



SkyGuider™ Tracking Equatorial Mount Instruction Manual

Product #3500 and #3520



WARNING!

**NEVER USE A TELESCOPE OR CAMERA TO LOOK AT THE SUN
WITHOUT A PROPER FILTER!**

***Looking at or near the Sun will cause instant and irreversible damage to your eye.
Children should always have adult supervision while observing.***

1. SkyGuider™ Tracking Equatorial Mount Overview

Thank you for choosing the new iOptron SkyGuider™ Tracking equatorial mount for astrophotography. This portable mount makes it easy to take long exposures of the night sky without streaking or star trailing.

The SkyGuider™ mount is simple to set up. Just attach the mount to a tripod. Mount your digital camera or lightweight scope onto the mount and balance it. Align the mount to the Pole Star using the included AccuAligning™ dark field illuminated polar scope and an optional smart phone App. Then turn on the motor and it will keep your camera tracking at the same speed the earth rotates. The unique DC servo motor keeps your camera in motion to avoid star trails and allows you to take long exposures for beautiful images of the night sky. A built-in ST-4 compatible guide port will enable you to use autoguiding and make the tracking even better!

Features:

- Accepts cameras weighing up to 11 lbs (5 kg)
- Capable for dual mount application up to 11 lbs (5kg) + 7.7lbs (3.5kg), balanced
- Spring loaded gear system with customer adjustable loading force
- Auto-tracking for smooth camera motion perfect for long-term exposures
- Four pre-set tracking speeds with northern/southern hemisphere selection
- Includes iOptron AccuAligning™ dark-field illuminated polar scope for Quick Polar Alignment
- Built-in ST-4 compatible guide port
- Padded carry bag included
- 1.5" stainless steel short field tripod with padded carry bag (#3500 only)
- Optional ball heads available separately (#3305)
- Optional AC/DC adapter (#8417)
- Optional 1.5" stainless steel regular height tripod (#3521)

DO NOT hold and swing the counterweight shaft rigorously. This will degrade the performance of the spring loaded gear meshing system and possibly damage it.

The Tension Adjuster is used as the last step to lock, and the first step to release the gears. When disengaging the gear system, release the Tension Adjuster first. Then turn the Gear Switch to OPEN position. When engaging the gear system, turn the Gear Switch to LOCK position first. Then tighten the Tension Adjuster.

Never fully tighten the Tension Adjusters during operations. Fully screw in the Tension Adjuster and then back out by from half a turn to about 2 turns. The optimum spot varies with actual conditions, but is mostly within 2 turns from the fully tightened position. Ideally, it should be at a position just deep enough to eliminate any free movement ("play"), while any force on the worm assembly is kept at a minimum.

2. SkyGuider™ Tracking Equatorial Mount Assembly

2.1. Introduction

You have just purchased a tracking equatorial mount that is capable of taking you to a new level of astrophotography. When the polar axis of the SkyGuider™ mount is aligned with the celestial North Pole (CNP), or celestial South Pole (CSP), the mount will evenly match the Earth's rotation against the sky. Since all celestial objects appear to rotate around the CNP, or CSP—the polar alignment allows the mount to "track" with the celestial sphere and provide accurate tracking for visual observations and astrophotography.

The AccuAligning™ polar scope, along with the Quick Polar Alignment procedure, provides a fast and accurate polar alignment for the mount. A built-in ST-4 compatible guide port will enable you to use autoguiding for high-performance tracking.

The SkyGuider™ mount is designed for wide field astrophotography. The following sections of this manual provide detailed steps to successfully set up and operate the SkyGuider™ mount.

2.2. Parts List¹

The SkyGuider™ comes with either a mount only (#3520) or as a package (#3500) with mount and a short field tripod.

