

# Dragonfly

## Introduction and Windows software



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# 1. Introduction

Setting up the remote control system of your observatory requires quite a bit of effort – our Dragonfly has been designed to help make it easier.

The Dragonfly is a very powerful and versatile device. Every effort has been made to make it simple to use, yet allowing for full customization. Setting it up to remotely control our observatory can be accomplished with little effort, yet you can go as deep as you want and have it performing incredibly complex tasks if needed.

The Dragonfly operates at different levels:

- it controls several relays and can read several inputs. These are at the heart of everything, and they can be accessed from:
  - \* a simple web interface
  - \* a custom smartphone app (from anywhere)
  - \* Windows, linux or OSX software
  - \* custom scripts
  - \* Web javascript
  - \* RESTful API
  - \* ...
- it is intelligent, and can perform **advanced functions by itself** (we call these “Macros” and they are explained in the Dragonfly Configurator users' manual), such as:
  - \* registering in our cloud server for Zero Configuration connections
  - \* checking internet status, and, for example, resetting the router if failed
  - \* sending us an email (or push message) if the roof is open and the weather unsafe
  - \* ...
- it includes a **3 level** (read, relay change, configuration) **password-based security system**
- with PC software, the possibilities are multiplied<sup>1</sup>:
  - \* scripts can be launched when any relay or sensor changes
  - \* the position of the mount can be checked, commanded to park
  - \* the roof can be commanded from 3<sup>rd</sup> party programs (via ASCOM or INDI/INDIGO)
  - \* the **opening and closing procedures can be customized without limit**: you can park the mount, lower the pier, send an email... anything.
  - \* ...

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<sup>1</sup> Not all features available on all operating systems, but more being constantly added.

## 2. Some basic background on relays

So, firstly, a bit of background – feel free to skip to section 3 if you're confident in your knowledge about relays and the like.

A relay is a very useful device indeed – being an electrically operated switch, it enables appliances such as our Dragonfly to turn on and off other appliances.

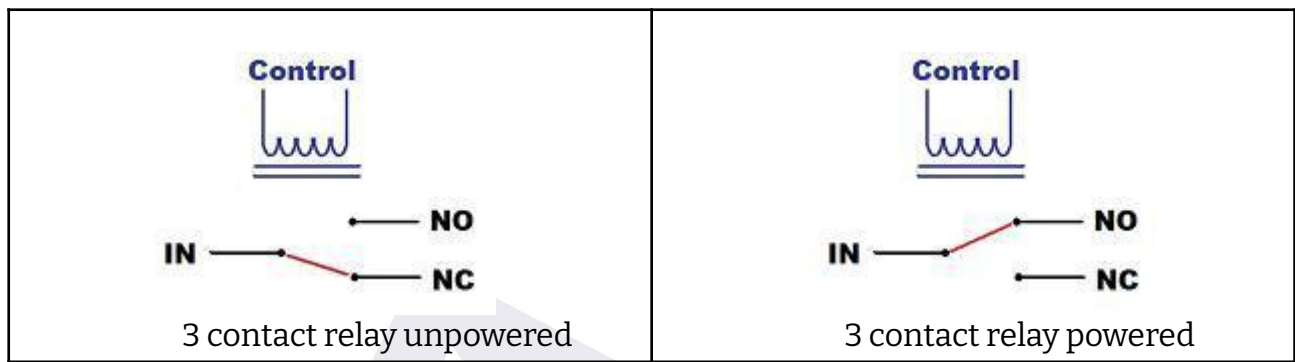
Let's compare relays and push buttons:

- Every relay has two sides: the control side (your finger able to push or release the button) and the switch properly said (the internals of the push button opening or closing the circuit).
- The most common push buttons leave the circuit open if nobody is pushing them, and close the circuit when pushed (push buttons working the other way around also exist). These most common push buttons are called “normally open”: they are open until some effort is made to change the state. The other model, yes, is called “normally closed”.
- The same applies to simple relays: they can be “normally open” or “normally closed”. When a relay is unpowered, it is in its **normal** state. When it is powered (power is applied to the control side, that is, like a finger push), the state changes. If we name the contacts of the relay IN and OUT, when the relay is closed, current will flow between IN and OUT, because internally IN and OUT will be connected. Conversely, if it's open, no current will flow.

