope's home position screen appears on the screen of your smartphone.

You move the mount by swiping the screen of the smartphone with your fingers.

**Vertical direction: DEC movement**

**Horizontal direction: R.A. movement**

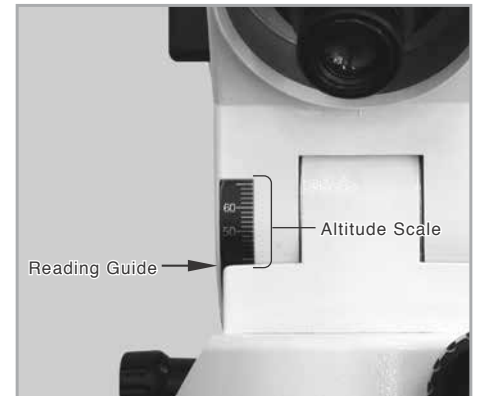


- 5 While looking into the opening on the declination body from the objective lens side of the polar alignment scope, turn the declination body with a vertical swiping motion on the screen of the smartphone until the objective lens of the polar alignment scope can be visible in the opening.

The declination body does not turn manually. Be sure to rotate it using the STAR BOOK Wireless app.

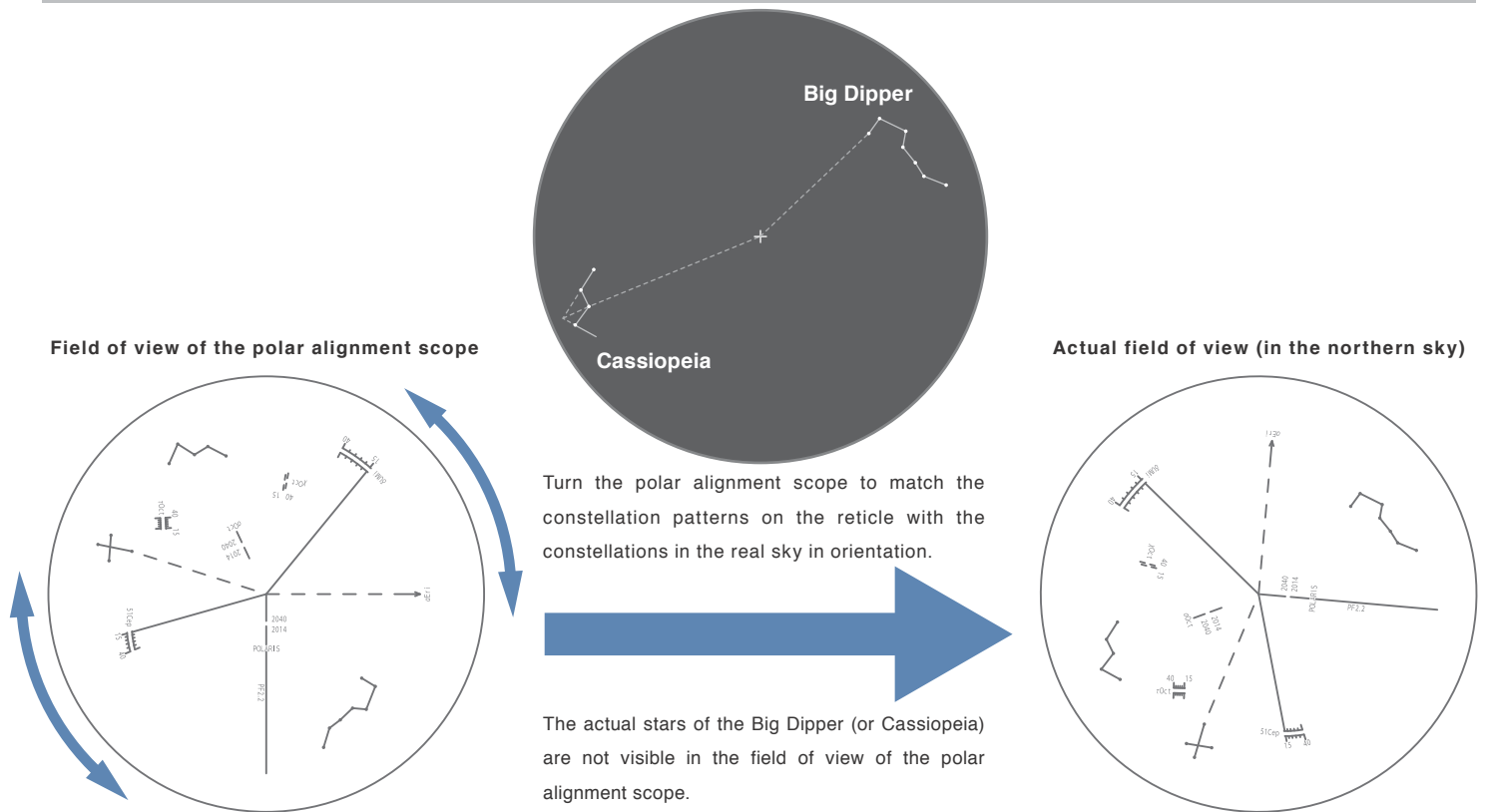


- 6 Turn the altitude adjustment handle so that the indicator of the altitude scale matches the latitude of your observing site. The mount is set for use in the middle altitude zone between 20 degrees and 50 degrees. To change the adjustments range to high or low latitude zone, please refer to page 43.



- 7 While looking through the eyepiece of the polar alignment scope, rotate the scope body so that the orientation of the engraved Big Dipper (or Cassiopeia) on the reticle matches the Big Dipper (or Cassiopeia) in the real sky.





## Note :

The patterns of the Big Dipper and Cassiopeia on the reticle are positioned to correspond to the real sky. These are used as a guidepost to know the turning direction of the reticle on the polar alignment scope. The positions of the Big Dipper and Cassiopeia on the reticle have no relationship with the positions of Polaris, Delta UMi, and 51 Cep on the reticle.

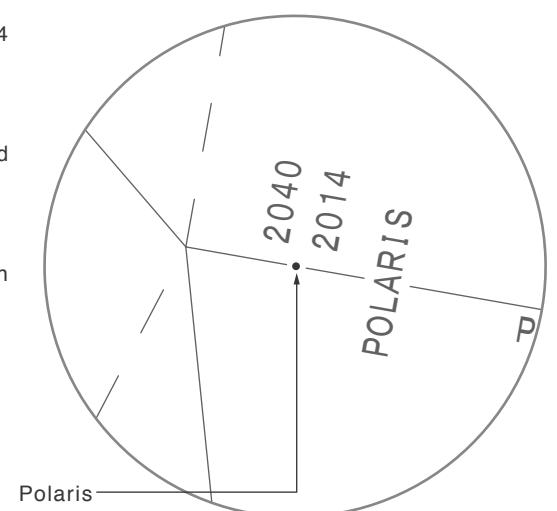
- 8 While looking through the eyepiece of the polar alignment scope, adjust the direction of the mount with the altitude adjustment handle and azimuth adjustment knobs alternatively so that Polaris comes as close as possible to the designated position on the reticle.



Introduce Polaris to the space between the two segments of the lines marked 2014 and 2040.

Polaris is relatively conspicuous in this area of the sky as it is a bright 2nd magnitude star adjacent to the north celestial pole.

You match the orientation of the reticle and introduce Polaris into the gap between the two linear lines



## APPLICATION

- 9 When you turn the azimuth adjustment knobs, unfastening one side of the azimuth adjustment knob will allow fastening the knob on the other side to change the azimuth direction.



- 10 Turn the altitude adjustment handle so that Polaris comes as close as possible to the designated position on the reticle.

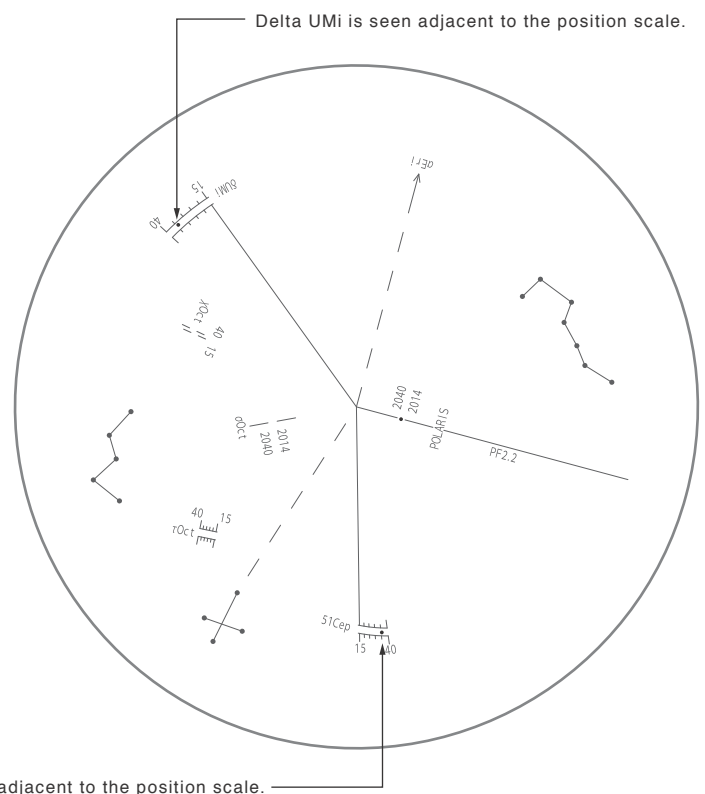


- 11 Because Polaris shifts to the designated position on the reticle, both Delta UMi and 51 Cep come close to their own designated positions on the scale as well. While looking through the eyepiece of the polar alignment scope, rotate the polar scope body so that each of the positions of Delta UMi and 51 Cap on the reticle come to the closest to actual UMi and 51 Cep.

The numbers 15 and 40 on the scales show the positions of UMi and 51 Cap for the years 2014 and 2040 respectively.

If Polaris comes to the right position on the reticle, both Delta UMi and 51 Cap will be found adjacent to the position scales on the reticle.

Adjust the brightness of the reticle illumination to be dimmer if the reticle is too bright to see the approximately 5th magnitude Delta UMi and 51 Cep.

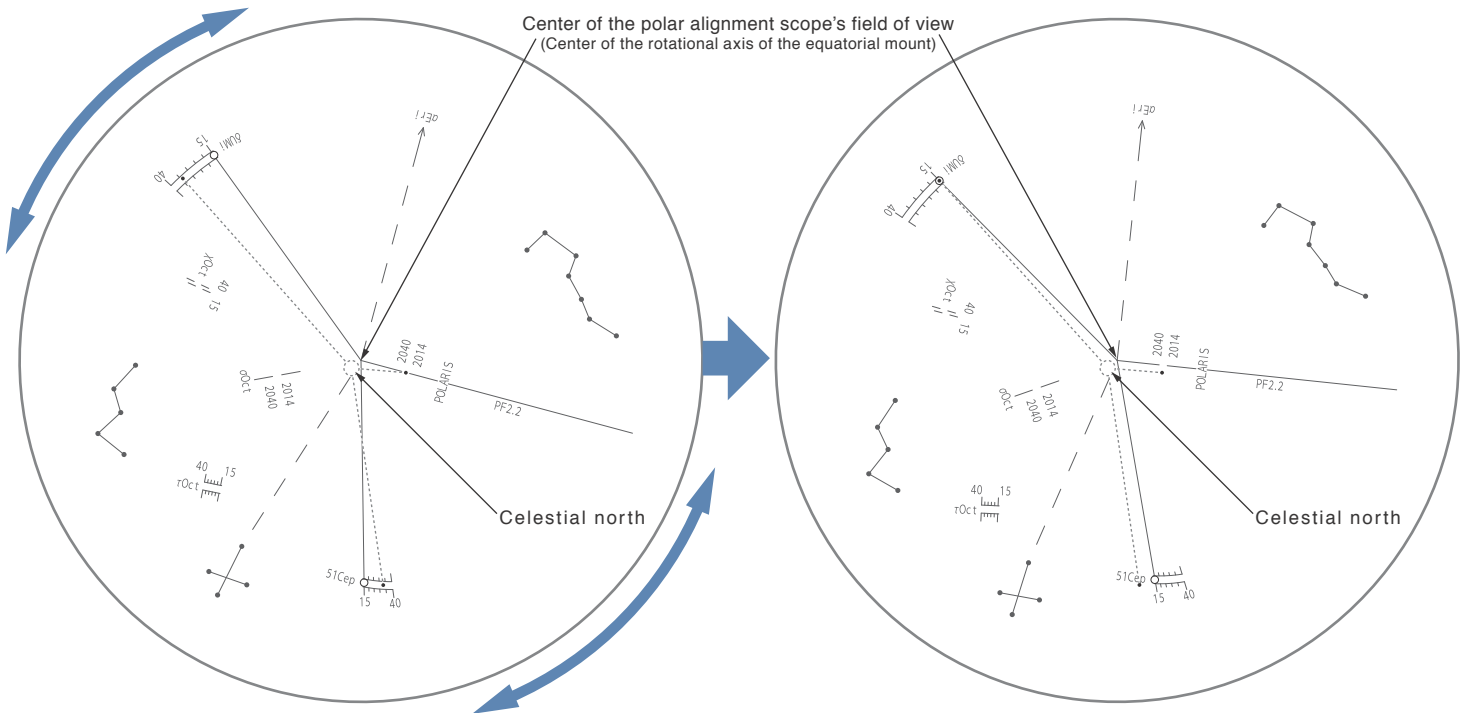


51 Cep is seen adjacent to the position scale.



## APPLICATION

Polaris is out of place from the designated position. This is part of the process.