#3520 SkyGuider™ Mount Includes (Figure 1):

- SkyGuider™ Tracking equatorial mount with AccuAligning™ polar scope
- Padded carry bag
- Counterweight shaft
- One 3.5 lbs (1.5kg) counterweight
- A short latitude adjust knob for low altitude

#3500 SkyGuider™ Mount Package Includes (Figure 2):

- #3520 SkyGuider™ mount
- #3501 1.5" stainless steel short field tripod with padded carry bag



Figure 1. Parts for a #3520 SkyGuider™ mount



Figure 2. Parts for a #3500 SkyGuider™ mount package

ADDITIONAL PARTS NEEDED:

The following parts are needed to take astrophotography but are not included in the package:

- Power source provided by a battery pack or an AC/DC adapter (#8417)
- Ball head adapter (#3305)
- DLSR camera
- Tripod (for #3520)

YOU MAY NEED THIS FOR POLAR ALIGNMENT:

- iPhone/iPad app for accurate polar alignment (<https://itunes.apple.com/us/app/ioptron-polar-scope/id564078961?mt=8>)
- Or other application/program to calculate the pole star position. Please refer to the FAQ section under "Support" at <http://www.ioptron.com> for more information.

ONLINE CONTENTS (click under "Support" menu) www.ioptron.com

- This manual
- Tips for set up
- Reviews and feedback from other customers

2.3. Assembly Terms

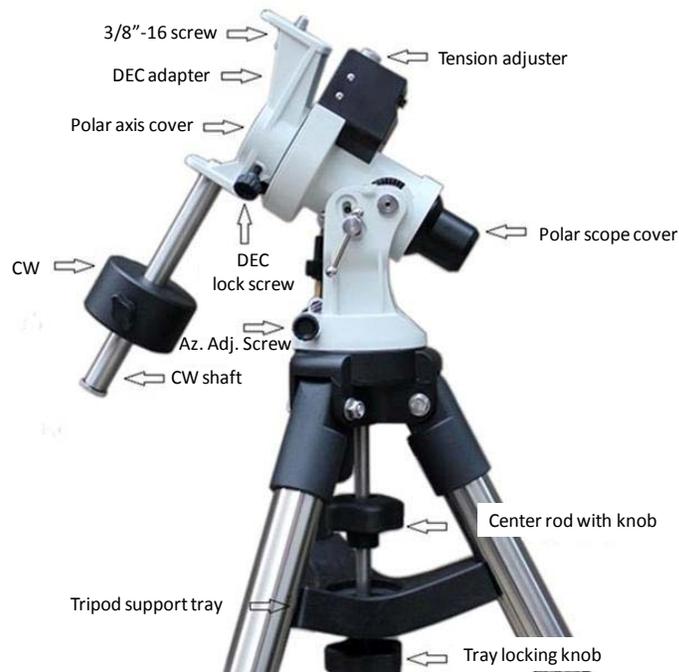


Figure 3. SkyGuider™ mount with tripod

2.4. SkyGuider™ EQ Mount Assembly

NOTE: The SkyGuider™ mount is a precision astronomical instrument. It is highly recommended that you read the entire manual and become familiar with the nomenclature and functions of all components before starting the assembly.

WARNING: Please DO NOT hold and swing the counterweight shaft rigorously. This will degrade the performance of the spring loaded gear meshing system and possibly damage it.

WARNING: The new Gear Switch will allow you to have more precise weight balance. This also means the mount will swing FREELY when the Gear Switch is disengaged. Always hold the mount when releasing the Gear Switch or adjusting the gear tension.

NOTE: The mount is shipped with the latitude setting at high range (35° ~ 60°). If your site latitude is lower than 35° please switch the latitude range before using.

¹ US market only. Actual contents and appearances may vary.

