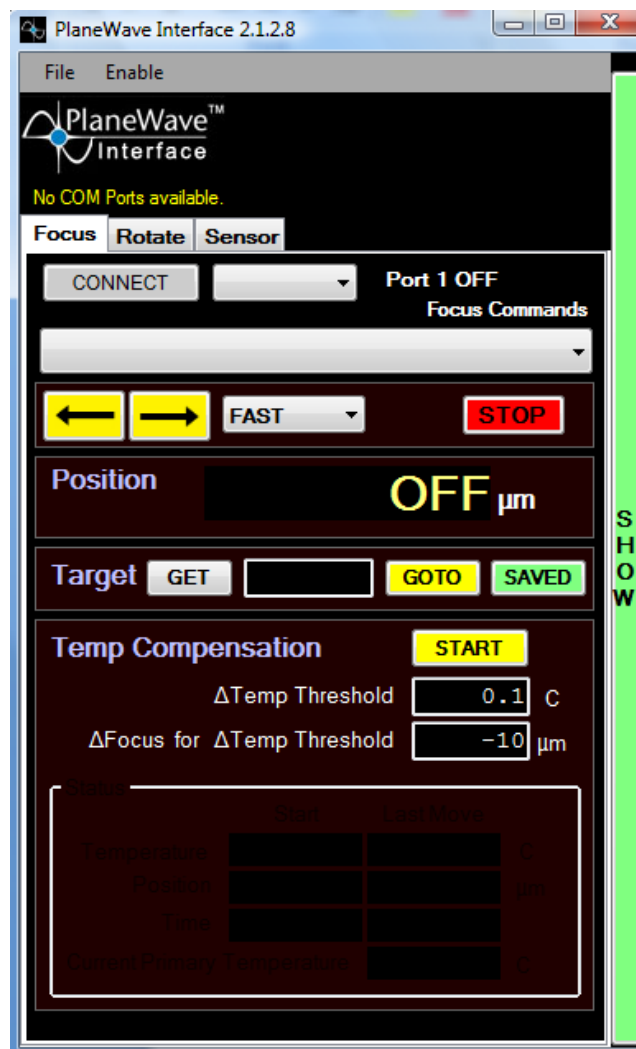




# PWI

## PlaneWave Interface Software

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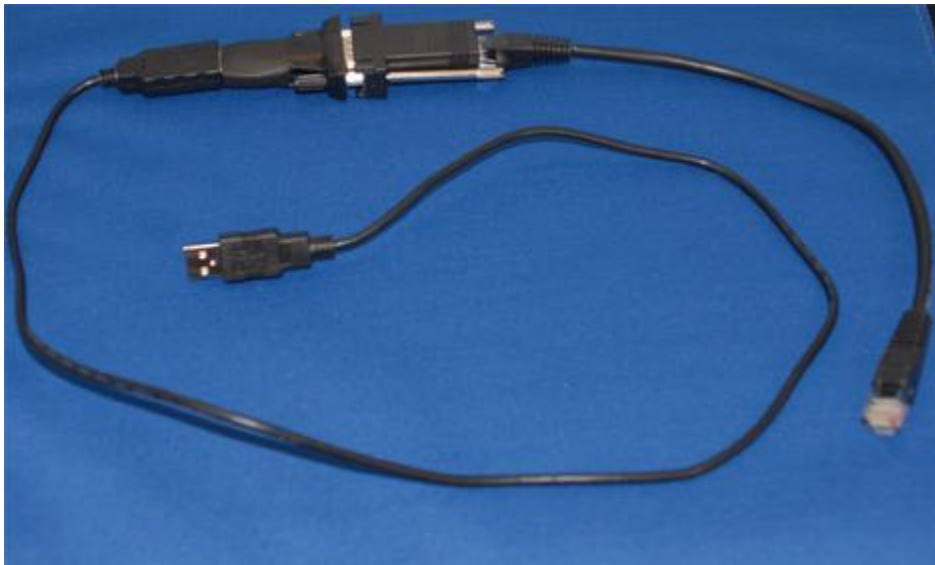
## Overview

PWI, PlaneWave Interface, is software that controls accessories on PlaneWave telescope such as, the Hedrick Focuser or the Rotating Focuser, and the on-board fans as well as monitoring the temperature sensors.

What is required is PlaneWave's EFA Kit which is an electronics box that mounts on the side of the telescope or an electronics panel that mounts in the backplate of the larger telescopes.

### ***Attach the Cable the EFA Kit to the Computer***

The EFA Electronics connects to a computer via the PC jack on the face plate of the EFA. Provided with the Rotating Focuser are the necessary cables to do this, a 12" long Ethernet cable, an Ethernet to 9 pin serial adapter, a serial to USB dongle and a USB cable. See the picture below. All the parts we supply are fairly short because it is assumed that you will use a USB extension cable to run through your mount. If this is not the case, you can use a longer USB cable than is provided.



## PWI Software Installation and Operation

### ***Software Installation***

The software for the Rotating Focuser and our standard Hedrick focuser is called PlaneWave Interface or PWI and it comes on a disk or USB flash drive shipped with the Rotating Focuser. It can also be found on PlaneWave's website, at [www.planewave.com/tech](http://www.planewave.com/tech) as seen below.

## PlaneWave - Tech Help

### PlaneWave A200



- [Software Help](#)
- [Software Downloads](#)

### PlaneWave Interface and the PC Port



#### Newest Release

[PlaneWave Interface 2.1.2.7](#) - 2011 August 15, Interface for PC Port Focuser and Rotator

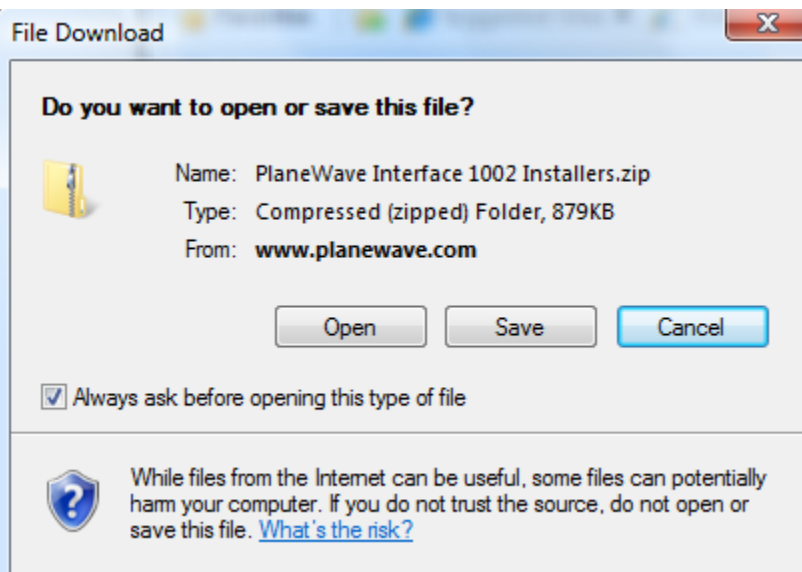
[ASCOM Focuser Driver 2.0](#) - 2011 July 18, Requires ASCOM Version 5.5 or 6