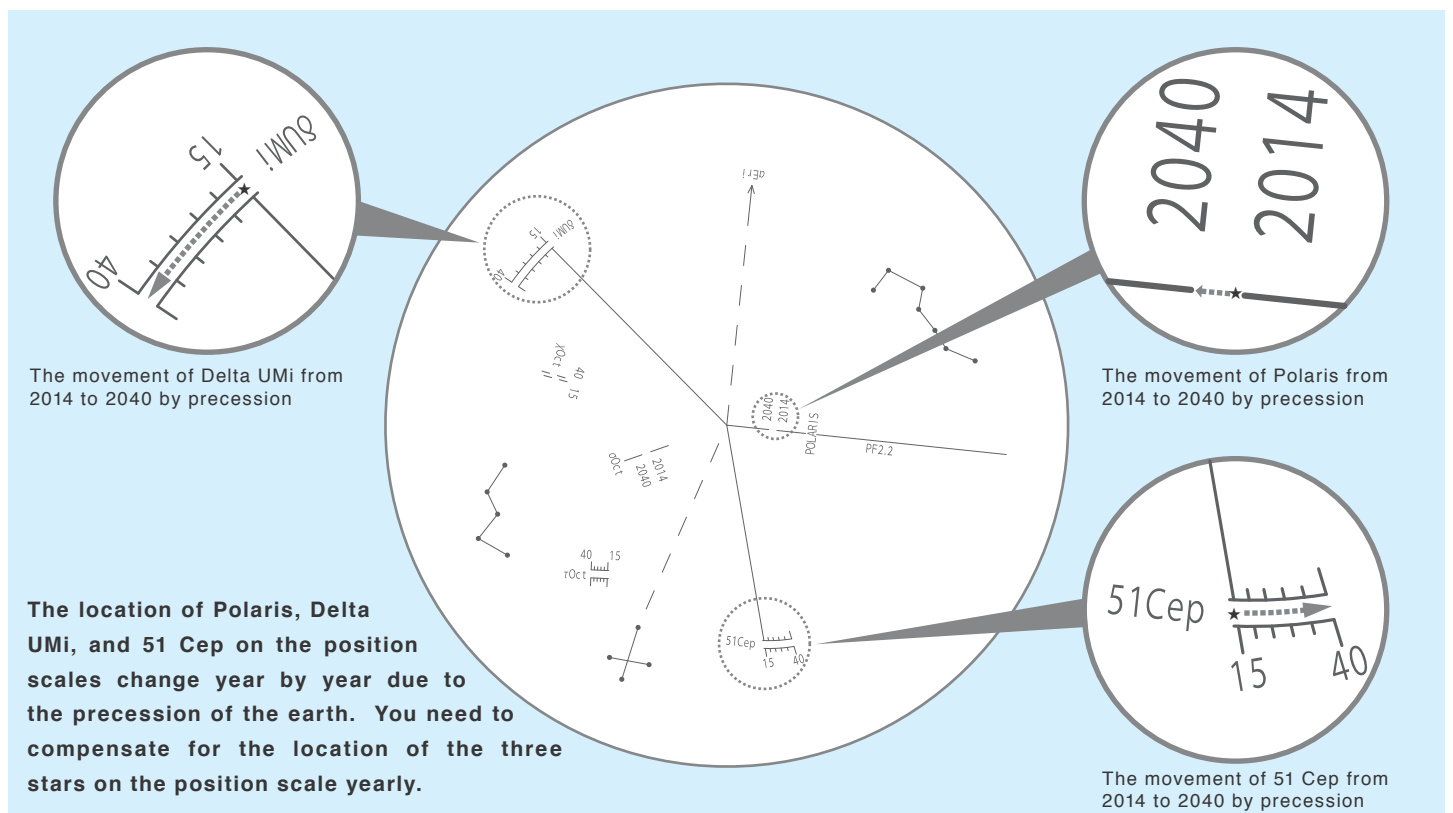


There is no mark in the sky to point to the North Celestial Pole. To locate the N.C.P., you use a conspicuous star like Polaris and two visible nearby stars in the same area of the sky. Your goal is to set Polaris of the year 2014 on the space between the two segments of the lines and place Delta UMi and 51 Cep on the year 2014 position of the position scales, respectively. (In the case of the year 2014)

The illustrations above show that you turn the polar alignment scope body so that Delta UMi can come near to the position of the year 2014 on the designated position scale.

As a consequence, Polaris got out of its position from the space between the lines.

If the 5th magnitude 51 Cep is hard to see in the field of view of the polar alignment scope, it is all right to set only Delta UMi on the position scale of the reticle. You reduce the illumination for the reticle to the minimum if it is too bright to see the 5th magnitude star.



The location of Polaris, Delta UMi, and 51 Cep on the position scales change year by year due to the precession of the earth. You need to compensate for the location of the three stars on the position scale yearly.



## APPLICATION

- 12** While looking through the eyepiece of the polar alignment scope, turn the altitude adjustment handle and azimuth adjustment knobs so that Polaris and the other two stars come as close as possible to the designated positions on the scales.

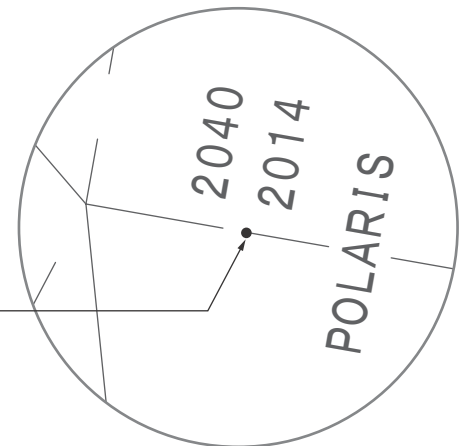


### Note :

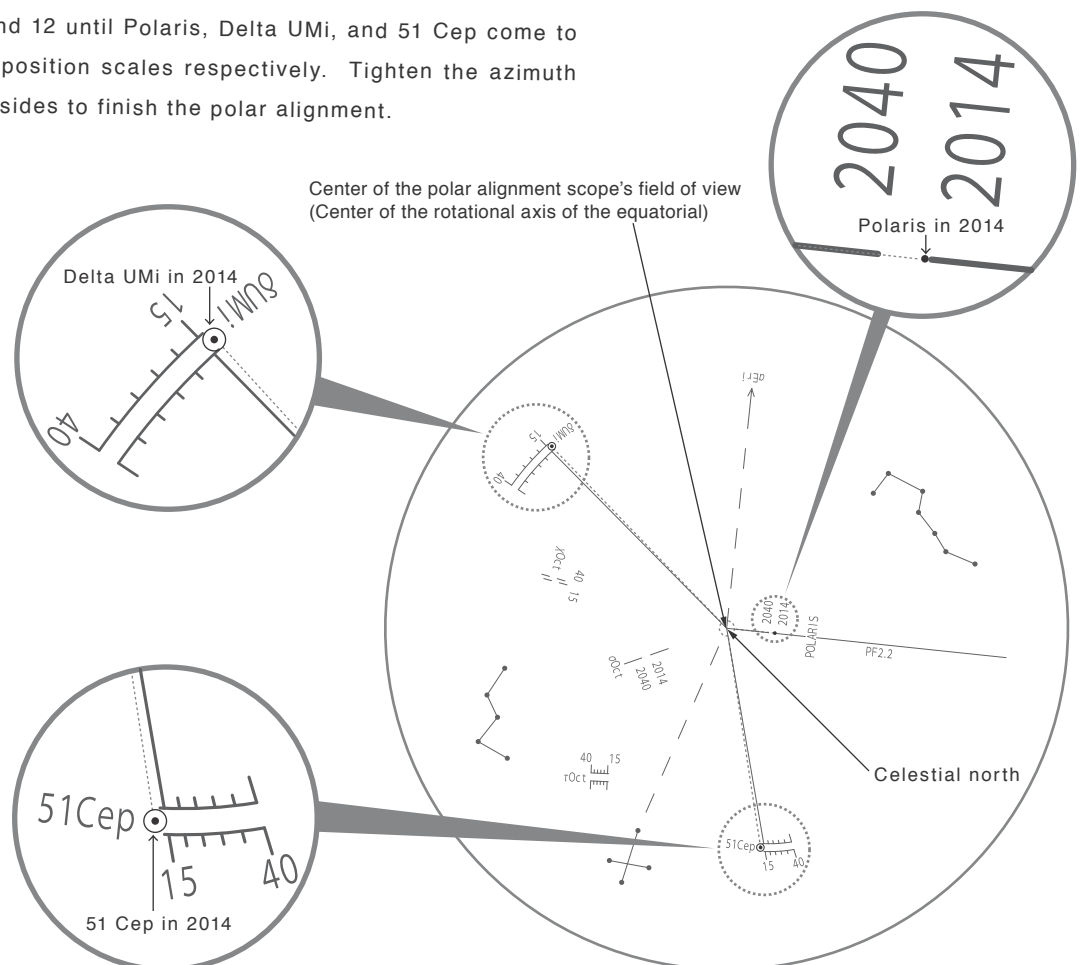
You introduce Polaris into the designated position with the altitude adjustment handle and the azimuth adjustment knobs.

You introduce Delta UMi and 51 Cep by rotating the polar alignment scope (for turning the reticle).

Set Polaris to the position corresponding to the year of your observation.



- 13** Repeat the procedures 11 and 12 until Polaris, Delta UMi, and 51 Cep come to the proper positions on the position scales respectively. Tighten the azimuth adjustment knobs from both sides to finish the polar alignment.

