iOptron® ZEQ25GT Balanced GoTo Equatorial Mount
With Go2Nova® 8408 Hand Controller

Instruction Manual

Product #7100, #7101 and #7102

Read the included ZEQ25 Quick Setup Guide (QSG) BEFORE taking the mount out of the case!

This product is a precision instrument and uses a magnetic gear meshing mechanism. Please read the included QSG before assembling the mount. Please read the entire Instruction Manual before operating the mount.

You must hold the mount firmly when disengaging or adjusting the gear switches. Otherwise personal injury and/or equipment damage may occur. Any worm system damage due to improper gear meshing/slippage will not be covered by iOptron's limited warranty.

If you have any questions please contact us at support@ioptron.com

WARNING!

NEVER USE A TELESCOPE 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.

Table of Content

Ver. 2.0 2014.07

1. ZEQ25GT Overview

Welcome to a new type of EQ mount! The iOptron® "Z" design mount puts the payload weight at the center of gravity allowing for greater natural stability. This also means the mount is extremely light compared to its payload—a nice benefit when setting up at a remote site. Other features include an adjustable counterweight bar to prevent obstruction with the tripod. And Polar aligning is quick and accessible all the time since the Polar scope is not blocked by the DEC shaft.

The ZEQ25 is equipped with the most advanced GOTONOVA® GOTO technology, making it one of the most powerful and accurate GOTO mounts available. It comes with over 59,000 objects in its database. Plus, the Go2Nova® Hand Controller is intuitive to use with a large 4-line LCD screen to easily set up your telescope and select where you want to go. The ZEQ25 – a new category of viewing and astrophotography. **Please read the instruction before operation the mount.**

Features:

- A new design "balanced" equatorial mount for maximum payload and minimum mount weight
- Specialized astrophotography mount ideal for entry-level and intermediate Astro-photographers
- Payload of 27 lbs (12.3 kg) with the mount-only weight of 10.4 lbs (4.7 kg)
- Spring loaded gear system with customer adjustable loading force
- Gear switches on both R.A. and DEC axes for easy balancing when disengaged
- Adjustable counterweight shaft for 0º latitude operation
- Dual-axis servomotor with enhanced optical encoder for precise GOTO and accurate tracking
- iOptron AccuAlign™ calibrated polar scope with dark-field illumination and easy polar alignment procedure, allowing for fast and accurate polar alignment (model #7100 and 7102)
- Polar alignment routine for those who can't see the Pole Star
- Go2Nova® 8408 controller with Advanced GOTONOVA® GOTO Technology
- Periodic error correction (PEC)
- Integrated autoguiding port
- Built-in 32-channel Global Positioning System (GPS)
- Serial port for firmware upgrade and computer control
- Spring loaded Vixen-style saddle
- Standard 1.5 inch heavy-duty stainless steel tripod (5kg), optional 2 inch tripod (8kg)
- Die-cast metal tripod spreader with accessory tray

DO NOT rock the counterweight shaft rigorously. You'll degrade the performance of the spring loaded gear meshing system, or even damage it.

The Tension Adjusters are 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 1/4 to 2 turns. The optimum spot varies with actual conditions and payload. Ideally, it should be at a position just deep enough to rid any free movements (plays), while force on the worm assembly is kept at a minimum.

2. ZEQ25 Terms

2.1. Parts List[1]

There are two shipping boxes for a regular tripod version. One box contains a ZEQ mount, hand controller, one 10.4 lbs (4.7kg) counterweight, counterweight shaft, tripod spreader and accessories. The other box contains a tripod.

- iOptron® ZEQ25GT telescope mount (with built-in GPS)
- Go2Nova® 8408 Hand Controller
- 1.5-inch Tripod (#7100) or 2-inch Tripod (#7102)
- Tripod spreader
- One 10.4lbs (4.7 kg) counterweight
- Counterweight shaft
- Dark field illuminating LED cable (for model #7100 and #7102 with polar scope)
- AC adapter (100V-240V)
- Controller Cable X 2 (6P4C or 6P6C, straight wired)
- Serial cable (RS232 to RJ9)

OPTIONAL PARTS

- Optional PowerWeight™ rechargeable battery pack (#8128)
- Optional StarFi wireless adapter (#8434)
- Optional Z MiniPier (#8035)

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

- Quick Start Guide
- This manual
- Tips for set up
- Hand controller and mount firmware upgrades (check online for latest version)
- ASCOM driver
- Reviews and feedback from other customers
- Accessories

[1] US market only. Actual contents may vary.

2.2. Assembly Terms

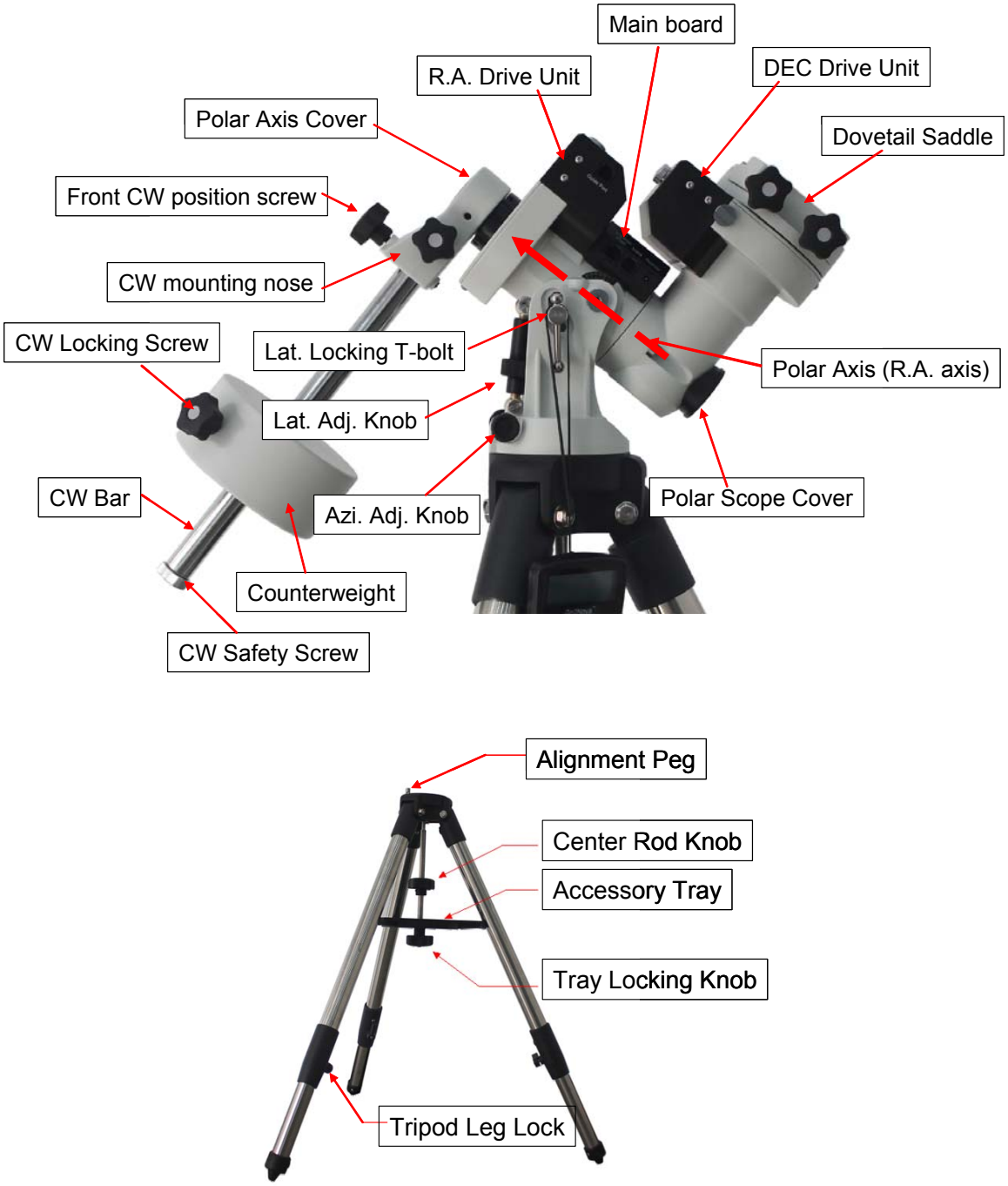


Figure 1. ZEQ25 assembly terms (mount and tripod)

2.3. ZEQ25 Ports

Ports on the mount

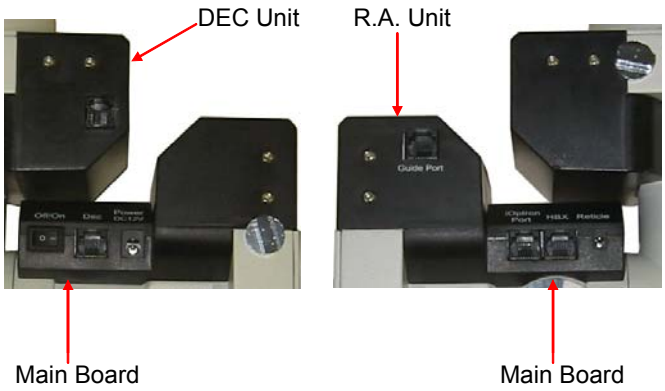


Figure 2. Ports on a ZEQ25 mount

On main control board:

- OFF/ON Switch: Power switch
- Dec: For connecting to DEC drive unit
- Power DC 12V: DC power plug (2.1mmX5.5mm)
- iOptron Port: For connecting to other iOptron accessories, such as a laser pointer or a planetary dome control.
- HBX (Hand Box): For connecting to an 8408 Hand Controller
- Reticle: Power supply for the polar scope dark field illumination LED, or illuminated eyepiece

On RA unit:

Guide Port: Autoguiding port for guiding cameras

On DEC unit:

The only port on the DEC unit is used to connect to the Dec port on main control board

2.4. Go2Nova® 8408 Hand Controller

Figure 3. Go2Nova® 8408 hand controller

The Go2Nova® 8408 hand controller (HC) shown in Figure 3 is the standard controllers that used for a ZEQ25 mount. It has a 4 line, 21 character large LCD screen, function keys, direction keys and number keys on the front; a and a HBX port (6-pin) and a serial port (4-pin) at the bottom.

2.4.1. Key Description

- MENU Key: Press "MENU" to enter the Main Menu.
- BACK Key: Move back to the previous screen, or end/cancel current operation, such as slewing.
- ENTER Key: Confirm an input, go to the next menu, select a choice, or slew the telescope to a selected object.
- Arrow (▲▼◄►) Keys: The arrow keys are used to control the movement of DEC and R.A. axes. Press and hold ▲(DEC+),▼(DEC-) buttons to move a telescope along the DEC direction, ◄(R.A.+), ►(R.A.-) to move a telescope along the RA direction. They are also used to browse the menu or move the cursor while in the menu. **Holding an arrow key for a fast scrolling.**
- Number Keys: Input numerical values. Also used to adjust slewing speeds (1: 1X; 2: 2X; 3: 8X; 4: 16X; 5: 64X; 6: 128X; 7: 256X; 8: 512X; 9: MAX)
- ? Key: **Identify and display nearby bright stars or objects where the telescope points to.**
- 0 Key: Stop the mount during GOTO. **Also toggling between start and stop tracking.**
- HBX (Handbox) port: connect the HC to a ZEQ25 mount using a 6 pin 4 wire (6P4C) RJ11 plug.
- Serial port: connect the HC to a Computer via a RS232 to 4 pin 4 wire (4P4C) RJ9 cable (iOptron item# 8412) for firmware upgrade and computer controller. The pin out of the serial port is shown in Figure 4.

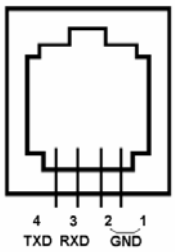


Figure 4. Serial port pin out on an 8408 hand controller

2.4.2. The LCD Screen

The 8408 HC has a large 4-line, 21-character per line LCD screen. The user interface is simple and easy to learn. When the mount first turned on, an initial information screen will be displayed as shown in **Figure 5**, after company logo displayed. It displays the Zero Position, current date and time.

