iOptron® AZ Mount Pro™ Altazimuth Mount
Instruction Manual

Product #8900 and #8920

This product is a precision instrument. Please read the included QSG before assembling the mount. Please read the entire Instruction Manual before operating the mount.

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

Rev. 1.1 2016.06

1. AZ Mount Pro™ Altazimuth Mount Overview

Introducing the AZ Mount Pro™ altazimuth mount featuring "***level and go***" intuitive GOTO setup.

We call it "level and go", the term used to describe iOptron new AZ Mount Pro's simple set up routing. Using its built-in precision level indicator, the operator simply levels the mount and turns on the power; this capable computerized alt-azimuth telescope mount takes it from there. Utilizing the on board 32 channel GPS receiver and built-in position and angular detection sensors; the AZ mount Pro calculates its global position as well as the telescope orientation. Automatically the mount slews the instrument to an easily identifiable bright object in the night sky. The user need only confirm a bright object is in the center of the view, to activate tracking and GOTO functionality.

Features:

- 33lb primary payload and 10lb secondary payload capacity, with a mount weighing only 13lbs
- Whisper quiet low-power consumption stepper motors
- Go2Nova® 8407 hand controller featuring 212K+ object library with an 8 line illuminated LCD screen
- Zero backlash driver system
- On board rechargeable lithium ion battery for up to 10 hours of use
- Built-in WIFI adapter for full ASCOM, iOptron Commander™ and Sky Safari wireless control
- Serial port for computer control and firmware upgrades
- Retractable counter weight shaft
- Position memorization at power interruption
- Die-cast aluminum body
- 3-Point easy level adjustment on tripod
- 6 inch dual dovetail saddle (Losmandy/Vixen styles)
- Stands a mere 10 inches tall (mount head only)
- Built-in 32-channel GPS receiver
- Automatic position and angular detection sensors
- Aluminum carrying case

2. AZ Mount Pro™ Mount Assembly

2.1. Parts List[1]

The mount head (#8920) is shipped in an aluminum carrying case, which includes:

- iOptron AZ Mount Pro telescope mount
- 6P6C RJ11 (6 pin connector, straight wired) coiled controller cables X1
- AC adapter for mount battery charging (100V~240V AC input, 12.6V/2000mA DC output)
- 4P4C RJ9 (4 pin connector) to DB9 RS232 serial cable for firmware upgrade and computer control.

If you are ordering a AZMP mount system (#8900), there will be another package with:

- 2" stainless steel tripod (#8121ACC)
- 4.5kg counterweight X1(#3006-10)
- Level adjustment screw X3 (#8340)

OPTIONAL PARTS

- #8953 Secondary Vixen-style dovetail saddle
- #3006-10 4.5kg counterweight
- #3006-05 2kg counterweigh
- #8321ACC MiniTower 1.5" tripod
- #8034 Tri-Pier
- #8034-RC Tri-Pier with rolling case
- #8032 MiniPier
- #8340-Pier Level adjustment screw with center post (for using with Pier and Tri-Pier)
- #8345 USB to RS232 Converter with FTDI chipset

ONLINE RESOURCES *(click on the "Support" menu at* ***www.iOptron.com)***

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

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

2.2. Identification of Parts

1. Altitude Lock
2. Counterweight Shaft
3. Counterweight Shaft Lock
4. AZMP Mount Body
5. Tripod Bolt
6. Tripod Support Spreader
7. Tripod Lock
8. Dovetail Saddle Lock Screw
9. Level Adjustment Screw
10. Tripod Knob
11. Bubble Level
12. Hand Controller hanger
13. Vixen/Losmandy Dual Saddle
14. Hand Controller Socket (HBX)
15. RS232 Socket
16. Battery Status LED
17. Power Switch
18. Battery Charging Socket

Figure 1. AZMP mount assembly

2.3. Go2Nova® 8407 Hand Controller

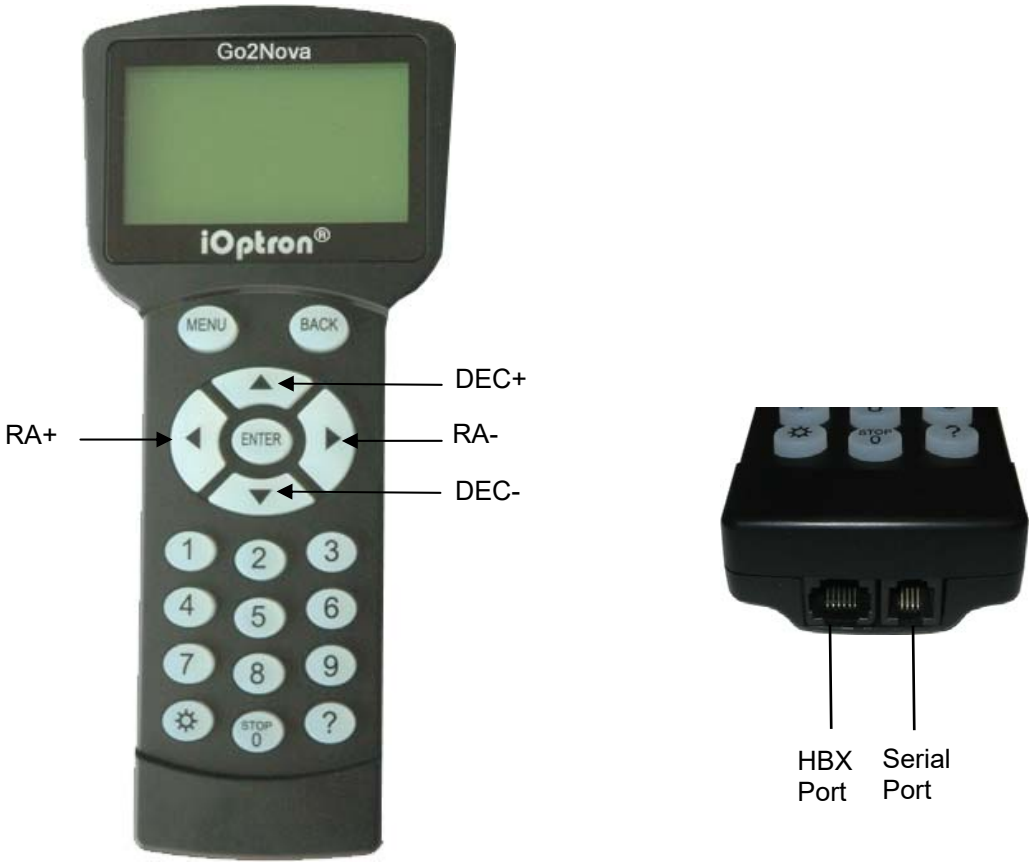


Figure 2. Go2Nova® 8407 hand controller

The Go2Nova® 8407 hand controller (HC) shown in Figure 2 is the standard controllers that used for the AZMP mount. It has an integrated temperature controller that ensures it can be operated as low as -20ºC (-4ºF). It has a large LCD screen, function, direction and number keys on the front; a red LED reading light on the back; and a HBX port (6-pin) and a RS232 serial port (4-pin) at the bottom.

2.3.1. 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. Press and holding an arrow key for a fast scrolling.
- Number Keys: Input numerical values. Also used to adjust speeds. The speed selections are 1: 1X; 2: 2X; 3: 8X; 4: 16X; 5: 64X; 6: 128X; 7: 256X; 8: 512X; 9: MAX(~10°/sec, 2400X)
- Light Key(☼): Turns on/off the red LED reading light on the back of the controller.
- Help (?) Key: Identify and display bright stars or objects where the telescope points to.
- STOP/0 Key: Stop the mount during GOTO. Also toggling between start and stop tracking.
- HBX (Handbox) port: connect the HC to the AZMP mount using a 6P6C RJ11 cable.

- Serial port (*i.e.,* RS232 port): connect the HC to a Computer for HC firmware upgrade via a RS232-RJ9 cable.

2.3.2. The LCD Screen

The 8407 HC has a large 8-line, 21-character per line LCD screen, which displays all the information as shown in Figure 3. The user interface is simple and easy to operate.

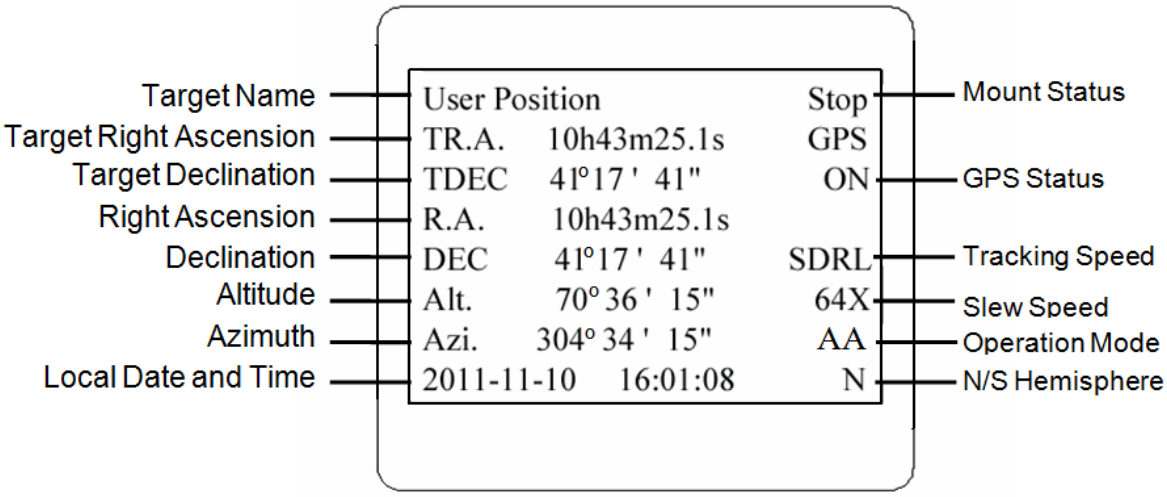


Figure 3. 8407+ HC LCD Information Screen

1. Target Name/Mount Position: displays the name of the target that telescope is currently pointed to or the current mount position.
   - Zero Position: The reference position for the mount. It will be displayed when moved to Zero Position using "**Goto Zero Position**";
   - User Position: The mount is point to a user defined position, which could be a particular celestial object or simply a position determined by pressing an arrow key;
   - An object name, such as "Mercury" or "Andromeda Galaxy": Name of the star or celestial object that the mount is currently slewing to or tracking.
2. Target R.A.: Right Ascension (R.A.) of the target object.
3. Target Declination: Declination (DEC) of the target object.
4. Right Ascension: Current R.A. of the telescope.
5. Declination: Current DEC of the telescope.
6. Altitude: Altitude of the telescope (degrees vertical from the local horizon - zenith is 90º).
7. Azimuth: Azimuth of the telescope (north is 0º, east 90º, south 180º, and west 270º).
8. Local Date and Time: display local time in a format of YYYY-MM-DD HH:MM:SS.
9. Mount Status: Display current operation status of the mount.
   - Stop: mount is not moving;
   - Slew: mount is moving with an arrow key is pressed or a GOTO command, such as "***Select and Slew***" or "***Goto Zero Position***";
   - Tracking: mount is at a tracking status.
10. GPS status: When the power is turned on, the initial GPS status will be "GPS ON", which means that the mount is connected to its GPS receiver and is seeking a satellite signal. When the GPS receiver finds the satellites and receives the GPS signal, the status will change to "GPS OK".
11. Tracking speed: Display current tracking rates of the mount

