HITECASTRO

HitecObs
User Manual

http://www.hitecastro.co.uk
support@hitecastro.co.uk

Congratulations on your purchase of the 'HitecObs'. We hope your device will provide for many years of satisfying service. HitecObs is a high quality digital interface between your PC/Laptop and your observatory roof motor enabling automatic control for your roll off roof with integrated safety features to ensure safe and reliable operation.

Warranty

Hitecastro warrants that this product will be free from defects for a period of 12 months following purchase. This warranty is in addition to any statutory rights which may exist in your jurisdiction. This warranty only applies to use as described in this document and also for use as an observatory roof controller. No other use is recommended or supported by Hitecastro. Any user repair attempt other than described in the troubleshooting section of this document or directed by Hitecastro will invalidate your warranty. Hitecastro and its affiliates disclaim any responsibility for any consequential damage or injury which may result from use of this device except as described in this document. Should your product fail within the first year of ownership we will repair/replace the unit at no cost to you.

Connecting the device

The device must be powered using a 12VDC center positive supply. The controller itself will run on any voltage between 12v and 15vDC.
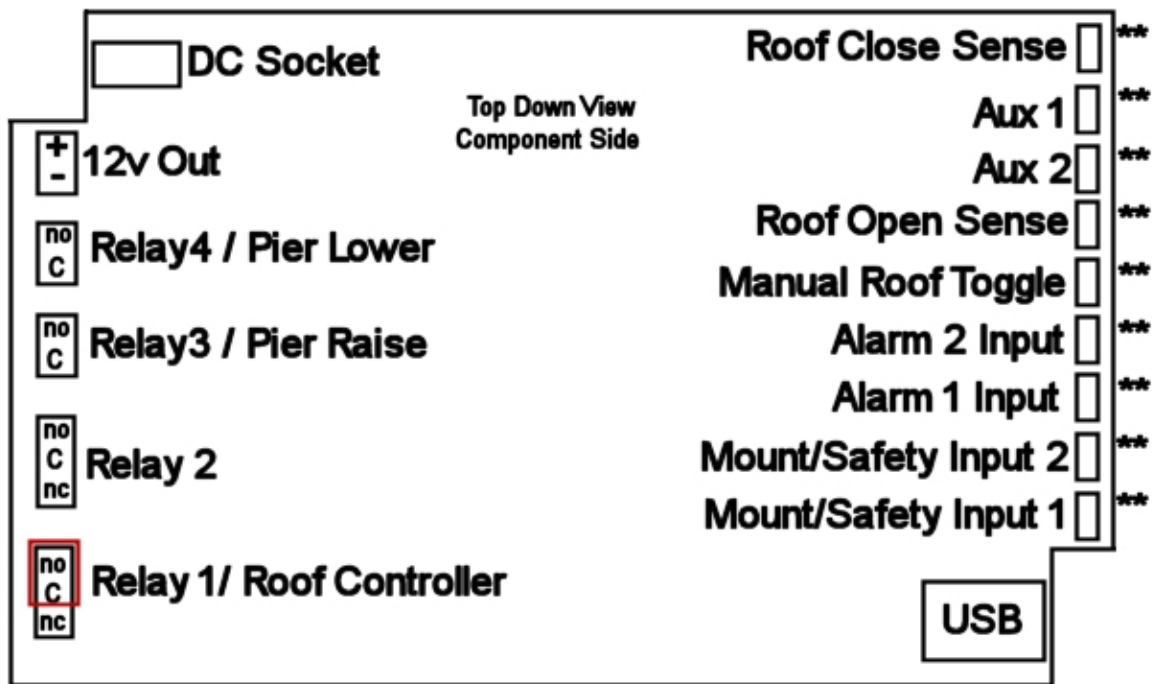Connect a high quality USB cable to the USB port on the device and connect the other end to a free USB port on your computer. You may use any USB 2.0 port. HitecObs is also backwardly compatible with the USB 1.1 standard. No matter which version of windows you use, the USB guider should be recognised as a 'HID device' without any further input from you. Before proceeding with the main installation ensure that the unit is powered off

Before connecting any cables to the unit, the unit MUST be powered off. Failure to do so may result in damage to the unit.

