



**SmartStar<sup>®</sup>-PR**  
**Computerized German Equatorial Mount**

Instruction Manual

# Table of Content

Table of Content .....	2
1. Overview.....	4
2. SmartStar <sup>®</sup> -PR Assembly .....	5
2.1. Assembly terms .....	5
2.2. Contents: .....	5
2.3. SmartStar-PR Ports .....	6
3. SmartStar <sup>®</sup> -PR Assembly .....	7
4. GoToNova <sup>®</sup> 8401 Hand Controller .....	12
4.1. Key Description .....	12
4.2. The LCD Screen .....	13
4.3. Connection to a Computer .....	13
5. Getting Started .....	14
5.1. Setting Up the SmartStar <sup>®</sup> -PR Mount .....	14
5.2. Setting Up the Hand Controller .....	15
5.2.1. Set Up Local Time .....	15
5.2.2. Set Up Site Info .....	15
5.2.3. Set Mount Type .....	17
5.2.4. Set N/S Hemisphere.....	17
5.2.5. Initial Star Alignment .....	18
5.2.6. Go to the Moon.....	18
5.3. Turn Off the Mount .....	18
6. Use the Hand Controller .....	19
6.1. Manual Operation of a Telescope.....	19
6.2. Select and Slew .....	19
6.2.1. Planets, Sun, Moon .....	19
6.2.2. Deep sky objects .....	19
6.2.3. Comets .....	19
6.2.4. Asteroids.....	19
6.2.5. Stars: .....	20
6.2.6. Constellations .....	20
6.2.7. User Objects.....	20
6.2.8. Enter R.A. DEC .....	20
6.3. Sync to Target.....	20
6.4. Electric Focuser .....	20
6.5. Set Up Controller .....	20
6.5.1. Set Up Local Time .....	20
6.5.2. Set Up Site .....	20
6.5.3. Set N/S Hemisphere.....	20
6.5.4. Set Display Contrast .....	21
6.5.5. Set Eyepiece Light.....	21
6.5.6. Set Backlight.....	21
6.5.7. Set Anti-backlash.....	21
6.5.8. Set Key Beep .....	22
6.5.9. Set Mount Type .....	22
6.5.10. Reset All .....	22

6.5.11. Update Firmware .....	22
6.5.12. Set gear ratio .....	22
6.5.13. Set Language .....	22
6.6. Align .....	22
6.6.1. Easy One Star Align .....	22
6.6.2. One Star Align .....	23
6.6.3. Two Star Align .....	23
6.6.4. Three-Star Align .....	23
6.6.5. Dis R.A axis error .....	23
6.6.6. Test Anti-backlash .....	23
6.6.7. Polaris Position .....	24
6.7. PEC Option .....	24
6.8. Set Up Tracking .....	24
6.9. User Objects .....	24
6.10. Auto Guide .....	24
6.11. Park Scope .....	24
6.12. To Park Position .....	24
7. Maintenance and Servicing .....	25
7.1. Maintenance .....	25
7.2. iOptron Customer Service .....	25
Appendix A. Technical Specifications .....	25
Appendix A. Technical Specifications .....	26
Appendix B. GoToNova <sup>®</sup> 8401 HC MENU STRUCTURE .....	27
Appendix C. GoToNova <sup>®</sup> Star List .....	29
Appendix D. Set Up USB-PC Connection .....	35
Appendix E. Firmware Upgrade .....	42
Appendix F. Use a PC to Control an iOptron Mount .....	45



## **WARNING!**

***Never use a telescope to look at the Sun without a proper solar filter!  
Looking at or near the Sun will cause instant and irreversible damage to your eye.  
Children should always have adult supervision while observing.***

# 1. Overview

SmartStar<sup>®</sup>-PR Computerized German Equatorial Mount and Tripod system is a medium sized mount that provides the combination of performance and stability. The PR is built with a mutual German equatorial mount and a state-of-the-art GOTONOVA technology which provide an accurate GOTO and tracking performance. It is ideally suited for astronomical observing and imaging. A heavy-duty, two-inch stainless steel tripod means your observation and imaging will not be disturbed in a windy night. The PR also includes a latitude scale for easier alignment. An illuminated polar finder scope, together with fine adjustment in both azimuth and altitude, will provide you an accurate polar alignment.

SmartStar<sup>®</sup>-PR is fully computerized with a database of 130,000 – the most of any GOTO system on the market. The GOTONOVA<sup>®</sup> controller is very intuitive with menu categories better organized. It also has the largest LCD screen on the market with 8 lines of content. Using the easy-to-use hand controller, you can easily set up your telescope and select where you want to go.

SmartStar<sup>®</sup>-PR is universally compatible with optical tubes using a Vixen-style dovetail connection, making it useful for the hobbyist with multiple tubes.

## **Features:**

- Computerized German Equatorial Mount
- Precision Engineered Worm Gear
- DC servomotor with high resolution optical encoder on both R.A. and DEC axes
- GoToNova<sup>®</sup> GOTO and tracking technology
- 8401 hand controller with USB port for firmware upgrade and computer control
- The largest LCD screen on the market with 8 lines and 21-characters with backlit
- ~130,000 object database with 256 user-defined objects
- 9-speed motor control
- HBX ports for iOptron auxiliary components
- GPS-compatible with optional GPS module (#8411)
- ST-4 autoguide compatible with optional ST-4 autoguiding adapter (#8427)
- LED socket for LED illumination on polar scope, finder scope or eyepiece
- Polar scope with illuminated reticle and real time Polaris position chart
- 2-inch heavy duty stainless steel tripod with heavy duty mount head
- All metal supports-no plastic trays or joints
- Comes standard with: Ac adapter, 12V DC car plug adaptor and USB cable

## 2. SmartStar<sup>®</sup>-PR Assembly

### 2.1. Assembly terms

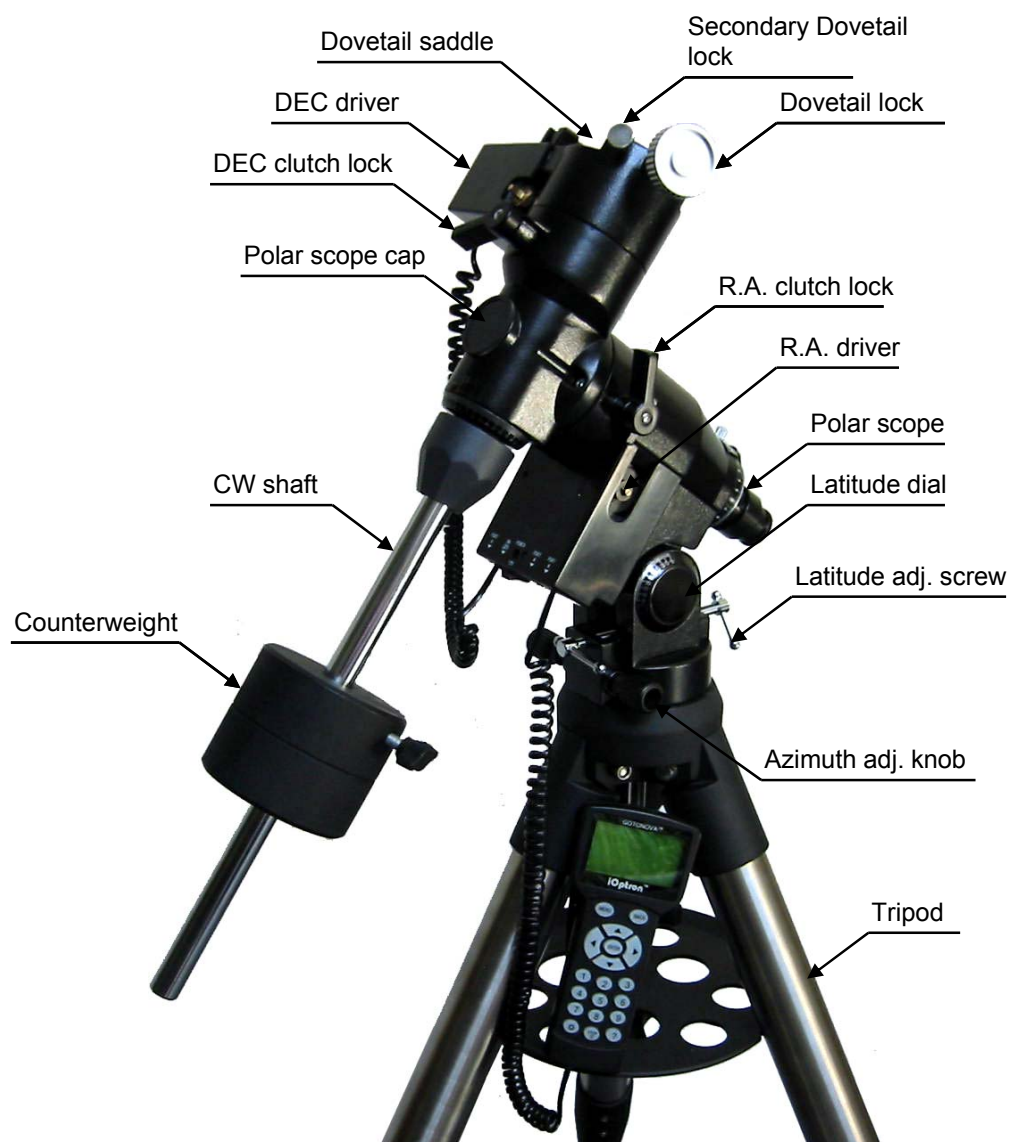


Figure 1. SmartStar<sup>®</sup>-PR assembly term

### 2.2. Contents:<sup>1</sup>

There are two shipping boxes. One box contains an EQ mount, a counterweight shaft and an accessory tray. The tripod box contains a tripod, an 8401 hand controller, a counterweight and accessories.

- SmartStar<sup>®</sup>-PR German equatorial mount

<sup>1</sup> Contents may vary without notice.

- GoToNova® 8401 hand controller
- Counterweight shaft with safety lock
- 2" Tripod
- One 8.8 lb (4kg) counterweight
- Accessory tray
- Two (2) coiled cables with RJ-11 connectors
- USB cable
- AC adapter
- 12V DC power adapter

### 2.3. SmartStar-PR Ports



Figure 2. R.A. driver



Figure 3. DEC driver

Shown in Figure 2 and Figure 3 are the DEC and R.A. motor driver units. The R.A. driver has an ON/OFF power switch, a 12V power inlet, a power LED indicator and three connectors named PORT A. The DEC driver has two cable connectors named PORT B and an LED socket for LED illumination on polar scope, finder scope or eyepiece (center positive). All the ports are exchangeable. You may plug your hand controller and accessories into any available port.

### 3. SmartStar<sup>®</sup> -PR Assembly

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

#### STEP 1. Setup Tripod

Extend the tripod legs to desired length. Then lock legs using the lock knobs on sides. Spread the tripod legs as far as possible. After the legs are adjusted and locked, stand the tripod with the Alignment Peg facing True North, as shown in Figure 4. The tripod leg beneath the Alignment Peg is called North-facing Tripod Leg. If you are located in the southern hemisphere, face the Alignment Peg True South. Level the tripod using a torpedo level.

