Application Overview

The AstroHub software application for Microsoft Windows enables remote monitoring, control and configuration of the functions for several 4tronix astronomy devices including:
- AstroHub Pro
- AstroHub Lite
- MiniHub RF
- MiniHub RFEQ
- Focus RFU

Not all the functions are applicable to every product: there are no dew heaters on the Focus RFU for example. But if the product contains a function that can be controlled by the software, then it is compatible.

The functions that can be controlled or monitored are:
- Focus Motors (DC Motors as well as Unipolar or Bipolar stepper motors
- Settings for the wireless remote controller used with many of these products
- Temperature compensation for the focuser
- Live current measurements for 12V DC outputs and dew heater outputs
- Software configurable current limits for the 12V DC outputs
- Configure the startup conditions of the 12V outputs either On or Off
- Control the dew heaters from software, or by using the physical dials
- Monitor the input voltage to the device (nominally 12V)

Note: When the AstroHub application is connected to the device, you cannot connect via the Ascom device driver. Either use the application, or use the ASCOM driver, but not both simultaneously.

Main Screen Overview

The main screen of the AstroHub software is divided into 4 quadrants:
- Top left are the system controls for connecting and displaying system information
- Top right are the controls for the focus motors and temperature compensation
- Bottom left are the controls and displays for the 12V DC outputs
- Bottom right are the controls and displays for the dew heaters

Each of these quadrants and occasionally some individual controls are enabled or disabled depending on the connected device. So the first task is always to connect the device.

Connecting the Application to the Device

In the top left quadrant of the application screen is a button labelled "Connect". To the left of that is the port name that you need to connect to. The list only includes devices that are attached to the PC and that are potentially 4tronix devices. Any other devices are not shown.

Most 4tronix devices will have two port names, the application will make a guess as to which is the correct one to connect to (the other will be the EQMod port). When you have selected the correct port, press the Connect button and the indicator will turn Green and the button will change to "Disconnect"
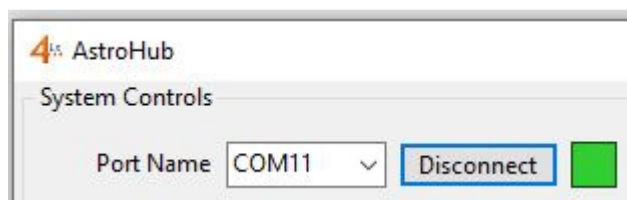
If it fails to connect to the device, the indicator will turn red. If this happens, select the other port and try again.

After you have successfully connected to the device, the software will display the name and version of the device, together with the supplied voltage
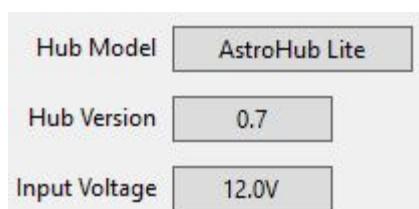
There are 2 other settings in the Systems group: (Colour) Scheme and Scan Period. Changing these won't change anything on the device, but affects the colours used in the application and how often the software application scans the attached device to get updated information (eg. Temperature or dew heater settings).
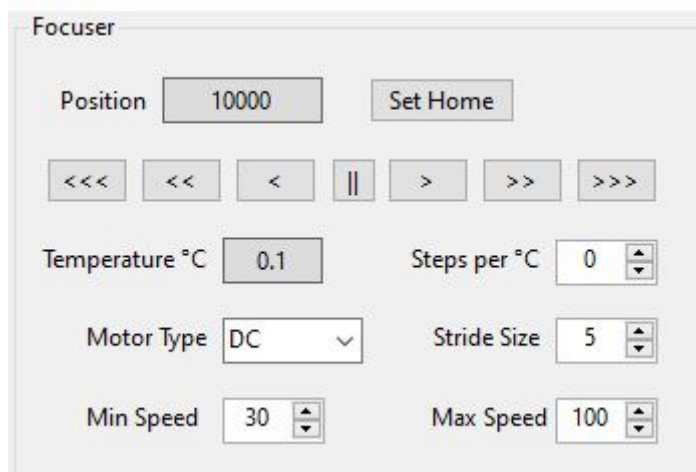
Controlling an Electronic Focuser

The top right quadrant of the screen contains a number of controls relevant to focus motors as well as for the wireless remote controllers. In fact some controls are only shown if a stepper motor is attached and some are only shown if a DC motor is attached.

