Thank you for your purchase of a Vixen SX2 equatorial mount.

The SX2 equatorial mount is a basic model of the Vixen Sphinx series which combines high precision mechanics and simple operations. The standard STAR BOOK ONE hand controller slews a telescope installed on the mount in the x-y directions (in the directions of RA and DEC). The STAR BOOK TEN featuring a high definition large color LCD screen with intuitive controls is optional for the SX2 mount.

*This manual describes the functions and uses of the SX2 equatorial mount and some accessories for telescopes provided as packages. You may occasionally find descriptions not relevant to your particular model.

*Use this instruction manual in conjunction with your telescope manual.

*Features may be updated or new functions added. Please visit Vixen’s website for the latest software updates.

*This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant of Part 15 of the FCC rules.

Safety Precautions

This instruction manual will assist you in the safe and effective use of the SX2 mount. Before using the mount, please be sure to read the safety precautions described below carefully.

Legend

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
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</thead>
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<tr>
<td>▼Warning▼</td>
<td>If misused, it can cause you a serious injury or death.</td>
</tr>
<tr>
<td>▼Caution▼</td>
<td>Misuse can cause injury or damage to you or other property.</td>
</tr>
<tr>
<td>▼Important▼</td>
<td>You must complete all of the steps in this manual.</td>
</tr>
<tr>
<td>▼Direction▼</td>
<td>You must completely execute the instructions in this manual.</td>
</tr>
</tbody>
</table>

**WARNING!**

Never look directly at the sun with your naked eyes or through your telescope and finder scope. Permanent and irreversible eye damage may result.

Do not leave the optical tube uncapped in the daytime. Sunlight passing through the telescope or finder scope may cause a fire.

Do not use the product in a wet environment. This could damage the mount, result in electrical shock or a fire.

Do not attempt to disassemble or alter any part of the equipment that is not expressly described in this manual. This could damage the mount, result in electrical shock, a fire or lead to an injury.

Keep small caps, plastic bags or plastic packing materials away from 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. This could result in fire or electrical shock. Make sure to be safe and consult your local Vixen dealer or distributor in your country.

Do not allow liquids or foreign objects to enter the product. Unplug the power cord or switch the power off. This could result in fire or electrical shock.

Do not damage, alter or place heavy item on the power cord. This could result in fire or electrical shock.

The product includes heavy items such as the counterweight and the mount body. Be sure to handle these units carefully. Be careful not to drop the unit when handling. This 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. This could lead to catching fire.

**CAUTION**

Do not operate the product with wet hands. Plugging in and out the power cord, electricity connectors and operating the electronic parts with wet hands may cause damage to the equipment or resulting in electrical shock.

Do not use the product while traveling or walking, as injuries may arise from stumbling, falling or collision with objects.

Do not bundle the power cord and electricity wires during the operation. This may result in a short circuit and damage to the surroundings.

Handle the power cord and electricity connectors properly. Do not pull the power cord by force when disconnecting. This may damage the cord and connectors, resulting in fire or electrical shock.

**HANDLING AND STORAGE**

Do not leave the product inside a car in bright sunshine, or in hot places. Keep any strong heat radiation sources away from the product.

When cleaning, do not use solvent such as paint thinners. It may cause deterioration.

Do not use the product in a wet environment. This may cause the product to malfunction or result in fire or electrical shock.

For storage do not expose to direct sunlight and keep the product in a dry place.

Do not expose the product to rain, water drops, dirt or sand. Gently wipe the product with a damp cloth for cleaning.
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</table>
BEFORE USE

Checking the Package Contents

The SX2 Equatorial mount package contains the items listed below. Check if all the items are included.

<table>
<thead>
<tr>
<th>Package Consisting of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX2 Equatorial Mount                                     -1</td>
</tr>
<tr>
<td>SX Counterweight 1.9kg</td>
</tr>
<tr>
<td>STAR BOOK ONE Hand Controller</td>
</tr>
<tr>
<td>STAR BOOK Cable</td>
</tr>
<tr>
<td>Ferrite Core (for commercial LAN cables)</td>
</tr>
<tr>
<td>Allen Wrench of 5mm on a side</td>
</tr>
<tr>
<td>Cigarette-lighter Plug Cord</td>
</tr>
<tr>
<td>Strap for STAR BOOK ONE</td>
</tr>
<tr>
<td>SX2 Instruction Manual (This book)                         -1</td>
</tr>
</tbody>
</table>

Note:
- The contents of your SX2 mount package may differ when you purchase it as a complete telescope package.
- A power supply unit is sold separately.

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. This is called diurnal motion and occurs because the earth turns on its own axis once a day. The equatorial mount is a platform which is designed to rotate parallel to earth’s rotational axis.

Basic Movement of the SX2 Mount

Every movement of the electrically driven SX2 Mount is fully controlled by the STAR BOOK ONE hand controller. The mount will perform smooth and accurate movements when each component on the mount is balanced correctly. An unbalanced mount may cause vibrations and can result in tracking errors or failure of rotational mechanisms. Make sure that the telescope is well balanced.

**CAUTION**

- Do not rotate the mount manually without loosening the clamp levers.
- Be careful not to bang the mount against other objects. This could damage the gears and bearings.

The SX2 mount has clamps which allow you to rotate the Right Ascension (R.A) and Declination (DEC.) axes freely for quick set up for home position and compact storage of the mount. Remember to tighten the clamp levers when you use the mount.

The clamp levers should be loosened to protect the inner gear train for storage and when you transport the mount.

**CAUTION**

- Never connect the STAR BOOK cable to other equipment such as a PC.

This could result in electrical shock, fire, or damage to the equipment. (The specifications of the STAR BOOK cable are not compatible with RS232C (D-SUB 9PIN) connectors.)
**BEFORE USE**