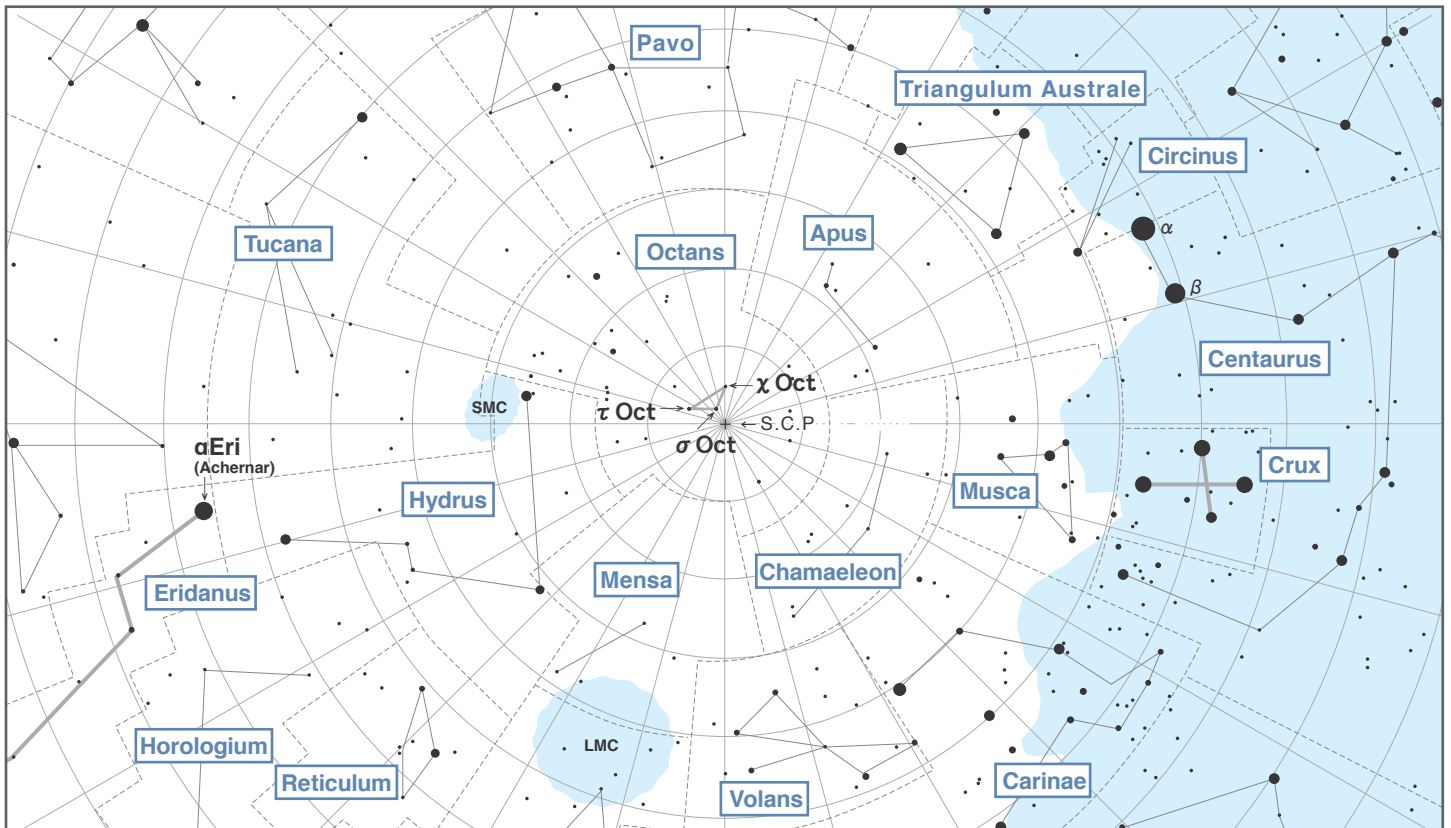


As an illustration here, Polaris is set to the edge of the line on the side of 2014. Both Delta UMi and 51 Cep are between the two curved lines of the position scales and are put near the protruded line on the scale. (In the case of the year 2014) Perfect!

## APPLICATION

### Polar Alignment in the Southern Hemisphere

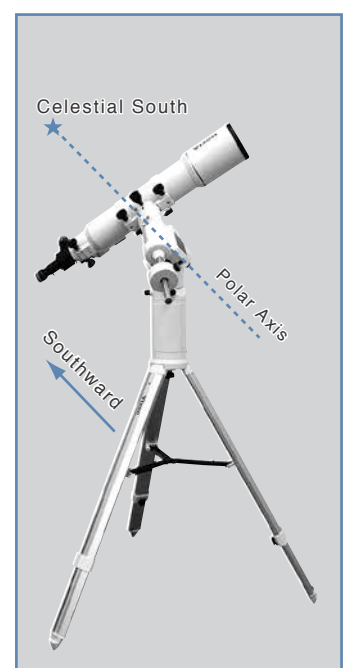
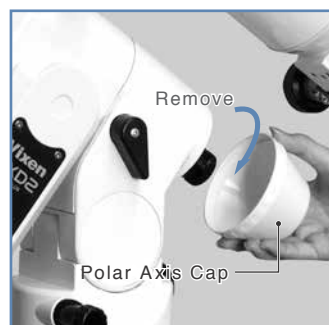
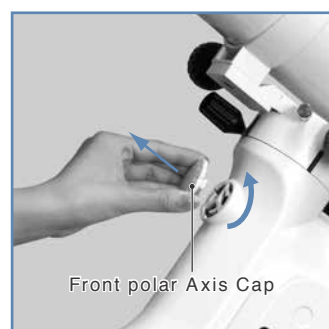
In the southern hemisphere, you need to align the equatorial mount to the south celestial pole (S.C.P.). The position scales for three stars near the S.C.P. are engraved on the reticle for the polar alignment. These stars are Sigma, Tau, and Chi in the constellation Octans. To locate the S.C.P., you merely match the scale positions on the reticle with the designated three stars seen in the field of view of the polar alignment scope. Also, the pattern of Crux (the Southern Cross) and Alpha Eridani (Achernar) are indicated on the reticle as a guidepost for the S.P.C..



1 Check your observing site with a compass, a GPS or a map in advance to confirm that Octans, the Southern Cross, and Alpha Eridani are seen from your observing location on the date of your observation.

2 Set up the telescope on flat and hard ground where you see Octans in the sky. A rough setting for pointing your telescope's equatorial mount at Octans using a compass will work sufficiently for observing celestial objects visually.

3 Turn on the power switch of the mount and advance the initial settings until the telescope's home position screen appears on the screen of the smartphone. You position the telescope tube to be level toward east in the southern hemisphere.

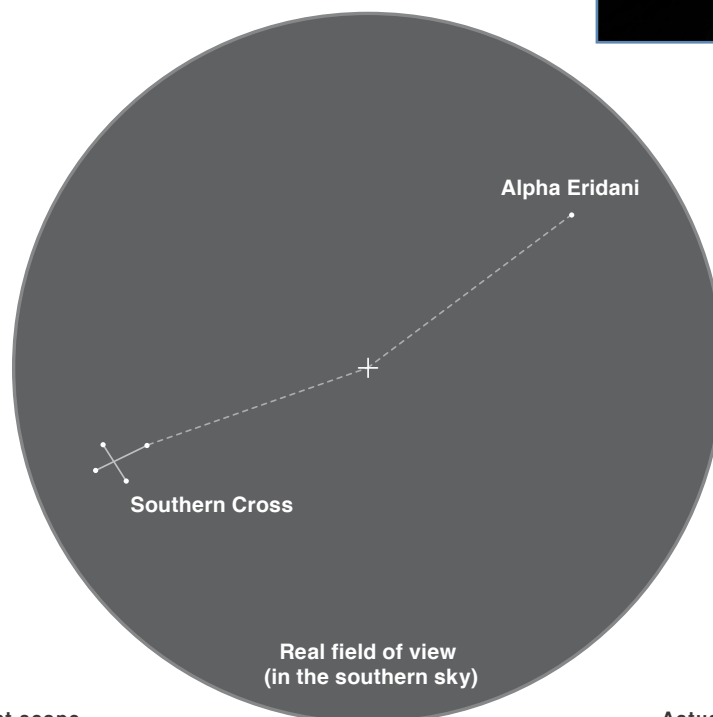


## APPLICATION

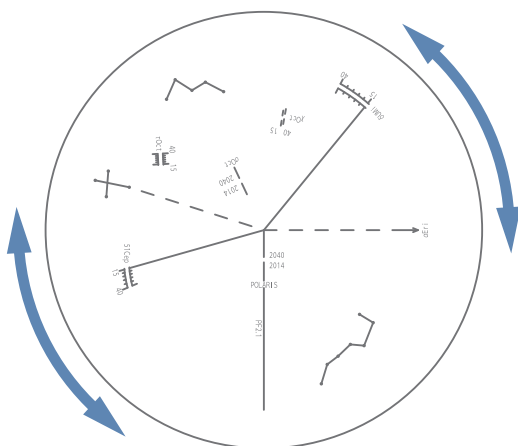
### Note:

Unlike Polaris which is a bright 2nd magnitude star adjacent to the N.C.P., the constellation Octans is made up of dark stars about 5th magnitude on average. The nearest star to the S.C.P. is Sigma Octantis, which is one of four stars forming a trapezoid in Octans, visible at 5.5th magnitude. You may need practices in locating the inconspicuous Sigma, Tau, and Chi from Octans.

- 4 While looking through the polar alignment scope, you turn the scope body to match the Southern Cross on the reticle with the orientation of Crux in the actual sky. Or you turn the scope body to match the direction of Alpha Eridani indicated on the reticle with Alpha Eridani in the real sky.



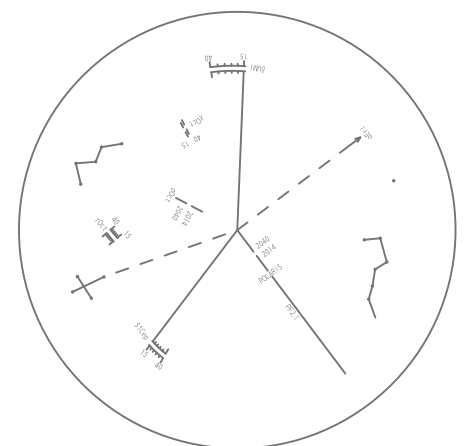
Field of view of the polar alignment scope



Turn the polar alignment scope to match the constellation patterns on the reticle with the constellations in the real sky in orientation.

The actual stars of Crux (or Alpha Eridani) are not visible in the field of view of the polar alignment scope.

Actual field of view (in the southern sky)

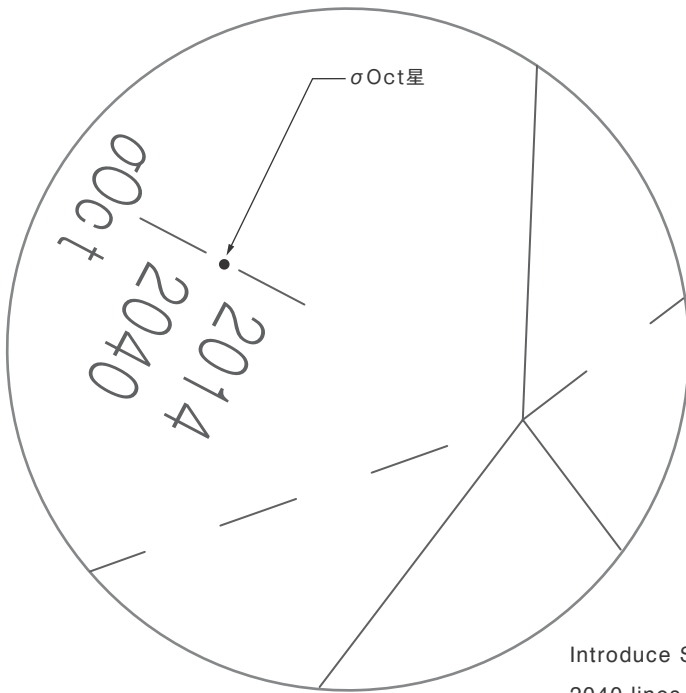


### Note:

The patterns of Crux and Alpha Eridani on the reticle are positioned to correspond to the real sky. These are used as a guidepost to know the turning direction of the reticle on the polar alignment scope. The positions of Crux and Alpha Eridani on the reticle have no relationship with the positions of Octans stars on the reticle.

## APPLICATION

- 5 While looking through the eyepiece of the polar alignment scope, adjust the direction of the mount with the altitude adjustment handle and azimuth adjustment knobs alternatively, so that Sigma Octantis comes as close as possible to the designated position on the reticle.



Azimuth Adjustment Knob



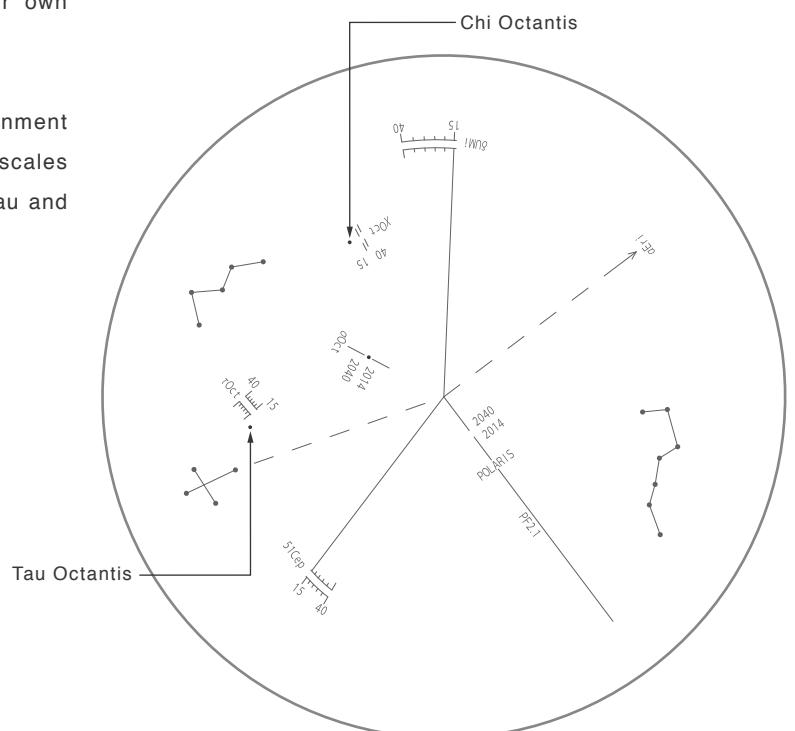
Altitude Adjustment Handle

Introduce Sigma Octantis into the space between the two segments of 2014 and 2040 lines, as shown in the figure.

