GoToNova™ 8401 Hand Controller

Instruction Manual

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WARNING!

NEVER USE A TELESCOPE TO LOOK AT THE SUN!
Looking at or near the Sun will cause instant and irreversible damage to your eye.
Children should always have adult supervision while observing.

1. GoToNova™ Overview

1.1. GoToNova™ Computerized Control System

The revolutionary GoToNova™ computerized control system is by far one of the most technologically advanced automated tracking systems available on the market today. With a database of 130,000 celestial objects, including all of the most famous galaxies, nebulae, star clusters, not to mention the planets, you'll be able to enjoy star gazing with the simple push of a button.

1.2. 8401 Hand Controller Features

This is an advanced version of iOptron's flagship product. The revolutionary GoToNova™ computerized control system that is one of the most technologically advanced automated tracking systems available on the market today. With a database of over 130,000 celestial objects and 256 user-defined objects, this GoToNova™ computerized control system allows even amateur astronomers to become masters of the night sky while being a perfect fit for the serious astronomer as well.

Using the easy-to-use hand controller and its large LCD screen, you can easily set up the telescope and select where you want to go with the very friendly user-interface. The control system also allows you the user to slew the telescope at 9 different drive speeds, keeping the object within the telescope's viewfinder for as long as you wish.

The GoToNova™ Controller is much easier to use than other similar products. The hand controller is more intuitive with menu categories better organized. It also has a larger LCD screen with more lines of content compared with the competition. Using the easy-to-use hand controller and its large LCD screen, you can easily set up your telescope and select where you want to go.

2. GoToNova™ 8401 Hand Controller

Figure 1. GoToNova 8401 Hand Controller

GoToNova™ 8401 hand controller (HC), as shown in Figure 1, can be used to control most of iOptron's GOTO mounts and telescopes, such as SmartStar® series, AstoBoy® series, CubePro™, MiniTower™, MiniTower Pro™, GoToNova™ kit and SmartStar®-PR.

2.1. 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 MiniTower mount using a 6-wire RJ11 cable.
- USB port: connect the HC to a Computer via a USB cable.

2.2. 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™ Equatorial 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 2. The user interface is simple and easy to learn.

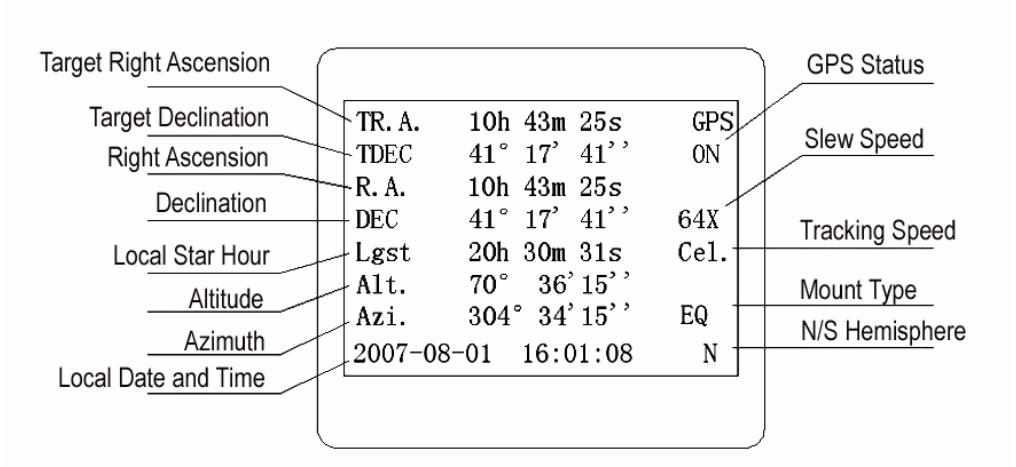


Figure 2. 8401 HC LCD Information Screen

- GPS status: When the power is turned on, it shows "GPS ON", which means a GPS receiver is connected. 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(1º/sec), 512X(2º/sec), MAX(4º/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.

2.3. Connection to a Computer

The GoToNova hand controller has a USB port which can be connected to a computer. This will allow Firmware Upgrading, Database Updating, or Planetarium application. A USB2COM driver is needed to simulate the USB port to a RS-232 serial port. (see Appendix D)

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 for more information.

3. Park Position of the Mount

In order to experience the full GOTO capability of GoToNova technology it is very important to set up the mount correctly before observation. The most important position is its Park Position.

3.1. Altazimuth (A/A) Mount

Each time the mount is turned on, the default position is Parking Position, *i.e.*, altitude is 90º 0’ 0” and azimuth is 180º 0’ 0”, which means the “SOUTH” mark is pointing to south and the telescope is pointing straight up at the zenith. To set the Park Position, you can:

Face the South. Align the mount to south by turning the South mark facing south. An additional compass is needed. There are two ways to do so. One is loosen the azimuth clutch lock a little and manually turn the mount to face south. Then tighten the azimuth clutch lock again. The other is turn on the mount. Turn the mount facing south using hand control. Then turn off the power. ***Note:*** Do not put the compass directly on top of the mount. The motor parts of the mount could affect the pointing accuracy of the compass.

Point to Zenith. Unlock the altitude clutch lock and rotate the telescope to point up directed at the Zenith. A torpedo level may help. Once it is straight, re-tighten the altitude lock to make sure OTA is secure and will not spin.

3.2. Equatorial (EQ) Mount

The Park Position of an EQ mount is when the mount is Polar aligned. Or roughly the R.A. axis is pointing to North and inclined at an angle above the horizon equal in magnitude to your latitude.

4. Use the Hand Controller

4.1. Manual Operation of a Telescope

You may observe land and astronomical objects using GoToNova'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.

4.2. 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.

4.2.1. Planets, Sun, Moon

There are 10 objects in the Solar system catalog.

4.2.2. 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.

4.2.3. Comets

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

4.2.4. Asteroids

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

4.2.5. 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.

4.2.6. Constellations

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

4.2.7. 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.

4.2.8. Enter R.A. DEC

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

4.3. 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.

4.4. Electric Focuser

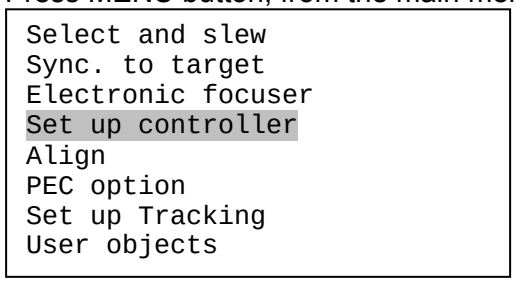
If you have an electric focuser in your system and it is supported by GoToNova, use this option to adjust the focuser. Use ◄► for coarse tuning and ▼▲ for fine tuning.

Refer to your Electric Focuser operation manual for detailed instruction.

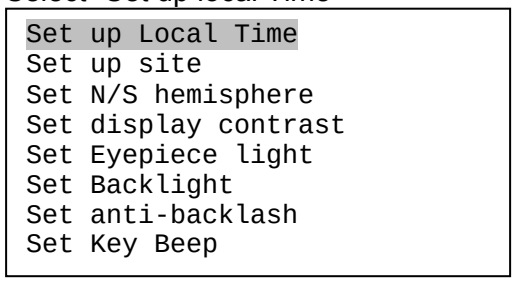
4.5. Set Up Controller

4.5.1. Set Up Local Time

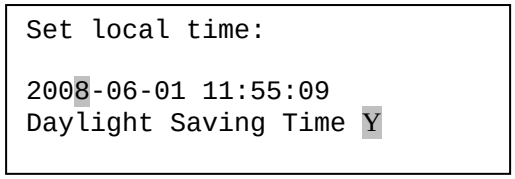
Press MENU button, from the main menu, scroll down and select "*Set up controller*"



Select "Set up local Time"



Press ENTER. The "Set Local Time" screen will show:



Use the ◄ or ► key to move the cursor, and the number button to change the time. Move the cursor to the bottom of the screen, use the ▲ or ▼ button to toggle between "Y" and "N" for Daylight Saving Time setting. Press ENTER to go back the previous screen.

4.5.2. Set Up Site

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 to go to “Setup Site Info” screen.

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

“W/E” means west/east hemisphere; “N/S” means north/south hemisphere; “d” means degree; “m” means minute; and “s” means second.

Set site coordinates:

Use the ◄ or ► key to move the cursor, and the ▲ or ▼ button to toggle between “W” and “E”, “N” and “S”. Use number button to change the numbers.

The site coordinates information can be found from internet, such as GPSVisualizer (http://www.gpsvisualizer.com/geocode), by enter the a city name or address.