Block Diagram.
The following diagram describes the connections on the HitecObs controller.

DC Socket

Top Down View
Component Side

+ 12v Out
−

no
c Relay4 / Pier Lower

no
c Relay3 / Pier Raise

no
c Relay 2
nc

no
c Relay 1/ Roof Controller
nc

Roof Close Sense **
Aux 1 **
Aux 2 **
Roof Open Sense **
Manual Roof Toggle **
Alarm 2 Input **
Alarm 1 Input **
Mount/Safety Input 2 **
Mount/Safety Input 1 **

USB

** Shielded part of cable to this side of connector

Basic Connection

The minimum connections which need to be made in order to operate your roof is to connect power, USB cable(and/or) toggle switch and connect the roof toggle wires and endpoint limit switches.

Please note HitecObs does not directly drive any motor. In order to use HitecObs, you must already have a system in place which allows you to open and close your roof by a manual toggle switch. Hitecastro (through our network of dealers) can supply full kits with everything you need to automate your roof.
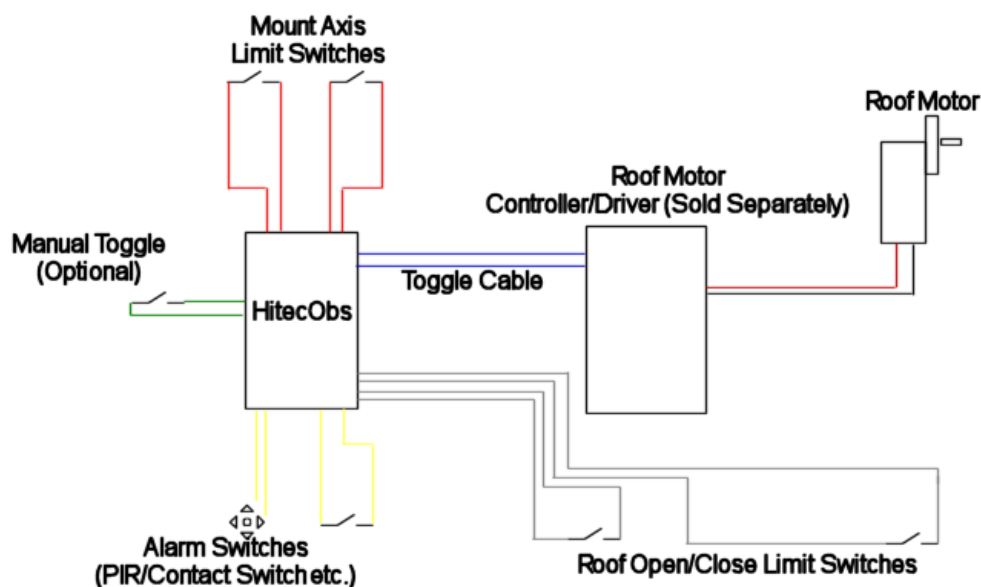

Figure 1.2 Connection Diagram.

The above connection diagram shows the possible connections which can be made to your HotecObs Controller. Some are mandatory and some are optional. Mandatory Connections are noted in the more detailed description of each function below.

Toggle Cable (Mandatory)   Supplied with your HitecObs controller is a length of shielded cable. Use this to connect your controller to your Motors drive electronics. Connect one end to Relay 1 at the points shown by the red square in the block diagram. There is no polarity to worry about. Just connect the cable to the points shown and connect the other end to the toggle input on your motors

drive electronics. If you purchased a full kit from Hitecastro this cable is already connected and you just need to connect the other end to your controller.

