



iOptron® HAE69C Strain Wave GoTo AZ/EQ Mount

Instruction Manual

Product HE692C and HE694C



Read the Quick Setup Guide (QSG) BEFORE setting up and operating the mount! Read the full online Instruction Manual for details.

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.***

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Ver. 1.0 2023.09

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1. HAE69C Overview

These light weight, compact, medium payload titans will deliver an astronomy experience like never before. Applying iOptron's multi-decade experience creating precision mounts, the HAE brings this vision to reality.

Utilizing state of the art strain wave gear technology for both RA and DEC movement, the HAEs deliver unparalleled weight to payload efficiency. Its black anodized all metal CNC machined body is not only appealing to the eye, it's a rugged platform that will perform at the highest level for many years to come. Unique features such as an electronic friction brake and power down memory allow the mount to safely stop and resume a GoTo slew or continue tracking even after an abrupt power loss (No need to realign and start from the beginning).

HAE69C dual SWG AZ/EQ mounts have an internal main board and no longer requires using with a handset. The mount has USB ports on both the mount base and saddle that connect directly to the main board for mount control and firmware upgrade. It also features a built-in Wi-Fi for connection.

The optional Go2Nova® handset with OLED will provide a better user experiences, especially at extreme temperatures.

The HAE69C EC features a high precision encoder on RA axis that delivers incredible tracking accuracy, enough that many will choose to image "sans" guiding.

Features:

- Advanced Strain Wave Gear (SWG) technology
- Payload capacity of 31 kg (69 lbs) with the mount weight of 8.6 kg (19 lbs, include dovetail saddle)
- CNC machined
- Unique friction brake to safely stop movement during a planned or unplanned power interruption
- 270 second gear period
- High precision encoder with real time PEC (RPEC) for HAE69C EC
- Go2Nova® handset with OLED display for better user experiences, especially at extreme temperatures (optional for some models)
- iPolar electronic polar scope for easy and accurate polar alignment (optional)
- Vixen/Losmandy-D dual saddle
- Built in zero position search and locator
- Integrated ST-4 autoguiding port
- USB-C ports on mount base and dovetail saddle for firmware upgrade and computer control
- Extra 12V 3A DC power output on dovetail saddle for onboard computer
- No cable drags
- Carrying case
- Two year warranty
- Optional LiteRoc tripod (#8023ACC), or Tri-Pier (#8034)
- Optional pier extension (#8043)
- Optional iGuider™ autoguiding system (#3360)
- Optional counterweight shaft (#P-SGP-CWS) and counterweight (#3006-10)

2. HAE69C Terms

2.1. Parts List¹

SHIPPING CONTENTS

Your new HAE69C mount comes in one shipping box:

- HAE69C (#HE692C) or HAE69CEC (HE694C)
- AC adapter 100V-240V, 12V/6A DC output (5.5mm/2.1mm plug, for indoor use only)
- USB-C cable for computer connection and firmware upgrade
- Go2Nova[®] 8411 handset with USB-C port and control cable (for a mount with optional handset)
- Carrying case

OPTIONAL PARTS

- LiteRoc tripod (#8023ACC), or Tri-Pier (#8034)
- iPolar (#3339)
- iGuider 1 mini autoguiding system (#3360)
- Pier extension #8043
- Counterweight shaft (#P-SGP-CWS) and counterweight (#3006-10)

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

- Updated Quick Start Guide
- Instructional manual
- Tips for set up
- Mount and handset firmware upgrades (check online for latest version)
- iOptron ASCOM driver and computer control
- Reviews and feedback from other customers
- Accessories

¹ US market only. Actual contents, design and function may vary.

2.2. Identification of Parts

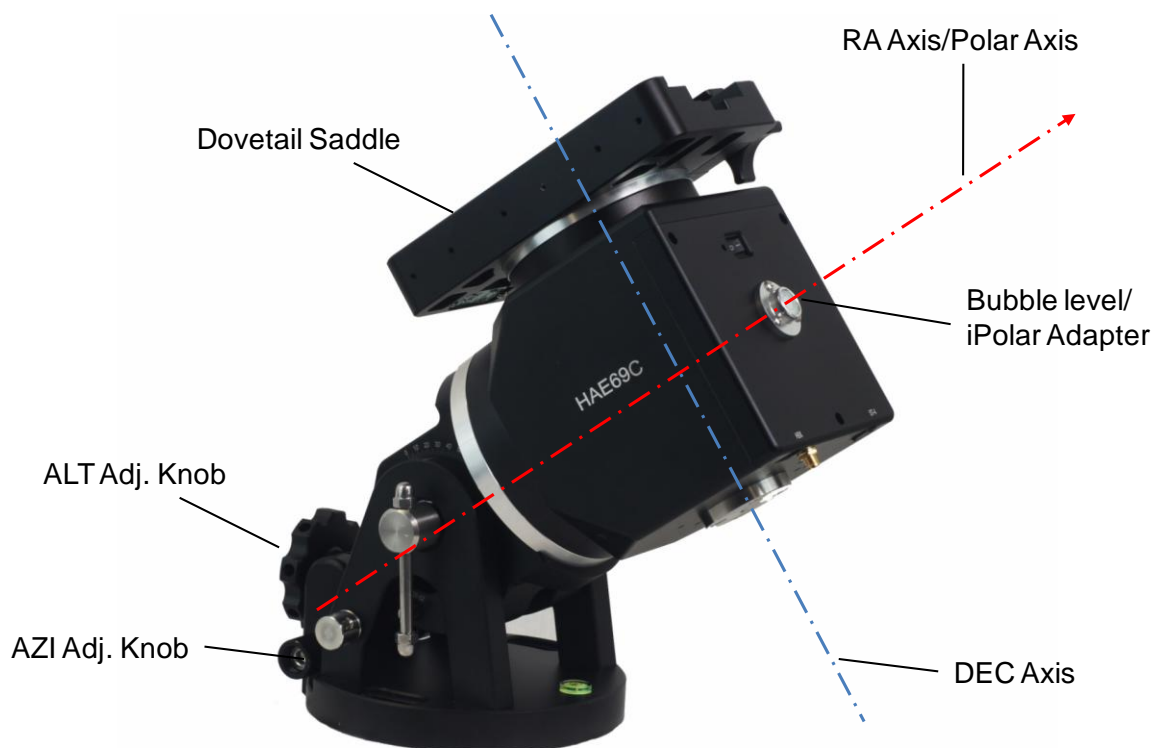


Figure 1. HAE69C mount assembly

2.3. HAE69C Mount Ports

Ports on an HAE69C mount:



Ports on EQ base

(a)



(a) Ports on mount

Figure 2. Ports on an HAE69 mount

- DC 12V IN: DC power socket to power the mount (5.5mmX2.1mm/5521, center positive)
- USB 2.0: USB-C type port for firmware upgrade and computer control

- I/O: Power switch
- HBX (Handbox): For connecting to an 8411 handset
- Brass connector: For WiFi antenna
- ST-4: ST-4 compatible autoguiding port. The wiring is shown in Figure 3

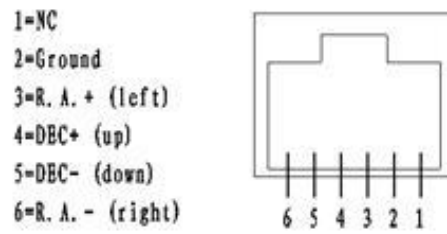


Figure 3. ST-4 Compatible Guiding Port Wiring

Ports on the Dovetail Saddle:



Figure 4. Ports on dovetail saddle

- USB2.0: USB-C port for mount control
- DC12V 3A OUT: DC output (5521 socket, center positive)

2.4. HAE69C Mount Control

There are two ways to control an HAE69C mount:

1. Use an 8411 handset;
2. Use a PC/MacOS/Linux (including Pi) device to connect to the mount via USB-C port on the mount and control the mount using ASCOM/Commander or INDI drivers. A handset is not needed.

3. HAE69C Mount Assembly

HAE69 is operated under unbalanced condition and could be tipped over if tripod is not secured.

Step 1. Set up tripod

Carefully remove the mount from the carrying case. The HAE69 has a 150mm base. An optional LiteRoc tripod #8023ACC or a tri-pier #8034 may be used. Setup and level the tripod. Adjust the tripod height. Tighten tripod locking knob to secure the tripod. Remove the **Alignment Peg** from the mount base and threaded it onto the tripod head, on top of a tripod leg or between two legs depending on the latitude. The two outside threaded holes are used for securing the mount head using Azimuth Locking Screws.

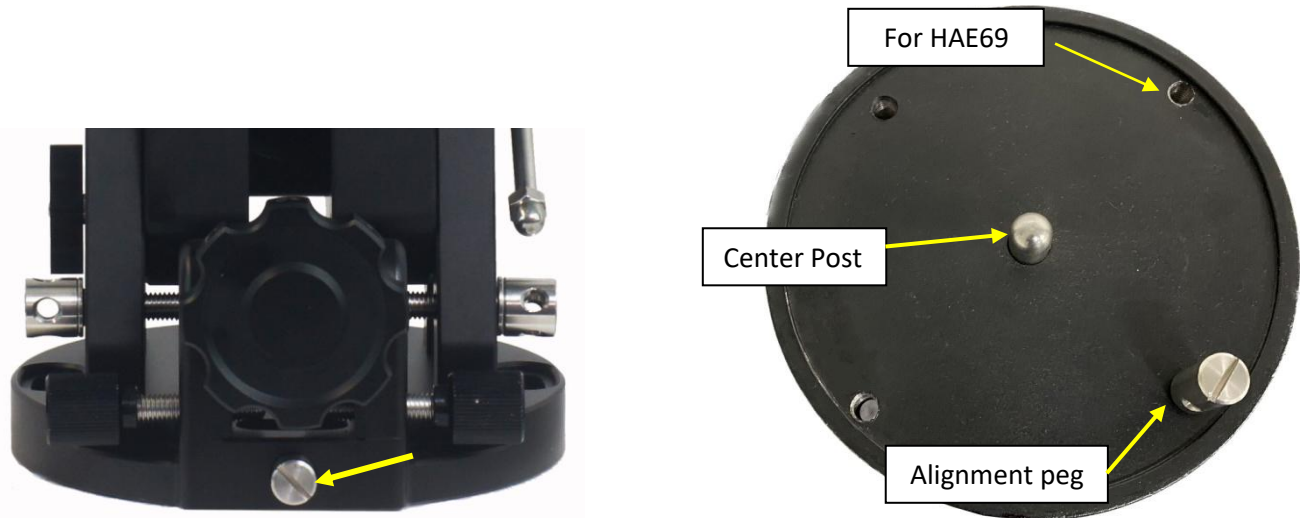
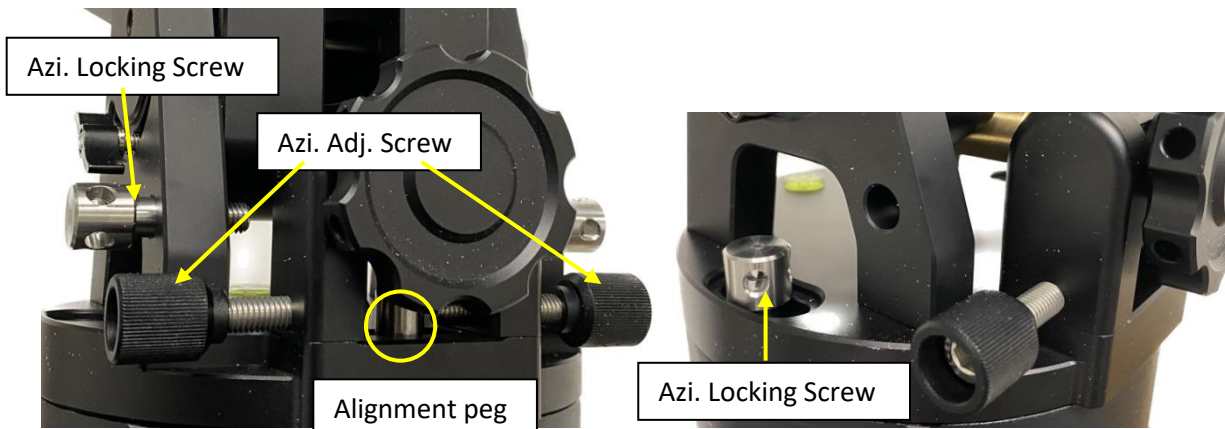


Figure 5. LiteRoc tripods

Step 2. Attach mount head

Remove the mount from the package. Retract the 2x Azimuth (Azi) Adjustment Screws from both sides to leave ample space for the alignment peg to be fitted in between the 2x Azi Adj. Screws. Remove the 2x Azi Locking Screws from the mount base and insert them into the opening next to Azi Adj. Screw. Secure the mount head by tightening the Azi Locking Screws into the M8 holes on the tripod. An Allen wrench is stored in the EQ base if needed.



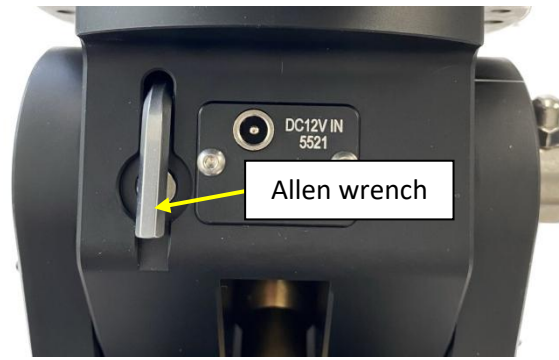


Figure 6. Attach the mount

Level the mount by adjusting the tripod legs. Use the build-in Bubble Level Indicator on the mount base or an external leveler for this purpose.

Step 3. Adjust latitude

The HAE69 mount has three latitude range settings: 0°~34°, 28°~62° and 56°~90°. The default position is 28°~62°.

To adjust the latitude, loosen both the Primary and Auxiliary Alt. Locking Lever on the RA base. Use the Altitude Adjustment Knob to move the mount to the desired latitude by aligning the scale to the Latitude Mark line. Tighten both Primary and Auxiliary Locking Lever. There are holes on the Altitude Adjustment Knob. An Allen wrench may be inserted for increased adjustment torque, if needed.