In case you only find the site information in decimal format, you can convert them into d:m:s format by times the decimal by 60. For example, N47.53 can be changed to N47º31'48”: 47.53º = 47º +0.53º, 0.53º=0.53x60'=31.8', 0.8'=0.8x60"=48". Therefore, 47.53º=47º31'48" or 47d31m48s. Same as N47º31.8’: 31.8’=31’+0.8’, 0.8’=0.8x60”=48”.

Set time zone

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). The minimum time difference is 60 minutes.

- New York City 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, use the ◄ or ► key to move the cursor, and the number button to change the numbers. To change the “behind” or “ahead of” UT, move the cursor to “ahead of” 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 out your “time zone” information from internet, such as http://www.timeanddate.com/worldclock/. DO NOT COUNT DAYLIGHT SAVING TIME.

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

If a mount is equipped with an internal GPS receiver or a GPS module, the local time, longitude and latitude information will be received from satellites after the link is established. ***However, Daylight Time Saving and Time Zone settings are still need to be entered manually.*** The local time and site info still can be manually entered in case of GPS malfunction or testing the mount inside. It is always a good idea to do your home work to get the GPS coordinates before traveling to a new observation site.

A clear sky outside is needed for GPS to communicate well with the satellites.

4.5.3. Set N/S Hemisphere

Set north or south hemisphere.

4.5.4. Set Display Contrast

Use arrow keys to adjust LCD display contrast.

4.5.5. 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.

4.5.6. Set Backlight

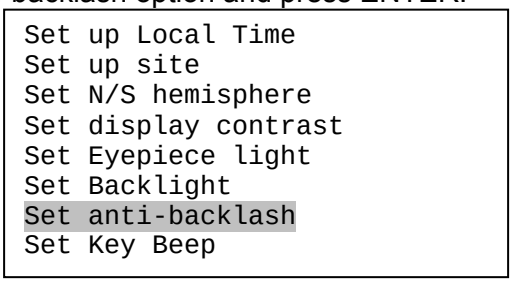
Adjust LCD and keypad backlight.

4.5.7. Set Anti-backlash

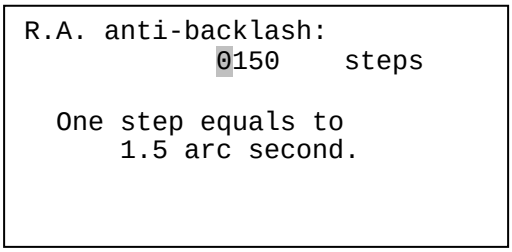
All mechanical gears have a certain amount of backlash or play between the gears. This play is evident by how long it takes for a star to move in the eyepiece when the hand control arrow buttons are pressed (especially when changing directions). The GoToNova anti-backlash feature allows the user to compensate 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 0-9999 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. For an Alt/Azi operation, 0 step is suggested for both R.A. and DEC anti-backlash. For an EQ mount, the default setting is 150 for both DEC and R.A.

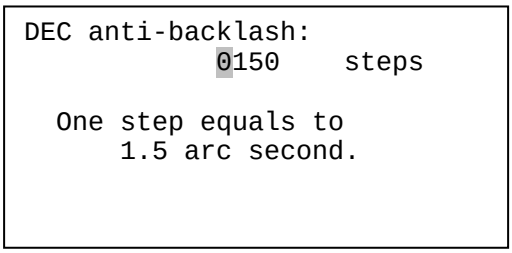
To set the anti-backlash value, select the Set Up Controller menu and scroll down to the set anti-backlash option and press ENTER.



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



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:



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.

4.5.8. Set Key Beep

Turn the key beep on/off.

4.5.9. Set Mount Type

Press MENU and 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 or Alt/Azi mount using ▲ or ▼ button and press ENTER to select the operation mode.

4.5.10. Reset All

Reset all settings to factory default data.

4.5.11. Update Firmware

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

4.5.12. Set gear ratio

Reserved for future products.

4.5.13. Set Language

Select hand controller language.

4.6. Align

This function is used for aligning the telescope. In addition to “Easy One Star Align,” the system also provides “One Star Align” and “Two Star Align” for Alt/Azi mount. “Three Star Align” is only supported by EQ mode.

4.6.1. 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.

4.6.2. 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.

4.6.3. 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.”

4.6.4. Three-Star Align

Three star alignment is only available for EQ mode. It will increase the accuracy of GOTO and tracking for 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 up, down, left or right 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.

4.6.5. Dis R.A axis error

This only works for EQ mode. 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.)

4.6.6. 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.

This command only works for EQ mode.

4.6.7. 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 GEM mounts with suitable polar scope.

4.7. PEC Option

Periodic Error Correction (PEC) is a system that improves the tracking accuracy of the drive by reducing the number of user corrections needed to keep a guide star centered in the eyepiece. PEC is designed to improve photographic quality by reducing the amplitude of the worm errors. Using the PEC function is a three-step process. First, the GoToNova needs to know the current position of its worm gear so that it has a reference when playing back the recorded error. Next, you must guide for at least 8 minutes during which time the system records the correction you make. (It takes the worm gear 8 minutes to make one complete revolution). This "teaches" the PEC chip the characteristics of the worm. The periodic error of the worm gear drive will be stored in the PEC chip and used to correct periodic error. The last step is to play back the corrections you made during the recording phase. Keep in mind, this feature is for advanced astrophotography and still requires careful guiding since all telescope drives have some periodic error.

PEC is not supported in Alt/Azi mode.

4.8. 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.

4.9. 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.

4.10. Auto Guide

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

This function is not supported in Alt/Azi mode.

4.11. Park Scope

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

4.12. 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.

5. Maintenance and Servicing

5.1. Maintenance

Do not drop the hand controller which will damage or affect the GOTO tracking accuracy permanently. 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 hand controller. Do not use solvent.

5.2. Error Messages

The following suggestions may be helpful for the operation of the 8401 hand controller. More information can be found in our online FAQ section (www.iOptron.com then click on "support").

1. ***Error Message "Warning! DEC. (or R.A.) driver motor over current. Please check balance."***
   (1) Check if the mount or OTA is blocked by any obstructions.
   (2) Try to operate the mount without an OTA.
   (3) Check the power supply. This is a common reason for this message and ***unexpected slew behavior or movement***. which include:
   - Batteries: Are the batteries fresh? How long have they been used? (frequent slewing and GOTO will deplete battery power very quickly)
   - AC or DC adapter: Check the plugs to the mount and to the power outlet.
   - Extension cord: Make sure the cord is in good condition. Power drop along the extension cord has been known to cause this error message. Also check all the plugs and connections.

   (4) Check the hand controller cord. Unplug it and re-plug into the other HBX port.

2. ***Error Message "Warning! Can not communicate with DEC motor controller."***
   (1) Check the hand controller cord. Unplug it and re-plug into another HBX port.
   (2) Check the power supply, which include:
   - Using the battery? Is the battery fresh? How long it has been used? (frequent slew and GOTO will deplete battery power very quickly)
   - Using AC or DC adapter? Check the plugs to the mount and to the power outlet.
   - Using extension cord? Make sure the cord is in good condition. Power drop along the extension cord was known to cause the problem. Also check all the plugs and connections.

