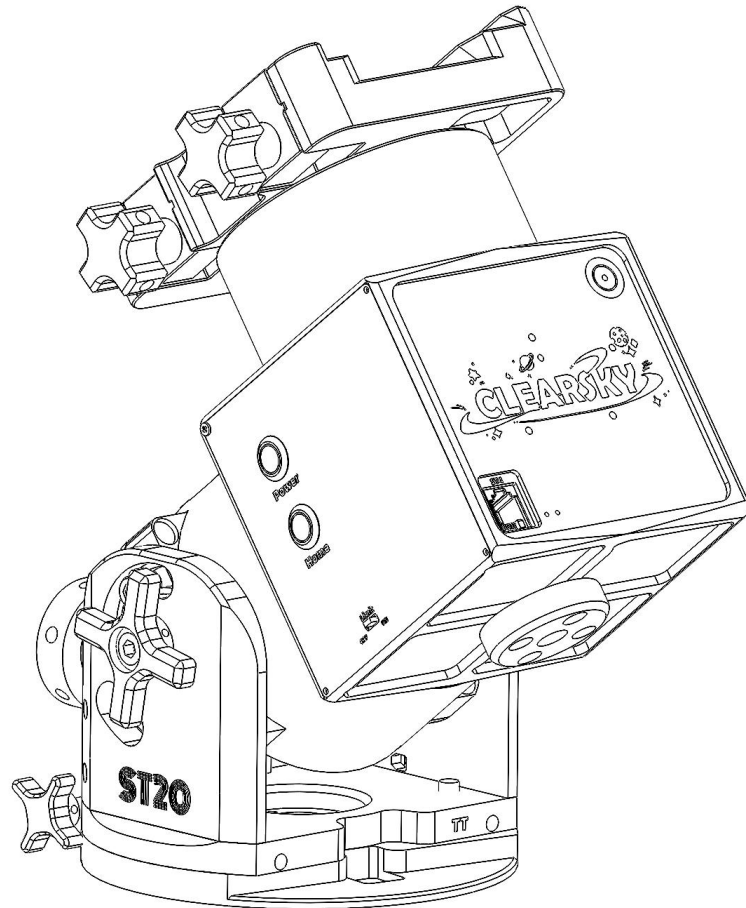




Clearsky Harmonic Mount

Instructions

Revision Log

Date	Edition	Revision content
2024.11	V1.0	First published
2024.12	V1.1	Description of the newly added patent feature "Mechanical Limiting"
2026.04	V1.2	Add new feature descriptions and update related images

 Clearsky



扫一扫上面的二维码图案，加我为朋友。

For any inquiries, please feel free to contact
ClearSky Astronomy Customer Service via
WeChat ID: clearskyastro

Preface

We sincerely appreciate your trust and choice of the Clearsky Harmonic Equatorial Instrument (hereinafter referred to as "Clearsky Harmonic Mount").

As a member of the Clearsky Astronomy brand, the ClearskyHarmonic Mount embodies our consistent innovation philosophy, dedicated to delivering more convenient, efficient, and enjoyable deep-space observation experiences for every astronomy enthusiast. Through continuous R&D and technological breakthroughs, we aim to enable users to effortlessly enjoy the pleasure of astronomical observation, particularly making deep-space photography more intuitive and effortless.

The entire Clearsky Harmonic Equatorial Instrument series comes standard with the patented "***Mechanical Limiting***" function. Utilizing ultra-high-precision industrial-grade sensors, this system ensures that regardless of the instrument's zero position definition, if the RA axis touches the physical east/west 90-degree boundary, the device will permanently disable pointing (goto) or zeroing operations. This mechanism effectively prevents equipment collisions with tripods caused by zero position errors.

The launch of the Clearsky Harmonic Mount Instrument marks a significant advancement in astronomical observation equipment. Building on our consistent commitment to high precision, the newly implemented mechanical limit technology ensures exceptional reliability, further expanding the selection options for astronomy enthusiasts. The Clearsky Harmonic Equatorial Instrument offers multiple models, each meticulously designed with tailored load-bearing capacity and functional features to meet diverse observation requirements and equipment weights. Whether it's the lightweight 14/17 models or the more robust 20/25 versions, we strive for excellence in design to provide optimal support for outdoor stargazing and deep-space photography.