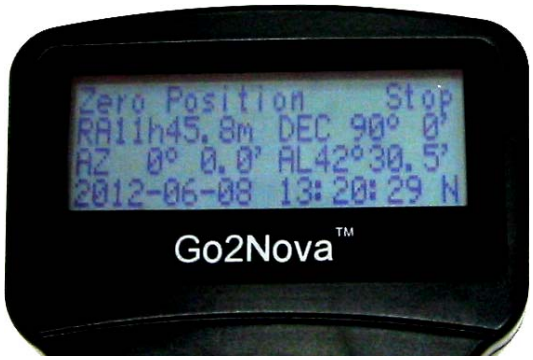


Figure 5. 8408 Initial Information Screen

The LCD screen will switch to the information screen, as indicated in **Figure 6**, with pressing any button.

Figure 6. 8408 HC LCD Information Screen

1. Target Name/Mount Position: displays the name of the target that telescope is currently pointed to or the current mount position.
   - An object name, such as “Mercury” or “Andromeda Galaxy”: Name of the Star or celestial object that the mount is currently slewing to, GOTO or tracking;
   - User Position: The mount is point to a user defined position, which could be a real sky object or just simply due to press an arrow key.
2. Magnitude: the magnitude of the current celestial object
3. Right Ascension: Right Ascension of the telescope, or R.A.
4. Declination: Declination of the telescope, or DEC.
5. Azimuth: Azimuth of the telescope (north is 0º, east 90º, south 180º, and west 270º).
6. Altitude: Altitude of the telescope (degrees vertical from the local horizon - zenith is 90º).
7. Mount Status: Display current operation status of the mount.
   - Stop: mount is not moving;
   - Slew: mount is moving with an arrow key is pressed;
   - GoTo: mount is slewing to a celestial object using “Select and Slew”;
8. Slew speed: It has 9 speeds: 1X, 2X, 8X, 16X, 64X, 128X, 256X, 512X, MAX (~4.5º/sec, depends on power source).
9. Current Time: display local time in a format of HH:MM:SS.

2.5. Check the Battery

The hand controller has a real time clock (RTC) which should display the correct time every time the mount is turned on. If the time is incorrect, please check the battery inside the hand controller and replace it if needed. The battery is a 3V, CR1220 button battery.

2.6. Bench Testing the Mount

The counterweight shaft is designed to counter balance the mount’s own weight. It is recommended that the CW shaft is installed when testing the mount’s function.

NEVER operate the mount with only the counterweight or OTA on it, as shown in the image in Figure 7. It may cause gear slippery and cause the worm and gear damage.

Figure 7.**Do not** operate the mount with an unbalanced load

3. ZEQ25GT Mount Assembly

3.1. Introduction

You have just purchased a telescope mount that is capable of taking you to a new level of astronomy. No matter which telescope or optical tube assembly (OTA) you select to install on the mount, the overall performance will be greatly enhanced. In order for you to get the optimum performance from the mount and OTA combination, you must assemble and adjust the mount correctly. The following fundamentals of telescope mounts are included to help you understand the big picture before you get into the specific details of the ZEQ25 mount.

Telescope mounts are either equatorial mounts or altitude-azimuth (Alt-Az) mounts. Both types of mounts rotate the OTA around two perpendicular axes to point to a desired object in the night sky. An equatorial mount has the right ascension (R.A.) axis aligned with the celestial North Pole (CNP), or celestial South Pole (CSP) in southern hemisphere, to provide rotation matching the celestial sphere rotation around the Earth and the declination axis (DEC) to provide elevation relative to the celestial equator. Since all celestial objects appear to rotate around the CNP, the R.A. axis allows the OTA to rotate with the celestial sphere and provide accurate tracking for visual observations and astrophotography. R.A. is the celestial equivalent of longitude. Like longitude, R.A. measures an angle that increases toward the East as measured from a zero reference point on the celestial equator. An Alt-Az mount has a horizontal axis to provide vertical (altitude) OTA movement from the local horizon and a vertical axis to provide horizontal (azimuth) OTA movement, similar to compass headings. An Alt-Az mount can provide tracking that is good enough for visual observing and short exposure photos, but not good enough for serious astrophotography. Alt-Az mounts require star alignments for the OTA to track stars and they do not have adjustment components on the mount. Equatorial mounts require alignment of the mount components as well as star alignments for accurate OTA tracking.

In order to provide the required Polar Axis alignment, equatorial mounts use a combination of both mount types described above. The adjustable part of the mount moves in the Alt-Az mode in order to align the R.A. axis, also known as the mount's Polar Axis, with the CNP. These Polar Axis adjustments do not involve any rotations of the OTA about the R.A. or DEC axes and can be performed without the OTA installed. The first step is to make an approximate azimuth alignment of the Polar Axis by aligning the specified tripod leg or reference point toward True North using a compass for reference (you must allow for the variation between True and Magnetic North at your location). Precise horizontal alignment of the Polar Axis is accomplished with azimuth adjustments on the mount. The second step is to adjust the Polar Axis vertically (altitude) above the North horizon by setting the observer's latitude on the provided latitude scale. This procedure is based on the fundamental geometry of the Earth's coordinate system in conjunction with the concept of the celestial sphere. You can verify this by visualizing yourself at the North Pole (latitude N90°) and Polaris will be 90° from the horizon, or directly overhead. These steps will place the Polar Axis very close to the CNP. Both of the above adjustments can be enhanced by the use of an opening along the R.A. axis that allows direct viewing of the North Star and the use of a polar scope to view through this opening. If you are going to get the most out of your equatorial mount it is essential to understand the concept of the Polar Axis and how the equatorial mount helps you establish and maintain a true Polar Axis alignment. Now, you are ready to perform star alignments using the equatorial mount's electronic controller and enjoy the night sky.

The ZEQ25 mount is a next-generation equatorial mount that provides the precision alignment capabilities required for today's complete astronomy solution. The following sections of this manual provide the detailed steps required to successfully set up and operate the ZEQ25 mount.

3.2. ZEQ25 Mount Assembly

NOTE: The ZEQ25 mount is a precision astronomical instrument. It is highly recommended that you read the entire manual and become familiar with the nomenclature and function of all components before starting the assembly.

WARNING: Please DO NOT rock the counterweight shaft rigorously. You'll degrade the performance of the spring loaded gear meshing system, or even damage it.

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

WARNING: DO NOT fully lock the 2 Tension Adjusters during operations.

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

STEP 1. Select Mount Latitude Range

Carefully remove the mount from the shipping box and familiarize yourself with the components shown in Figure 1.

The mount is by default shipped with the **Long Latitude Adjustment Knob** installed (for 35-60º). At lower latitudes of 0-35º, the **Short Latitude Adj. Knob** needs to be used. To change this knob, remove the Latitude Locking T-bolts on both sides (do not lose the 4 washers). Unscrew Bottom Post Locking Screw to free the Bottom Latitude Adj. Post and remove the Latitude Adj. Knob. Thread in evenly the adequate 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 Latitude Locking T-bolts into the upper threaded holes.

Figure 8. Switching latitude adjustment knob

STEP 2. Tripod Setup

Expand the tripod legs. Adjust the tripod height by unlocking and re-locking the Tripod Leg Locks to desired height. Position the tripod so that the Alignment Peg faces north, if you are located at northern hemisphere. If you are located in southern half, face the Alignment Peg south. Thread the tripod center rod into the tripod head and install the Accessory Tray and tread 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. The Alignment Peg may be moved to the opposite position shall the mount hit the tripod leg when used at a high latitude.

Figure 10. Set up tripod

STEP 3. Attach the ZEQ25 Mount

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.

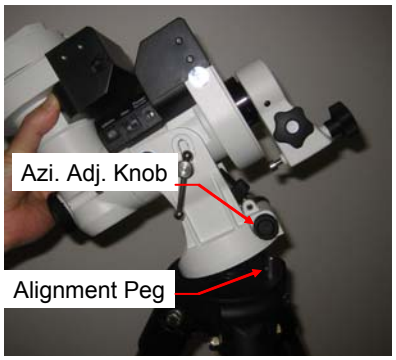


Figure 9. Attach a mount

STEP 4. Adjust Latitude

This step requires you to know the latitude of your current location. This can be found from your 8408 hand controller after the embedded GPS receives the signal from the satellites. It also can be easily found on the Internet, with your 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 and GOTO 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 8b). 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 piggy-back (camera mounted on top of the OTA) astrophotography.

STEP 5. Install Counterweight (CW) Shaft

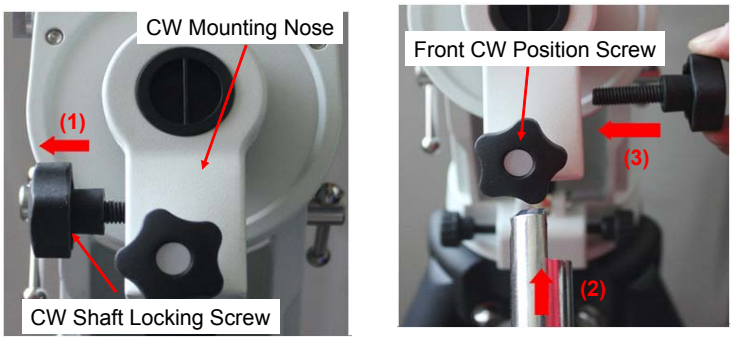


Figure 11. Install counterweight shaft

(1) Remove CW Shaft Locking Screw from the CW Mounting Nose.

(2) Insert CW shaft into the CW Mounting Nose as indicated in 2nd photo below.

(3) Lock it using CW Shaft Locking Screw from the other side of the CW Mounting Nose. Tighten the Front CW Positioning Screw which is located in front of the CW Mounting Nose.

If the latitude of the observation location is lower than 10º, thread in the Rear CW Position Screw (a hex head set screw) before tightening the Front CW Positioning Screw to avoid CW hit tripod legs. Then tighten the Front CW Positioning Screw.

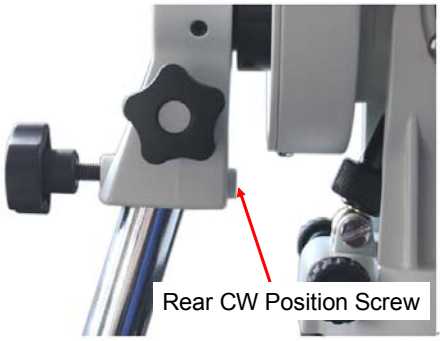


Figure 12. Tilt counterweight shaft for low altitude

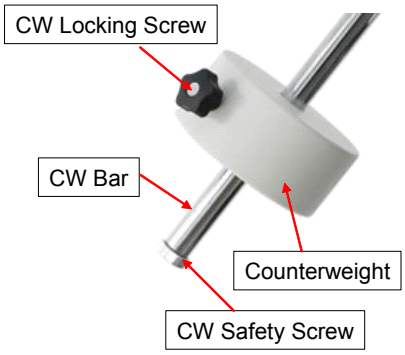


Figure 13. Install counterweight

STEP 6. Install Counterweight

Before installing the counterweight, make sure that both R.A. and DEC Gear Switches are fully engaged to avoid sudden mount movements which could cause injury and/or damage the mount gear system and your equipment.

Make sure the mount is at the zero position (i.e. counterweight shaft is pointing to the ground) when installing the counterweight.

Turn the R.A. gear switch to OPEN position to set the R.A. axis free before loading the CW. Remove CW Safety Cap at the end of CW Shaft. With the wider opening towards the shaft end, guide CW through the shaft. Use the CW Locking Screw to hold the CW in place. Place Safety Cap back onto the shaft. Turn the R.A. gear switch to CLOSE position again.