If you need to shorten any of the cables, it is important that you make a clean cut, strip back enough cable to expose the shielding (don't cut through the shielding). Wrap and tin with solder to ensure a good connection. Poor connections will result in malfunctions which may cause damage not only to your Observatory controller but to your telescope and other equipment. Use only shielded cable to avoid any unwanted behavior caused by unwanted ambient electromagnetic interference

If you are in any doubt about correctly wiring your controller consult an electrician.

Before connecting the toggle cable to the controller check that it functions correctly by touching the two wires on the controller end together. This should toggle the roof. If it does not, check the cable is attached to the motor drive electronics correctly.

Roof Open/Close Limit Switches.

These limit switches allow your HitecObs Controller to detect the state of your roof. They need to be installed so the supplied magnetic stalk will be directly over the magnetic switch when the roof is in the open or closed position.

It pays to give the installation of these switches a bit of thought. Consider a suitable location on the moving part of your roof which can accept the magnet stalk and install it with brass wood screws. With the roof closed, install one of the magnetic switches on the non moving wall of your observatory so that the switch sites approximately 6 – 8 mm below the magnetic stalk.
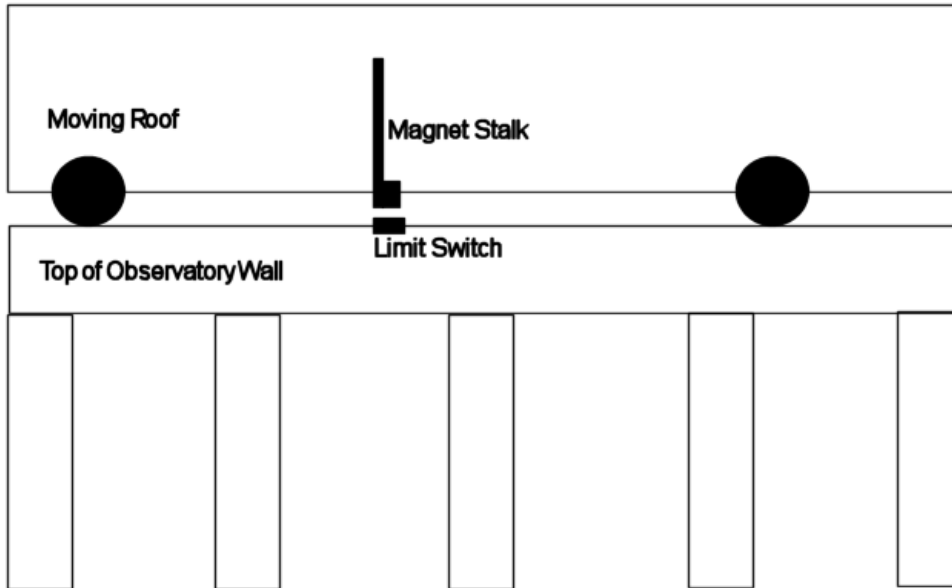
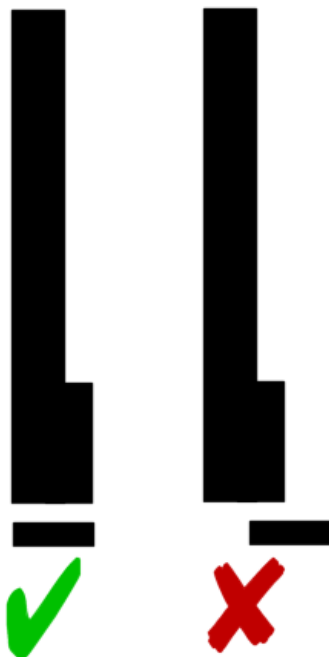**Figure 1.3 Correctly Locating a magnetic limit switch on the roof.**

Figure 1.4 Correct Alignment of the Roof Open/Close Magnetic Limit Switch

Ensure the magnet stalk is located directly above the limit switch, if it is offset in any direction it may not operate correctly.

Now repeat this process with the roof in the fully open position and install the open limit switch sensor in the same manner. Once these are installed

satisfactorily run the cables back to the controller and secure them to the observatory walls securely (e.g. cable clips or using cable ties.)
The next task is to connect the roof limit sensor cables to the controller.