The Clearsky Harmonic Mount not only features lightweight structural design to enhance portability and operational convenience, but also offers multiple load capacity options. The ST14 model weighs only 3.9kg and supports equipment up to 8kg without a weight hammer, while its load capacity increases to 13kg with the hammer added. The ST17R weighs just 5.2kg, accommodating 13kg of equipment without the hammer and reaching 20kg with the hammer. The ST20 weighs 5.5kg, supporting 20kg of equipment without the hammer and up to 30kg with the hammer. The ST25 provides greater load flexibility, capable of carrying equipment up to 31kg without the hammer and supporting 36kg with the hammer, ensuring robust performance for larger astronomical instruments. Additionally, a custom-made ST32 ultra-load capacity version (35-45kg load capacity) is available upon request.

Furthermore, the Clearsky Harmonic Mount features an azimuth angle self-locking base. During polar axis adjustment, there's no need to manually lock the azimuth angle, ensuring operational efficiency and stability. The pitch angle employs a four-screw locking mechanism: lightweight equipment can be secured using two side hand-tightening screws, while heavy-duty equipment requires dual magnetic-side wrench locking after axis alignment to guarantee rock-solid stability and absolute reliability.

Thank you for choosing the Clearsky Harmonic Mount and Clearsky Astronomy. We remain committed to innovation, pushing boundaries to deliver exceptional and satisfying astronomical exploration experiences. Your trust and support mean the world to us. Let's embark on this extraordinary journey to the stars together!

*

$(\text{Telescope weight} \times 9.8, \text{ unit kg}) + (0.1 + \text{distance from telescope center to the corioid groove, unit m}) < 56 \text{ N} + m$, where 0.1 m is the distance from the corioid groove to the RA center.

(1) Safety Guidelines

We place high importance on user safety. To ensure your personal and financial security, we strongly recommend that you carefully read and understand all safety precautions outlined in this guide before using the equatorial mount. Please always adhere to these safety guidelines to avoid potential injuries or property damage.

1. Security Notice

▲ Risk of electric shock: Do not touch power cables with wet hands to avoid electric shock accidents.

▲ Electrical fire risk: Do not pull power cords or batteries. Ensure that power cords and batteries are free from damage or short circuits before use to prevent electrical fires.

▲ Battery short circuit risk: When using a battery, ensure the DC plug is properly inserted to prevent short circuits that may cause combustion or explosion.

▲ Child Safety: The equatorial mount and its related accessories contain small parts that may be accidentally ingested by young children. This device is not intended for use by children under 12 years of age. Minors under 18 years of age must operate the device under the supervision and guidance of a guardian prior to use.

2. Equipment Installation and Transportation

▲ Equipment transportation: Handling with care can prevent equipment from being impacted during handling and transportation, thereby avoiding damage to the equipment.

▲ Equipment handling: When moving equipment, ensure that your hands grip the device firmly and maximize the contact area between hands and equipment to enhance hand stability. This prevents accidental drop of the equipment, thereby avoiding injuries to personnel or damage to the equipment.

▲ Equipment installation and placement: Please use the equatorial mount when it is in a flat position. If the equatorial mount is not placed at a 90-degree angle on the base, it may cause accidental falls and result in equipment damage.

3. Standardize Operations

▲ Operating procedures: Please refer to the user manual included with the product for the use and operation of the equatorial mount. Strict adherence to operating procedures is required, and do not arbitrarily alter the device's position or installation method.

▲ Safety precautions: When adjusting the angle of the equator instrument or during installation, avoid sudden forceful movements, as this may cause hands to collide with other protruding parts or edges of the instrument, resulting in abrasions.

▲ Do not disassemble the equatorial instrument without authorization: Unauthorized disassembly of the equatorial instrument is strictly prohibited. For necessary repairs, please contact after-sales support for professional maintenance. The equatorial instrument is a precision device. Damage caused by improper operation or unauthorized disassembly may directly affect the warranty coverage of the equipment.