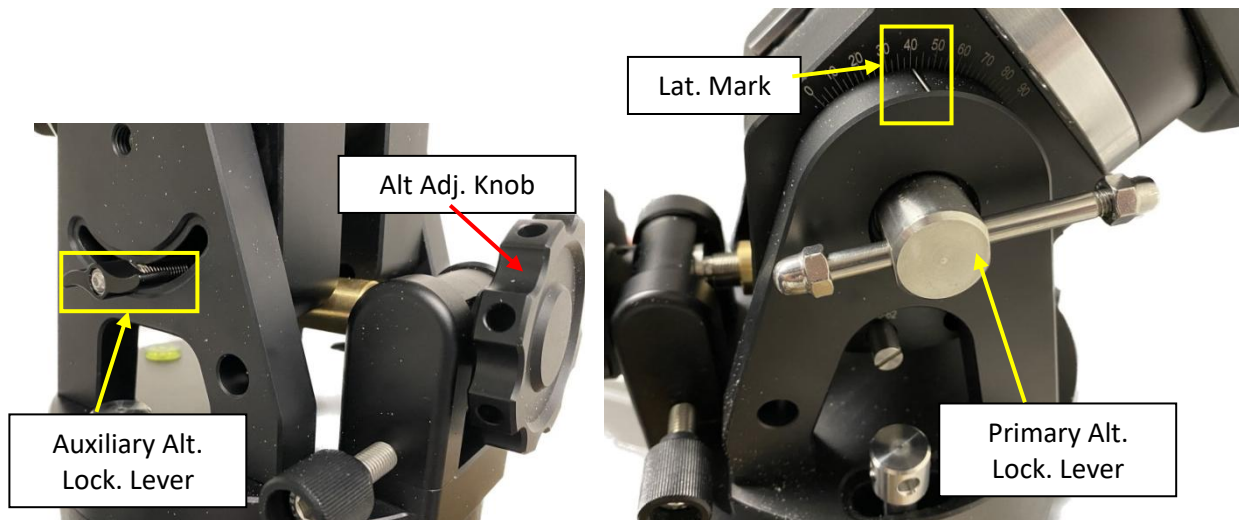


Figure 7. HAE latitude adjustment

If your latitude is out of the 28°~62° latitude range, you may switch the range as following (from: 28°~62° to 56°~90°)

1. Remove any payload from the mount. Loosen Altitude Locking Levers.
2. Adjust the mount latitude so both ranges can be seen inside the RA base.

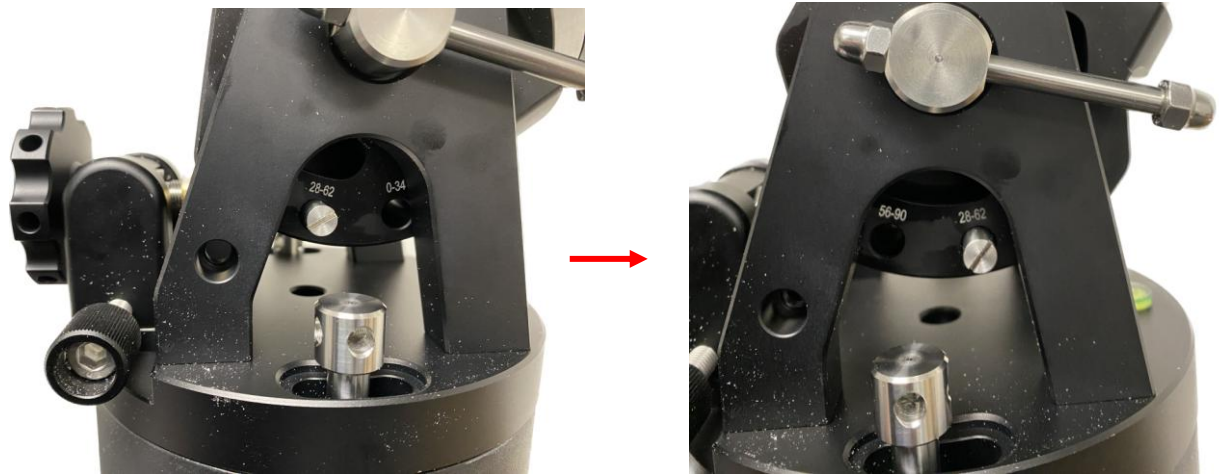


Figure 8. HAE69 latitude range switching

3. Remove Latitude Range Locking Bolt

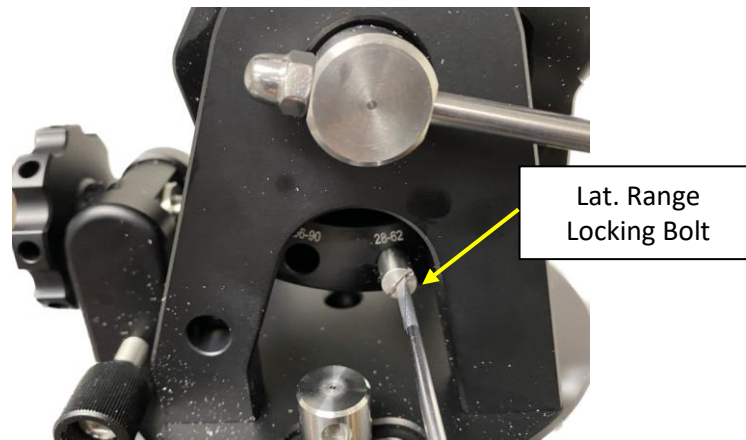


Figure 9. Remove latitude range locking bolt

4. Adjust the mount so that the hole on the brass Latitude Adjustment ball are aligned to 56°~90°



Figure 10. Adjust mount and align the range holes

5. Insert Locking Bolt into 56°~90° and fine adjust the Latitude Adjustment Knob so the bolt will go through the brass ball and threaded into the hole on the other arm of the RA base.

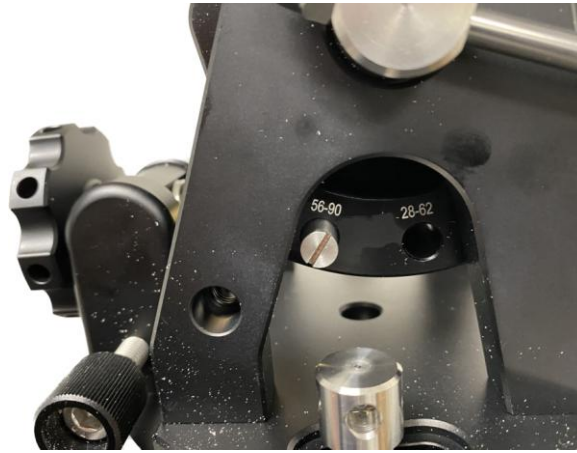


Figure 11. Secure the bolt

6. Tighten the Range Locking Bolt. Now you can adjust the mount between 56° ~ 90°

To use the mount near equator, set it to 0° ~ 34° . To use the mount at AA mode, use the range 58° ~ 90° .



Figure 12. An HAE69 mount set for equator (0° , left) and altazimuth (90° , right)

Step 4. Install telescope

HAE69 is equipped with a Vixen/Losmandy-D dual dovetail saddle. It accepts a Vixen or a Losmandy-D dovetail mounting bar. Release the dovetail Saddle Locking Screws and slide the telescope dovetail plate into the. Make sure that the arrow sign on the saddle is pointing forward. Tighten the Saddle Locking screws. Double check the scope to make sure it is installed securely!

Step 5. Install counterweight bar and CW:

The mount is designed to operate without a counterweight (CW). If you want to use an optional CW, the CW shaft mounting hole is 3/8"-16 threaded. Thread in a CW shaft and install a 10 lbs CW.



Figure 13 Install CW shaft and a 10lbs CW

Step 6. Install optional iPolar

An HAE69 may use an external iPolar™ electronic polar scope. Just place the iPolar over the bubble level on top of the mount and secure the thumb screws. Make sure that the arrow key is facing upward.



Figure 14. Install an external iPolar on an HAE mount

Refer to iPolar Operation Manual from iOptron's website to perform the polar alignment:
https://www.ioptron.com/v/manuals/3339_iPolarOperationManual.pdf.

The steps are briefly outlined below:

- Download and install iPolar Software (first time use)
https://www.ioptron.com/v/firmware/3339_iOptron_iPolar.exe;
- Connect a miniUSB cable between the iPolar USB port and a computer USB port;
- Click Connect and start polar alignment by following onscreen instructions.

Step 7. Install optional iGuider (EQ mode only)

There are two sets of 2XM3 threaded holes on the side of the dovetail saddle for mounting an iOptron mini autoguiding system, iGuider 1. Refer to iOptron website for more information on #3360.



Figure 15. iGuider mini-autoguiding system

Step 8. Set the mount in AA mode

An HAE mount can be set as either EQ or AA mode. To set the mount to operate in AA mode:

1. Switch the latitude range to 56°~90°.
2. Adjust the mount latitude to 90 degree by following **Step 3**.
3. Level the mount by adjusting the tripod legs to center the air bubble inside the spirit level. You may slew the mount in AZI direction to check the leveling, during which the air bubble should stay inside the small circle or stay at the same place.



Figure 16. Bubble level for AA mount leveling

4. Adjust/Slew the mount via a handset/Commander/software so that the telescope is pointing to Zenith and dovetail saddle is facing the WEST.
5. **Set the mount to AA mode via Commander or optional handset.**

4. HAE69C Mount Operation via an 8411 Handset

4.1. Go2Nova[®] 8411 Handset

A HAE69C mount can be operated via a Go2Nova[®] 8411 handset, as shown in Figure 17. It has an 8-line large OLED display screen function, direction, and number keys on the front; and an HBX (6-pin) and a USB port (C-type) at the bottom.



Figure 17. Go2Nova[®] 8411 handset

4.1.1. 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 R.A. 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 (1: 1X; 2: 2X; 3: 8X; 4: 16X; 5: 64X; 6: 128X; 7: 256X; 8: 512X; 9: MAX)
- 0 Key: Stop the mount during GOTO. Also toggling between starting and stopping tracking.
- ? Key:
 - Identify and display bright stars or objects that the telescope is pointing to;
 - When on main menu, press and hold ? to turn on/off handset reading light;
 - Press and hold ? during power on to show language selection menu

- HBX (Handbox) port: connect the HC to a mount using a 6P6C RJ11 cable.
- USB port: connect the HC to a computer for firmware upgrade and computer control.

4.1.2. The Display

The 8411 handset has a large 8-line, 21-character per line OLED display, which displays all the information as shown in Figure 18. The user interface is simple and easy to operate.

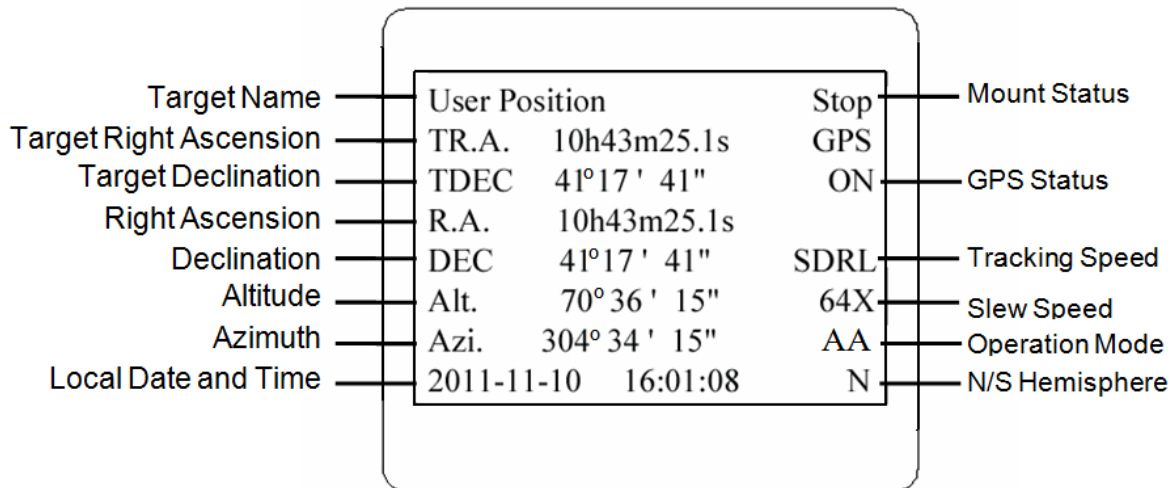


Figure 18. an 8411 handset display

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;
 - **Zero Position:** Mount is at Zero Position. When set the mount at Zero Position physically, the handset should display the same.
2. GPS Status: Indicates if there is GPS or GPS is connected to the satellite. If a mount does not have a GPS, the GPS status will be always OFF.
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 0°, east 90°, south 180°, and west 270°).
6. Altitude: Altitude of the telescope (degrees vertical from the local horizon - zenith is 90°).
7. Mount Status: Display current operation status of the mount.
 - Stop: mount is not moving;
 - Slewing: 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;
 - Guiding: mount is under autoguiding.
8. 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.
9. Slew speed: It has 9 speeds: 1X, 2X, 8X, 16X, 64X, 128X, 256X, 512X, MAX.
 10. Current Time: display local time in a format of HH:MM:SS.

4.2. Install and Check the Handset Battery

The handset uses a button battery to keep the Real Time Clock running. The battery is a CR2032 Lithium battery, which is not included due to shipping restrictions.

Open the HC back cover with a good, size 1 (4mm) Phillips Screw Driver. With battery + sign facing up, slide the battery under two small metal hooks on the positive side first. Then push the battery down to make a good contact. Make sure that two spring contacts on the negative side are underneath the battery. If none of the metal pins in battery holder can be seen after battery is installed, the battery is not installed properly.

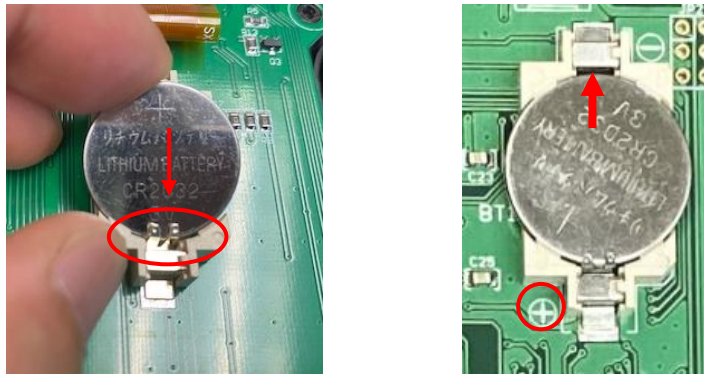


Figure 19. Install a CR2032 battery

If the handset can't display the correct date and time, most likely the battery is installed wrong, or power is low and needs be replaced.

4.3. Connect DC power and handset

Plug the 8411 handset into mount HBX port. Plug DC12V power into DC12V IN on mount base. Flip the ON/OFF power switch to turn on the mount.



Figure 20. Connecting handset and 12V DC power

Press an arrow key to slew the mount and press a number key to change the slew speed.

4.4. Setup Handset

An HAE69 mount does not equip with a GPS receiver. Hence one needs to manually enter the GPS location.

To set up the controller, turn the mount power ON. Press **MENU**=> **“Settings”**:

```
Select and Slew
Sync. to Target
Alignment
Settings
Park Telescope
Edit User Objects
Firmware Information
Zero Position
```

Press **ENTER** and select **“Set Time and Site”**

```
Set Time and Site
Set Beep
Set Display
Set Maximum Slew Rate
Set Guiding Rate
Set Parking Position
Set Tracking Rate
Meridian Treatment
```

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

```
Daylight Saving Time Y ← Daylight Saving Time
UTC -300 Minute(s)
2019-03-09 10:19:18

Longitude:W071d08m50s
Latitude: N42d30m32s

Northern Hemisphere
```

Set Local Time

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 handset 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 “-”. When the time information entered is correct, 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). Instead please select “Y” for DST when daylight saving time begins.