5.3. iOptron Customer Service

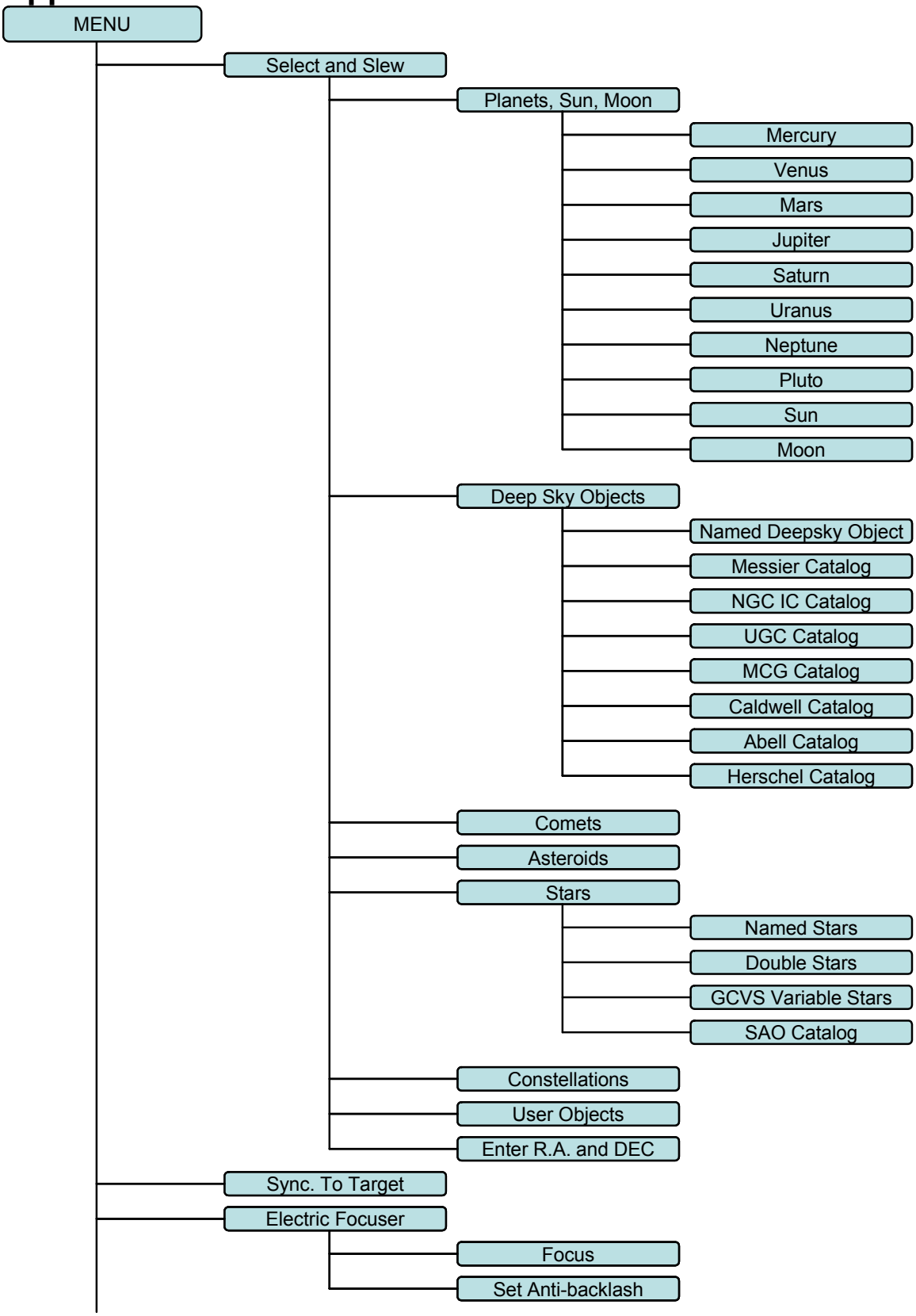
If you have a question concerning your MiniTower contact the iOptron Customer Service Department. Customer Service hours are 9:00 AM to 5:00 PM, Eastern Time, Monday through Friday. In the unlikely event that the MiniTower requires factory servicing or repairs, write or call the iOptron Customer Service 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

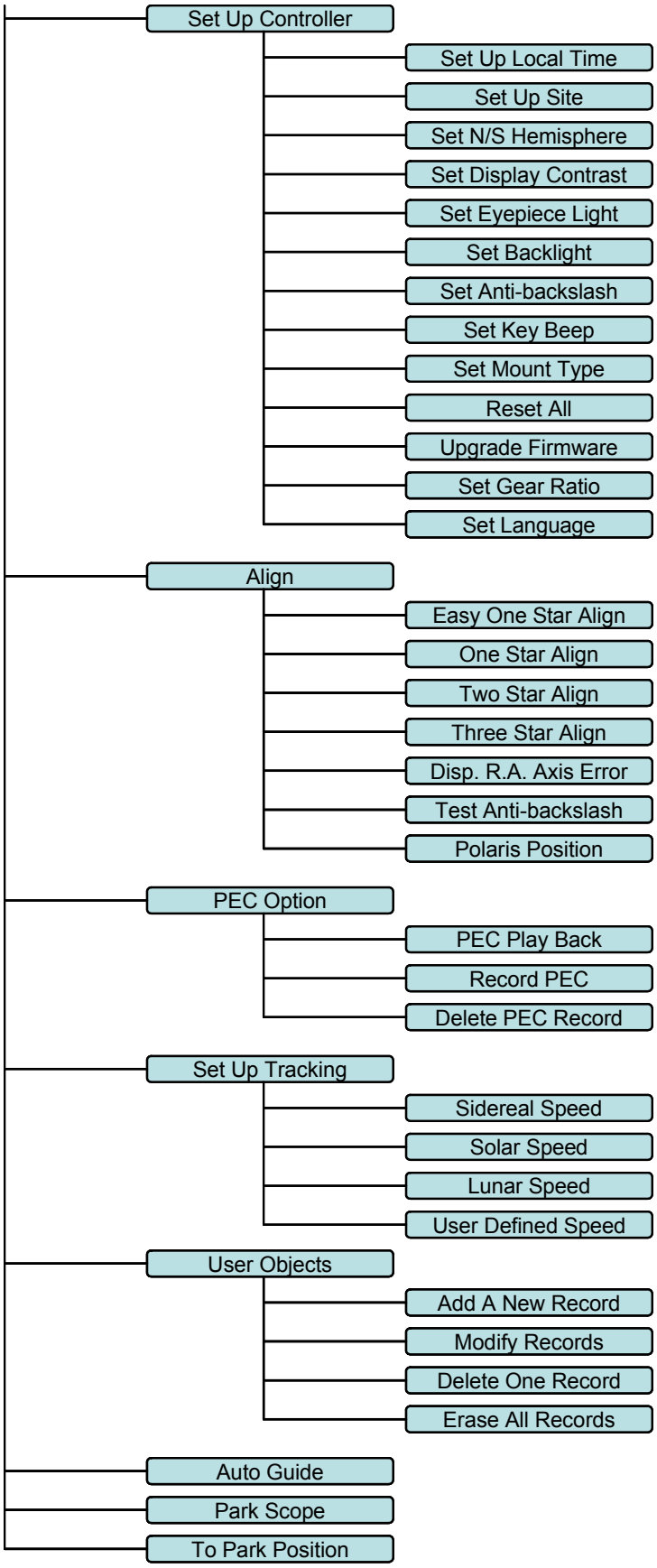
name, address, and daytime telephone number. We have found that most problems can be resolved by telephone. So please call first to avoid returning the telescope for repair. Call toll free in the U.S. 866.399.4587 or 1.781.569.0200. It is also strongly suggested that to send technical questions to support@ioptron.com .

Appendix A. Technical Specifications

LCD	8-Line Display
CPU	32 bit ARM
Control Speed	9 speed (1×,2×,8×,16×,64×,128×,256×,512×,MAX)
Database	GoToNova™ 130,000 objects database
USB Port	Yes
Protocol	ASCOM
Firmware Upgrade	Yes
PC Computer Control	Yes

Appendix B. GoToNova™ 8401 HC MENU STRUCTURE




Set Up Controller
Set Up Local Time
Set Up Site
Set N/S Hemisphere
Set Display Contrast
Set Eyepiece Light
Set Backlight
Set Anti-backslash
Set Key Beep
Set Mount Type
Reset All
Upgrade Firmware
Set Gear Ratio
Set Language
Align
Easy One Star Align
One Star Align
Two Star Align
Three Star Align
Disp. R.A. Axis Error
Test Anti-backslash
Polaris Position
PEC Option
PEC Play Back
Record PEC
Delete PEC Record
Set Up Tracking
Sidereal Speed
Solar Speed
Lunar Speed
User Defined Speed
User Objects
Add A New Record
Modify Records
Delete One Record
Erase All Records
Auto Guide
Park Scope
To Park Position