[ASCOM Rotator Driver 2.0](#) - 2011 July 18, Requires ASCOM Version 5.5 or 6

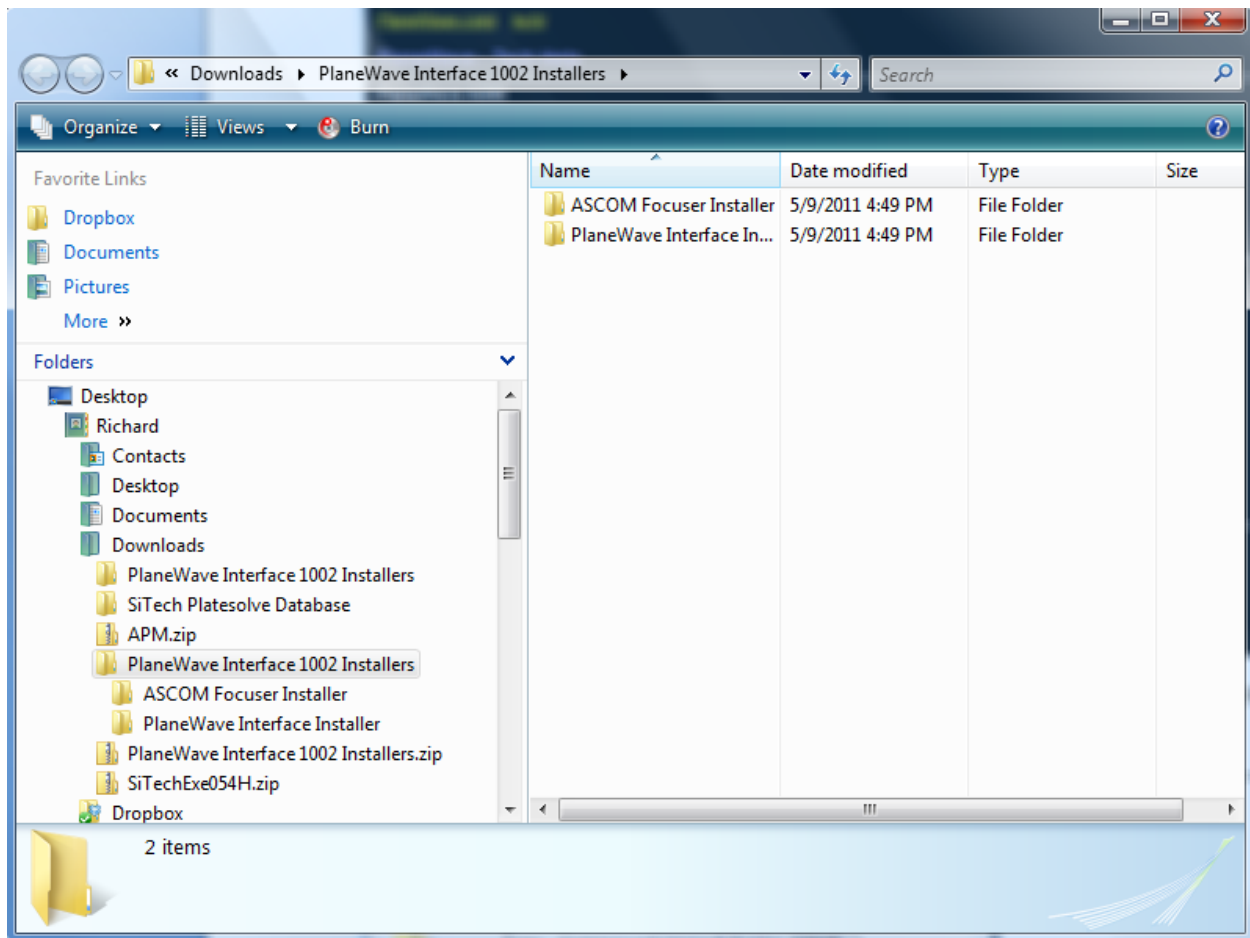
#### PC Port Protocol

Create your own applications to talk directly to the PC port [PC Port Protocol](#)

Click on the link to PlaneWave Interface 2.1.2.7 Zip file (or the latest) and download to your computer. Press the Save button to download the zip file to your computer. Please notice that in this instruction manual, we show version 1.0.0.2. You should also download the installers for the ASCOM drivers for the Focuser and the Rotator. The Focuser driver will work with either the Hedrick Focuser or the Rotating Focuser.



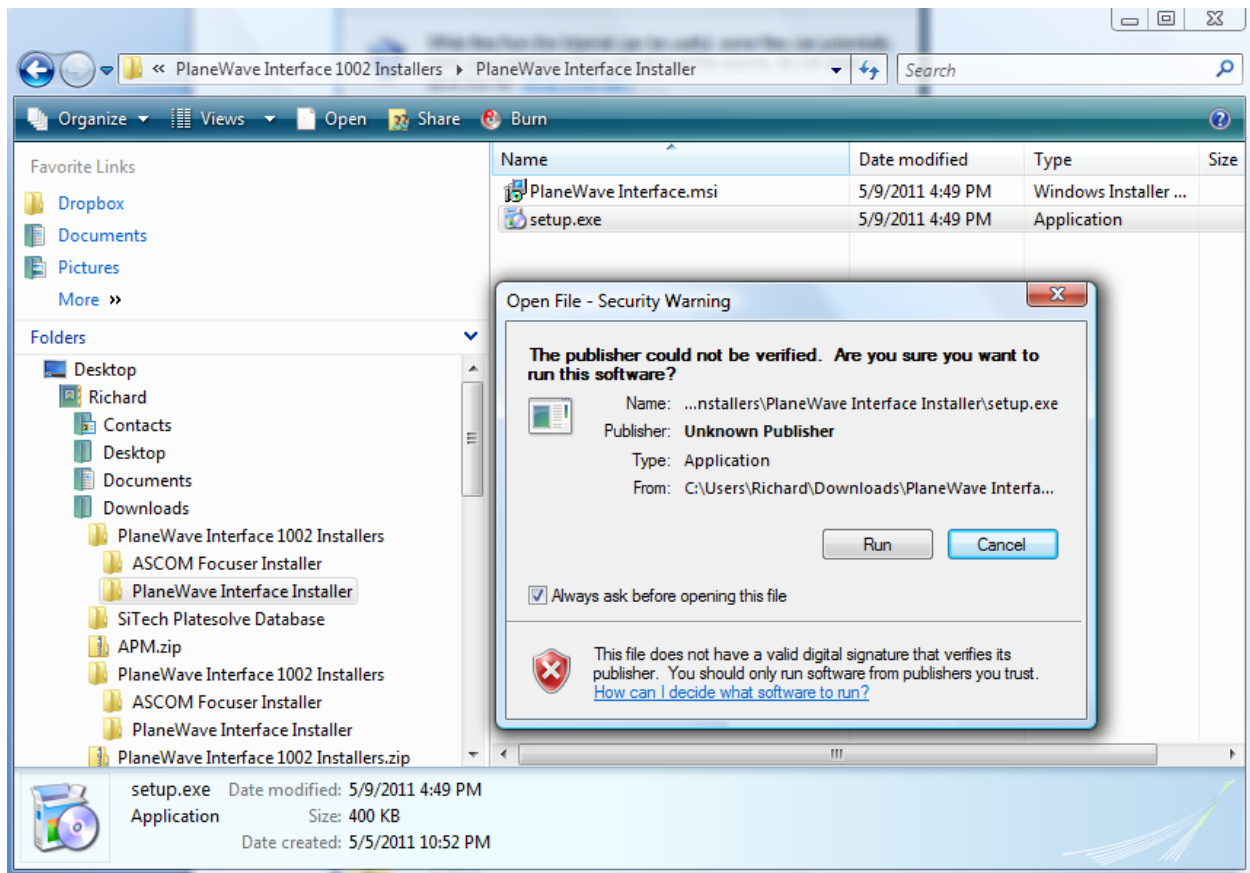
Since this is a zipped file, you will want to extract the files. Once that is done, you should go to the directory called PlaneWave Interface 1002 Installers (the 1002 will change as new versions become available) as shown below.



Click on the PlaneWave Interface Installer folder.

Double Click on the Setup Icon.

A window may open as shown below that asks whether to Run the program or not, please press Run.



NOTE: If PlaneWave Interface has been previously loaded on your computer, you will be asked to uninstall the program before installing a new version. To uninstall go to the Control Panel and uninstall PlaneWave Interface.

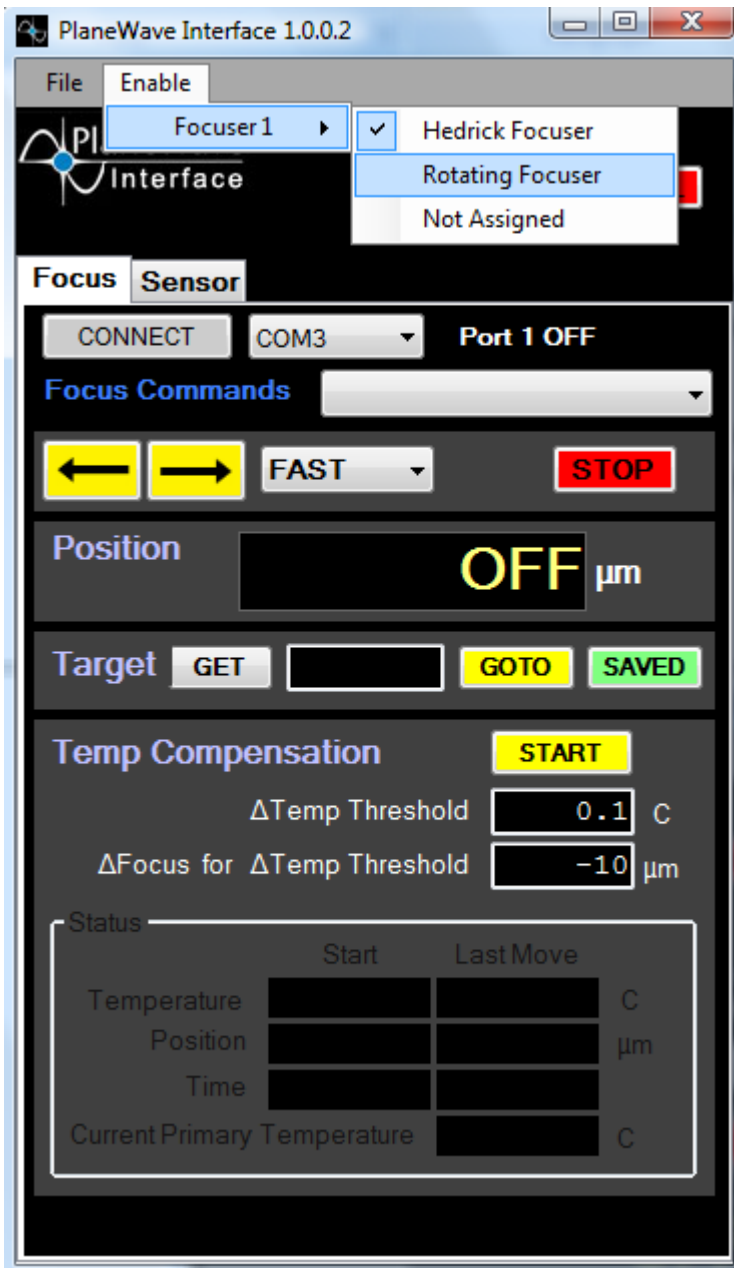
Follow the steps of the installer program to install the software. When the installation is completed go to the START menu of Window, then to All Programs and select PW Interface.