STEP 1. Select Mount Latitude Range

Carefully remove the mount from the package and familiarize yourself with the components shown in **Error! Reference source not found.**

The mount is by default shipped with the **Long Latitude Adjustment Knob** installed (for 35-60°). At lower latitudes of 0-35°, the **Short Latitude Adj. Knob** needs to be used. To change this knob, remove the Latitude Locking T-bolts on both sides (Be careful not to lose the washers). Unscrew Bottom Post Locking Screw to free the Bottom Latitude Adj. Post and remove the Latitude Adj. Knob. Thread in evenly the Short Latitude Adj. Knob to Top and Bottom Latitude Adjustment Posts. Reinstall and tighten bottom locking screw. Lastly, with 4 washers all properly placed, insert and tighten the Latitude Locking T-bolts into the upper threaded holes.



Figure 4. Switching latitude adjustment knobs

STEP 2. Setup Tripod and Mount

Expand the tripod legs and adjust the tripod height. Position the tripod so that the Alignment Peg faces north, (if you are located in the northern hemisphere). If you are located in southern half—face the Alignment Peg south. Thread the Tripod Center Rod into the tripod head. Install the Tripod Support Tray and thread the Tray Locking Knob onto it. Do not fully tighten the Tray Locking Knob.

There are two threaded holes on the tripod head for alignment peg installation. You may place the peg at either position, as long as the mount does not hit the tripod leg when tracking.

Retract both Azimuth Adj. Knobs to allow enough clearance inside the chamber. Position the mount on the tripod head with the Alignment Peg in between the 2 Azimuth Adj. Knobs. Thread the Center Rod into mount

to secure it with tripod. Tighten the Tray Locking Knob to fully spread the tripod legs. Adjust the tripod legs to level the mount using the Level Bubble.

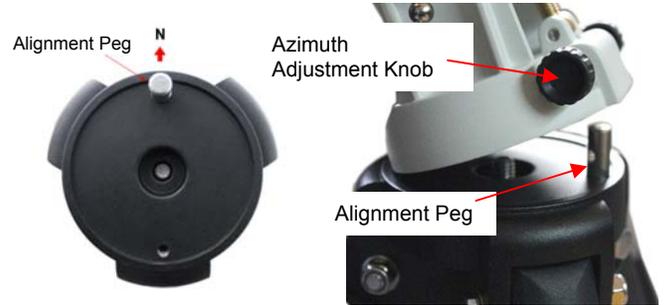


Figure 5. Set up tripod and mount

STEP 3. Adjust Latitude

This step requires you to know the latitude of your current location. This can be found on the Internet, with a GPS navigator or a GPS capable cell phone. You will have to change this latitude setting every time you significantly change your night sky viewing location. This setting directly affects the mount's tracking accuracy.

Slightly loosen the Latitude Locking T-bolts. Turn Latitude Adjust Knob to adjust the latitude until the arrow points to your current latitude on the Latitude Indicator (see Figure 4b). Relock the Latitude Locking T-bolts. At this point, with the mount leveled and pointed north, and the latitude set, the Polar Axis (R.A. axis) should be pointing very close to the NCP and Polaris. This alignment accuracy will be sufficient for visual tracking and short duration astrophotography.

STEP 4. Install Counterweight (CW) shaft and CW

Thread the stainless steel counterweight shaft onto the 3/8"-16 threaded hole on the short arm of the DEC Adapter. Remove CW Safety Screw and slide the CW onto the CW shaft. Tighten the CW Locking Screw to hold the CW in place. Tighten the CW Safety Screw.

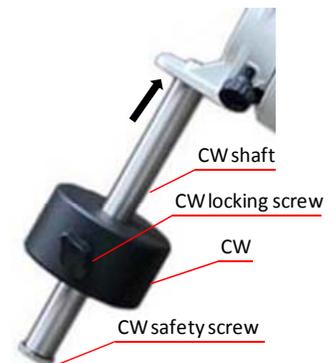


Figure 6. CW shaft and CW

STEP 5. Balance the SkyGuider™ Mount

After attaching an optional ball head and a camera or telescope onto the mount, the SkyTracker mount must be balanced to ensure minimum stress on the mount gears and motors inside.