Turn the scope body so that the space between the two segments on the reticle comes as close as possible to Sigma Octantis.

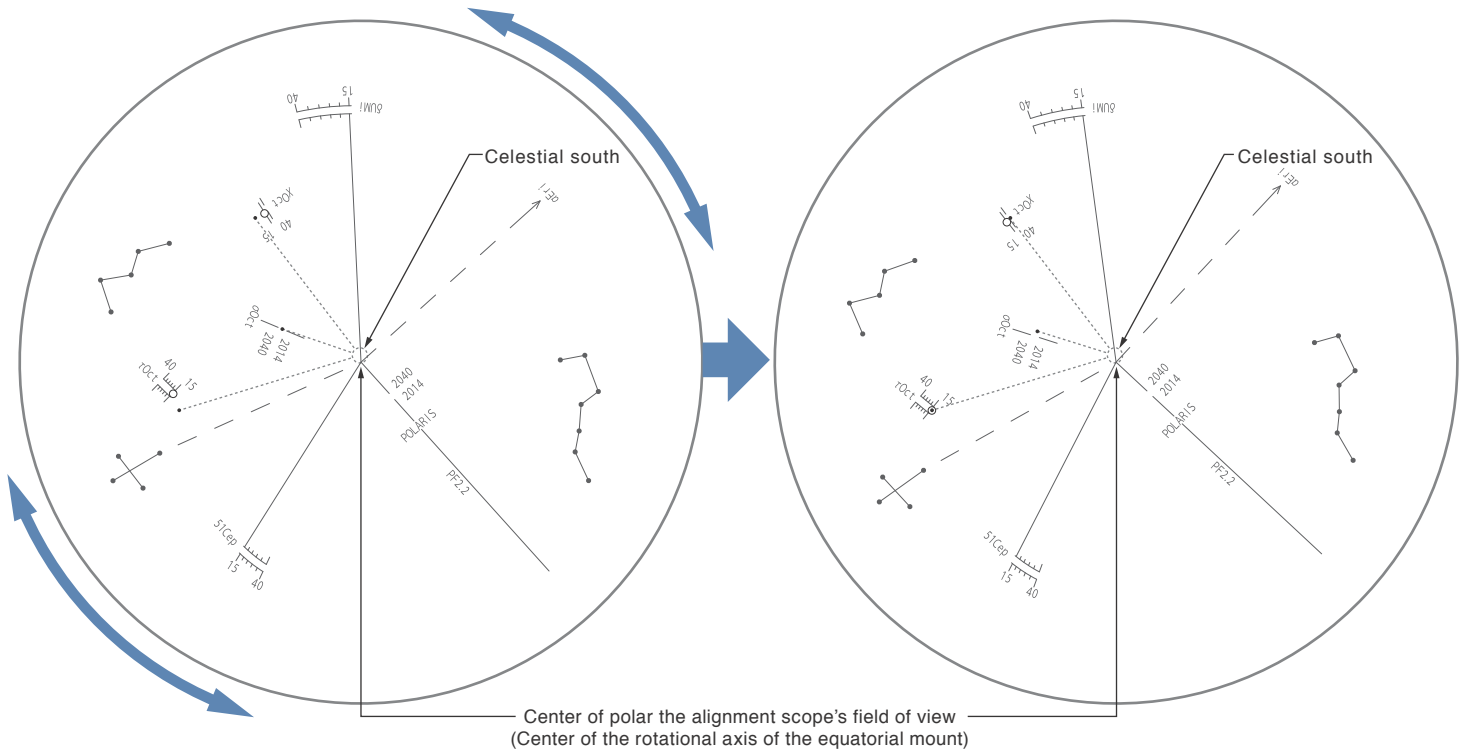
- 6 As Sigma Octantis shifts toward the designated position on the reticle, both Tau and Chi Octantis come close to their own position scales.

While looking through the eyepiece of the polar alignment scope, turn the scope body so that each of the position scales for Tau and Chi Octantis come to the closest to actual Tau and Chi Octantis in the scope's field of view.



## APPLICATION

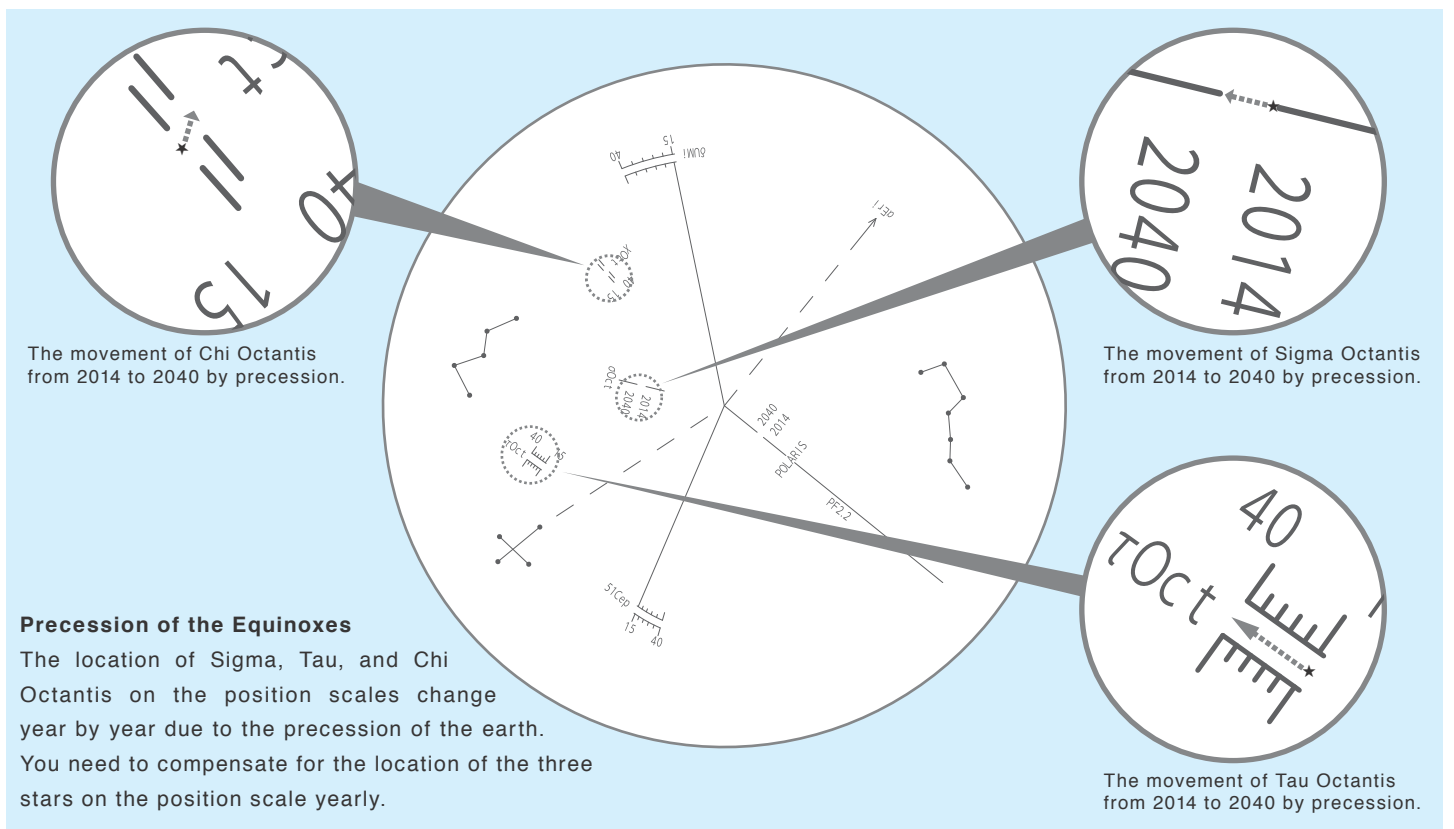
Polaris is out of place from the designated position. This is part of the process.



There is no mark in the sky to point to the South Celestial Pole. To locate the S.C.P., you use three stars in the constellation Octant nearby the S.C.P.. Your goal is to set Sigma Octantis on the space between the two segments of the lines and place both Tau and Chi Octantis on the year 2014 position of the position scales respectively. (In the case of the year 2014)

The illustrations above show that you turn the polar alignment scope body so that Tau Octantis can come near to the position of the year 2014 on the designated position scale.

As a consequence, Sigma Octantis got out of its position from the space between the lines.

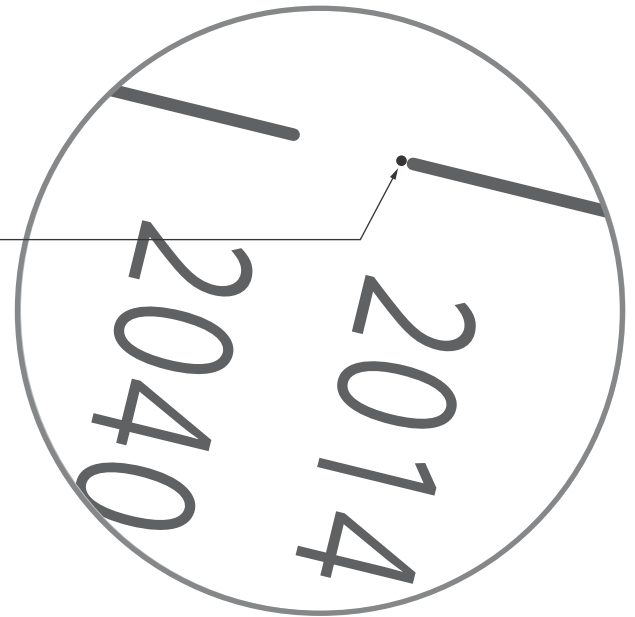


## APPLICATION

- 7 While looking through the eyepiece of the polar alignment scope, turn the altitude adjustment handle and azimuth adjustment knobs so that Sigma Octantis and the other two stars come as close as possible to the designated positions on the scale.



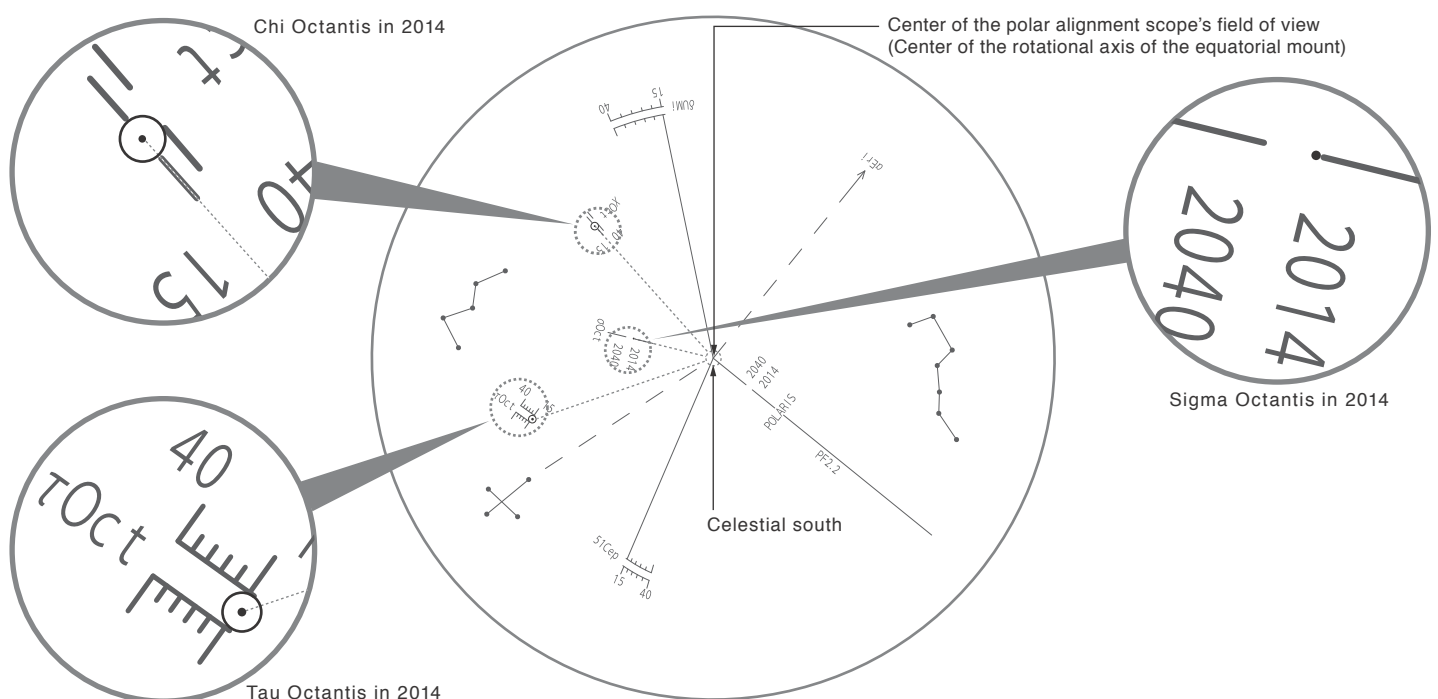
Set Sigma Octantis to the position corresponding to the year of your observation.