## Software Operation

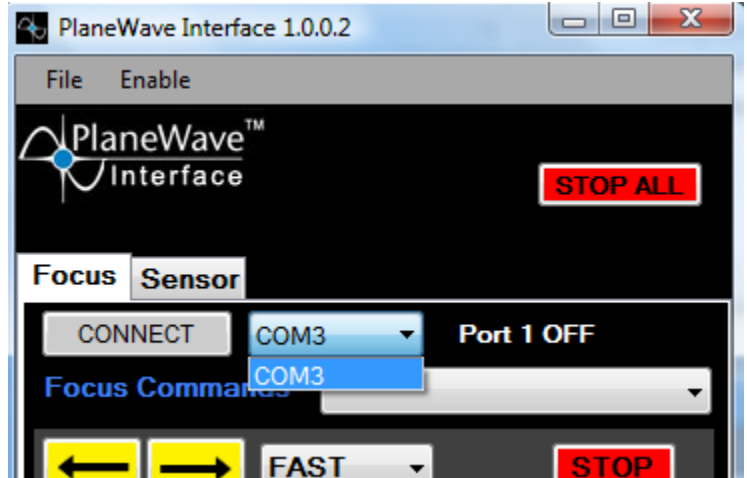
### *Connecting your Computer to PlaneWave Interface*

Open PlaneWave Interface.

Select Enable/Focuser1/Rotating Focuser as shown below.

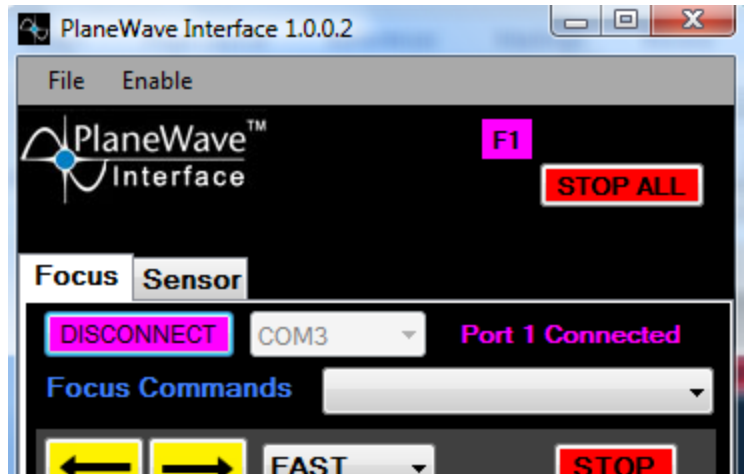


Next connect PWI to the computer. Notice the CONNECT button and the pull down window, in this case showing COM3. It may show multiple COM ports open. Trying selecting one at a time until PWI connects.



Once you have connected the focuser to PWI, an F1 appears signaling that there is a focuser connected to F1. For other applications there can be a second focuser and even another device shown there.

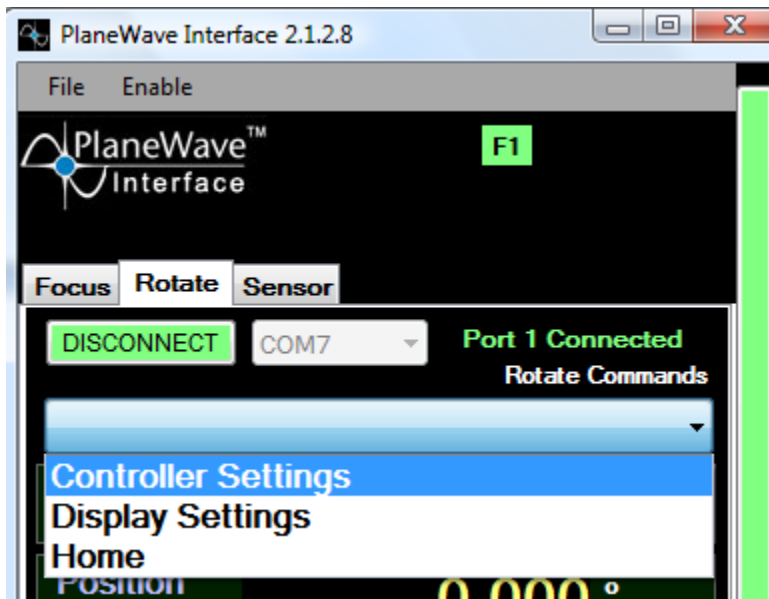
Also notice that the CONNECT button changes to DISCONNECT and that a note to the right of the COM3 window shows, Port 1 Connected.



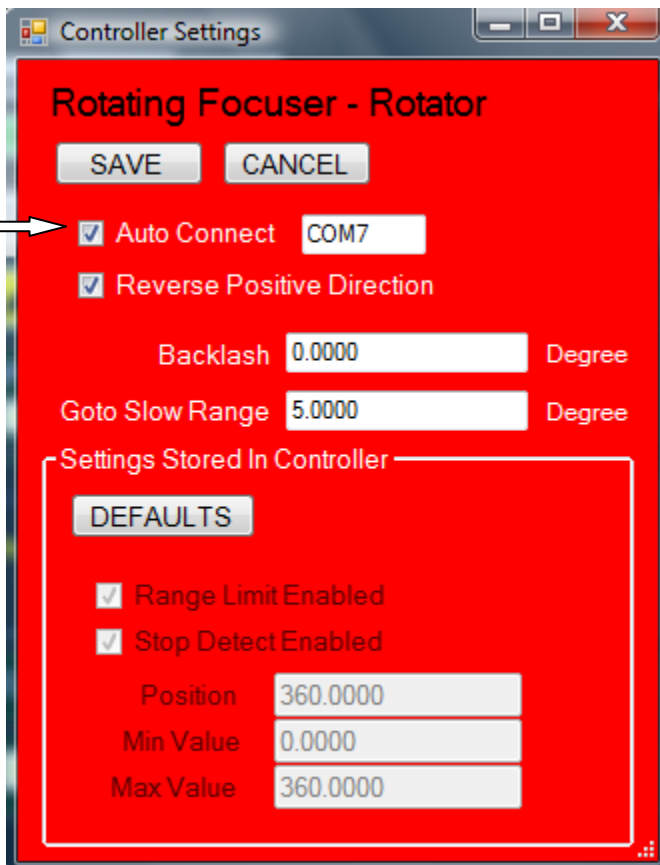


## Set up PlaneWave Interface to Auto Connect

Open and connect to PWI.



Open the pull down menu and select Controller Settings.