### SX2 Mount Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount</td>
<td>SX2 Equatorial Mount</td>
</tr>
<tr>
<td>R.A Slow Motion</td>
<td>180-tooth full circle micro-movement wheel gear, 72mm in diameter, Aluminum alloy</td>
</tr>
<tr>
<td>DEC. Slow Motion</td>
<td>180-tooth full circle micro-movement wheel gear, 72mm in diameter, Aluminum alloy</td>
</tr>
<tr>
<td>Worm Gear Shaft</td>
<td>9mm in diameter, Brass</td>
</tr>
<tr>
<td>R.A. Axis</td>
<td>40mm in diameter, Aluminum alloy die casting</td>
</tr>
<tr>
<td>DEC. Axis</td>
<td>35mm in diameter, Aluminum alloy</td>
</tr>
<tr>
<td>Number of Bearings</td>
<td>5 pieces</td>
</tr>
<tr>
<td>Counterweight Bar</td>
<td>20mm in diameter, retractable to the DEC body</td>
</tr>
<tr>
<td>Polar Axis Scope</td>
<td>Built-in 6x20mm scope with 8 degrees field of view, bubble level, illuminated reticle, Setting accuracy within 3 arc minutes, Time graduation circle: 10 arc minutes increments between 16h and 8h (the following day), Date graduation circle: 2-day increments, Meridian offset circle: Adjustable between E20 degrees and W20 degrees in 5-degree increments, Northern hemisphere: Polaris guide scale (Applicable to year 2025), Southern hemisphere: Octant 4 stars pattern</td>
</tr>
<tr>
<td>Azimuth Adjustment</td>
<td>Fine adjustments: About ±7 degrees, Twin tangent screws/knobs: About 1.2 degrees per rotation</td>
</tr>
<tr>
<td>Altitude Adjustment</td>
<td>Latitude between 0 degree ~ 70 degrees, 3-altitude zone setting (high, middle and low latitude, adjustment range: ±15 degrees in each zone), Altitude Scale:2-degree increments, Twin T-bar handles: 0.8 degrees per rotation</td>
</tr>
<tr>
<td>Drive Motor</td>
<td>Stepping (Pulse) motors with 250PPS</td>
</tr>
<tr>
<td>Celestial Tracking</td>
<td>High precision tracking with STAR BOOK ONE controller</td>
</tr>
<tr>
<td>Loading Capacity</td>
<td>About 1.2kg ~ 12kg (26.5lb), (300kg / cm torque load = About 12kg at a point of 25cm from the fulcrum)</td>
</tr>
<tr>
<td>Controller Cable Connection Port</td>
<td>D-SUB 9PIN male plug</td>
</tr>
<tr>
<td>Power Connecting Port</td>
<td>DC12V EIAJ RC5320A Class4, Center-plus polarity</td>
</tr>
<tr>
<td>Electricity Consumption</td>
<td>DC12V 0.3A ~ 2.0A</td>
</tr>
<tr>
<td>Dimensions</td>
<td>343mm (L) × 128mm (W) x 360mm (H)</td>
</tr>
<tr>
<td>Weight</td>
<td>About 7kg (15.4 lb), excluding counterweight</td>
</tr>
<tr>
<td>Counterweight</td>
<td>1.9kg (4.2 lb) x 1pc</td>
</tr>
<tr>
<td>Optional Accessories (Available separately)</td>
<td>STAR BOOK TEN Controller, SXG-HAL130 Tripod, SXG Half Pillar, AXG-P85DX Pillar, AC Power Source</td>
</tr>
</tbody>
</table>

### STAR BOOK ONE Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Controller</td>
<td>STAR BOOK ONE</td>
</tr>
<tr>
<td>CPU</td>
<td>32bit CISC Processor 40MHz RX210</td>
</tr>
<tr>
<td>Display</td>
<td>Two-line STN characters, with backlight</td>
</tr>
<tr>
<td>Power Connecting Port</td>
<td>DC12V EIAJ RC5320A Class4, Center-plus polarity</td>
</tr>
<tr>
<td>Autoguider Port</td>
<td>6-pole 6-wired modular jack (For external Autoguider)</td>
</tr>
<tr>
<td>Controller Cable Port</td>
<td>D-SUB9PIN male plug</td>
</tr>
<tr>
<td>Power Supply</td>
<td>DC12V (Supplied from the mount side.)</td>
</tr>
<tr>
<td>Electricity Consumption</td>
<td>12V 0.3A ~ 2.0A (Combined with the mount.)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 ~ 40°C (104°F)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>137mm (L) x 65mm (W) x 21mm (H)</td>
</tr>
<tr>
<td>Net Weight</td>
<td>110g (3.88 oz) (Excluding the cable.)</td>
</tr>
<tr>
<td>Major Functions</td>
<td>Celestial, Solar, Lunar and Kings rate speeds, tracking variable from 0.1x to 10x by steps, Backlash compensation, PEC, Autoguider port, Two languages (Japanese and English), Screen brightness adjustable, Direction keys, Red LED light</td>
</tr>
</tbody>
</table>
BEFORE USE

STAR BOOK ONE Components Guide

(1) Mount button
Set up menus for the mount such as tracking mode and backlash compensation, with the mount button. Pressing the Mount button turns up the brightness of the button itself and allows you to change the settings with the direction keys. Press the Mount button again to leave the menu and the brightness dims. The new setting is saved as you enter the new value. (Your recorded PEC data are for temporary use and not saved if you turn off the mount.)

(2) Display button
Set up menus for the controller such as language and backlight adjustments, with the display button. Pressing the Display button turns up the brightness of the button itself and allows you to change the settings with the direction keys. Press the Display button again to leave the menu and the brightness dims. The new setting is saved as you enter the new value.

(3) Direction Keys
You can move your telescope in the RA and DEC directions with these keys. Pressing any of the four direction keys will accelerate the motor speed toward the maximum value you selected. Then, that speed is maintained while the key is being pressed. The motor speed is decelerated if you stop pressing the key. The Direction keys function as menu selection buttons to change the settings while the Mount button or Display button is selected and lit brightly.

(4) RA Reverse button
The tracking direction of the RA can be reversed to have the orientation of your eyepiece’s field of view change to an opposite direction. Pressing the RA Reverse button turns up the brightness of the button itself and the button will function. Pressing the button again will change the orientation of the telescope to the original direction, and it will turn down the brightness of the button to leave the menu.

(5) DEC Reverse button
The tracking direction of the DEC can be reversed to have the orientation of your eyepiece’s field of view change to an opposite direction. Pressing the DEC Reverse button turns up the brightness of the button itself and the button will function. Pressing the button again will change the orientation of the telescope to the original direction, and it will turn down the brightness of the button to leave the menu.

(6) Plus and Minus buttons
With these buttons you set up the maximum slewing speed of the telescope. The Plus and Minus buttons function as menu selection buttons to change settings as long as the Mount button or Display button is turned up brightly.

(7) LED Light button
There is a built-in red LED light on the back of the STAR BOOK ONE. The red light is switched to ON or OFF alternatively each time the button is pressed shortly. The red light stays lit while you continue pressing the LED light button and the light goes off as you release the button.

(8) LED Light button
A 2 line (8 character each line) information screen with adjustable backlight.

(9) Red LED Light
The built-in red LED light on the back of the STAR BOOK ONE is useful to keep accommodating your eyes to darkness at an observation site when you want to avoid white light.

(10) Eyelet
The eyelet hole for a strap. The eyelets are provided on either side of the controller.

(11) Autoguider Port
Compatible with the SBIG autoguider’s connection port. Designed for 6-pole 6-wired modular jack.

(12) Mount Connecting Port
A connecting port to connect between the SX2 mount and the STAR BOOK ONE. Designed for D-SUB9PIN.
## Before Use

### Flow of Operation

Take the following steps to set up and use the SX2 equatorial mount correctly.

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<td></td>
<td>Balancing the Mount in DEC.</td>
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<td><strong>Application</strong></td>
<td>Using the Polar Axis Scope</td>
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<td>High or Low Latitude Setup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Changing various settings on the mount and controller.</td>
<td></td>
</tr>
</tbody>
</table>
PREPARATION

Assembling the Mount
Refer to the instruction manual of your telescope and accessory together with this manual when you attach the optical tube assembly to the mount.

The unit includes heavy items. Take care not to drop them when assembling as it could seriously damage the equipment or lead to injury.

Take care not to pinch your finger in the slide leg of the tripod when setting up.

Setting up the Tripod
1. Place the tripod on a level ground to make the telescope stable during observation.

2. Loosen the extension clamp on the tripod leg so that the tripod leg can be adjusted. Pull the tripod legs apart until each leg is fully extended.

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

4. Attach the metal post on the tripod head. Thread the metal post into the hole marked as SX and tighten it with a screwdriver.

   Tighten the metal post completely until the end of the thread; otherwise it could cause bend and break.

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

Attaching the SXG Half Pillar
Proceed to step II if this accessory is not provided with your telescope package.