A ZEQ25 mount comes with a 10.4 lbs (4.7kg) counterweight. It should be able to balance a total payload of about 13 lbs (6kg) for a 6" diameter telescope. An optional CW or extension bar is needed for a heavier payload or a larger diameter Telescope.

STEP 7 Attach and Balance an OTA

After attaching an OTA and accessories to the mount, the ZEQ25 mount must be balanced in both R.A. and DEC axes to ensure minimum stress on the mount (such as gears and motors inside). **Make sure the OTA is properly secured.**

CAUTION: The telescope may swing freely when the R.A. or DEC Gear Switch is released. Always hold on to the OTA before you release the gear switch to prevent it from swinging. It can cause personal injury or damage to the equipment.

Release Tension Adjuster by turning it counterclockwise. Turn Gear Switch knob 90 degree to OPEN position to disengage the worm from the worm wheel.

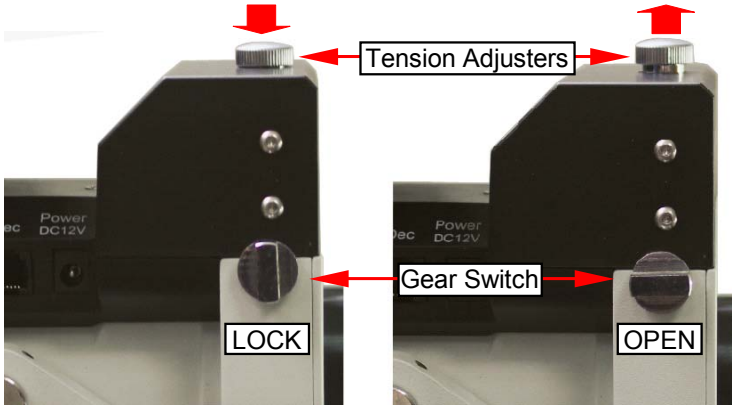


Figure 14. Gear Switch operation

Rotate the DEC axis to horizontal position. Adjust the CW position to balance the mount in R.A. axis (Figure 15a) and move the OTA position to balance the mount along DEC axis (Figure 15b).

(a) (b)

Figure 15. Balance along R.A. axis (a) and DEC axis (b)

CAUTION: The balance process MUST be done with Gear Switch at OPEN position! Otherwise it might damage the worm system.

Return the mount to Zero Position after balance, i.e. the CW shaft points to ground and telescope is at the highest position.

Turn Gear Switch Knob by 90° to LOCK position to re-engage the worm to the worm wheel. Retighten the Tension Adjuster as the last step to lock the gear.

Important Notes on Tension Adjusters

The rule of thumb is to fully screw in the Tension Adjuster and then back out from 1/4 to 2 turns. The optimum spot varies with actual conditions and payload. Ideally, it should be at a position just deep enough to rid any free movements (plays), while force on the worm assembly is kept at a minimum.

STEP 8. Connect Cables

Connect DEC unit to the main control unit with a short, straight RJ11 cable. Connect the Go2Nova® 8408 hand controller to the HC port on the main unit. Plug 12V DC power supply into the POWER socket. The power indicator on the main unit will be on when the power switch is turned on.

STEP 9. Setup Hand Controller

The ZEQ25 is equipped with a GPS receiver, which will receive the time, longitude and latitude information from satellites after the link is established. However, there are still some parameters need to be entered to reflect your location, such as time zone info and daylight saving time. The information will be stored inside the hand controller memory along with longitude and latitude coordinates until they need to be changed.

A clear sky and open space outside is needed for the GPS to establish its link with the satellites. The GPS is installed inside main control board compartment. If it has difficulty to receive the GPS signal, you may turn the mount head 90º to the side of the mount to clear the space on top of the main board. ***Do not leave the hand controller on GPS Status submenu waiting for GPS ON tuning into GPS OK.***

Figure 16. Rotate mount head 90º to clear the space for GPS receiver

To set up the controller, press MENU button on the hand controller. From the main menu, scroll down and select "***Set Up Controller***"

```
Select and Slew
Sync. to Target
Set Up Controller
Align
```

Press ENTER and select "Set Up Time and Site"

```
Set Up Time and Site
Set Display and Beep
Set Anti-backlash
Meridian Treatment
```

Press ENTER. A time and site information screen will be displayed:

```
2013-04-01 12:01:36     N  <-- Daylight Saving Time
300 Min. behind   UT
W071d08m50s
N42d30m32s        Northern
```

Set Local Time

The time will be updated automatically when the GPS has picked up a signal. You also can manually input the time information in case GPS does not function. Use the ◄ or ► key to move the cursor _ and use number keys to change the numbers. Use the ▲ or ▼ button to toggle between "Y" and "N" for Daylight Saving Time. Hold the arrow key to fast forward or rewind the cursor.

In order to make hand control reflect your correct local time, time zone information has to be entered. Press ◄ or ► key, move the cursor to the third line "300 Min. behind UT" to set the time zone information (add or subtract 60 minutes per time zone). Enter minutes "ahead of" or "behind" UT (universal time). For Example,

- Boston is 300 minutes "behind" UT
- Los Angeles is 480 minutes "behind" UT
- Rome is 60 minutes "ahead of" UT
- Beijing is 480 minutes "ahead of" UT
- Sydney is 600 minutes "ahead of" UT

All the time zones in North America are *behind* UT, as shown in the following table. So make sure it shows "behind" instead of "ahead of" UT.

Time Zone	Hawaii	Alaska	Pacific	Mountain	Central	Eastern
Hour behind UT	-10	-9	-8	-7	-6	-5
Enter Minutes	600	540	480	420	360	300

To adjust minutes, move the cursor to each digit and use the number keys to input number directly. To change the "behind" or "ahead of" UT, move the cursor to "ahead" and using ▲ or ▼ key to toggle between "behind" and "ahead of". When the number is correct, press ENTER and go back to the previous screen.

For other parts of the world you can find your "time zone" information from internet. **DO NOT COUNT DAYLIGHT SAVING TIME.** Fraction time zone can be entered.

Set Observation Site Coordinate

The third and fourth lines display the longitude and latitude coordinates, respectively. The longitude and latitude coordinates will be automatically updated when the GPS picks up satellite signals. "W/E" means western/eastern hemisphere; "N/S" means northern/southern hemisphere; "d" means degree; "m" means minute; and "s" means second.

If for any reason your GPS can't pick up a signal, you can manually enter the GPS coordinates. Press ◄ or ► key to move the cursor and using ▲ or ▼ key to toggle between "W" and "E", "N" and "S", using number key to change the numbers. It is always a good idea to do your home work to get the GPS coordinates before traveling to a new observation site.

The site coordinates information can be found from *Support* section in iOptron website, under *Controller Set-up* (http://www.ioptron.com/support.cfm?module=faq#). By entering the city name or address, you can find its latitude and longitude. In case you only find the site information in decimal format you can convert them into d:m:s format by multiplying the decimal numbers by 60. For example, N47.53 can be changed to N47º31'48": 47.53º = 47º +0.53º, 0.53º=0.53x60'=31.8', 0.8'=0.8x60"=48". Therefore, 47.53º=47º31'48" or 47d31m48s.

Select N/S Hemisphere

If the polar axis is aligned to North Celestial Pole, then set the mount to Northern Hemisphere. If the polar axis is pointing to South Celestial Pole, set the mount to Southern Hemisphere. Press ◄ or ► key to move the cursor and using ▲ or ▼ key to toggle between "Northern Hemisphere" and "Southern Hemisphere".

Select Northern Hemisphere if you are located in US and press ENTER to go back to the main menu.

The time and site information will be stored inside the HC memory chip. If you are not traveling to another observation site, they do not need to be changed.

STEP 10. Polar Alignment

One of ZEQ25's unique features is that the polar scope can be accessed at anytime. It will not be blocked by DEC axle as in a German equatorial mount. This makes it possible to adjust the polar alignment during the tracking.

In order for an equatorial mount to track properly, it has to be accurately polar aligned.

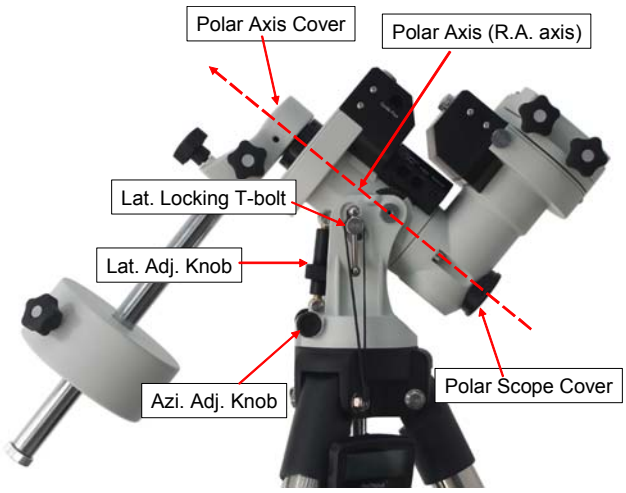


Figure 17. Polar alignment

If a ZEQ25GT mount equipped with an iOptron's AccuAligning™ polar scope, you can do a fast and accurate polar axis alignment with iOptron's **Quick Polar Alignment** procedure.

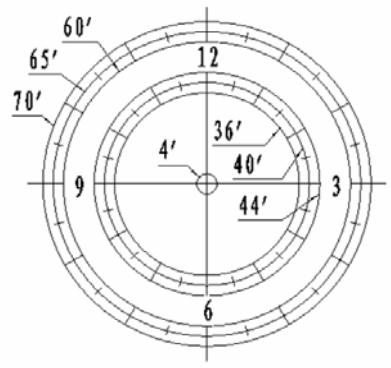


Figure 18. Polar Scope

Figure 19. Polar Scope LED

As indicated in Figure 18, the Polar Scope Dial has been divided into 12 hours along the angular direction with half-hour tics. There are 2 groups, 6 concentric circles marked from 36' to 44' and 60' to 70', respectively. The 36' to 44' concentric circles are used for polar alignment in northern hemisphere using Polaris. While the 60' to 70' circles are used for polar alignment in southern hemisphere using Sigma Octantis.

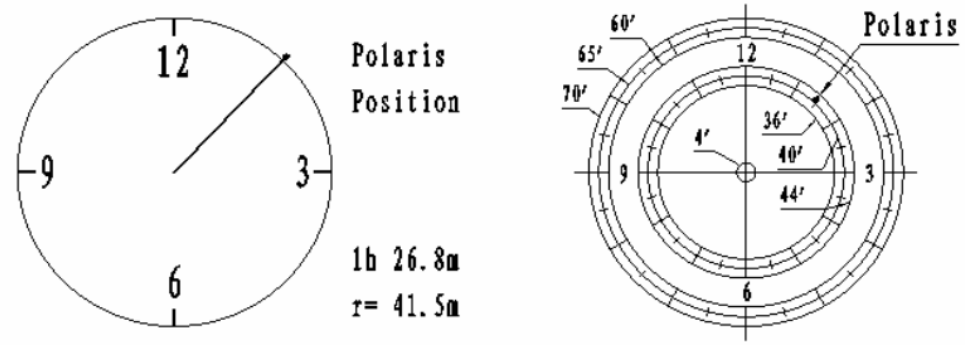
Quick Polar Alignment

(1) Level the ZEQ25 mount and set it at Zero Position. Make sure the telescope is parallel to the pole axis (R.A. axis) of the mount. If a finder scope is used, adjust it to be parallel to the telescope optical axis. Take off the Polar Axis Cover and Polar Scope Cover.

(2) Connect polar scope LED cable between Reticle plug located on the main unit and the LED socket at the bottom of the DEC axle, as shown in Figure 19. The light intensity can be adjusted using the HC via "***Set Polar Scope Light***" function under "***Set Up Controller***" menu.