The Control Settings window opens. Check the box that says Auto Connect

## Overview

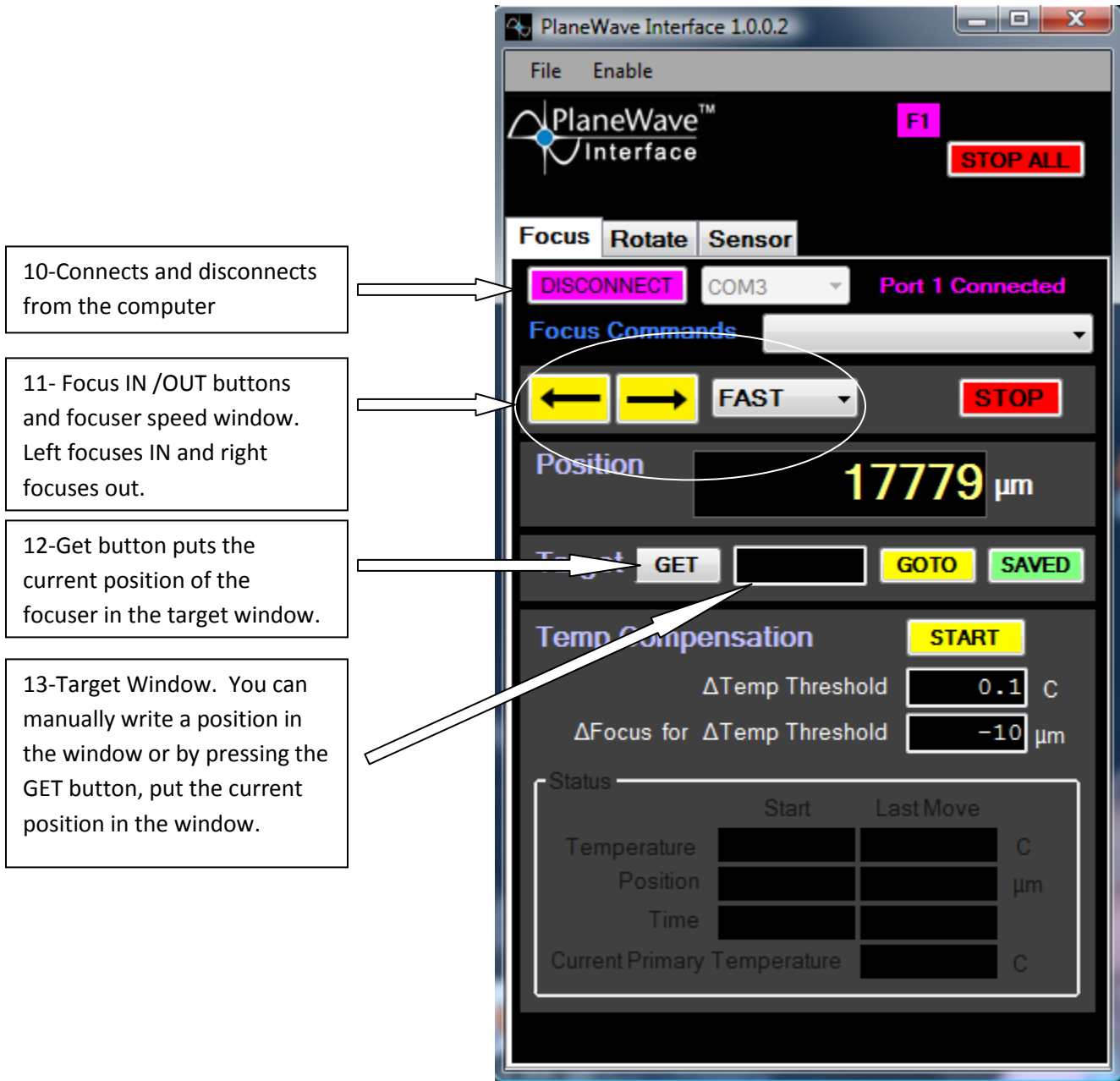
The PlaneWave Interface window with the Focus tab selected.

The screenshot shows the PlaneWave Interface 1.0.0.2 window with the Focus tab selected. The interface is divided into several sections:

- Top Bar:** Contains the 'File' and 'Enable' menus, the 'PlaneWave Interface' logo, and a status indicator 'F1'.
- Control Panel:** Includes a 'DISCONNECT' button, a 'COM3' dropdown menu, and a 'Port 1 Connected' status indicator.
- Focus Commands:** A dropdown menu for selecting focus commands.
- Position Control:** Features left and right arrow buttons, a 'FAST' dropdown menu, and a 'STOP' button.
- Position Display:** A large digital display showing the current position as '17779 μm'.
- Target Control:** Includes a 'GET' button, an input field, a 'GOTO' button, and a 'SAVED' button.
- Temp Compensation:** Contains a 'START' button, a 'ΔTemp Threshold' input field set to '0.1 C', and a 'ΔFocus for ΔTemp Threshold' input field set to '-10 μm'.
- Status Table:** A table with columns for 'Start' and 'Last Move', and rows for 'Temperature', 'Position', 'Time', and 'Current Primary Temperature'.

Annotations on the right side of the image identify key features:

- 1 - Focuser1 is connected
- 2 - STOP ALL Button
- 3 - Tabs for changing control window.
- 4 - Command Window
- 5 - Stop Focuser Button
- 6 - Position Window in microns
- 7 - Shows the saved focuser positions
- 8 - Sends the focuser to the position manually typed in the target window.
- 9 - Temperature Compensation Window



10-Connects and disconnects from the computer

11- Focus IN /OUT buttons and focuser speed window. Left focuses IN and right focuses out.

12-Get button puts the current position of the focuser in the target window.

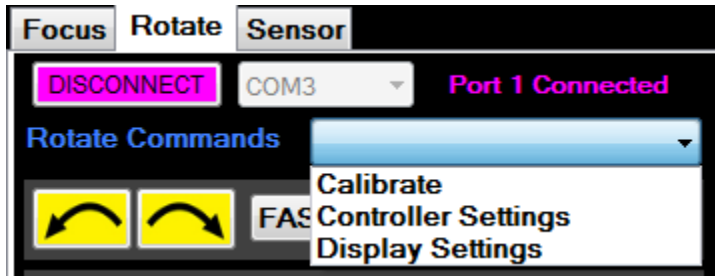
13-Target Window. You can manually write a position in the window or by pressing the GET button, put the current position in the window.

**1 – F1:** Under the Enable drop down menu at the top of PlaneWave Interface, the first selection is Focus1. In future versions of this software there will also be a Focus2 to choose from. For Focus1 and Focus2 you can select either the Rotating Focuser or the Hedrick Focuser. If Focuser1 is connected to a focuser, the F1 will appear. If Focuser2 is connected to a focuser, then F2 will appear.

**2 – Stop All:** This is the panic button to stop both the rotator and the focuser. This is the same when the ROTATE Tab is selected.

**3 – Tab Windows:** There are three different windows that can show on the PWI, Focus, Rotate and Sensor if the Rotating Focuser is connected. If the Hedrick Focuser is connected than there will only be two tabs that show, Focus and Sensor.

**4 – Command Window:** There is a command window for both the Focus tab and the Rotate tab. Under the both Command Windows there are three different options that can be selected, Calibrate, Controller Settings, and Display Settings. See the chapter entitled Command Window Functions.



**5 – STOP Button:** The Stop button will Stop the focuser or the Rotator depending on which tab is open. It is different from STOP ALL which will stop both the focuser and the rotator.

**6 – Position Window:** Displays the position of the focuser in microns. 0 is fully racked in and when racked out it is about 33,000 microns which is 33mm or 1.3”.

**7 – SAVED:** Opens up the PWI window larger to show the saved focuser positions as seen in the picture below. The same button appears on the Rotate tab. Also notice that when the SAVED window is opened, there are tabs labeled Focus Position and Rotate Position. See the section on saving positions in this chapter.

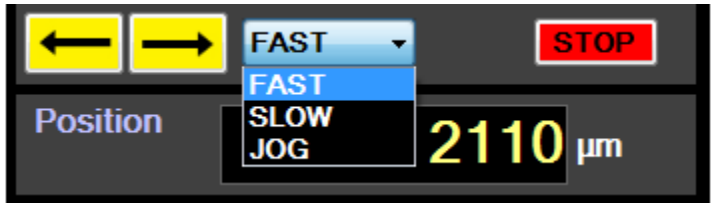


**8 – GOTO:** When this button is pressed, the focuser or rotator will move to the position in the Target window.

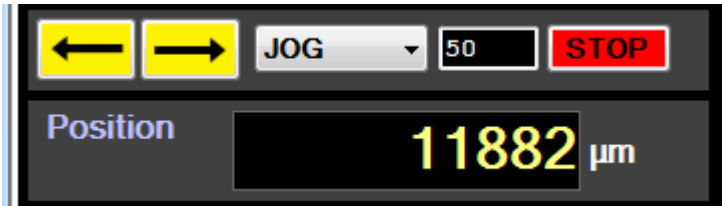
**9 – Temperature Compensation:** See the section on temperature compensation.

**10 –Connect/Disconnect Button:** Connects and Disconnects to the COM selected in the COM Selection window to the right of the button. The Com Selection Window is a pull down window that displays all the ports that are active.

**11 – Focus IN/OUT and Speed Buttons:** Of the Focus IN/OUT buttons, the right buttons focuser OUT and the left button focuses IN. The Speed button has three settings, FAST, SLOW and JOG. FAST is the top speed of 333 microns/sec (1/3mm/sec, or .013"/sec), SLOW is 8 microns/sec, and JOG is a movement to a specified distance.