Let us first consider the case of a DC motor as used in the basic SkyWatcher AutoFocus units. All 4tronix auto focus controllers are wired so that the standard cable from the SkyWatcher autofocus motor can plug directly in – so this is the most common attachment.

NOTE: The Motor Type is stored in the device and used when being controlled by the wireless remote. If you set it to stepper when the motor is a DC motor, or vice versa, then it won't work

DC Motors

The chevron arrow keys <<< to >>> are used to move the motor. A single chevron moves it one step, a double chevron moves 5 steps and a triple chevron moves 25 steps. The double bar in the centre will move the focus motor to its Home position. The Home position is set to 10000 by default, but you can set it to any position by pressing on the "Set Home" button. For instance, if the Position is displaying as 7823 when you press Home, it will subsequently treat 7823 as the Home position when you press the double bar symbol

Before you can start focusing, you should ensure that the correct values are set in Stride Size, Min Speed and Max Speed.
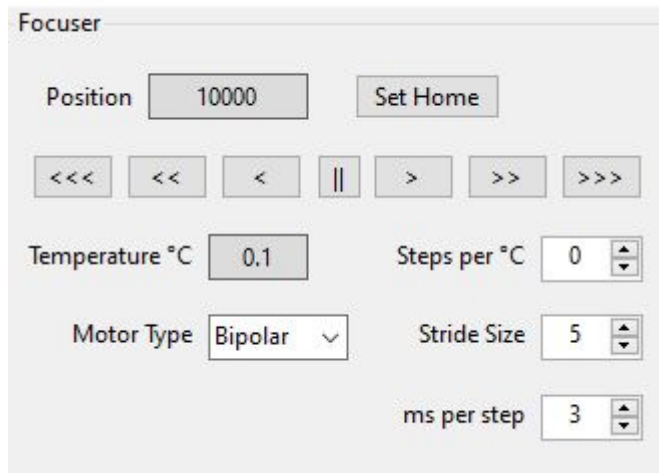
Stride Size sets the number of micro-steps per step. Depending on the gearing you have on the motor or on the actual focuser, you may want to increase this to a higher number or reduce to 1. This will be the number of motor microsteps for a single chevron move. **NOTE: This setting is stored in the device and will also be used when being controlled by the wireless remote in Step Mode**.

The minimum and maximum speeds for the DC motor can also be set. These are not used by the software application because the software application always uses "Step Mode" to control the focus motor, and Step Mode is always full speed to get maximum torque. The Minimum and Maximum speeds can be set to any value between 1 and 100, with 1 being extremely slow and 100 being full speed. This are in fact the PWM ON percentage time – you will find that most DC motors do not operate at all below a value of 20% to 25% or so, so the default values are 30% and 100%. **NOTE:**

These settings are stored in the device and will be used when being controlled by the wireless remote in Continuous Mode. [Remember: Press the 7 button to select Continuous and the 8 button to select Step Mode]

When using Unipolar (5 wire) or Bipolar (4 wire) stepper motors, you will see these controls

Stepper Motors

The Minimum and Maximum speeds have been replaced with a control that sets the number of milliseconds per step. Every stepper motor is different, but the principle is that the controller "steps" the motor to its next position, then waits for it to get there, then steps it again. If the controller steps the motor too fast, then the motor cannot keep up and doesn't revolve. If it steps too slow then there will be vibration as the motor starts and stops a lot – however it will work just fine. So it is best to start too slow (larger values) and speed up until the motor stops working. Then slow it down a bit. Between 3 and 8 ms seems to be a good value. **NOTE: This value is stored in the device and used by the wireless remote**

The remaining two controls in this quadrant are Temperature and Steps per °C.
The Temperature shows the value read by the probe attached to the device. It is always show in °C (future releases are likely to add Fahrenheit). If there is no temperature probe attached, then it will show 0.1°C. This is because some software applications won't operate correctly if they get a value of 0°C when they start up and initially attach.