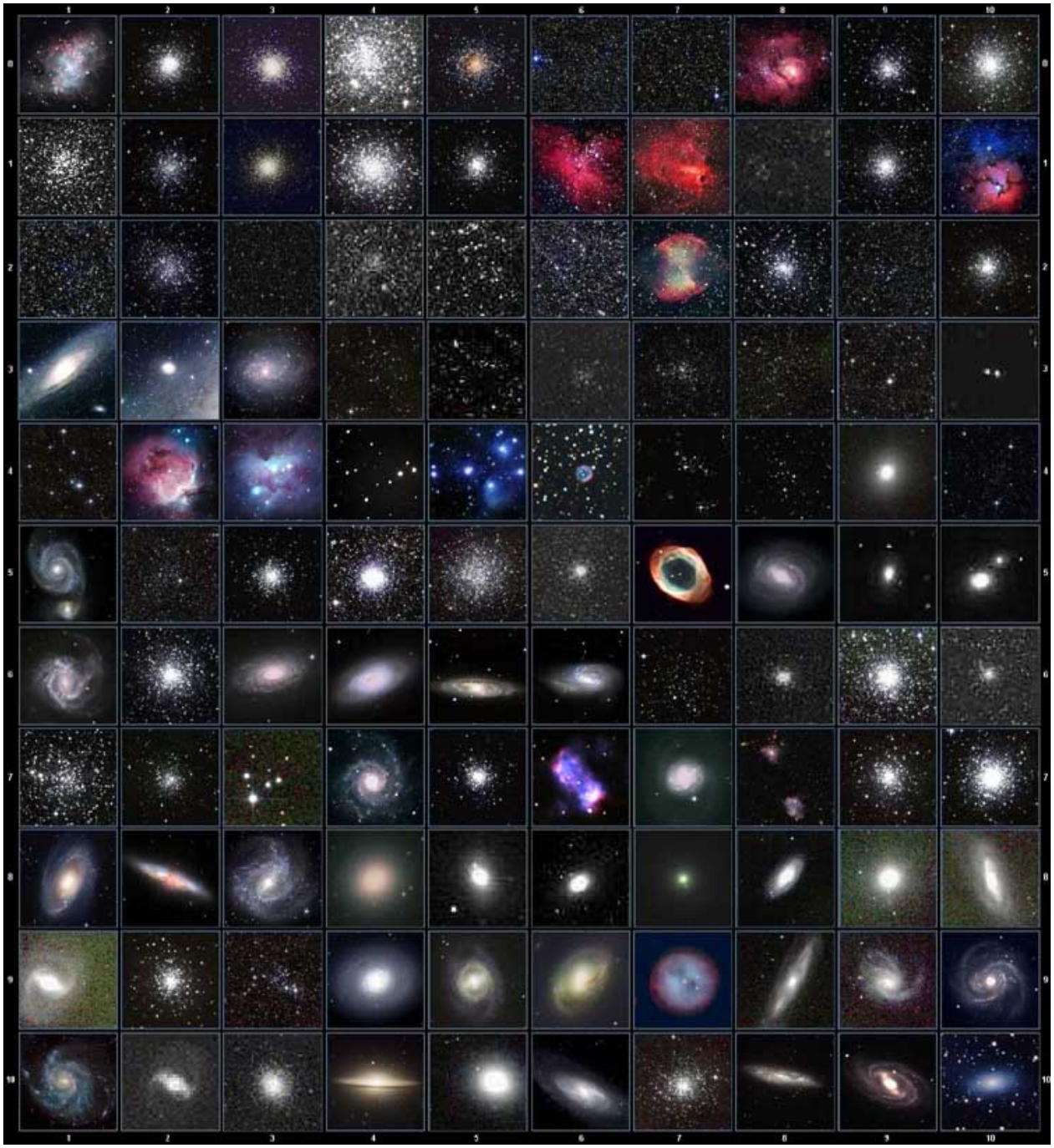
Appendix C. GoToNova™ Star List

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



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 Alkalurops	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 Alnilam	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 Giausar	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 Zubeneschamali
048 Arneb	096 Izar	144 Propus	