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

Set Observation Site Coordinate

The fifth and sixth 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.

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 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 N47°31'48”:
 $47.53^{\circ} = 47^{\circ} + 0.53^{\circ}$,
 $0.53^{\circ} = 0.53 \times 60' = 31.8'$, $0.8' = 0.8 \times 60'' = 48''$. Therefore, $47.53^{\circ} = 47^{\circ}31'48''$ or 47d31m48s.

Select N/S Hemisphere

The northern/southern hemisphere will be determined by your latitude coordinate, with one exception. If you are near the equator (within +/- 10°), you can choose your own N/S setting.

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”.

The site information is stored inside the memory chip of the handset and the main board. If you are not traveling to another observation site, they do not need to be changed.

4.5. Zero Position

The **Zero Position** is the mount GOTO reference. Without set the mount zero position properly, it may cause large GOTO error or even cause the scope to hit the tripod leg. The simplest way to find the mount Zero Position of the EQ mode is using the zero position sensors. Press **MENU=>Zero Position =>Search Zero Position**, then press **ENTER**.

The Zero Position of an EQ mount is defined as the telescope being on top of the mount head and pointing to the North Pole (in northern hemisphere), with CW shaft mounting hole pointing to the ground. If one would like to register the Zero Position manually, power on the mount and use handset to slew the mount to Zero Position. Press **MENU=>Zero Position =>Set Zero Position**. Press **ENTER** to confirm.

The Zero Position for the alt-azimuth mode is defined as Level-South-Zenith. Make sure that the mount is leveled, telescope points to Zenith and the dovetail saddle is facing WEST. And the HC is set at AA mode.

4.6. Perform Polar Alignment (EQ mode)

BrightStar Polar Alignment

BrightStar Polar Alignment allows you to perform coarse polar align the mount even if you cannot view the Celestial Pole.

- (1) Level the mount and set it to the Zero Position. Align the telescope to the R.A. axis of the mount. If a finder scope is used, adjust it to be parallel to the telescope optical axis.
- (2) Use the HC (**MENU => "Alignment" => "Polar Iterate Align"**) to display the azimuth and altitude position of several bright stars near the meridian. Select one that is visible at a high altitude as Alignment Star A. Follow the HC instruction to move Alignment Star A to the center of the eyepiece using a combination of the Latitude Adjustment Knob and the "◀" or "▶" buttons. Press **ENTER** to confirm when the star is centered. Next, select a bright star that is close to the horizon as Alignment Star B. Center it using the Azimuth Adjustment Knob and the "◀" or "▶" button (*the "▲" and "▼" buttons are not used here*). Press **ENTER** to confirm the settings.
- (3) The telescope will now slew back to Alignment Star A. Repeat the steps above. The iteration can be stopped when it is determined that the alignment error has been minimized. Press the **BACK** button to exit the alignment procedure.

NOTE: It is highly recommended to use an eyepiece with an illuminated crosshair for accurate centering.

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

Polar Alignment with Optional iPolar Electronic Polar Scope

An iPolar™ electronic polar scope can be mounted onto the HAE69C mount. To perform polar alignment, please refer to online **iPolar Operation Menu**. It is simple and fast. Steps are briefly outlined below:

- Download and install iPolar Software (first time use)
- Connect a USB cable between the mount and a computer USB port
- Start polar alignment by following on screen instructions

Polar Alignment Software

There is software available for polar alignment, such as PHD2 guiding, TheSky software, PemPro, KStars/Ekos or Alignmaster.

4.7. Go To a Celestial Object

Press **MENU=> "Select and Slew"** to perform the GOTO. Select a category, in this example "**Solar System**", and then select an object of interest, in this case "**Moon**". Press **ENTER** and the telescope will slew to the moon and automatically start tracking. If the target is not centered in your eyepiece, use the arrow keys to center it. Then use **MENU => "Sync to Target"** for better performance.

Any object with a "◊" symbol next to it is currently below the horizon and the mount will not slew to it.

4.8. Complete Function of a Go2Nova® 8411 Handset

NOTE: Some functions may not be available depending on mount operation mode.

4.8.1. 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® 8411 handset for HAE mount has a database of over 212,000 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 handset.

4.8.1.1. Solar System

There are 9 objects in the Solar system catalog.

4.8.1.2. 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.
- Messier Catalog: consists of all 110 Messier objects.
- NGC Catalog: consists of 7,840 objects in NGC catalog.
- IC Catalog: consists of 5,386 objects in IC catalog.
- UGC Catalog: consists of 12,921 objects.
- Caldwell Catalog: consists of 109 objects.
- Abell Catalog: consists of 4076 objects.
- Herschel Catalog: consists of 400 objects.

4.8.1.3. Stars:

- Named Stars: consists of 259 stars with their common names. They are listed alphabetically. A list is included in Appendix.
- Binary Stars: consists of 208 binary stars. A list is attached in Appendix.
- Hipparcos Catalog: the new HIP catalog consists of 120,404 records (2008).

4.8.1.4. Constellations

This catalog consists of 88 modern constellations with their names. They are listed alphabetically.

4.8.1.5. Comets

This catalog contains 15 comets.

4.8.1.6. Asteroids

This catalog contains 116 asteroids.

4.8.1.7. User Objects

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

4.8.1.8. Enter R.A. DEC

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

4.8.2. 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.

"**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.

4.8.3. Alignment

4.8.3.1. Pole Star Position

This function displays the position of the Pole Star for **Quick Polar Alignment** using the iOptron® AccuAlign™ polar scope. In the Northern Hemisphere the position of Polaris is displayed, while in the Southern Hemisphere the position of Sigma Octantis is shown.

4.8.3.2. Polar Iterate Align

This alignment method allows you to polar align the mount even if you cannot view the Celestial Pole. Press the **MENU** => "**Alignment**" => "**Polar Iterate Align**". The HC will display a list of bright alignment stars near the meridian as Alignment Star A. Follow the HC instructions to move Alignment Star A to the center of the eyepiece using a combination of the Latitude Adjustment Knob and the "◀" and "▶" buttons. Press **ENTER** to confirm the settings. Next, select a bright star that is close to the horizon as Alignment Star B. Center it using the Azimuth Adjustment Knobs and the "◀" and "▶" buttons (*the "▲" and "▼" buttons will not function*). Press **ENTER** to confirm the settings.

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

NOTE: It is highly recommended to use an eyepiece with illuminated crosshairs for accurate centering.

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

4.8.4. Settings

4.8.4.1. Set Time and Site

Refer to 4.4 Set up Handset.

4.8.4.2. Set Beep

The handset 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 Maximum Slew Rate
Set Guiding Rate
Set Parking Position
Set Tracking Rate
Meridian Treatment
```

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.

4.8.4.3. Set Display

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

```
Set Time and Site
Set Beep
Set Display
Set Maximum Slew Rate
Set Guiding Rate
Set Parking Position
Set Tracking Rate
Meridian Treatment
```

Use the arrow keys to adjust the display contrast (**LCD contrast**) and keypad's backlight intensity (**Key light**).

4.8.4.4. Set Maximum Slew Rate

This function will help the mount to slew properly under low temperature or extreme payload condition (extra long or large diameter scope). Press **MENU** => **"Settings"** => **"Set Maximum Slew Rate."** You can select one of three slew rates. The default is MAX.

4.8.4.5. Set Guiding Rate

This is an advanced function for autoguiding when a guiding camera is utilized either via a Guide Port or using the ASCOM protocol. Before autoguiding, align the polar axis carefully. Select an appropriate guiding speed. The latest firmware allows you to set the R.A. and DEC guiding speed differently. The R.A. guiding speed can be set between $\pm 0.01X$ to $\pm 0.90X$ sidereal rate. The DEC guiding speed can be set between $\pm 0.10X$ to $\pm 0.99X$ sidereal rate. Follow the instructions of your autoguiding software for detailed guiding operation. The default number is 0.5X.

The guide port wiring is shown in **Figure 3**, which has the same pin-out as that from Celestron / Starlight Xpress / Orion Mount / Orion/ QHY/ZWO autoguider camera.

If you have an autoguider which has a pin-out 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. It will damage the mount or guiding camera electronics.

4.8.4.6. Set Parking Position

You may park the telescope before powering off the mount. This is very useful if the mount is on a permanent pier or the mount will not be moved in between observation sessions. The mount will keep all the alignment info and reference points.

There are five parking positions. Two positions that park the scope horizontally (**Horizon Position**). Two positions that park the scope vertically (**Zenith Position**). "**Current Position**" will park the scope at its current position. When the mount is turned on, it will use the last parking position setting as the default setting.

4.8.4.7. Set Tracking Rate

You can set up the mount tracking rate by selecting "**Set Tracking Rate**". Then the user can select "**Automatic Rate**" to let the mount choose a proper Solar/Luna/Sidereal tracking rate based on the GOTO target. The "**User defined speed**" can be adjusted from 0.9900X to 1.0100X of sidereal.

4.8.4.8. Meridian Treatment

This function tells the mount what to do when it tracks past the meridian. You can tell the mount if it needs a meridian flip and when to do it.

- "**Set Position Limit**" will tell the mount when to stop tracking or to do a meridian flip. The limit can be set at from 0° to 15° (60 minutes) past meridian.
- "**Set Behavior**" will determine if the mount will stop tracking or perform a meridian flip at the set position limit.

4.8.4.9. Set Altitude Limit

This function allows the mount to keep tracking an object even if it is below the horizon but can still be seen, for example from an elevated observation site, such as a hill. The range can be set from -89° to +89°. The default limit is 00°. **Be careful when setting this limit.** It may cause mount GOTO problems.

4.8.4.10. Wi-Fi Options

This function will display Wi-Fi module functions:

```
Wireless Status
Restart
Restore to factory
```

- **Wireless Status:** displays WI-Fi network current status
 - SSID: is HAECser_XXXXXX
 - IP: IP: 010.010.100.254
 - Port: 08899
 - MAC: XX-XX-XX-XX-XX-XX
- **Restart:** restart the network adapter
- **Restore to Factory:** restore the factory network setting

4.8.4.11. Set RA Guiding (EC mount Only)

You can turn off R.A. guiding by selecting “**Filter R.A. Guiding**” to allow the high precision encoder to correct the tracking error, or turn the R.A. guiding on by selecting “**Allow RA Guiding**” to allow the mount to receive guiding corrections from the autoguiding software.

4.8.4.12. Language

Select one of supported menu languages. Currently it has English and Chinese.

4.8.4.13. Enable CW Up Position

This setting will allow the CW moving to an up position. The upward angle limit is same as the meridian flipping setting, or 20 degree at maximum. When this set is enabled, the mount will GOTO past the meridian if an object is close to the meridian, within the angle limit. There will be no meridian flip when past the meridian.

4.8.4.14. Enter AA/EQ Mode

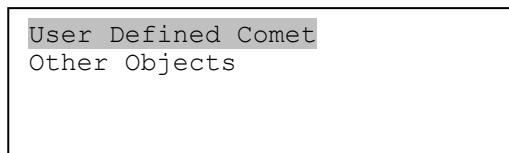
This setting will switch the mount between AA/EQ mode.

4.8.5. Edit User Objects

Besides various star lists available in the handset, 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.

4.8.5.1. Enter a New Comet

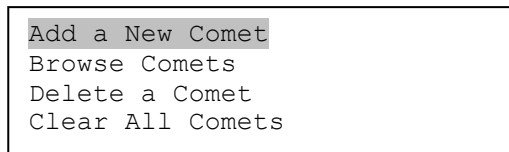
Press **MENU** => “**Edit User Objects**” to set user objects.



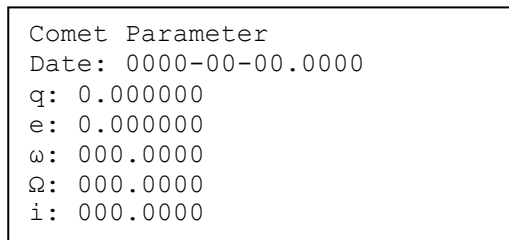
Select “**User Defined Comet**” to add/browse/delete the user-defined comet list. Find the orbit parameters of a comet in the SkyMap format. For example, the C/2012 ISON has an orbit parameter:

| 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 handset 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.

4.8.5.2. Enter Other Objects or Observation List

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

```
User Defined Comet
Other Objects
```

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

```
Add a New Object
Browse Objects
Delete an Object
Clear All Objects
```

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