- SDRL: mount is tracking at a sidereal speed;
- Solar: mount is tracking at a solar speed;
- Lunar: mount is tracking at a lunar speed;
- King: mount is tracking at a King speed;
- CSTM: mount us tracking at a customer defined speed.

12. Slew speed: It has 9 speeds: 1X, 2X, 8X, 16X, 64X, 128X, 256X, 512X, MAX (2400X,~10º/sec).
13. Operation Mode: AA is for alt-azimuth mode.

2.4. Check Hand Controller 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.

3. AZ Mount Pro™ Mount Assembly

3.1. Un-package the Mount

Remove the AZ Mount Pro™ (AZMP) mount from the aluminum carrying case. Make sure that the Altitude Lock is fully tightened. **Charge the mount** using the included AC battery charging to fully charge the mount, until the LED indicator on the AC adapter changed to green.

Warning: Make sure use the included battery charger to charge the mount. **DO NOT** plug in any standard AC/DC adapter. **NEVER charge the battery when it is below 0°C.**

A ***slowly flashing*** battery status LED indicates the battery is low, which you still have about 30 minutes of operation time. You may keep using the mount by plugging in the battery charger. **NEVER** use the mount this way when it is below 0°C. iOptron is **NOT** responsible for any damages and consequences caused by misuse.

If you are running out of the battery during an observation session, you may also plug in a 12V DC power source, such as iOptron PowerWeight™ battery counterweight, for temporary use if the temperature is above 0°C.

Full charge the battery every 6 month if the mount is not used.

3.2. Tripod Setup

Evenly extend tripod legs to a desired length. Then lock legs using the locking knobs on sides. Set the tripod upward. If set a tripod on an uneven surface, make sure the tripod head is leveled.

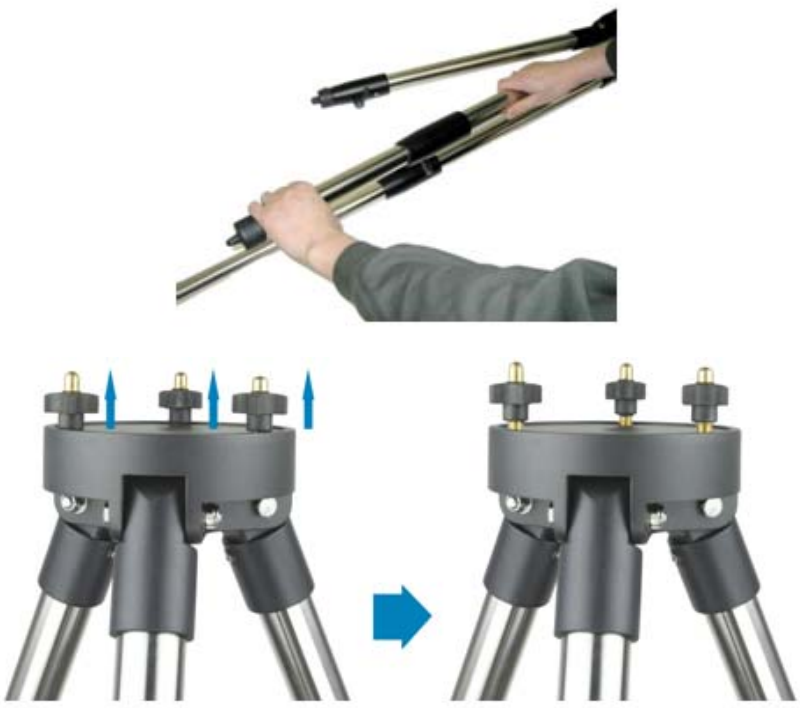


Figure 4 Set up tripod

Install three star-shaped adjustment screws onto the tripod head. Raise the screws up about 5mm.

3.3. Attach Mount

Carefully position telescope mount onto the tripod by aligning the three holes on the bottom of the mount base to the three level adjustment screws on the top of the tripod.

Figure 5 Attach mount

Thread the tripod bolt into the bottom of the mount while holding the mount with your hand. Slightly tighten the tripod bolt by turning the tripod bolt lock knob.

3.4. Level Mount

Adjust level adjustment screws to level the mount using the bubble level on the base. You may use a torpedo level on the opposite side of the bubble level to assist the leveling.

Figure 6 Level mount

3.5. Lock Mount

Tighten the bolt lock knob to secure the mount. Slide tripod support spreader onto the bottom of bolt. Position the three edges to fit against the three tripod legs. Then hand tighten tripod lock knob to secure the tripod support spread in place.

Figure 7 Lock mount

3.6. Attach Telescope

Attach a telescope to dual dovetail saddle. Make sure that the telescope objective end is pointing to the direction as the arrow mark on the dovetail pointed to. The dovetail saddle can be

rotated freely when the altitude lock knob is released. Fully tighten the altitude lock knob afterwards. **Tighten two dovetail saddle lock screws to secure the telescope**.

Figure 8 Install the telescope along the arrow direction on dovetail saddle

NOTE: Push the CW shaft out first if a counterweight is needed.

3.7. Install Counterweight

Make sure the altitude lock knob is tightened. Back out CW shaft lock screw slightly. Push the CW shaft out of the mount from the center of the dovetail saddle. Retighten the CW shaft lock screw.

Figure 9 Push the counterweight shaft out from the mount

Slide the counterweight onto the CW shaft, **with large opening hole facing inward,** if the CW has a stepped CW shaft hole. Insert the brass pin into the hole on the CW. Secure the CW by tightening the CW lock knob. (The groove on the CW shaft is designed for secondary dovetail saddle use.)

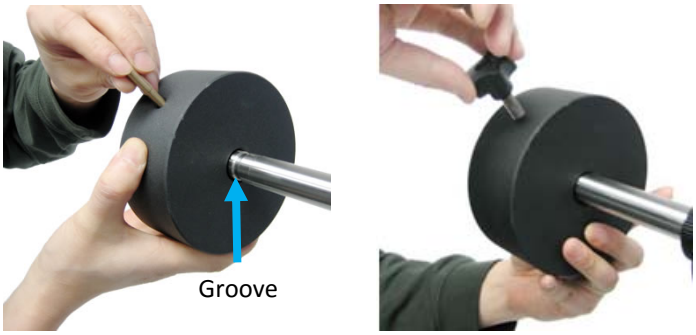


Figure 10 Install CW and CW lock

Warning: Counterweight is heavy. Please handle with care to avoid injury.

3.8. Balance Payload

After attaching scope and accessories, the mount needs to be balanced. To balance in altitude direction, release the altitude lock knob, rotate the scope to horizontal position. Move the telescope back and forth to find the balance point and lock the altitude lock knob.

CAUTION: The telescope may swing freely when the altitude lock knob is released.

Add one (1) 4.5kg CW if the scope at the primary side is over 5kg, and add two (2) 4.5kg CWs if the payload is over 10kg.

***Note**: This number is estimated and telescope size dependent.*

***Note:** if you have a light scope less than 10 lb, attach a CW is optional. However, a CW is always helpful to balance the OTA in order to have smooth and accurate GOTO and tracking.*

Figure 11 Heavy/large scope with two CWs

A simple and safe method to estimate the CW and its position is by calculating the torques (*weight times the distance to the center*) of the payload and CW, and making them equal or close.

NOTE: Please re-check leveling before operation the mount.

3.9. Connect Cable

Connect the Go2Nova® 8407 Hand Controller to the HBX port on the mount panel using the supplied coiled control cable. Put the hand controller onto the hand controller hanger.

3.10. Install Second Telescope

An optional secondary saddle (#8953) is available for dual balanced OTAs. To install a secondary dovetail saddle, loose the CW shaft lock and push the CW shaft out to a desired length. Lock the CW shaft lock. Slide the secondary CW onto the CW shaft and tighten the secondary dovetail saddle lock.

After you mount a secondary OTA onto the secondary dovetail holder, make sure you align it with the primary OTA. This alignment is easier to be done during the daytime. Point the primary telescope to a target at a remote building or flagpole and center the target in the eyepiece. Loosen the secondary dovetail saddle lock. Rotate the secondary OTA around the counterweight shaft. Center the object in the eyepiece of the secondary OTA. If the secondary OTA is tilted, it can be adjusted by adjusting two tilting adjustment screws as shown in Figure 12 (M6 x 12mm Allen set screws). The maximum payload on secondary side is 5kg (11lbs).