CAUTION: The mount may swing freely when the Gear Switch is released. Always hold on to the mount before you release the gear switch to prevent it from swinging. Otherwise it may cause personal injury or damage to the equipment.

Turn the Tension Adjuster counterclockwise until the Gear Switch Knob can be turned 90 degree to **OPEN** position to disengage the worm from the worm wheel.

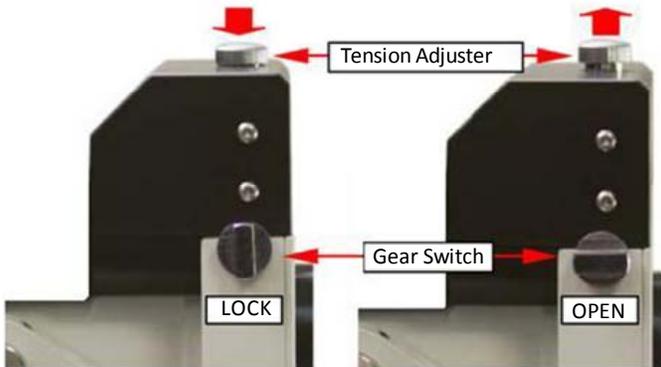


Figure 7. Gear switch and Tension Adjuster

Rotate the mount head along the R.A. axis to horizontal position. Adjust the CW position to balance the mount.



Figure 8. Balance a SkyGuider™ mount

CAUTION: The balancing must be performed while the Gear Switch is disengaged (OPEN position).

Turn Gear Switch Knob 90 degree again to **LOCK** position to re-engage the worm to the worm wheel. Retighten the Tension Adjuster a few turns clockwise.

The rule of thumb is to fully screw in the Tension Adjuster and then back out by about 2 turns. The optimum spot varies with actual conditions which can be from half a turn to 2 turns. Ideally, it should be at a position just deep enough to eliminate any free movement (play) while force on the worm assembly is kept at a minimum.

Step 6. Polar Alignment

In order for an equatorial mount to track properly, it has to be polar aligned to the pole star. For those located in the northern hemisphere, Polaris is the pole star. For

those in the southern hemisphere, use Sigma Octantis in Octans as the pole star.

To locate the pole star from the polar scope, take off the Polar Axis Cover and Polar Scope Cover. Look through the polar scope eyepiece to locate Polaris (if you are located in northern hemisphere). Slightly turn the tripod Center Rod Knob to loosen the mount head. Adjust the Azimuth Adjustment Knobs to do a fine adjustment of the mount to center the pole star in the azimuth direction. Tighten the Center Rod Knob to secure the mount. Slightly loosen the two Latitude Locking T-bolts on the side of the mount, turning the Latitude Adjustment Knob to adjust the latitude (altitude). Re-tighten the locking screws.

The SkyGuider™ mount is equipped with iOptron's AccuAligning™ dark field illuminated polar scope. You can do a fast and accurate polar alignment with iOptron's **Quick Polar Alignment** procedure to maximize the benefit of the iOptron polar scope.



Figure 10. Threaded polar scope LED socket

Plug a power source to the mount. Connect the polar scope LED to the mount by threading the polar scope illuminating LED into the polar scope LED threading hole (Figure 9). Plug the other end of the LED cable into the LED socket located on the control board.

Press the power switch on the mount to turn the SkyGuider™ mount on. Look through the polar scope eyepiece. Adjust the eyepiece to bring the reticle dial in focus. As indicated in Figure 10, the Polar Scope Dial has been divided into 12 hours along the angular direction with half-hour ticks. There are 2 groups, 6

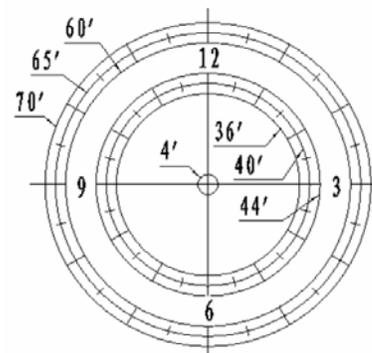


Figure 9. Polar scope

concentric circles marked from 36' to 44' and 60' to 70', respectively. The 36' to 44' concentric circles are used for polar alignment in the northern hemisphere using Polaris. While the 60' to 70' circles are used for polar alignment in the

southern hemisphere using Sigma Octantis.