So, a **normally open** relay **won't** allow current flow unless powered,  
and a **normally closed** relay **will** allow current flow unless powered.

So far, so good.

But some relays are a bit more complex (and useful!). They have 3 contacts – let's think of them as IN, NO (for normally open) and NC (for normally closed). The unpowered or relaxed relay will have IN connected to NC – with the ability to change this connection, and short IN with NO when powered (breaking of course the IN to NC connection).



For added flexibility, we use both kinds of relays in the Dragonfly.

### 3. Planning

As we're going to follow a step by step procedure to set up our observatory, let's start by deciding exactly what we want to be able to control:

1. opening / closing the roof
2. powering the mount
3. powering the CCD Camera(s)
4. forcing off the observatory lights

and monitor:

1. the position of the mount (at home or not) if needed to operate the roof
2. the position of the roof
3. the power (mains availability)

...remotely. The above list can be considered a typical setup. Of course, it is not the same to set up your backyard observatory so it can be controlled from the living room, than setting up your truly remote observatory 300 Km away from home.

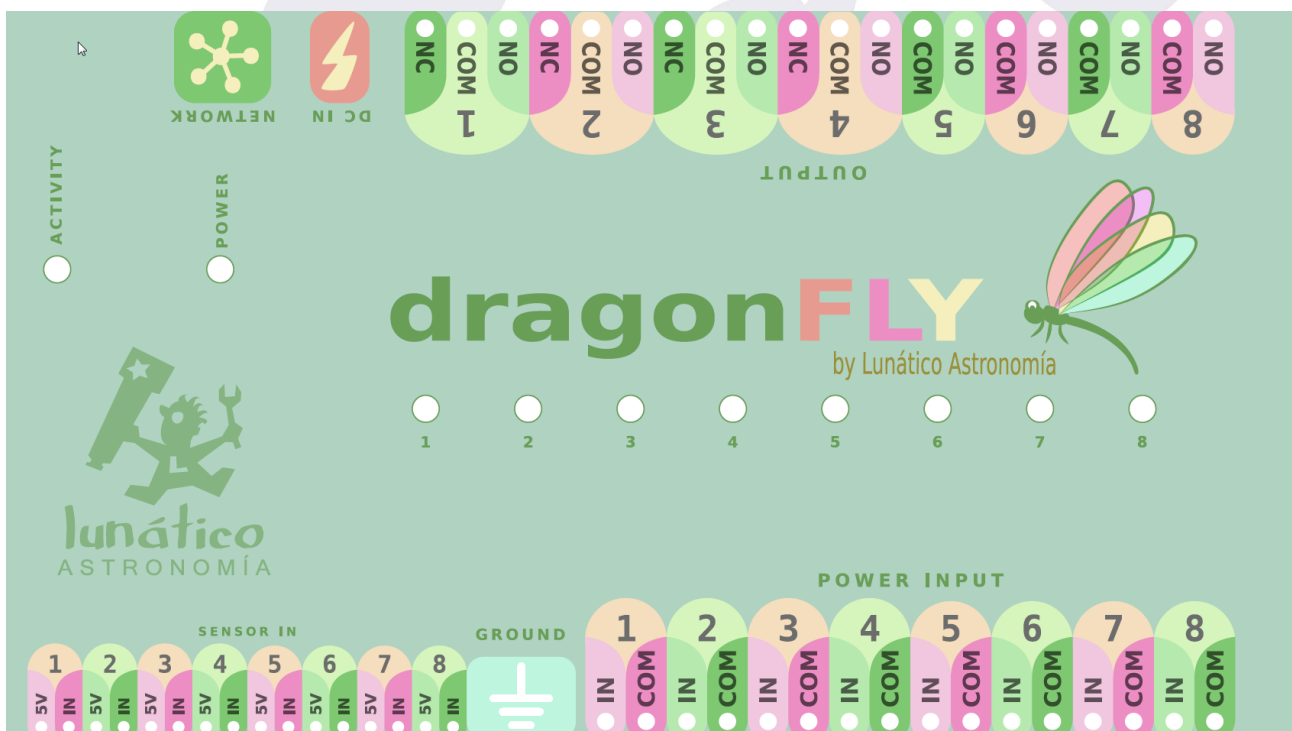
All the following examples will be aimed at setting up an observatory with these requirements; please use the same relay / sensor positions, as this will greatly simplify the process.