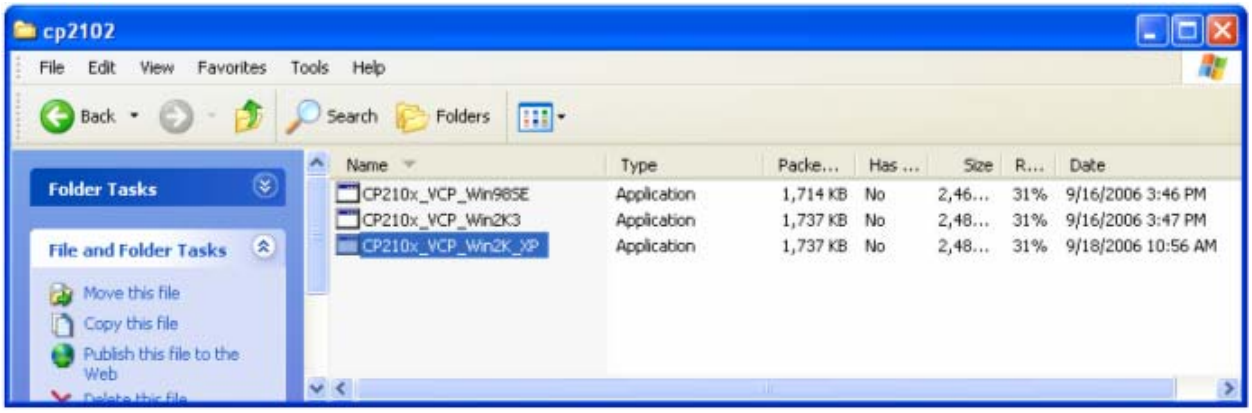
GoToNova Double Star List

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

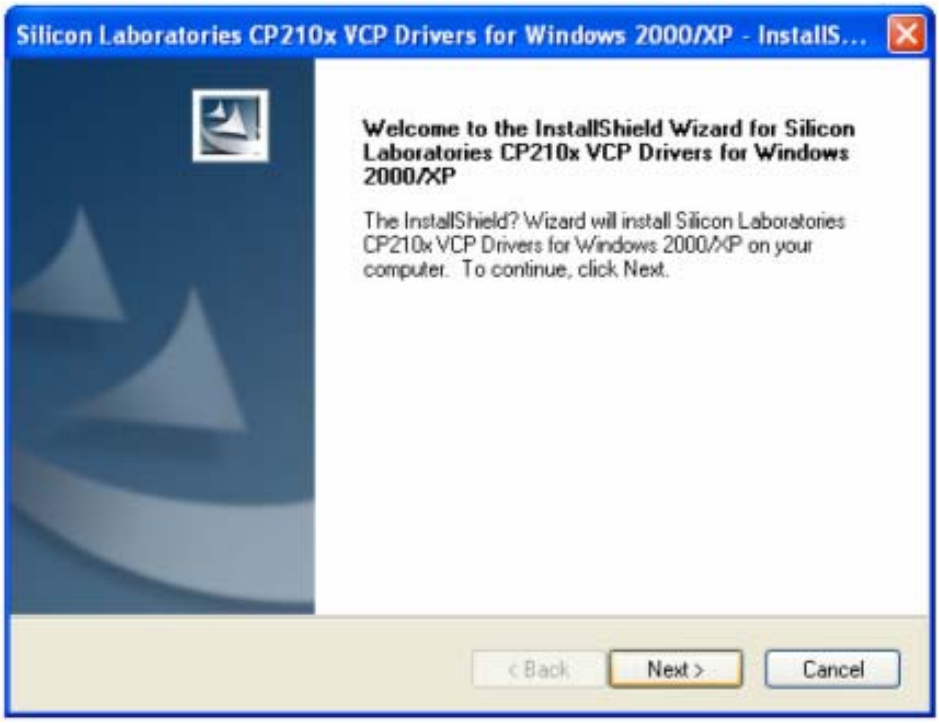
Appendix D. Set Up USB-PC Connection

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

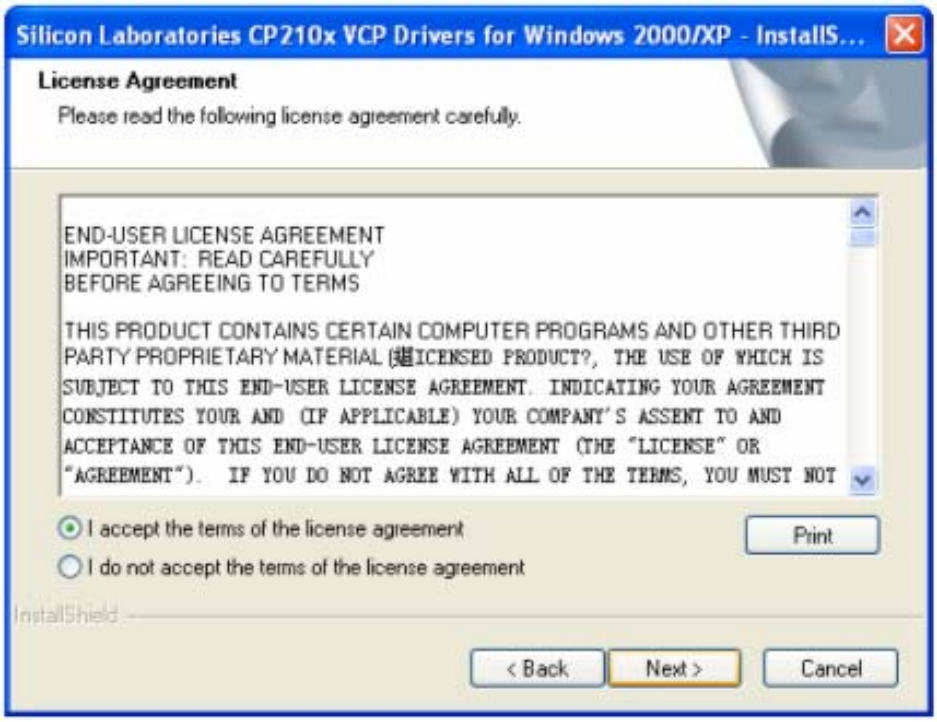
2. Install cp210x(usb2com) driver



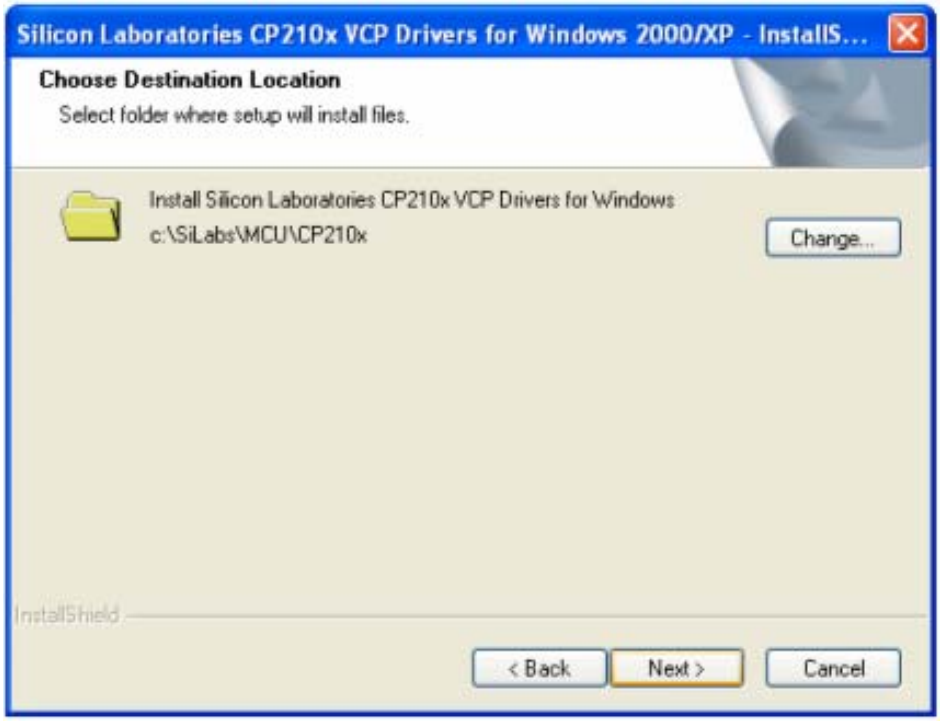
Choose the appropriate driver for your OS. In this case is a Windows XP operation system. Double click on it, and you will see:



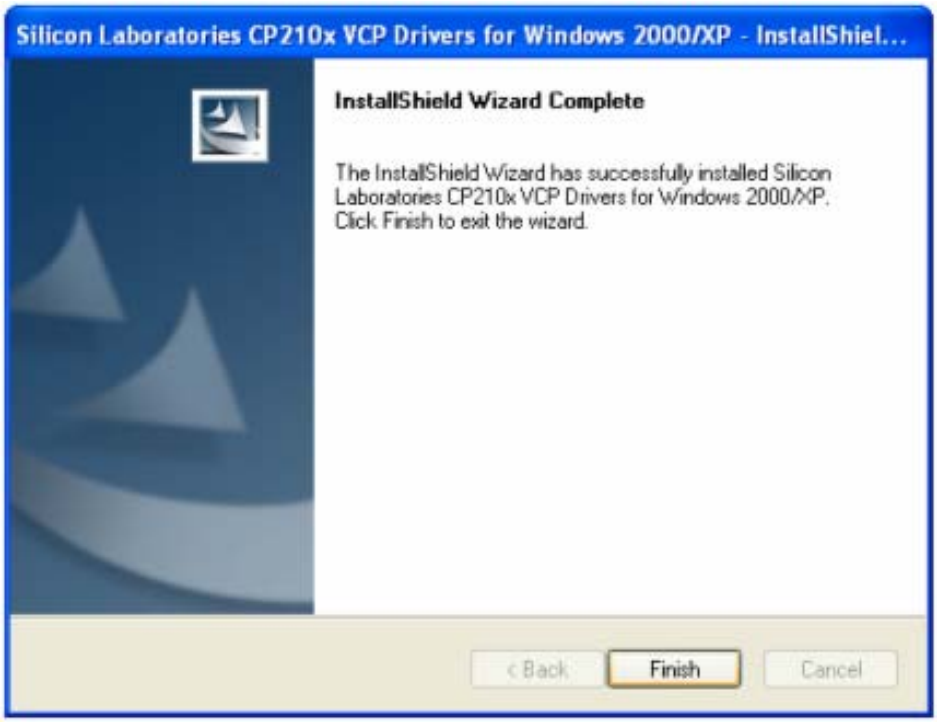
Click “Next”.



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”.



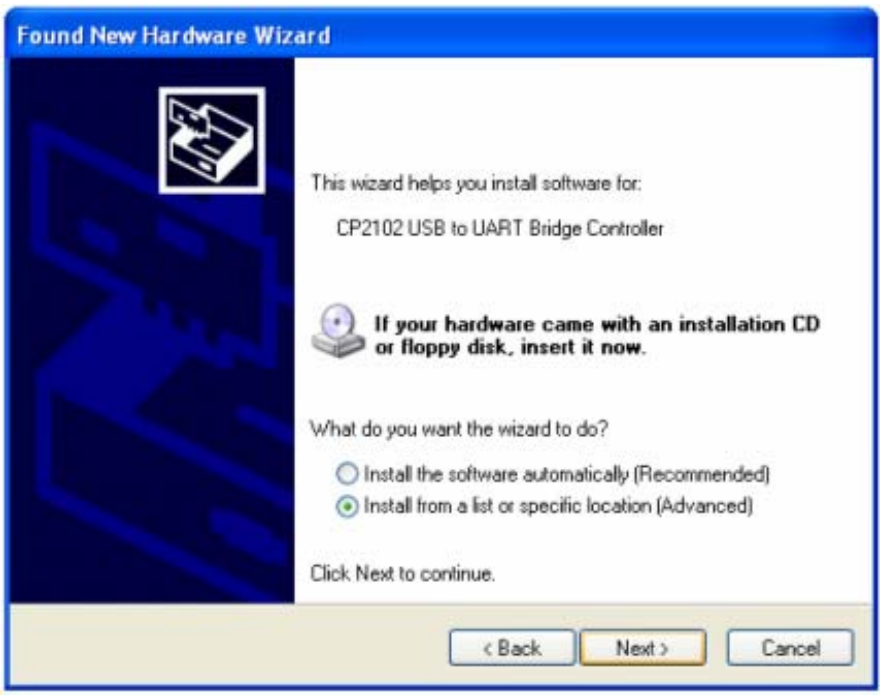
When finished installation, click “Finish”

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.

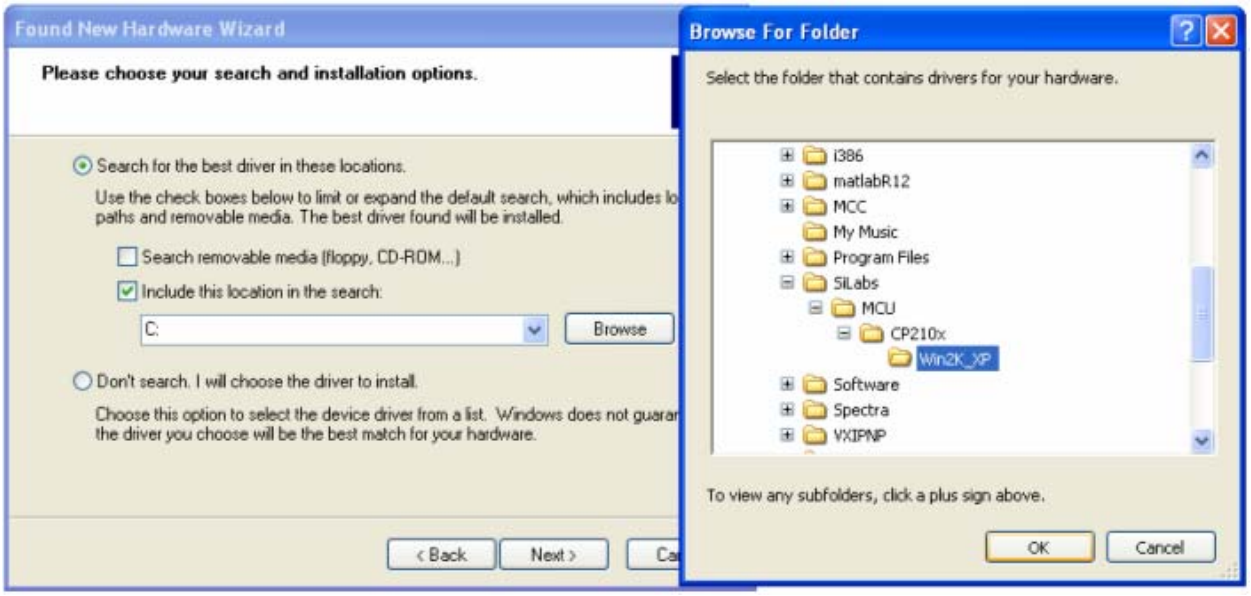
4. Install the Hardware

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

Select “No, not this time” and click “Next”.