4. Fault Treatment

▲ Abnormal conditions detected in the device during use: If the device exhibits abnormalities such as unusual noises or black smoke emission, immediately disconnect the power supply and contact after-sales service.

(II) Product Overview

Parameter Specifications

	ST25	ST20	ST17-R	ST17	ST14
赤道仪类型	赤道仪/经纬仪				
传动模式	超高精度谐波减速机+同步带				
材质	阳极氧化6061铝材、304不锈钢、黄铜				
赤经	42步进电机, 25型谐波, 300: 1减速比	42步进电机, 20型谐波, 300: 1减速比	42步进电机, 17型谐波, 300: 1减速比	42步进电机, 17型谐波, 300: 1减速比	42步进电机, 14型谐波, 300: 1减速比
赤纬	42步进电机, 20型谐波, 300: 1减速比	42步进电机, 17型谐波, 300: 1减速比	42步进电机, 17型谐波, 300: 1减速比	42步进电机, 17型谐波, 300: 1减速比	42步进电机, 14型谐波, 300: 1减速比
载重	30-35kg	20-30kg	13-20kg	13-20kg	10-13kg
主体重量	8.5KG	5.5KG	5.2KG	4.7KG	3.9kg
鸠尾槽配置	赤道仪数据口、电源管理、数据管理。	赤道仪数据口、电源输出口	赤道仪数据口、电源输出口	无	赤道仪数据口、电源输出口
GOTO速度	2°/s (6°/s MAX)				
电子极轴镜	iPolar/PoleMaster				
电源输入	12-15V/3-5A				
掉电刹车	赤经赤纬电子刹车, ≥ 80 N*m	赤经电子刹车, ≥ 68 N*m	赤经电子刹车, ≥ 48 N*m	赤经电子刹车, ≥ 48 N*m	赤经电子刹车, ≥ 35 N*m
零位	标配机械零位	电子零位/选配机械零位	电子零位/选配机械零位	电子零位/选配机械零位	电子零位/选配机械零位
限位	标配专利机械限位				
通讯方式	USB,BT,WiFi,ST4	USB,BT,WiFi,ST4	USB,BT,WiFi,ST4	USB,BT,WiFi,ST4	USB,BT,WiFi,ST4
控制系统	ONSTEP/ONSTEPX				
三脚架连接	3/8"、M6、TC40、晴空40、EQ3D/HEQ5钢腿、EQ6R钢腿 (ST25可兼容)				
包装	硬质包+气泡柱+纸箱				

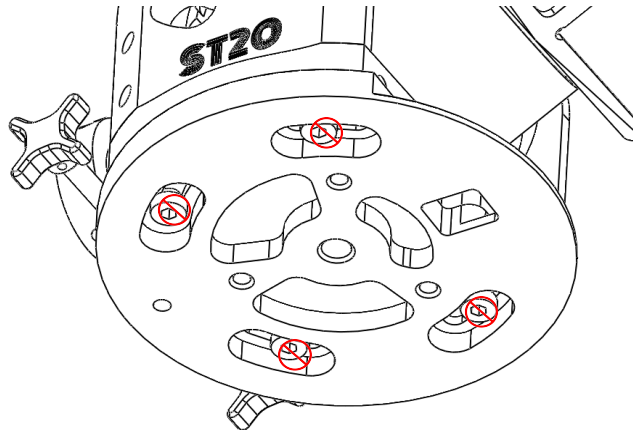
3 . List of Articles

Note: This manual may not have been updated when factory configurations changed. If the product you receive differs from the listed specifications, please contact ClearskyCustomer Service for a replacement.

Order number	Name	Quantity
1	Clear Sky Harmonic Equatorial Instrument	1
2	Dual male power cable (DC5.5-2.1mm) 1 meter	1
3	Type-C USB data cable	1
4	Safe storage bag	1
5	Instruction Manual (Electronic/Paper)	1
6	Paster	Stochastic
7	Azimuth screw*2	

(III) Installation and Use

Note: Do not adjust or remove the four factory-rated torque sealing screws and fixing screws shown in the figure without authorization.