(3) Turn on the mount power by pressing the **On/Off** switch on the main unit. Make sure that the time and site information of the hand controller is correct. Press the **MENU** button, then select "**Align**" and "**Pole Star Position**" to display the current Polaris position. For example, on May 30, 2010, 20:00:00 in Boston, United States (Lat N42º30'32" and Long W71º08'50", 300 min behind UT, DST set to Y), the Polaris Position is 1hr 26.8m and r = 41.5m, as shown in Figure 20 (a).

(4) Look through the polar scope to find the Polaris. Using Azimuth Adjustment Knob and Latitude Adjustment Knob to adjust the mount in altitude and azimuth directions and put the Polaris in the same position on the Polar Scope Dial as indicated on the HC LCD. In this case, the Polaris will be located at a radius of 41.5' and an angle of 1 hour 26.8 minute, as shown in Figure 20 (b).



(a) (b)

Figure 20. Polaris Position shown on HC (a) and where to put on polar scope dial (b)

NOTE: If you are located in southern hemisphere, Sigma Octantis will be chosen for Polar Alignment. For example, on May 20, 2010, 20:00:00 in Sydney, Australia (Lat S33º51'36" and Long E151º12'40"), 600 min ahead of UT, the Sigma Octantis Position is 1hr21.8m and 64.4m.

BrightStar Polar Alignment

For those who do not have a polar scope, take off the Polar Axis Cover and Polar Scope Cover. Look through the polar scope opening to locate the Polaris. Slightly turn 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 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. Use the **BrightStar Polar Alignment** procedure below to further align the mount.

If the mount is not equipped with a polar scope or the pole star cannot be seen, you can use this BrightStar Polar Alignment procedure.

(1) Level the ZEQ25 mount and set it at Zero Position. Make sure the telescope is parallel to the pole axis (R.A. axis) of the mount. If a finder scope is used, adjust it to be parallel to the telescope optical axis. Turn the mount power on. Set correct R.A. and DEC backlash numbers. An eyepiece with cross hairs is recommended.

(2) Pressing the **MENU** button, then select "***Align***" and "***Polar Align***". The HC will display the azimuth and altitude position of several bright stars near meridian. Select one that is visible with high altitude as Alignment Star A. Follow the HC instruction to move the Star A to the center of the eyepiece with the combination of Latitude Adjustment Knob and "◄" or "►" button. Press ENTER to confirm. Next, select a bright star that is close to the horizon as the Alignment Star B. Center it using the Azimuth Adjustment Knob and "◄" or "►" button *(The "▲" and "▼" buttons are not used here)*. Press ENTER to confirm.

(3) The telescope will now slew back to Star A to repeat above steps. The iteration can be stopped when it is determined that the alignment error is at the minimum. Press **BACK** button to exit alignment procedure.

NOTE: It is highly recommended to use an eyepiece with crossed-hair line for accurate centering.

NOTE: The movement of the alignment star in your eyepiece may not be perpendicular but crossed, depends on its location in the sky.

STEP 11. Return Mount to Zero Position

After polar alignment and balancing OTA, return the mount to Zero Position, as shown in Figure 21. The Zero Position is the position with the CW shaft pointing toward the ground, OTA at the highest position with its axis parallel to the polar axis and the OTA pointing to the CP. Loosen the DEC and R.A. Gear Switches to adjust the mount to the Zero Position. Engage the clutches after each adjustment. **Remember, the hand controller needs to be at the Zero Position as well!** The simplest way is turn the mount power OFF and ON again to reset the hand controller.

Figure 21. Zero position

4. Getting Started

In order to experience the full GOTO capability of GOTONOVA® technology it is very important to set up the mount correctly before observation.

4.1. Setup the Mount and Polar Alignment

Assemble your ZEQ25 mount according to Section 3.2. Turn the mount power switch on. When the GPS receiver is connected to satellites, LCD will display GPS OK. The mount will have correct time and site information. You can also enter them manually as described before. Mount an OTA and accessories, and carefully balance the mount around the polar axis. Polar align you mount using either ***Quick Polar Alignment*** or ***BrightStar Polar Alignment Procedure***.

The default position for the mount is the Zero Position, when the mount is powered on: the counterweight shaft is pointing to ground, telescope is at the highest position with its axis parallel to the polar axis and the telescope is pointing to the North Celestial Pole, if you are located in northern hemisphere.

4.2. Manual Operation of the Mount

You may observe astronomical objects using the arrow keys of a Go2Nova® hand controller.

Flip the I/O switch on the telescope mount to turn on the mount. Use ►,◄,▼ or ▲ buttons to point the telescope to the desired object. Use the number keys to change the slewing speed. Then press **0** button to start tracking. Press **0** button again to stop the tracking.

4.3. Initial Star Alignment

Perform a simple one star alignment/synchronization after set up the hand controller to correct any pointing discrepancy of the Zero Position and to improve the GOTO accuracy.

To perform "***One Star Align***," press MENU button, scroll down to "***Align***", select "***One Star Align***" and press ENTER. The screen will display a list of bright objects for you to select from. Select an object using ▲ or ▼ key. Then press ENTER. After the mount slews to the target, use the arrow keys to center it in your eyepiece. Then press ENTER. (More align details in 5.4)

An alternate way is to perform "***Sync to Target***." Press the MENU button, select "***Select and Slew***" and press ENTER. Browse over the catalogs and select an object. Press ENTER. After the mount slews to the star, press the MENU button, scroll down to "***Sync. To Target***", follow the on-screen instruction to center the star and press ENTER. You may need to use the number keys to change the slewing speed to make the centering procedure easier.

4.4. Go to the Moon and Other Stars

After performing these set-ups the mount is ready to GOTO and track objects. One of the most common objects is the Moon.

To slew to the Moon press the MENU button. Select "***Select and Slew***" by pressing the ENTER button. Select "***Solar System***", and use the ▲ or ▼ buttons to select Moon. Press ENTER. The telescope will automatically slew to the Moon and lock on it. It will automatically begin to track once it locks on. If the Moon is not centered in your eyepiece, use the arrow keys to center the Moon. Or for better performance use "***Sync to Target***."

You may also select other bright celestial objects to start with, such as Jupiter or Saturn.

4.5. Star Identifying Function

The 8408 hand controller has a star identifying function. After ***Polar Alignment*** and ***Set Up Time and Site***, slew the telescope to an bright star, manually or using GOTO. Press **?** button to identify the star name telescope is pointing to, as well as nearby bright stars if there are any.

4.6. Gear Tension Adjustment

Never fully tighten them during operations. The rule of thumb is to fully screw in the Tension Adjuster and then back out 1/4 to 2 turns. The optimum spot varies with actual conditions and payload. Ideally, it should be at a position just deep enough to rid any free movements (plays), while force on the worm assembly is kept at a minimum.

4.7. Turn Off the Mount

When you have finished your observation, just simply turn the mount power off and disassemble the mount and tripod. If the mount is set up on a pier or inside an observatory, it is recommended that you return the mount to Zero Position. This will ensure that there is no need for you to perform the initial setup again when you power up the mount subsequently, if the mount is not moved. To return the mount to its Zero Position, press the MENU button, scroll down to "***To Zero Position***" and press ENTER. Once the telescope returns to Zero Position turn the power off.

5. Complete Functions of Go2Nova® 8408 Hand Controller

5.1. Slew to an Object

Press the MENU button. From the main menu select "***Select and Slew***." Select an object that you would like to observe and press the ENTER key.

The Go2Nova® 8408 hand controller has a database of about 50,000 objects. Use the ► or ◄ buttons to move the cursor. Use the number buttons to enter the number, or the ▼ or ▲ buttons to change the individual number. Hold on a button to fast scroll through the list. The "⌓" indicates the object is above the horizon, and a cross mark "⌔" means it is below the horizon. In some catalogs those stars below the horizon will not display on the hand controller.

5.1.1. Solar System

There are 9 objects in the Solar system catalog.

5.1.2. Deep Sky Objects

This menu includes objects outside our Solar system such as galaxies, star clusters, quasars, and nebulae.

- Named Objects: consists of 60 deep sky objects with their common names. A list of named deep sky objects is included in Appendix E.
- Messier Catalog: consists of all 110 Messier objects.
- NGC IC Catalog: consists of 7,840 objects in NGC catalog and 5,386 objects in IC catalog. To select an object from NGC or IC catalog, move the cursor to NGC, using▲ or ▼ button to toggle between NGC and IC. Then move the cursor to a numerical position and use the number button to select the object.
- UGC Catalog: consists of 12,921 objects.
- Caldwell Catalog: consists of 109 objects.
- Herschel Catalog: consists of 400 objects.

5.1.3. Stars:

- Named Stars: consists of 195 stars with their common names. They are listed alphabetically. A list is included in Appendix E.
- Binary Stars: consists of 210 binary stars. A list is attached in Appendix E.
- GCVS: consists of 5,553 bright variable stars in the catalog.
- SAO Catalog: consists of 26,584 bright SAO catalog objects. They are listed numerically.

5.1.4. Constellations

This catalog consists of 88 modern constellations with their names. They are listed alphabetically. A list is attached in Appendix E.

5.1.5. Comets

This catalog contains 15 comets.

5.1.6. Asteroids

This catalog contains 116 asteroids.

5.1.7. User Objects

It can store up to 60 used entered objects, including comets.

5.1.8. Enter R.A. DEC

Here you can go to a target by entering its R.A. and DEC numbers.

5.2. Sync to Target

This operation will match the telescope's current coordinates to Target Right Ascension and Declination. After slewing to an object, press MENU—then scroll to "***Sync to Target***" and press ENTER. Follow the screen to do the sync. Using this function will re-calibrate the computer to the selected object. Multiple syncs can be performed if needed. This operation is most useful to find a faint star or nebula near a bright star.

"***Sync to Target***" will only work after "***Select and Slew***" is performed. You can change the slewing speed to make the centering procedure easier. Simply press a number (1 through 9) to change the speed. The default slew speed is 64X.

"***Sync to Target***" does the same thing as one star alignment except that you choose the object to "sync" to. "***One star align***" chooses the star/object for you.

5.3. Set Up Controller

5.3.1. Set Up Time & Site

Refer to STEP 9 in Section 3.2.

5.3.2. Set Display and Beep

Press MENU button, from the main menu, scroll down and select "***Set Up Controller***". Press ENTER and select "***Set Display and Beep***":

```
Set Up Time and Site
Set Display and Beep
Set Anti-backlash
Meridian Treatment
```

Use arrow keys to adjust LCD display contrast, LCD backlight intensity, keypads backlight Intensity and turn the keep beep ON/OFF

5.3.3. Set Anti-backlash

All mechanical gears have a certain amount of backlash or play between the gears. This play is evident by how long it takes for a star to move in the eyepiece when the hand control arrow buttons are pressed (especially when changing directions). The Go2Nova anti-backlash feature allows user to compensate for backlash by inputting a value which quickly rewinds the motors just enough to eliminate the play between gears.

To set the anti-backlash value, scroll down and select "***Set Anti-backlash***"

```
Set Up Time and Site
Set Display and Beep
Set Anti-backlash
Meridian Treatment
```

Press ENTER. A R.A. anti-backlash screen will display:

```
R.A. anti-backlash:
            0000    steps
One step equals to
0.14 arc second.
```

To adjust steps move the cursor to each digit and use the number keys to input number directly. Press ENTER – “DEC anti-backlash” will display:

```
DEC anti-backlash:
            0000    steps
One step equals to
0.14 arc second.
```

Move the cursor to each digit and use the number keys to set the anti-backlash. Press ENTER to go back the previous screen. Press BACK button to go back to main menu.

While viewing an object in the eyepiece, observe the responsiveness of each of the four arrow buttons. Note which directions you see a pause in the star movement after the button has been pressed. Working one axis at a time, adjust the backlash settings high enough to cause immediate movement without resulting in a pronounced jump when pressing or releasing the button. The hand controller will remember these values and use them each time it is turned on until they are changed.

5.3.4. Meridian Treatment

This function tells mount what to do when it tracks across the meridian. There are three options. Stop Tracking will stop the mount when it passes the meridian. Telescope Flip will flip the telescope and continuous to track the object. The third option is Continue to Track. In this case, the mount will keep tracking and the OTA could hit the tripod leg if the mount is not monitored.