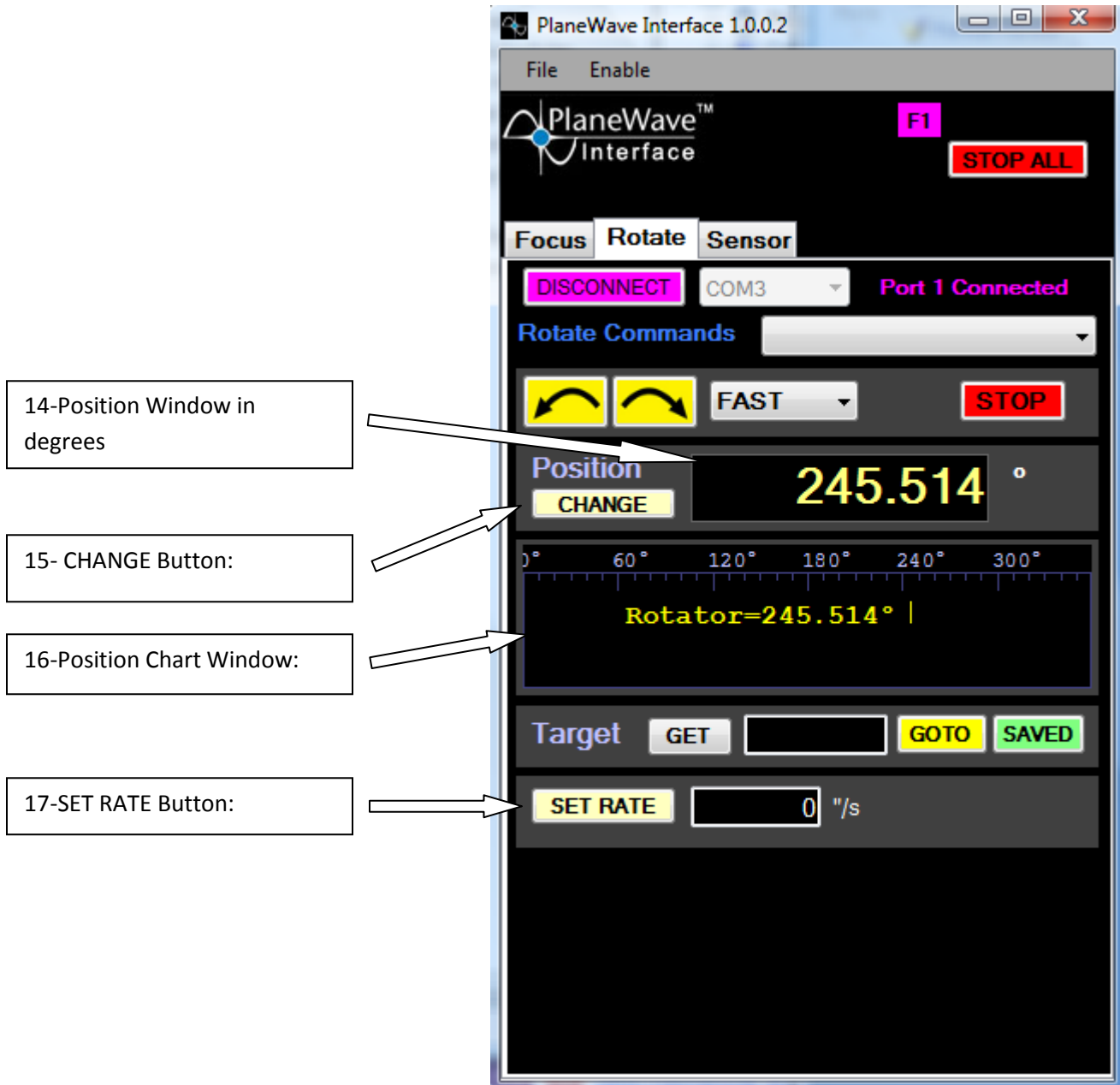
If you select JOG a JOG window appears next to the drop down menu, see below. Enter the amount you want to JOG the focuser. If you want to JOG in then press the left button and if you want to jog out press the right button. The JOG window units are in microns like the Position Display Window.



**12 – GET Button:** The GET button puts the current position of the focuser (displayed in the Position Window) into the TARGET Window.

**13 – TARGET Window:** Input the desired position of the focuser into the TARGET Window and then press the GOTO button. The focuser will go to that position. This works the same on the Rotator if the Rotate Tab is open.

The PlaneWave Interface window with the Rotate tab selected

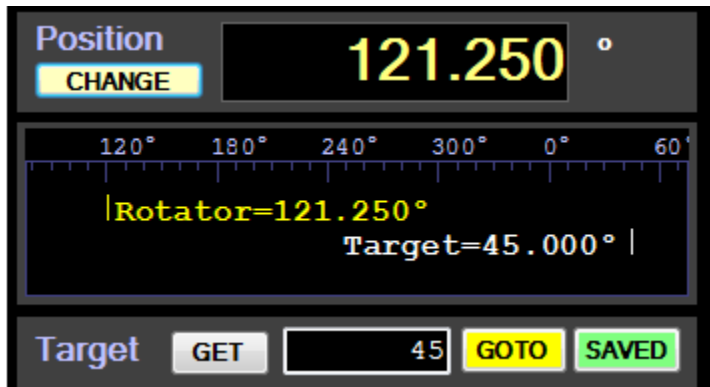


**14 – Position Window:** Displays the position angle of the rotator assuming it has been set. If not it displays the angle relative to the zero position.

**15 – CHANGE Button:** This is how you set the position angle of the rotator. To learn more about the position angle see Appendix A on Position Angle. Once you know your position angle, press the CHANGE button and the Set Position window will open up.



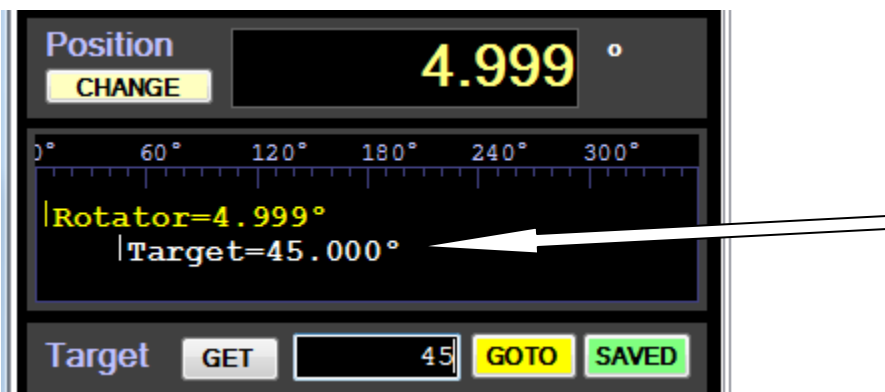
Input the known position angle into the box in degrees and press SET. You will notice that the location on the display window does not change but the value will change. Also notice that the number scale on the top has moved to represent the new position angle.



Please note that when the crossing the meridian on a German Equatorial mount, it will be necessary to find the position angle again as it is now moved by 180 degrees.

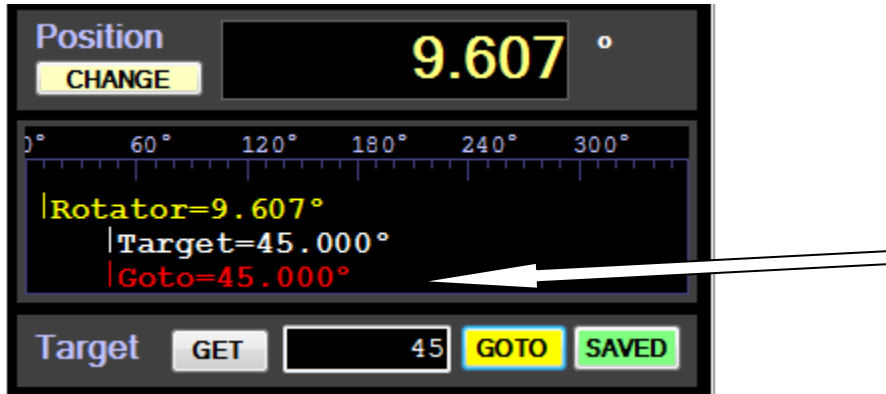
**16 – Position Chart Window:** Displays the position angle of the rotating focuser in degrees. The window itself represents the limits of travel of the rotating focuser. The Rotator can travel 367 degrees. So if you go to the extreme left, the focuser can go about 3.5 degrees past the end of the window. The position will roll over the right side when this happens.

When you place a position in the TARGET Window, the TARGET will also appear in the Position Window as seen below.



If you press the GOTO button, then the GOTO position will also appear in the Position Window until the rotator reaches the target, see below.





**17 – Set Rate Button:** If you want to use the rotator as a field de-rotator to correct for an alt/az telescope or a non-polar aligned telescope, you can manually put a rotation rate in window to the right of the SET RATE Button and then press SET RATE.