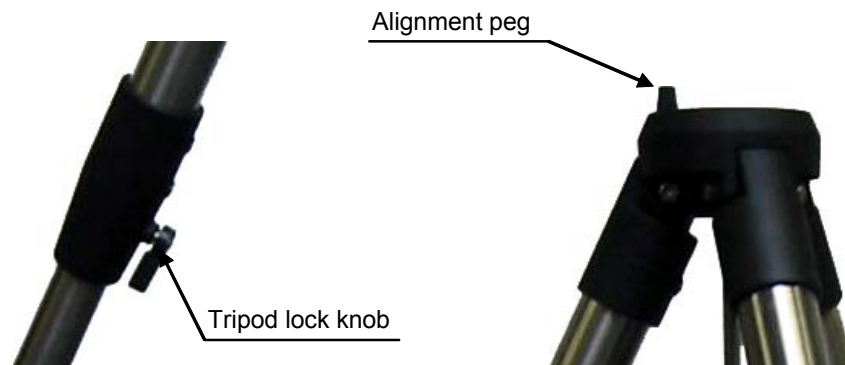


Figure 4. Setup tripod

#### STEP 2. Attach the Mount

Locate the Azimuth Adjustment Knobs and retract them to allow enough clearance for the mount to fit on the tripod head. Place the mount onto the Tripod Head with the Azimuth Adjustment Knobs on top of the Alignment Peg as shown in Figure 5. Secure the mount to the tripod by using the long central tripod rod. Hand tighten the rod into the bottom of the mount by turning the tripod knob. Next, slide tripod accessory tray onto bottom of central rod, as shown in Figure 6. Position the three cuts to fit against the three tripod legs. Then hand tighten tripod lock knob to secure the tripod.



Figure 5. Attach mount to tripod



Figure 6. Secure mount and tripod

### STEP 3. Set the Location Latitude

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

If your mount equipped an optional GPS receiver (#8411), the latitude information can be found from your 8401 hand controller after the GPS receives the signal from the satellites.

There are two T-shaped Latitude Adjustment Screws that work in a "push - pull" operation. Turn the Latitude Adjustment Screws (one is loosened while the other is tightened) until the pointer (circled in red) reads the correct value against the graduated scale on the latitude dial, as shown in Figure 7.



Figure 7. Adjust latitude

At this point, with the mount level and pointed North, and the latitude set, the Polar Axis (R.A. axis) should be pointing very close to the NCP and Polaris. This alignment accuracy will be sufficient for visual tracking and short duration piggy-back (camera mounted on top of the OTA) astrophotography.

### STEP 4. Attach Counterweight (CW) Shaft and Install the Counterweight

Locate the opening in the PR mount head on the DEC axis. Thread the Counterweight shaft into the opening until it is tight. Tighten the CW shaft lock nut for extra support. Position the mount so that the CW shaft points toward the ground. Remove the CW Safety Lock on the end of the CW shaft. Loosen the CW lock screw on the side of the CW, make sure a small metal pin is inside the threaded hole. Slide the CW onto the shaft and tighten the lock screw on the side of the CW to hold it in appropriate place. Put back the CW safety lock, as indicated in Figure 8.



Figure 8. Install CW shaft and counterweight

### STEP 5. Attach and Balance an OTA on the Mount

After attaching an OTA and accessories to the mount, the mount must be balanced to ensure minimum stress on the mount's gears and motors. The R.A. or DEC axis will rotate freely after the related clutch screw is released. The balancing procedure should be performed after the CWs, OTA, and any accessories are installed.



**CAUTION:** The telescope may swing when the R.A. and DEC clutch screws are released. Always hold on to the OTA before you release the clutch screws to prevent it from swinging. It can cause personal injury or damage to the equipment.

***Balance the mount in DEC axis***

Release the R.A. Clutch Lock and rotate the R.A. axis to place the DEC axis in the horizontal position, as shown in Figure 9(a), and then tighten the R.A. Clutch Lock. The OTA can be on either side. Then release the DEC Clutch Lock and rotate the OTA to a horizontal position as shown in Figure 9(b). If the OTA has a tendency to rotate about the DEC axis, you will have to slide the OTA forward or backward to balance it in the horizontal position about the DEC axis. When the OTA is balanced horizontally, tighten the DEC Clutch Lock.

***Balance the mount in R.A. axis***

Release the R.A. Clutch Lock. If the DEC axis stays in the horizontal position, as shown in Figure 9(a), it means the R.A. axis is balanced. Otherwise, release the CW Locking Screw and move the CW as required to balance the R.A. axis. Tighten the CW Locking Screw. Return the mount to the Park Position, with the CW bar pointing to the ground and the OTA pointing to the NCP and tighten the R.A. and DEC Clutch Locks.



Figure 9. OTA balancing

**STEP 6. Connect Cables**

Plug one end of a supplied RJ-11 coiled cable into any one of Port A on the R.A. driver and the other end of the cable into one of Port B on the DEC unit to connect the R.A. and DEC units. Plug one end of the other RJ-11 coiled cable into the HBX port of 8401 hand controller (HC) and the other end of the cable into any available port on R.A or DEC unit. Connect the mount to a 12V DC power supply or an AC adapter.

**STEP 7. Polar Alignment**

As explained in the introduction, an equatorial mount must have an accurate polar axis alignment in order to track properly.

**Remove Plastic Strip from Reticle LED:** The polar alignment reticle LED contains two watch batteries. The reticle's LED is shipped with a plastic strip between the two batteries to protect battery life. Unthread the cap and remove the plastic strip before using.

**Note:** Remember to turn off the LED when you are not using the reticle.

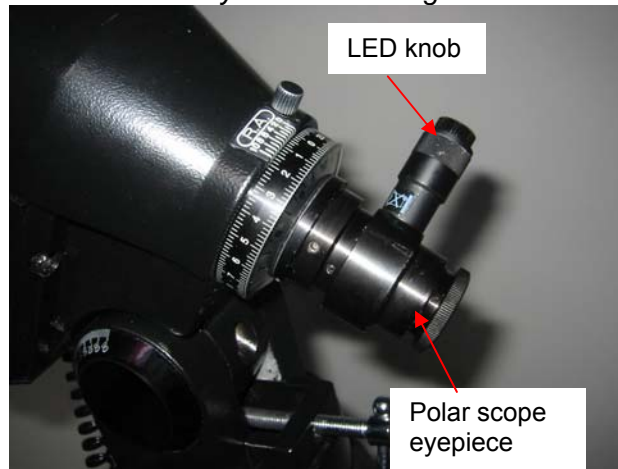


Figure 10. Illuminated polar scope

**To align your mount to North using the polar scope:**

Since Polaris is not exactly on the North Celestial Pole, you need to offset the telescope's R.A. axis from Polaris by a small amount in the correct direction.

1. Set your mount in the Park Position.
2. Remove the polar scope cap and cover.
3. If you have not already done so, remove the plastic separating the watch batteries inside the polar scope reticle LED.
4. Turn the polar scope reticle LED knob to turn on the LED and look through the eyepiece. You'll find an illuminated pattern as shown in Figure 11. Adjust the polar scope eyepiece to bring the pattern in focus. There is a radial line with tick marks (40 minutes to 60 minutes) and a circle in the polar scope.

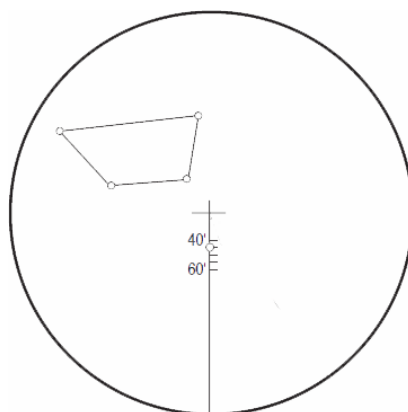


Figure 11. Polar scope reticle dial

5. Release the DEC clutch and turn the DEC axis to unblock the polar scope view. Retighten the DEC clutch.

6. Locate Polaris and place it in the center of the polar scope by adjusting the Altitude and Azimuth of the mount using the T-shaped Latitude Adjustment Screws and the Azimuth Adjustment Knobs. **Do not use hand controller (HC)!** Place Polaris directly under the cross in the center of the reticle.
7. Rotate the mount in R.A. using hand controller's ► or ◀ button, until the radial line points towards Beta-Ursa Minoris. If this star can not be seen, Mizar, the second star in the Big Dipper's handle, can be used. Or you can use the "**Polaris Position**" function of the 8401 HC (under **Align** submenu) to display the distance between the North Pole and Polaris (*r* in minutes) and radial line pointing direction. You may loose the R.A. clutch and hold the OTA when rotating the R.A. axis.
8. Fine tune the mount adjustment using the Latitude Adjustment Screws and the Azimuth Adjustment Knobs until Polaris is in the circle on the line in the polar scope. The *r* number displayed on 8401 HC can be used to determine the current position of Polaris along the line in the polar scope.

The polar alignment is now complete. The center crosshair denotes the North Celestial Pole. Return the mount to the Park Position. Tighten the R.A. and DEC clutches.

#### **To align your mount to South Pole in Southern Hemisphere:**

The four-sided figure in the reticle represents a grouping of four stars in Octantis (Sigma, Tau, Chi, and Upsilon) for use in the Southern Hemisphere. Move the telescope mount on its R.A. axis until the four stars depicted in the reticle are superimposed on the four star group that matches the reticle pattern.

## 4. GoToNova<sup>®</sup> 8401 Hand Controller



Figure 12. GoToNova<sup>®</sup> 8401 Hand Controller

GoToNova 8401 hand controller (HC) is the standard controller for a SmartStar<sup>®</sup> -PR equatorial mount, as shown in Figure 9.

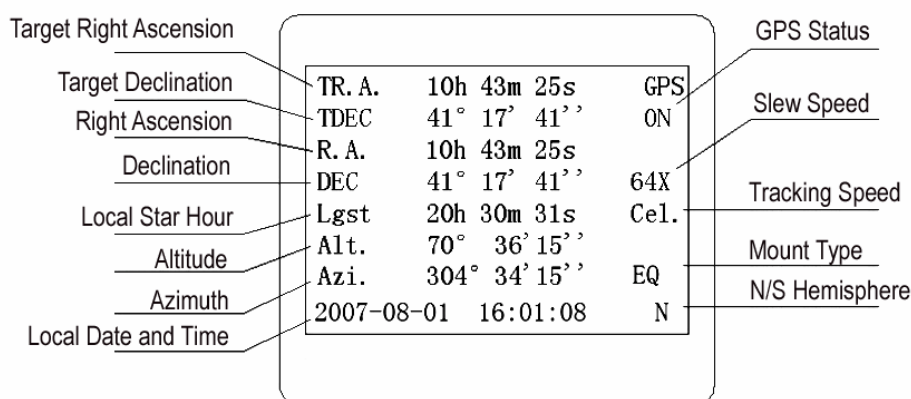
### 4.1. Key Description

- MENU: Press “MENU” to enter the Main Menu.
- BACK: Move back to the previous screen, or end/cancel current operation, such as slewing.
- ENTER: Confirm an input, go to the next menu, select a choice, or slew the telescope to a selected object.
- Arrow (▲▼▶◀): Press ▲▼ buttons to move a telescope along the DEC direction, ▶◀ to move a telescope along the RA direction. Brows the menu or move the cursor in operating menu.
- 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)
- Light Key(⚙️): Turns on/off the red LED reading light on the back of the controller.

- ? Key: For help or extra information.
- STOP/0 Key: Stop/Start tracking.
- HBX (Handbox) port: connect the HC to the mount using a 6-wire RJ-11 cable.
- USB port: connect the HC to a Computer via a USB cable.

## 4.2. The LCD Screen

The 8401 HC is designed to use for both iOptron's equatorial (EQ) mount, such as the SmartStar®-PR GOTO German equatorial mount and the GoToNova GOTO Kit, and AltAzimuth (A/A) mount, which includes all SmartStar® GOTO mounts and telescopes. It consists of a large 8-line LCD screen, which displays all the information as shown in Figure 13. The user interface is simple and easy to learn.



**Figure 13. 8401 HC LCD Information Screen**

- GPS status: When the power is turned on, it shows "GPS ON", which means a GPS receiver is connected, if there is a GPS receiver. When the GPS receiver finds the satellite and receives GPS signal, it shows "GPS OK". The "GPS OK" may turn off after few minutes.
- Slew speed: It has 9 speeds: 1X, 2X, 8X, 16X, 64X, 128X, 256X, 512X, MAX(~4°/sec).
- Tracking speed: It has 4 speeds: Cel (celestial), Sol (Solar), Lun (Lunar), Def (user defined)
- Mount Type: EQ is equatorial and A/A altazimuth.