5.3.5. Track Below Horizon

This function allows mount to keep tracking an object even it is below horizon but still can be seen from an elevated observation site, such as at a hill. The power on default is at OFF state. One can turn it on when needed.

5.3.6. Set Polar Light

Use this function to adjust the light intensity of ZEQ25GT illuminated polar scope. If you have an illuminated-reticule eyepiece and has the same socket size, you may use this option to adjust its light intensity.

5.3.7. Firmware Information

This option will display firmware version information of hand controller, R.A. control board and DEC control board.

5.3.8. GPS Status

Check GPS status. After the GPS connected to satellites, the status will changed to OK. ***Do not leave the screen on this sub-menu, otherwise the ON will not change to OK.***

5.3.9. Upgrade RA & DEC

Use this operation to upgrade 8408 hand controller, R.A. and DEC motor controller firmware. Please refer to iOptron online documents for ZEQ25 firmware upgrade details. The password is **9999**.

5.4. Align

This function is used for aligning the telescope. The hand controller provides "Polar Align", which uses a set of 2 bright stars for polar alignment. This provides a viable polar alignment approach for those who can't see the polar star or has a mount does not equip an iOptron AccuAlign™ polar scope. The system also provides three alignment methods: "SolarSys Align", "One Star Align", and "Multi-Star Align". The mount has to be at Zero Position before performing any star alignment.

5.4.1. Polar Alignment

Press the MENU button, then select "***Align***" and "***Polar Align***". The HC will display the azimuth and altitude position of several bright stars near meridian. Select one that is visible with high altitude as Alignment Star A. Follow the HC instruction to move the Star A to the center of the eyepiece with the combination of Latitude Adjustment Knob and "◄" or "►" button. Press ENTER to confirm. Next, select a bright star that is close to the horizon as the Alignment Star B. Center it using the Azimuth Adjustment Knob and "◄" or "►" button (*The "▲" and "▼" buttons are not used here*). Press ENTER to confirm.

The telescope will now slew back to Star A to repeat above steps. The iteration can be stopped when it is determined that the alignment error is at the minimum. Press BACK button to exit alignment procedure.

NOTE: It is highly recommended to use an eyepiece with crossed-hair line for accurate centering.

NOTE: The movement of the alignment star in your eyepiece may not be perpendicular but crossed, depends on its location in the sky.

5.4.2. SolarSys Alignment

Press MENU button and select "***Align***". Select "***SolarSys Align***" and press ENTER for available alignment object.

5.4.3. One-Star Alignment

Press MENU button and select "***Align***". Select "***One Star Align***" and press ENTER. A list of alignment stars that are above the horizon is computed based on your local time and location. With the mount at the "Zero Position," use ▲ and ▼ buttons to select a star and press ENTER. Center the target in your eyepiece using arrow key. Press ENTER when finished. If your mount is well set up and polar aligned, one star alignment should be sufficient for good GOTO accuracy. To increase the accuracy you may choose to do multi star alignment.

5.4.4. Multi-Star Alignment

With iOptron's multi-star alignment, you can choose two, three, or as many stars as you want to reduce the mount alignment offset.

Press MENU button and select "***Align***". Select "***Multi-Star Align***" in the align menu. A list of alignment stars that are above the horizon is computed based on your local time and location. With the mount is at the "Zero Position," use ▲ and ▼ buttons to select first alignment star and press ENTER. Center the target in your eyepiece using arrow key. Press ENTER when finished. The hand controller will prompt you to choose the second star. If the star you choose is too close to the first one, the system will let you choose another one. When you are aligned with the second star, the two star alignment is finished. You can reject the suggested star if it is blocked by a tree or other obstruction.

If you've done with the two star alignment, press the BACK button to finish the alignment. Press ENTER key to select third star for further alignment.

5.4.5. Pole Star Position

This shows Polaris position in northern hemisphere or Sigma Octantis position in southern hemisphere, which is used for Quick Polar Alignment.

5.5. PEC Option

5.5.1. PEC Playback

You can turn "***PEC Playback On***" while you do the tracking, especially for long time astro-photography. The default status is PEC Playback Off when the mount is turned on.

5.5.2. Record PEC

All Equatorial mounts have a small variation in the worm gears which can be corrected by using Period Error Correction or PEC. PEC is a system which improves the tracking accuracy of the mount by compensating for variations in the worm gear and is especially useful when doing astrophotography without autoguiding. Because the variations are regular, it is possible to record the corrections required to cancel out the worm gear variations and to play them back.

In order to use the PEC function, the Go2Nova hand controller needs to record the PE first. The periodic error of the worm gear drive will be used to correct periodic error. The data will be lost when the power is turned off.

Here's how to use the PEC function.

1. Setup the mount with a telescope in autoguiding condition by connecting a guiding camera to a computer via mount's Guide Port or ASCOM protocol;

2. Press MENU, select "***Auto Guide***" and press ENTER. Select a guiding speed from 0.20X to 1.00X;

3. Then press the BACK button and select "***PEC Option"*** from the menu. Use the ▲ and ▼ scroll buttons to display the "***Record PEC"*** option and press ENTER to start record the PE.

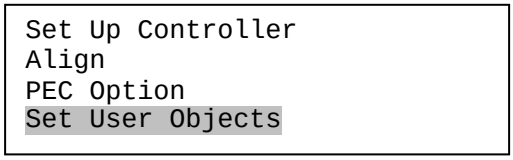
4. It takes the worm gear 600 seconds to make one complete revolution. After 600 seconds PEC will automatically stop recording.

5. The data will be lost when the power is turned off.

5.6. Set User Objects

Besides various star lists available in the hand controller --you can add, edit or delete your own user-defined objects. You can also add your favorite observation object into the user object list for easy sky surfing. Up to 60 user objects can be stored here.

To set user objects, press MENU button, from the main menu, scroll down and select "***Set User Objects***".



Press ENTER to bring up user objects setting screen.

```
Add a New Record
Browse Records
Delete One Record
Delete All Records
```

Select "***Add a New Record***". A screen will display asking to ***Enter R.A. DEC***:

```
Enter R.A. DEC
R.A.:  00h00m00s
DEC:  +00d00m00s
```

You may enter the R.A. and DEC coordinates of the star you want to watch, and press ENTER. A confirmation screen will show. Press ENTER to confirm storing your object under assigned user object number, or press BACK button to cancel it.

A more useful application of this function is to store your favorite viewing objects before heading to the filed. When "***Enter R.A. DEC***" screen showed, press the MENU button. It brings up the star catalogs that you can select the star from. Follow the screen to add your favorite objects. Press BACK button to go back one level.

Press BACK button few times to go back to ***Set User Objects*****.** You may review the records or delete the ones you don't want it anymore. Press BACK button to finish the operation. Now you can slew to your favorite stars from ***User Objects*** catalog using "***Select and Slew***."

5.7. Set Guide Rate

This is an advanced function for autoguiding when a guiding camera is equipped either via a Guide Port or an ASCOM protocol. Before autoguiding, align the polar axis carefully. Select a proper guiding speed. The suppositional guiding speed can be selected from ±0.20X to ±1.00X. Follow the autoguiding software for detailed operation.

The guide port wiring is shown in Figure 22, which has same pin-out as that from Celestron / Starlight Xpress / Orion Mount / Orion Autoguider/ QHY5 autoguider.

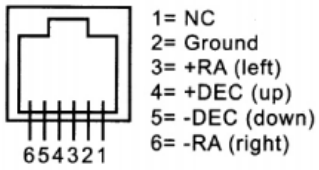


Figure 22. Guide port pin-out

If you have an autoguider which has a pin-out which is the same as the ST-I from SBIG, such as Meade/ Losmandy/ Takahashi/ Vixen, make sure a proper guiding cable is used. Refer to your guiding camera and guiding software for detailed operation.

WARNING: DO NOT plug your ST-4 guiding camera cable into the HBX port or other Port. It may damage the mount or guiding camera electronics.

5.8. To Zero Position

This moves your telescope to its Zero Position. When the power is turned on, the mount assumes the Zero Position. This is its reference point for alignment and go to functions.

6. Maintenance and Servicing

6.1. Maintenance

The ZEQ25GT is designed to be maintenance free. Do not overload the mount. Do not drop the mount, this will damage the mount or degrade the GOTO tracking accuracy permanently. Use a wet cloth to clean the mount and hand controller. Do not use solvent.

If your mount is not to be used for an extended period, dismount the OTAs and counterweight(s).

6.2. iOptron Customer Service

If you have any question concerning your ZEQ25 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 ZEQ25 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. So please contact iOptron first to avoid returning the mount for repair.

It is strongly suggested that to send technical questions to support@ioptron.com. Call in the U.S. 1.781.569.0200.

6.3. 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 the product representative.

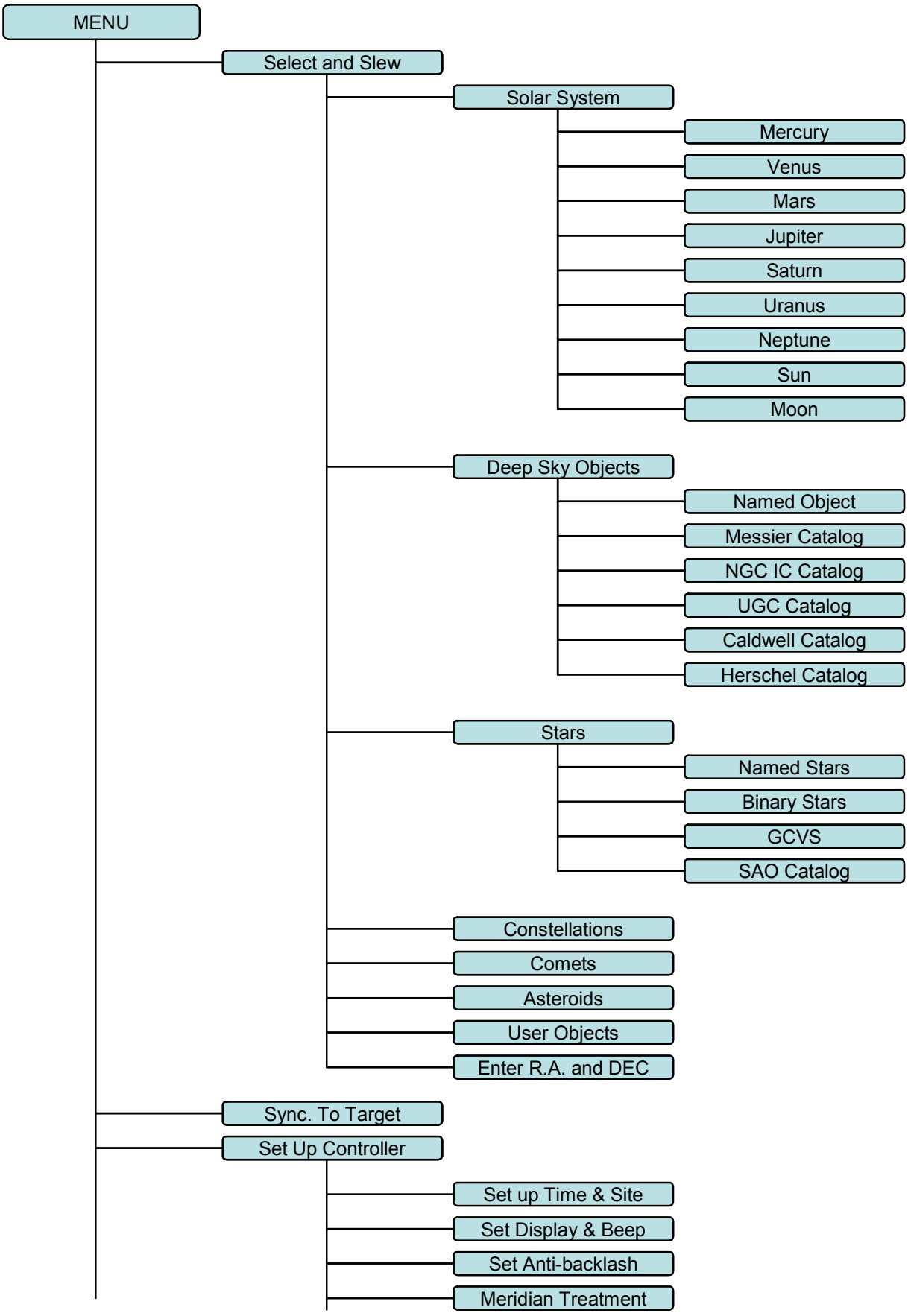
6.4. Battery Replacement and Disposal Instructions