1. Put the vanity ring on the thread of the metal post and attach the metal post on the head of the half pillar. (1-1)

   There are two threaded holes on the head of the half pillar. Thread the metal post into the outer 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 put the half pillar on the tripod head. (2-1)

   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. (2-2)

   Tighten the lock knob beneath the tripod head to secure the half pillar. (2-3)

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

Attaching the Equatorial Mount

⚠️ CAUTION: Be sure to handle the equatorial mount carefully as it is very heavy.

Package without the SXG Half Pillar

1. Loosen the azimuth adjustment screws in advance by turning the azimuth adjustment knobs on the mount.

2. Position the mount so that the azimuth adjustment screws of the mounting base comes above the metal post as shown in the figure. (2-1)

   Place the mount on the tripod and tighten the fixing bolt underneath the tripod head to hold the mount in place. (2-2)

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

Package with the SXG Half Pillar

1. Loosen the azimuth adjustment screws in advance by turning the azimuth adjustment knobs on the mount.

2. Attach the mount on the half pillar so that the center projection on the bottom of the mount fits the center hollow on the half pillar as shown in the figure. (2-1)

   Tighten the fixing bolt underneath the head of the half pillar to hold the mount in place. (2-2)

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

Tips on Assembling the Mount
Generally equatorial mounts are heavier on the declination axis side. Because of this feature, placing the equatorial mount so that its declination axis comes directly over one of the tripod legs can make the equatorial mount most stable when you use the equatorial mount for a north (or south) latitude of 50 degrees and lower. However, the balance of the equatorial mount may vary if the equatorial mount is used in latitude higher than 50 degrees. This may result in shifting the center of balance to the opposite side of the declination axis depending on the location of the loading equipment. Change the position of the tripod legs so that the equatorial mount becomes more stable in such a case.

Attaching the Counterweight
The counterweight bar is in the declination body. You may balance the SX2 mount with only the counterweight bar to start.

⚠️ CAUTION: Be sure to handle the counterweight carefully as it is very heavy.

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

2. Remove the safety screw on the end of the counterweight bar. Loosen the lock knob on the side of a counterweight and install the counterweight by sliding it onto the counterweight bar.

3. Attach the counterweight so that the lock knob on the counterweight is on the far side of the safety screw as shown in the figure.

4. Tighten the counterweight lock knob and replace the safety screw to screw it down on the end of the counterweight bar tightly.
**PREPARATION**

**Attaching the Optical Tube**

The telescope attaches to the SX2 mount via a dovetail tube plat or a dovetail slide bar.

⚠️ **CAUTION: Take care not to drop the optical tube as it could result in serious damage.**

Make sure that the slide bar or dovetail tube plate is flat against the saddle plate. Tightening the lock screws with a gap between these parts may cause the telescope to fall.

<table>
<thead>
<tr>
<th>The ED103S shown as an Example:</th>
</tr>
</thead>
</table>

1. Loosen the lock knob and the safety screw on the mount head before you attach the optical tube.

2. Slide the dovetail tube-plate mounted optical tube onto the sunken platform of the mount head.

3. Tighten the lock knob onto the dovetail tube-plate centering notch until snug. Tighten the safety screw securely.
PREPARATION

Balancing the Equatorial Mount

The Vixen SX2 mount is a German equatorial mount, in which the rotating RA axis and rotating DEC axis cross each other at right angle. The axes are rotated by using the movement of both axes to get maximum stability and limit the stress on the gears. If the equatorial mount is in an unbalanced state, it will increase stress to the gears and this could result in damage or erratic operation.

Precise slewing requires a high level of accuracy in rotation of both axes and is important in eliminating stress to the gears. Make sure to balance the equatorial mount properly in RA and DEC accordingly.

An optical tube weighing 1.2kg (2.6 lb.) or less cannot be balanced with the SX2 mount.

Note:

Take care not to drop the optical tube assembly as it could seriously damage the equipment or lead to injury. Pay close attention to the security of the telescope tube and do not excessively loosen the lock knobs on the equipment.

Balancing the Mount in Declination

In case of Optical Tube Assembly with Dovetail Slide Bar

1. Loosen the R.A. clamp while holding the counterweight bar (1-1) and turn the telescope tube until the DEC. axis comes to horizontal (1-2). Tighten the R.A. clamp and loosen the DEC. clamp. Be sure to hold the optical tube or counterweight in hand while loosening the clamps.

2. Release the telescope gradually to see which way the telescope rotates around the declination axis. If the telescope tube starts rotating as you release, it shows there is an imbalance in DEC.

To determine the balance point, loosen the lock knob that hold the telescope tube to the dovetail-plate mounting block and slide the telescope tube either forward or backward until it remains stationary.

Note:

Do not loosen the lock knob too much in balancing. This could cause telescope to fall and lead to injury.

3. Tighten the lock knob (and the safety screw) securely to hold the telescope tube in place.

4. Tighten the DEC clamp to finish this adjustment.
In case of Optical Tube Assembly with Tube Rings

1. Loosen the R.A. clamp while holding the counterweight bar (1-1) and turn the telescope tube until the DEC. axis comes to horizontal (1-2). Tighten the R.A. clamp and loosen the DEC. clamp. Be sure to hold the optical tube or counterweight in hand while loosening the clamps.

2. Release the telescope gradually to see which way the telescope rotates around the declination axis. If the telescope tube starts rotating as you release, it shows there is an imbalance in DEC.

To determine the balance point, loosen the tube ring lock knobs that hold the telescope tube and slide the telescope tube either forward or backward until it remains stationary.

**Note:**
Do not loosen the lock knobs too much in balancing. This could cause telescope to fall and lead to injury.

3. Tighten the tube ring lock knobs (and the safety screw if any) securely to hold the telescope tube in place.

4. Tighten the DEC clamp to finish this adjustment.

**Note:**
An optional dovetail slide bar is useful to extend a balancing range.

Balancing the Mount in R.A (Right Ascension)

1. Loosen the R.A. clamp while holding the counterweight bar and turn the telescope tube until the DEC axis comes to horizontal as shown in the figure.

2. Release the telescope tube gradually to see which way the telescope rotates around the R.A. axis. If the telescope tube starts moving by its own weight as you release, it shows there is an imbalance in the R.A.

While holding the counterweight bar, loosen the lock knob on the counterweight so that it can be moved to a point where it balances the telescope tube. This is the point at which the telescope remains stationary when the R.A. clamp is loose.

If your telescope is light in weight, the mount may balance without the supplied counterweight. (The extended counterweight bar itself can act as a counterweight.) Retract the counterweight bar for further balance adjustment.

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

4. Tighten the R.A. clamp on the mount securely.

**Note:**
Do not move the counterweight too much in balancing. This could damage the telescope tube or lead to injury.
PREPARATION

Tips on Proper Balancing

The balance arrangements below illustrate various possible settings, depending on the length and weight of your optical tube. The center of gravity of the telescope is given as 25cm from the intersection of the RA and DEC axes.