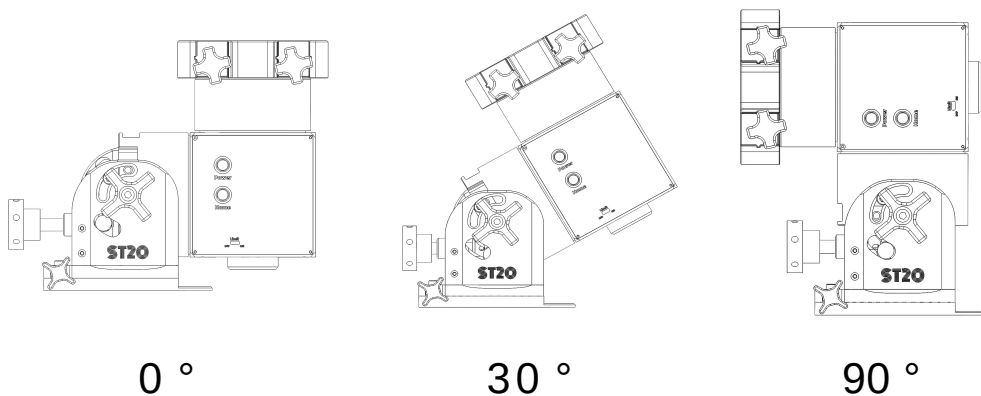
1. Body Installation (dual Mode)

(1) Equatorial Mount Mode

Bottom M10 threaded hole compatible with both 3/8 and M10 threads, with three evenly spaced M6 bolts (radius 30mm)

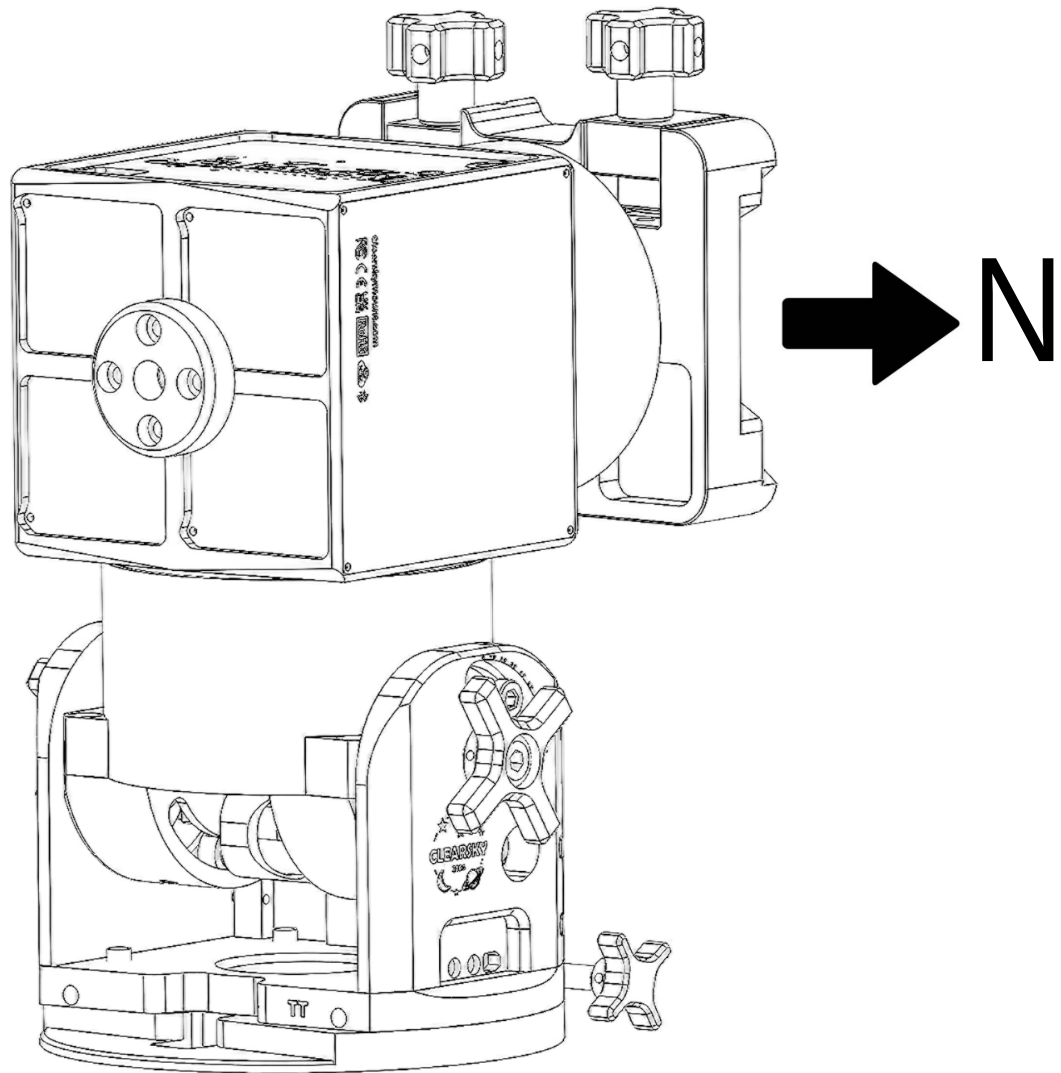
It can be mounted on a photography tripod, TC40-spec tripod, or EQ3D tripod.