## 4. Electrical setup

The setup of the Dragonfly is quite straightforward – it may involve, however, dealing with dangerous voltages and currents (depending on your setup); **please contact a qualified electrician if you don't have the skills needed to perform a 100% safe setup.**

When naming the state of any relay, we'll think of the “NO” output. This applies to the software, too. So, we'll say the relay is OPEN if its NO output is. All relays will be open when unpowered. Conversely, we'll say the relay is CLOSED if its NO output is connected to the input side.

If you take a look at the sticker covering the upper side of your Dragonfly:



...you'll note we've used this naming convention for labelling the input and output connectors.

Second thing to notice: *Power Input* connectors are at the lower side, *Power Output* ones at the upper side. Current, be it AC mains (max 240V) or DC from a battery or power supply, will enter the Dragonfly via the Power Input and will be blocked or routed to the Output side. At the Output side we'll have our devices, mount, roof, CCD Camera or whatever.



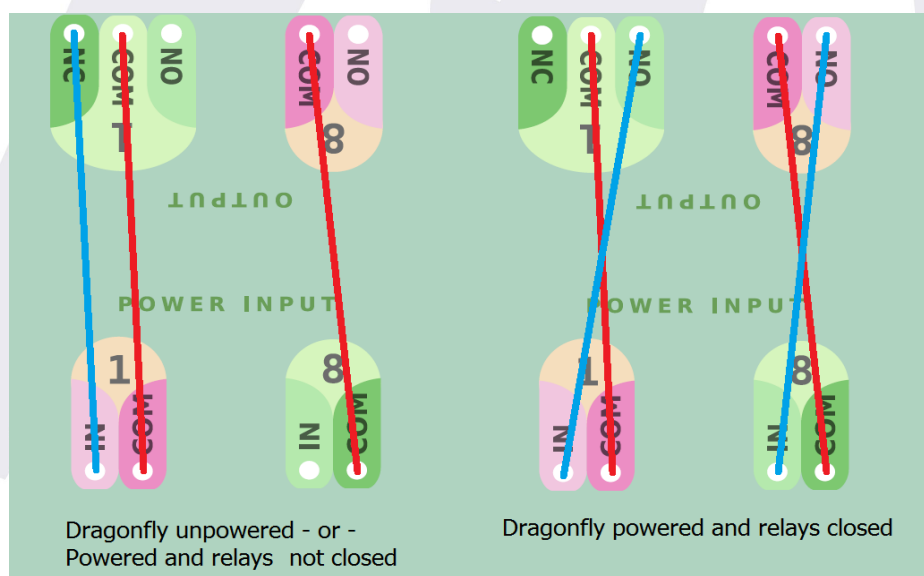
So, to make sure how the internal wiring goes is clear:

- “COM” will be internally routed from the input to the output side – *always*
- “NO” (Normally Open) will be connected to “In” when the relay is closed by the software
- “NC” (Normally Closed, only available in relays 1 to 4), will be connected to “In” when the relay is open in the software