## 4.3. Connection to a Computer

The GoToNova hand controller has a USB port which can be connected to a computer for firmware upgrade and computer control the mount. A USB2COM driver is needed to simulate the USB port to a RS-232 serial port. (see Appendix D. Set Up USB-PC Connection)

The iOptron mounts can be controlled by a number of popular astronomy software programs. For astronomy software that does not have an embedded iOptron mount driver, an ASCOM driver and related platform are needed. Please refer to Appendix F. Use a PC to Control an iOptron Mount for more information.

## 5. Getting Started

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

### 5.1. Setting Up the SmartStar<sup>®</sup> -PR Mount

The most important position of a SmartStar<sup>®</sup> -PR mount is its **Park Position**. The mount has to be at this position every time the mount is setting up to ensure the GOTO performance.

The Park Position of an EQ mount is when the mount is Polar aligned. The important detail is:

- The North-facing Tripod Leg (the one underneath the Tripod Alignment Peg) is facing north;
- The mount is leveled;
- The counterweight shaft is pointing straight down, in line with the North-facing Tripod Leg;
- The edge of the dovetail saddle is parallel to the polar axis, with DEC motor unit on the east side of the mount;
- The R.A. axis is pointing to North and inclined at an angle above the horizon equal in magnitude to your latitude; and
- The optical axis of the telescope is parallel to the polar axis and is on top the mount, as shown in Figure 14.

After the mount is set up, connect the R.A. motor unit and DEC unit with one coiled cable. Connect the 8401 HC to the mount (Port A or Port B). Connect the 12V DC power to the R.A. unit. Turn the mount on by press the power switch.



Figure 14. Park position

## 5.2. Setting Up the Hand Controller

The mount needs to have correct date, time and site information before it can perform GOTO correctly. The 8401 HC has a backup battery to remember the date and time between the sessions. The site information includes longitude, latitude and time zone offset, will be stored in HC flash memory until you change them.

If your SmartStar-PR equipped with an optional GPS receiver (#8411), the hand controller will receive the local time, longitude and latitude information from satellites after the link is established. A clear sky outside is needed for the GPS to establish its link with the satellites. **However, manual input is still needed for time zone and Daylight Saving setting.**

### 5.2.1. Set Up Local Time

Press MENU button, from the main menu, scroll down and select “**Set up controller**”

```
Select and Slew
Sync. to Target
Electronic Focuser
Set Up Controller
Align
Set Up Tracking
User Objects
Auto Guide
```

Press ENTER. Select “**Set Up Local Time**”

```
Set Up Local Time
Set Up Site
Set N/S Hemisphere
Set Display Contrast
Set Eyepiece Light
Set Backlight
Set Snti-backlash
Set Key Beep
```

Press ENTER. The “**Set Local Time**” screen will show:

```
Set Local Time:
2009-06-01 11:55:09
Daylight Saving Time Y
```

Use ◀ or ▶ key to move the cursor and the number key to enter the number. Use the ▲ or ▼ button to toggle between “Y” and “N” of Daylight Saving Time. Press ENTER to go back the previous screen.

### 5.2.2. Set Up Site Info

Scroll down and select “**Set up site**”

```

Set up Local Time
Set up site
Set N/S hemisphere
Set display contrast
Set Eyepiece light
Set Backlight
Set anti-backlash
Set Key Beep

```

Press ENTER. “W/E” means western/eastern hemisphere; “N/S” means northern/southern hemisphere; “d” means degree; “m” means minute; and “s” means second.

```

Set up site info:
Longitude:
    W071d27m47s
Latitude:
    N42d15m40s
300 Min. behind UT

```

Press ◀ or ▶ key to move the cursor and ▲ or ▼ key to toggle between “W” and “E”, “N” and “S”. Use 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 GPS navigator, smart phone or internet. You may also find it from *Support* section in iOptron website, under *Controller Set-up* (<http://www.ioptron.com/support.cfm?module=faq#> ).By entering the city name or address, you can find its latitude and longitude. In case you only find the site information in decimal format you can convert them into d:m:s format by multiplying the decimal numbers by 60. For example, N47.53 can be changed to 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.

Press ◀ or ▶ key, move the cursor to the bottom of the screen to set the time zone information (add or subtract 60 minutes per time zone). Enter minutes “*ahead of*” or “*behind*” UT (universal time).

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

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

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

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



For other parts of the world you can find your “time zone” information from iOptron website (<http://www.ioptron.com/support.cfm?module=faq#>). DO NOT COUNT DAYLIGHT SAVING TIME.

**8401 HC also accept fraction time zone setting.**

### 5.2.3. Set Mount Type

The 8401 HC will automatic detect the mount type as EQ. You may also manually select if from “**Set Mount Type**” menu. Scroll down and select “**Set Mount Type**”,

```
Set up site
Set N/S hemisphere
Set display contrast
Set Eyepiece light
Set Backlight
Set anti-backlash
Set Key Beep
Set Mount Type
```

Press Enter.

```
Equatorial Mount
Alt/Azi Mount
```

Select **Equatorial Mount** and press ENTER to go back the previous screen.

### 5.2.4. Set N/S Hemisphere

If the polar axis is aligned to North Celestial Pole, then set the mount to Northern Hemisphere. If the polar axis is pointing to South Celestial pole, set the mount to Southern Hemisphere.

```
Set up Local Time
Set up Observ. site
Set N/S hemisphere
Set display contrast
Set Eyepiece light
Set Backlight
Set anti-backlash
Set Key Beep
```

Press Enter.

```
North hemisphere
South hemisphere
```

Select **North Hemisphere** if you are located in US and press ENTER to go back to the previous screen.

### 5.2.5. Initial Star Alignment

A simple star alignment/synchronization can be performed to improve the GOTO accuracy.

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

An alternate way is to perform “**Sync to Target**.” Press the MENU button, select “**Select and Slew**” and press ENTER. Browse over the catalogs and select an object, such as “**Stars**” → “**Named stars**” → **140 (Polaris)**, and press ENTER. After the mount slews to Polaris, press the MENU button, scroll down to “**Sync. To Target**”, follow the on-screen instruction to center Polaris and press ENTER. You may need to use the number keys to change the slewing speed to make the centering procedure easier.

### 5.2.6. Go to the Moon

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

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

## 5.3. Turn Off the Mount

When you have finished your observation, it is recommended that you return the mount to Park Position before powering down. This will ensure that there is no need for you to perform the initial setup again when you power up the mount subsequently, if the mount is not moved. To return the mount to its Park Position, press the MENU button, scroll down to “**To Park Position**” and press ENTER. Once the telescope returns to Park Position turn the power off.

## 6. Use the Hand Controller

### 6.1. Manual Operation of a Telescope

You may observe land and astronomical objects using 8401 HC's arrow keys.

After the telescope was assembled, flip the I/O switch on the telescope mount to turn on the mount. Use ►, ◀, ▼ or ▲ buttons to point the telescope to the desired object. You may need to use the number keys to change the slewing speed. Simply press a number while slewing to change the slew speed.

### 6.2. Select and Slew

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

The GoToNova® 8401 hand controller has a database of about 130,000 objects. Use the ► or ◀ buttons to move the cursor and the ▼ ▲ buttons to change the individual number. The check mark (√) indicates the object is above the horizon, and a cross mark (X) means it is below the horizon. In some catalogs those stars below the horizon will not display on the hand controller.

#### 6.2.1. Planets, Sun, Moon

There are 10 objects in the Solar system catalog.

#### 6.2.2. Deep sky objects

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

- Named Deep Sky Objects: consists of 60 deep sky objects with their common names. A list of named deep sky objects is attached in Appendix C.
- Messier Catalog: consists of all 110 objects.
- NGC IC Catalog: consists of 7840 objects in NGC catalog and 5386 objects in IC catalog. To select an object from NGC or IC catalog, move the cursor to NGC, using ▲ or ▼ button to toggle between NGC and IC. Then move the cursor to numerical position and use the number button to select the object.
- UGC Catalog: consists of 12939 objects.
- MCG Catalog: consists of 29004 objects. They are listed numerically from MCG+15 to MCG-05.
- Caldwell Catalog: consists of 109 objects.
- Abell Catalog: consists of 2712 objects.
- Herschel Catalog: consists of 400 objects.

#### 6.2.3. Comets

This catalog contains up to 190 comets. This database is customer upgradeable.

#### 6.2.4. Asteroids

This catalog contains up to 4096 asteroids. This database is customer upgradeable.

### 6.2.5. Stars:

- Named Stars: consists of 191 stars with their common names. They are listed alphabetically. A list is attached in Appendix C.
- Double Stars: consists of 40 double stars. A list is attached in Appendix C.
- GCVS Variable Stars: consists of 38624 GCVS variable stars. They are listed numerically.
- SAO Catalog: consists of 26584 SAO catalog objects. They are listed numerically.

### 6.2.6. Constellations

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

### 6.2.7. User Objects

This catalog can consist up to 256 user predefined objects. These objects need to be entered before they can be selected for slewing.

### 6.2.8. Enter R.A. DEC

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

## 6.3. Sync to Target

This operation will match the telescope's current coordinates to Target Right Ascension and Declination. After slew to an object, press MENU—then scroll to “**Sync to Target**” and press ENTER. Follow the screen to do the sync. Using this function will re-calibrate the computer to the selected object. Multiple syncs can be performed if needed.

“**Sync to Target**” will only work after “**Select and slew**” is performed. Otherwise, the system may perform incorrectly. You can change the slewing speed to make the centering procedure easier. Simply press a number (1 through 9) to change the speed. The default slew speed is 64X.

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

## 6.4. Electric Focuser

For future use.

## 6.5. Set Up Controller

### 6.5.1. Set Up Local Time

Please refer to 5.2.1.

### 6.5.2. Set Up Site

Please refer to 5.2.2.

### 6.5.3. Set N/S Hemisphere

Please refer to 5.2.4.

#### 6.5.4. Set Display Contrast

Use arrow keys to adjust LCD display contrast.

#### 6.5.5. Set Eyepiece Light

If you have an illuminated-reticule eyepiece or illuminated polar scope, and it is supported by GoToNova hand controller -- use this option to adjust the light intensity.

#### 6.5.6. Set Backlight

Adjust LCD and keypad backlight.

#### 6.5.7. Set Anti-backlash

All mechanical gears have a certain amount of backlash or play between the gears. This play is evident by how long it takes for a star to move in the eyepiece when the hand control arrow buttons are pressed (especially when changing directions). The GoToNova anti-backlash feature allows the user to compensate for backlash by inputting a value which quickly rewinds the motors just enough to eliminate the play between gears. The amount of compensation needed depends on the slewing rate selected; the slower the slewing rate the longer it will take for the star to appear to move in the eyepiece. You will need to experiment with different values (from 0-2000 steps, each step equals to 1.5 arc sec). A value between 100 and 200 is usually best for most visual observing, whereas a higher value may be necessary for photographic guiding.

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

To set the anti-backlash value, select the "**Set Up Controller**" menu and scroll down to the "**Set anti-backlash**" option and press ENTER.

```
Set up Local Time
Set up site
Set N/S hemisphere
Set display contrast
Set Eyepiece light
Set Backlight
Set anti-backlash
Set Key Beep
```

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

```
R.A. anti-backlash:
    0150  steps

One step equals to
  1.5 arc second.
```

To adjust steps, move the cursor to each digit and use the number key to input number directly. Press ENTER, a DEC anti-backlash will display:

```
DEC anti-backlash:
    0150  steps

One step equals to
  1.5 arc second.
```

Move the cursor to each digit and use the number key to set the anti-backlash. Press ENTER to go back the previous screen.