```
Enter RA and DEC

RA      07h57m22.7
DEC     +90°00'00"
Alt     42°21'24"
Azi     000°00'00"
```

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.**"

4.8.6. Firmware Information

This option will display the mount type, firmware version information for the handset (HC), Main Board (Main), R.A. board (RA), and DEC board (DEC).

4.8.7. Zero Position

4.8.7.1. GoTo Zero Position

This moves your telescope to its Zero Position what the handset thinks it should be. At the end of move, the mount needs be adjusted if the mount is not at Zero Position physically.

4.8.7.2. Set Zero Position

This sets the Zero Position for the firmware.

The Zero Position reference may be an undefined value before the first time powering on the mount, after firmware upgrade, or HC battery replacement. You can use this function to set the zero position reference.

Press the **ENTER** button after moving the mount to Zero Position either manually or with the handset.

4.8.7.3. Search Zero Pos.

Select “**Search Zero Pos.**” and the mount will start to slew slowly and find the R.A. and DEC position to set the mount to the Zero Position. When the mount has found the Zero Position, the HC will ask if you want to calibrate the Zero Position. Press **ENTER** to confirm. Use the arrow button to adjust the mount in RA and DEC to correct the obvious discrepancy in the Zero Position. Alternatively, press **BACK** to cancel.

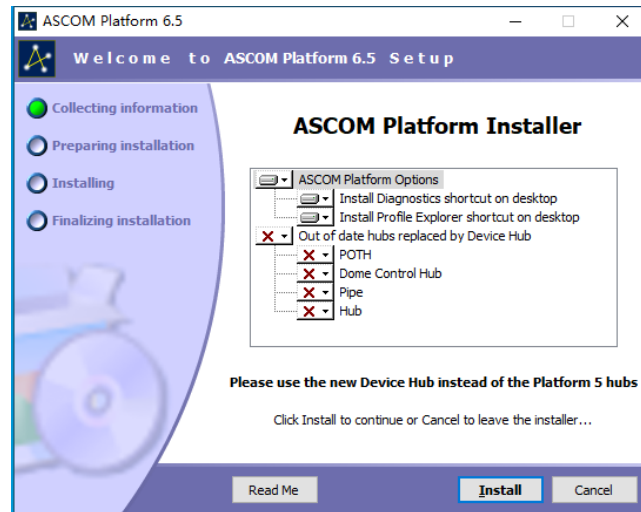
5. HAE69C Mount Operation via iOptron Commander

An HAE69C mount can also be operated by connecting to a Windows PC via ASCOM, a MacOS or Linux computer via INDI driver, or a single board computer like Pi. Connect the mount to a computer via the USB-C port on the mount base. Install drivers and software and you are ready to go. No handset is needed.

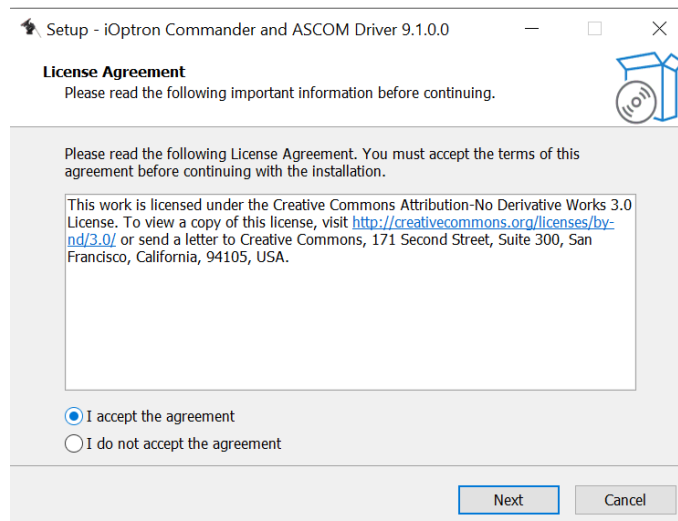
5.1. Download and Install ASCOM Platform and Commander

Here is an example on how to connect an HAE69C to a Windows PC using iOptron Commander/ASCOM driver. The software/firmware needed:

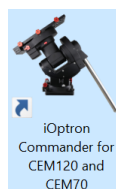
- Windows 7 /8.1 /10/11 64bit system with .NET Framework 4.8 installed. For Win10 and 11, make sure that .NET Framework 3.5 is activated.
- ASCOM Platform 6.6 or late version. Download and install it from <http://www.ascom-standards.org>;



- iOptron Commander and ASCOM Driver Installer 9.1 or later. Download and install it from the device product page.



After installation, you should see an iOptron Commander icon like this on your computer desktop.

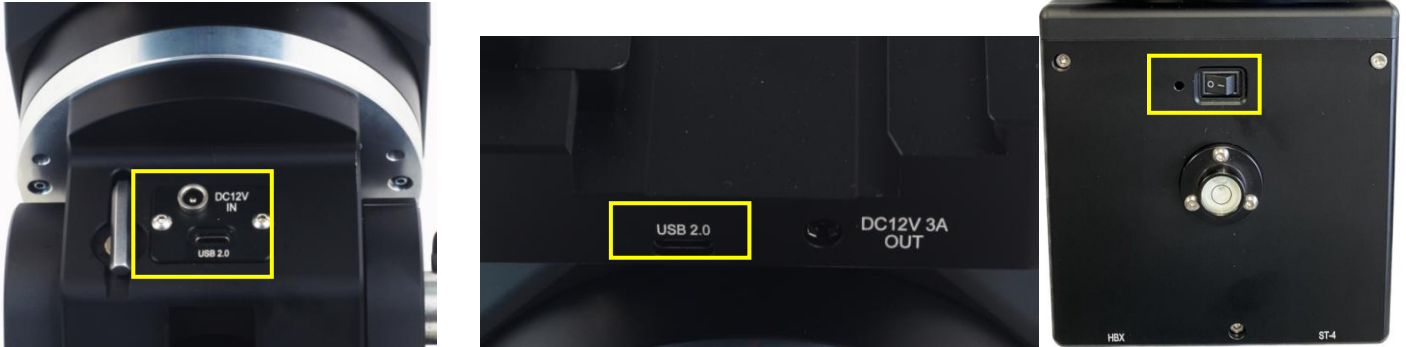



- Latest mount firmware

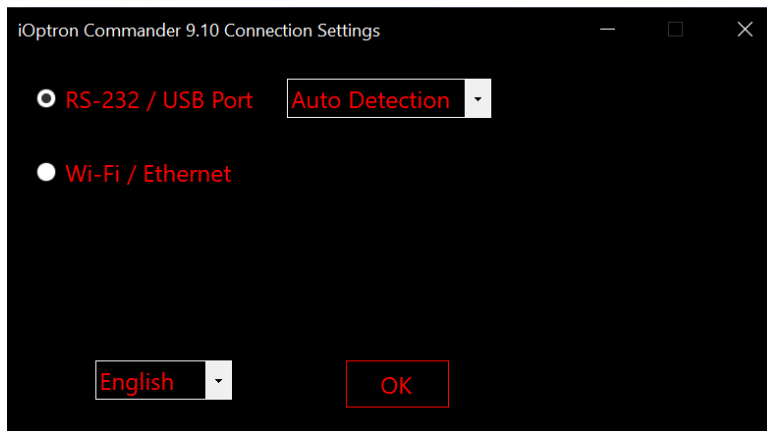
5.2. Connect HAE69C to a Computer

5.2.1. Connect the mount to Commander via USB-C port

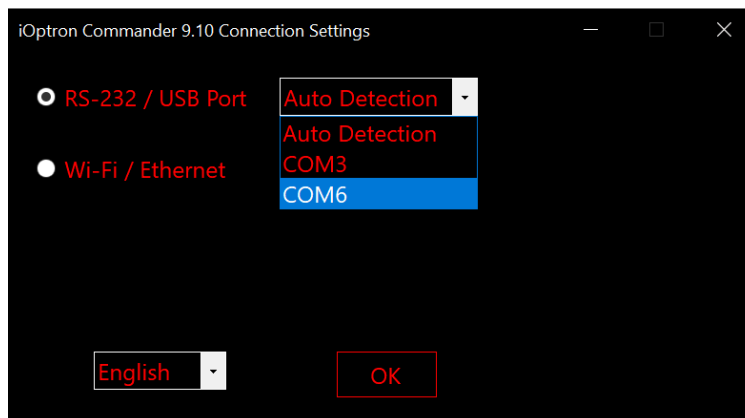
Plug a DC12V power into DC12V IN on mount base. Connect the USB 2.0 port on the base, or the USB 2.0 port on dovetail saddle, to a computer USB port via a USB-C cable. Flip the ON/OFF power switch to turn on the mount.



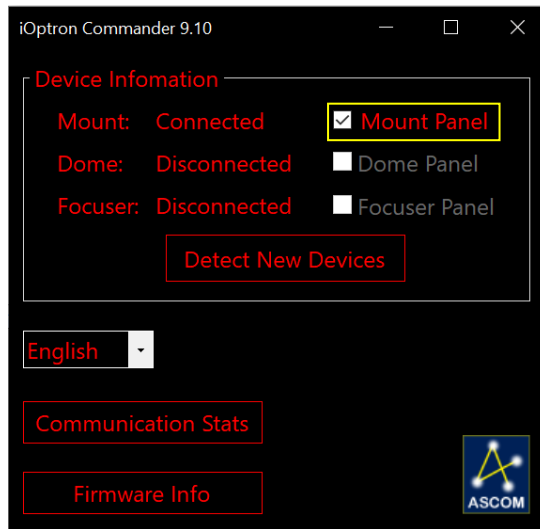
Click on iOptron Commander icon  on desktop to launch the Commander. An **iOptron Commander Connection Setting** window will open:



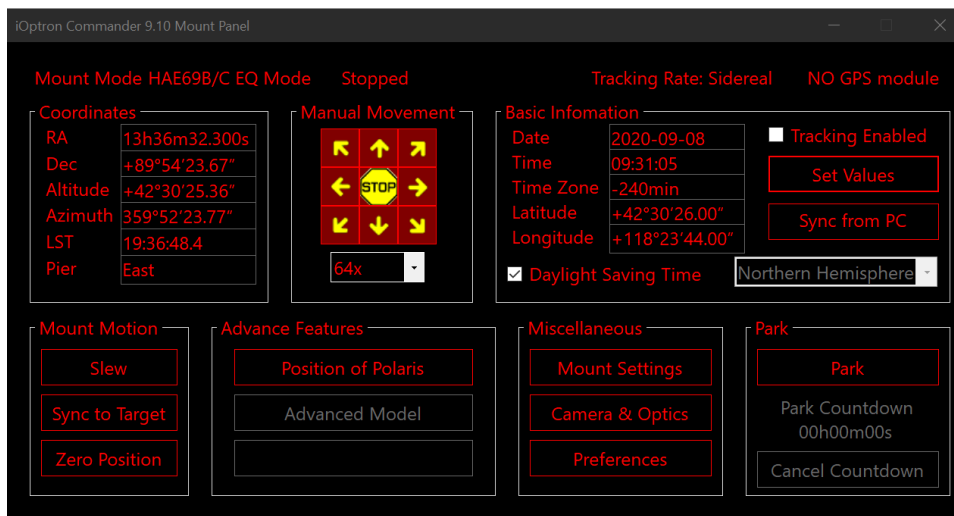
Select “**RS-232/USB Port**” with “**Auto Detection**”, or click on the RS-232/USB Port pull down menu to select a COM port manually. The COM6 is selected as shown below.



Click **OK** to connect. An iOptron Commander connection panel will display when the computer connected to the mount.



Check the mount panel to bring up the Commander.

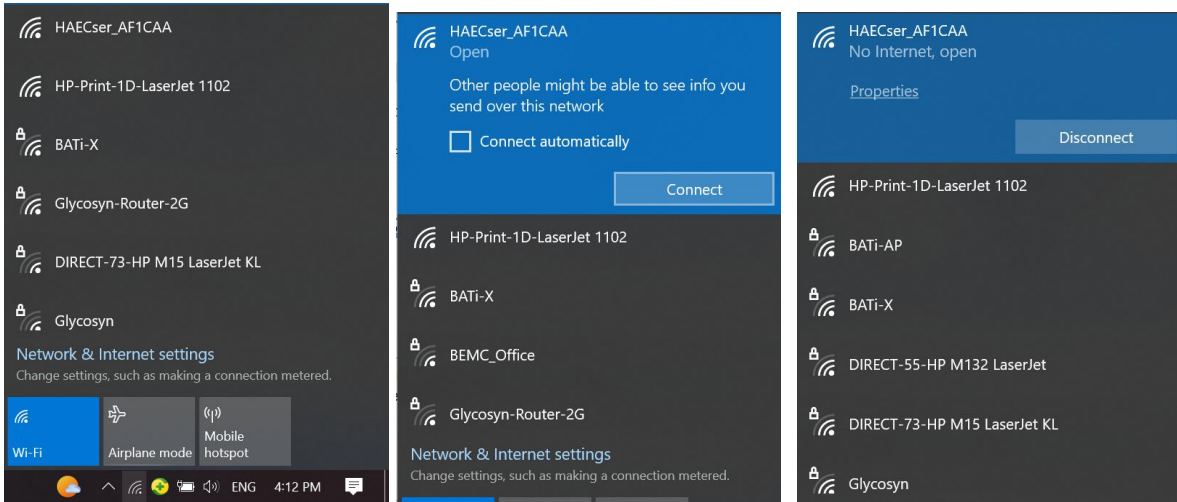



5.2.2. Connect the mount to Commander via Wi-Fi

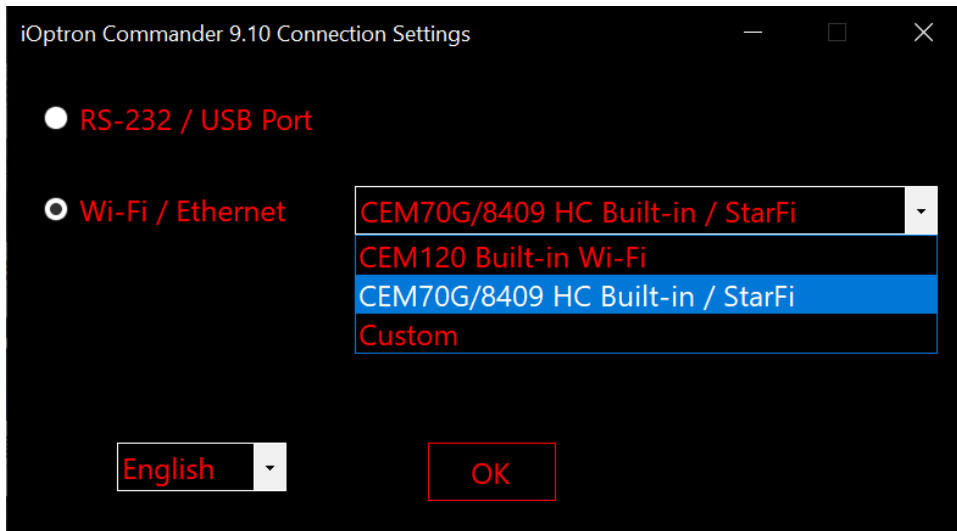
Thread Wi-Fi antenna onto coaxial base on the mount. Plug a DC12V power into DC12V IN on mount base. Turn the mount power on.



Click on the Wi-Fi sign located on right bottom corner of your computer to bring up Wi-Fi network menu. The Wi-Fi SSID for an HAE69C is in a form of HAECser_XXXXXX. Select the HAE69C Wi-Fi network, here is HAECser_AF1CAA. Click to connect to it.



Click on iOptron Commander icon  on desktop to launch the Commander. An **iOptron Commander Connection Setting** window will open. Select “**Wi-Fi/Ethernet**” and choose “**CEM70G/8409 HC Built-in/StarFi**” from pull down menu. Click **OK** to connect.

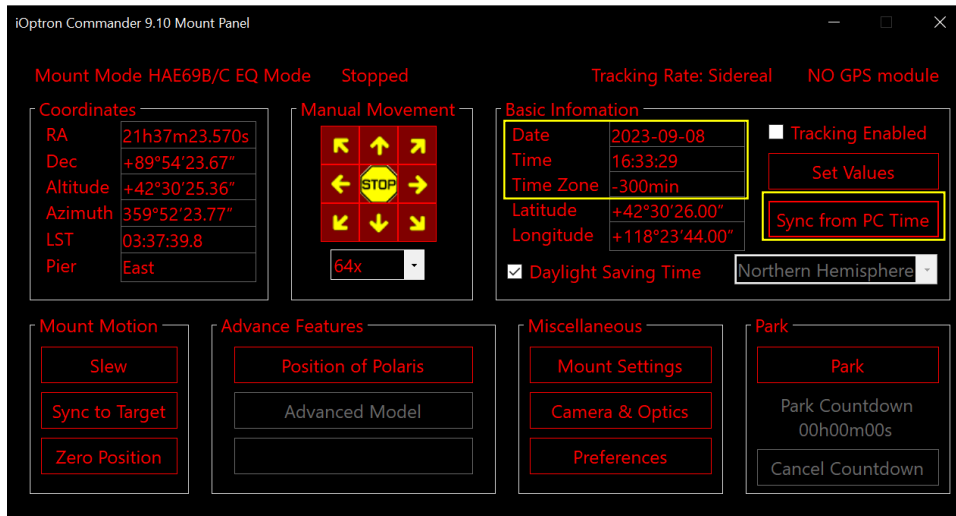


An iOptron Commander connection panel will display when the computer connected to the mount. Check the mount panel to bring up the Commander.

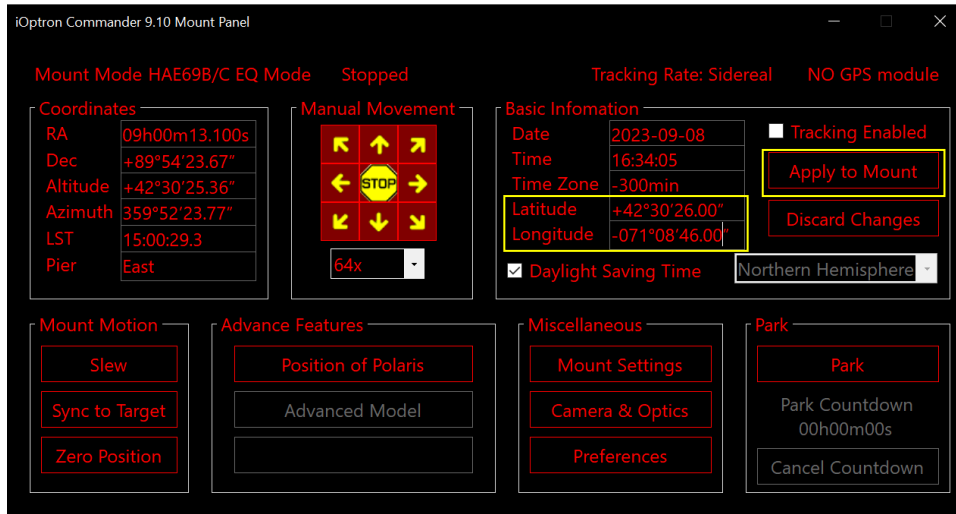
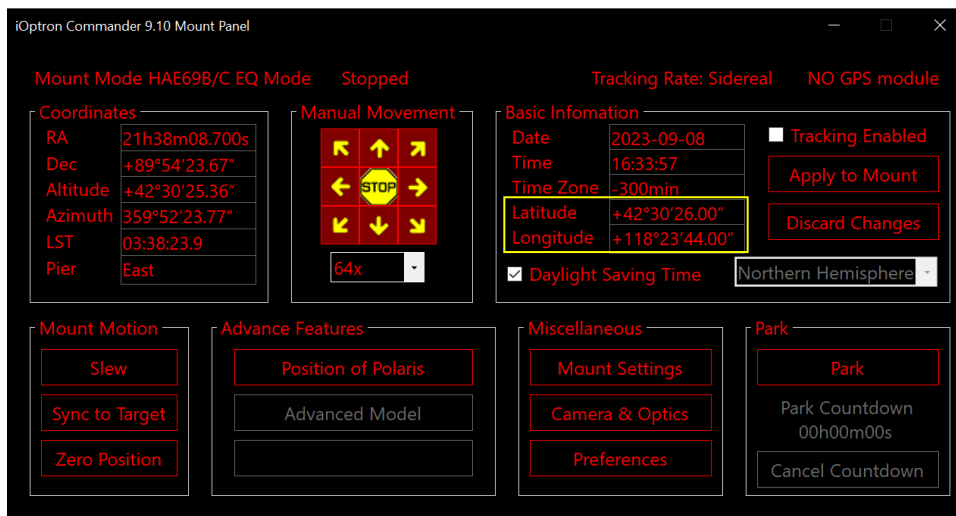
5.3. Use iOptron Commander

5.3.1. Set up Time and Site

Click on **Sync from PC** to set up the mount time.



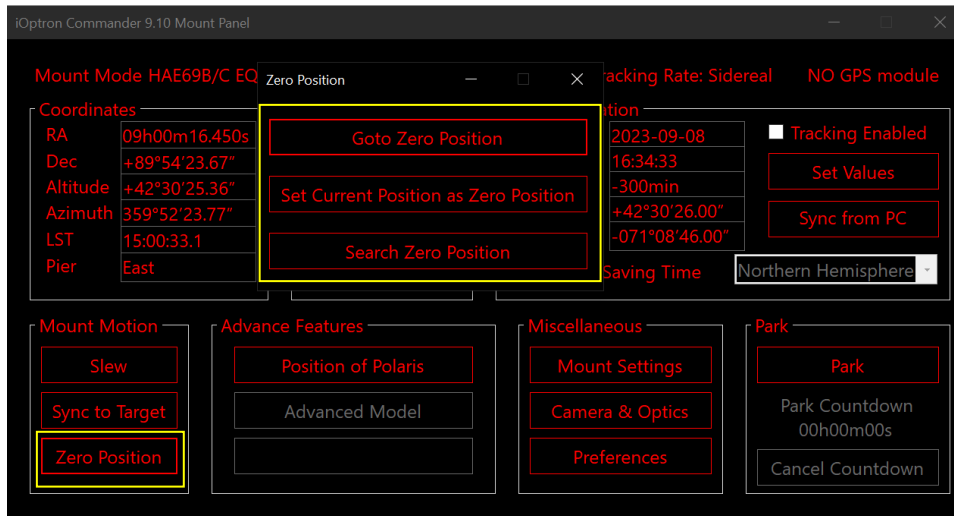
Click on **Set Values** to change GPS info, as well as Date and Time if needed.



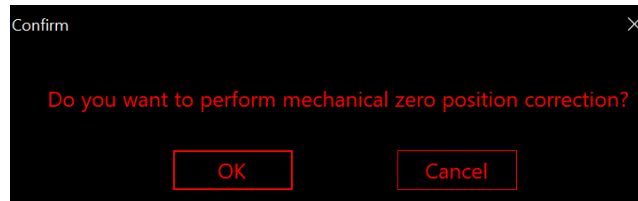
Click on **Apply to Mount** to save the changes.

5.3.2. Set Zero Position

Click on **Zero Position** to bring up **Zero Position** submenu.

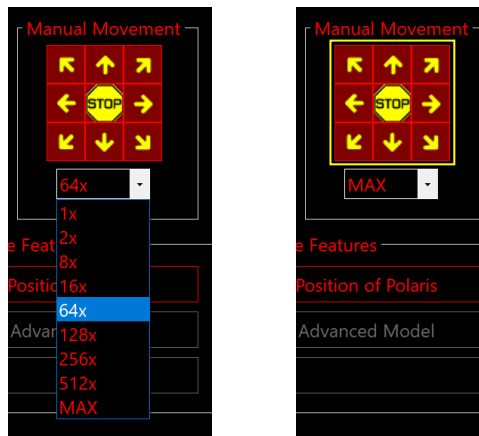


Click on **Goto Zero Position**. The mount will start searching the Zero Position. Check the mount RA and DEC position visually. Click **OK** if any adjustment is needed.



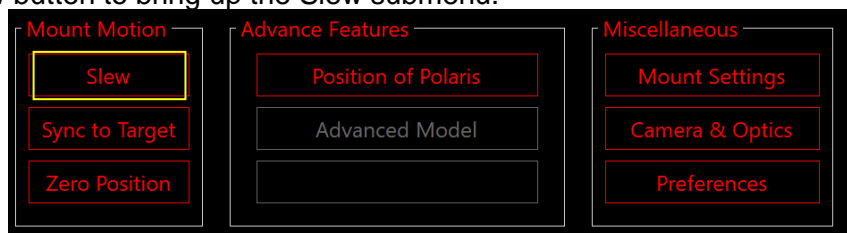
5.3.3. Move the Mount Manually

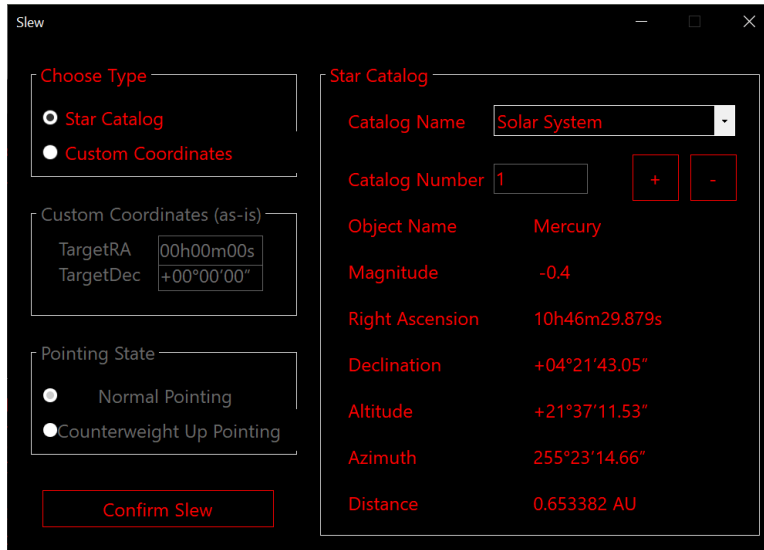
Click the speed selection pull down menu to choose a speed. Click on an arrow button to move the mount.



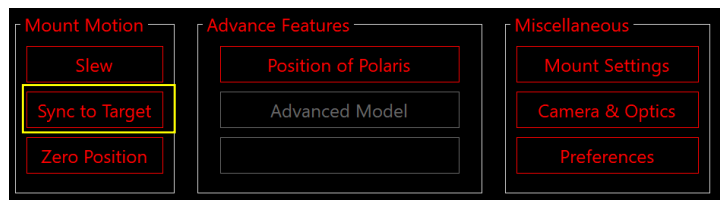
5.3.4. GoTo an Object

Click on Slew button to bring up the Slew submenu.



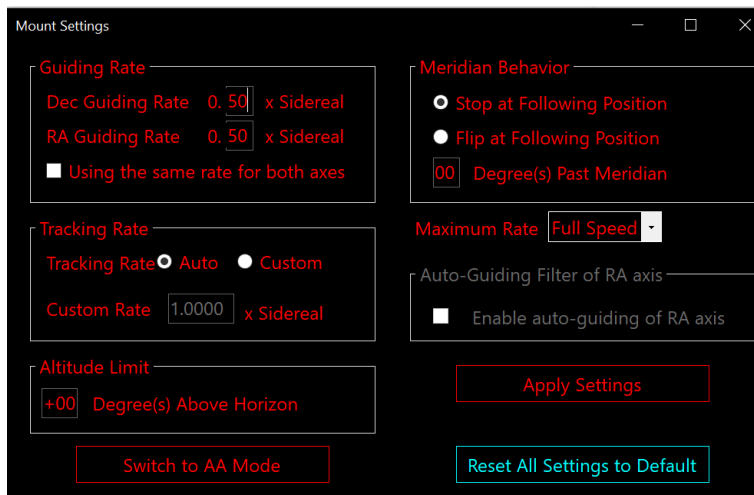
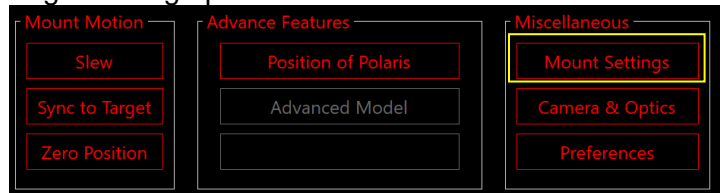


Select an object from Star catalog pull down menu and click on Confirm Slew. After the mount moving to the object, use an arrow key to center the object if it is not centered. Then click on Sync to Target.



5.3.5. Other Settings

Click on Mount Settings to bring up the submenu



Click on the parameters you would like to change and click on Apply Settings at the end of the process to save the changes.

6. Maintenance and Servicing

6.1. Maintenance

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 handset. Do not use solvent.

The real time clock battery in the handset needs be replaced if it can't keep the time after powering off the mount.

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

6.2. iOptron Customer Service