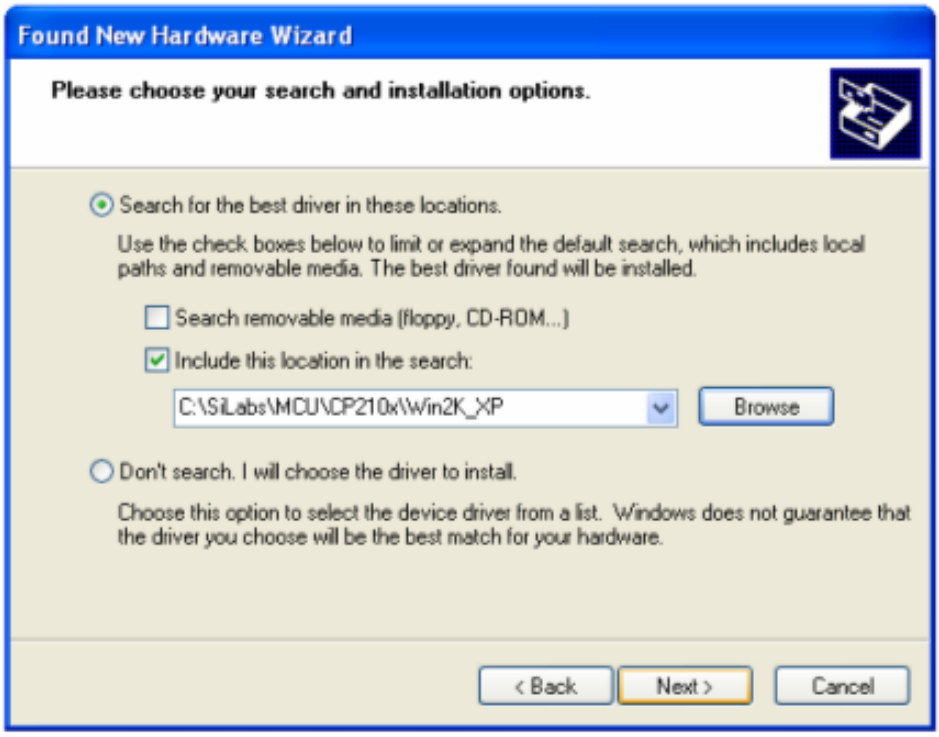


Select “Install from a list or specific location” and click “Next”.



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.

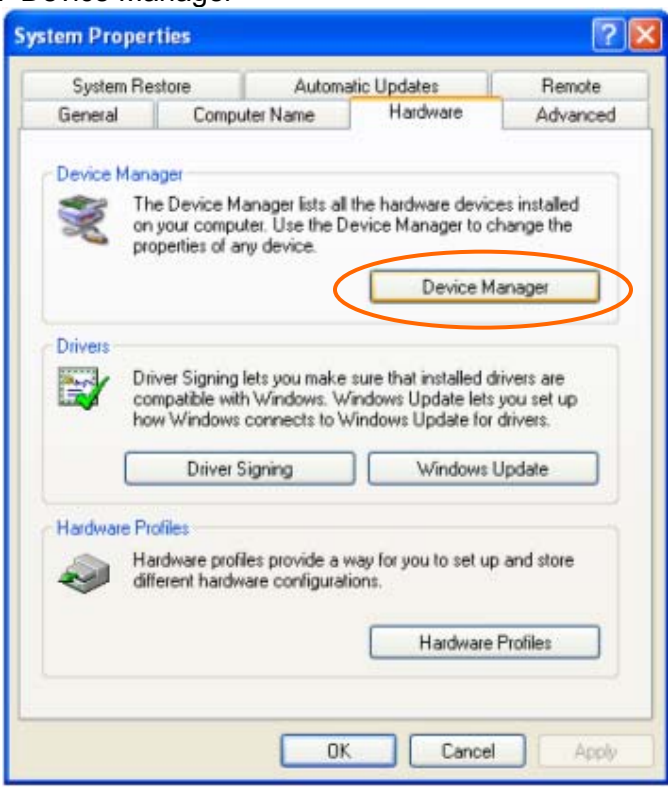


Click “Next”. The computer will start to install the driver for the USB2COM. When the installation is done, click “Finish”.

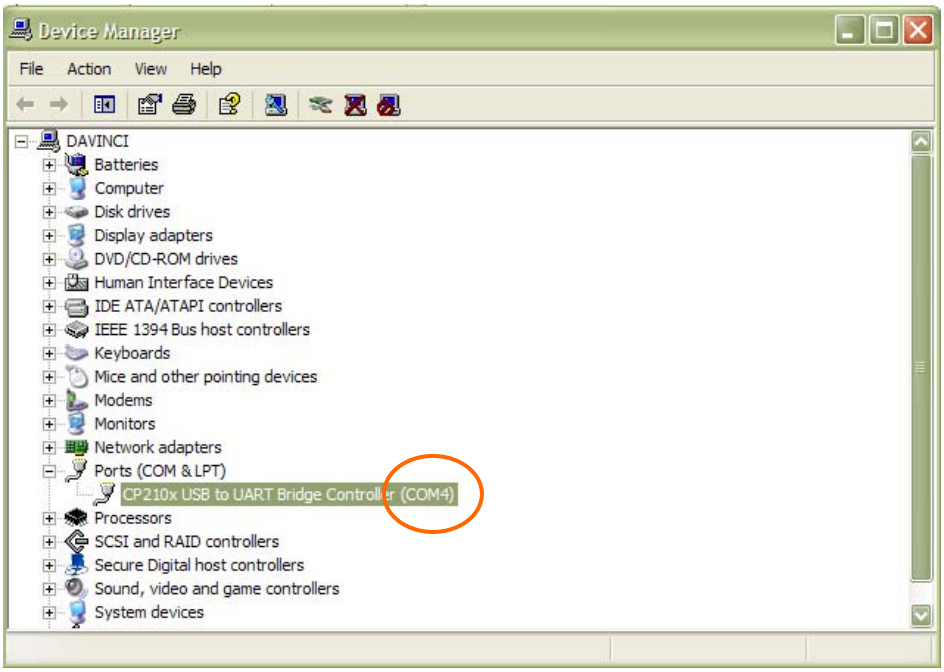
If the computer shows “find a new hardware” screen again, just repeat the steps in this section again.

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”



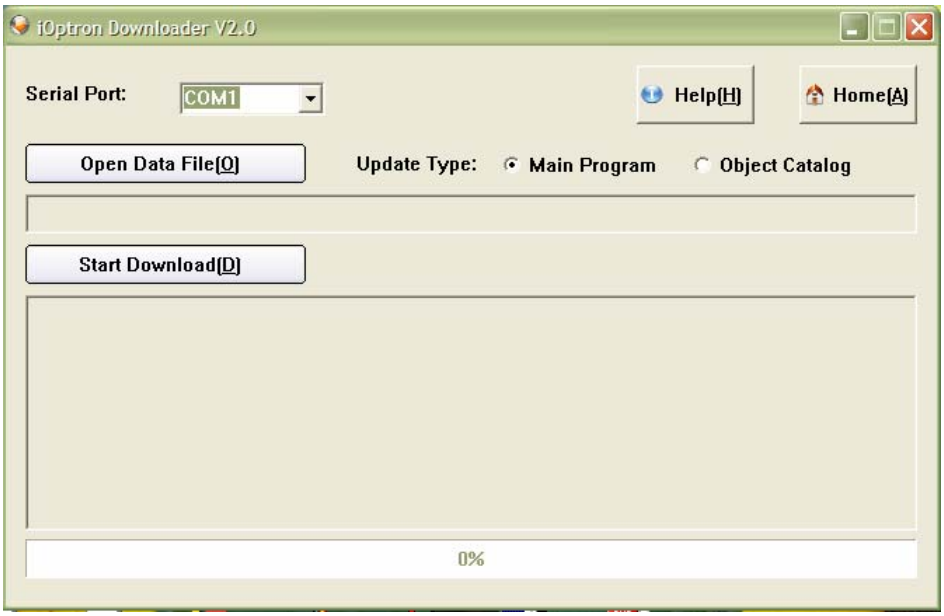
Double click on “Ports (COM & LPT)”. Find the COM number and write it down (in the following figure, it is COM4)