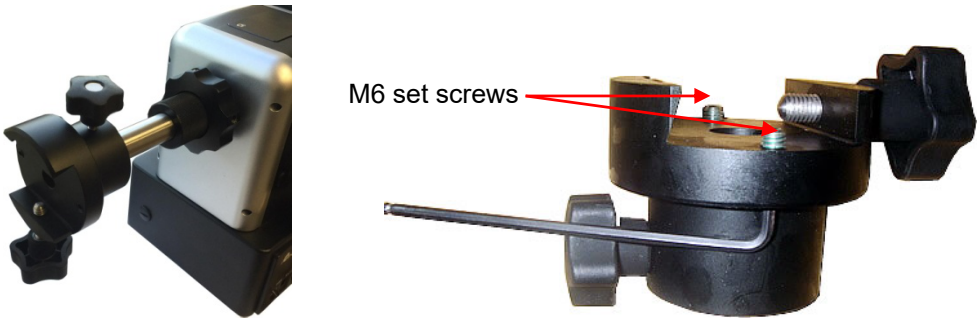


Figure 12. Secondary dovetail saddle and set screws

A combination of a light OTA and a CW can be used to balance a heavier primary OTA.

4. AZ Mount Pro™ Mount Operation

4.1. Power the Mount and GO

Assemble your mount. **Make sure the mount is leveled.**

Just flip the power switch ON and wait! The mount will first perform an Assistant Alignment Wizard which will determine the Zero Position, *i.e.* the South and Zenith. Then the mount will pick up GPS signal. Lastly the mount will GOTO a bright star for a Star Calibration. Follow the instruction on the hand controller screen to center the bright star. If the star displayed is blocked by a tree or building, just press the **BACK** button to go to next one.

Now you can use "***Select and Slew*"** to go to any objects!

Note: *The date and time displayed on the hand controller may differ from your local time. Just ignore it. You can change it later.*

4.2. GOTO a Celestial Object

Press ***MENU*** on the hand controller and select *"**Select and Slew**".* Select a category, such as "***Named Star***", and then select a star of interest, and press ***ENTER*.** The telescope will slew to the object and automatically start tracking. If the target is not centered in your eyepiece, use "**Sync to Target**" to improve the performance. Press ***MENU*** => "***Sync to Target***" and enter the star you are observing. Use the arrow keys (►, ◄, ▼, and ▲) to center it, press a number key to change the star moving speed.

4.3. Solar Observation

Press ***MENU*** => "***Sync to Target***" on the hand controller, then follow the instruction on the hand controller screen to select a catalog, here is "***Solar System***", and then select "***Sun***" and use the arrow keys to center it and press ***ENTER***.

Change the tracking rate to Solar by press ***MENU*** => "***Settings***" => "***Set Tracking Rate***" => "***Solar***"

4.4. Enter Initial Information

After turn on the mount power, the mount will ask if you want to run the "***assist alignment wizard***," as shown in LEFT screen in Figure 13. Press ***ENTER*** or do nothing to start the wizard. Or press ***BACK*** to cancel.

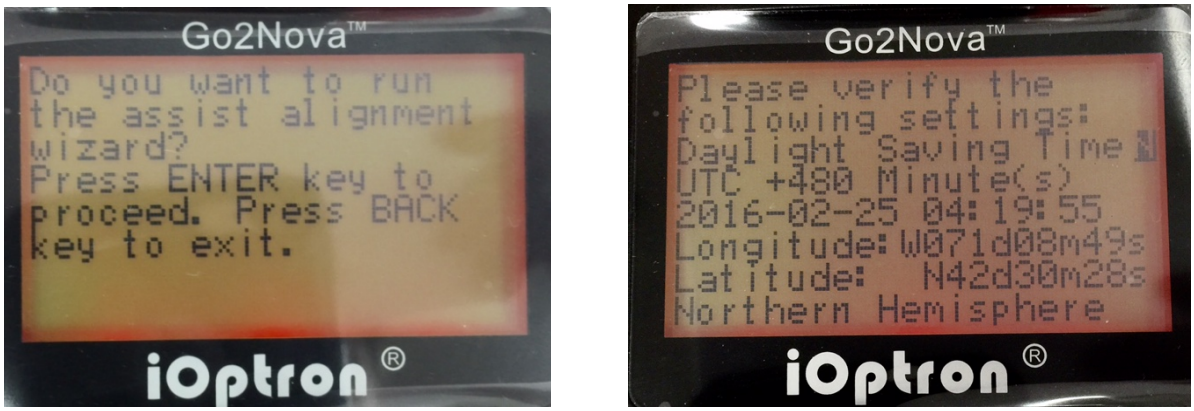


Figure 13 Initial hand controller screen

The mount will start to ***perform self calibration*** by rotating in both altitude and azimuth directions to find the Zero Position, *i.e.*, the mount's **"S"** (bubble level) facing south and the telescope tube pointing up at the zenith.

When it stops, the hand controller will display your current time and site info (RIGHT screen of Figure 13).

If all the information is correct, you may press ***ENTER*** to confirm and skip waiting for GPS signal. Or if the mount could not pick up the GPS signal (the mount won't advance to next step to start slewing), you can manually change it by setting Daylight Saving Time (DST) to Y(es) or N(o); adjusting the date and time; inputting your location coordinates; entering the time zone offset to the UTC.

Warning: If you enter your data, make sure they are complete and correct. Or just let the mount computer and GPS do the job for you.

4.5. Set Up the Mount Manually

In the event that the mount does not perform well for assistant align wizard and/or star calibration, or you would like to set up the mount quickly as a MiniTower mount, you may do the following:

1. Assemble the tripod and install the mount onto the tripod;
2. Level the mount;
3. Attach OTA, accessories and CW(s), balance the mount;
4. Turn on the mount. Press BACK button to skip the ***Alignment Wizard*** when the HC asks;
5. Press number 9 button to change the slew speed to MAX;
6. Slew the mount in azimuth to double check the leveling;
7. Slew the bubble level side facing south. Slew the telescope to point to Zenith;
8. Press ***MENU=> "Zero Position"=> "Set Zero Position"=>ENTER*** to set the current position as zero Position;
9. Press ***MENU="Settings"=>"Set Time and Site"*** to set the Daylight Saving Time (Y/N), UTC, as well as current time and location info. The press ***ENTER***.
10. Do a ***Star Alignment***, or "***Select and Slew***" followed by "***Sync to Target***" to align the mount.
11. Now happy GOTO!

4.6. Manual Operation of the Mount

The mount can now be used to observe astronomical objects using the HC. Use the arrow keys to point the telescope to the desired part of the sky. Use the number keys to change the slewing speed. Press the **STOP/0** button to start tracking.

4.7. Position Memorization

The AZMP mount can memorize its current position if the power is interrupted, either during tracking or slewing. You only need to use "***Select and Slew***" to go to the same object after power is restored if the mount Is not physically moved. No alignment is needed.

4.8. Star Identifying Function

The 8407+ hand controller has a star identification function. After setting the correct local time and location and completing polar alignment, slew the telescope to a bright star manually or using the GOTO function. Press the **?** key to identify the star that the telescope is pointing to, as well as nearby bright stars if there is any.

4.9. Turn Off the Mount

When you have finished your observation, simply turn the mount power off and disassemble the mount and tripod.

5. Complete Functions of Go2Nova® Hand Controller

5.1. Slew to an Object

Press **MENU** => "***Select and Slew***." Select an object that you would like to observe and press the **ENTER** key.

The Go2Nova® 8407 hand controller (HC V1 with 120614 Catalog) for an AZMP mount has a database of over 358,000 objects. Use the ► or ◄ button to move the cursor. Use the number buttons to enter the number, or the ▼ or ▲ button to change a number. Hold a button to fast scroll through the list. The "$\underline{\diamond}$" symbol indicates that the object is above the horizon, and the "$\overline{\diamond}$" symbol means it is below the horizon. In some catalogs the stars below the horizon will not be displayed 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 popular 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 Catalog: consists of 7,840 objects
- IC Catalog: consists of 5,386 objects.
- UGC Catalog: consists of 12,921objects.
- MCG Catalog: consists of 30,642 objects
- Caldwell Catalog: consists of 109 objects.
- Abell Catalog: consists of 4,076 objects.
- Herschel Catalog: consists of 400 objects.

5.1.3. Stars

- Named Stars: consists of 259 stars with their common names. They are listed alphabetically; a list is included in Appendix E.
- Double Stars: consists of 208 binary stars; a list is attached in Appendix E.
- GCVS catalog: consists of 38,528 objects.
- SAO Catalog: consists of 258,997 records.

5.1.4. Comets

This catalog contains 15 comets.

5.1.5. Asteroids

This catalog contains 116 asteroids.

5.1.6. Constellations

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

5.1.7. Custom Objects

This allows the storage of up to 60 user-defined objects, including comets.

5.1.8. Custom R.A. DEC

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

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** => "***Sync to Target***" => **ENTER**. Follow the screen to perform 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.

You can change the slew rate to make the centering procedure easier. Simply press a number (1 through 9) key to change the speed. The default slew rate is 64x.

"**Sync to Target**" will improve the local GOTO accuracy near by the synced star, which is useful for finding a faint object nearby.

5.3. Alignment

This function is used to align the telescope mount. Please keep in mind that LEVELING is the most critical part of goto and tracking accuracy.

5.3.1. One Star Alignment

Press **MENU** => "***Alignment***" => "***One Star Align***". A list of alignment stars that are above the horizon is computed based on your local time and location. With the mount in the Zero Position, use the▲ and ▼ buttons to select a star and press **ENTER**. Center the target in your eyepiece using the arrow keys. Press **ENTER** when finished. If your mount is well leveled, one star alignment should be sufficient for good GoTo accuracy. To increase the pointing accuracy over the sky, you may choose to do a two star and three star alignment.

5.3.2. Two Star Alignment

Two Star Align can improve the mount's average goto pointing accuracy. Two star alignment requires a wider view of the sky, since the two align stars need to be far apart. Press **MENU** => "***Alignment***" => "***Two Star Polar Align***." 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 the ▲ and ▼ buttons to select the first alignment star and press **ENTER**. Center the target in your eyepiece using the arrow keys after the mount slews to it. Press **ENTER** when finished. The hand controller will prompt you to choose a second star. After selecting and centering the second star, the two-star alignment is finished.