It is a good idea to label all cables with some masking tape or other method to avoid connecting the wrong cables. It's easy to create a cable mess!

Examine the end of the cables and note the shielded part of the sensor cable. At this point refer to the block diagram on page three of this document. You should connect the cable which senses the roof is closed to the 'Roof Close Sense' input on the controller. Note in the diagram that it is required to connect the shielded part of the cable to the side indicated by **. This again avoids stray EMF causing unwanted signal. You should now connect the 'Roof Open Sensor' to the 'Roof Open Sense' input on the controller. (again refer to block diagram).

If you have reached this point congratulations you have completed all of the mandatory wiring. Connect the controller to a suitable 12v (center positive) power supply and connect a USB cable to the USB port and to the host computer.

It might be a good idea at this point to skip forward and install the HitecObs Software suite. You can come back to this part of the document later and install the optional components once you are happy the roof opens and closes as required.

Installing limit switches on your mount.

Included in your kit is a further two magnetic limit switches which you can attach to your telescopes mount RA and DEC axis (or Altitude and Azimuth). The purpose of these switches is to ensure that he roof will not operate while the telescope is not in the correct park position. These operate exactly the same way as the roof limit switches. Exactly how you will attach these to your mount is a little problem you will need to solve.

The following two photos show prototype limit switches installed on the developers mount. Although your mount might not look the same, they show

how the switches are intended to work. Install the switches with the mount in the normal parked position. Before installing on the mount connect the other end of the cables to the controller 'Mount Safety Input" 1 and 2 (see block diagram) again paying heed to the correct side for the shielded part of the cable. You can now run the Hitec Obs software. Placing the magnet over the switch should cause the corresponding software LED to light. Once you have installed the switches on your mount you will see these software LEDs light green. This indicates the switches are in the proper contact position. Refer to the discussion later in this document regarding the proper operation of these switches and how they should be used to protect your mount from being damaged by a closing roof.

Note: Hitecastro cannot warrant that any electronic system will protect your equipment in every situation. You should ensure that you fully understand the workings of the safety switches before trusting your equipment to unattended opening/closing. Where the limit switches have not made contact however, should the toggle cable get shorted by moisture or any other contactor the drive system may well operate the roof. The HitecObs controller cannot prevent this.

The motor driver supplied with the full HitecObs hardware kit uses a driver with a reverse function which will cause the direction of the roof to reverse direction if it meets an obstacle. If you are using another motor driver, check if a similar function is available. We do not recommend using any roof driver which does not have this feature.

Installing a manual Toggle Switch.

It is possible to use a manual toggle switch to open/close your roof. Although not included in the standard kit, Hitecastro can supply a suitable switch installed in an appropriate housing. You can use any 'Push to Make' switch for this function. These are available from any electrical supplier. Ask for a 'Push to make door latch switch'. Connect it to the controller "Manual Roof Toggle" port (again pay attention to the side to connect the shield in the block diagram). Once installed 'Making' the switch will cause the roof to open or close. This is handy for the times when you need to open the roof but would rather not power up your PC.

Installing Alarm Components

HitecObs comes with functionality to provide alarm notifications should the security of your observatory be compromised. This is only intended as a deterrent for intruders and cannot replace a commercial security system. **Please also not that Hitecastro are NOT a security company and thus your insurer may well require you to have a system in place provided by an approved supplier.**

There are two inputs on the controller called Alarm1 and Alarm2. There are many different types to security sensors which you can connect here. The only requirement is that the sensor makes or breaks a switch when activated. Examples of suitable sensors.

Magnetic window switches
PIR Sensor
IR Reflective Switch

Hitecastro can supply any of the above sensors in a format suited to the controller. Contact your dealer for more info.

Aux Inputs

At design time we had the option to add two auxiliary inputs to the controller. At the time of writing they have no function. The ability to read these is included on the device firmware and we may well find a suitable use for these in the future. One possibility is to sense the output from external sensors and act accordingly.