Press BACK button to go back to main menu.

### 6.5.8. Set Key Beep

Turn the key beep on/off.

### 6.5.9. Set Mount Type

The HC will detect and automatic set the mount as Equatorial Mount.

### 6.5.10. Reset All

Reset all settings to factory default data.

### 6.5.11. Update Firmware

Firmware updating using iOptron Downloader through USB port on hand controller. (Refer to Appendix E.)

### 6.5.12. Set gear ratio

Reserved for future products.

### 6.5.13. Set Language

Select hand controller language.

## 6.6. Align

This function is used for aligning the telescope. In addition to “**Easy One Star Align**,” the system also provides “**One Star Align**”, “**Two Star Align**” and “**Three Star Align**”. **The mount has to be at Park Position before performs any alignment procedure.**

### 6.6.1. Easy One Star Align

Press MENU button, scroll down to “**Align**”, select “**Easy One Star Align**” and press ENTER. The screen will list three bright objects for you to select from (ex. Moon, Jupiter, Venus). Select an object using ▲ or ▼ key. Then press ENTER. Next use the arrow keys to slew to the object until it is centered in your eyepiece. Then press ENTER.

You may need to use the number keys to change the slewing speed to make the centering procedure easier.

### 6.6.2. One Star Align

From the main menu select "**Align**". Select "**One Star Align**". Use ▲ and ▼ buttons to select a star and press ENTER. A list of align planets or stars that are above the horizon is computed based on your local time and location. Use arrow buttons to move the telescope and center the star in your eyepiece. You can use the number buttons to change the slew speed.

Press ENTER when finished. If your setup is leveled well, one star alignment should be sufficient for good GOTO accuracy. To increase the accuracy you may choose to do two star alignment.

### 6.6.3. Two Star Align

Two star alignment will increase the GOTO accuracy of the mount. It is suggested to do two star alignment after one star alignment. Two star alignment requires a wider view of the sky, since the two align stars need to be far apart. Select "**Two Star Align**" in the **Align** menu. When you finish the first star, the system will prompt you to choose the second star. If the star you choose is too close to the first one, the system will let you choose another one. When you are aligned with the second star, two star alignment is finished. You can reject the suggested star if it is blocked by the tree or behind the house.

"**Two Star Align**" results will be overridden if "**One Star Align**" or "**Sync. to Target**" is performed after "**Two Star Align**."

### 6.6.4. Three-Star Align

Three-star alignment procedure will reduce the so-called "**corn error**" of an EQ mount. Before GoToNova can find anything for you it needs to establish that the Park Position of your mount's polar axis is indeed pointing at the north celestial pole. Furthermore, every mount's accuracy of construction varies somewhat, so the optical axis of the telescope may not be perpendicular to the declination axis or, more rarely, the polar axis may not be at right angles to the declination axis. These small errors (known collectively as the cone error) can make a big difference to the GOTO performance of your mount, so it pays to understand the implications.

From the main menu select "**Align**". Select "**Three Star Align**". GoToNova will then present you with the name of a suggested alignment star. If this star is hidden by a tree or building, press the down arrow to advance through the list in alphabetical order until you find a star that is visible. Press ENTER and the mount will slew to where it thinks the star you have selected lies, beeping once it has finished moving. Most likely, the scope won't be pointing exactly at the star, so use the ▲▼► or ◀ arrows to centre the star — first in the finder, then in the eyepiece. Once you are done, press ENTER and the next alignment star will be selected. Repeat this process until you have selected all three stars whereupon GoToNova will compute the polar axis positioning error of your mount and display it. For a better result, select three stars located in the different part of the sky.

Press BACK and you will return to the display.

### 6.6.5. Dis R.A axis error

This displays the celestial pole point error after two star or three star alignment. Point error is zero when you power on the mount (unless you "**Park Telescope**" before powering off.)

### 6.6.6. Test Anti-backlash

This command tests the backlashes in both R.A. and DEC. The saved numbers will show in "Set Anti-backlash" menu. However, if no high accuracy is needed or your equatorial mount is not a

high accurate unit (*i.e.* the worm gear has different clearance in different positions) you may omit this procedure.

### **6.6.7. Polaris Position**

Polaris is NOT at the exact point of the Polar Axis. This shows the offset (about 40 min) between the Polaris and the actual Celestial Pole (Polar Axis), as well as the direction of the Polaris to the Polar Axis at the observing location. For a precise polar alignment, this offset needs to be taken into account. In order to use this function, a better mount with a suitable polar scope is needed.

### **6.7. PEC Option**

Does not support this model.

### **6.8. Set Up Tracking**

A user can set up tracking in the main menu by selecting "**Set up tracking**". Then the user can select "**Sidereal speed**", "**Solar speed**", "**Lunar speed**", and "**User defined speed**". For "**User defined speed**" this can be adjusted from 91% to 109% of sidereal speed by pressing the ▲ or ▼ buttons.

### **6.9. User Objects**

Besides various star lists available in the hand controller --you can add, edit or delete your own user-defined objects. All data you enter is supposedly J2000.0 epoch.

### **6.10. Auto Guide**

This is an advanced function for autoguiding when a guiding camera is equipped. The GoToNova supports autoguiding through ASCOM protocol or an ST-4 guiding camera (an extra ST-4 to HBX adapter is needed). Please follow the guiding software for detailed instructions.

### **6.11. Park Scope**

This procedure only needs to be done if you are turning off the mount and do not move your telescope mount after the mount is powered off. Celestial pole pointing error will be stored to flash memory and recalled when you power on again.

To move the mount to its Park Position, please use "**To Park Position**".

### **6.12. To Park Position**

This moves your telescope to park position. When power is turned on--the mount assumes the physical position is the park position. This is its reference point for all other objects.



## **7. Maintenance and Servicing**

### **7.1. Maintenance**

The SmartStar-PR is designed to be maintenance free. Do not overload the mount. Do not drop the mount, this will damage the mount or degrade the GOTO tracking accuracy permanently. Do not drop the hand controller. Do not connect other accessories to the hand controller. Only use iOptron supplied coiled cables and USB cables. 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 a question concerning your products, contact the 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 kit or hand controller requires factory servicing or repairs, write or call the iOptron Customer Service Department first to receive an RMA# before returning the telescope to the factory. Please provide details as to the nature of the problem as well as your name, address, and daytime telephone number. We have found that most problems can be resolved by e-mail or telephone. So please contact iOptron first to avoid returning the telescope for repair. It is strongly suggested that to send technical questions to [support@ioptron.com](mailto:support@ioptron.com). Call toll free in the U.S. 866.399.4587 or 1.781.569.0200.