5.3.3. Three Star Alignment

The three-star alignment will further improve the average pointing accuracy based on 3-point sky model.

Press **MENU** => "***Alignment***" => "***Three Star Align.***" 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 the▲ and ▼ buttons to select the first alignment star and press **ENTER**. Center the target in your eyepiece using the arrow keys. Press **ENTER** when finished. The hand controller will prompt you to choose a second star. Select third star after the mount aligned to the second star.

5.3.4. Solar System Alignment

This function uses a planet or the moon as an alignment object. Press **MENU** => "***Alignment***" => "***Solar System Align***" for a list of available alignment objects.

5.3.5. Clear Alignment Data

The alignment data will be kept for your next observation session. This function will clear all alignment data created during one star, two star or three star alignment process.

5.4. Settings

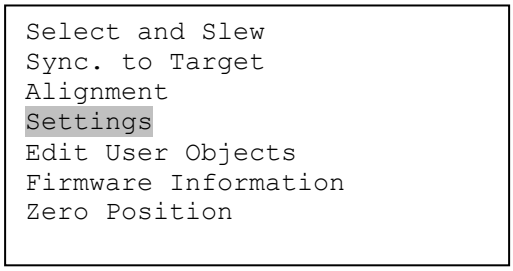
5.4.1. Set Time and Site

The AZ Mount Pro mount is equipped with a GPS receiver which will receive the time, longitude and latitude information for your current location from satellites after a link is established. However, there are still some parameters which need to be entered to reflect your location, such as time zone information and whether daylight saving time is currently in effect. This information will be stored in the hand controller memory along with longitude and latitude coordinates until they need to be updated.

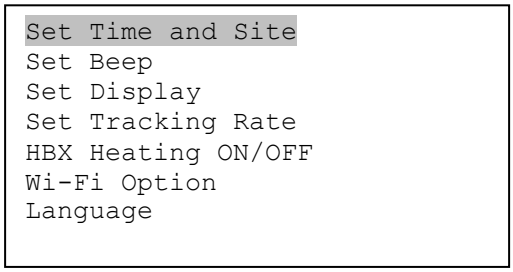
NOTE: you don't need to do anything if the mount is in an automatic mode, even the time zone is wrong.

A clear sky and open space outside is needed for the GPS to establish a link with the satellites. The GPS is installed on the top of the main board under main control board cover. If the GPS module has difficulty receiving the satellite signal, you may rotate the R.A. axis to one side to exposure the GPS module.

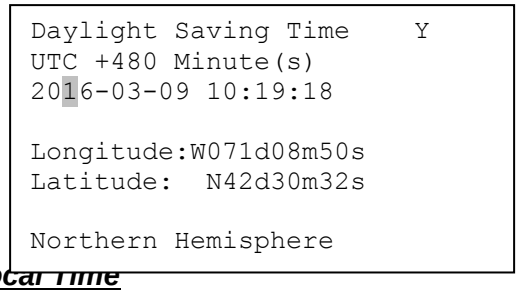
To set up the controller, press **MENU =>"*Settings*"**



Press **ENTER** and select "***Set Time and Site***"



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



Set Local Time

The time will be updated automatically when the GPS receiver has established its link with the GPS satellites. In the event that the GPS module is unable to establish a link to the satellites, local time can be entered manually. Use the ◄ or ► key to move the cursor _ and use the number keys to change the numbers. Use the ▲ or ▼ button to toggle between "Y" and "N" for Daylight Saving Time, or "+" and "-" for UTC (Coordinated Universal Time) setting. Hold the arrow key to fast forward or rewind the cursor.

In order to make the Hand Controller reflect your correct local time, **time zone information has to be entered.** Press the ◄ or ► key, move the cursor to the third line "**UTC -300 Minute(s)**" to set the time zone information (add or subtract 60 minutes per time zone). For example:

- Boston is "UTC -300 minutes"
- Los Angeles is "UTC -480 minutes"
- Rome is "UTC +60 minutes"
- Beijing is "UTC +480 minutes"
- Sydney is "UTC +600 minutes"

All the time zones in North America are "UTC –", as shown in the following table, so ensure the display shows "**UTC -**" instead of "**UTC +**" if in North or South America.

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

To adjust minutes, move the cursor to each digit and use the number keys to input the number directly. Use ▲ or ▼ key to toggle between "**+**" and "**-**". After the time zone information is entered, press ENTER and go back to the previous screen. **Note that fractional time zones can be entered.**

Do not manually add or subtract an hour from displayed time to reflect Daylight Saving Time (DST). Only select "**Y**" after DST begins.

For other parts of the world you can find your "time zone" information from the internet.

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 a satellite signal. "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 does not pick up the satellite signal, you can manually enter your longitude and latitude coordinates. Press the ◄ or ► key to move the cursor, use the ▲ or ▼ key to toggle between "W" and "E", and "N" and "S", and use the number keys to change the numbers. It is always a good idea to do your homework and get longitude and latitude coordinates before traveling to a new observation site.

The site coordinates information can be found from your smart phone, GPS receiver or via the internet. Site information in decimal format can be converted 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 the North Celestial Pole, then set the mount to Northern Hemisphere. If the polar axis is pointing to the South Celestial Pole, set the mount to Southern Hemisphere. Press the ◄ or ► key to move the cursor and use the ▲ or ▼ key to toggle between "Northern Hemisphere" and "Southern Hemisphere".

As an example, 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 hand controller's memory chip. If you are not traveling to another observation site, they do not need to be changed.

Check Hand Controller 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.

5.4.2. Set Beep

The Hand Controller allows a user to turn off the beep partially, or even go to a silent mode. To change this setting press **MENU** => "***Settings*" =>** "***Set Beep***",

```
Set Time and Site
Set Beep
Set Display
Set Tracking Rate
HBX Heating ON/OFF
Wi-Fi Option
Language
```

Select one of three available modes:

"**Always On**" – a beep will be heard on each button operation or mount movement;

"**On but Keyboard**" – a beep will be heard only when the mount is slewing to the object or there is a warning message;

"**Always Off**" – all sounds will be turned off, including the SUN warning message.

5.4.3. Set Display

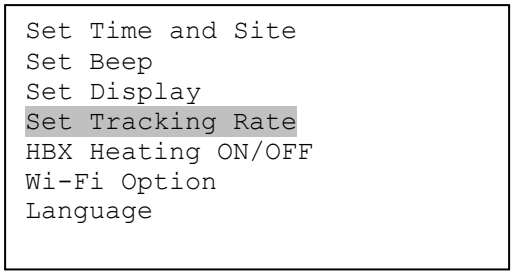
Press **MENU => "*Settings*" => "*Set Display***",

```
Set Time and Site
Set Beep
Set Display
Set Tracking Rate
HBX Heating ON/OFF
Wi-Fi Option
Language
```

Use the arrow keys to adjust LCD display contrast, LCD backlight intensity, and keypad's backlight intensity.

5.4.4. Set Tracking Rate

You can set up the mount tracking rate by selecting "***Set Tracking Rate***".



Then the user can select "***Sidereal Rate***", "***Lunar Rate***", "***Solar Rate***", "***King Rate***", and "***User Defined Speed***". The "User defined speed" can be adjusted from 0.9900X to 1.0100X of sidereal.

When use "Select and Slew" to Moon or Sun, "Lunar Rate" or "Solar Rate" will be used automatically. "Sidereal Rate" will be used for other object tracking.

The "King Rate", developed by Edward S. King, corrects the tracking rate of a telescope to account for atmospheric refraction. This is more useful for unguided tracking.

5.4.5. Set Altitude Limit

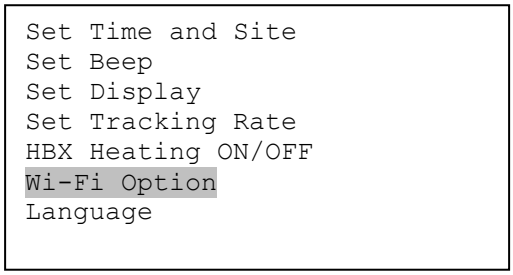
Set the tracking limit in altitude, a useful function for tracking an object all the way to below the horizon when set it at a minus number (degree). The default setting is 0. The mount will stop tracking when the telescope is point to horizon. ***Use this function at your own risk***.

5.4.6. Set Heating OFF/ON

Turn on/off the controller LCD back heater. When "**Heating**" is set to **ON**, the heater will automatically be turned on when the ambient temperature reaches 0°C (32°F) and shut off at 10°C.

5.4.7. Wi-Fi Option

AZ Mount Pro mount has a built-in Wi-Fi adapter that allows a user to wirelessly control the mount via SmartPhone/Tablet/Computer.



- Wi-Fi Status: indicates if the Wi-Fi is turned on and password pretected. Password can be set after internet login
- IP Addess & Socket: the parameters needed for settiing up a manual WI-Fi access, such as SkySafari
- SSID: Wi-Fi broadcast ID, which can be changed.
- Wi-Fi ON/OFF: turn ON/OFF Wi-Fi connection
- Restart: restart the Wi-Fi adapter
- Restore to Factory: restore the Wi-Fi factory setting

5.4.8. Language

Select one of supported menu languages.

5.5. Edit User Objects

Besides various star lists available in the hand controller, you can add, edit or delete your own user-defined objects. This is especially useful for newly found comets. You can also add your favorite observation object into the user object list for easy sky surfing. Up to 60 comets and other user objects can be stored.

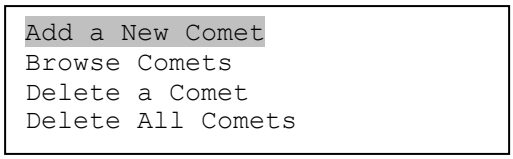
5.5.1. Customer Comets

Press **MENU** => "***Edit User Objects*"** to set user objects.