The ClearskyHarmonic Equatorial Instrument features five latitude adjustment settings, supporting 0 -90 degree range adjustment. Select the appropriate setting based on your latitude. To switch settings: First, remove the magnetic wrench from the side, insert it through the opposite opening, loosen the setting screw, adjust to the desired position, and then retighten the screw.



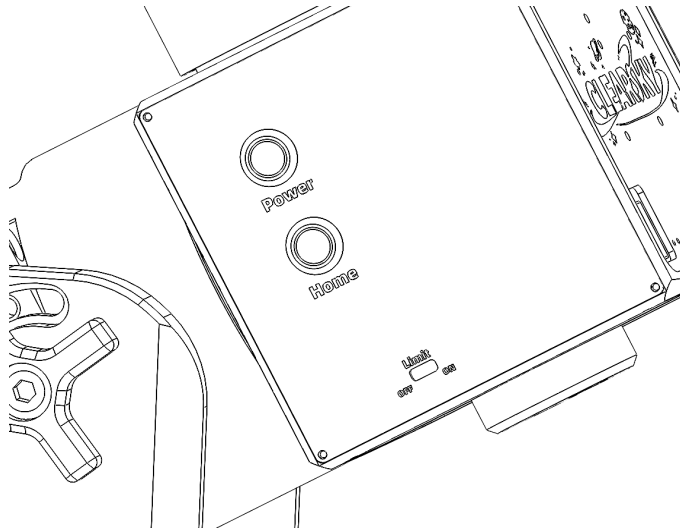
First Tier: 0-37°
Second Tier: 28-60°
Third Tier: 54-85°
Fourth Gear: 80-90°

(2) ALT/AZ Mode



1. By adjusting the gear position and hand-tightening the screws at the elevation angle, the main body of the equatorial mount can be raised to a 90-degree height.
2. After powering on, use WEB/Industrial Control/ASIAR to align the equatorial instrument's declination axis to true north (as shown in the figure above), then switch its operating mode via the web interface and restart the device.

(3) Mechanical Limit and One-Touch Reset Function



1. Set the Limit to ON to enable the mechanical limit function. (Default: On)

2. When the mechanical limit function is activated, regardless of the zero position defined by the equatorial mount, if its RA axis touches the physical east/west 90-degree boundary, the mount will be unable to perform pointing (goto) or zeroing operations, thereby preventing legging caused by zero position errors.

*Patent number ZL 2024 2 3159176.X, this patent function is not open to the public, please pay attention to identification.