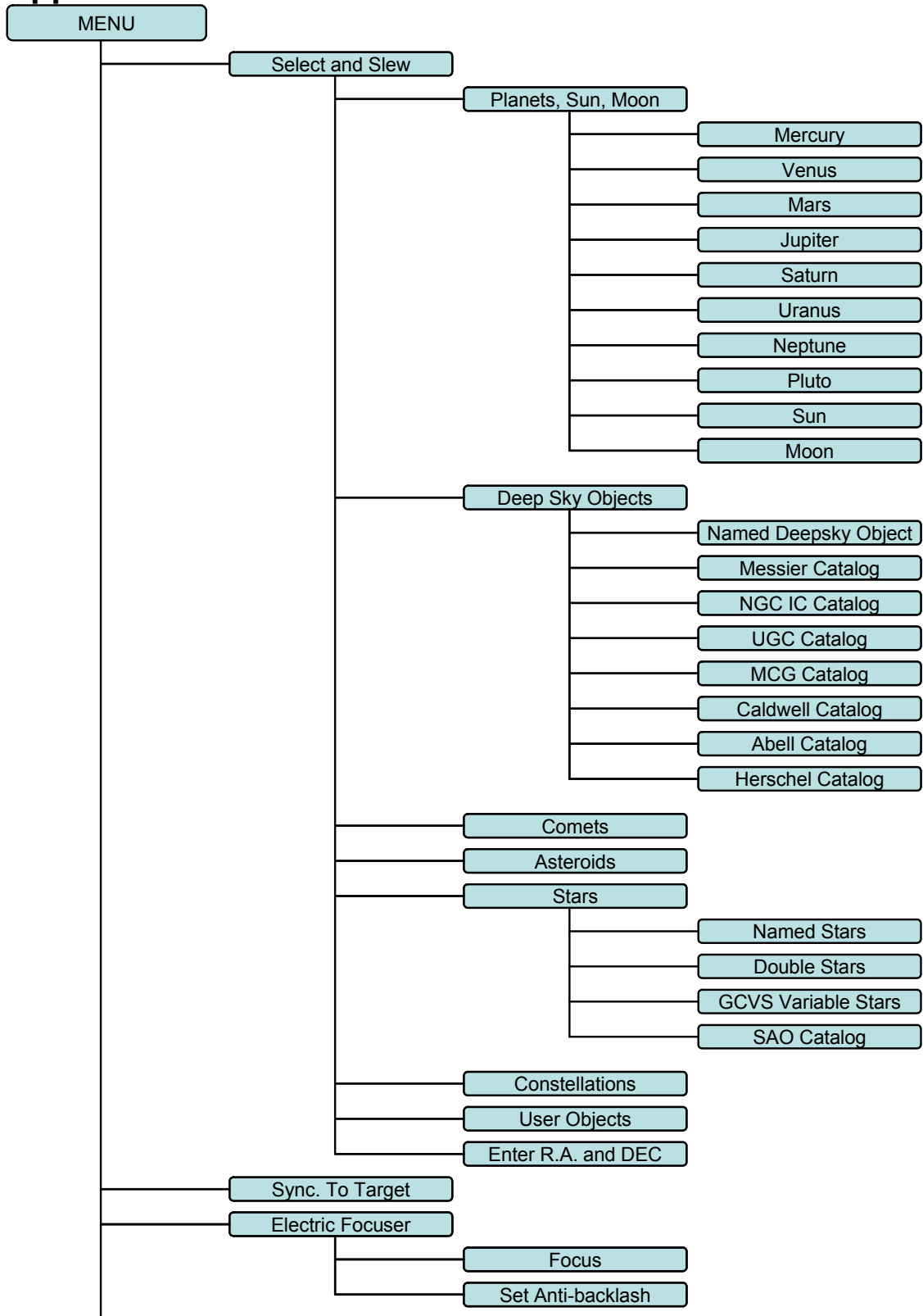
May 2011 V2.0

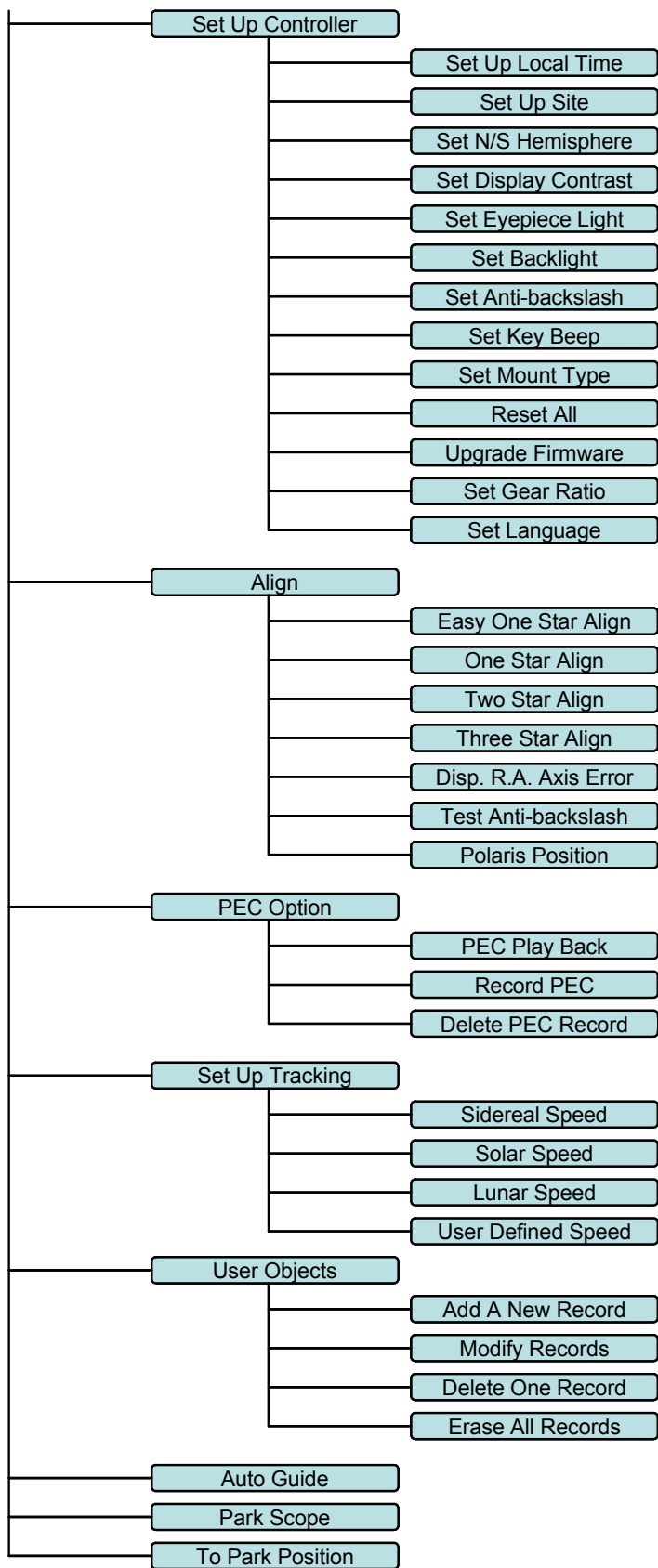
iOptron reserves the rights to revise this instruction without notice. Actual color/contents/design may differ from those described in this instruction.

## Appendix A. Technical Specifications

Product name	SmartStar <sup>®</sup> -PR German Equatorial Mount
R.A. and DEC worm wheel	Φ72mm, 144 teeth aluminum
R.A. and DEC worm gear	Brass
Motor	DC servomotor with optical encoder
Resolution	0.375 arc second
Latitude adjustment	0° ~ 90°
GPS	Optional 32 channel GPS receiver (#8411)
Polar scope	Yes. (with dark field illumination)
GOTO system	GoToNova <sup>®</sup>
Processor	32bit ARM
Hand controller	GoToNova <sup>®</sup> 8401
Object database	130,000
Control speed	9 speed (1×,2×,8×,16×,64×,128×,256×,512×,MAX)
LCD display	8 line, 21 character with LED backlit
Tracking control	Automatic
Tracking speed	celestial, solar, lunar and user defined
Counterweight shaft	Φ20 mm (included)
Counterweight	8.8 lb (4kg) (Φ100X84 mm, included)
Tripod	2" Stainless steel
Dovetail saddle	Vixen
Power consumption	0.2A(Tracking), 1A(Slew)
Power requirement	12V DC(11 ~ 15V), 1.5Amp, center positive
USB port	Yes (on hand controller)
ST-4 autoguiding port	Yes (with optional ST-4 adapter #8427)
LED reticle connector	Yes
Operation temperature	0°C ~ 40°C
Firmware upgrade	Yes
PC computer control	Yes

# Appendix B. GoToNova<sup>®</sup> 8401 HC MENU STRUCTURE





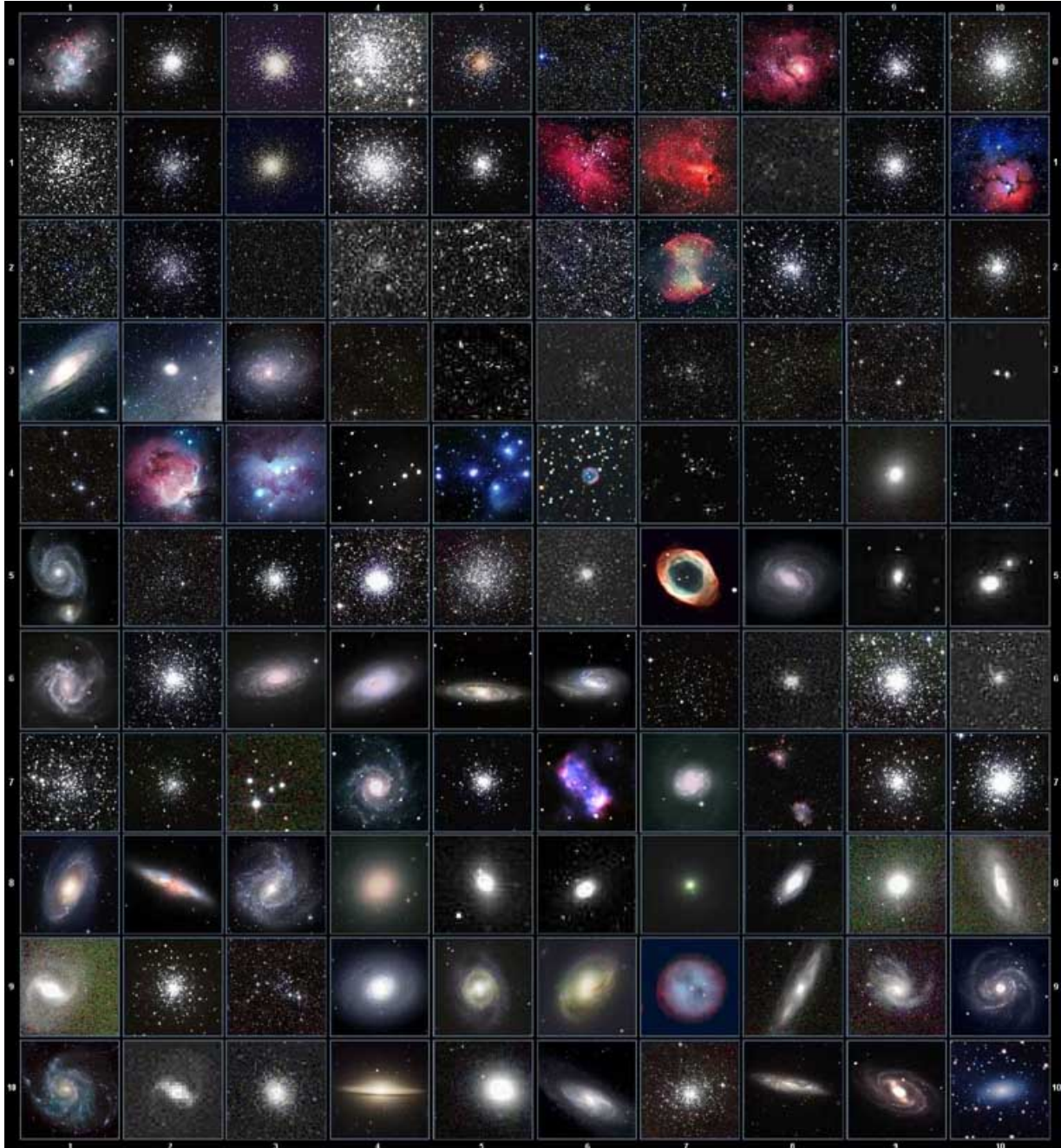
## Appendix C. GoToNova<sup>®</sup> Star List

### GoToNova 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	
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			

# Messier



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## 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



## GoToNova Named Star List

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

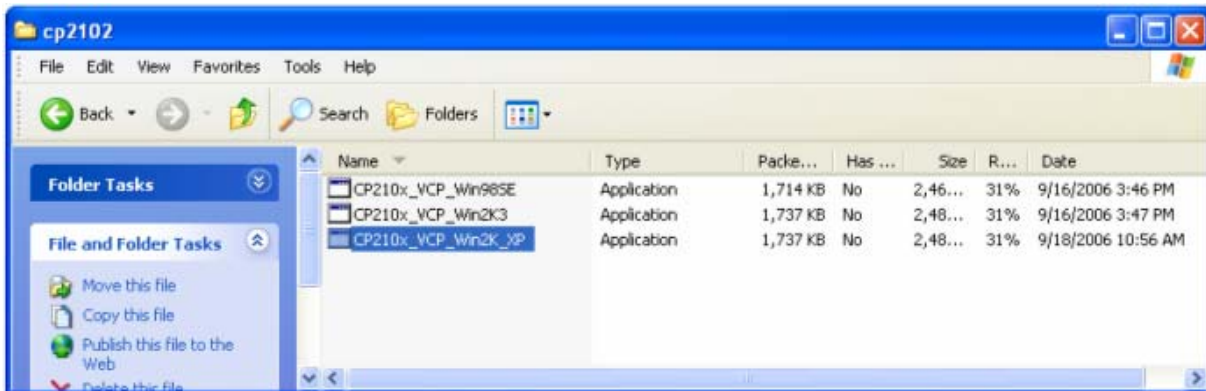
## GoToNova Double Star List

No.	Object	Const	SAO	Name
1	Eta	Cas	21732	Achird
2	Alpha	Psc	110291	Alrisha
3	Theta	Per	38288	
4	Alpha	For	168373	Fornacis
5	Alpha	Aur	40186	Capella
6	Sigma	Ori	132406	
7	Mu	Ori	113389	
8	Alpha	CMa	151881	Sirius
9	Delta	Gem	79294	Wasat
10	Alpha	Gem	60198	Castor
11	Alpha	CMi	115756	
12	Epsilon	Hya	117112	
13	HR 3579		42642	
14	Kapa	UMa	42661	
15	Psi	Vel	221234	
16	Gamma	Leo	81298	Algieba
17	HR 4167		222199	
18	Mu	Vel	222321	
19	Alpha	UMa	15384	Dubhe
20	Zeta	UMa	28737	Mizar
21	Iota	Leo	99587	
22	Gamma	Cen	223603	
23	Gamma	Vir	138917	Porrima
24	Beta	Mus	252019	
25	HR 5089		204545	
26	Alpha	Cen	252838	
27	Zeta	Boo	101145	
28	Gamma	Lup	225938	
29	Gamma	CrA	83958	
30	Xi	Sco	159665	
31	Alpha	Sco	184415	Antares
32	Lambda	Oph	121658	Marfic
33	Zeta	Her	65485	
34	Eta	Oph	160332	Sabik
35	70	Oph	123107	
36	Zeta	Sgr	187600	Ascella
37	Delta	Cyg	48796	
38	Beta	Del	106316	Rotanev
39	Tau	Cyg	71121	
40	Epsilon	Lyr	67310	double double

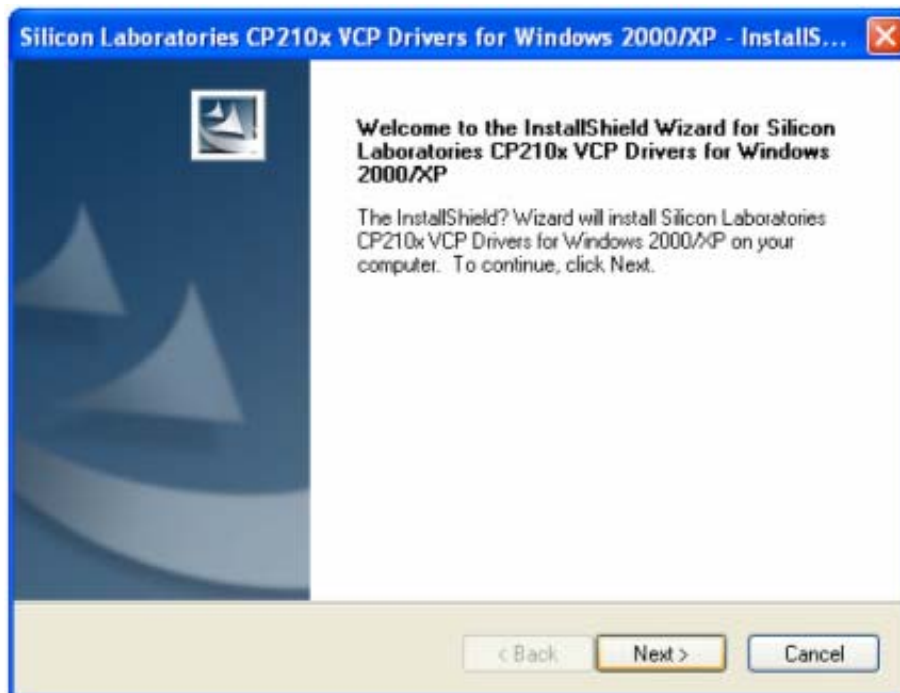
## Appendix D. Set Up USB-PC Connection

The example shown is using a PC with windows XP operation system.