If you have any question concerning your mount, please contact the iOptron Customer Service Department. It is strongly suggested to send technical questions to support@ioptron.com for prompt response.

If the mount requires factory servicing or repairing, e-mail to 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 unnecessarily returning the mount for repair.

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



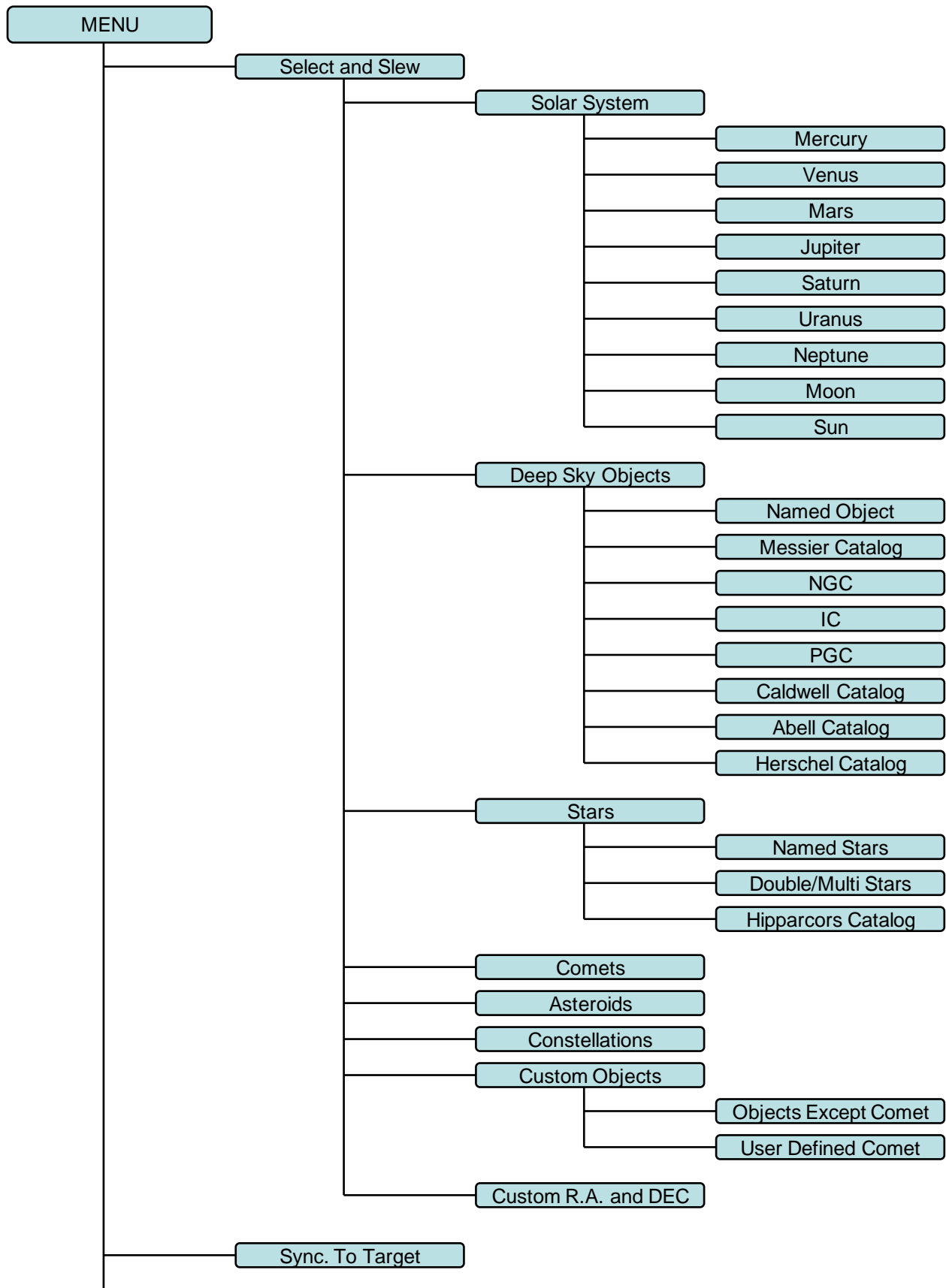
Battery Disposal- Batteries contain chemicals that, if released, may affect the environment and human health. Batteries should be collected separately for recycling, and recycled at a local hazardous material disposal location adhering to your country and local government regulations. To find out where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

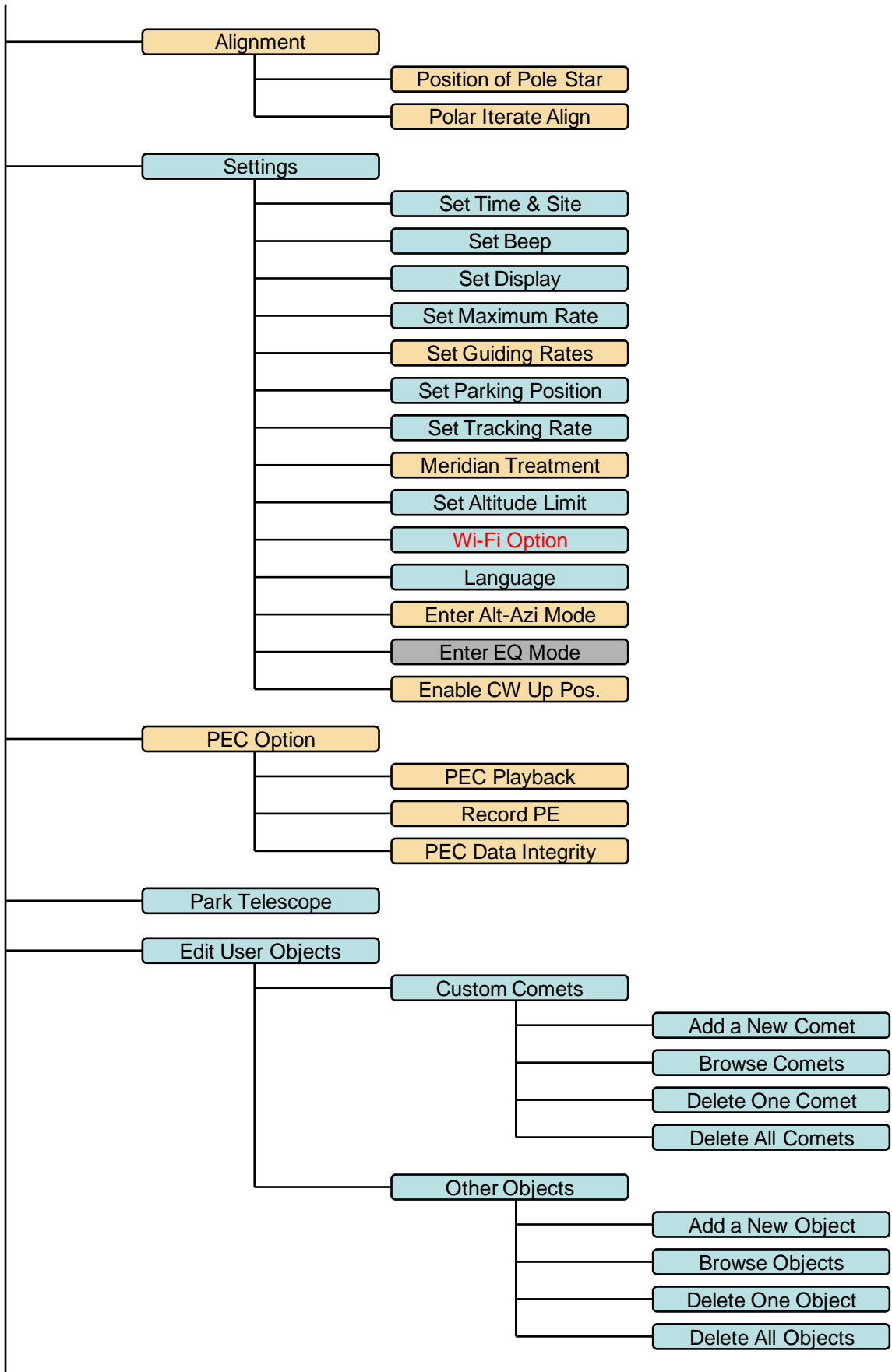
Appendix A. Technical Specifications

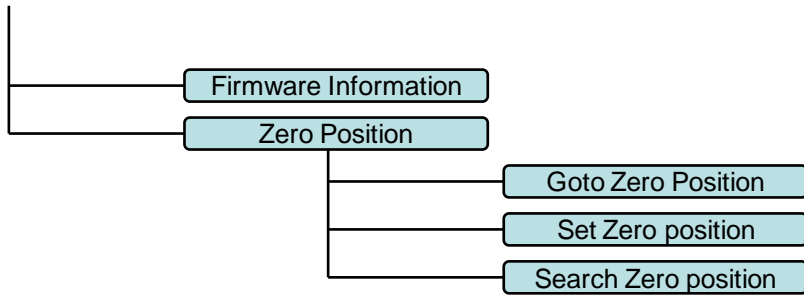
| Model | HAE69C and HAE69C EC |
|---------------------------|--|
| Mount | Strain Wave Gear Altazimuth/Equatorial Mount |
| RA/DEC gear system | StrainWave |
| RA reduction ratio | RA 800:1, DEC 800:1 |
| Payload w/o CW* | 69 lbs (31kg) |
| Mount weight | 19 lbs (8.6 kg) with dovetail saddle |
| Payload/Mount weight | 3.6 |
| Payload with CW | 79 lbs (36 kg) |
| Structure Material | All metal, CNC machined, Anodized |
| High precision encoder | Yes (RA, HAE69C EC only) |
| PEC | Realtime PEC (RPEC) (HAE69C EC only) |
| Period | 270 second |
| Drive motor | Stepper motor |
| Latitude adjustment range | 0° ~ 90° |
| Azimuth adjustment range | ± 8° |
| Polar Scope | External iPolar™ electronic polar scope (optional) |
| Level indicator | Level bubble |
| Control system | GOTONOVA/Commander |
| Handset | Go2Nova® 8411 w/OLED display (optional) |
| Tracking | Automatic |
| Speed | 1x,2x,8x,16x,64x,128x,256x,512x,MAX(4.5°/sec) |
| Power consumption | 1A(Tracking), 1.6A(GOTO) |
| AC/DC adapter | AC100V~240V input, DC12V-6A output (included, indoor use only) |
| Power off brake | Electronic friction brake |
| Ports on dovetail saddle | DC12V output (3A max.) and USB-C port |
| Communication port | Yes (USB and Wi-Fi) |
| Autoguide port | Yes (ST-4 compatible) |
| Firmware upgrade | Yes (USB via Windows) |
| Dovetail saddle | Vixen/Losmandy dual saddle |
| Base diameter | 152mm |
| Counterweight shaft | SS Φ20mmX200mm, 3/8-16 thread (optional) |
| Counterweight | 10 lb (4.5kg) (optional) |
| Tripod | Optional |
| Operation temperature | -20°C ~ 40°C |
| Warranty | Two year limited |

* Payload calculated with payload center of gravity to the RA rotation axis is 200mm.

Appendix B. Go2Nova[®] 8411 HANDSET MENU STRUCTURE







For both EQ and AA

EQ Only

AA Only

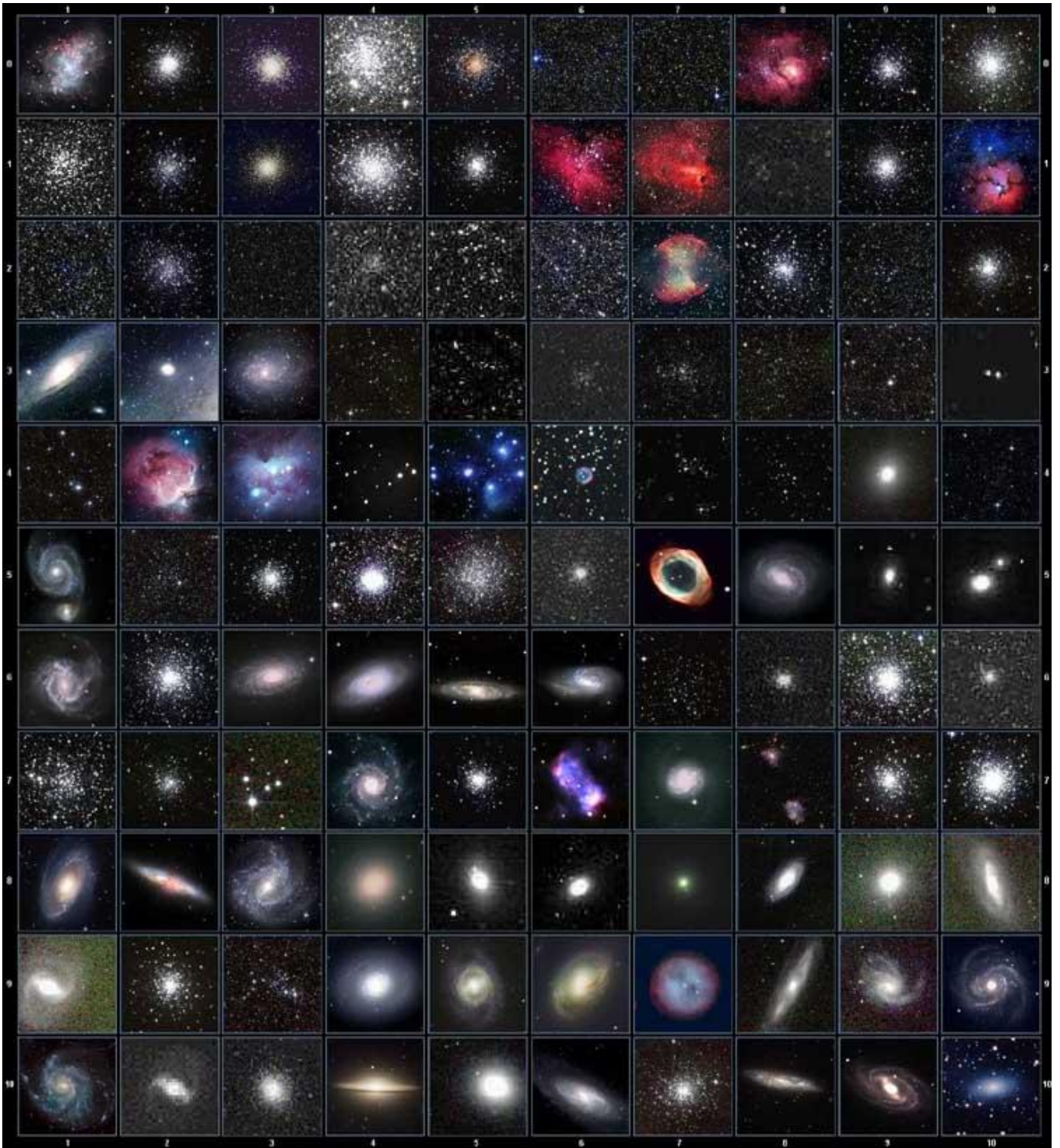
Available functions are mount specified.

Appendix C. Go2Nova[®] Star List

Named Deep Sky Object

| ID No. | OBJECT | ID No. | OBJECT |
|--------|---------------------------|--------|--------------------------|
| 1 | Andromeda Galaxy | 31 | Hind's Variable Nebula |
| 2 | Barnards Galaxy | 32 | Hubble's Variable Nebula |
| 3 | Beehive Cluster | 33 | Integral Sign Galaxy |
| 4 | Blackeye Galaxy | 34 | Jewel Box Cluster |
| 5 | Blinking Planetary Nebula | 35 | Keyhole Nebula |
| 6 | Blue Flash Nebula | 36 | Lagoon Nebula |
| 7 | Blue Planetary | 37 | Little Gem |
| 8 | Blue Snowball Nebula | 38 | Little Gem Nebula |
| 9 | Box Nebula | 39 | Little Ghost Nebula |
| 10 | Bubble Nebula | 40 | North American Nebula |
| 11 | Bipolar Nebula | 41 | Omega Nebula |
| 12 | Butterfly Cluster | 42 | Orion Nebula |
| 13 | California Nebula | 43 | Owl Nebula |
| 14 | Cat's Eye Nebula | 44 | Pelican Nebula |
| 15 | Cocoon Nebula | 45 | Phantom Streak Nebula |
| 16 | Cone Nebula | 46 | Pinwheel Galaxy |
| 17 | Cork Nebula | 47 | Pleiades |
| 18 | Crab Nebula | 48 | Ring Nebula |
| 19 | Crescent Nebula | 49 | Ring Tail Galaxy |
| 20 | Draco Dwarf | 50 | Rosette Nebula |
| 21 | Duck Nebula | 51 | Saturn Nebula |
| 22 | Dumbbell Nebula | 52 | Sextans B Dwarf |
| 23 | Eagle Nebula | 53 | Small Magellanic Cloud |
| 24 | Eight-Burst Nebula | 54 | Sombrero Galaxy |
| 25 | Eskimo Nebula | 55 | Spindle Galaxy |
| 26 | Flaming Star Nebula | 56 | Tank Track Nebula |
| 27 | Ghost of Jupiter | 57 | Trifid Nebula |
| 28 | Great Cluster | 58 | Ursa Minor Dwarf |
| 29 | Helix Nebula | 59 | Whirlpool Galaxy |
| 30 | Hercules Galaxy Cluster | 60 | Wild Duck Cluster |

Messier Catalog



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Named Star

| | | | | | | | |
|----|------------------|----|-----------------|-----|------------------------|-----|---------------|
| 1 | Acamar | 50 | Alrescha | 99 | Deneb el Okab | 148 | Lalande 21185 |
| 2 | Achernar | 51 | Alshain | 100 | Deneb Kaitos | 149 | Lesath |
| 3 | Achird | 52 | Altair | 101 | Denebakrab | 150 | Mahasim |
| 4 | Acrab | 53 | Altais | 102 | Denebola | 151 | Maia |
| 5 | Acrux A | 54 | Alterf | 103 | Dschubba | 152 | Marfik |
| 6 | Acrux B | 55 | Aludra | 104 | Dubhe | 153 | Marfikent |
| 7 | Acubens | 56 | Alula Australis | 105 | Edasich | 154 | Markab |
| 8 | Adhafera | 57 | Alula Borealis | 106 | El Rehla | 155 | Markeb |
| 9 | Adhara | 58 | Alya | 107 | Electra | 156 | Matar |
| 10 | Adid Australis | 59 | Ancha | 108 | Elnath | 157 | Mebсутa |
| 11 | Ahadi | 60 | Ankaa | 109 | Eltanin | 158 | Megrez |
| 12 | Al Dhanab | 61 | Antares | 110 | Enif | 159 | Meissa |
| 13 | Al Dhibain Prior | 62 | Apollyon | 111 | Errai | 160 | Mekbuda |
| 14 | Al Kab | 63 | Arcturus | 112 | Fomalhaut | 161 | Menkalinan |
| 15 | Al Nair | 64 | Arkab Prior | 113 | Furud | 162 | Menkar |
| 16 | Al Nair al Baten | 65 | Arneb | 114 | Gacrux | 163 | Menkent |
| 17 | Al Niyat(Sigma) | 66 | Ascella | 115 | Gatria | 164 | Menkib |
| 18 | Al Niyat(Tau) | 67 | Asellus Austral | 116 | Giausar | 165 | Merak |
| 19 | Albaldah | 68 | Asellus Boreali | 117 | Gienah Cori | 166 | Merope |
| 20 | Albali | 69 | Aspidiske | 118 | Gienah Cygni | 167 | Mesartim |
| 21 | Albireo | 70 | Atik | 119 | Girtab | 168 | Miaplacidus |
| 22 | Alchiba | 71 | Atlas | 120 | Gliese 1 | 169 | Mimosa |
| 23 | Alcor | 72 | Atria | 121 | Gomeisa | 170 | Mintaka |
| 24 | Alcyone | 73 | Arior | 122 | Graffias(Zeta) | 171 | Mira |
| 25 | Aldebaran | 74 | Azha | 123 | Groombridge 1830 | 172 | Mirach |
| 26 | Alderamin | 75 | Barnard's Star | 124 | Gruid | 173 | Mirfak |
| 27 | Alfirk | 76 | Baten Kaitos | 125 | Grumium | 174 | Mirzam |