When the Dragonfly is unpowered, all the relays will be in the relaxed (normal) state, so:

- All “NC” contacts, present in relays 1 to 4, will be connected to their matching “In” (so they’ll be closed)
- All “NO” contacts, will be, of course, just open

Graphically:



So what are the “NC” contacts for? When designing the Dragonfly, we noticed that certain things should be powered at all times except during the imaging session. One simple example is the observatory lights – you may choose to route the hand switch through the Dragonfly in such a way that no one can accidentally turn on the lights when you are imaging. You can even use the “NO” contact of the same relay to power on some other thing when the lights go off.

In my case, I have an electrical dehumidifier and I want it off for sure before the roof is opened!

So let's setup things for our minimalist observatory – adding the dehumidifier:

**Relay 1** → Roof control (pulsed – that is, a push button, as standard in many



garage door automation motors)

**Relay 2** → Mount

**Relay 3** → CCD Camera

**Relay 4** → Observatory lights

Bear in mind! – at the input side, for each relay:

- neutral (AC) or ground (DC) should be wired to “COM” (common)
- phase or live (AC) or positive (DC) should be wired to “In”

So, the wiring, input side:

- the same for relays 2, 3, and 4: mains neutral to **COM**, mains phase to **IN**
- for relay 1, roof, as we want to “push a push button”, we'll wire **COM** and **IN** together (just a short wire connecting them both). This case is different as we do not need to power the roof motor, but just to push a button, something like this:



...and output side:

- Relay 1: **COM** and **NO** to the roof motor push button
- Relay 2: **COM** and **NO** to the mount power supply
- Relay 3: **COM** and **NO** to the CCD Camera power supply
- Relay 4: **COM** and **NC** to the observatory lights. NOTE in this case it is NC, not NO, as we want the lights working in normal conditions

**Note:** the box of the unit must be connected to ground (earth).

The LED for each relay will be **on** when the relay is **closed**.