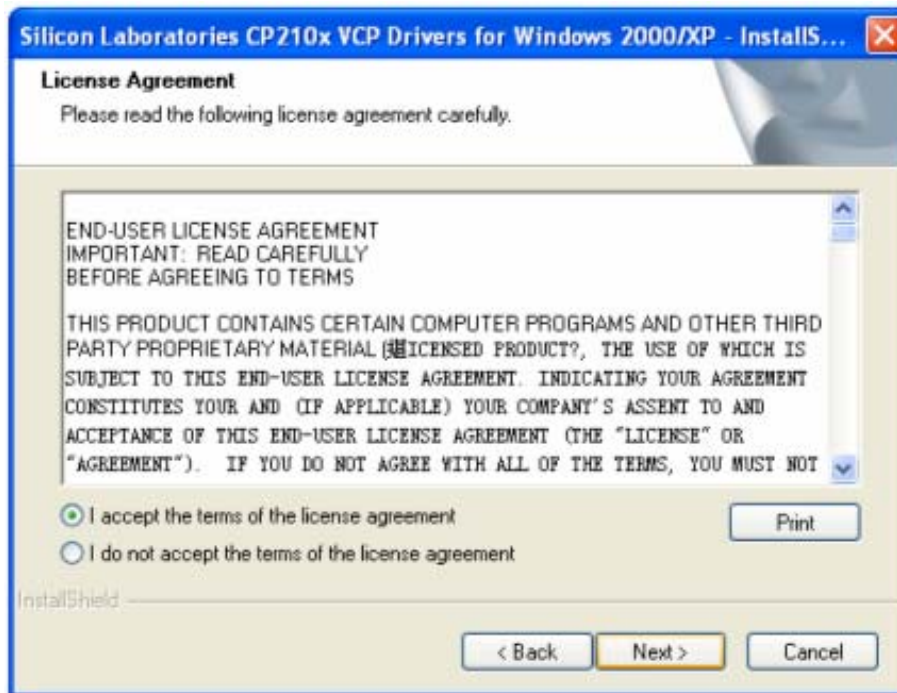
1. Download USB2COM driver (cp210x.zip file for 8401) from iOptron Website
2. Install cp210x(usb2com) driver



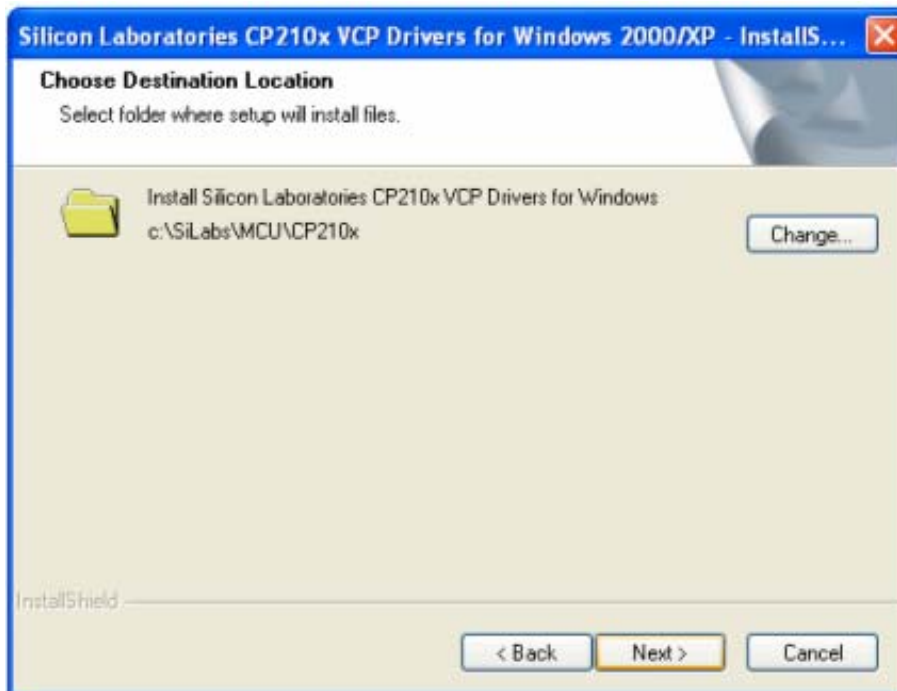
Choose the appropriate driver for your OS. In this case is a Windows XP operation system. Double click on it, and you will see:



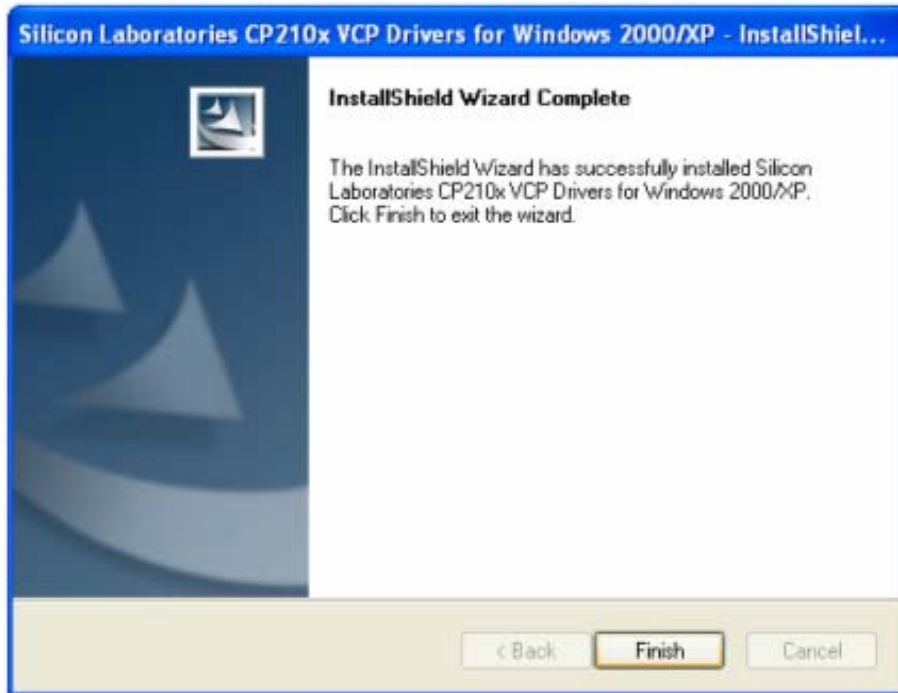
Click "Next".



Select "I accept the terms of license agreement", and click "Next"



Using the default installation path, c:\SiLabs\MCU\CP210x, or specify your own path by click "Change". Click "Next". Then click "Install".

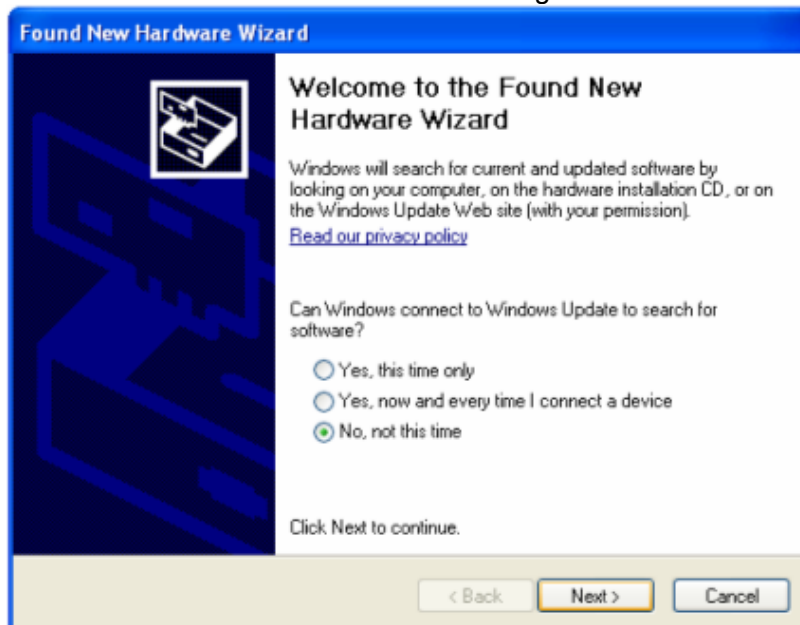


When finished installation, click "Finish"

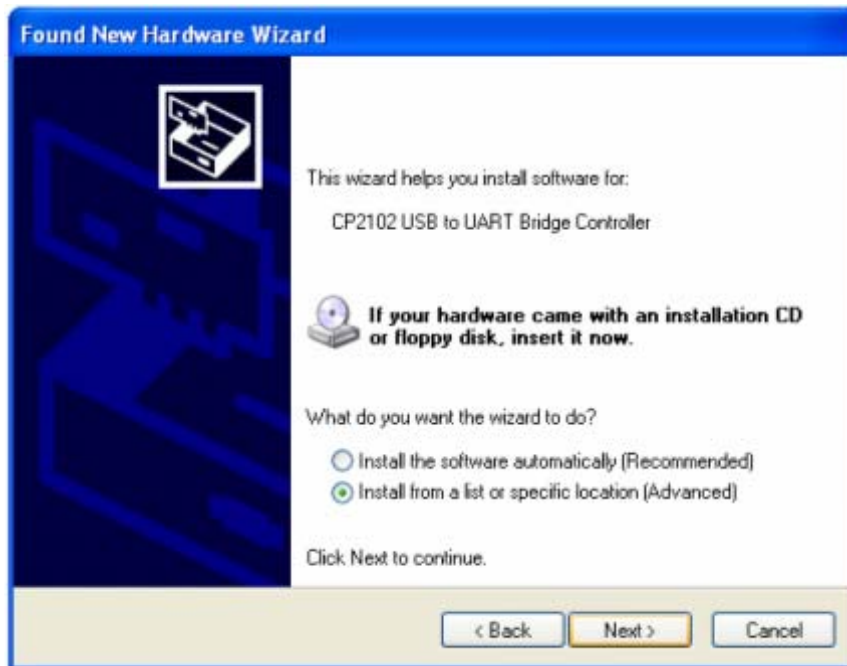
**3. Plug the USB cable to the USB port on your PC, plug the other end of the USB cable to hand controller. Turn on the power on the mount.**