### Note :

You introduce Sigma Octantis into the designated position with the altitude adjustment handle and the azimuth adjustment knobs.  
You introduce Tau and Chi Octantis by rotating the polar alignment scope (for turning the reticle).

- 8 Repeat the procedures 6 and 7 until Sigma, Tau, and Chi Octantis come to the proper positions on the position scales, respectively. Tighten the azimuth adjustment knobs from both sides to finish the polar alignment.



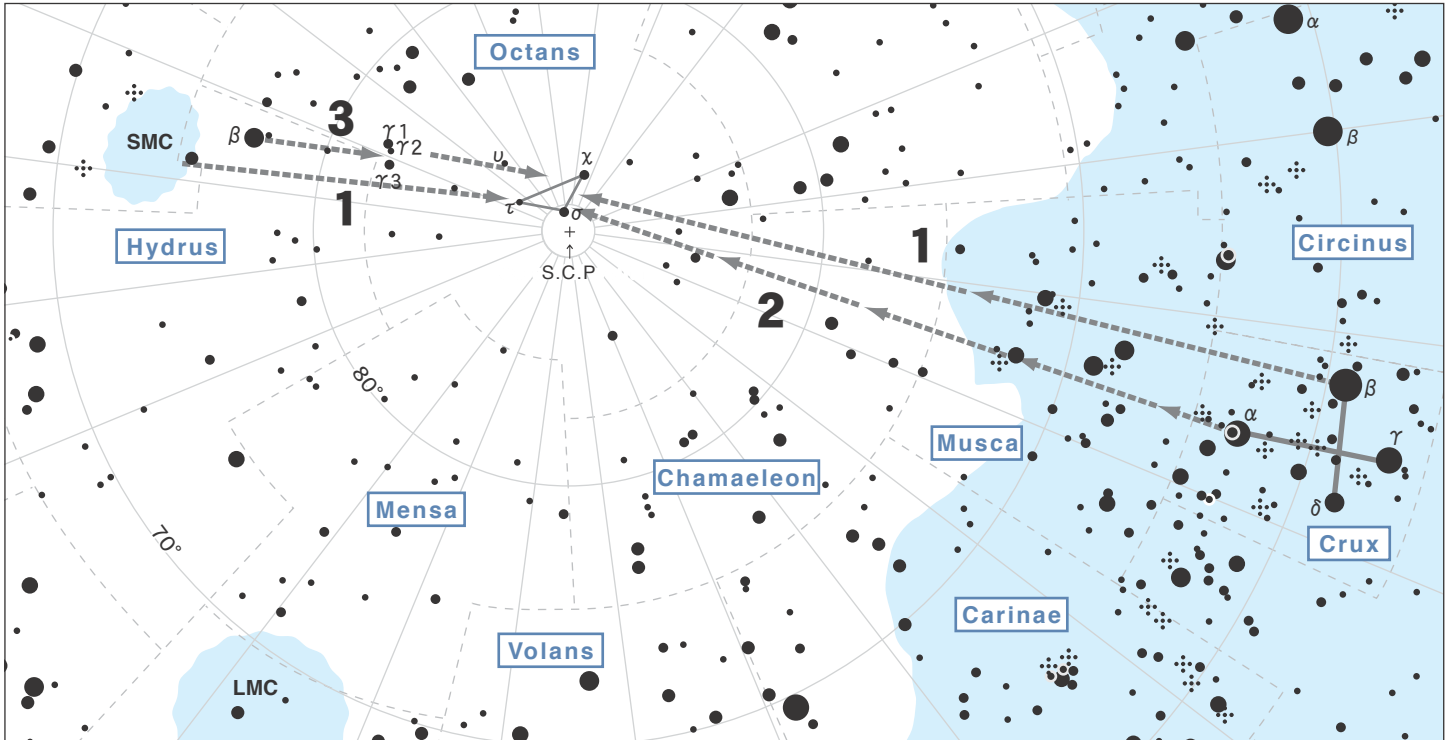
As an illustration here, Sigma Octantis is set to the edge of the line on the side of 2014. Both Tau and Chi Octantis are between the two curved lines of the position scales and are put near the protruded line on the scale. (In the case of the year 2014) Perfect!



## APPLICATION

### Tips on finding the constellation Octans

You find a few methods to locate inconspicuous Octans using the surrounding stars and constellations.



**Note:** The orientation of Octans changes depending on the seasons of the year.

#### 1 Directing to Octans using Small Magellanic Cloud and Crux (the Southern Cross)

Draw an imaginary line between the center of SMC and Beta Crux, and divide it at a ratio of one to two. You will find the four stars of Octans at the divide point.

#### 2 Directing to Octans using the arrangement of stars of Crux (the Southern Cross)

Draw an imaginary line extended toward SMC by using another imaginary line drawn between Alpha and Gamma Crux. The imaginary line from Crux reaches the Octantis three stars when extended by 4.5 times.

#### 3 Directing to Octans using SMC, Beta Hydrus, and Gamma Octantis

If you cast your eyes from SMC toward Crux by little, you will find Beta Hydrus. Going southward toward Crux from Beta Hydra will find you Gamma Octantis, which consists of a row of three stars. Continue on your eyes by the same distance toward Crux, and you will find the four stars of Octans.

### About PF-L Assist App

The PF-L Assist app helps align a Vixen equatorial mount to the north celestial pole or south celestial pole by simulating the field of view of the polar alignment scope. The app displays the current night sky seen in your location, and it will guide you to match the orientation of the constellations on the reticle in the polar alignment scope with the constellations in the actual sky when you set up the equatorial mount.

You can readily locate stars designated for polar alignment even if the constellations are hidden by trees or buildings, when the night sky is affected by city lights, or when you set up the equatorial mount at dusk.



## PF-L Assist

The free download PF-L Assist app is available for iPhone, Android, and Kindle Fire.

Visit our website at: <https://www.vixen.co.jp>



## APPLICATION

### Precise Polar Alignment (Drift Alignment – for advance users)

If you precisely align the mount with the provided polar alignment scope, the mount will keep tracking the celestial objects that are caught in a field of view of your telescope's eyepiece.

It enables you to take exposures of 5 to 10 minutes with a telephoto lens of 200mm focal length or less in taking astrophotography. However, if you want to take exposures longer than 10 minutes or use a telephoto lens of a focal length longer than 200mm, more precise polar alignment is what you require. The following method of polar alignment is called 'Drift Alignment'. You make adjustments for the alignment by watching the movements of a bright star introduced in the eyepiece.

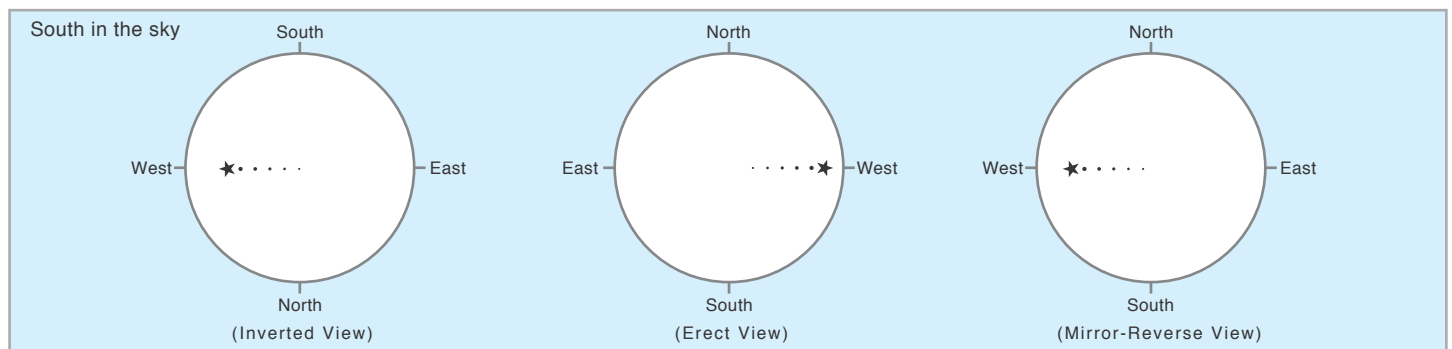
#### Note:

Perform the drift alignment before you proceed to the alignment of the mount using the STAR BOOK Wireless Unit. Information acquired for alignment will correct a deviation from the polar axis automatically. The difference will disappear as a result and will spoil the drift alignment.

### Drift Alignment in the Northern Hemisphere

- 1 First, align the mount to the north celestial pole using the polar alignment scope. It will save time during the process of drift alignment.
- 2 Align the mount to match the direction of the azimuth with your observing site. Prepare an eyepiece with an illuminating cross hairs reticle. Choose a bright star just north of the celestial equator near the meridian (due south), and put it in a field of view of the eyepiece. Turn off the power switch of the mount momentarily while looking through the eyepiece to see which direction the star moves. Confirm the west and rotate the eyepiece so that one of the crosshairs can be parallel to the east-west direction in the field of view.

The figure shows the directions of north, south, east, and west in the eyepiece according to the type of your telescope with or without a star diagonal.



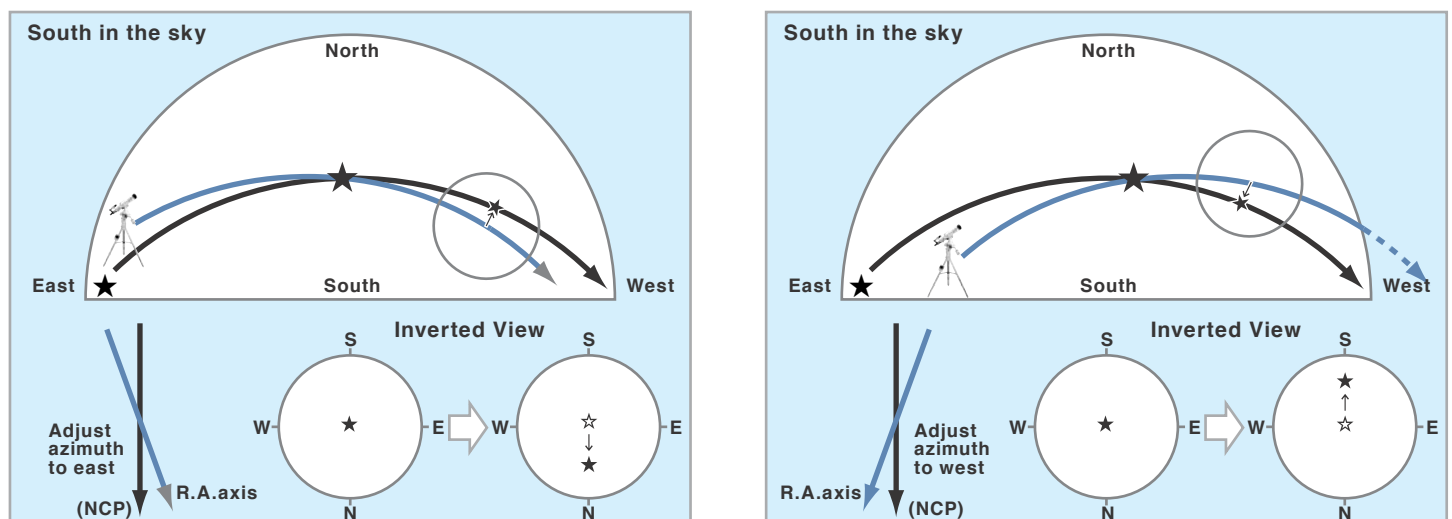
The following descriptions are based on a refracting telescope without a star diagonal. Drive the mount at a sidereal rate and look through the eyepiece to monitor the drift motion of the star in the north-south direction.