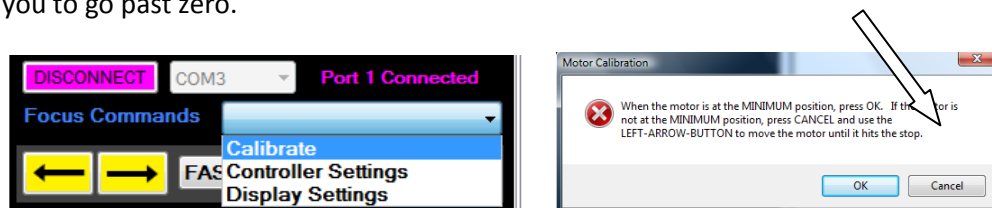
## Command Window Functions

### Calibrate

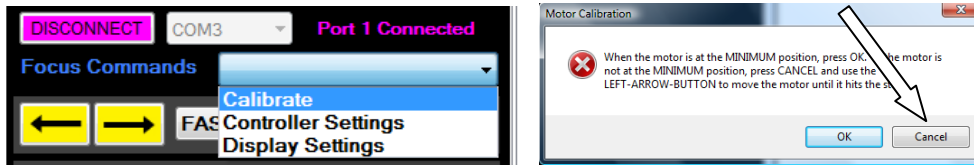
Calibrating is setting the zero position of the focuser or of the rotator. The zero position for the focuser is fully racked in. The zero position of the rotator is rotating counter clockwise until the stop is reached. This is also done by pressing the left button.

To calibrate the focuser:

- Set the rate to FAST.
- Press the left button until focuser is fully racked in and hits its stop.
  - a. If it the focuser stops before it is fully racked in, then select Calibrate from the focus commands drop down menu and when the window pops up, press cancel. This allows you to go past zero.

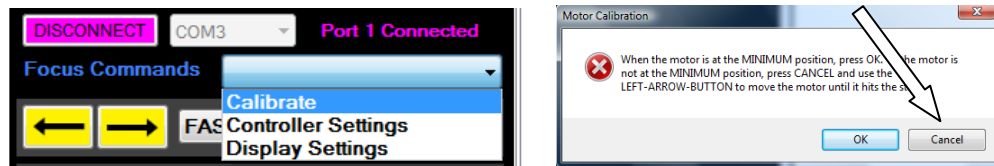


- When the focuser is fully racked in, select Calibrate from the Focus Commands menu and press the OK button in the pop up window. This sets the position to zero.

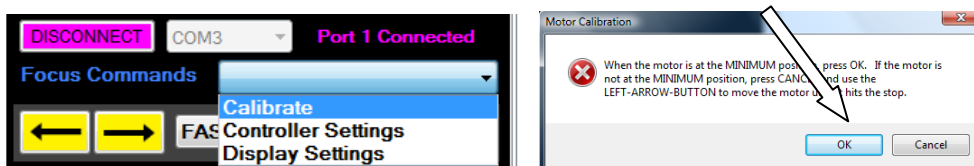


To calibrate the rotator:

- Select the ROTATE tab.
- Set the rate to FAST.
- Press the left button until rotator hits the internal stop.
  - a. If it the focuser stops before it is hits the internal stop, meaning it reaches zero before hitting the stop, then select Calibrate from the focus commands drop down menu and when the window pops up, press cancel. This allows you to go past zero.



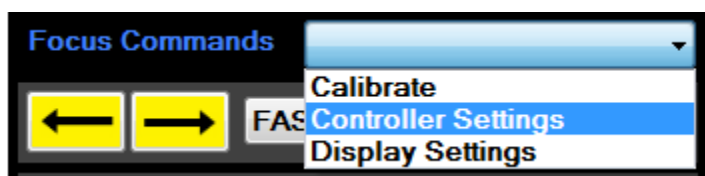
- When the rotator hits the stop, select Calibrate from the Focus Commands menu and press the OK button in the pop up window. This sets the position to zero.



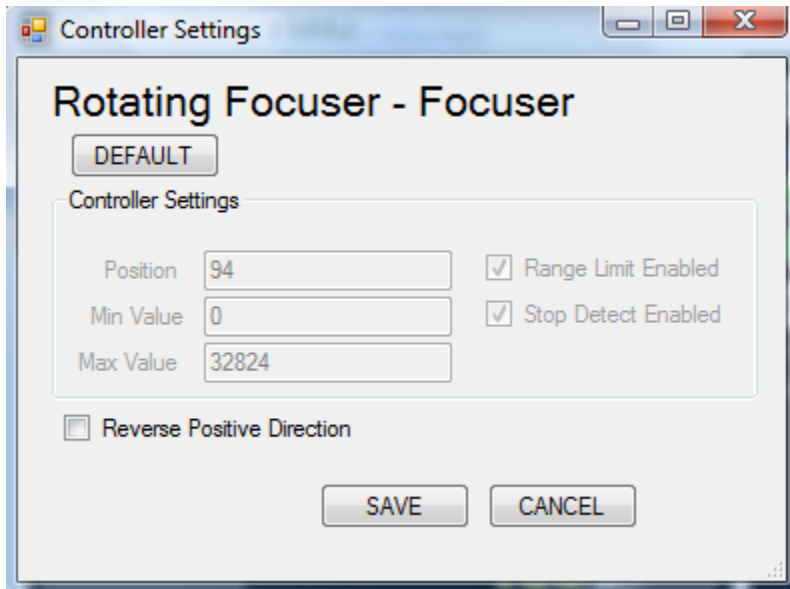
## Controller Settings - Focuser

Controller settings for the focuser and the rotator allow you to override some defaults like the start position and end position and other features.

From the Focus Commands menu, select Controller Settings.



After a moment the Controller Settings window pops up.



Most of the items are grayed out, meaning you cannot edit them. This is because these are functions you do not need unless you are using the focuser in out of-the-ordinary way. So for general use, you will not need to change anything.

One choice that is not grayed out is the Reverse Positive Direction box. If the focuser is being used on a non Cassegrain telescope or on the CDK700, the direction of positive may need to be reversed. Select the box to reverse the direction. When this button is checked and SAVE is pressed, the box will remain checked each time the program is opened in the future until changed again.

#### **Definition of Grayed out Items:**

**Position:** By changing this value, you are redefining the current position of the focuser or rotator. The focuser is in microns and the rotator is in degrees.

**Min Value:** This sets Minimum value of the focuser or rotator range.

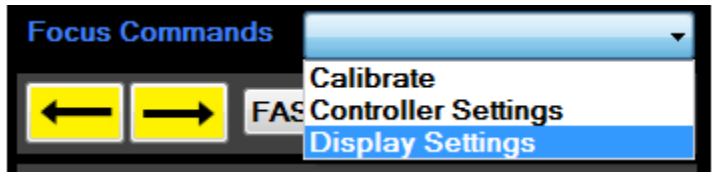
**Max Value:** This sets the Maximum value of the focuser or rotator range.

**Range Limit Enabled:** When range limit is enabled, the focuser will stop just prior to hitting the physical stops. This helps prevent unnecessary wear of the gear train driving the focuser.

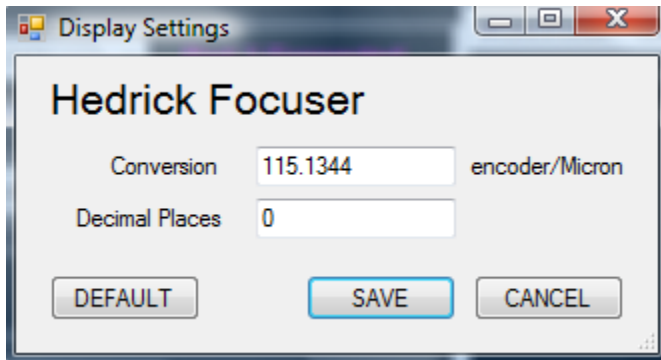
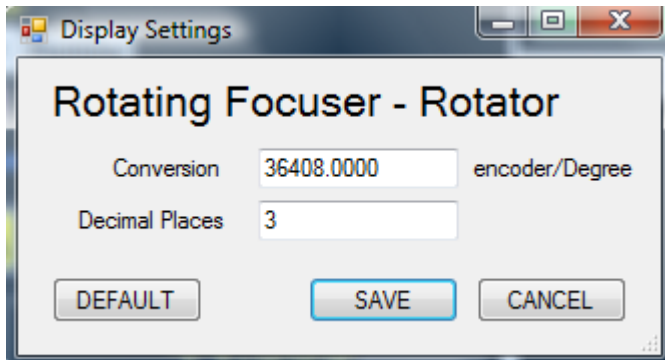
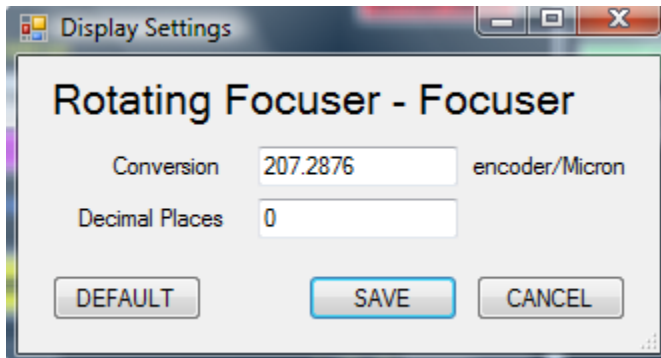
**Stop Detect Enabled:** A firmware feature that detects if the motors becomes difficult to move and will tell the drive electronics to shut down. This is because the motor and gear box together have such torque, that it is fairly easy for them to damage the gear train when the focuser or rotator runs up against a hard stop. This feature keeps the full torque of the motor/gearbox from damaging the instrument.