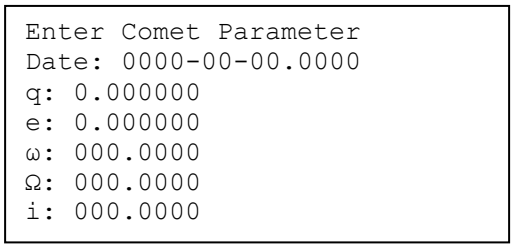
Select "***Custom Comets***" to add/browse/delete the user-defined comet list. Find the orbit parameters of a comet in the SkyMap format. For example, the C/2012 ISON has an orbit parameter:

No.	Name	Year	M	Day	q	e	ω	Ω	I	H	G
C/2012	S1 ISON	2013	11	28.7960	0.0125050	1.0000030	345.5088	295.7379	61.8570	6.0	4.0

Select "***Add a New Comet***" to add a new one:



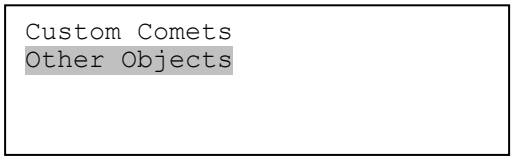
The hand controller will display the parameter entry screen:



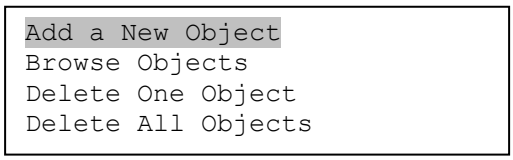
Enter the parameters using the arrow buttons and number keys. Press **ENTER** and a confirmation screen will be displayed. Press **ENTER** again to store the object under the assigned user object number, or press **BACK** button to cancel.

5.5.2. Enter Other Objects or Observation List

Press **MENU** => "***Edit User Objects*"** to set user objects.



Select "***Other Objects***" to enter you own object:



Select "***Add a New Object***". A screen will be displayed asking you to **Enter R.A. and DEC coordinates**:

```
Enter R.A. and DEC

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

You may enter the R.A. and DEC coordinates of the object you want to store, and press **ENTER** to confirm.

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

Press the **BACK** button to go back to the object entry submenu**.** You may review the records or delete those that are no longer wanted. Press the **BACK** button to finish the operation. Now you can slew to your favorite stars from "***Custom Objects***" catalog using "**Select and Slew**."

5.6. Firmware Information

This option will display the mount type, firmware version information for the hand controller (HC), Main board (Main), Azimuth motor board (Azi), and Altitude motor board (Alt).

5.7. Zero Position

5.7.1. Goto Zero Position

This moves your telescope to its Zero Position. The mount memorizes its Zero Position. The power on position is not necessary the zero position.

5.7.2. Set Zero Position

This set the Zero Position for the firmware.

The Zero Position reference will be an undefined value after firmware upgrade or HC battery replacement. You can use this function to set the zero position reference.

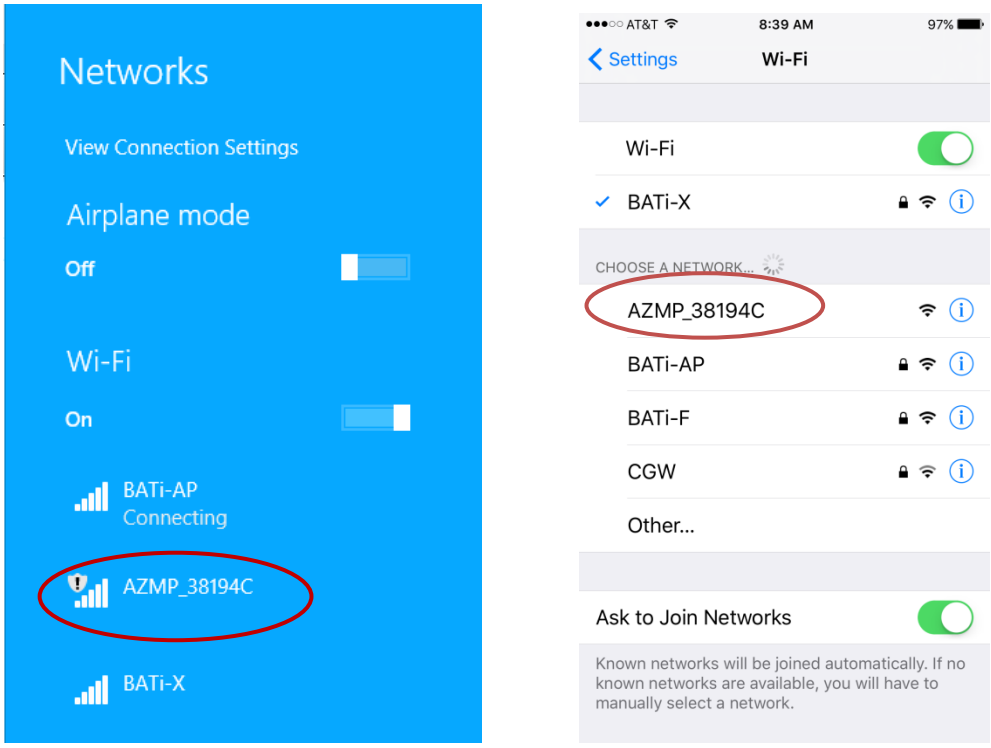
Press the **ENTER** after moving the mount to Zero Position with the hand controller.

6. Wi-Fi Operation

6.1. Wi-Fi Connection

6.1.1. For a Windows/Mac Operation System

Open the Wi-Fi connection panel on your device, Find a Wi-Fi SSID called “AZMP_XXXXXX”, as shown in Figure 14(a), then connect.



(a) (b)

Figure 14. Wi-Fi connection panel (a) PC and Mac, (b) iOS

6.1.2. Tablet/SmartPhone with iOS

Connect the iOS Tablet/SmartPhone to the AZMP_XXXXXX wireless network, as shown in Figure 14(b).

6.1.3. Tablet/SmartPhone with Other OS

Open the Wi-Fi connection panel on your device, Find a Wi-Fi SSID called “AZMP_XXXXXX”, then connect.

6.2. Connect the Mount

6.2.1. Windows

After connecting a computer to AZMP Wi-Fi network, launch the iOptron Commander. Select ***iOptron StarFi/Built-in Wi-Fi*** to connect the mount to your computer via Wi-Fi/Ethernet connection (Figure 15). Check the ***Mount Panel,*** as shown in Figure 15, to open iOptron Commander Mount Panel (Figure 16).

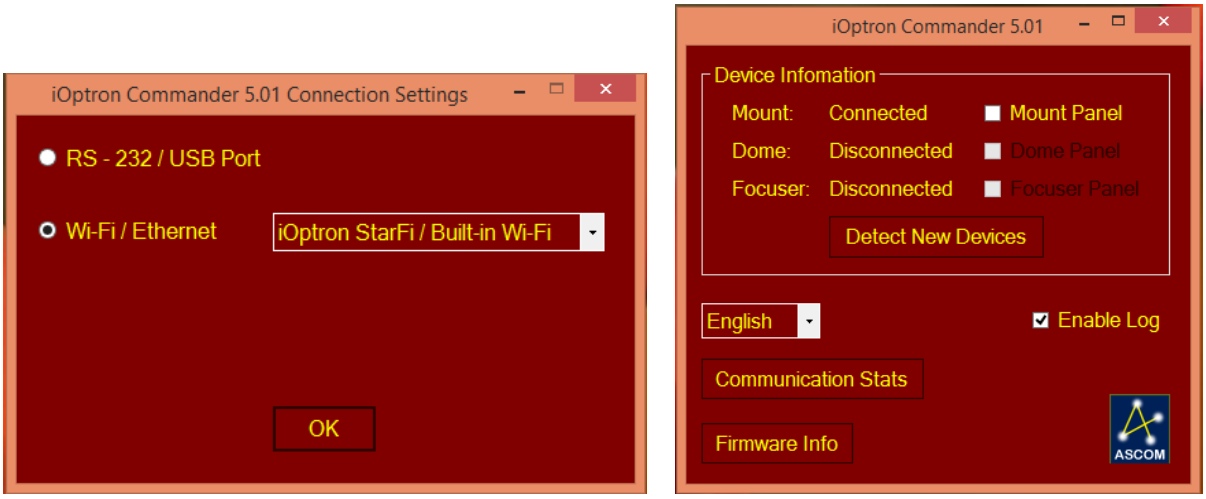


Figure 15 iOptron Commander Connection

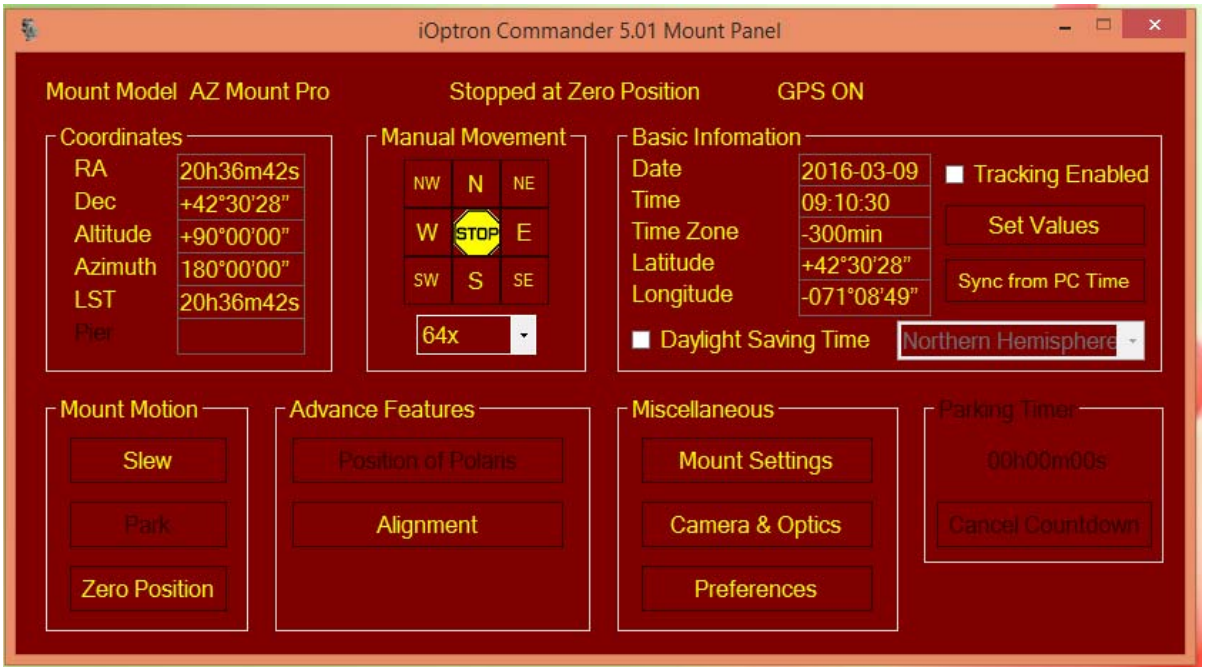


Figure 16 iOptron Commander Mount Panel

Now you can use iOptron Commander to direct control the AZMP mount, or use your favorite ASCOM compatible software to control the mount.

6.2.2. Mac OS

You need planetarium software that runs on Mac OS and has an embedded AZMP mount drive, such as Sky Safari. Check the software for support information.

6.2.3. Tablet/SmartPhone with Sky Safari

The App needs be configured first.

- Click on ***Settings***.
- Click on ***Setup***.
- Select ***Scope Type*** as **iOptron CEM/iEQPro & 8407+** and ***Mount Type*** should be **Alt-Az. GoTo**.
- Turn off ***Auto-Detect SkyFi.*** Change the ***IP Address*** to **10.10.100.254** and ***Port Number*** to **8899**. Click ***Done***.

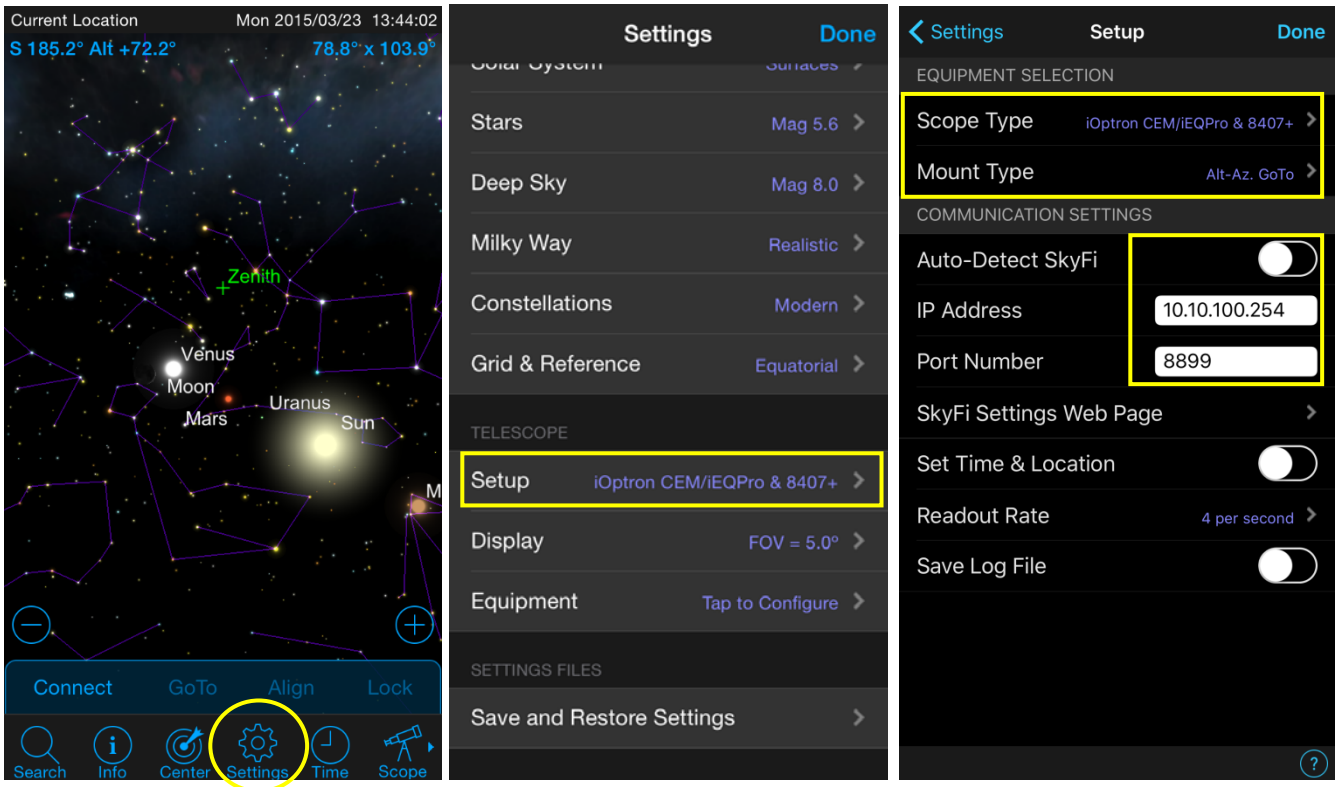


Figure 17 Using Sky Safari on a SmartPhone/Tablet

This procedure only needs to be performed once unless you have changed your AZMP Wi-Fi settings.

Then click on the ***Scope*** icon and tap on ***Connect*** to connect the mount. Now you can perform GOTO and Slew from your SmartPhone/Tablet.

6.3. Wi-Fi Configuration

The AZMP Wi-Fi is shipped with no password protection. You can change the SSID and enable password protection so only you can make the connection.

To change the Wi-Fi settings:

- Connect the computer/tablet/SmartPhone to AZMP Wi-Fi;
- Open the internet browser and type in http://10.10.100.254;
- A login window will open. Enter "**admin**" as both **User Name** and **Password**;
- Go to AP Settings;
- Now you can change the SSID name from AZMP_XXXXXX to Your Name, enable WPA2 encryption, etc.;
- You may also go to account to change login name and password;
- Restart the mount.

Note:

1. Please keep the Wi-Fi at AP (access point) mode, unless you know how to setup the ST mode.
2. If ever you forgot your password, use the hand controller "***Restore to Factory"*** to reset the WI-FI adapter to factory default settings.

7. Maintenance and Servicing

7.1. Maintenance

The AZ Mount Pro mount is designed to be maintenance free. Do not overload the mount. Do not drop the mount as this will damage the mount and / or permanently degrade GOTO performance and tracking accuracy. 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).

7.2. iOptron Customer Service

If you have any question concerning your mount contact iOptron Customer Service Department. Customer Service hours are 9:00 AM to 5:00 PM, Eastern Time, Monday through Friday. In the unlikely event that the mount requires factory servicing or repairing, write or call iOptron Customer Service Department first to receive an Return Merchandise Authorization Number (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 information 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.

7.3. 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.

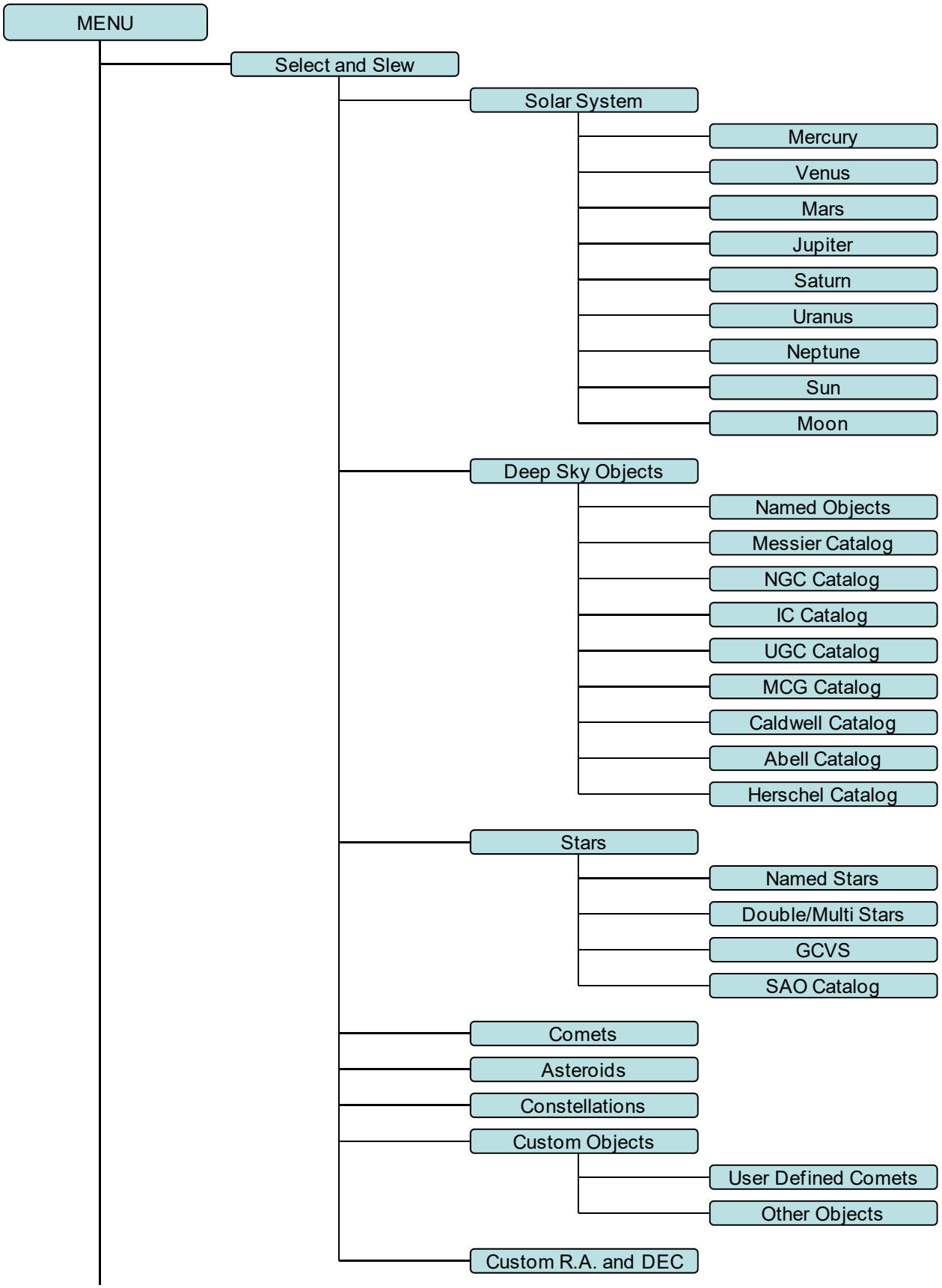
7.4. Battery Replacement and Disposal Instructions

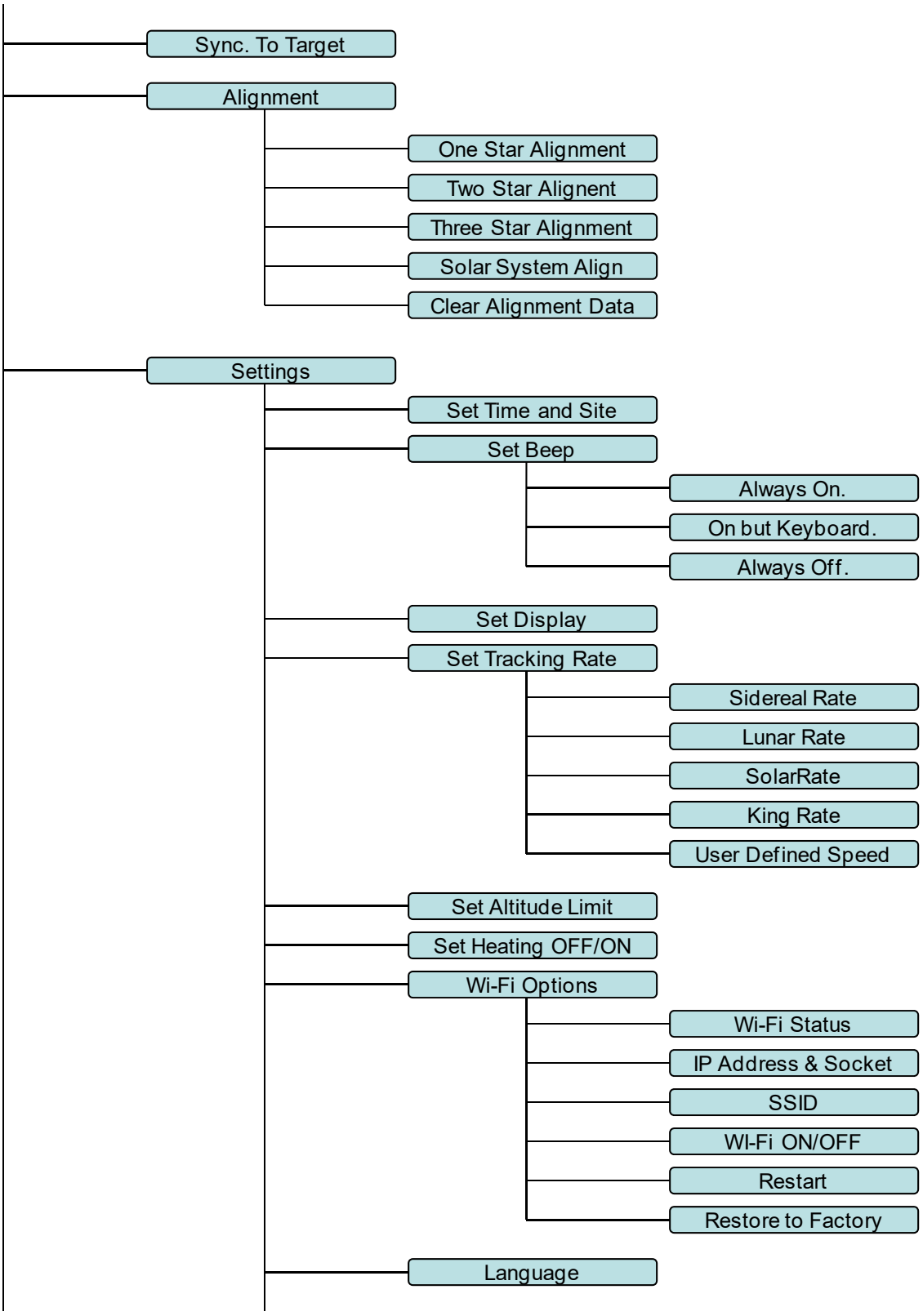
Battery Disposal: Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling, and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where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

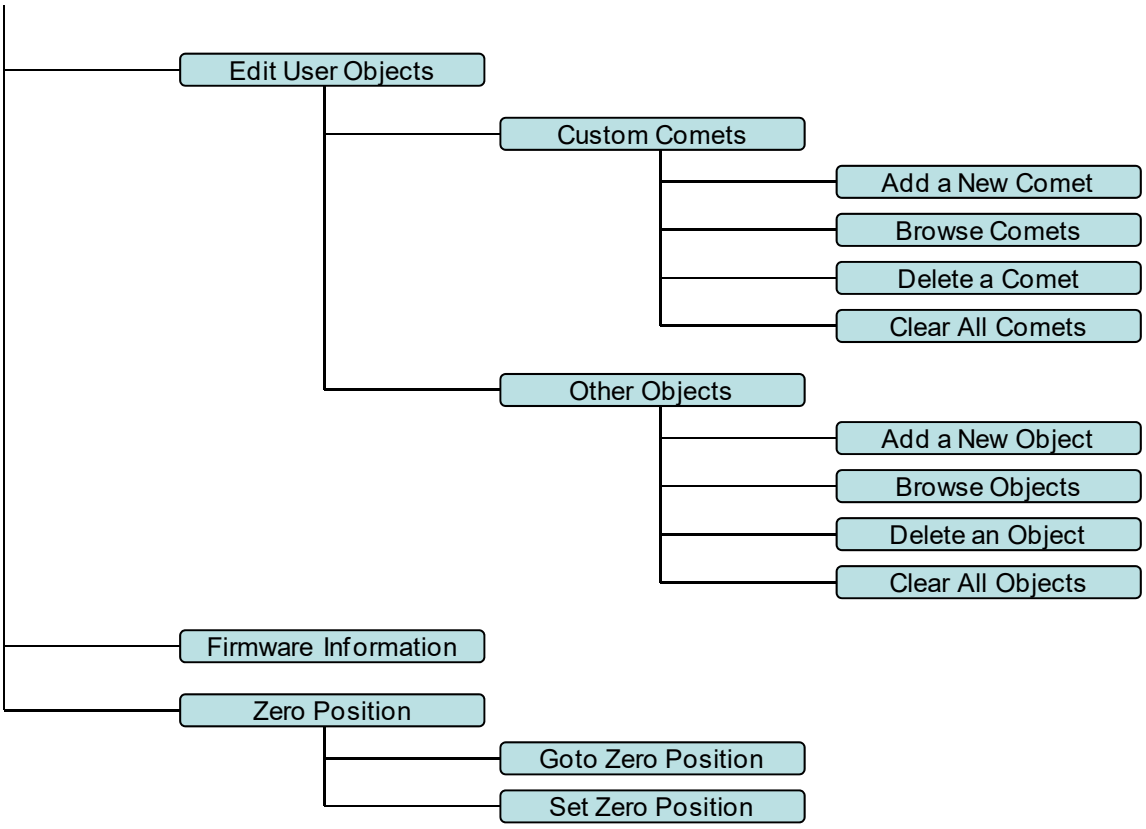
Appendix A. Technical Specifications

Mount	Altazimuth Mount
Body material	Die-cast aluminum
System	GOTONOVA®
Primary payload	33 lb
Secondary payload	10 lb
Mount weight	13 lb (including CW shaft and battery)
Gear	Aluminum worm wheel/Brass worm gear
Motor	128X microstep stepper motor
Resolution	0.1 arc seconds
Transmission	Synchronous belt
Tracking	Automatic
Tracking rate	sidereal, solar, lunar, King and user defined
Hand Controller	Go2Nova® 8407 with 212,000+ object database
Slew speed	1×,2×,8×,16×,64×,128×,256×,512×,MAX(~10 º /sec, 1400X)
GPS	Built-in 32-channel GPS
Sensors	Position and angular detection
Level indicator	Precision bubble
Dovetail saddle	6" VIXEN/LOSMANDY-D dual saddle Optional secondary Vixen saddle
Battery	Built-in rechargeable Li-ion battery (11.1V, 4.4AH)
Battery running time	10 hour at 20ºC
Battery charger	100-240V AC input /12.6V DC 2000mA output (Included)
Wireless control	Yes, full control via built-in WIFI adapter
Firmware upgrade	Yes, via serial (RS232) port on mount and hand controller
Computer control	Yes. PC (ASCOM) and Mac/Tablet/SmartPhone
Counterweight	10 lb (optional for #8900)
Tripod/Pier/Tri-Pier	Optional for #8900
Operation temperature	-10ºC ~ 40ºC
Warranty	Two year limited for mount 90 day limited for battery

Appendix B. AZ Mount Pro Go2Nova® 8407 HC MENU




Sync. To Target
Alignment
One Star Alignment
Two Star Alignent
Three Star Alignment
Solar System Align
Clear Alignment Data
Settings
Set Time and Site
Set Beep
Always On.
On but Keyboard.
Always Off.
Set Display
Set Tracking Rate
Sidereal Rate
Lunar Rate
SolarRate
King Rate
User Defined Speed
Set Altitude Limit
Set Heating OFF/ON
Wi-Fi Options
Wi-Fi Status
IP Address & Socket
SSID
WI-Fi ON/OFF
Restart
Restore to Factory
Language


Edit User Objects
Custom Comets
Add a New Comet
Browse Comets
Delete a Comet
Clear All Comets
Other Objects
Add a New Object
Browse Objects
Delete an Object
Clear All Objects
Firmware Information
Zero Position
Goto Zero Position
Set Zero Position

Appendix C. Firmware Upgrade

The firmware in the 8407 Hand Controller and control board can be upgraded by the customer. Please check iOptron's website, http://www.iOptron.com, under ***Support > Firmware/Software*** for details.

Appendix D. Computer Control an AZMP Mount

The AZ Mount Pro mount can be controlled by a SmartPhone, a tablet 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 via built-in Wi-Fi connection. The mount can be controlled via ASCOM protocol (Windows OS), SmartPhone/tablet and Mac OS wirelessly (with supported software, such as Sky Safari.

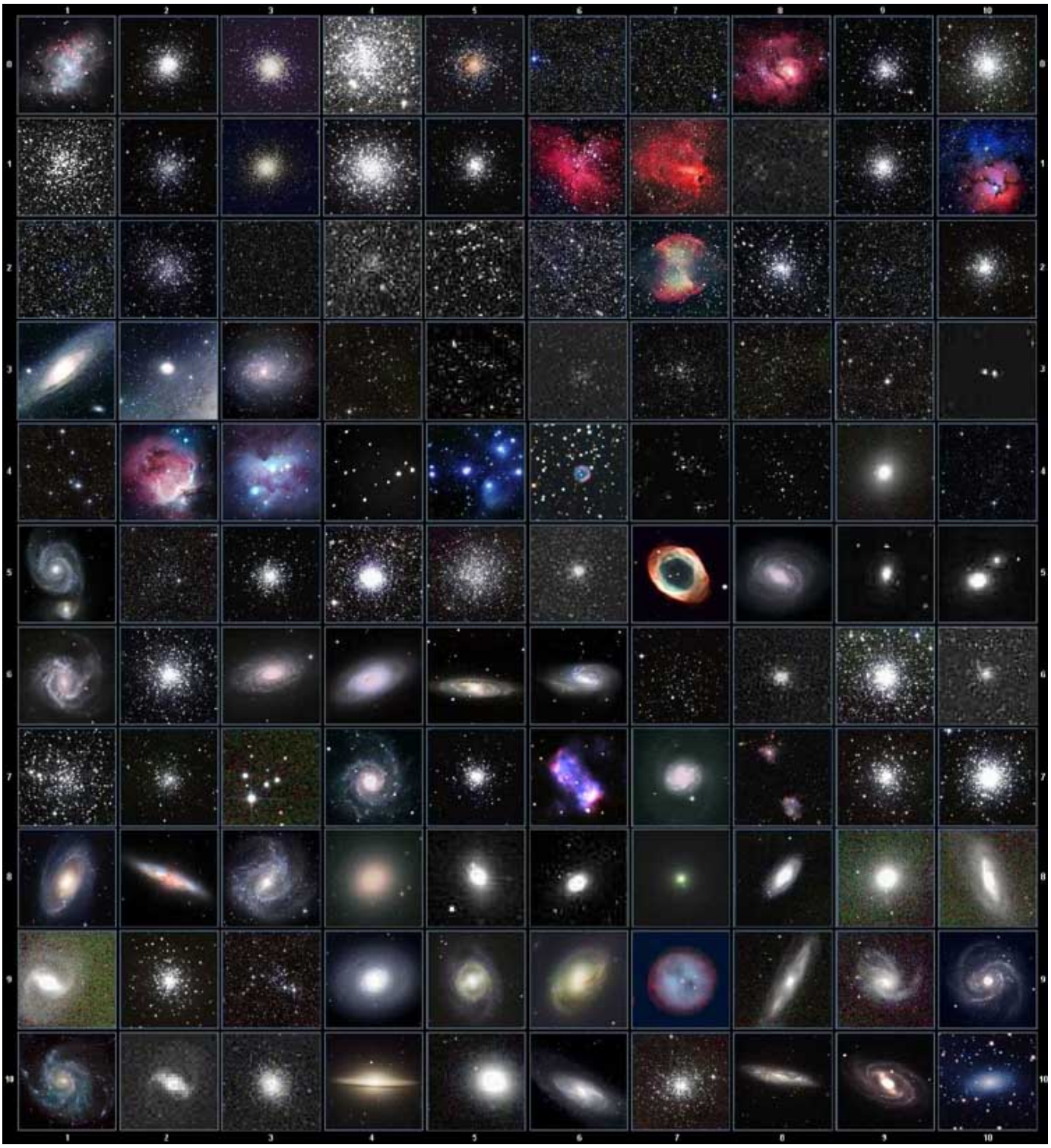
To control the mount via ASCOM protocol, you need:

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 ASCOM drive for AZMP 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 > iOptron ASCOM Driver*** for more detail.

Appendix E. Go2Nova® 8407 Hand Controller Star List

Messier Catalog



Named Star List

001 Acamar	050 Alrescha	099 Deneb el Okab	148 Lesath
002 Achernar	051 Alshain	100 Deneb Kaitos	149 Mahasim
003 Achird	052 Altair	101 Denebakrab	150 Maia
004 Acrab	053 Altais	102 Denebola	151 Marfik
005 Acrux A	054 Alterf	103 Dschubba	152 Marfikent
006 Acrux B	055 Aludra	104 Dubhe	153 Markab
007 Acubens	056 Alula Australis	105 Edasich	154 Markeb
008 Adhafera	057 Alula Borealis	106 Electra	155 Matar
009 Adhara	058 Alya	107 Elnath	156 Mebsuta
010 Al Dhanab	059 Ancha	108 Eltanin	157 Megrez
011 Al Dhibain Prior	060 Ankaa	109 Enif	158 Meissa
012 Al Kab	061 Antares	110 Epsilon Persei	159 Mekbuda
013 Al Mizan	062 Apollyon	111 Errai	160 Menkalinan
014 Al Nair	063 Arcturus	112 Fomalhaut	161 Menkar
015 Al Niyat	064 Arkab	113 Furud	162 Menkent
016 Albaldah	065 Arneb	114 Gacrux	163 Menkib
017 Albali	066 Ascella	115 Gamma Lupi	164 Merak
018 Albireo	067 Asellus Australis	116 Gatria	165 Merope
019 Alchiba	068 Asellus Borealis	117 Giausar	166 Mesartim
020 Alcor	069 Aspidiske	118 Gienah	167 Miaplacidus
021 Alcyone	070 Atik	119 Gienah Cygni	168 Mimosa
022 Aldebaran	071 Atlas	120 Girtab	169 Mintaka
023 Alderamin	072 Atria	121 Gliese 1	170 Mira
024 Alfirk	073 Avior	122 Gomeisa	171 Mirach
025 Algenib	074 Azha	123 Graffias	172 Mirfak
026 Algenubi	075 Barnard's Star	124 Groombridge 1830	173 Mirzam
027 Algieba	076 Baten Kaitos	125 Grumium	174 Mizar
028 Algiedi Secunda	077 Beid	126 Hadar	175 Mu Leporis
029 Algol	078 Bellatrix	127 Hamal	176 Mu Velorum
030 Algorab	079 Beta Gruis	128 Hatsya	177 Muphrid
031 Alhakim	080 Beta Hydri	129 Head of Hydrus	178 Muscida
032 Alhena	081 Betelgeuse	130 Homam	179 Naos
033 Alioth	082 Betria	131 Iritjinga	180 Nasak Yamani
034 Alkaid	083 Biham	132 Iritjinga	181 Nashira
035 Alkalurops	084 Birdun	133 Izar	182 Navi
036 Alkes	085 Canopus	134 Kapteyn's Star	183 Nekkar
037 Almaaz	086 Capella	135 Kaus Australis	184 Nihal
038 Almach	087 Caph	136 Kaus Borealis	185 Nunki
039 Alnair	088 Castor A	137 Kaus Media	186 Nusakan
040 Alnasl	089 Castor B	138 Keid	187 Peacock
041 Alnilam	090 Cebalrai	139 Kekouan	188 Phact
042 Alnitak	091 Chara	140 Kitalpha	189 Phecda
043 Alniyat	092 Chertan	141 Kochab	190 Pherkad
044 Alpha Lupi	093 Choo	142 Koo She	191 Pi Puppis
045 Alpha Muscae	094 Cor Caroli	143 Kornephoros	192 Pi Scorpii
046 Alpha Tucanae	095 Cursa	144 Kraz	193 Polaris
047 Alphard	096 Dabih	145 Kurhah	194 Pollux
048 Alphecca	097 Deneb	146 Lacaille 9352	195 Porrima
049 Alpheratz	098 Deneb Algedi	147 Lalande 21185	196 Procyon

197 Propus	213 Sadachbia	229 Suhail	245 Vindemiatrix
198 Proxima Centauri	214 Sadalbari	230 Sulafat	246 Wasat
199 Rasalas	215 Sadalmelik	231 Syrma	247 Wazn
200 Rasalgethi	216 Sadalsuud	232 Talitha	238 Wei
201 Rasalhague	217 Sadr	233 Tania Australis	249 Wezen
202 Rastaban	218 Saiph	234 Tania Borealis	250 Yed Posterior
203 Regor	219 Sargas	235 Tarazed	251 Yed Prior
204 Regulus	220 Scheat	236 Tau Puppis	253Zaniah
205 Rigel	221 Schedar	237 Taygeta	253 Zaurak
206 Rigel Kentaurus B	222 Seginus	238 Tejat Posterior	254 Zavijava
207 Rigil Kentaurus A	223 Shaula	239 Theta Carinae	255 Zeta Persei
208 Ruchbah	224 Sheliak	240 Thuban	256 Zeta Tauri
209 Rukbat	225 Sheratan	241 Turais	257 Zosma
210 Rukh	226 Sirius	242 Unukalhai	258 Zubenelgenubi
211 Rutilicus	227 Skat	243 Vasat-ul-cemre	259 Zubeneschamali
212 Sabik	228 Spica	244 Vega	

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	

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1. iOptron battery has 90 day limited warranty
2. iOptron mount has two (2) year limited 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.
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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.

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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:

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Woburn, MA 01801
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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.