If the star drifts north (i.e., it seemingly moves down due to the inverted view), move the mount to the east with the azimuth knobs.

If the star drifts south (i.e., it seemingly moves up due to the inverted view), move the mount to the east with the azimuth knobs.

#### Note:

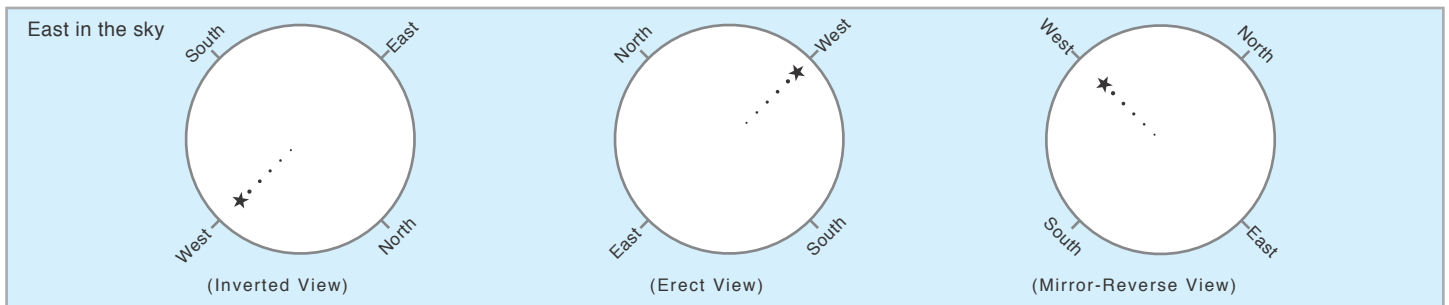
You may find that the star in the field of view moves slightly in the east-west direction, but disregard it at this stage and continue the adjustments.



Continue the adjustments until the star stops drifting in the north (star drifts down) or south (star drifts up) direction. You finish the drift alignment in the azimuth direction.

## APPLICATION

- 3 Align the mount to match the height of altitude with your observing site. Choose a bright star in the east or west sky near the celestial equator, and put it in a field of view of the eyepiece. Here, a star in the eastern sky is chosen.



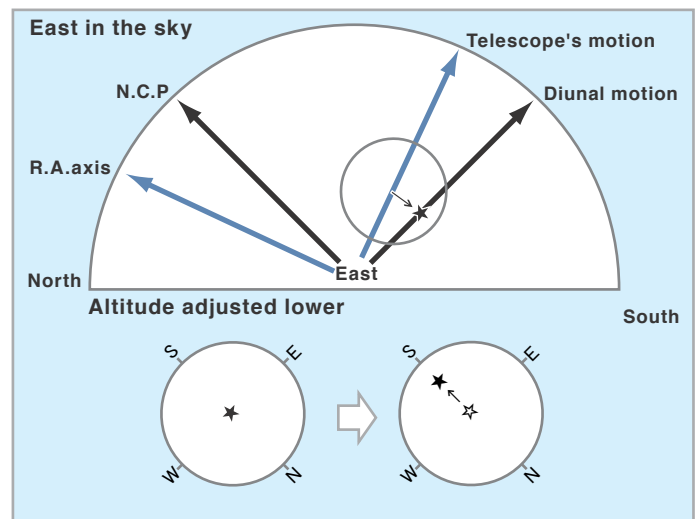
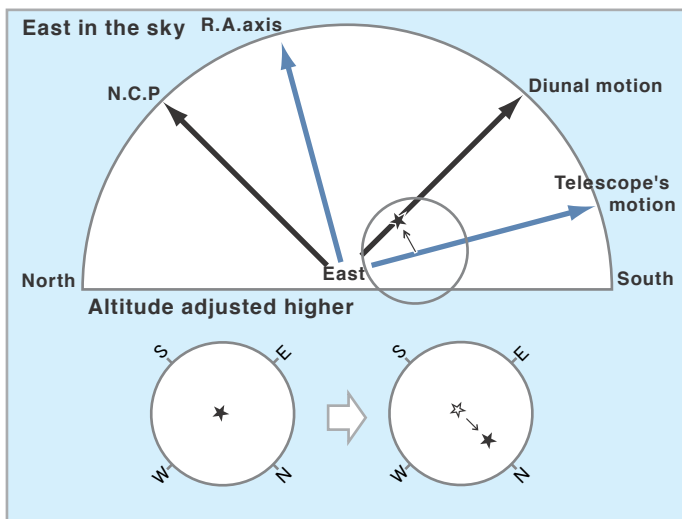
Confirm the west-east direction in the field of view and rotate the eyepiece so that one of the crosshairs is parallel to the east-west direction in the eyepiece.

Track the star in the eastern sky with the mount to observe it.

Drive the mount and look through the eyepiece to monitor the drift motion of the star in the north-south direction.

If the star drifts north (i.e., it seemingly moves lower right due to the inverted view), move the mount to low with the altitude handle.

If the star drifts south (i.e., it seemingly moves upper left due to the inverted view), move the mount to high with the altitude handle.



Continue the adjustments until the star stops drifting in the north (star drifts lower right) or south (star drifts upper left) direction. You finish the drift alignment in the altitude direction.

## APPLICATION

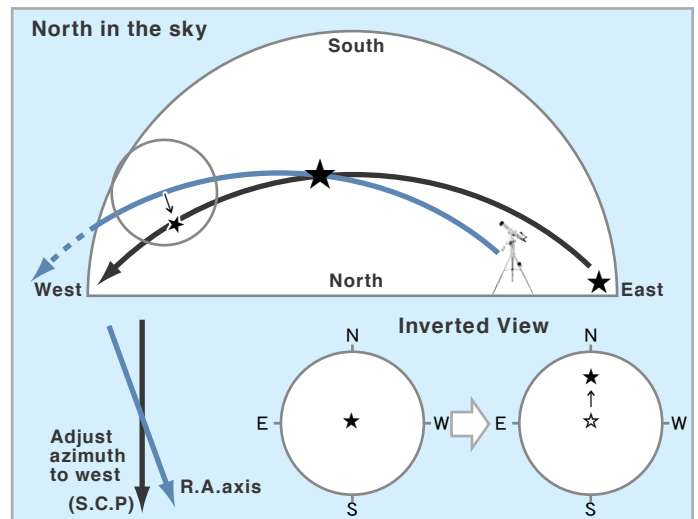
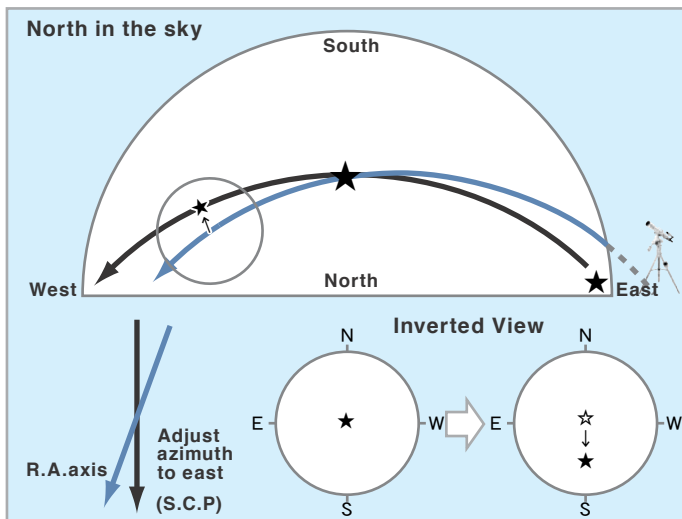
### Drift Alignment in the Southern Hemisphere

- Align the mount to match the direction of the azimuth with your observing site. Prepare an eyepiece with an illuminating cross hairs reticle. Choose a bright star just south of the celestial equator near the meridian (due north), and put it in a field of view of the eyepiece.

Turn off the power switch of the mount momentarily while looking through the eyepiece to see which direction the star moves. Confirm the west and rotate the eyepiece so that one of the crosshairs can be parallel to the east-west direction in the field of view. The following descriptions are based on a refracting telescope without a star diagonal.

If the star drifts south (i.e., it seemingly moves down due to the inverted view), move the mount to the east with the azimuth knobs.

If the star drifts north (i.e., it seemingly moves up due to the inverted view), move the mount to the east with the azimuth knobs.



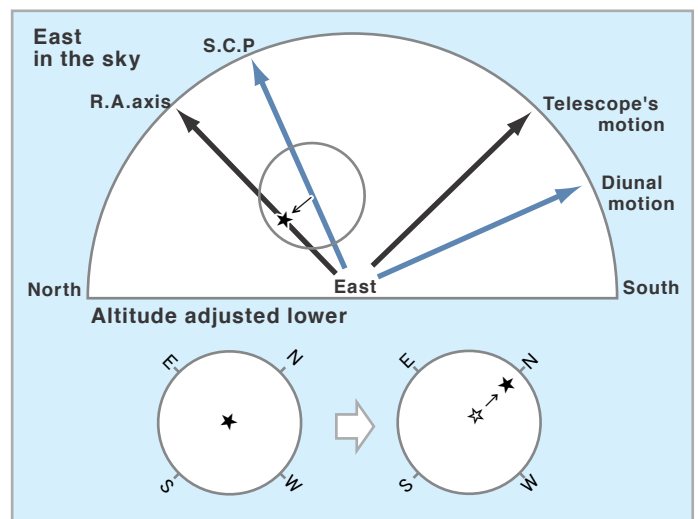
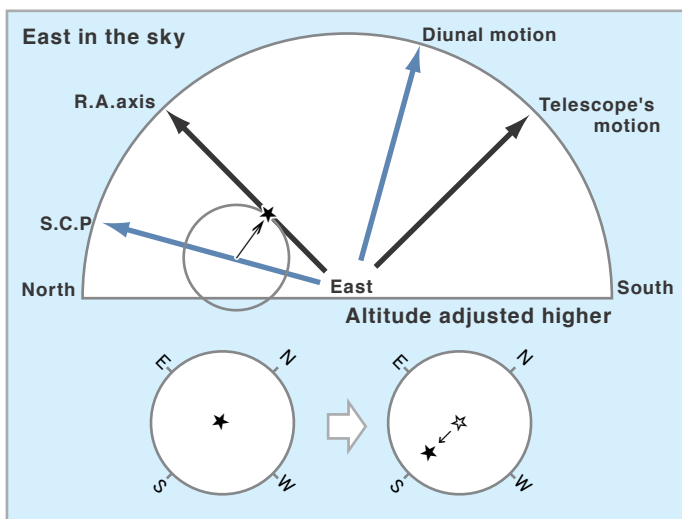
Continue the adjustments until the star stops drifting in the north (star drifts down) or south (star drifts up) direction. You finish the drift alignment in the azimuth direction.

- Align the mount to match the height of altitude with your observing site. Choose a bright star in the east or west sky and near the celestial equator, and put it in a field of view of the eyepiece. Here, a star in the eastern sky is chosen.

Confirm the west-east direction in the field of view and rotate the eyepiece so that one of the crosshairs is parallel to the east-west direction in the eyepiece.

If the star drifts south (i.e., it seemingly moves lower left due to the inverted view), move the mount to low with the altitude handle.

If the star drifts north (i.e., it seemingly moves upper right due to the inverted view), move the mount to high with the altitude handle.



Continue the adjustments until the star stops drifting in the south (star drifts lower left) or north (star drifts upper right) direction. You finish the drift alignment in the altitude direction.

## APPLICATION

### Changing the Altitude Setting to Low or High

The mount is set for use in the middle latitude zone (35 degrees plus/minus 15 degrees in latitude) at Vixen's factory. If your observing site is lower or higher than the range of the middle latitude zone, you need to change the current altitude setting to match the latitude of your observing place.

The range of altitude adjustments is divided into three positions (low, middle, and high) between 0 degree and 70 degrees in latitude.