<table>
<thead>
<tr>
<th>No counterweight:</th>
<th>One 3.7 kg (8.1 lbs) only:</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 1.2kg (2.6 lbs.) up to 1.7kg (3.7 lbs.)</td>
<td>from 5.4kg (11.9 lbs.) up to 8.2kg (18 lbs.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One 1.0kg (2.2 lbs) only:</th>
<th>One 3.7kg (8.1 lbs) and one 1.9kg (4.1 lbs):</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 2.7kg (5.9 lbs.) up to 3.4kg (7.5 lbs.)</td>
<td>from 7.7kg (16.9 lbs.) up to 11.1kg (24.4 lbs.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One 1.9kg (4.1 lbs) only:</th>
<th>One 3.7kg (8.1 lbs) and one 2.8kg (6.1 lbs):</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 3.5kg (7.7 lbs.) up to 4.9kg (10.8 lbs.)</td>
<td>from 9.0kg (19.8 lbs.) up to 12.3kg (27.1 lbs.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One 2.8kg (6.1 lbs) only:</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 4.4kg (9.7 lbs.) up to 6.5kg (14.3 lbs.)</td>
</tr>
</tbody>
</table>
PREPARATION

Connecting the STAR BOOK Cable

Connecting to the Mount

1 Plug one end of the STAR BOOK cable, where no ferrite core is attached, into the connecting port on the mount for the controller cable.

2 Secure the connector with the setscrews.

Connecting to the STAR BOOK ONE

1 Plug the other end of the STAR BOOK cable, where the ferrite core is attached, into the connecting port on the STAR BOOK ONE for the controller cable.

2 Secure the connector with the setscrews.

Note:

- Hold the connector part of the STAR BOOK cable securely and pull it straight when you unplug the cable. Unplugging by grabbing the cable part may cause a wire to break.

- Never connect the STAR BOOK cable to other equipment such as a PC. It may cause failure, fire or electrical shock. (The STAR BOOK cable does not meet the RS232C specifications.)

- Do not bundle or bend the STAR BOOK cable forcefully. It may cause a wire to snap.

Connecting the Power Cable

Use an optional AC Adapter 12V-3A or portable power supply with the supplied cigarette-lighter plug cord. The portable power supply is sold separately.

Confirm that the power switch is turned OFF (i.e. the O mark on the switch is depressed) before you plug the power cable to the DC12V input of the mount.

Specifications:

DC12V EIAJ RC5320A
Class4 center positive (+) polarity

Note:

- When unplugging the power cable, be sure to hold the connector part and pull it straight. Unplugging by grabbing the cable part may cause a wire to snap.

- Avoid pulling or bending a part of the power cable adjacent to the connectors. It may cause a wire to snap.

- Do not use the power cable in a folded and tied condition. It may cause electrical shock or fire.
BASIC OPERATION

Turning ON the Power

1. The power switch is located on the bottom of the declination body of the mount. To turn on the power, press the side marked I on the switch and to turn off the power, press the O marked side on the switch.

Note:
The mount starts the celestial tracking at the same time the power is ON although it seems the mount stands still.

2. The initial screens below appear on the display of the STAR BOOK ONE as you turn on the power switch.

Setting 言語/Language

1. Pressing the Display key illuminates that key and the setting screen* is displayed.

   ![Contrast LCD 07](image)

   *The setting screen used with the last setting will appear if you press the key.

First, designate the language you use.

2. In the setting screen, choose “Language” with the left or right direction key.

   ![Language English](image)

   The setting is defaulted to “English”

3. You can choose “Japanese” language with the up or down key (or plus or minus key also).

   ![Language 二ホンコ](image)
**BASIC OPERATION**

**Slewing the Telescope**

First, you need to accustom yourself to the basic operation of the equatorial mount.

1. Make sure that the SX2 mount is turned on and the R.A and DEC clamps on the mount are locked tightly.

2. Move the telescope in the direction of R.A with the left and right direction keys and in the direction of DEC with the up and down keys respectively.

**Changing the Slewing Speed**

You can move the telescope at different speeds through use of the direction keys.

While both the Mount and Display keys are inactive with no illumination, pressing the Plus key will accelerate the slewing speed and pressing the Minus key will decelerate the slewing speed.

Defaultslewing speed: 999x of the sidereal rate at a maximum, and it is slow down to 30X, 1.0X and 0.5X of the sidereal rate by step. The slewing speed can be changed between 0.5X and 999X of the sidereal rate.

<table>
<thead>
<tr>
<th>Slewing Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X999</td>
<td>It is useful to choose this option when you dramatically change the telescope’s pointing direction. You can move the telescope by loosening the clamp levers on the mount in combination with use of this setting. Be sure to tighten the clamp levers again after slewing the telescope manually.</td>
</tr>
<tr>
<td>X30</td>
<td>Use this option when you bring your target object in the crosshairs in the field of view of the finder scope. The telescope moves slowly.</td>
</tr>
<tr>
<td>X10</td>
<td>Choose this option when you correct a position of the object in the field of view of the telescope as it makes you move the telescope very slowly.</td>
</tr>
<tr>
<td>X0.5</td>
<td>Choose this option when you use the telescope with high magnification. The telescope moves extremely slow.</td>
</tr>
</tbody>
</table>
**BASIC OPERATION**

**Terrestrial Viewing**

Try observing landscape in daylight first in order to understand the movements of the SX2 mount and the filed of view of your finder scope and telescope.

The mount starts celestial tracking at the same time the power is ON. You need to stop the tracking using the following procedure to view terrestrial objects.

Press the MOUNT button to enter the mount menus. Choose “TrackSpd Star” with the left or right direction key and choose “TrackSpd Stop” with the up or down key. Press the MOUNT button again to leave the menu.

![Menu Selections](image1)

**Observing the Moon**

With the finder scope aligned and the eyepiece attached, you are ready to use the telescope with your SX2 mount for your celestial observation in the night sky. Let’s begin by observing a bright and easy-to-find object, the Moon at moderate magnification.

It is recommended to choose the tracking speed at “StarX0.1” in the menu.

![Menu Selections](image2)
Rough Alignment of the Mount

After setting up the telescope, locate the SX2 mount so that its R.A. axis points toward the north celestial pole, if you use the telescope in the northern hemisphere. A rough setting with a compass or pointing at Polaris will work well for visual observation.

If your intention is to take lengthy astrophotography, however, you must align the R.A. axis to the celestial pole. This requires the use of the SX Polar Axis Scope sold separately.

In this section a rough Polar alignment using the finder scope is described. The finder scope of your telescope must be aligned accurately before you start aligning the mount.

1. Make sure that the R.A and DEC lock clamps on the mount are tightened securely. Point the mount toward the north celestial pole in the northern hemisphere as shown in the figure.

2. Loosen the R.A and DEC lock clamps and position the telescope’s optical tube so that it points toward the north. The home position guideposts marked on the mount are useful to position the telescope in place.

3. While looking for Polaris in the finder scope’s field of view, adjust the mount with the azimuth adjustment screws and altitude adjustment knob so that Polaris comes to the center of the finder scope’s field of view (an intersection point of the crosshairs).

   Turn the altitude adjustment knob so that the elevation of the R.A. axis matches the latitude of your observing site.

   Turn the azimuth adjustment screws so that Polaris comes to the center. Loosening the azimuth adjustment screw on one side will allow you to tighten the screw on the other side. Thus the direction in azimuth can be changed.

4. Bring Polaris into the center of the finder scope’s field of view to finish.
**APPLICATION**

**Using the Polar Axis Scope**

The polar axis scope is a small telescope that is installed parallel to the R.A. axis of an equatorial mount so that the polar axis scope 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. Check longitude and latitude of your observing site with a GPS system or a map before the polar alignment. The polar axis scope allows you to accurately align the mount to Polaris at 3 arc minutes or less.

**Note:**
* Inaccurate polar alignment could result in trailed stars and field rotation in your imaging device.
* It is not possible to use the SX2 mount in the north latitude over 70 degrees and in the south latitude over 70 degrees.