| 28 | Algenib | 77 | Beid | 126 | Hadar | 175 | Mizar |
| 29 | Algenubi | 78 | Bellatrix | 127 | Hamal | 176 | Mu Velorum |
| 30 | Algieba | 79 | Beta Hydri | 128 | Han | 177 | Muhlifain |
| 31 | Algiedi Secunda | 80 | Betelgeuse | 129 | Hatsya | 178 | Muphrid |
| 32 | Algol | 81 | Betria | 130 | Head of Hydrus | 179 | Muscida |
| 33 | Algorab | 82 | Biham | 131 | Homam | 180 | Naos |
| 34 | Alhakim | 83 | Birdun | 132 | Iritjinga(Cen) | 181 | Nashira |
| 35 | Alhena | 84 | Canopus | 133 | Izar | 182 | Navi |
| 36 | Alioth | 85 | Capella | 134 | Kakkab Su-gub Gud-Elim | 183 | Nekkar |
| 37 | Alkaid | 86 | Caph | 135 | Kapteyn's Star | 184 | Nihal |
| 38 | Alkalurops | 87 | Castor A | 136 | Kaus Australis | 185 | Nunki |
| 39 | Alkes | 88 | Castor B | 137 | Kaus Borealis | 186 | Nusakan |
| 40 | Almaaz | 89 | Cebalrai | 138 | Kaus Media | 187 | Palida |
| 41 | Almach | 90 | Chara | 139 | Keid | 188 | Peacock |
| 42 | Alnasi | 91 | Chertan | 140 | Kekouan | 189 | Phact |
| 43 | Alnilam | 92 | Choo | 141 | Kitalpha | 190 | Phecda |
| 44 | Alnitak | 93 | Cor Caroli | 142 | Kochab | 191 | Pherkad |
| 45 | Alpha Muscae | 94 | Cursa | 143 | Koo She | 192 | Polaris |
| 46 | Alpha Tucanae | 95 | Dabih | 144 | Kornephoros | 193 | Pollux |
| 47 | Alphard | 96 | Deltotum | 145 | Kraz | 194 | Porrima |
| 48 | Alphecca | 97 | Deneb | 146 | Kurhah | 195 | Procyon |
| 49 | Alpheratz | 98 | Deneb Algedi | 147 | Lacaille 9352 | 196 | Propus |

| | | | | | | | |
|-----|-------------------|-----|------------|-----|-------------------|-----|----------------|
| 197 | Proxima Centauri | 213 | Sadalbari | 229 | Sulafat | 245 | Vindemiatrix |
| 198 | Rasalas | 214 | Sadalmelik | 230 | Syrma | 246 | Vrischika |
| 199 | Rasalgethi | 215 | Sadalsuud | 231 | Talitha | 247 | Wasat |
| 200 | Rasalhague | 216 | Sadr | 232 | Tania Australis | 248 | Wazn |
| 201 | Rastaban | 217 | Saiph | 233 | Tania Borealis | 249 | Wei |
| 202 | Regor | 218 | Sargas | 234 | Tarazed | 250 | Wezen |
| 203 | Regulus | 219 | Scheat | 235 | Taygeta | 251 | Yed Posterior |
| 204 | Rigel | 220 | Schedar | 236 | Tejat Posterior | 252 | Yed Prior |
| 205 | Rigel Kentaurus A | 221 | Seginus | 237 | Thuban | 253 | Zaniah |
| 206 | Rigel Kentaurus B | 222 | Shaula | 238 | Thusia | 254 | Zaurak |
| 207 | Ruchbah | 223 | Sheliak | 239 | Tien Kwan | 255 | Zavijava |
| 208 | Rukbat | 224 | Sheratan | 240 | Turais | 256 | Zeta Persei |
| 209 | Rukh | 225 | Sirius | 241 | Unukalhai | 257 | Zosma |
| 210 | Rutilicus | 226 | Skat | 242 | Vasat-ul-cemre | 258 | Zubenelgenubi |
| 211 | Sabik | 227 | Spica | 243 | Vathorz Posterior | 259 | Zubeneschamali |
| 212 | Sadachbia | 228 | Suhail | 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 |

Double/Multi Stars

| No. | HC Item | | Constellation | Name | HIP | WDS | SAO |
|-----|-------------------|-------------------------|----------------|-----------------|-------|------------|--------|
| 1 | Rigel Kentaurus A | Alpha Centauri | Centaurus | | 71683 | 14396-6050 | 252838 |
| 2 | Rigel | Beta Orionis | Orion | | 24436 | 05145-0812 | 131907 |
| 3 | Gacrux | Gamma Crucis | Crux | | 61084 | 12312-5707 | 240019 |
| 4 | Sargas | Theta Scorpii | Scorpius | | 86228 | 17373-4300 | 228201 |
| 5 | Castor A | Alpha Geminorum | Gemini | | 36850 | 07346+3153 | 60198 |
| 6 | Mizar | Zeta Ursae Majoris | Ursa Major | | 65378 | 13239+5456 | 28737 |
| 7 | Almach | Gamma Andromedae | Andromeda | | 9640 | 02039+4220 | 37735 |
| 8 | Algieba | Gamma Leonis | Leo | | 50583 | 10200+1950 | 81298 |
| 9 | Aludra | Eta Canis Majoris | Canis Major | | 35904 | 07241-2918 | 173651 |
| 10 | Iritjinga (Cen) | Gamma Centauri | Centaurus | Muhlifain | 61932 | 12415-4858 | 223603 |
| 11 | Zubenelgenubi | Alpha Librae | Libra | | 72603 | 14509-1603 | 158836 |
| 12 | Alcyone | Eta Tauri | Taurus | | 17702 | 03475+2406 | 76199 |
| 13 | Cor Caroli | Alpha Canum Venaticorum | Canes Venatici | | 63125 | 12560+3819 | 63257 |
| 14 | Acamar | Theta Eridani | Eridanus | | 13847 | 02583-4018 | 216113 |
| 15 | Adhafera | Zeta Leonis | Leo | | 50335 | 10167+2325 | 81265 |
| 16 | Rasalgethi | Alpha Herculis | Hercules | | 84345 | 17146+1423 | 102680 |
| 17 | Meissa | Lambda Orionis | Orion | | 26207 | 05351+0956 | 112921 |
| 18 | Graffias | Beta1 Scorpii | Scorpius | | 78820 | 16054-1948 | 159682 |
| 19 | Alya | Theta Serpentis | Serpens | | 92946 | 18562+0412 | 124068 |
| 20 | HIP 48002 | Upsilon Carinae | Carina | Vathorz Prior | | 09471-6504 | 250695 |
| 21 | HIP 95947 | Beta1 Cygni | Cygnus | Albireo | | 19307+2758 | 87301 |
| 22 | HIP 20894 | Theta2 Tauri | Taurus | | | 04287+1552 | 93957 |
| 23 | HIP 74395 | Zeta Lupi | Lupus | | | 15123-5206 | 242304 |
| 24 | HIP 27072 | Gamma Leporis | Lupus | | | 05445-2227 | 170759 |
| 25 | HIP 26549 | Sigma Orionis | Orion | | | 05387-0236 | 132406 |
| 26 | HIP 85667 | HD 158614 | Ophiuchus | | | 17304-0104 | 141702 |
| 27 | HIP 74376 | Kappa1 Lupi | Lupus | | | 15119-4844 | 225525 |
| 28 | HIP 34481 | Gamma2 Volantis | Carina | | | 07087-7030 | 256374 |
| 29 | HIP 53253 | Upsilon Carinae | Carina | | | 10535-5851 | 238574 |
| 30 | HIP 99675 | Omicron1 Cygni | Cygnus | 31 Cyg | | 20136+4644 | 49337 |
| 31 | HIP 63003 | Mu1 Crucis | Crux | | | 12546-5711 | 240366 |
| 32 | HIP 43103 | Iota Cancri | Cancer | 48 Cnc | | 08467+2846 | 80416 |
| 33 | HIP 110991 | Delta Cephei | Cepheus | 27 Cep | | 22292+5825 | 34508 |
| 34 | HIP 20635 | Kappa1 Tauri | Taurus | 65 Tau | | 04254+2218 | 76601 |
| 35 | HIP 88601 | 70 Ophiuchi | Orion | | | 18055+0230 | 123107 |
| 36 | HIP 2484 | Beta1 Tucanae | Horologium | | | 00315-6257 | 248201 |
| 37 | HIP 91971 | Zeta1 Lyrae | Cygnus | 6 Lyr | | 18448+3736 | 67321 |
| 38 | HIP 79374 | Nu Scorpii | Scorpius | Jabbah | | 16120-1928 | 159764 |
| 39 | HIP 102532 | Gamma2 Delphini | Pegasus | 12 Del | | 20467+1607 | 106476 |
| 40 | HIP 52154 | Xi Velorum | Vela | | | 10393-5536 | 238309 |
| 41 | HIP 37229 | HD 61555 | Canis Major | | | 07388-2648 | 174198 |
| 42 | HIP 30419 | Epsilon Monocerotis | Orion | 8 Mon | | 06238+0436 | 113810 |
| 43 | HIP 108917 | Xi Cephei | Cepheus | Al kurhah | | 22038+6438 | 19827 |
| 44 | HIP 53417 | 54 Leonis | Leo | | | 10556+2445 | 81584 |
| 45 | HIP 65271 | J Centauri | Centaurus | | | 13226-6059 | 252284 |
| 46 | HIP 67669 | 3 Centauri | Centaurus | | | 13518-3300 | 204916 |
| 47 | HIP 105319 | Theta Indi | Indus | | | 21199-5327 | 246965 |