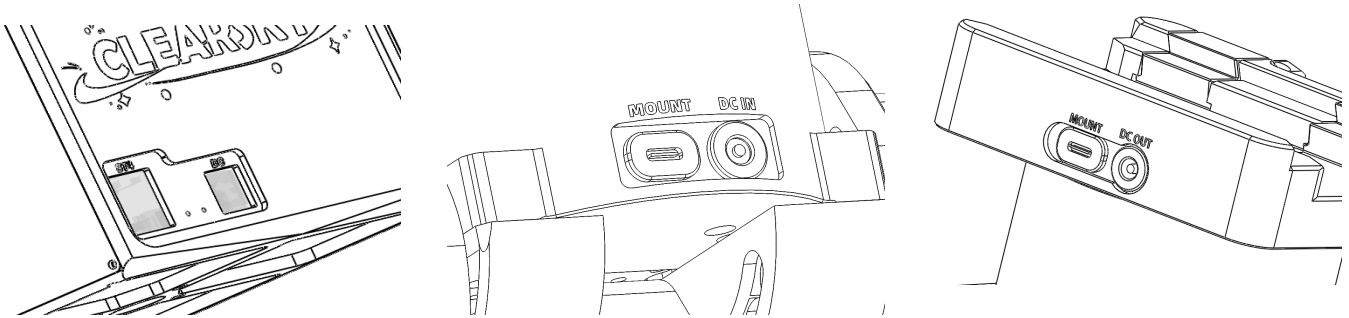
3. Home button usage instructions:

- ① The mechanical limit version of the equatorial mount will rotate to the startup zero position at normal speed.
- ② For the mechanical zero-position version of the equatorial mount, first synchronize the time and latitude/longitude data with the ONSTEPX motherboard, then press the home button. The mount will then rotate to the mechanical zero position at a slower speed.

(4) Mechanical Zero Position Function (optional)

It can automatically locate the mechanical zero position and be used in conjunction with mechanical limiters to ensure the equatorial mount is correctly positioned during startup, as well as prevent leg strikes that may cause equipment damage during operation.

2. Cable Connection



(1) Connect the Power Cord

- ① Insert one end of the dual male power cable into either the front panel or rear DC port of the equatorial mount.
- ② Connect the other end of the dual male power cable to the DC power interface, then press the equatorial mount switch to power on the device. When powered on, the power indicator light remains blue (indicating stopped tracking), while a blinking blue light signifies active tracking mode.

(2) Connect to a Computer or ASI AIR and Other Astronomical Equipment

- ① Connect the USB Type A end of the USB cable to the USB Type A port of your computer or astronomical equipment such as ASI AIR.
- ② Insert the USB Type-C end of the USB cable into the USB port located on the dovetail slot of the equator instrument.

3 . ASI AIR Connection

Download the app: Search for "ASI AIR" in your mobile app store and install it.

(1) Wired Connection

- ① Connect the ASI AIR's USB 2.0 port to the equatorial mount's USB port, and ensure the equatorial mount is powered on.
- ② Open the ASI AIR mobile app and select serial port connection on the equatorial mount page. The equatorial mount recommends choosing OnStep Electronic/OnStep, and confirm the serial port baud rate is set to 9600.

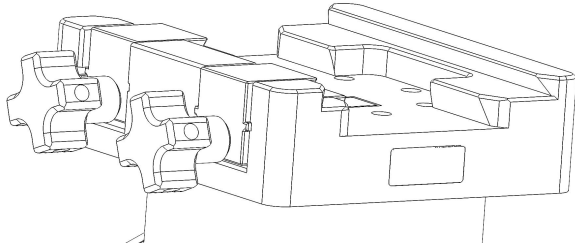
(2) Wireless Connections

operating steps

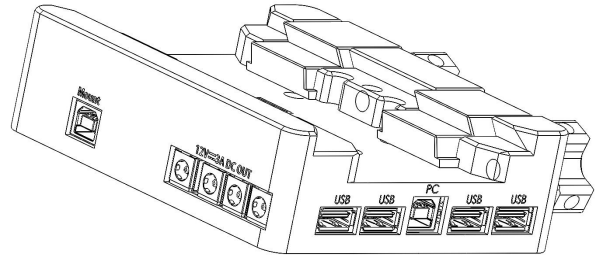
- ① Open the box and select OnStep WiFi for WiFi bridging (password: password)
- ② Select OnStep as the equatorial mount connection option (use another OnStep if connection is unavailable).
- ③ Click the connection method to switch to network, enter 192.168.0.1 in the IP field, and enter 9999 in the port field. Tutorial: <https://www.bilibili.com/video/BV1cNEBzuEPK/>