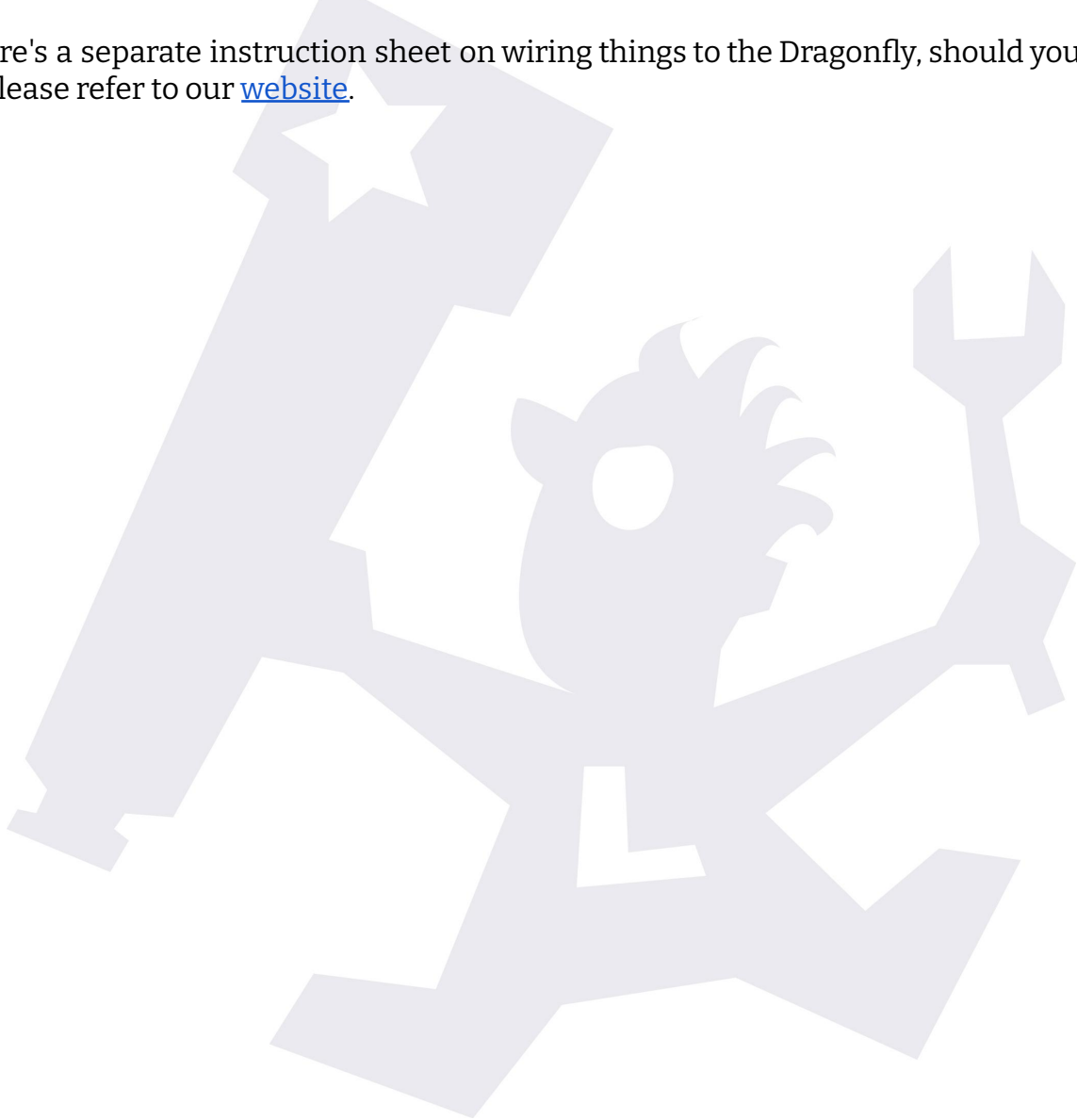
We can't forget to mention earthing; the Dragonfly incorporates 8 banana-style plugs at each side to make earthing really simple. They are all connected together and to the metallic box.

The rule is simple; all A.C. current appliances should be earthed. Also, even if all current

routed by the Dragonfly is D.C., the box should be earthed; this is accomplished by wiring any of the 16 plugs to earth.

Regarding the sensors, they are connected to the “sensor in” section; most of them (proximity, contact, etc) will just need the “+5v” and “In” connections. For other, more complex sensors (such as our Sharp distance one), ground is also needed; there are 4 ground plugs between the “sensor in” and “power in” strips.

There's a separate instruction sheet on wiring things to the Dragonfly, should you need it, please refer to our [website](#).



## 5. Windows software

**If not using Windows: for Linux and OSX, there are 2 implementations of the drivers, [INDIGO](#) and [INDILib](#). Please check their respective websites for more information.**

Let's look at the supplied software step by step.

We strongly suggest first making sure everything in the observatory works as intended and can be operated safely from remote, but with you supervising and actively switching things on, off, and looking at the sensors. Only once you are comfortable with this, should automation be addressed.

### 5-a) Installation

Installing the software is as easy as it gets. The only prerequisite is to have the ASCOM platform installed. You can download it freely from:

[www.ascom-standards.org](http://www.ascom-standards.org)

Once ready, download the Dragonfly software from our web page :

[Dragonfly's software web page](#)

..., run the installer and follow the simple instructions.