Device Relays.

Your HitecObs is equipped with 5 high quality relay switches. Some of these are reserved for particular functions, others can be used to power on/off other equipment.

Relay 1 is reserved for use as roof toggle. You will have connected this to your roof driver electronics. This has no other function.

Relay 2 currently has no function. Later software updates will make use of this.

Relay 3 and 4 are reserved to control our 'HitecPier'. HitecPier is designed to raise and lower your pier before opening and closing the mount. We will provide instructions for customers wishing to connect a HitecPier unit to our controller upon request.

Relay 5 is a DC output which can be activated when the roof is opening or closing. The output voltage is the same as that which is input to the controller as the relay passes through the input voltage. You could use this for example to power a low voltage DC light or sound module while the roof is opening or closing. Connect your device to this. The polarity is indicated in the block diagram (+ closest to the DC input socket).

It is your responsibility to ensure that any device you connect to this relay can be powered successfully from the input voltage of the controller and that the polarity is correct for your device. We cannot take any responsibility for any damage caused by incorrectly connecting any device to this port.

The next section of this document describes the software suite and how to use it.

Installing the HitecObs Software Suite.

Ensure you have downloaded the latest version of the HitecObs software suite from our website. The installer includes both the main software application and also an ASCOM Dome driver, to allow you to operate your roof through any software which supports the ASCOM Standards. To ASCOM, a roll of roof is just a dome with only a shutter (the roof). The ASCOM Dome Driver supports opening and closing a shutter (roof) but it does not have azimuthal motion (like a standard dome).

Install the software by double clicking on the installer and following the on screen instruction. You should not need to change any of the default settings.

Installing and Using the HitecDCFocus Software Application.

This will be the primary means of operating the focuser. Its installation and use are now described. Before installing any of our software or ASCOM drivers, you must ensure that your computer has the following installed.

- Dot Net Framework v4
- ASCOM Platform v5.5.1

See links at the end of this document.

Installing the HitecDCFocus Application.

Download and run the installer application from the Hitecastro website. Currently the URL for this is;

http://www.hitecastro.co.uk/support/DCFocus/HitecDCFocus_v1.2_Setup.exe

However this may change after future updates. Always check our support site for updates.

Run the installer package by double clicking on it. We recommend accepting the installer defaults. The installer will create a desktop icon which you can double-click to run the application.

Using the HitecDCFocus Application

When the application is run you should be presented with the following screen;
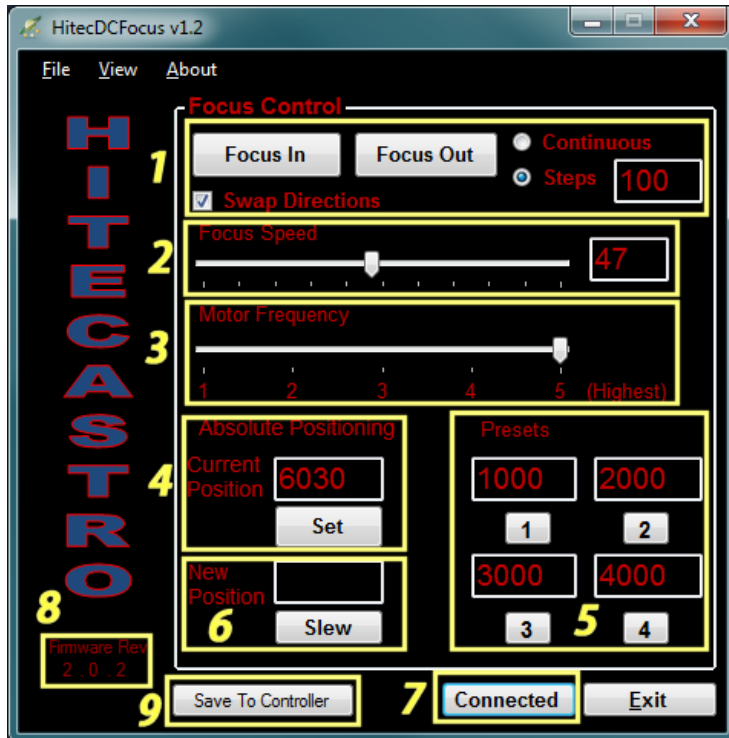
Once you have your power, motor, and USB cable plugged in click the 'Connect' (7) Button. If all is well, the text of the button will change to 'Connected' and the focuser will retrieve the current settings from the unit.