#### **4. Install the Hardware**

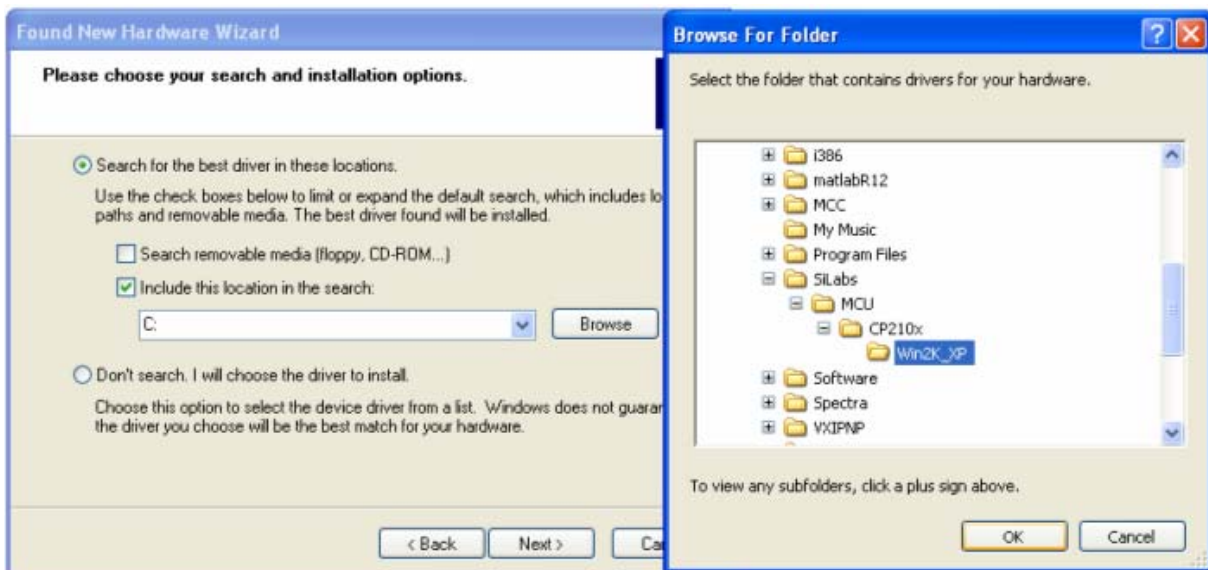
The computer will find a new hardware and show the following screen



Select "No, not this time" and click "Next".

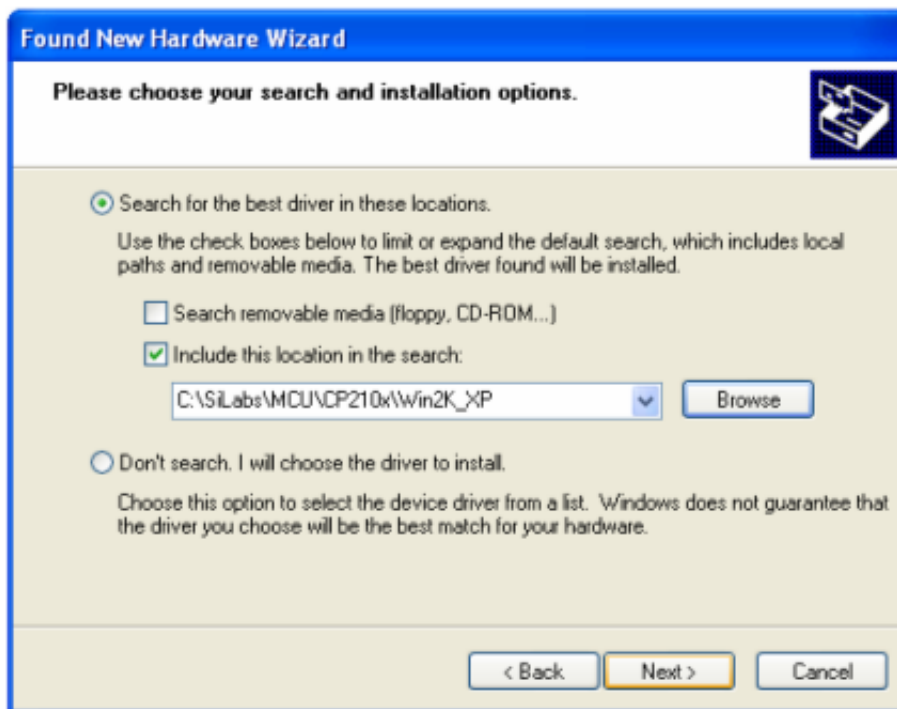


Select “Install from a list or specific location” and click “Next”.



Select “Search for the best driver in these locations,” and check “Include this location in the search.”

Click on “Browse” and select the cp210x driver from directory c:\SiLabs\MCU\CP210x\Win2K\_XP, click OK.



Click “Next”. The computer will start to install the driver for the USB2COM. When the installation is done, click “Finish”.

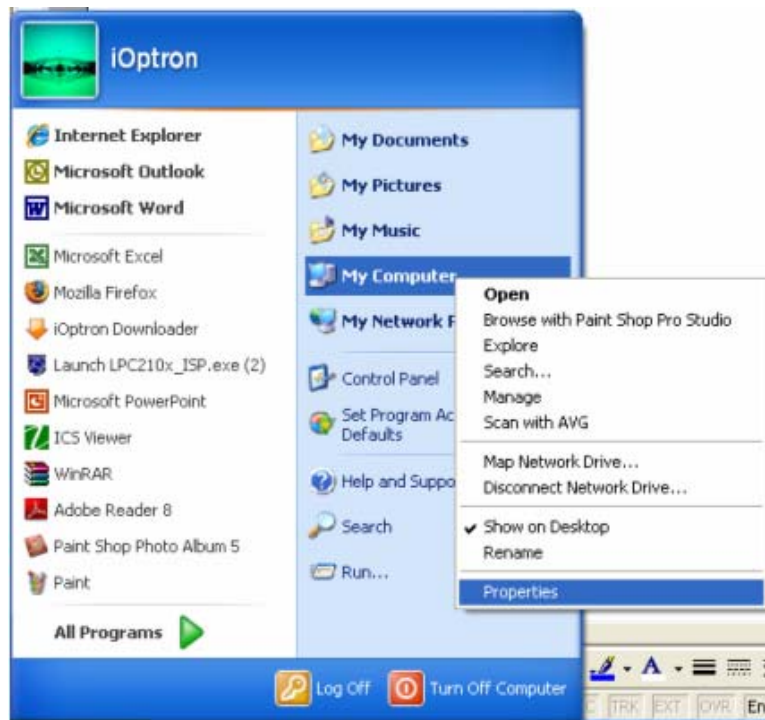


***If the computer shows “find a new hardware” screen again, just repeat the steps in this section again.***

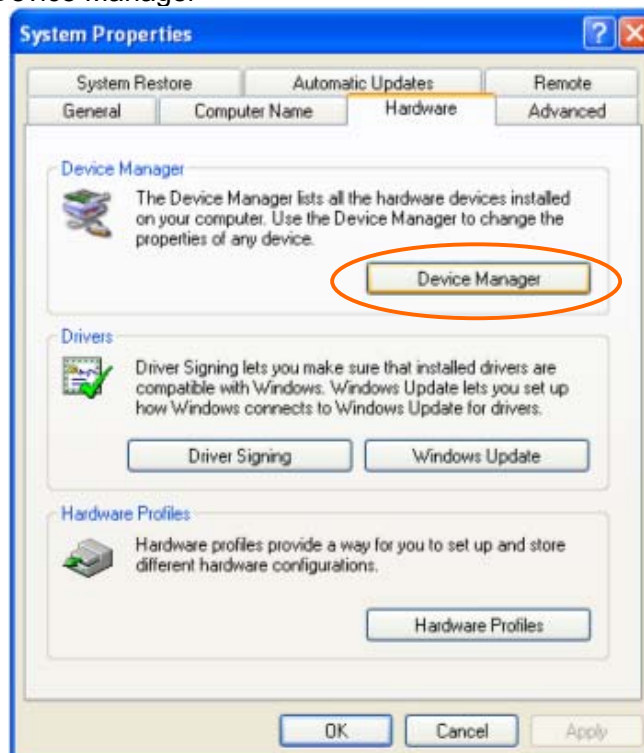
Now your computer should be ready for Firmware Upgrading; computer communication with the mount via ASCOM platform; and planetarium software applications. However, you need to find



assigned COM port number for the USB connection. To do so, right click “My Computer”, and click “Properties”

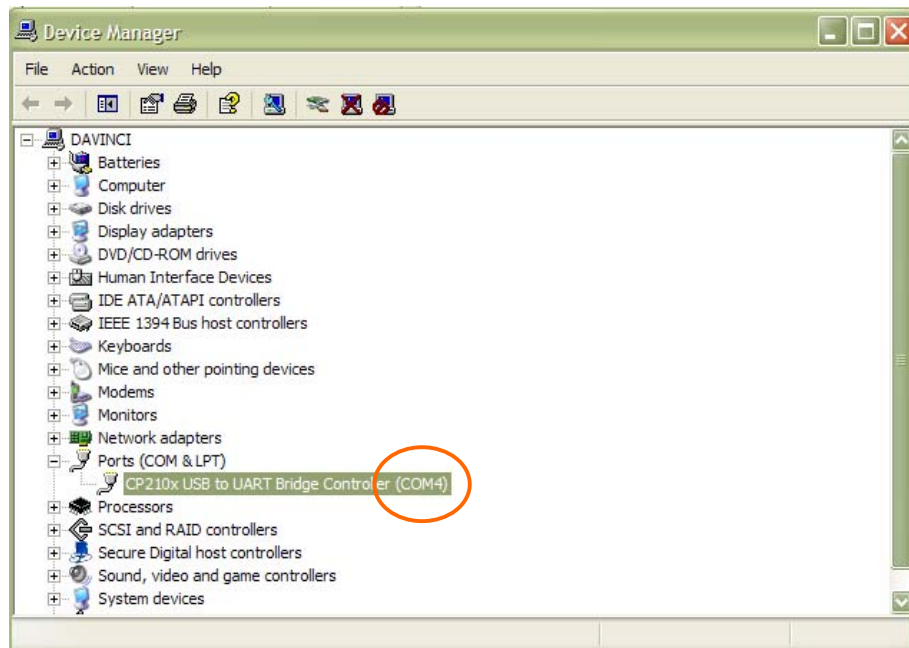


Click “Hardware”, click “Device Manager”



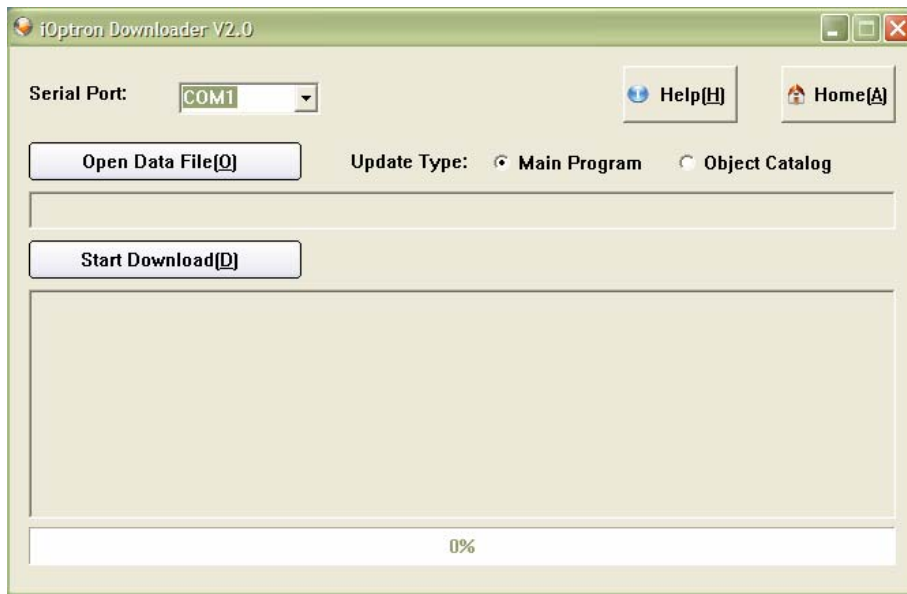
Double click on “Ports (COM & LPT)”. Find the COM number and write it down (in the following figure, it is COM4)