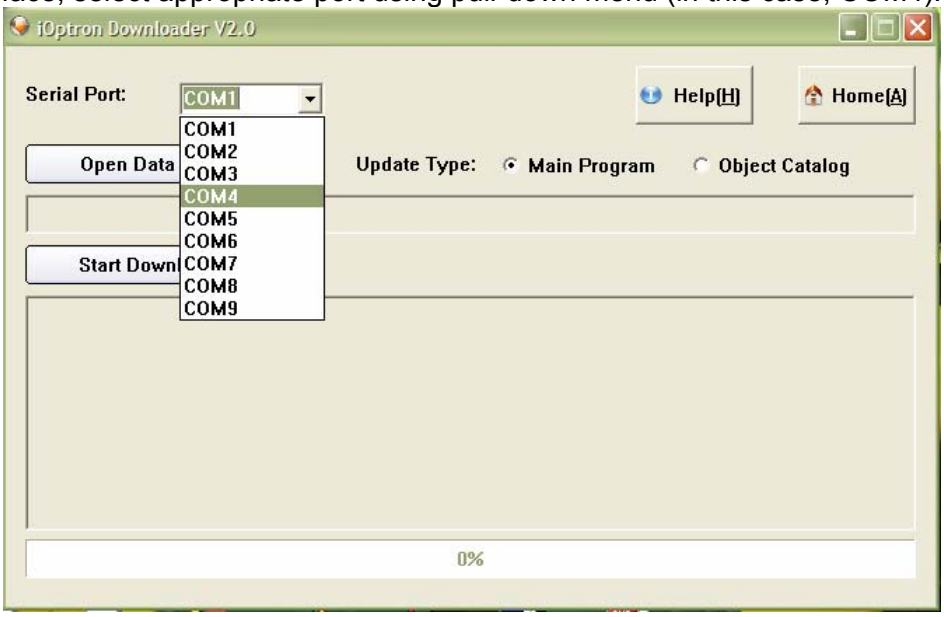
Appendix E. Firmware Upgrade

1. Download and install Firmware Downloader from iOptron Website

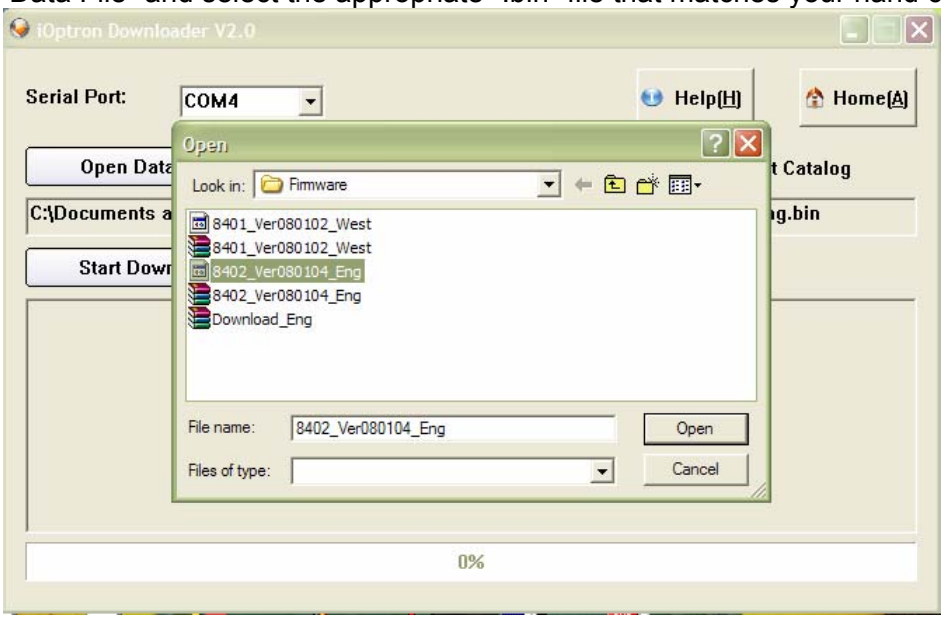
2. Double click and open "iOptron Downloader"



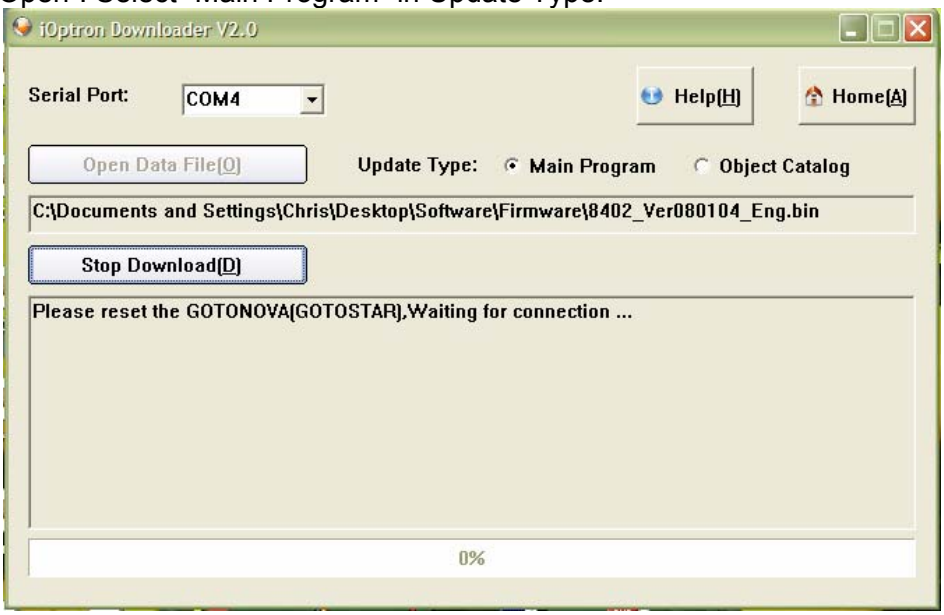
On the interface, select appropriate port using pull-down menu (in this case, COM4):