All settings are automatically saved to the ASCOM profile on your PC.

Once you have connected successfully, you will need to adjust some settings to get the best performance from your motor.

For now just accept the defaults and examine the 'Focus Control' buttons (1).

Push the 'Focus In' or 'Focus Out' to move your focus motor. You should see your focus motor move in the direction which you clicked. We chose these directions to suit a motor installed on the left hand side of a typical refractor telescope. However if your motor is mounted in a different orientation then the directions the motor moves may be incorrect. Click the 'Swap Directions' checkbox to rectify this. Remember this setting is permanently stored until you change it again.

Note the radio buttons marked 'Continuous' and 'Steps'. With 'Continuous' checked when you push the Focus In or Out button the motor will continue to slew until you release this button.

Note: When operating in continuous mode, the controller will not update the simulated step position. This mode is purely designed to enable you to slew your motor freely. It is not designed for focus operations.

For MUCH finer control over your focuser, choose the 'Steps' option. Now when you press the focus buttons the motor will move only a fixes amount to simulated steps. The number of steps moved is determined by the number entered in the textbox to the right of the 'Steps' radio button.

The 'Steps' option is a very powerful tool. Used correctly with a small value in the steps field you can move the focus motor an extremely tiny amount. Very useful for really fine focusing!

2 – Focus Speed

This slider controls the voltage to the motor (from 0% to 100%) of the rated voltage of your power supply. The result of this is the speed at which your motor operates. You may find at very low values your motor does not appear to turn at all. Choose a value which moves your motor at a suitable speed. You should not need to continually adjust this once you have chosen a speed which works well for you. Keep in mind that higher speeds also means that each 'Simulated' step the focuser makes will be larger.

DO NOT Overvolt your motor. With Skywatcher and JMI motors are rated for 12VDC therefore using a regular 12v power supply, you cannot overvolt these motors. If you are using your own motor, they MUST be rated for at least 12VDC.

3 – Motor Frequency.

This slider adjusts the 'Pulse Width Modulation' frequency delivered to your motor. This ranges from 400Hz (position 1) to 6.4KHz (option 5). A change here may be required to eliminate vibration in your motor. If you do not experience vibration in your motor then there is no need to adjust this parameter.

4 – Absolute Positioning.

The value displayed here is the current position of your motor. You can edit this value if you choose. Click the 'Set' button to set the edited value as the new current position of your focuser. Note: This does not move the focus motor. Note the box marked 'New Position' you can enter any position for your focuser in this box and then press 'Slew' to slew the focus motor to that position.

5. – Presets

These four values can be set by the user. Clicking the numbered button underneath each preset value box will slew the motor to that simulated step position. These could be, for example, the focus position of your favourite eyepieces or CCD cameras.

Once again we remind you that a DC motor is not always capable of repeatable positioning. Therefore the presets are there as a guide. It may not always be possible to repeat the same focus positions time after time. The repeatability will be affected by the load and orientation of your focuser. For example it is much easier for the motor to lower the load on your focuser than lift it. Therefore expect that when the focuser is lowering the load it may move a little further than when lifting it. In our tests we found the repeatability of focus positions to be very good using both the JMI and Skywatcher motors used to test.

7 - Connect Button

Use this to connect or disconnect from your focuser. Upon connect all stored values are retrieved from the memory of the focuser.

8 – Firmware Revision

The value here is the firmware revision retrieved from your controller. Please note this value should you need to contact support.