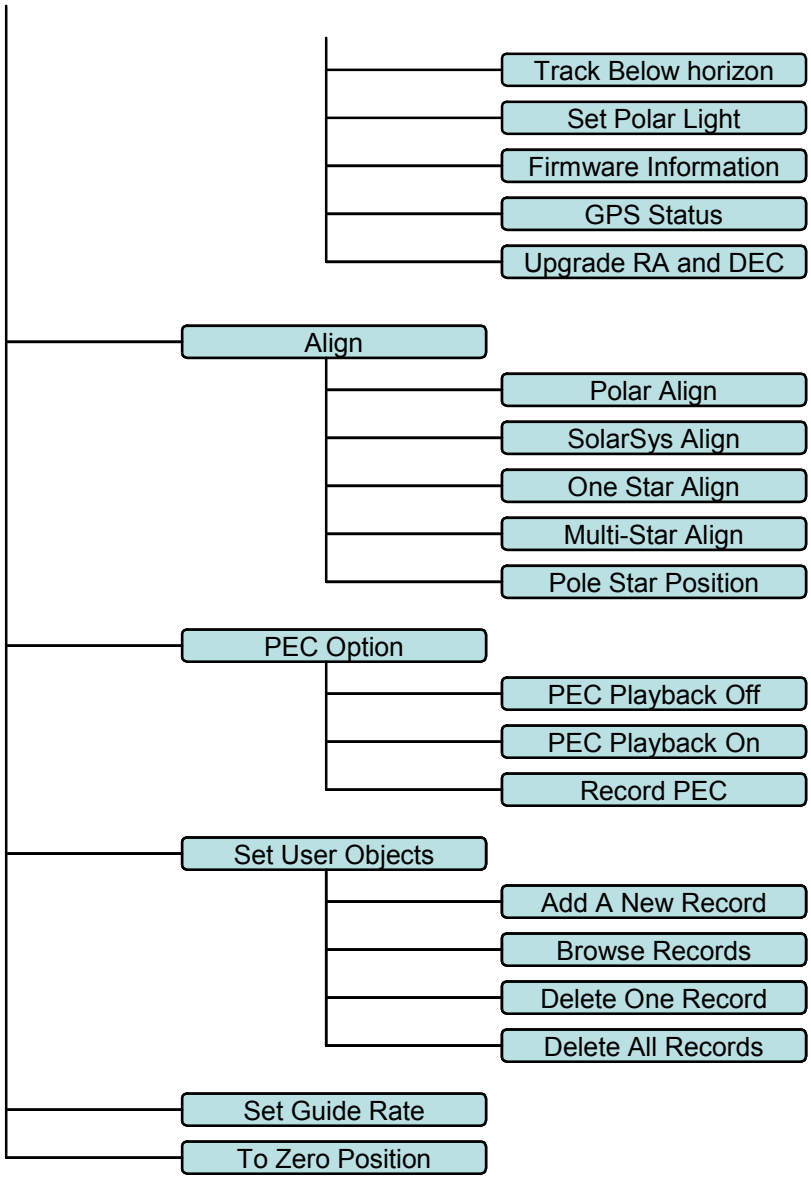
Battery Disposal- Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling, and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service or the product representative.

Appendix A. Technical Specifications

Mount	“Z Balanced” Equatorial Mount
Payload	Up to 27 lb (12.3kg), exclude counterweight
Mount weight	10.4 lb (4.7kg)
Payload/Mount weight	2.60
Right Ascension worm wheel	Φ88mm, 144 teeth aluminum
Declination worm wheel	Φ88mm, 144 teeth aluminum
Right Ascension axis shaft	Φ35mm steel
Declination axis shaft	Φ35mm steel
Right Ascension bearing	Φ55mm ball bearing
Declination bearing	Φ55mm ball bearing
Worm gears	Brass
Motor drive	Planetary Gear Reducer DC servo with encoder
Resolution	0.14 arc seconds
Transmission	Synchronous belt/Gear
Latitude adjustment range	0º ~ 60º
Azimuth adjustment range	± 10º
GPS	Internal 32-channel GPS
Polar Scope	AccuAligning™ dark field illuminated
Level indicator	Level bubble
Hand Controller	Go2Nova® 8408 with 59,000 objects database
PEC	PEC
Tracking	Automatic
Speed	1×,2×,8×,16×,64×,128×,256×,512×,MAX(~4.5°/sec)
Counterweight shaft	Φ20mm
Counterweight	10.4 lb (4.7kg)
Tripod	1.5" Stainless Steel(5kg), optional 2"(8kg)
Dovetail saddle	Spring loaded Vixen-style
Power consumption	0.2A(Tracking), 0.7A(GOTO)
Power requirement	12V DC(9 ~ 15V), 1.5Amp
AC adapter	100V ~ 240V (included)
Serial port	Yes (on hand controller)
Autoguide port	Yes
Firmware upgrade	Yes
PC computer control	Yes (ASCOM)
Operation temperature	-10ºC ~ 40ºC
Warranty	Two year limited

Appendix B. Go2Nova® 8408 HC MENU STRUCTURE




Track Below horizon
Set Polar Light
Firmware Information
GPS Status
Upgrade RA and DEC
Align
Polar Align
SolarSys Align
One Star Align
Multi-Star Align
Pole Star Position
PEC Option
PEC Playback Off
PEC Playback On
Record PEC
Set User Objects
Add A New Record
Browse Records
Delete One Record
Delete All Records
Set Guide Rate
To Zero Position

Appendix C. Firmware Upgrade

The firmware in the 8408 hand controller and motor control boards can be upgraded by the customer. Please check iOptron's website, www.iOptron.com, under Support Directory/ZEQ Mounts, select ZEQ25GT with 8408 Hand Controller, for detail.

Appendix D. Computer Control an ZEQ25GT Mount

The ZEQ25 mount can be controlled by a SmartPhone, a Pad or a computer. It is supported by two types of computer connections:

- Connect to a computer via RS232 serial port. An optional RS232 to USB adapter (iOptron part #8435) is needed if your computer does not have a serial port, like most of the laptops on the market today. Follow the adapter instructions to install the adapter driver. The mount can be controlled via ASCOM protocol (Windows OS), or directly by some software, such as Sky Safari (Mac OS)
- Connect wirelessly with iOptron StarFi adapter (#8434) or some other third party adapter (may with limited function). The mount can be controlled via ASCOM protocol (Windows OS), SmartPhone/Pad and Mac OS wirelessly. See StarFi Instruction Manual for detailed information.

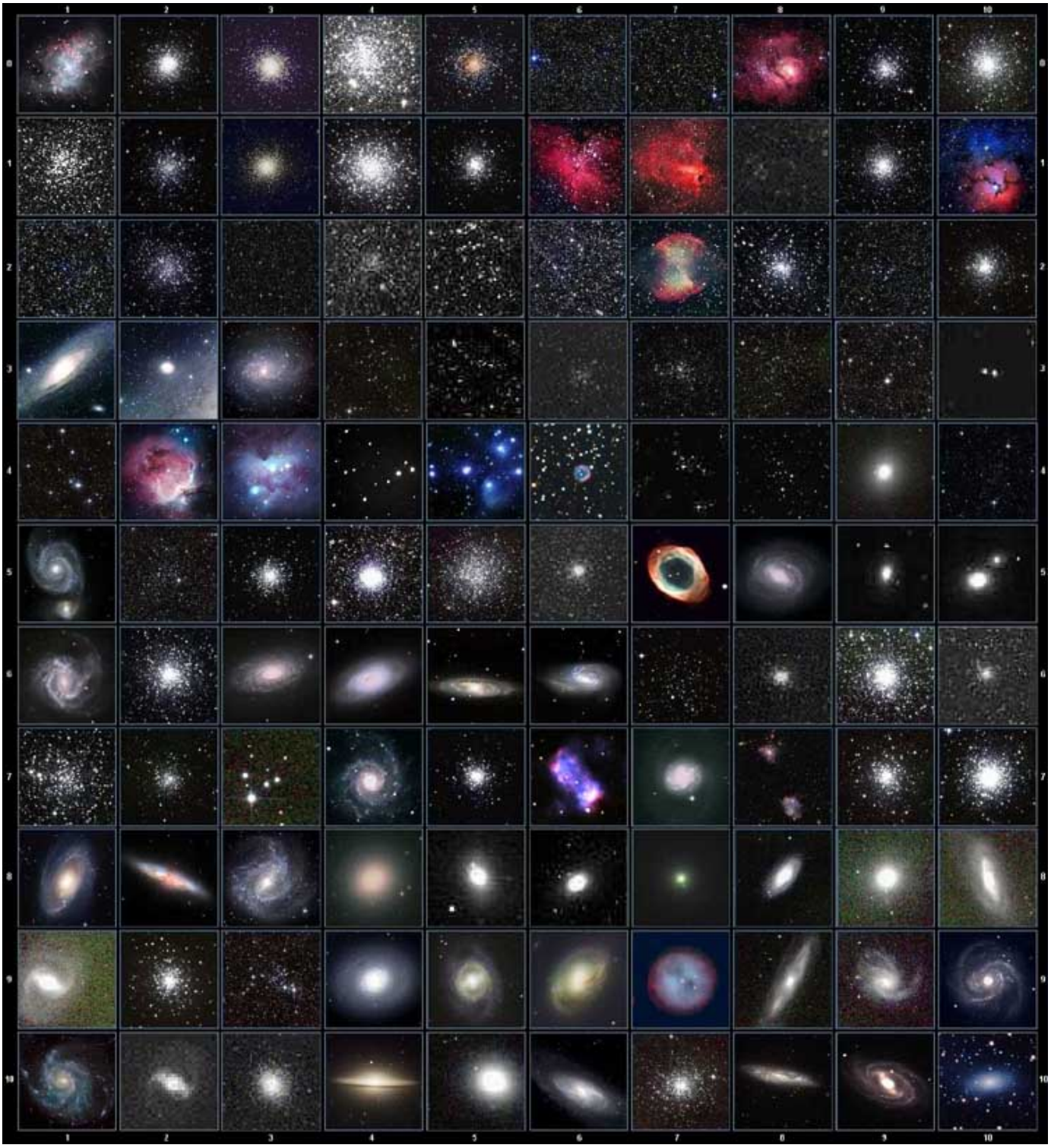
To control the mount via ASCOM protocol, you need:

1. Download and install the latest ASCOM Platform, currently 6.1 SP1, from http://www.ascom-standards.org/. Make sure your PC meets the software requirement. For 6.1 SP1, Windows XP users should install .NET Framework 4 (not the Client Profile). Windows Vista and Windows 7 users should install .NET Framework 4.5.2. Windows 8 and 8.1 users do not need install any additional components.
2. Download and install the latest iOptron Telescope ASCOM drive for ZEQ25 from iOptron website.
3. Planetarium software that supports ASCOM protocol. Follow software instructions to select the iOptron Telescope.

Please refer to iOptron website, www.iOptron.com, under Support Directory/ASCOM Driver, iOptron Telescope ASCOM Driver, for more detail.