### 5-b) Connecting

If, after installing, you launch the software (Dragonfly, from the start menu or apps), two windows will appear, one for controlling the relays and checking the sensors, and a smaller one for the configuration of the network settings:



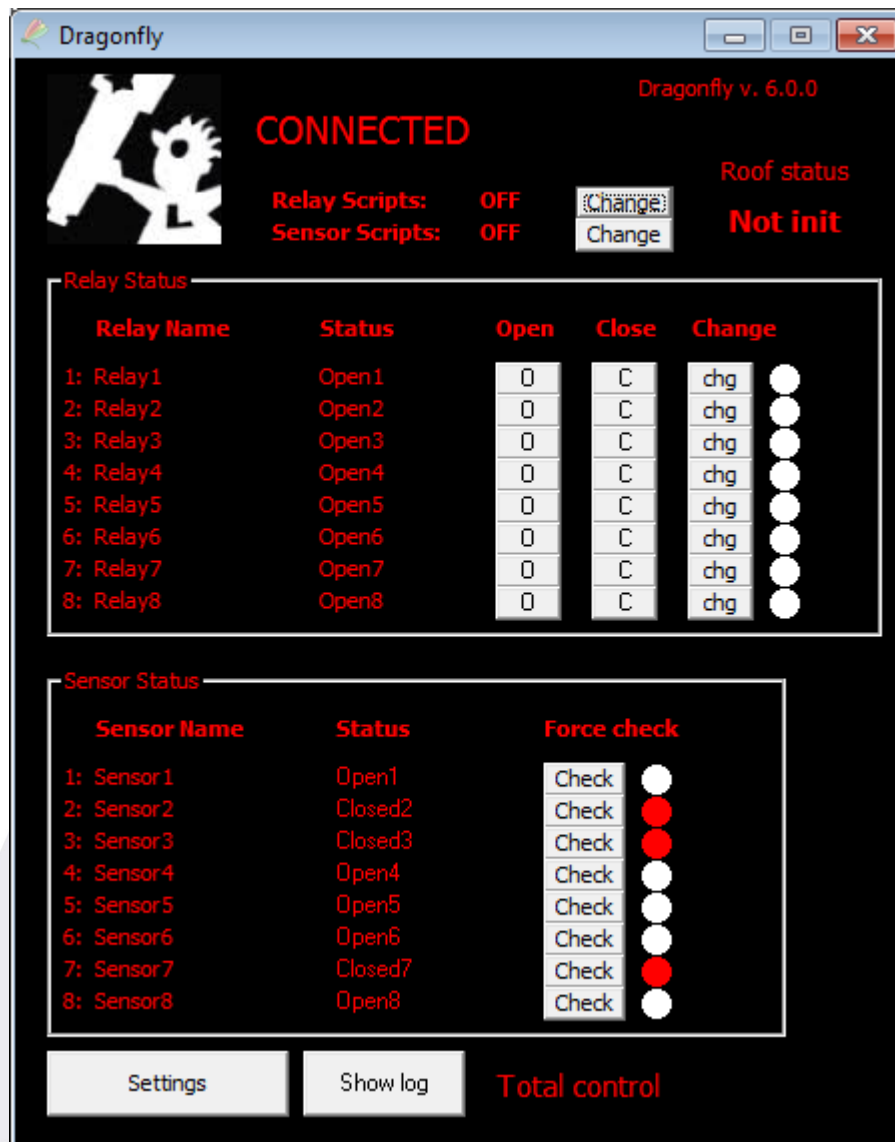
We won't be using this one for the moment, so just please minimize (do not close!) it. It will remain open, but hidden, in the lower right Windows notification area. In the configuration you can select to have it hidden, in the Windows notification area, by default.

In case you have any problem connecting to your controller, check [section 6](#).

### 5-c) Remote control

The remote control software supplied with your Dragonfly allows you to name every physical connection so you don't have to guess, apply restrictions, configure relays and sensors... It is really easy to understand and we'll review it while working for our example observatory.

So we are going to spend some time with this Dragonfly control panel, also visible:



We'll focus, for now, on the two big areas, upper one for relays, lower for sensors. It's easy to see there are 8 rows of relays and 8 of sensors, just as in the physical box.

Let's give a name to each relay, and even to each state – so relay 1 becomes “Roof motor”, relay 2 “Mount power”, with closed becoming “On” and opened “Off”, etc.