The focuser can automatically compensate for temperature if you set the number of steps to move per °C change in temperature. In order to get the correct value to use, note the focuser position at different temperatures, divide the difference in position by the difference in temperature, then enter that value in the steps per °C box.
For instance if the focused position is 10040 at 20°C and 10280 at 12°C then set the number of steps per °C to be (10280-10040) / (18 – 20) → 240/(-8) → -8
Ie. Minus 8 milliseconds per step.

Monitoring and Controlling 12V Outputs

At the time of writing only the AstroHub has controllable and monitorable 12V outputs. Each output is capable of supplying 4A and is automatically protected above this level in hardware. In addition to this hardware absolute 4A limit, you can set a limit in software from 0.5A up to 3.5A (selecting values of 0A or 4A will simply leave it to the hardware limit to cutoff).
Note: The hardware limit is actioned within about 100 microseconds, but software limit is managed by scanning the current monitors in software and may take a few hundred milliseconds to respond depending where it is in the scan cycle.
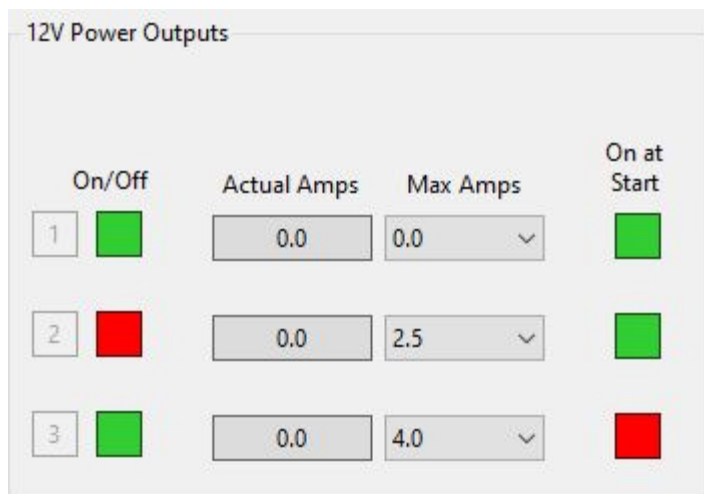
Each 12V output uses a Hall effect current sensor to monitor the output current. This method places almost zero resistance in the current path and so doesn't require large sense resistors. However, it is only accurate to about +/- 0.1A. This means it may show, for example, 0.1A when it should show 0.0A or 0.2A.

The indicators on the left of each 12V Output display can be clicked on (Green) or Off (Red) and that will immediately switch the selected output On or Off.

The indicators on the right of each output select whether that output will be set to On or Off when the device is powered up: **Note: This setting is stored on the device and enable or disable the outputs when the device is powered up. These settings will remain until the software application changes them**.

The example shown above has:
- Output 1 switched On when the device is powered up and is still On and using the hardware 4A current limit
- Output 2 is switched On at device power up, but is now Off. Either the application has switched it Off or the software limit of 2.5A has switched it Off
- Output 3 is switched Off at the start, but has now been switched On by the application software

Monitoring and Controlling Dew Heaters

The bottom right quadrant of the application allows the controlling and monitoring of three dew heater outputs.

The heaters can be controlled from the device using the dials on the device, or by the application by entering percentage numbers or by moving the green bars directly.
Select the control method by clicking on the Radio buttons Dial or App. **Note: This setting is NOT stored by the device. When it is not connected to the application, the dials on the device will control the dew heater outputs**.

The values shown on the green bars and the "Percent" boxes are the percentage of time that the output is On using a PWM control method. So if you set an output to 50% then half the time it is fully Off and the other half it is fully On. Of course, this plays havoc with the current monitoring, so be careful how much you read into the Total Amps display.

Note: Each dew heater output is hardware current limited to 4A. There is no software control of this limit.