Appendix E. Go2Nova® Star List

Messier Catalog



Named Star List

001 Acamar	050 Asellus Australis	099 Kaus Media	148 Rastaba
002 Achernar	051 Asellus Borealis	100 Keid	149 Regulus
003 Acrux	052 Aspidiske	101 Kitalpha	150 Rigel
004 Acubens	053 Atik	102 Kochab	151 Rigel Kentaurus
005 Adhafera	054 Atlas	103 Kornephoros	152 Ruchbah
006 Adhara	055 Atria	104 Kurhah	153 Rukbat
007 Al Na'ir	056 Avoir	105 Lesath	154 Sabik
008 Albali	057 Azha	106 Maia	155 Sadachbia
009 Alberio	058 Baten Kaitos	107 Marfik	156 Sadalbari
010 Alchibar	059 Beid	108 Markab	157 Sadalmelik
011 Alcor	060 Bellatrix	109 Matar	158 Sadalsuud
012 Alcyone	061 Betelgeuse	110 Mebsuta	159 Sadr
013 Aldebaran	062 Biham	111 Megrez	160 Saiph
014 Alderamin	063 Canopus	112 Meissa	161 Scheat
015 Alfirk	064 Capella	113 Mekbuda	162 Schedar
016 Algedi	065 Caph	114 Menkalinan	163 Seginus
017 Algenib	066 Castor	115 Menkar	164 Shaula
018 Algiebra	067 Celabrai	116 Menkent	165 Sheiak
019 Algol	068 Celaeno	117 Menkib	166 Sheratan
020 Algorab	069 Chara	118 Merak	167 Sirius
021 Alhena	070 Chertan	119 Merope	168 Skat
022 Alioth	071 Cor Caroli	120 Mesartim	169 Spica
023 Alkaid	072 Cursa	121 Miaplacidus	170 Sterope
024 Alkalurops	073 Dabih	122 Mintaka	171 Sulafat
025 Alkes	074 Deneb	123 Mira	172 Syrma
026 Almach	075 Deneb Algedi	124 Mirach	173 Talitha
027 Alnasl	076 Deneb Kaitos	125 Mirfak	174 Tania Australis
028 Alnilam	077 Denebola	126 Mirzam	175 Tania Borealis
029 Alnitak	078 Dubhe	127 Mizar	176 Tarazed
030 Alphard	079 Edasich	128 Muphrid	177 Taygeta
031 Alphecca	080 Electra	129 Muscida	178 Thuban
032 Alpheratz	081 Elnath	130 Nashira	179 Unukalhai
033 Alrakis	082 Eltanin	131 Nekkar	180 Vega
034 Alrescha	083 Enif	132 Nihal	181 Vindemiatrix
035 Alshain	084 Errai	133 Nunki	182 Wasat
036 Altair	085 Fomalhaut	134 Nusakan	183 Wazn
037 Altais	086 Furud	135 Peacock	184 Yed Posterior
038 Alterf	087 Gacrux	136 Phact	185 Yed Prior
039 Aludra	088 Giausar	137 Phecda	186 Zaniah
040 Alula Australis	089 Gienah	138 Pherkad	187 Zaurak
041 Alula Borealis	090 Gomeisa	139 Pleione	188 Zavijava
042 Alya	091 Graffias	140 Polaris	189 Zosma
043 Ancha	092 Groombridge 1830	141 Pollux	190 Zubenelgenubi
044 Ankaa	093 Grumium	142 Porrima	191 Zubeneschamali
045 Antares	094 Hamal	143 Procyon	192 Barnard's Star
046 Arcturus	095 Homan	144 Propus	193 Kapteyn's Star
047 Arkab	096 Izar	145 Rassalas	194 Kruger 60
048 Arneb	097 Kaus Australis	146 Rasagethi	195 Luyten's Star
049 Ascella	098 Kaus Borealis	147 Rasalhague	

Modern Constellations

No.	Constellation	Abbreviation
1	Andromeda	And
2	Antlia	Ant
3	Apus	Aps
4	Aquarius	Aqr
5	Aquila	Aql
6	Ara	Ara
7	Aries	Ari
8	Auriga	Aur
9	Boötes	Boo
10	Caelum	Cae
11	Camelopardalis	Cam
12	Cancer	Cnc
13	Canes Venatici	CVn
14	Canis Major	CMa
15	Canis Minor	CMi
16	Capricornus	Cap
17	Carina	Car
18	Cassiopeia	Cas
19	Centaurus	Cen
20	Cepheus	Cep
21	Cetus	Cet
22	Chamaeleon	Cha
23	Circinus	Cir
24	Columba	Col
25	Coma Berenices	Com
26	Corona Australis	CrA
27	Corona Borealis	CrB
28	Corvus	Crv
29	Crater	Crt
30	Crux	Cru
31	Cygnus	Cyg
32	Delphinus	Del
33	Dorado	Dor
34	Draco	Dra
35	Equuleus	Equ
36	Eridanus	Eri
37	Fornax	For
38	Gemini	Gem
39	Grus	Gru
40	Hercules	Her
41	Horologium	Hor
42	Hydra	Hya
43	Hydrus	Hyi
44	Indus	Ind

No.	Constellation	Abbreviation
45	Lacerta	Lac
46	Leo	Leo
47	Leo Minor	LMi
48	Lepus	Lep
49	Libra	Lib
50	Lupus	Lup
51	Lynx	Lyn
52	Lyra	Lyr
53	Mensa	Men
54	Microscopium	Mic
55	Monoceros	Mon
56	Musca	Mus
57	Norma	Nor
58	Octans	Oct
59	Ophiuchus	Oph
60	Orion	Ori
61	Pavo	Pav
62	Pegasus	Peg
63	Perseus	Per
64	Phoenix	Phe
65	Pictor	Pic
66	Pisces	Psc
67	Piscis Austrinus	PsA
68	Puppis	Pup
69	Pyxis	Pyx
70	Reticulum	Ret
71	Sagitta	Sge
72	Sagittarius	Sgr
73	Scorpius	Sco
74	Sculptor	Scl
75	Scutum	Sct
76	Serpens	Ser
77	Sextans	Sex
78	Taurus	Tau
79	Telescopium	Tel
80	Triangulum	Tri
81	Triangulum Australe	TrA
82	Tucana	Tuc
83	Ursa Major	UMa
84	Ursa Minor	UMi
85	Vela	Vel
86	Virgo	Vir
87	Volans	Vol
88	Vulpecula	Vul

Deep Sky Object List

ID No.	OBJECT	NGC #	Messier#	IC#	A(Abell)	U(UGC)
1	Andromeda Galaxy	224	31			
2	Barnards Galaxy	6822				
3	Beehive Cluster	2632	44			
4	Blackeye Galaxy	4926	64			
5	Blinking Planetary Nebula	6826				
6	Blue Flash Nebula	6905				
7	Blue Planetary	3918				
8	Blue Snowball Nebula	7662				
9	Box Nebula	6309				
10	Bubble Nebula	7635				
11	Bipolar Nebula	6302				
12	Butterfly Cluster	6405	6			
13	California Nebula	1499				
14	Cat's Eye Nebula	6543				
15	Cocoon Nebula			5146		
16	Cone Nebula	2264				
17	Cork Nebula	650-51	76			
18	Crab Nebula	1952	1			
19	Crescent Nebula	6888				
20	Draco Dwarf					10822
21	Duck Nebula	2359				
22	Dumbbell Nebula	6853	27			
23	Eagle Nebula		16			
24	Eight-Burst Nebula	3132				
25	Eskimo Nebula	2392				
26	Flaming Star Nebula			405		
27	Ghost of Jupiter	3242				
28	Great Cluster	6205	13			
29	Helix Nebula	7293				
30	Hercules Galaxy Cluster				2151	

ID No.	OBJECT	NGC #	Messier#	IC#	A(Abell)	U(UGC)
31	Hind's Variable Nebula	1555				
32	Hubble's Variable Nebula	2261				
33	Integral Sign Galaxy					3697
34	Jewel Box Cluster	4755				
35	Keyhole Nebula	3372				
36	Lagoon Nebula	6523	8			
37	Little Gem	6445				
38	Little Gem Nebula	6818				
39	Little Ghost Nebula	6369				
40	North American Nebula	7000				
41	Omega Nebula	6618	17			
42	Orion Nebula	1976	42			
43	Owl Nebula	3587	97			
44	Pelican Nebula			5070		
45	Phantom Streak Nebula	6741				
46	Pinwheel Galaxy	598	33			
47	Pleiades		45			
48	Ring Nebula	6720	57			
49	Ring Tail Galaxy	4038				
50	Rosette Nebula	2237				
51	Saturn Nebula	7009				
52	Sextans B Dwarf					5373
53	Small Magellanic Cloud	292				
54	Sombrero Galaxy	4594	104			
55	Spindle Galaxy	3115				
56	Tank Track Nebula	2024				
57	Trifid Nebula	6514	20			
58	Ursa Minor Dwarf					9749
59	Whirlpool Galaxy	5194	51			
60	Wild Duck Cluster	6705	11			

Double Star List

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
1	Gam	And	9.8	2.3 / 5.1	37734	Almaak
2	Pi	And	35.9	4.4 / 8.6	54033	
3	Bet	Aql	12.8	3.7 / 11	125235	Alshain
4	11	Aql	17.5	5.2 / 8.7	104308	
5	15	Aql	34	5.5 / 7.2	142996	
6	E2489	Aql	8.2	5.6 / 8.6	104668	
7	57	Aql	36	5.8 / 6.5	143898	
8	Zet	Aqr	2.1	4.3 / 4.5	146108	
9	94	Aqr	12.7	5.3 / 7.3	165625	
10	41	Aqr	5.1	5.6 / 7.1	190986	
11	107	Aqr	6.6	5.7 / 6.7	165867	
12	12	Aqr	2.5	5.8 / 7.3	145065	
13	Tau	Aqr	23.7	5.8 / 9.0	165321	
14	Gam	Ari	7.8	4.8 / 4.8	92681	Mesartim
15	Lam	Ari	37.8	4.8 / 6.7	75051	
16	The	Aur	3.6	2.6 / 7.1	58636	
17	Nu	Aur	55	4.0 / 9.5	58502	
18	Ome	Aur	5.4	5.0 / 8.0	57548	
19	Eps	Boo	2.8	2.5 / 4.9	83500	Izar
20	Del	Boo	105	3.5 / 7.5	64589	
21	Mu 1	Boo	108	4.3 / 6.5	64686	Alkalurops
22	Tau	Boo	4.8	4.5 / 11	100706	
23	Kap	Boo	13.4	4.6 / 6.6	29046	
24	Xi	Boo	6.6	4.7 / 6.9	101250	
25	Pi	Boo	5.6	4.9 / 5.8	101139	
26	Iot	Boo	38	4.9/7.5/13	29071	
27	E1835	Boo	6.2	5.1 / 6.9	120426	
28	44	Boo	2.2	5.3 / 6.2	45357	
29		Cam	2.4	4.2 / 8.5	24054	
30	32	Cam	21.6	5.3 / 5.8	2102	
31	Alp 2	Cap	6.6	3.6 / 10	163427	Secunda giedi
32	Alp 1	Cap	45	4.2 / 9.2	163422	Prima giedi
33	Pi	Cap	3.4	5.2 / 8.8	163592	
34	Omi	Cap	21	5.9 / 6.7	163625	
35	Alp	Cas	64.4	2.2 / 8.9	21609	Shedir