**Polar Alignment in the Northern Hemisphere**

1. Set up the mount and telescope on a flat and hard ground where you can see Polaris in the sky. Point the polar axis of the SX2 mount in the direction of north as shown in the figure. Adjust the tripod legs so that will the tripod is as level as possible.

2. Take off the declination cap and polar axis cap. These caps can be removed readily by twisting counter-clockwise.

**Note:**
Be sure to extend the counterweight bar to align the mount with the polar axis scope; otherwise the view through the polar axis scope will be obstructed.

3. Turn on the power switch of the SX2 mount.
While looking into the opening of the polar axis scope on the declination body, turn the declination body with the up or down direction key so that the objective lens of the polar axis scope can be seen in the opening.

**Note:** Be sure to turn the DEC axis using the STAR BOOK ONE controller.

Loosen the altitude clamp lever and turn the altitude adjustment knob so that the indicator of the altitude scale fits the latitude of your observing site.

**Note:** The mount is set at an altitude of approximately 35 degrees at Vixen’s factory.

While looking into the eyepiece of the polar axis scope, turn the focus ring until the reticle is in focus. Hold the eyepiece tube with the other hand while you turn the focus ring.

Adjust the brightness of the illuminator for the polar axis scope so that the reticle is dimly illuminated.

Turn the time graduation circle by holding both sides of the bubble level so that the bubble is brought into the center of the level marks.

Check the difference between standard time meridian of your region (or country) and your observing site on a map of the area or by using a GPS system.

**Examples: US Time Zones and Standard Time Meridian**

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>60 degrees West Longitude</td>
</tr>
<tr>
<td>Eastern</td>
<td>75 degrees West Longitude</td>
</tr>
<tr>
<td>Central</td>
<td>90 degrees West Longitude</td>
</tr>
<tr>
<td>Pacific</td>
<td>105 degrees West Longitude</td>
</tr>
<tr>
<td>Alaska</td>
<td>135 degrees West Longitude</td>
</tr>
<tr>
<td>Hawaii</td>
<td>150 degrees West Longitude</td>
</tr>
</tbody>
</table>

If the observing site is east of standard time meridian, rotate the time-meridian offset scale in the direction as indicated by “E”. If the observing site is west of standard time meridian, rotate the time-meridian offset scale in the direction as indicated by “W”. Turn the time-meridian offset scale while holding the eyepiece tube with the other hand.
Match the date graduation circle with your local observing time by rotating the polar axis scope. The figure below shows 21h 42m on December 20th. The time graduation circle has a scale in 10-minute increments, but you may set it as fine as one minute.

While looking into the eyepiece of the polar axis scope, turn the azimuth adjustment knobs and the altitude adjustment knob alternately so that Polaris comes to the position in the reticle as shown in the figure. Readjust the brightness of the reticle to be dimmer if necessary.

Adjust the azimuth direction so Polaris comes to the right position in the reticle. Unfastening one side of the azimuth adjustment knobs will allow fastening the knob on the other side.

Turn the altitude adjustment knob.

Tighten the azimuth adjustment knobs and altitude adjustment knob securely and complete the polar alignment.

Note: Adjust the brightness for the reticle of the polar axis scope to have the reticle and Polaris visible at the same time.
APPLICATION

Polar Alignment in the Southern Hemisphere

Octans is a constellation located near the south celestial pole and it can be used to align the SX2 Mount in the southern hemisphere. Unlike Polaris which is a bright 2nd magnitude star adjacent to the north celestial pole, Octans is made up of dark stars about 5th magnitude on average. The nearest star to the south celestial pole is Sigma Octantis, which is one of four stars forming a trapezoid in Octans, visible at 5.5th magnitude. There are a few methods to locate inconspicuous Octans using the surrounding stars.

1. Directing to Octans using Small Magellanic Cloud and the Southern Cross (Crux) as pointers

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

2. Directing to Octans using the arrangement of stars in the Southern Cross (Crux) as pointers

   Draw an imaginary line straight through the two stars (Alpha and Beta Crux) of the Southern Cross making the vertical line of the cross toward Small Magellanic Cloud. You will find the four stars of Octans at a place about 4.5 times extended from the span of the two stars.

3. Directing Octans using Small Magellanic Cloud, Beta Hydrus and Gamma Octantis as pointers

   If you cast your eyes toward Crux from Small Magellanic Cloud, you will see Beta Hydrus. Going southward from Beta Hydrus will find you Gamma Octans which consists of a row of three stars. Continue on your eyes by the same distance toward the Southern Cross and you will find the four stars of Octans.

Note: The orientation of Octans changes depending on the season of year.
APPLICATION

The polar axis scope contains a reticle showing the relative positions of four stars near the southern celestial pole. The stars are Sigma, Tau, Chi and Upsilon of Octans. Polar align the mount with these four stars but precession is not considered.

1. Set up the mount and telescope in a flat and hard ground where you can see Octans in the sky. Point the polar axis of the SX2 mount in the direction of south. Adjust the tripod legs so that the tripod is as level as possible.

2. Take off the declination cap and polar axis cap. These caps can be removed readily by twisting counter-clockwise.

3. Turn on the power switch of the mount.

4. Refer to set up procedures 4 to 7 that are described for the use in the northern hemisphere.

5. While looking into the eyepiece of the polar axis scope, turn the azimuth adjustment screws and the altitude adjustment screw alternately so that the four stars of Octans comes into the field of view of the polar axis scope. Readjust the brightness of the reticle to be dimmer if necessary.

<table>
<thead>
<tr>
<th>Octantis</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>σ (Sigma)</td>
<td>5.5</td>
</tr>
<tr>
<td>χ (Chi)</td>
<td>5.2</td>
</tr>
<tr>
<td>τ (Tau)</td>
<td>5.6</td>
</tr>
<tr>
<td>ν (Upsilon)</td>
<td>5.7</td>
</tr>
</tbody>
</table>

6. While looking into the eyepiece of the polar axis scope, rotate the polar axis scope so that the four stars of Octans comes to the position in the reticle as shown in the figure.

7. Match the form of the Octantis four stars on the reticle with the four stars of Octans while looking through the polar axis scope.

Note: The position of the celestial poles moves gradually each year due to precession. According to this, the pattern of Octans shifts every year.
APPLICATION

Precise Polar Alignment (Drift Alignment Method)

If you align the mount with the provided polar axis scope correctly, the mount will be able maintain tracking celestial objects within the field of view of your telescope’s eyepiece. For astrophotography, it enables you to take exposures of 5 to 10 minutes with a telephoto lens of 200mm focal length or less.

However, if you want to take longer exposures than 10 minutes or use a telephoto lens of longer focal length than 200mm, more precise polar alignment is required. The following method of polar adjustment will be done by watching the movement of a bright star in the eyepiece and it is called drift alignment.

Drift Alignment in the Northern Hemisphere

1. Align the mount to the north celestial pole by using the polar axis scope. This will save time during the process of drift alignment.

2. Align the Mount in Azimuth
   Prepare an eyepiece with illuminated reticle (cross hairs) or such as the Vixen OR12.5mm with illuminated reticle. Choose a bright star near the celestial equator and near the meridian, and put it in the field of view of the eyepiece. Turn off the power switch of the mount momentarily while looking into the eyepiece to see which direction the star moves. Confirm the west and rotate the eyepiece so that one of the cross hairs is parallel to the east-west direction in the field of view. The figure on the right shows the directions of north, south, east and west in the eyepiece according to a type of your telescope with or without a star diagonal.