<b>High Latitude: 40 degrees up to 70 degrees</b>
<b>Middle Latitude: 20 degrees up to 50 degrees</b> (Initial setting at Vixen's factory)
<b>Low latitude: 0 degree up to 30 degrees</b>

1 Remove the optical tube, counterweight(s), and wireless unit from the mount.

2 Loosen the altitude clamp lever on the side where no altitude scale is attached and turn the altitude adjustment handle so that the altitude of the mount comes to a position of 35 degrees. Then, tighten the altitude clamp lever.



3 Loosen and remove the bolt beneath the altitude clamp lever with the supplied 5mm Allen wrench.



4 While holding the mount head with one hand, loosen the altitude clamp lever with the other hand so that the mount body is moved slowly to a high or low latitude setting position.

5 Set the mount body to a position of 55 degrees in altitude if you use it in the range of high latitude. Or set the mount body to a position of 15 degrees in altitude if you use it in the range of low latitude. Then, tighten the altitude clamp lever.



6 Put back the bolt and tighten it securely with the Allen wrench.



7 Loosen the altitude clamp lever again and turn the altitude adjustment handle so that the altitude of the mount matches your observing site.

8 Finally, tighten the altitude clamp lever to finish the setting.

#### ⚠ CAUTION

Never tilt the mount body quickly, as it may result in damage or lead to injury.

It is not possible to set the latitude over 70 degrees.

## APPLICATION

### IV. Autoguider

The wireless unit has an autoguider port to connect a commercially available autoguider.

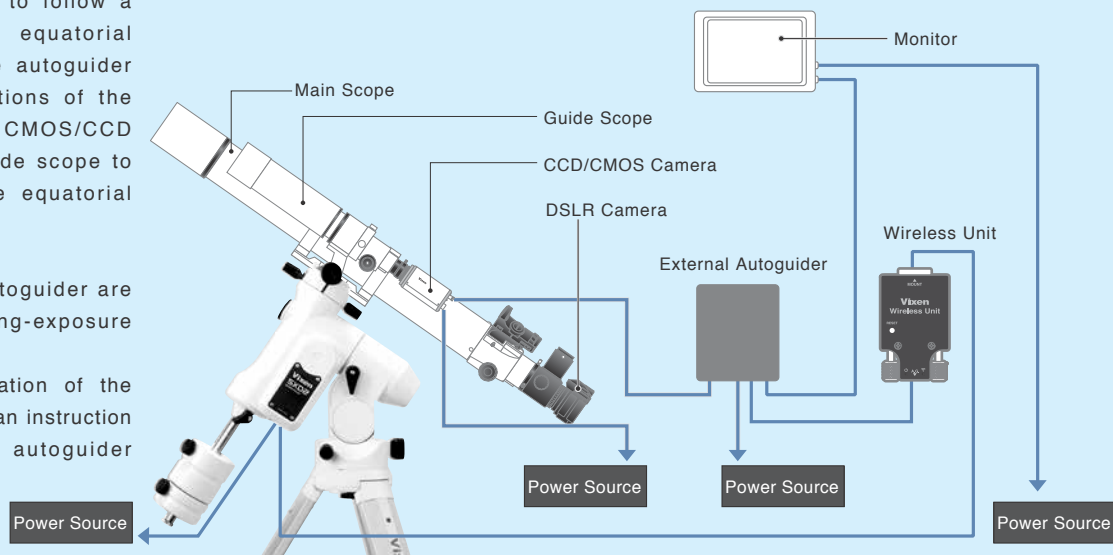
**The autoguider pinout is compatible with the ST series autoguiders from SBIG.**

#### Auto Guiding Configuration

Auto Guiding allows you to follow a star accurately with an equatorial mount automatically. The autoguider compensates for the motions of the star captured with a CMOS/CCD camera attached to a guide scope to achieve tracking of the equatorial mount precisely.

The advantages of the autoguider are most apparent during long-exposure astrophotography.

For installation and operation of the autoguider, please refer to an instruction manual provided by the autoguider manufacturer.





## APPENDIX

### Specifications – SX2-WL

	SX2 Equatorial Mount Body
R.A. Slow Motion Wheel	Gear with 180-tooth full circle micro-movement, 72mm dia., Aluminum-alloy
DEC Slow Motion Wheel	Gear with 180-tooth full circle micro-movement, 72mm dia., Aluminum-alloy
Worm Gear Shaft	9mm dia., Brass made
R.A. Axis Shaft	40mm dia., Aluminum-alloy die-casting
DEC Axis Shaft	35mm dia., Aluminum-alloy
Number of Bearings	5
Counterweight Bar	20mm dia., Retractable
Polar Alignment Scope	Optional
Azimuth Adjustment	About +/- 7 degrees in fine adjustments, 1.2 degrees per knob rotation
Altitude Adjustment	About 0.8 degrees per rotation, Adjustable altitude range: 0 degree to 70 degrees, with 2-degree increments scale
Motor Drive	Stepping (Pulse) motors with 250PPS micro-step control
Automatic Slewing and Tracking	Wireless Unit and Smartphone with a dedicated app, Maximum tracking speed at 1000x sidereal rate
Maximum Loading Weight	12 kg (at a distance of 25cm from the R.A. and DEC crossing point.)
Controller Cable Port	D-SUB 9PIN male plug
Power Cable Port	DC12V EIAJ RC5320A Class 4, Center-plus polarity
Electricity Consumption	DC 12V, 0.3A to 2.0A (Mount with Wireless unit)
Dimensions	343mm x 360mm x 128mm
Weight	About 7kg (without a counterweight)
Optionally Available Accessories	SXG-HAL130 Aluminum Tripod, SXG Half Pillar, SXG-P85DX Metal Pillar, Power Source

### Specifications – SXD2-WL

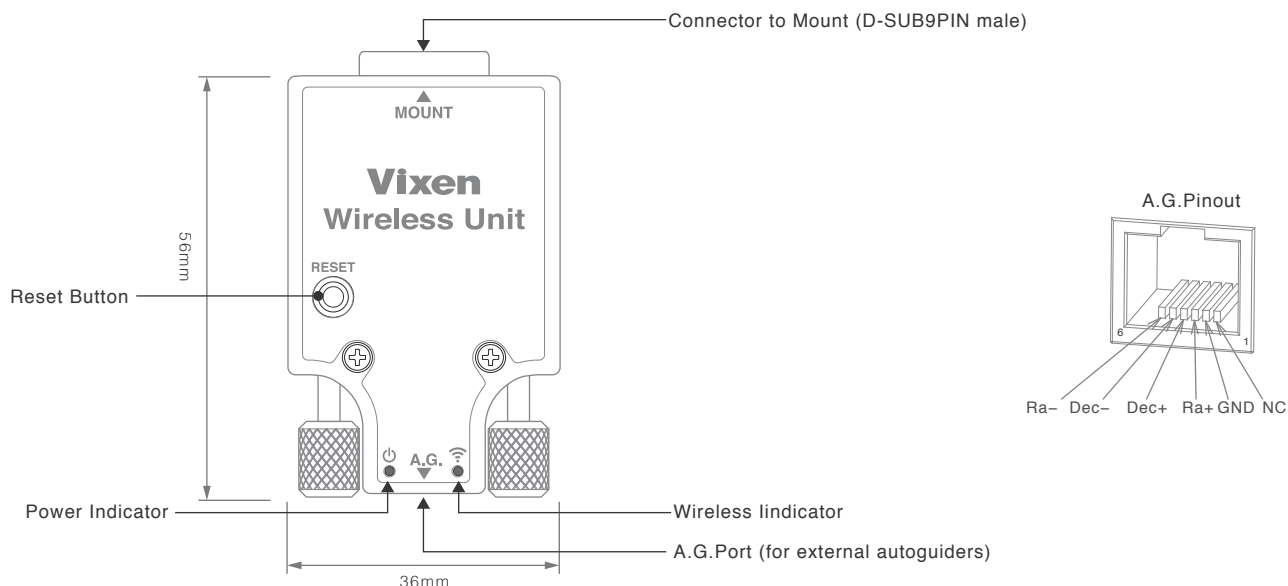
	SXD2 Equatorial Mount Body
R.A. Slow Motion Wheel	Gear with 180-tooth full circle micro-movement, 72mm dia., Brass made
DEC Slow Motion Wheel	Gear with 180-tooth full circle micro-movement, 72mm dia., Brass made
Worm Gear Shaft	9mm dia., Brass made
R.A. Axis Shaft	40mm dia., Carbon steel
DEC Axis Shaft	35mm dia., Carbon steel
Number of Bearings	9
Counterweight Bar	20mm dia., Retractable
Polar Alignment Scope	Built-in 5x20mm scope, Field of view 10 degrees, 3-star alignment system, Self-light-off reticle illuminator, brightness adjustable in 8 steps, 3 arc minutes setting accuracy, 1 x CR2032 battery
Azimuth Adjustment	About +/- 7 degrees in fine adjustments, 1.2 degrees per knob rotation
Altitude Adjustment	About 0.8 degrees per rotation, Adjustable altitude range: 0 degree to 70 degrees, with 2-degree increments scale
Motor Drive	Stepping (Pulse) motors with 250PPS micro-step control
Automatic Slewing and Tracking	Wireless Unit and Smartphone with a dedicated app, Maximum tracking speed at 1000x sidereal rate
Maximum Loading Weight	15 kg (at a distance of 25cm from the R.A. and DEC crossing point.)
Controller Cable Port	D-SUB 9PIN male plug
Power Cable Port	DC12V EIAJ RC5320A Class 4, Center-plus polarity
Electricity Consumption	DC 12V, 0.3A to 2.2A (Mount with Wireless unit)
Dimensions	343mm x 360mm x 128mm
Weight	About 9.2kg (without a counterweight)
Optionally Available Accessories	SXG-HAL130 Aluminum Tripod, SXG Half Pillar, SXG-P85DX Pillar, Power Source

## APPENDIX

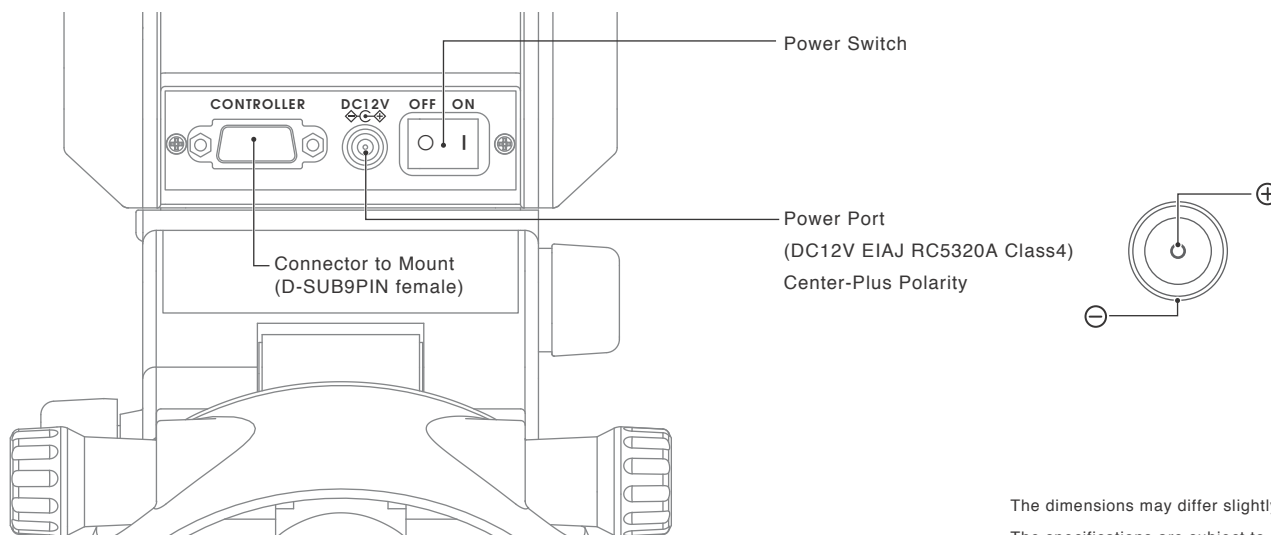
### Specifications – Wireless Unit

	Wireless Unit
Type	Wireless connection equatorial mount controller unit
Applicable mount	SX2, SXD2-PFL, SXP, SXP-PFL, SXP2, AXJ (Not available for a mount with AXJ encoders), AXD, AXD2
Equipped CPU	32bit CISC Processor 120MHz
Controller Cable Port	D-SUB 9PIN Female
Autoguider Port	6-pole 6-wired modular jack (for external autoguider)
Wi-Fi Function	With dedicated application software and use a smartphone as a user interface.
Operating environment of the app	Applicable OS : Android ver.6 or higher, iOS ver.9.0 or higher* · Wireless LAN Standards : IEEE 802.11b/g/n · Data Encryption methods: WPA2-APK *Even if you satisfy the conditions, it may not be usable. Please be sure to check the operation of the app before use.
Power Source	Supplied from a mount.
Operating Voltage / Current consumption	DC12V 0.1A (Max.)
Operating Temperature	0~40°C
Specification Remarks	Updating via Wi-Fi is available. / Cannot be used together with AXJ encoders.
Dimensions and Weight	56×36×19.5mm · 60g