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
36	Eta	Cas	12.9	3.5 / 7.5	21732	Achird
37	Iot	Cas	2.3	4.7/7.0/8.2	12298	
38	Psi	Cas	25	4.7 / 8.9	11751	
39	Sig	Cas	3.1	5.0 / 7.1	35947	
40	E3053	Cas	15.2	5.9 / 7.3	10937	
41	3	Cen	7.9	4.5 / 6.0	204916	
42	Bet	Cep	13.6	3.2 / 7.9	10057	Alfirk
43	Del	Cep	41	3.5 / 7.5	34508	
44	Xi	Cep	7.6	4.3 / 6.2	19827	Al kurhah
45	Kap	Cep	7.4	4.4 / 8.4	9665	
46	Omi	Cep	2.8	4.9 / 7.1	20554	
47	E2840	Cep	18.3	5.5 / 7.3	33819	
48	E2883	Cep	14.6	5.6 / 7.6	19922	
49	Gam	Cet	2.8	5.0 / 7.7	110707	Kaffaljidhma
50	37	Cet	50	5.2 / 8.7	129193	
51	66	Cet	16.5	5.7 / 7.5	129752	
52	Eps	CMa	7.5	1.5 / 7.4	172676	Adhara
53	Tau	CMa	8.2	4.4/10/11	173446	
54	145	CMa	25.8	4.8 / 6.8	173349	
55	Mu	CMa	2.8	5.0 / 7.0	152123	
56	Nu 1	CMa	17.5	5.8 / 8.5	151694	
57	Iot	Cnc	30.5	4.2 / 6.6	80416	
58	Alp	Cnc	11	4.3 / 12	98267	Acubens
59	Zet	Cnc	6	5.1 / 6.2	97646	
60	24	Com	20.6	5.0 / 6.6	100160	
61	35	Com	1.2	5.1/7.2/9.1	82550	
62	2	Com	3.7	5.9 / 7.4	82123	
63	Zet	CrB	6.1	5.0 / 6.0	64833	
64	Gam	Crt	5.2	4.1 / 9.6	156661	
65	Del	Crv	24.2	3.0 / 9.2	157323	Algorab
66	Alp	CVn	19.4	2.9 / 5.5	63257	Cor caroli
67	25	CVn	1.8	5.0 / 6.9	63648	
68	2	CVn	11.4	5.8 / 8.1	44097	
69	Gam	Cyg	41	2.2 / 9.5	49528	Sadr
70	Del	Cyg	2.5	2.9 / 6.3	48796	

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
71	Bet	Cyg	34.4	3.1 / 5.1	87301	Albireo
72	Omi 1	Cyg	107	3.8 / 6.7	49337	
73	52	Cyg	6.1	4.2 / 9.4	70467	
74	Ups	Cyg	15.1	4.4 / 10	71173	
75	Mu	Cyg	1.9	4.7 / 6.1	89940	
76	Psi	Cyg	3.2	4.9 / 7.4	32114	
77	17	Cyg	26	5.0 / 9.2	68827	
78	61	Cyg	30.3	5.2 / 6.0	70919	
79	49	Cyg	2.7	5.7 / 7.8	70362	
80	E2762	Cyg	3.4	5.8 / 7.8	70968	
81	E2741	Cyg	1.9	5.9 / 7.2	33034	
82	Gam	Del	9.6	4.5 / 5.5	106476	
83	Eta	Dra	5.3	2.7 / 8.7	17074	
84	Eps	Dra	3.1	3.8 / 7.4	9540	Tyl
85	47	Dra	34	4.8 / 7.8	31219	
86	Nu	Dra	61.9	4.9 / 4.9	30450	
87	Psi	Dra	30.3	4.9 / 6.1	8890	
88	26	Dra	1.7	5.3 / 8.0	17546	
89	16&17	Dra	90	5.4/5.5/6.4	30012	
90	Mu	Dra	1.9	5.7 / 5.7	30239	
91	40/41	Dra	19.3	5.7 / 6.1	8994	
92	1	Equ	10.7	5.2 / 7.3	126428	
93	The	Eri	4.5	3.4 / 4.5	216114	Acamar
94	Tau 4	Eri	5.7	3.7 / 10	168460	
95	Omi 2	Eri	8.3	4.4/9.5/11	131063	Keid
96	32	Eri	6.8	4.8 / 6.1	130806	
97	39	Eri	6.4	5.0 / 8.0	149478	
98	Alp	For	5.1	4.0 / 6.6	168373	Fornacis
99	Ome	For	10.8	5.0 / 7.7	167882	
100	Alp	Gem	3.9	1.9 / 2.9	60198	Castor
101	Del	Gem	5.8	3.5 / 8.2	79294	Wasat
102	Lam	Gem	9.6	3.6 / 11	96746	
103	Kap	Gem	7.1	3.6 / 8.1	79653	
104	Zet	Gem	87	3.8/10/8.0	79031	Mekbuda
105	38	Gem	7.1	4.7 / 7.7	96265	

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
106	Del	Her	8.9	3.1 / 8.2	84951	Sarin
107	Mu	Her	34	3.4 / 9.8	85397	
108	Alp	Her	4.6	3.5 / 5.4	102680	Rasalgethi
109	Gam	Her	42	3.8 / 9.8	102107	
110	Rho	Her	4.1	4.6 / 5.6	66001	
111	95	Her	6.3	5.0 / 5.2	85647	
112	Kap	Her	27	5.0 / 6.2	101951	
113	E2063	Her	16.4	5.7 / 8.2	46147	
114	100	Her	14.3	5.9 / 5.9	85753	
115	54	Hya	8.6	5.1 / 7.1	182855	
116	HN69	Hya	10.1	5.9 / 6.8	181790	
117	Eps	Hyd	2.7	3.4 / 6.8	117112	
118	The	Hyd	29.4	3.9 / 10	117527	
119	N	Hyd	9.4	5.6 / 5.8	179968	
120		Lac	28.4	4.5 / 10	72155	
121	8	Lac	22	5.7/6.5/10	72509	
122	Gam 1	Leo	4.4	2.2 / 3.5	81298	Algieba
123	Iot	Leo	1.7	4.0 / 6.7	99587	
124	54	Leo	6.6	4.3 / 6.3	81583	
125	Gam	Lep	96	3.7 / 6.3	170757	
126	Iot	Lep	12.8	4.4 / 10	150223	
127	Kap	Lep	2.6	4.5 / 7.4	150239	
128	h3752	Lep	3.2	5.4 / 6.6	170352	
129	Iot	Lib	57.8	4.5 / 9.4	159090	
130		Lib	23	5.7 / 8.0	183040	
131	Mu	Lib	1.8	5.8 / 6.7	158821	
132	Eta	Lup	15	3.6 / 7.8	207208	
133	Xi	Lup	10.4	5.3 / 5.8	207144	
134	38	Lyn	2.7	3.9 / 6.6	61391	
135	12	Lyn	1.7	5.4/6.0/7.3	25939	
136	19	Lyn	14.8	5.8 / 6.9	26312	
137	Bet	Lyr	46	3.4 / 8.6	67451	Sheliak
138	Zet	Lyr	44	4.3 / 5.9	67321	
139	Eta	Lyr	28.1	4.4 / 9.1	68010	Aldafar
140	Eps 1	Lyr	2.6	5.0 / 6.1	67309	Double dbl1

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
141	Eps 2	Lyr	2.3	5.2 / 5.5	67315	Double dbl2
142	Alp	Mic	20.5	5.0 / 10	212472	
143	Zet	Mon	32	4.3 / 10	135551	
144	Eps	Mon	13.4	4.5 / 6.5	113810	
145	Bet	Mon	7.3	4.7/4.8/6.1	133316	
146	15	Mon	2.8	4.7 / 7.5	114258	
147	70	Oph	4.5	4.0 / 5.9	123107	
148	67	Oph	55	4.0 / 8.6	123013	
149	Lam	Oph	1.5	4.2 / 5.2	121658	Marfic
150	Xi	Oph	3.7	4.4 / 9.0	185296	
151	36	Oph	4.9	5.1 / 5.1	185198	
152	Tau	Oph	1.7	5.2 / 5.9	142050	
153	Rho	Oph	3.1	5.3 / 6.0	184382	
154	39	Oph	10.3	5.4 / 6.9	185238	
155	Bet	Ori	9.5	0.1 / 6.8	131907	Rigel
156	Del	Ori	53	2.2 / 6.3	132220	Mintaka
157	Iot	Ori	11.3	2.8 / 6.9	132323	Nair al saif
158	Lam	Ori	4.4	3.6 / 5.5	112921	Meissa
159	Sig	Ori	13	3.8/7.2/6.5	132406	
160	Rho	Ori	7.1	4.5 / 8.3	112528	
161	E747	Ori	36	4.8 / 5.7	132298	
162	1	Peg	36.3	4.1 / 8.2	107073	
163	Eps	Per	8.8	2.9 / 8.1	56840	
164	Zet	Per	12.9	2.9 / 9.5	56799	Atik
165	Eta	Per	28.3	3.3 / 8.5	23655	Miram in becvar
166	The	Per	18.3	4.1 / 10	38288	
167	E331	Per	12.1	5.3 / 6.7	23765	
168	Del	PsA	5.1	4.2 / 9.2	214189	
169	Iot	PsA	20	4.3 / 11	213258	
170	Bet	PsA	30.3	4.4 / 7.9	213883	
171	Gam	PsA	4.2	4.5 / 8.0	214153	
172	Eta	PsA	1.7	5.8 / 6.8	190822	
173	Alp	Psc	1.8	4.2 / 5.2	110291	Alrisha
174	55	Psc	6.5	5.4 / 8.7	74182	
175	Psi	Psc	30	5.6 / 5.8	74483	

No.	Object	Const	Sep.	Magitude	SAO	Comm. Name
176	Zet	Psc	23	5.6 / 6.5	109739	
177	Kap	Pup	9.9	4.5 / 4.7	174199	
178	Eta	Pup	9.6	5.8 / 5.9	174019	
179	Eps	Scl	4.7	5.4 / 8.6	167275	
180	Bet	Sco	13.6	2.6 / 4.9	159682	Graffias
181	Sig	Sco	20	2.9 / 8.5	184336	Alniyat
182	Nu	Sco	41	4.2 / 6.1	159764	Jabbah
183	2	Sco	2.5	4.7 / 7.4	183896	
184		Sco	23	5.4 / 6.9	207558	
185	Hn39	Sco	5.4	5.9 / 6.9	184369	
186	12	Sco	3.9	5.9 / 7.9	184217	
187	Bet	Ser	31	3.7 / 9.0	101725	
188	Del	Ser	4.4	4.2 / 5.2	101624	
189	Nu	Ser	46	4.3 / 8.5	160479	
190	The	Ser	22.3	4.5 / 5.4	124070	Alya
191	59	Ser	3.8	5.3 / 7.6	123497	
192	Zet	Sge	8.5	5.0 / 8.8	105298	
193	Eta	Sgr	3.6	3.2 / 7.8	209957	
194		Sgr	5.5	5.2 / 6.9	209553	
195	Phi	Tau	52	5.0 / 8.4	76558	
196	Chi	Tau	19.4	5.7 / 7.6	76573	
197	118	Tau	4.8	5.8 / 6.6	77201	
198	6	Tri	3.9	5.3 / 6.9	55347	
199	Zet	UMa	14	2.4 / 4.0	28737	Mizar
200	Nu	UMa	7.2	3.5 / 9.9	62486	Alula borealis
201	23	UMa	23	3.6 / 8.9	14908	
202	Ups	UMa	11.6	3.8 / 11	27401	
203	Xi	UMa	1.8	4.3 / 4.8	62484	Alula australia
204	Sig 2	UMa	3.9	4.8 / 8.2	14788	
205	57	UMa	5.4	5.4 / 5.4	62572	
206	Alp	UMi	18.4	2.0 / 9.0	308	Polaris
207	Gam	Vir	1.4	3.5 / 3.5	138917	Porrima
208	The	Vir	7.1	4.4 / 9.4	139189	
209	Phi	Vir	4.8	4.8 / 9.3	139951	
210	84	Vir	2.9	5.7 / 7.9	120082	

IOPTRON TWO YEAR TELESCOPE, MOUNT, AND CONTROLLER WARRANTY

A. iOptron warrants your telescope, mount, or controller to be free from defects in materials and workmanship for two years. 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 of 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.

IOPTRON DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HERE. THE SOLE OBLIGATION OF IOPTRON UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HERE. IOPTRON EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY IOPTRON PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF TWO YEARS FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

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.