3. Align the Mount in Altitude
   Choose a bright star near celestial equator in east but not too low, and put it in the field of view of the eyepiece. Turn off the power switch of the mount momentarily while looking into the eyepiece to see in which direction the star moves. Confirm the west and rotate the eyepiece so that one of the cross hairs is parallel to the east-west direction in the field of view. The figure on the right shows the directions of north, south, east and west in the eyepiece according to a type of your telescope with or without a star diagonal.

The following descriptions are based on a telescope without a star diagonal.

Drive the mount at sidereal rate and look into the eyepiece to monitor the drift motion of the star in the north-south direction.

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

If the star drifts south (i.e. moves up due to inverted view), move the mount to west in azimuth.

Adjust the mount with the azimuth adjustment screws. Make appropriate adjustments to the polar axis to eliminate the drift.

The following descriptions are based on a telescope without a star diagonal.

Drive the mount at sidereal rate and look into the eyepiece to monitor a drift motion of the star in the north-south direction.

If the star drifts south (i.e. moves toward the lower left due to inverted view), move the mount to low in altitude.

If the star drifts north (i.e. moves toward the upper right to inverted view), move the mount to high in altitude.

Adjust the mount with the altitude adjustment screw. Make appropriate adjustments to the polar axis to eliminate the drift.
APPLICATION

Drift Alignment in the Southern Hemisphere

Align the mount to the south celestial pole by using the polar axis scope. It will save you a lot of time in the process of drift alignment.

1 Align the Mount in Azimuth

Prepare an eyepiece with illuminated reticle (cross hairs) or such as the Vixen OR12.5mm with illuminated reticle. Choose a bright star near the celestial equator and near the meridian, and put it in the field of view of the eyepiece. Turn off the power switch of the mount momentarily while looking into the eyepiece to see which direction the star moves. Confirm the west and rotate the eyepiece so that one of the cross hairs is parallel to the east-west direction in the field of view.

The following descriptions are based on a telescope without a star diagonal.

Drive the mount at sidereal rate and look into the eyepiece to monitor the drift motion of the star in the north-south direction. If the star drifts south (i.e. moves down due to inverted view), move the mount to east in azimuth. If the star drifts north (i.e. moves up due to inverted view), move the mount to west in azimuth.

Adjust the mount with the azimuth adjustment screws. Make appropriate adjustments to the polar axis to eliminate the drift.

2 Align the Mount in Altitude

Choose a bright star in east but not too low, and put it in the field of view of the eyepiece. Turn off the power switch of the mount momentarily while looking into the eyepiece to see which direction the star moves. Confirm the west and rotate the eyepiece so that one of the cross hairs is parallel to the east-west direction in the field of view.

The following descriptions are based on a telescope without a star diagonal.

Drive the mount at sidereal rate and look into the eyepiece to monitor a drift motion of the star in the north-south direction. If the star drifts south (i.e. moves toward the lower left due to inverted view), move the mount to low in altitude. If the star drifts north (i.e. moves toward the upper right to inverted view), move the mount to high in altitude.

Adjust the mount with the altitude adjustment screw(s). Make appropriate adjustments to the polar axis to eliminate the drift.

Change the Altitude Setting

The SX2 mount is set for use in the middle latitude zone (latitude of 35 degrees plus/minus 15 degrees) 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 site. The range of altitude adjustments is divided into three positions (low, middle and high) between 0 degrees and 70 degrees in latitude.

| High Latitude: | 40 degrees up to 70 degrees |
| Middle Latitude: | 20 degrees up to 40 degrees |
| Low Latitude: | 0 degree up to 30 degrees |

1 Remove the optical tube and the counterweights from the mount.

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

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

4 Loosen the altitude clamp lever while holding the mount head with the other hand so that the mount body is moved slowly to high or low position in altitude.

5 Move the mount to a position of 55 degrees in altitude if you use the mount in the range of high latitude. Or move the mount to a position of 15 degrees in altitude of you use the mount in the range of low latitude. Tighten the altitude clamp lever.

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

7 Loosen the altitude clamp lever again and turn the altitude adjustment knob so that the mount is set at the latitude of your observing site.

8 Tighten the altitude clamp lever and the setting is completed.

🔍 CAUTION: Never tilt the mount body quickly. It may result in damage or lead to injury.
APPLICATION

How to Change Settings on the Mount / Controller

There are useful menus which allow you to change your desired settings on the mount and controller.

Mount Menu

Pressing the MOUNT button will turn up the brightness of the button itself and allows you to access various Mount menus using the direction keys. At the same time, it makes the direction keys disabled for slewing the mount except adjustments in the duration of a PEC recoding. Press the MOUNT button again to return to slewing with the direction keys. The brightness of the MOUNT button dims. The new settings are saved to the flash memory.

Your settings are not saved in the following:

- Turned off the power without completing saving.
- Recorded PEC data are not saved if you shut off the power.

Tracking Speed

This allows for changing the tracking speed. The setting is defaulted to “Star”.

Procedure:

Pressing the MOUNT button will turn up the brightness of the MOUNT button and enables you to access subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “TrackSpd” to choose the tracking speed setting.

Press the up or down direction key to choose your desired tracking speed other than the sidereal rate (“Star”). The new tracking speed is saved as indicated.

The following tracking speeds are available.

- Sidereal rate:

- Kings rate (mean sidereal time):
  Atmospheric refraction is compensated in the Kings rate.

- Lunar rate (mean lunar time):

- Solar rate (mean solar time):

- Faster tracking speed:

  You can track the mount at 10 times faster than the sidereal rate at the maximum. The tracking speed can be changed from X0.1 to X10 of the sidereal rate. It is convenient for star-scape photography and time-lapse photography. The setting is defaulted to “X10”.

  The tracking speed is divided into three ranges from low to high speed and you choose your desired speed with the plus or minus buttons.

  Tracking speed ranges:

  | From X0.1 to X2.0 at 0.1 increment |
  | From X2.0 to X5.0 at 0.5 increment |
  | From X5 to X10 at 1 increment      |

  Stop tracking:

  It is convenient when you view a terrestrial object in a daytime.
APPLICATION

Tracking Direction
The slewing direction of a telescope differs in the northern and southern hemispheres. This allows for changing the rotation of the motors to slew the telescope correctly in your observing site. The setting is defaulted to the motion in the northern hemisphere “TrackDir N Hemis”.

Procedure:
Pressing the MOUNT button will turn up the brightness of the button and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “TrackDir N Hemis” to choose the tracking direction setting.

For the use of the SX2 mount in the southern hemisphere, you need to revise the rotation of the motor. Display the “TrackDir S Hemis” with the up or down direction key to choose.

Setting in the northern hemisphere: TrackDir N Hemis  Setting in the southern hemisphere: TrackDir S Hemis

Motor Power
This allows for changing electricity consumption of the mount as the need arises. The setting is defaulted to “3”. The smaller the value is chosen, the lower the electricity is consumed, but it may cause a failure in tracking due to a drop of the motor torque.

Procedure:
Pressing the MOUNT button will turn up the brightness of the button and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “Motor Power” to choose the motor power setting.

Motor Power 3

Note:

• The wattages are based on the loading weight of 8kgs (17.6 lbs) approximately. The electricity consumption is affected by the size of a telescope mounted and the temperature.

• At the maximum loading weight of 12kg (26.4 lbs), it would be about 0.4A to 2.0A (6.0W to 24W) at 12V.
**APPLICATION**

**Slewing Speed**

This allows for changing a slewing speed using the plus or minus button. The slewing speed can be chosen from either a preset 4 speed range or different speed ranges from the listed slewing speeds. The setting is defaulted to “Slew 4-Speed”.