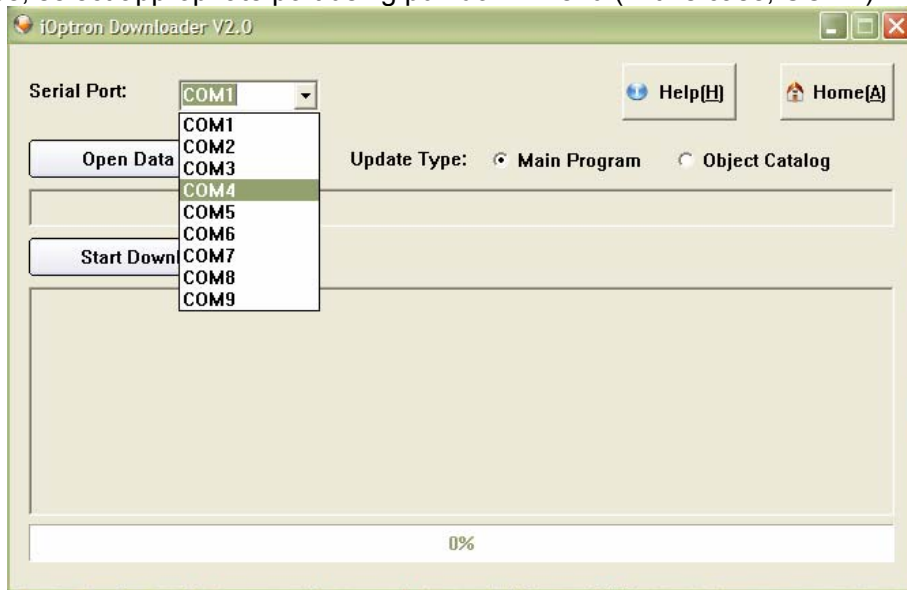


## Appendix E. Firmware Upgrade

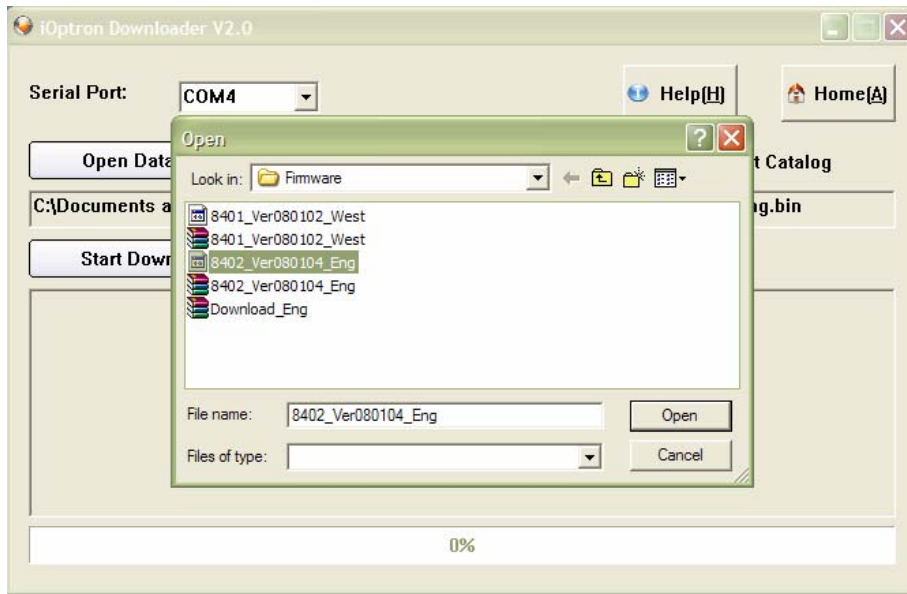
1. Download and install Firmware Downloader from iOptron Website
2. Double click and open “iOptron Downloader”



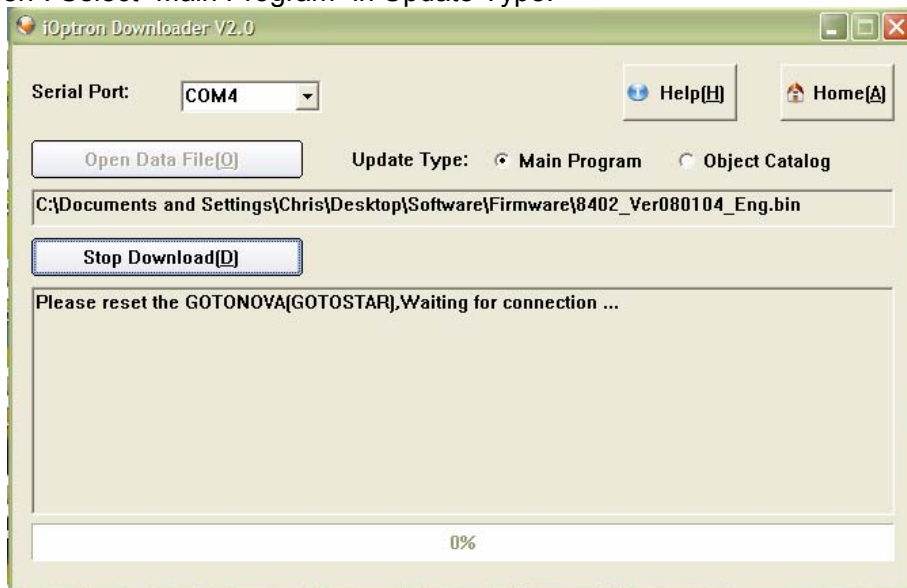
On the interface, select appropriate port using pull-down menu (in this case, COM4):



Click “Open Data File” and select the appropriate “.bin” file that matches your hand controller.



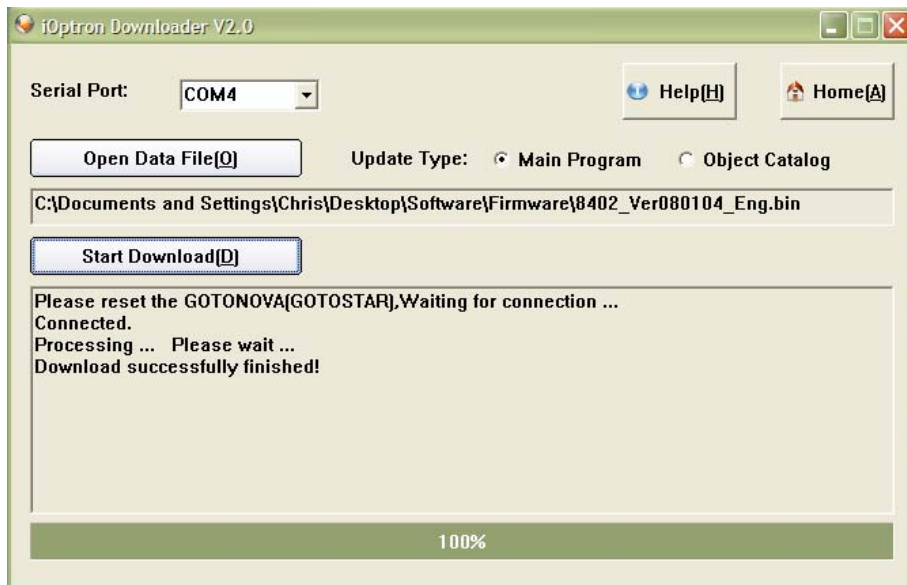
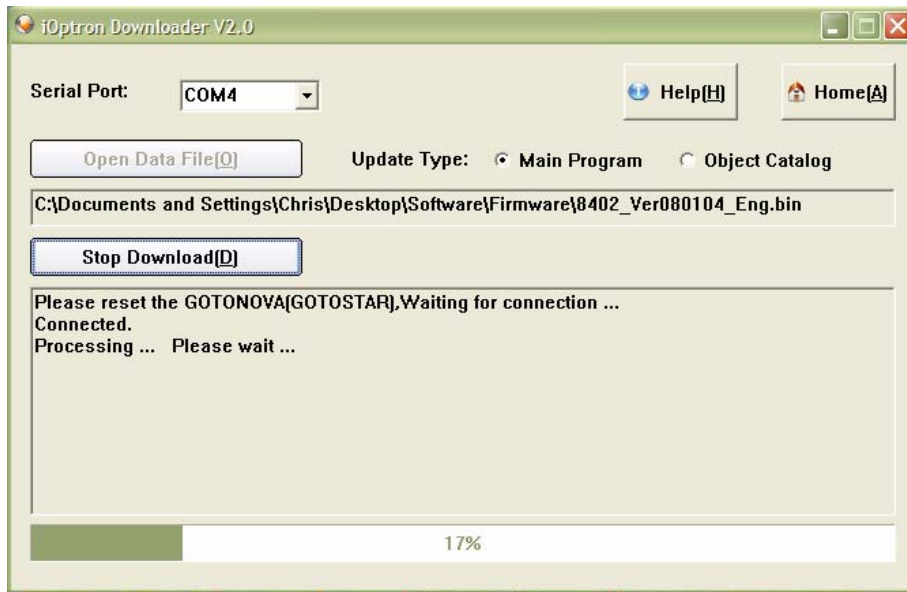
Then click “Open”. Select “Main Program” in Update Type.



Click “Start Download”

It shows “Please reset GoToNova[GOTOSTAR], waiting for connection...”

On the hand controller, press “MENU”, and using ▼▲ scroll to select “Set u controller”, press “ENTER”, then select “Upgrade firmware”, press “ENTER” and the upgrade will start.



The upgrade is completed. Turn your mount power off then on again.

#### Typical Errors:

1. Invalid Port Number: in Device Manager: make sure you have the correct COM port number for CP210x.
2. Wrong downloader: you should use iOptron Downloader instead of the Flash Downloader.
3. Use cp210x driver provided by iOptron. The newest version from SiLab may not work properly for iOptron's hand controller.
4. Screen is now blank: wrong ".bin" file: make sure you have the correct ".bin" file for firmware upgrade. Follow iOptron online FAQ, "***What can I do if the firmware upgrade was interrupted, or after download the screen is blank or does not respond?***" to reset your hand controller (<http://www.ioptron.com/support.aspx?catalog=26>).

## Appendix F. Use a PC to Control an iOptron Mount

In general you need the followings to use a PC to control an iOptron mount:

1. A GoToNova Hand Controller with USB port, such as 8402 or 8401 Hand Controller;
2. Download USB2COM driver from iOptron website <http://www.ioptron.com>, click on **Support**, select **GoToNova Hand Controllers**.
  - For 8401, 8402 hand controller, download cp2102.zip or CP210x VCP driver depends on your windows operation system;
  - For 8402G hand controller, download PL-2303 VCP driver
3. Install USB2COM to establish the connection between the mount and the PC;
4. Download and install ASCOMPlatform5b.msi from <http://www.ascom-standards.org/>
5. Download and install ASCOMPlatform5.5.1 Update from <http://www.ascom-standards.org/>.
6. Download and install iOptron Telescope ASCOM drive 1.03b from iOptron website, click on **Support**, select **ASCOM Driver**.
  - Please remove previous installed iOptron ASCOM driver before installation
  - If your computer does not have a Visual C++ 2008 SP1 Redistribute, which gave an error message during ASCOM installation, you need download and install one from [http://download.microsoft.com/download/d/d/9/dd9a82d0-52ef-40db-8dab-795376989c03/vcredist\\_x86.exe](http://download.microsoft.com/download/d/d/9/dd9a82d0-52ef-40db-8dab-795376989c03/vcredist_x86.exe).
7. Planetarium software support ASCOM protocol. Follow software instruction to select iOptron Telescope.

Some company has integrated iOptron's products into their planetarium software, such as Voyage and The Sky X Pro. Therefore, an ASCOM plug-in will not be needed. Most planetarium software can be used to control iOptron's product via ASCOM.