| 48 | HIP 80582 | Epsilon Normae | Norma | | | 16272-4733 | 226773 |
| 49 | HIP 8832 | Gamma Arietis | Aries | | | 01535+1918 | 92680 |
| 50 | HIP 69483 | Kappa Boötis | Boötes | Asellus Tertius | | 14135+5147 | 29045 |
| 51 | HIP 92946 | Theta Serpentis | Serpens | | | 18562+0412 | 124068 |
| 52 | HIP 86614 | Psi1 Draconis | Draco | 31 Draconis | | 17419+7209 | 8890 |

| No. | HC Item | | Constellation | Name | HIP | WDS | SAO |
|-----|------------|-----------------------|-----------------|---------------------|-----|------------|--------|
| 53 | HIP 95771 | Alpha Vulpeculae | Vulpecula | Anser | | 19287+2440 | 87261 |
| 54 | HIP 30867 | Beta Monocerotis | Monoceros | | | 06288-0702 | 133316 |
| 55 | HIP 35363 | NV Puppis | Puppis | | | 07183-3644 | 197824 |
| 56 | HIP 94761 | Gliese 752 | Aquila | Wolf 1055, Ross 652 | | 19169+0510 | |
| 57 | HIP 21683 | Sigma2 Tauri | Taurus | | | 04393+1555 | 94054 |
| 58 | HIP 8497 | Chi Ceti | Cetus | 53 Cet | | 01496-1041 | 148036 |
| 59 | HIP 26199 | HD 36960 | Orion | | | 05350-0600 | 132301 |
| 60 | HIP 104521 | Gamma Equulei | Equuleus | 5 Equ | | 21103+1008 | 126593 |
| 61 | HIP 116389 | Iota Phoenicis | Phoenix | | | 23351-4237 | 231675 |
| 62 | HIP 17797 | HD 24071 | Eridanus | | | 03486-3737 | 194550 |
| 63 | HIP 21036 | 83 Tauri | Taurus | | | 04306+1343 | 93979 |
| 64 | HIP 107310 | Mu1 Cygni | Cygnus | 78 Cyg | | 21441+2845 | 89940 |
| 65 | HIP 72659 | Xi Boötis | Boötes | 37 Boo | | 14514+1906 | 101250 |
| 66 | HIP 21029 | HD 28527 | Taurus | | | 04306+1612 | 93975 |
| 67 | HIP 42726 | HY Velorum | Vela | | | 08424-5307 | 236205 |
| 68 | HIP 18255 | 32 Eridani | Eridanus | | | 03543-0257 | 130806 |
| 69 | HIP 9153 | Lambda Arietis | Aries | | | 01580+2336 | 75051 |
| 70 | HIP 88267 | 95 Herculis | Hercules | | | 18015+2136 | 85648 |
| 71 | HIP 85829 | Nu2 Draconis | Draco | 25 Dra | | 17322+5511 | 30450 |
| 72 | HIP 43937 | V376 Carinae | Carina | b1 Carinae | | 08570-5914 | 236436 |
| 73 | HIP 71762 | Pi2 Boötis | Boötes | 29 Boo | | 14407+1625 | 101139 |
| 74 | HIP 80047 | Delta1 Apodis | Apus | | | 16203-7842 | 257380 |
| 75 | HIP 58484 | Epsilon Chamaeleontis | Chamaeleon | | | 11596-7813 | 256894 |
| 76 | HIP 25142 | 23 Orionis | Orion | | | 05228+0333 | 112697 |
| 77 | HIP 54204 | Chi1 Hydrae | Hydra | | | 11053-2718 | 179514 |
| 78 | HIP 76669 | Zeta Coronae Borealis | Corona Borealis | 7 CrB | | 15394+3638 | 64833 |
| 79 | HIP 99770 | b3 Cygni | Cygnus | 29 Cyg | | 20145+3648 | 69678 |
| 80 | HIP 101027 | Rho Capricorni | Capricornus | 11 Cap | | 20289-1749 | 163614 |
| 81 | HIP 74911 | Nu Lupi | Lupus | | | 15185-4753 | 225638 |
| 82 | HIP 35210 | HD 56577 | Canis Major | | | 07166-2319 | 173349 |
| 83 | HIP 26235 | Theta2 Orionis | Orion | 43 Ori | | 05354-0525 | 132321 |
| 84 | HIP 40321 | OS Puppis | Puppis | | | 08140-3619 | 198969 |
| 85 | HIP 70327 | HD 126129 | Boötes | | | 14234+0827 | 120426 |
| 86 | HIP 26221 | Theta1 Orionis | Orion | Trapezium | | 05353-0523 | 132314 |
| 87 | HIP 80473 | Rho Ophiuchi | Ophiuchus | 5 Oph | | 16256-2327 | 184381 |
| 88 | HIP 78105 | Xi1 Lupi | Lupus | | | 15569-3358 | 207144 |
| 89 | HIP 79043 | Kappa Herculis | Hercules | 7 Her | | 16081+1703 | 101951 |
| 90 | HIP 61418 | 24 Comae Berenices | Coma Berenices | | | 12351+1823 | 100160 |
| 91 | HIP 91919 | Epsilon Lyrae | Lyra | 4 Lyr | | 18443+3940 | 67309 |
| 92 | HIP 41639 | HD 72127 | Vela | | | 08295-4443 | 219996 |
| 93 | HIP 104214 | 61 Cygni | Cygnus | | | 21069+3845 | 70919 |
| 94 | HIP 23734 | 11 Camelopardalis | Camelopardalis | | | 05061+5858 | 25001 |
| 95 | HIP 60189 | Zeta Corvi | Corvus | 5 Crv | | 12206-2213 | 180700 |
| 96 | HIP 66821 | Q Centauri | Centaurus | | | 13417-5434 | 241076 |
| 97 | HIP 14043 | HD 18537 | Perseus | | | 03009+5221 | 23763 |
| 98 | HIP 5737 | Zeta Piscium | Pisces | 86 Psc | | 01137+0735 | 109739 |
| 99 | HIP 84626 | Omicron Ophiuchi | Ophiuchus | 39 Oph | | 17180-2417 | 185238 |
| 100 | HIP 60904 | 17 Comae Berenices | Coma Berenices | | | 12289+2555 | 82330 |
| 101 | HIP 58684 | 67 Ursae Majoris | Ursa Major | | | 12021+4303 | 44002 |
| 102 | HIP 5131 | Psi1 Piscium | Pisces | 74 Psc | | 01057+2128 | 74482 |
| 103 | HIP 115126 | 94 Aquarii | Aquarius | | | 23191-1328 | 165625 |
| 104 | HIP 62572 | HD 112028 | Camelopardalis | | | 12492+8325 | 2102 |

| No. | HC Item | | Constellation | Name | HIP | WDS | SAO |
|-----|------------|-------------------------|------------------|----------|-----|------------|--------|
| 105 | HIP 40167 | Zeta1 Cancri | Cancer | Tegmen | | 08122+1739 | 97645 |
| 106 | HIP 40817 | Kappa Volantis | Volans | | | 08198-7131 | 256497 |
| 107 | HIP 81292 | 17 Draconis | Draco | | | 16362+5255 | 30013 |
| 108 | HIP 80197 | Nu1 Coronae Borealis | Corona Borealis | | | 16224+3348 | 65257 |
| 109 | HIP 88060 | HD 163756 | Sagittarius | | | 17591-3015 | 209553 |
| 110 | HIP 42637 | Eta Chamaeleontis | Chamaeleon | | | 08413-7858 | 256543 |
| 111 | HIP 21039 | 81 Tauri | Taurus | | | 04306+1542 | 93978 |
| 112 | HIP 100965 | 75 Draconis | Draco | | | 20282+8125 | 3408 |
| 113 | HIP 25768 | HD 36553 | Pictor | | | 05302-4705 | 217368 |
| 114 | HIP 93717 | 15 Aquilae | Aquila | | | 19050-0402 | 142996 |
| 115 | HIP 79980 | HD 148836 | Scorpius | | | 16195-3054 | 207558 |
| 116 | HIP 12086 | 15 Trianguli | Triangulum | | | 02358+3441 | 55687 |
| 117 | HIP 90968 | Kappa2 Coronae Australe | Corona Australis | | | 18334-3844 | 210295 |
| 118 | HIP 22531 | Iota Pictoris | Pictor | | | 04509-5328 | 233709 |
| 119 | HIP 34065 | HD 53705 | Puppis | | | 07040-4337 | 218421 |
| 120 | HIP 79607 | Sigma Coronae Borealis | Corona Borealis | | | 16147+3352 | 65165 |
| 121 | HIP 109786 | 41 Aquarii | Aquarius | | | 22143-2104 | 190986 |
| 122 | HIP 56280 | 17 Crateris | Hydra | | | 11323-2916 | 179968 |
| 123 | HIP 51561 | HD 91355 | Vela | | | 10320-4504 | 222126 |
| 124 | HIP 107930 | HD 208095 | Cepheus | | | 21520+5548 | 33819 |
| 125 | HIP 97966 | 57 Aquilae | Aquila | | | 19546-0814 | 143898 |
| 126 | HIP 117218 | 107 Aquarii | Aquarius. | | | 23460-1841 | 165867 |
| 127 | HIP 82676 | HD 152234 | Scorpius | | | 16540-4148 | 227377 |
| 128 | HIP 111546 | 8 Lacertae | Lacerta | | | 22359+3938 | 72509 |
| 129 | HIP 29151 | HD 42111 | Orion | | | 06090+0230 | 113507 |
| 130 | HIP 107253 | 79 Cygni | Cygnus | | | 21434+3817 | 71643 |
| 131 | HIP 88136 | 41 Draconis | Draco | | | 18002+8000 | 8996 |