Procedure:
Pressing the MOUNT button will turn up the brightness of the button itself and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “Slew 4-Speed” to choose the slewing speed setting.

The slewing speed can be chosen between the preset “Slew 4-Speed” and versatile “Slew VariSpd” each time you pressed the up or down direction key (or the plus or minus button). The new slewing speed is saved as indicated.

**Slewing at four defined speeds:**

<table>
<thead>
<tr>
<th>Slewing 4-Speed</th>
<th>X0.5, X1.0, X30 and X999 of sidereal rate</th>
</tr>
</thead>
</table>

**Slewing at your desired speed variation from the following ranges:**

<table>
<thead>
<tr>
<th>Slewing VariSpd</th>
<th>X0.5 to X2.0 at 0.1 increments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X2.0 to X5.0 at 0.5 increments</td>
</tr>
<tr>
<td></td>
<td>X5.0 to X10 at 1 increment</td>
</tr>
<tr>
<td></td>
<td>X10 to X30 at 5 increments</td>
</tr>
<tr>
<td></td>
<td>X30 to X100 at 10 increments</td>
</tr>
<tr>
<td></td>
<td>X100 to X300 at 50 increments</td>
</tr>
<tr>
<td></td>
<td>X300 to X900 at 100 increments</td>
</tr>
<tr>
<td></td>
<td>X999</td>
</tr>
</tbody>
</table>
Backlash Compensation

Backlash is a momentary stoppage of the tracking motion of the mount that occurs when the motor gears reverse their rotation. The backlash does not occur while the mount continues tracking at a constant speed as the gears keep contact with each other; however, it may occur when the telescopes are slewed with different speeds.

The backlash compensation provides a reduced time lag at the point of revised motion where the gears lose the contact. It gives smoother rotation of the gears on the mount.

Too much tight engagement of the gears will halt the rotation. Make sure that there is slight play.

Note:
- The backlash compensation is not compatible with an autoguider in most cases. Cancel using this option when you use an autoguider.

First, Checking the Backlash

It is convenient to use a bright 1st magnitude star in order to check a backlash amount for compensation.

Procedure:

1. Precisely polar align the mount.

2. Center a bright 1st or 2nd magnitude star in the field of view of your eyepiece.

3. Press the Mount button and Call up “Slewing Speed” in the Mount menu to choose the “Slew VariSpd”.

4. Press the Mount button to make the direction keys available. Set the slewing speed between X1.2 and X4.0 with plus or minus button.

5. Pressing the Mount button will turn up the brightness of the button and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “Backlash X or Y” (X = RA and Y = DEC) with the left or right direction key. The setting is done individually. The settings for backlash compensation are defaulted to “X: 0, Y: 0”. This manual describes the setting of RA first, but you can start from either direction, RA or DEC.

Pressing the up or down key will increase or decrease the value by 10 increments and pressing the plus or minus button will increase or decrease by one increment. The values for the backlash compensation are available between 0 and 99 both in RA and DEC.
Press the Mount button to make the direction keys available. Confirm the amount of backlash in the direction of RA.

Center the star in the field of view of your eyepiece and watch how the star moves while pressing the left direction key. Keep pressing the direction key until the star begins to move.

Next, press the right direction key to watch how the star moves in the field of view.

If there is a time lag and the star does not begin to move instantly toward the direction you press, a value for the backlash compensation is set too small (weak) or set to “0”.

If the star begins to move quickly and largely at the same time you press, a value for the backlash compensation is set too big (strong).

Confirm the amount of backlash in the direction of DEC in the same way using the left and right keys.

Watch how the telescope moves when you increase the value. Start with setting an initial reference value (10 for example), and double this value after checking the telescope movement with the initial value. If the second value (= 20) is too small to compensate for the backlash, enter the number doubled (= 40) as the second value. Likewise increase the number by doubling the value if necessary.

Example: Enter 20 for the backlash compensation. If this value is too small for the compensation, increase the value to 40. If it generates too much compensation as a result, decrease to the value halfway between 20 and 40. If the value of 30 is still somewhat bigger for the compensation, decrease to 25. On the contrary, if 30 is somewhat small, increase to 35. In this way you can adjust the mount for the most effective backlash compensation.

Backlash compensation is not compatible with an autoguider in most cases. Set the values to “0” in RA and DEC when you use the autoguider.
APPLICATION

Setting for Autoguider

The STAR BOOK ONE can be used for auto guiding in conjunction with an external autoguiding system that is compatible with the SBIG autoguider. Available setting rates for compensating guide errors are described here.

Auto guiding allows you to automatically guide a telescope on an equatorial mount by means of an autoguider, which translates signals from a CCD video camera attached on a guide scope, to achieve uniform and precise tracking speed of the mount. The advantages of the autoguider are most apparent during long exposure astrophotography.

Procedure:

1. Pressing the Mount button will turn up the brightness of the button and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the "A. Guide X or Y" (X = RA and Y = DEC)" with the left or right direction key. The setting is done individually. The settings for autoguider are defaulted to "X: 10, Y: 10". This manual describes the setting of RA first, but you can start from either direction, RA or DEC.

   ![Diagram](diagram.png)

   **A. guide X 10**  **A. guide Y 10**

2. Pressing the up or down key will increase or decrease the value by 10 increments and pressing the plus or minus button will increase or decrease by one increment. The values for the autoguider are available between 0 and 99 both in RA and DEC. The new values are saved as indicated.

   ![Diagram](diagram.png)

   It is not recommended for use with backlash compensation. It may cause interference with in tracking.

Setting Rates for Compensation

The value of the compensation can be set between 0 and 99 in one increment both in RA and DEC (0.1X of sidereal rate). Enter a smaller value if you move slower to make small compensation, or enter a larger value if you move faster to make a large compensation.

The optimum value for the compensation may vary according to equipment used. Choose the most effective rate to make your autoguiding smoothest.

The direction keys are available to move the mount while this position is used.

It autoguiding signals are detected, the direction key corresponding to the input signal will light to indicate the status of the operation visually.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Keep sidereal rate (No compensation is made.)</td>
</tr>
<tr>
<td>1</td>
<td>±0.1X of sidereal rate</td>
</tr>
<tr>
<td>2</td>
<td>±0.2X of sidereal rate</td>
</tr>
<tr>
<td>3</td>
<td>±0.3X of sidereal rate</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>99</td>
<td>±9.9X of sidereal rate</td>
</tr>
</tbody>
</table>
Equatorial mounts with drive motors are designed to precisely track the motion of celestial objects. With the use of a telescope mounted on the equatorial mount, you may notice that stars in the field of view of the telescope at high magnification are drifting back and forth very slowly over a period of time (e.g. 480 seconds with the SX2 mount) in the direction of R.A. This is caused by the motion of the tracking gear wheels and it is part of the design of equatorial mounts. The PEC (periodic error correction) rectifies this phenomenon on the equatorial mount and records the correction electronically.

The tracking accuracy varies in irregular motion and must be corrected as precisely as possible.

**Note:**
- The SX2 mount does not detect a start point of the PEC recording until the R.A and DEC axes are rotated electrically at an angle of one degree and more. Be sure to confirm this before you start the PEC recording.

### Starting the PEC Recording

**Procedure:**

1. Precisely polar align the mount.

2. Prepare an eyepiece with crosshairs. Center a moderate star in the field of view of the eyepiece. Put high magnification as high as 200X and more.