You will need to know where Polaris is in the northern hemisphere. You may find this information via an iPhone/iPad app (iOptron Polar Scope in Apple iTunes store).

Shown in Figure 11 is a screen shot of an iPhone chart. For example, on December 3, 2012, 12:48:36 in Boston, USA (Lat N42°30'28" and Long W71°08'49"), the Polaris Position is 10hr 24.1m and $r = 40.8\text{min}$ (the green dot on the chart).

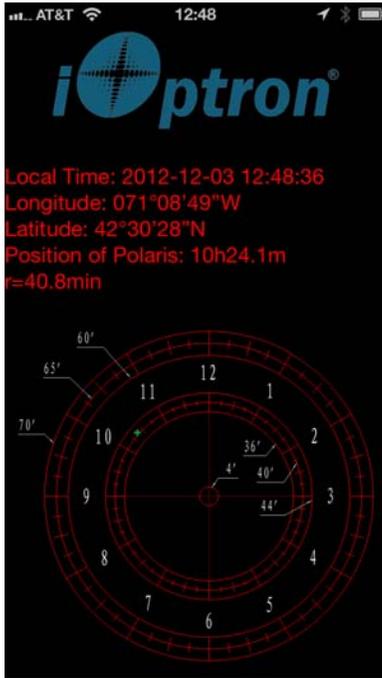


Figure 11. iPhone display

Adjust the mount in latitude and azimuth direction to place Polaris in the same position on the Polar Scope Dial as indicated on your iPhone/iPad screen. In this case, the Polaris will be located at a radius of 40.8' and an angle of 10 hour 24.1 minute.

If you don't have an iPhone/iPad, you can still get a better polar alignment using other programs/ software to calculate the pole star position.

STEP 7. Start Sky Tracking

Now you are ready to track the sky! Point the camera to the sky you are interested in. You may also release two DEC locking screws to rotate the DEC adapter along the RA axis (Make sure all the screws/locks are tightened afterwards). Select N or S (northern or southern hemisphere) depending on your location. Select 1X tracking speed to take photos of only the sky. Select 0.5X tracking speed to include landscape in the photo. S and L speeds are for Solar and Lunar tracking. Double check the polar alignment and realign it if needed. Turn power switch on to begin tracking the sky.



Figure 12. SkyGuider™ mount control board

Using 0.5X Speed

The 0.5X tracking speed evenly divides image blur between the sky and foreground. With wide-angle lenses, it can produce dramatic images of a starry sky suspended above a landscape with everything sharp to the eye.

Advanced Application

The SkyGuider™ mount is equipped with a guiding port to enable autoguiding while tracking. The guide port wiring is shown in Figure 13, which is same as that from Celestron / Starlight Xpress / Orion Mount / Orion Autoguider/ QHY5 autoguider pinout.

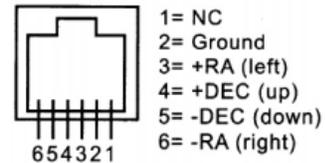


Figure 13. Guide port pinout

If you have an autoguider that has a pinout similar to ST-i of SBIG, such as Meade/ Losmandy/ Takahashi/ Vixen, make sure a proper guiding cable is used with the SkyGuider™ mount. Refer to your guiding camera and guiding software for detailed operation.

The SkyGuider™ mount is also capable of dual camera/scope mounting as shown below.



Figure 14. Dual mounting

Additional accessories are needed for autoguiding and dual mounting.