## Display Settings

Select Display Settings from the Focus Commands or the Rotator Commands drop down menu.



When Display Settings is selected the Display Settings Window pops up. Below are the windows for the Focuser tab of the Rotating Focuser, the Rotator Tab of the Rotating Focuser, and the Display Setting in case you happened to be connected to the Hedrick Focuser.



As seen in the Display Settings window, there are a couple of items that are settable.

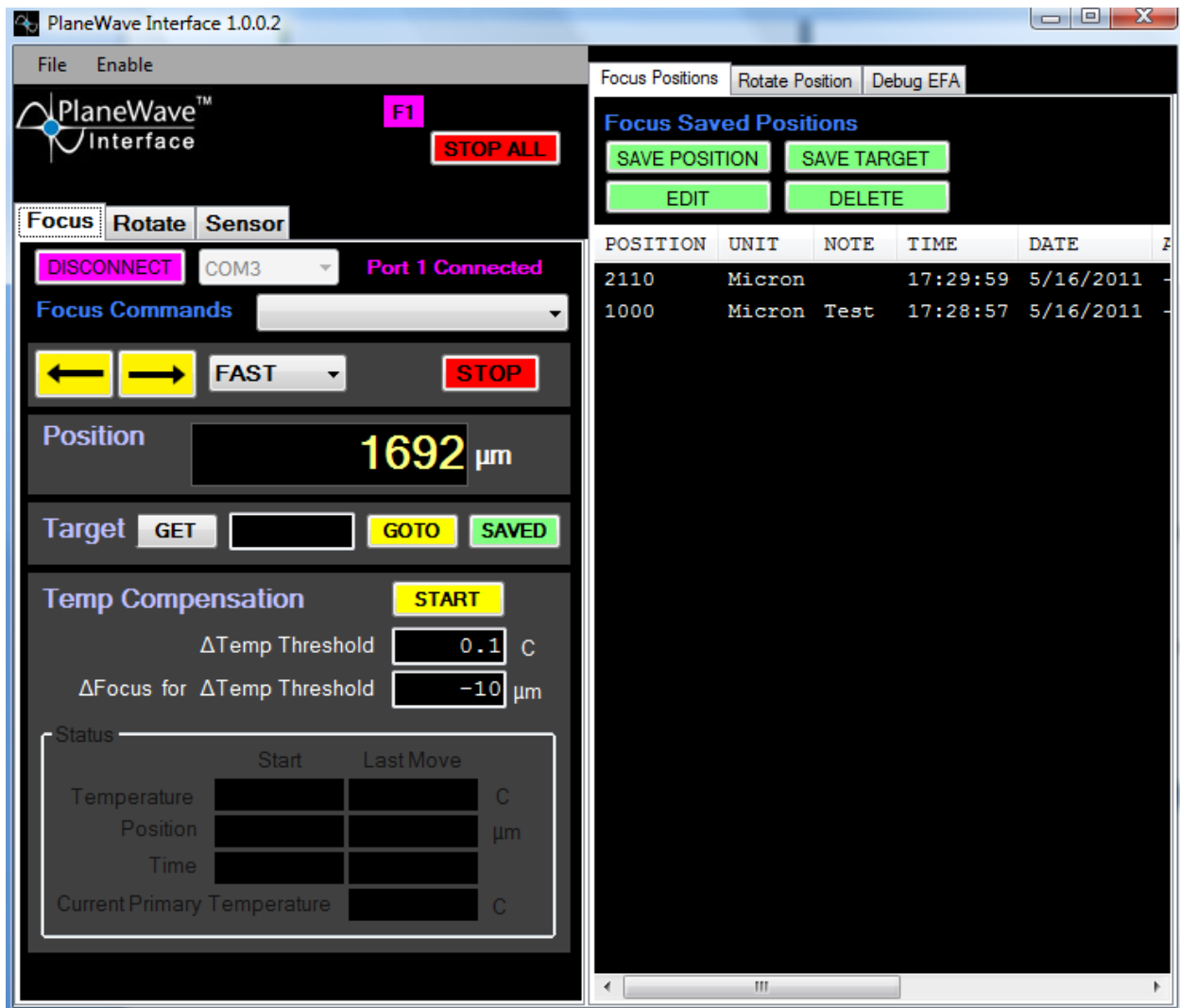
**Conversion:** This is the number of encoder ticks per micron of travel or in the case of the rotator, the encoder ticks per degree of travel.

**Decimal Places:** This is the number of decimal places displayed.

**Default:** The default button resets the Conversion and the Decimal Place numbers back to the default numbers in the case that they have been changed.

### *Saving Positions – Focuser and Rotator*

Positions can be saved for the focuser and the rotator. There is a green button on the right side of the TARGET section of the PWI window for both the Focuser Tab and the Rotator Tab. Press this button and the saved positions window opens, see below. To close the saved position window, drag the right side of the window back to the left.



At the top of the window there are three tabs, Focus Position, Rotate Position, and Debug. The Focus Position Tab shows the saved focus positions and the Rotate Position Tab shows the saved rotator

positions. The tab selections in the Saved Position window are independent of the tabs selected in the control window. Meaning, Focus can be selected in the window while Rotate Position can be selected in the Saved Positions window.

The buttons in the saved positions window are pretty self-explanatory.

- SAVE POSITION: Saves the value that is in the position display box.
- EDIT: Select a position from the list and press edit, this will allow you to write a custom note.
- SAVE TARGET: Saves the value that is in the Target Window.
- DELETE: Deletes a selected position from the position list.

## ***Temperature Compensation***

This is a very simple temperature compensation routine. There are two parameters to set. One is called "Delta Temp Threshold" and the other is called "Delta Focus for Delta Temp Threshold".

Delta Temp Threshold defines at what change in temperature do you want to make a move? In other words, if you make this number 1 degree, then temperature compensation routine will move the focuser every time the temperature changes by 1 degree. If the temperature changes by .8 degrees, it will not move.

Delta Focus for Delta Temp defines how far and in what direction the focuser will move. If you set it to negative 25 microns, then when the temperature changes by +1 degrees, the focuser will move -25um.

The routine poles every 5 seconds. So every 5 seconds the temperature is checked. And if it changed more than the threshold, the focuser will move. The temperature being poled is the primary mirror temperature.

The way this should be used is that the correct focus should be found for an observing session and then the temperature compensation should be turned on. It is not expected that this compensation will work from one night to another without some focus error because of the initial conditions will likely be different from one night to another. The result is that there could be an offset from night to night. But once you have determined the focus position starting point for the night, it should work fairly well.

Once you have characterized the Delta Focus and Delta Temp,

We have not collected a lot of data on thermal focus shift

## **Hints on setting up the Temperature Compensation Values**

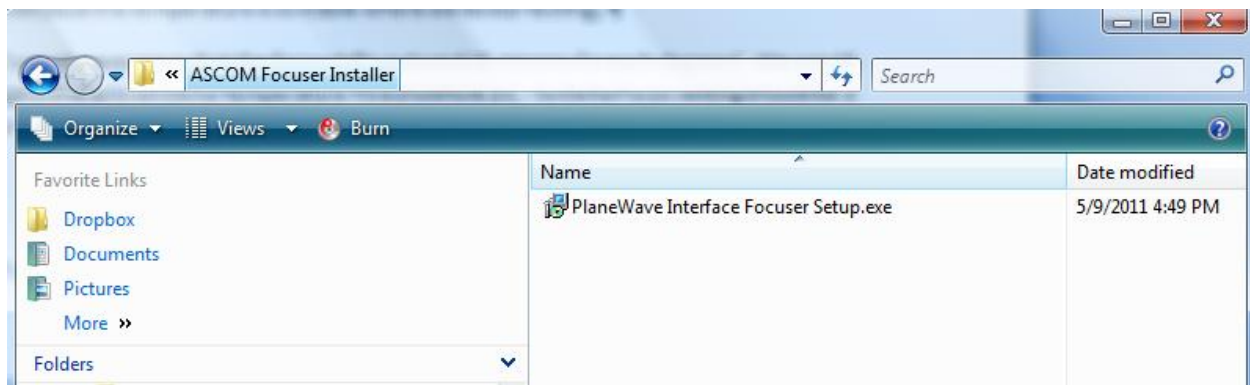
1. For the most stable thermal focus, it is best to cool the primary 30 minutes to an hour prior to observing. And when you start observing, turn off the fans.