(IV) Appendix

1. Introduction to Multifunctional Caudal Jaw Groove



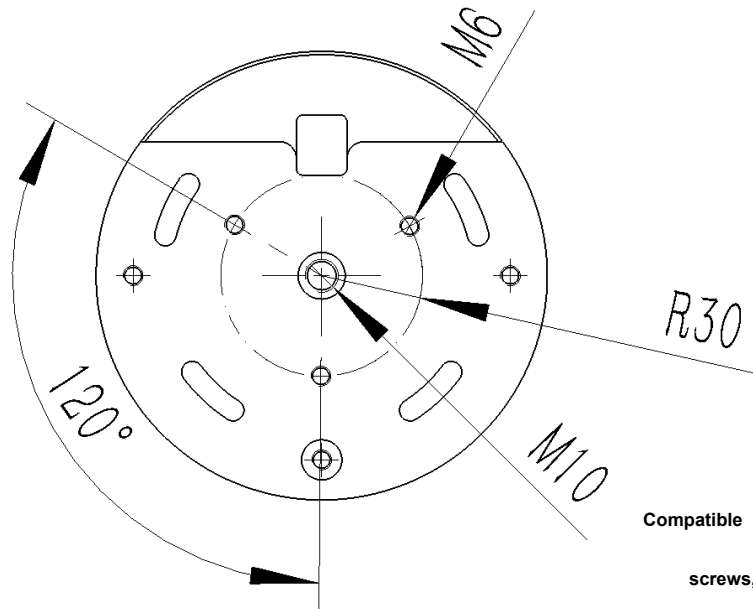
The front section of the multifunctional dovetail slot features a power display screen that provides real-time monitoring of input voltage, output current, and output power.



The multifunctional coccygeal fossa has an equatorial instrument number on its lateral surface.

The device features four DC power outputs and a USB hub on the rear for data expansion.

2. Related Drawings



Compatible with 3/8-inch and M12 screws, suitable for most steel tripods.

2. Frequently Asked Questions

Clearsky User Self-Check Manual, You can check whether there is a solution for your situation. If not, please contact Customer Service/Technology.

<https://kdocs.cn/II/calmKOIFvJ4Y>

(1) ASIAIR Does Not Rotate the Mount When the Polar Axis Is Aligning?

Cause: When connecting ASIAIR to the OnStep equatorial mount, there may be instances where the counter-pole axis fails to respond (i.e., does not rotate) during polar axis-controlled rotation of the equatorial mount.

Solution 1: In the ASIAIR equatorial mount tab, switch to an equatorial mount driver connection with an OnStep name prefix and try again.

Solution 2: Restart the ZWO box.

(2) ASIAIR Does Not Move When Controlling the Equatorial Instrument?

Cause: When connecting the ASIAIR to the OnStep equatorial mount, manual operation may occasionally fail to rotate the device.

Solution 1: In the ASIAIR equatorial mount preview interface, first set the movement speed to the lowest level, then adjust it to MAX to resolve the issue.

Solution 2: Restart the ZWO box.

(3) ASIAIR Exhibited Significant Satellite Guidance Errors When Controlling the Equatorial Instrument.

Reason: The harmonic equatorial instrument requires recalibration of the guide star data before each use due to the application of previously calibrated data.

Solution: Clear the previous star guide data and recalibrate. Uncheck the 'Use previous star guide data' option in the star guide settings to avoid this issue next time.

(4) ASIAIR Exhibited Significant Post-Saturation Guidance Star Errors When Controlling the Equatorial Instrument.

Reason: The harmonic equatorial instrument requires recalibration of its guiding star data after the equinox, as it utilized pre-equinox guiding star data.

Solution: Clear the previous star guide data and recalibrate. Select the 'Recalibrate star guide after mid-sky rotation' option in the star guide settings to automatically rotate DEC data, preventing this issue next time.

(5) Why Is the GOTO Position Inaccurate? (It's Completely Outside the Target's Celestial Region, or Even Pointing the Telescope Downward.)