3. Maintenance and Servicing

3.1. Maintenance

The SkyGuider™ equatorial mount is designed to be maintenance free. Do not overload the mount. Do not drop the mount. This will damage the mount or degrade the tracking accuracy permanently. Use a damp cloth to clean the mount if necessary. Do not use solvent.

3.2. iOptron Customer Service

If you have any question concerning your mount, contact iOptron Customer Service Department. Customer Service hours are 9:00 AM to 5:00 PM, Eastern Time, Monday through Friday. In the unlikely event that the mount requires factory servicing or repairing, write or call iOptron Customer Service Department first to receive an RMA# before returning the mount to the factory. Please provide details as to the nature of the problem as well as your name, address, e-mail address, purchase info and daytime telephone number. We have found that most problems can be resolved by e-mails or telephone calls. Please contact iOptron first to avoid returning the mount for repair.

It is recommended to send technical questions to support@ioptron.com or call in the U.S. 1.781.569.0200.

3.3. Product End of Life Disposal Instructions



This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service or product representative.

Technical Specifications

Mount	Single Axis Tracking EQ
Payload (Max.)	5kg + 3.5kg balanced
Mount weight	2.6kg w/o counterweight shaft
Body material	Cast aluminum
Latitude adjustment range	0° ~ 60°
Azimuth adjustment range	± 10°
Worm wheel	Φ88mm, 144 teeth aluminum alloy
Motor drive	DC servo motor with optical encoder
Tracking	R.A. automatic
Tracking speed	Cel, 1/2 Cel, Solar, Lunar, N/S
Guiding port	ST-4 compatible
Polar scope	AccuAligning™ dark field illuminated (~6° FOV)
Level indicator	Level bubble
Counterweight shaft	Φ20x200 mm, stainless steel w/ 3/8"-16 threads
Counterweight	1.5kg
Power consumption	0.05A at maximum load
Power requirement	DC 10 ~14V, 1Amp
Base connect	3/8"-16 threaded socket
Field Tripod	1.5", 2 section stainless steel, 3.8kg (for #3500 only) About 460~720mm in height, 510-800mm in length
Operation Temperature	-10°C ~40°C
Warranty	One year limited

IOPTRON ONE YEAR TELESCOPE, MOUNT, AND CONTROLLER WARRANTY

A. iOptron warrants your telescope, mount, or controller to be free from defects in materials and workmanship for one year. iOptron will repair or replace such product or part which, upon inspection by iOptron, is found to be defective in materials or workmanship. As a condition to the obligation of iOptron to repair or replace such product, the product must be returned to iOptron together with proof-of-purchase satisfactory to iOptron.

B. The Proper Return Merchant Authorization Number must be obtained from iOptron in advance of return. Call iOptron at 1.781.569.0200 to receive the RMA number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement stating the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of iOptron.

The customer shall be responsible for all costs of transportation and insurance, both to and from the factory of iOptron, and shall be required to prepay such costs.

iOptron shall use reasonable efforts to repair or replace any telescope, mount, or controller covered by this warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, iOptron shall notify the customer accordingly. iOptron reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void and of no force or effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

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Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

iOptron reserves the right to modify or discontinue, without prior notice to you, any model or style telescope.

If warranty problems arise, or if you need assistance in using your telescope, mount, or controller contact:

iOptron Corporation
Customer Service Department
6E Gill Street
Woburn, MA 01801
www.ioptron.com
support@ioptron.com
Tel. (781)569-0200
Fax. (781)935-2860
Monday-Friday 9AM-5PM EST

NOTE: This warranty is valid to U.S.A. and Canadian customers who have purchased this product from an authorized iOptron dealer in the U.S.A. or Canada or directly from iOptron. Warranty outside the U.S.A. and Canada is valid only to customers who purchased from an iOptron Distributor or Authorized iOptron Dealer in the specific country. Please contact them for any warranty.