| 132 | HIP 81702 | HD 150136 | Ara | | | 16413-4846 | 227049 |
| 133 | HIP 97423 | HD 186984 | Sagittarius | | | 19480-1342 | 162998 |
| 134 | HIP 30444 | HD 45145 | Columba | | | 06240-3642 | 196774 |
| 135 | HIP 66400 | HD 118349 | Hydra | | | 13368-2630 | 181790 |
| 136 | HIP 17579 | 21 Tauri | Taurus | Asterope | | 03459+2433 | 76159 |
| 137 | HIP 35785 | 19 Lyncis | Lynx | | | 07229+5517 | 26312 |
| 138 | HIP 81641 | 37 Herculis | Hercules | | | 16406+0413 | 121776 |
| 139 | HIP 7751 | p Eridani | Eridanus | | | 01398-5612 | 232490 |
| 140 | HIP 21148 | 1 Camelopardalis | Camelopardalis | | | 04320+5355 | 24672 |
| 141 | HIP 9021 | 56 Andromedae | Andromeda | | | 01562+3715 | 55107 |
| 142 | HIP 97816 | HD 187420 | Telescopium | | | 19526-5458 | 246311 |
| 143 | HIP 88818 | 100 Herculis | Hercules | | | 18078+2606 | 85753 |
| 144 | HIP 36817 | HD 60584 | Puppis | | | 07343-2328 | 174019 |
| 145 | HIP 25695 | HD 35943 | Taurus | | | 05293+2509 | 77200 |
| 146 | HIP 98819 | 15 Sagittae | Sagitta | | | 20041+1704 | 105635 |
| 147 | HIP 61910 | VV Corvi | Corvus | | | 12413-1301 | 157447 |
| 148 | HIP 111643 | Sigma2 Gruis | Grus | | | 22370-4035 | 231217 |
| 149 | HIP 80399 | HD 147722 | Scorpius | | | 16247-2942 | 184368 |
| 150 | HIP 83478 | HD 154228 | Hercules | | | 17037+1336 | 102564 |
| 151 | HIP 101123 | Omicron Capricorni | Capricornus | | | 20299-1835 | 163626 |
| 152 | HIP 28271 | 59 Orionis | Orion | | | 05584+0150 | 113315 |
| 153 | HIP 64246 | 17 Canum Venaticorum | Canes Venatici | | | 13101+3830 | 63380 |
| 154 | HIP 96895 | 16 Cygni | Cygnus | | | 19418+5032 | 31898 |
| 155 | HIP 35564 | HD 57852 | Carina | | | 07204-5219 | 235110 |
| 156 | HIP 37843 | 2 Puppis | Puppis | | | 07455-1441 | 153363 |

| No. | HC Item | | Constellation | Name | HIP | WDS | SAO |
|-----|------------------|--------------------|----------------|------|-----|------------|--------|
| 157 | HIP 28790 | HD 41742 | Puppis | | | 06047-4505 | 217706 |
| 158 | HIP 4675 | HD 5788 | Andromeda | | | 01001+4443 | 36832 |
| 159 | HIP 31676 | 8 Lyncis | Lynx | | | 06377+6129 | 13897 |
| 160 | HIP 10176 | 59 Andromedae | Andromeda | | | 02109+3902 | 55330 |
| 161 | HIP 25950 | HD 36408 | Taurus | | | 05322+1703 | 94630 |
| 162 | HIP 117931 | AL Sculptoris | Sculptor | | | 23553-3155 | 214860 |
| 163 | HIP 81914 | HD 150591 | Scorpius | | | 16439-4107 | 227123 |
| 164 | HIP 21242 | m Persei | Perseus | | | 04334+4304 | 39604 |
| 165 | HIP 86831 | 61 Ophiuchi | Ophiuchus | | | 17446+0235 | 122690 |
| 166 | HIP 115272 | HD 220003 | Grus | | | 23208-5018 | 247838 |
| 167 | HIP 46657 | Zeta1 Antliae | Antlia | | | 09308-3153 | 200444 |
| 168 | HIP 41404 | Phi2 Cancri | Cancer | | | 08268+2656 | 80188 |
| 169 | HIP 29388 | 41 Aurigae | Auriga | | | 06116+4843 | 40925 |
| 170 | HIP 49321 | HD 87344 | Hydra | | | 10040-1806 | 155704 |
| 171 | HIP 84054 | 63 Herculis | Hercules | | | 17111+2414 | 84896 |
| 172 | HIP 39035 | HD 66005 | Puppis | | | 07592-4959 | 219249 |
| 173 | HIP 25303 | Theta Pictoris | Pictor | | | 05248-5219 | 233965 |
| 174 | HIP 52520 | HD 93344 | Carina | | | 10443-7052 | 256750 |
| 175 | HIP 95398 | 2 Sagittae | Sagitta | | | 19244+1656 | 104797 |
| 176 | UCAC4 277-135548 | | | | | | |
| 177 | HIP 32609 | HD 48766 | Lynx | | | 06482+5542 | 25963 |
| 178 | HIP 101765 | 48 Cygni | Cygnus | | | 20375+3134 | 70287 |
| 179 | HIP 24825 | YZ Leporis | Lepus | | | 05193-1831 | 150335 |
| 180 | HIP 31158 | 21 Geminorum | Gemini | | | 06323+1747 | 95795 |
| 181 | HIP 3885 | 65 Piscium | Pisces | | | 00499+2743 | 74295 |
| 182 | HIP 93371 | HD 176270 | Australis | | | 19011-3704 | 210816 |
| 183 | HIP 36345 | HD 59499 | Puppis | | | 07289-3151 | 198038 |
| 184 | HIP 108364 | HD 208947 | Cepheus | | | 21572+6609 | 19760 |
| 185 | HIP 50939 | HD 90125 | Sextans | | | 10242+0222 | 118278 |
| 186 | HIP 76603 | HD 139461 | Libra | | | 15387-0847 | 140672 |
| 187 | HIP 32269 | HD 49219 | Carina | | | 06442-5442 | 234683 |
| 188 | HIP 42516 | 39 Cancri | Cancer | | | 08401+2000 | 80333 |
| 189 | HIP 62807 | 32 Comae Berenices | Coma Berenices | | | 12522+1704 | 100309 |
| 190 | UCAC4 226-128246 | | | | | | |
| 191 | HIP 94913 | 24 Aquilae | Aquila | | | 19188+0020 | 124492 |
| 192 | HIP 94336 | HD 179958 | Cygnus | | | 19121+4951 | 48193 |
| 193 | HIP 107299 | HD 206429 | Indus | | | 21440-5720 | 247151 |
| 194 | HIP 59984 | HD 106976 | Virgo | | | 12182-0357 | 138704 |
| 195 | HIP 16411 | HD 21743 | Taurus | | | 03313+2734 | 75970 |
| 196 | HIP 23287 | HD 32040 | Orion | | | 05006+0337 | 112305 |
| 197 | HIP 105637 | HD 203857 | Cygnus | | | 21238+3721 | 71280 |
| 198 | HIP 108925 | HD 209744 | Cepheus | | | 22039+5949 | 34016 |
| 199 | HIP 103814 | HD 200011 | Microscopium | | | 21022-4300 | 230492 |
| 200 | HIP 58112 | 65 Ursae Majoris | Ursa Major | | | 11551+4629 | 43945 |
| 201 | HIP 109354 | V402 Lacertae | Lacerta | | | 22093+4451 | 51698 |
| 202 | HIP 43822 | 17 Hydrae | Hydra | | | 08555-0758 | 136409 |
| 203 | HIP 21986 | 55 Eridani | Eridanus | | | 04436-0848 | 131442 |
| 204 | HIP 17470 | HD 23245 | Taurus | | | 03446+2754 | 76122 |
| 205 | HIP 35960 | V368 Puppis | Puppis | | | 07248-3717 | 197974 |
| 206 | HIP 42936 | HD75086 | Carina | | | 08451-5843 | 236241 |
| 207 | HIP 19272 | SZ Camelopardalis | Camelopardalis | | | 04078+6220 | 13031 |
| 208 | HIP 76143 | HD 138488 | Libra | | | 15332-2429 | 183565 |

Appendix D. Firmware Upgrade

The firmware of the HAE69C mount and 8411 handset firmware can be upgraded by the customer. The mount firmware upgrade is via the USB-C port on mount base and 8411 firmware is via the USB-C port on the handset.

Please check iOptron's website, www.iOptron.com, under the product page or Support Directory, for detailed information.

Appendix E. Computer Control an HAE Mount

To use a computer or a Pi based astronomical control box, please either the USB2.0 port (USB-C connector) on the base or the one on dovetail saddle, but not both.

iOptron Commander/ASCOM driver (for Windows) is located on iOptron website, under the product page or Support Directory.

Third party INDI driver is available too.

IOPTRON TWO YEAR TELESCOPE, MOUNT, AND CONTROLLER WARRANTY

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

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www.ioptron.com
support@ioptron.com

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