Cause: The electronic zero-position version of the equator instrument failed to initiate operation at the correct zero position, resulting in subsequent GOTO position errors.

Solution: Manually set the equator仪 to the correct zero position, then restart the equator仪.

(6) What Do the Indicator Lights Represent?

Red light on: Power on

Blue light status 1: continuously flashing. Tracking is enabled.

Blue light status 2: Indicator off. Tracking is disabled (when encountering limit) / GOING TO

(5) After-Sales Service

We provide a comprehensive two-year warranty service to ensure you enjoy worry-free protection during use. The warranty period starts from the date you actually receive the product and covers all potential quality issues, ensuring your interests are maximally protected.

We offer a "7-day no-questions-asked return policy" and "15-day exchange service":

"7-Day No-Reason Return" Service: Allows consumers to return products within seven days of receipt without providing any reason. However, it is important to note that the product must remain in its original condition, i.e., unused, with intact packaging, complete accessories, and no damage. The customer is responsible for the return shipping costs.

"15-Day Return Policy": Consumers are permitted to request a return within 15 days of receiving the product if quality issues or discrepancies with the description are identified. The product must remain in its original condition during return, and purchase receipts must be provided. All return shipping costs shall be borne by the company.

During the warranty period, we guarantee free repairs or replacements for product quality issues, including but not limited to firmware upgrades, replacement parts delivery, in-factory repairs, and product exchanges, to ensure your optimal user experience. However, our warranty services are subject to certain limitations.

Specifically:

1. Damage to products beyond the free warranty period is not covered under warranty.
2. Damage to the product caused by external forces, such as drops or collisions during transportation, is also not covered by the warranty.
3. Losses or product quality issues caused by failure to use the product in accordance with the instructions shall not be covered by the warranty.
4. Any unauthorized disassembly, third-party repair, modification, or flashing without explicit written authorization from the official after-sales department of Clearsky Astronomy Studio shall not be covered by the warranty.
5. Damage caused by water immersion, rain exposure, or other unsuitable environmental conditions is not covered under the warranty.
6. Product damage caused by irresistible external forces is not covered under the warranty.
7. Products without purchase records are not covered by the warranty.

For products beyond the free warranty period, we offer paid repair services.

Regarding product quality issues, we provide warranty services for products within the warranty period. If you encounter any problems during use and require warranty assistance, please contact us. We will provide corresponding solutions based on the nature of the issue, such as firmware upgrades, replacement parts delivery, factory repairs, or product exchanges.

Due to the considerable weight of the equatorial mount, if the issue is caused by the customer, the shipping costs incurred after sales shall be borne by the customer. If the issue is attributable to our company, all postage expenses resulting from after-sales services shall be fully covered by our company.

(The above after-sales terms apply to domestic transportation in China)

Regarding product transportation issues, if you notice obvious deformation or damage to the shipping packaging after receiving the product, please immediately contact the official online store or authorized dealer of your order channel. Upon confirmation, you may refuse to accept delivery and request a return from the carrier, with our authorized dealer providing return/exchange services. If product damage is discovered after acceptance, you must submit either the original packaging or third-party documentation from the carrier. If the order channel verifies that the damage resulted from transportation, we or authorized dealers will process the corresponding return/exchange procedures.

We consistently strive to provide customers with high-quality products and superior services. Our warranty policy represents our commitment to customers, ensuring you receive maximum protection during the use of our products.

(7) Submission of Works

We warmly invite you to share your outstanding works created with the Clearsky Harmonic Equatorial Camera or showcase the device's true capabilities. Submit your portfolio or take high-definition photos of the camera in action, and let us experience the exceptional photography experience it delivers. We look forward to your creations becoming part of the story that highlights the charm of ClearskyHarmonic!

Submit via WeChat: Clearskyastro

Email: Clearskyastro@foxmail.com

Submission format:

Shooting Target: C20 North American Nebula

Telescope: A s k a r 103APO

Camera: ZWO2600AIR

Equatorial mount: ST20

Filter: LEX7nm

Star Guide Camera: ZWO ASI220mm mini

Exposure: 500s*30

Shooting location: Yulong Snow Mountain, Lijiang City, Yunnan Province