3. Pressing the Mount button will turn up the brightness of the button and it enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “PEC No Data” with the left or right direction key.

4. Pressing the up or down key will advance the display to “PEC StrtRec?” and the plus and minus buttons will blink.

5. Press the + button to start a PEC recording. The period of time for the PEC recording is 8 minutes (480 seconds). On starting the PEC recording, the counter starts from 480 (479) and counts down every second to 0 and repeats. The speed of correction with the left or right direction key is fixed at 0.5 times of sidereal rate. To cancel the menu, press the minus button.
APPLICATION

6 As you monitor the star in the field of view after a while, it begins to shift away from the center of the crosshairs in direction of the RA tracking. At the point in time of finding deviation, bring the star back to the center of the crosshairs with the left or right direction key for correction.

7 A cycle of the PEC recording ends as the 480 seconds has elapsed, but the duration of the recording continues until you stop it. The old recording data is overridden by new ones.

**Note:**
- Be sure to continue more than 8 minutes to make sure one cycle of the PEC recording.

### Stopping the PEC Recording

**Procedure:**

1. Press the MOUNT or DISPLAY button to stop the PEC recording. The dialogue “PEC StopRec” appears on the display and press the + button to stop. Pressing the minus button will cancel the dialogue and continue the PEC recording.

2. If the PEC recording is stopped, only the ongoing record of the current cycle is cleared.
   - If the PEC recording goes more than one cycle before you stop, playback will start at the same time you stop it and the numbers will be counted down every second.
   - If you adjust the mount with the direction keys while the PEC recording is played back, press the MOUNT button. The countdown remains displayed as it is.

3. If less than one cycle is recorded before you stop, the PEC recording is cleared and not saved for playback.

### Resuming in the Playback Status

**Procedure:**

1. Display “PEC ●●● Play” during the playback status of the PEC (The MOUNT button is turned up.). ●●●are arbitrary numbers.

2. The “PEC StopRec?” or “PEC StrtRec?” appears in the menu alternately as you press the up (or down) direction key each time.
   - Choose “PEC StrtRec?” and press the + button to resume the recording of the PEC. To stop the PEC recording, choose “StopRec?” and press the + button.

To cancel the menu, press the minus button.
APPLICATION

Resuming in the Stop Status
Resume the playing back/erasing/recording/of the PEC.

Procedure:

1 Display “PEC StopPlay?” during the stop status of the PEC (The MOUNT button is turned up.).

2 The “PEC StrtPlay?” or “PEC StrtRec?” or “PEC Delete?” appears in a cycle in the menu as you press the up (or minus) direction key each time.

3 Choose “PEC StrtPlay?” and press the + button to resume the playback of the PEC. Choose “PEC StrtRec?” and press the + button to resume the recording of the PEC. Choose “PEC Delete?” and press the + button to resume the erasing of the PEC. (Turning off the power will erase the recorded PEC, too.)

To cancel the menu, press the minus button.
APPLICATION

Display Menu

Pressing the DISP. button will turn up the brightness of the button itself and allows you to access various Display menus for setting with the direction keys. At the same time, it makes the direction keys disabled for slewing the mount. Press the DISP. button again to return to slewing with the direction keys. The brightness of the DISP. button dims. The new settings are saved to the flash memory.

Contrast Adjustment

This allows for adjusting the contrast of the LCD screen on the controller. The contrast is adjustable between 1 (low) and 10 (high). The setting is defaulted to “07”.

Procedure:

Pressing the DISP. button will turn up the brightness of the button and enables you to choose subsidiary menus. The subsidiary menu appears as you press the left or right direction key each time. Display the “Contrast LCD” to choose the contrast adjustment setting.

Pressing the up or down direction key will increase or decrease the value to set and adjust to your desired contrast setting. The new setting is saved as indicated.

Brightness Adjustment

This allows for adjusting the brightness of the LCD screen on the controller. The brightness is adjustable between 1 (low) and 10 (high). The setting is defaulted to “07”.

Procedure:

Pressing the DISP. button will turn up the brightness of the button itself and enables you to choose a subsidiary menu in the Display menu. The subsidiary menu appears as you press the left or right direction key each time and display the “Bright LCD” to choose the brightness adjustment setting.

Pressing the up or down direction key will increase or decrease the value to set and adjust to your desired brightness setting. The new setting is saved as indicated.

Backlight Adjustment

This allows for adjusting the backlight of the keys and buttons on the controller. The backlight is adjustable between 1 (low) and 10 (high). The setting is defaulted to “07”.

Procedure:

Pressing the DISP. button will turn up the brightness of the button itself and enables you to choose a subsidiary menu in the Display menu. The subsidiary menu appears as you press the left or right direction key each time and display the “Bright Key” to choose the backlight adjustment setting.

Pressing the up or down direction key will increase or decrease the value to set and adjust to your desired backlight setting. The new setting is saved as indicated.
**Application**

### Red LED Light Adjustment

This allows for adjusting the brightness of the red LED light on back of the controller. The brightness is adjustable between 1 (low) and 10 (high). The setting is defaulted to “07”.

**Procedure:**

Pressing the DISP. button will turn up the brightness of the button itself and enables you to choose a subsidiary menu in the Display menu. The subsidiary menu appears as you press the left or right direction key each time and display the “Bright Lamp” to choose the red LED light adjustment setting.

Pressing the up or down direction key will increase or decrease the value to set and adjust to your desired brightness setting. The new setting is saved as indicated.

### Polar Scope Illumination Adjustment

This allows for adjusting the brightness of the illumination reticle for an optional Polar axis scope on the mount installed. The brightness is adjustable between 1 (low) and 10 (high). The setting is defaulted to “07”.

**Procedure:**

Pressing the DISP. button will turn up the brightness of the button itself and enables you to choose a subsidiary menu in the Display menu. The subsidiary menu appears as you press the left or right direction key each time and display the “Bright PlrScp” to choose the Polar scope illumination adjustment setting.

Pressing the up or down direction key will increase or decrease the value to set and adjust to your desired brightness setting. The new setting is saved as indicated.

### Other Functions

#### Field of View Orientation

When you try to put your target celestial object in the center of the eyepiece’s field of view on your telescope at high magnification, you may occasionally move the telescope in an opposite direction due to a misleading orientation in the eyepiece’s field of view when you use a mirror diagonal, for example. This feature allows you to reverse the direction of the direction keys instantly.

Pressing the RA Reverse button will turn up the brightness of the button itself and allows you to reverse the direction of the RA so that you can change the tracking orientation in the field of view to an opposite direction. Press the RA Reverse button again to return the tracking to the original direction.

Pressing the DEC Reverse button will turn up the brightness of the button itself and allows you to reverse the direction of the DEC so that you can change the tracking orientation in the field of view to an opposite direction. Press the DEC Reverse button again to return the tracking to the original direction.

#### Reset

All the settings for the mount and controller can be initialized to the defaulted settings at the Vixen factory. To reset the settings, turn on the power while pressing the plus button and the red LED light button simultaneously for more than one second. Secure your necessary setting values, before you proceed to initialization.

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APPENDIX

Connectors on the STAR BOOK ONE

Connectors on the SX2 Mount

Controller Cable Connecting Port (D-sub 9pin male)

External Autoguider Connecting Port

Controller Cable Connecting Port (D-sub 9pin male)

Power Switch

Power Connection Port DC 12V, Center positive polarity
Dimensions of the SX2 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.