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

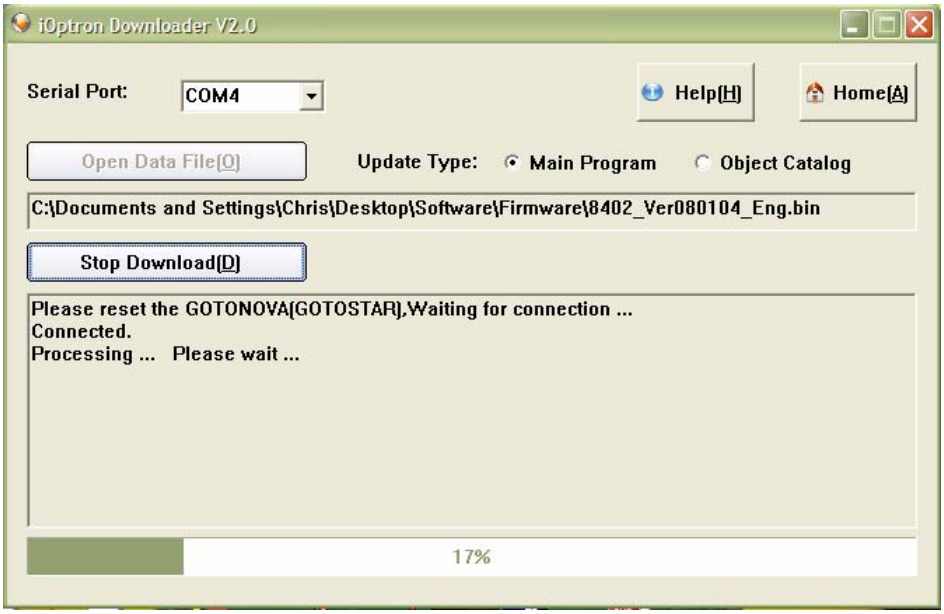


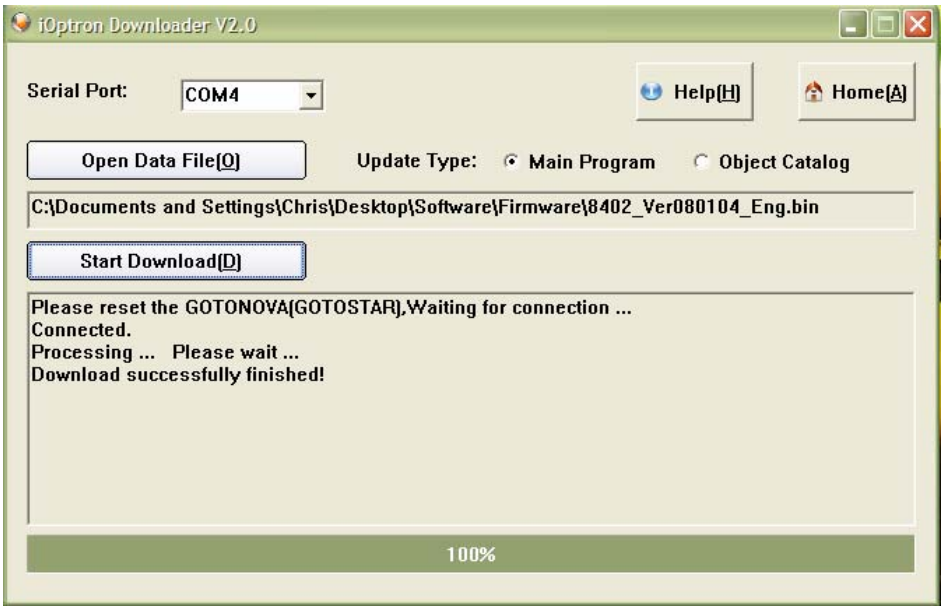
Then click “Open”. Select “Main Program” in Update Type.



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 the mount,

1. Download USB2COM driver (cp2102, zip file for 8401 and 8402A) http://www.ioptron.com/manuals/USB_2COM_Driver.zip;
2. Install USB2COM and establish the connection between the mount and the PC (see instruction);
3. ASCOM platform (download from http://ascom-standards.org/);
4. iOptron ASCOM drive (download it from iOptron website http://www.ioptron.com/Files/File/iOptronAscomSetupV1.02.rar); and
5. Planetarium software.

Some company 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.

Some other ASCOM drivers such as LX200 Generic ASCOM driver and AstroPhysics GTO mount driver may also be compatible with the SmartStar® mount.

Appendix G. RS-232 Command Set

Abbreviations used:

DD or DDD degrees or day of the month depending on the context
HH hours
MM minutes or month depending on the context
MM.M minutes and tenths of minutes
s + or – sign, assumed to be + if omitted
SS seconds
SS.S seconds and tenths of seconds
YY last two digits of the year

General Telescope Information:

Command: :SG sHH#
Response: "1"
Set the offset from Greenwich mean time. The offset can be entered in signed format (-12 to +12) hours.

Command: :Sg sDDD*MM:SS#
Response: "1"
Set the current longitude. The east is positive while the west is negtive.

Command: :St sDD*MM:SS
Response: "1"
Set the current latitude.

Command: :SL HH:MM:SS#
Response: "1"
Set the current local time.

Command: :SC MM/DD/YY#
Response: 32 spaces followed by "#", followed by 32 spaces, followed by "#"
Set the current date.

Command: :GG#
Response:
East Longitude E HH:00**#**
West Longitude W HH:00**#**
Get the offset from Greenwich mean time.

Command: :Gg#
Response: sDDD*MM:SS#
Get the current longitude.

Command: :Gt#
Response: sDD*MM:SS#
Get the current latitude.

Command: :GL#
Response: HH:MM:SS.S#
Get the current local time in 24 hour format. Overflows from 23:59:59 to 00:00:00.

Command: :GS#
Response: HH:MM:SS.S#
Get the current local sidereal time in 24 hr. format.

Command: :GR#
Response: HH:MM:SS.S#
Get the current Right Ascension of mount.

Command: :GD#
Response: sDD*MM:SS#
Get the current Declination.

Command: :GA#
Response: sDD*MM:SS#
Get the current Altitude.

Command: :GZ#
Response: sDD*MM:SS#
Get the current Azimuth.

Command: :GC#
Response: MM:DD:YY#
Get the current calendar day.

Telescope Motion
Command: :MS#
Response: “0” if command accepted,
"1Object is below horizon #" the desired object is below 0 degrees altitude. (8 trailing spaces before “#”, 32 total characters plus “#”)
Target command: Slew to the most recently defined RA and DEC coordinates in RA-DEC mode,

Command: :Mn# :Ms# :Me# :Mw#
Response: (none)
Command motion in the direction specified (n=north, s=south, e=east, w=west) at the currently selected guide or centering rate. Motion will continue until a quit command is issued.

Command: :Qn# :Qs# :Qe# :Qw#
Response: (none)
Stop motion in the specified axis. Note that :Qn# is identical to :Qs#, and :Qe# is identical to :Qw#. Motion is terminated only if it was not started by a slew (:MS#) command.

Command: :Q#
Response: (none)
Motion in both axes is stopped, regardless of how the motion was invoked.

Command: :RG#
Response: (none)
Selects guide. If tracking is stopped, turns tracking on.

Command: :RC#
Response: (none)
This command sets to quit guide mode.

Command: :RCn#
Response: (none)
:RC0 # Set moving speed by N-S-E-W Keys to 16x
:RC1 # Set moving speed by N-S-E-W Keys to 64x
:RC2 # Set moving speed by N-S-E-W Keys to 256x
:RC3 # Set moving speed by N-S-E-W Keys to 512x

Command: :pS#
Response: "East#" or "West#"
This command returns the side of the pier on which the telescope is currently positioned.

Position
Command: :CM#
Response: "Coordinates matched. #"
(there are 5 spaces between "Coordinates" and "matched", and 8 trailing spaces before the "#", the total response length is 32 character plus the "#".
Calibrate mount. Current Right Ascension and Declination become the commanded Right Ascension and Declination. This command does the same thing as synchronize to target. This command should be used after a ":MS#" command has been finished. This means a GOTO must be done first.

Command: :CMR#
Response: "Coordinates matched. #"
(there are 5 spaces between "Coordinates" and "matched", and 8 trailing spaces before the "#", the total response length is 32 character plus the "#".

Calibrate mount. Current Right Ascension and Declination become the commanded Right Ascension and Declination. This command synchronizes HC coordinate to commanded coordinate. No GOTO needs to be done first.

Command: :Sr HH:MM:SS.S#
Response: "1"
Define the commanded Right Ascension, RA.

Command: :Sd sDD*MM:SS#
Response: "1"
Define the commanded Declination.
Miscellaneous

Command: :F+# :F-# :FF# :FS# :FQ#
Response: (none)
Advances (F+) or retracts (F-) focus adjust motor on the eyepiece. F+ or F- commands commence adjustment and :FQ# stops it. If :FS# has been issued previously, then the focus adjustment will be slow. If the :FF# command has been issued, then the adjustment will be fast. If neither FF nor FS is specified, the power up default of FS is assumed.

Command: :F1# :F2# :F3# :F4#
Response: (none)
Set the focus speed to 1.2,3,4, from slow to fast.

Command: :V#
Response: (current servo controller software RS232 command language version number)
This command returns the current servo controller software RS232 command language version.

Command: :Vs#
Response: (current servo controller software infomation)
This command returns the current servo controller software information.

Command: :STR0#,:STR1#,:STR2#
Response: '1'
This command sets the track rate.
0 - sidereal
1- solar
2- lunar

Command: :GTR#
Response: '0','1','2'
This command gets the current tracking rate.
0 - sidereal
1 – solar

2 - lunar

Command: :SGS0#,:SGS1#,:SGS2#,:SGS3#,
Response: (none)
This command sets the guide rate.
0 – 1.0X of sidereal
1 – 0.8X of sidereal
2 – 0.6X of sidereal
3 – 0.4X of sidereal

Command: :GGS#
Response: '0','1',2,'3'
This command gets the current guide rate.
0 – 1.0X of sidereal
1 – 0.8X of sidereal
2 – 0.6X of sidereal
3 – 0.4X of sidereal

Command: :SE?#
Response: '0','1',
This command gets the slewing status.
'1' in slewing
'0 ' not in slewing

Command: :GAM#
Response: '0','1', '2'
This command gets the current mount type.
0 – Altitude/Azimuth type
1 – fork mount
2 – Germany equator mount

Command: :PK#"
Response: '1'
This command parks the telescope .

Command: : STPKP0#, :STPKP1#, :STPKP2#, :STPKP3#, :STPKP4#,
Response: '1'
These command sets the mount park position.
0 – original to north pole
1 - Left and vertical
2 - Left and horizon
3 - Right and vertical
4 - Right and horizon