2. The focus will move out as the temperature drops on all of the CDK telescopes. So the DeltaFocus value should be a positive while the DeltaTemp value should be a negative number.
3. Collect temperature and focus data over several nights to come up with the thermal focus rate. Take the average of the focus rates from each night. (PlaneWave does not have a lot of data on this because the temperature is so stable where we do our testing).
4. Let's say the average is that the focus shifts outward 20 microns for each degree C. We would suggest that you set Delta Temperature Threshold to 0.1 C. So Delta Focus setting should be 2 microns.

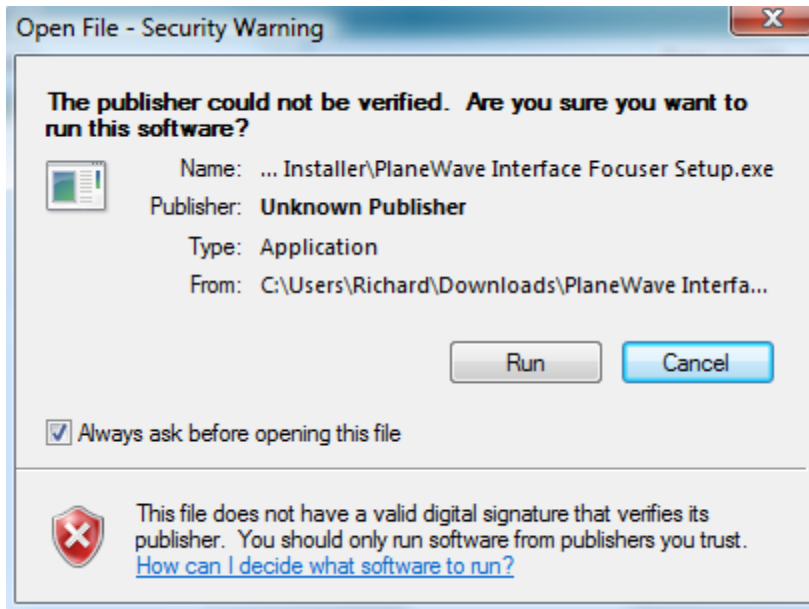
## ASCOM Driver Installation

Two ASCOM drivers are included for the Focus Rotator on the download site and should have already been downloaded. To connect to ASCOM compatible products, run the ASCOM Setup and follow the instructions below. Note, for the Rotating Focuser, you will need to install both the Rotator ASCOM driver and the Focuser ASCOM driver. For the Hedrick Focuser you will only need to install the Focus ASCOM driver.

1 – Under the ASCOM Focuser Installer, select the PlaneWave Interface Focuser Setup.exe and double click.



2 – A window Security Warning will likely open up. Press RUN.

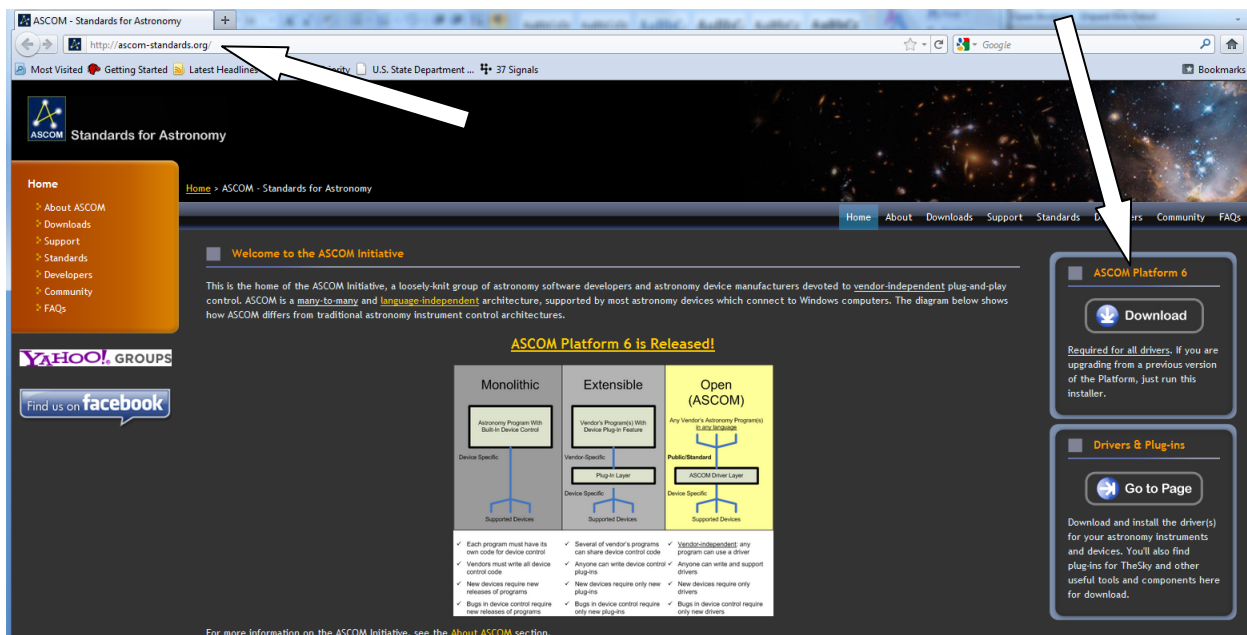


3 - If you don't already have ASCOM Platform 6, you will be asked to install it.

4 – If you need to install the ASCOM Platform, go to the following website,

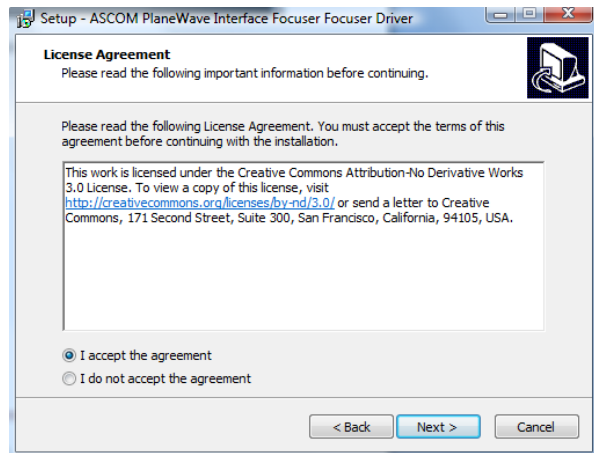
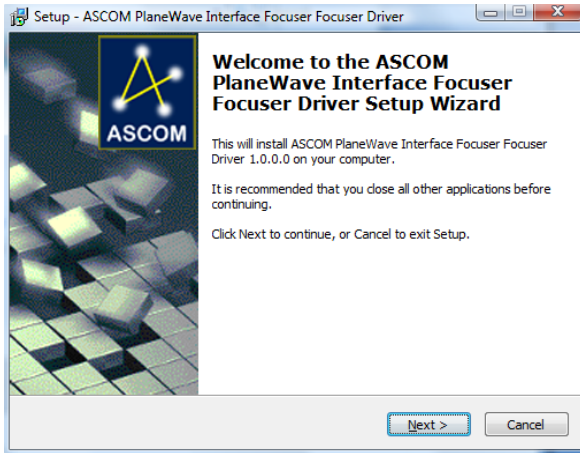
<http://ascom-standards.org/>

The page will look like the picture below. Click on the ASCOM Platform 6 download button and follow the instructions to download the Platform.

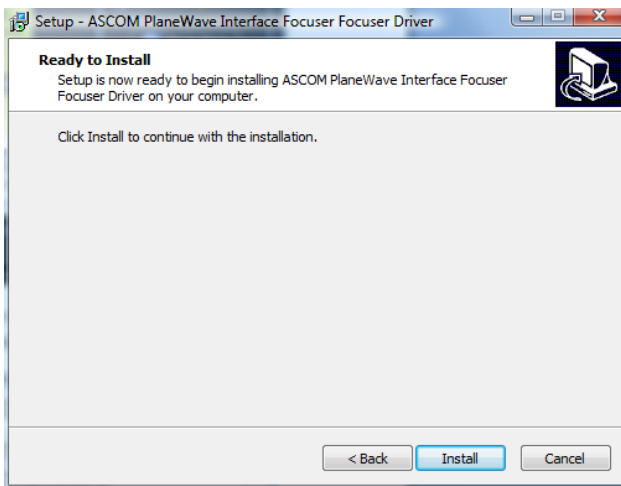


5 – After pressing RUN, as in Step 2, the Setup Window will appear as shown below. Press Next. The on the license agreement window select “I accept the agreement” and then press Next.





6 – A ready to install window will appear. Press the Install button.



6 – After a moment the completed window will appear. Press Finish.



## Trouble Shooting

If the controller was not properly configured, or was configured with a Hedrick Focuser, the user may have issues such as the Focuser will not move the full travel, or the Rotator is misbehaving. To solve do the following for both Rotator and Focuser:

- a) The user selects the Pulldown Commands "Controller Settings" and clicks "Defaults"
- b) Click Save