9 – Save To Controller.

You will have noticed that our controller comes equipped with In/Out buttons integrated into the unit. These enable focus operations even when the controller is not connected to a PC. But how does the controller know which motor frequency/speed to use with these buttons? Pressing the 'Save to Controller' buttons saves both the frequency and speed value to the controller permanently. If you plan to use your controller away from a PC you will need to do this beforehand. You can change use this button as often as you like. Even when the unit is powered off, it will remember the values sent to it the last time this button was pressed.

Night Vision Mode

Click View -> Night vision to toggle the screen between Red on Black colour scheme and the default colour scheme which helps preserve your eyes dark adaption.

Installing the ASCOM driver

VERY IMPORTANT

Before installing our ascom driver ensure that you have already installed the latest version of the ASCOM platform from http://www.ascom-standards.org

At the time of writing this is version 5.5

Also note that installing the ASCOM driver sets the controller values back to defaulf factory settings. If you wish to avoid this install the ASCOM driver BEFORE the PC application.

Before installing the ascom driver check our website to ensure that the version provided on disk is the very latest. You can download updated drivers directly from our support area.

Double click on the setup file to begin installation. We recommend you accept the default installation defaults. Once complete the driver will be ready to use.

Using the ASCOM Driver.

We cannot go into specifics about the nuances of each individual piece of ASCOM compliant software. However there are some similarities which you will find across all software.

Whatever software you use. You should go to the ASCOM focuser chooser and select 'HitecObs Dome'

Click Properties to display the setup dialog.

Click OK

You are reminded that all settings should be made using our supplied PC application. You can have this open at the same time as the ASCOM driver so that setting changes can be made 'On the fly'.

Depending on the software you are using, you may need to click 'Connect' (e.g. Maxim DL). However some software applications will just connect automatically.

For use of the focuser and general focus operations within your third party software, consult the documentation supplied with that software.

Troubleshooting

Q: I cannot install the software application or ASCOM driver.

A: Ensure that you have dot net framework v4 and ASCOM platform v6 (at least) installed.

Q: My HitecObs unit does not connect to my computer

A: Ensure that your version of windows has all the latest updates and service packs. Please note any error message you are given and contact support (support@hitecastro.co.uk)

Q: My device connects but does not activate Roof.

Ensure that your roof is capable of being toggled by shorting a switch. Ensure all connections are secure. Ensure the rook sensors are correctly determining the roof to be opened or closed.

Declaration of Conformity for CE Marking.

EU Declaration of Conformity

This product carries the CE Mark in accordance with relevant European Union Directives. CE Marking is the responsibility of;

David A. Jackson and David M. Grennan, Hitecastro, 30 Waverley Play, Worksop, Nottinghamshire, S802SX, United Kingdom

This product is designed for recreational use only and must not be used in any application where safety or personal injury may result from its failure.

This product is not a toy.

This product may cause unwanted interference in a domestic environment. The user may be required to take remedial measures.

Disposal
This product may not be disposed of along with domestic waste. To dispose of this item, take it to a local facility authorized to dispose of electrical waste covered under Electrical and Electronic Equipment (WEEE) regulations.

Links

Requirements for using our software

Dot Net Platform Version 4
http://www.microsoft.com/downloads/

ASCOM Platform
http://www.ascom-standards.org/

Some Software which leverages the ASCOM standard for focusers

CCD Auto Pilot
http://www.ccdware.com/

Maxim DL
http://www.cyanogen.com/

CCD Soft
http://www.bisque.com/sc/shops/store/CCDSoftWin2.aspx

Sharp Cap (Free)
http://sites.google.com/site/rwgastro/sharpcap

EQMOD (Free)
http://eq-mod.sourceforge.net/

FocusMax (Free)
http://users.bsdwebsolutions.com/~larryweber/FocusMaxDownload.htm

Please note that there are many more applications available. **Hitecastro has no connection with any of the above software suppliers. Users should evaluate any software first to ensure that it meets your needs**