### Wireless Unit Components Guide



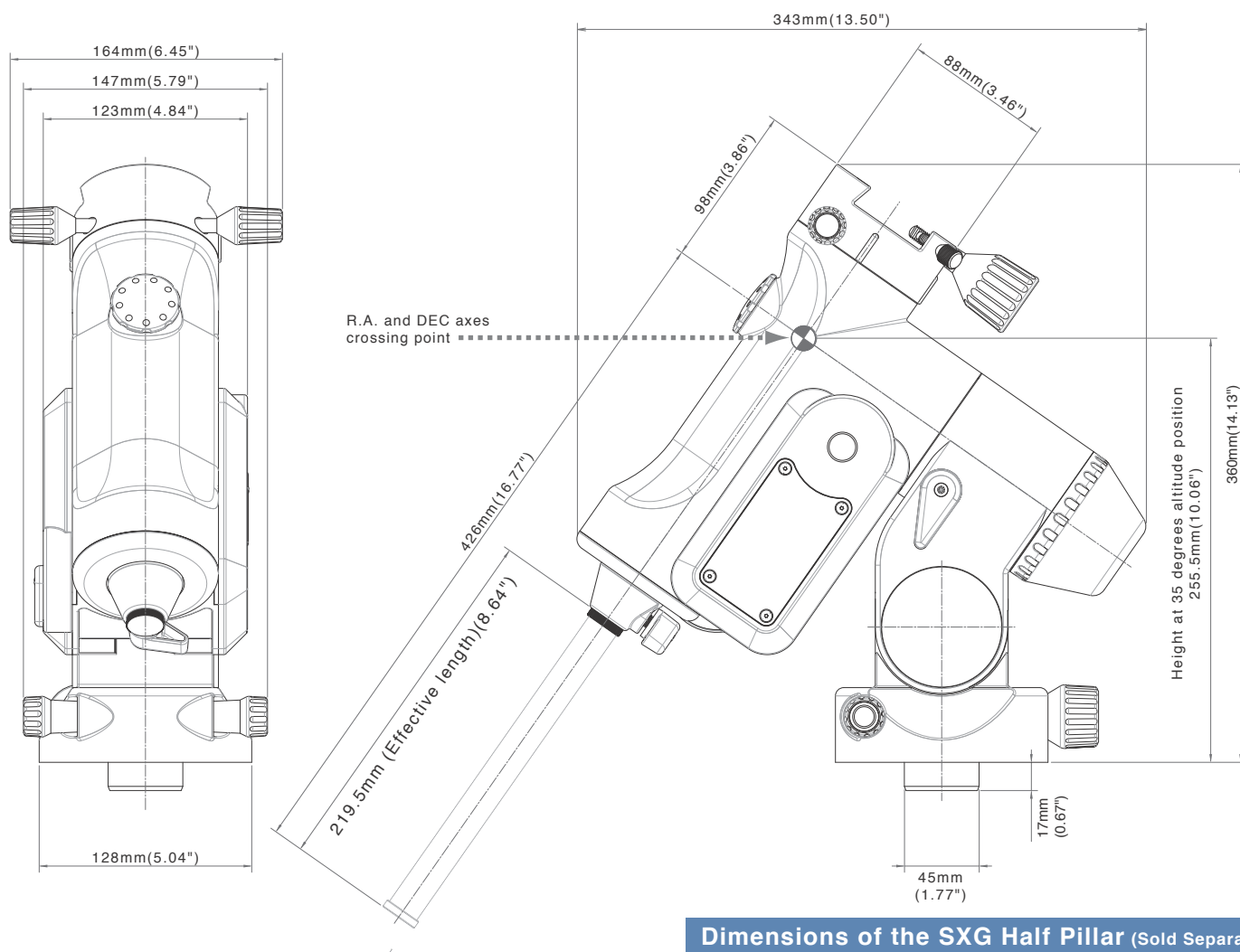
### Connectors on the Mount



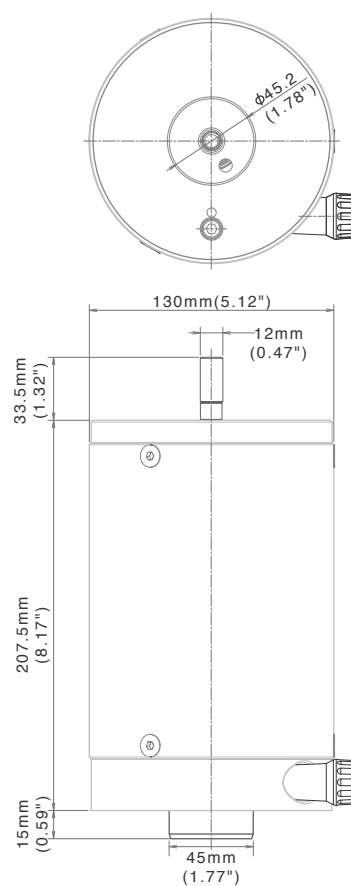
The dimensions may differ slightly on your product.  
 The specifications are subject to change without notice.

## APPENDIX

### Dimensions of the Mount

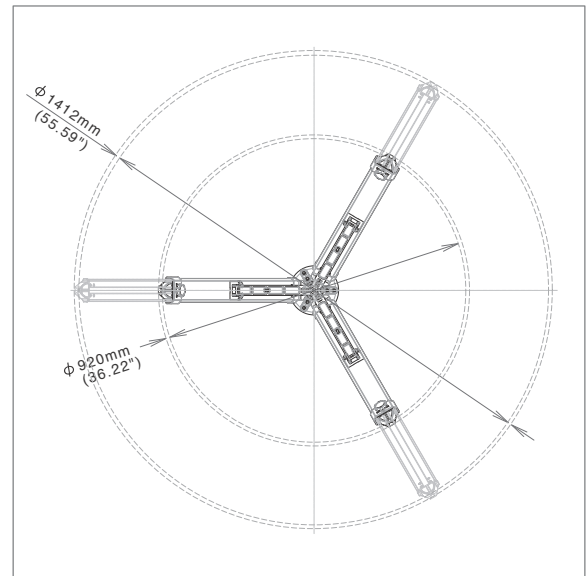
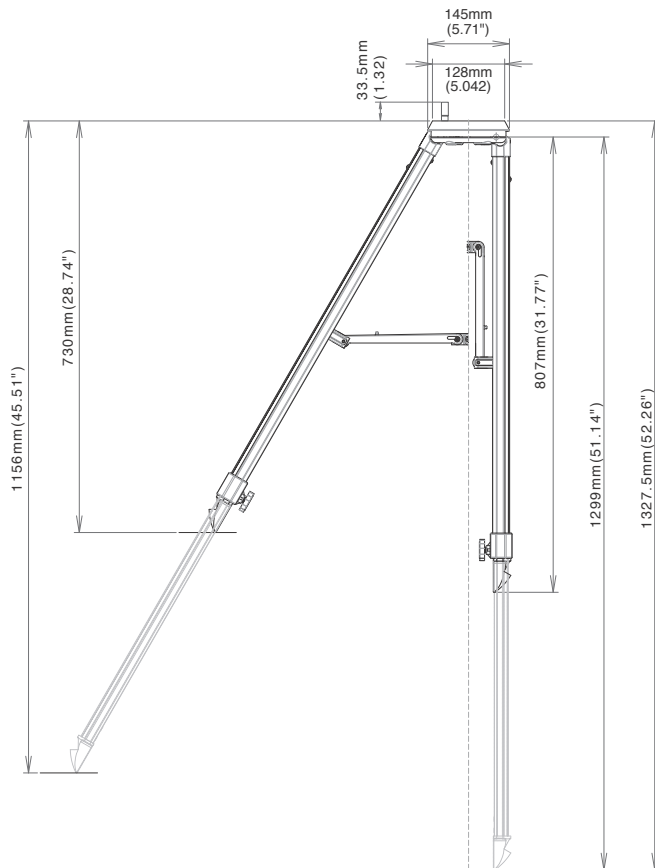


### Dimensions of the SXG Half Pillar (Sold Separately)

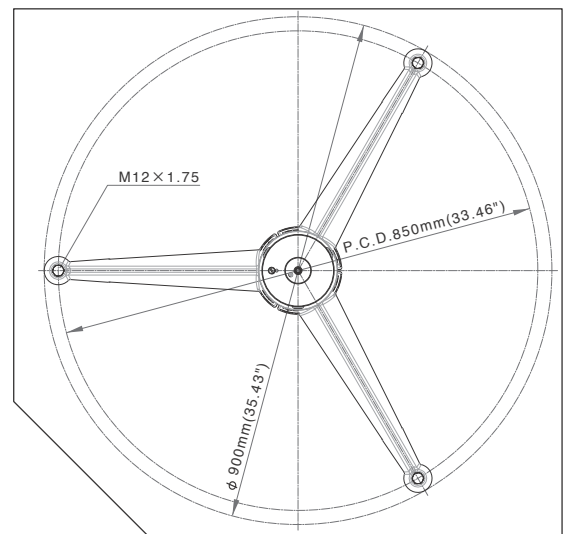
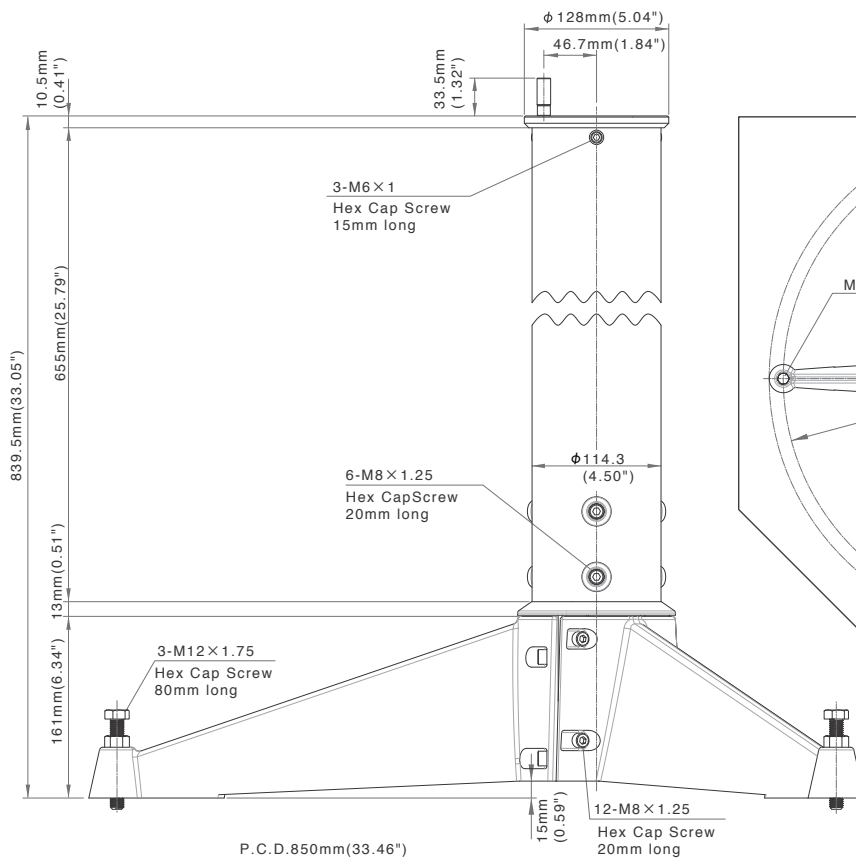


## APPENDIX

### Dimensions of the SXG-HAL130 Tripod (Sold Separately)



### Dimensions of the SXG-P85DX Pillar (Sold Separately)



\*Actual dimensions may differ slightly on your product.  
\*The specifications are subject to change without notice.









# Vixen