Just click over the current name of the relay (where the mouse cursor is in the following image):

Relay Status					
Relay Name	Status	Open	Close	Change	
1: Relay1	Open1	0	C	chg	<input type="radio"/>
2: Relay2	Open2	0	C	chg	<input type="radio"/>
3: Relay3	Open3	0	C	chg	<input type="radio"/>
4: Relay4	Open4	0	C	chg	<input type="radio"/>
5: Relay5	Open5	0	C	chg	<input type="radio"/>
6: Relay6	Open6	0	C	chg	<input type="radio"/>
7: Relay7	Open7	0	C	chg	<input type="radio"/>
8: Relay8	Open8	0	C	chg	<input type="radio"/>

... and you'll be presented with the settings for that relay:

**Settings for relay 1**

Relay name:  If open display:  If closed display:  Pulse period (ms):  ☐ Pulse? ☐ Confirm on manual change?

Don't OPEN relay if:

Relay: 1 2 3 4 5 6 7 8 Sensor: 1 2 3 4 5 6 7 8

Don't CLOSE relay if:

Relay: 1 2 3 4 5 6 7 8 Sensor: 1 2 3 4 5 6 7 8

☐ Relay / Sensor is ignored (default)
 ☐ Action blocked if relay / sensor is OPEN
 ☐ Action blocked if relay / sensor is CLOSED
 ☐ No comms (can't edit)

OK Cancel

This has two zones: the upper one, and an advanced area to define restrictions. Let's start with the upper one:

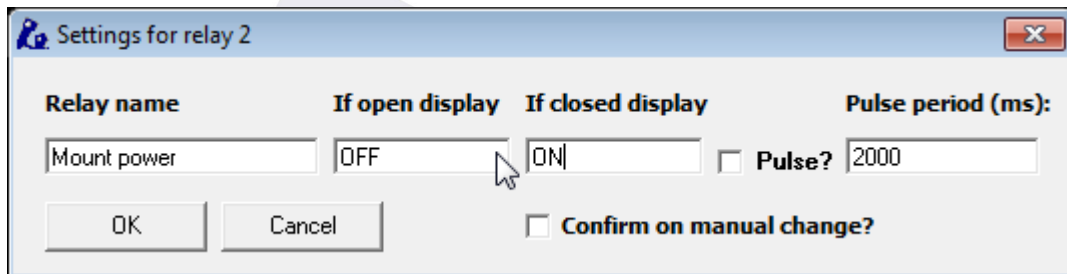
**Settings for relay 1**

Relay name:  If open display:  If closed display:  Pulse period (ms):  ☒ Pulse? ☐ Confirm on manual change?

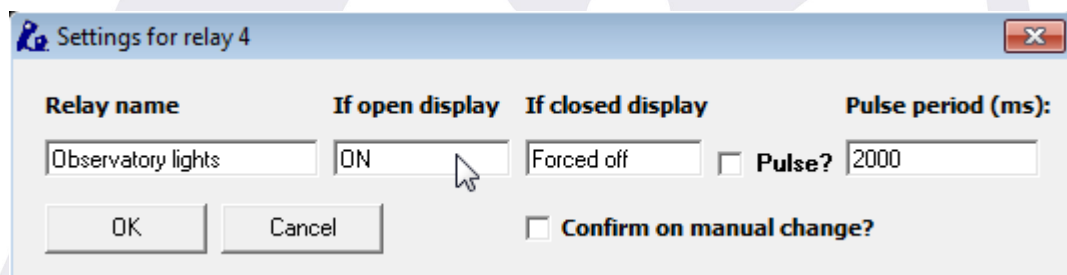
OK Cancel

You can name the relay and what should appear when it's closed and open. You can also define it to be a “pulsed” relay, as appropriate in the roof motor configuration. The pulse period, you surely guessed it, is the approximate duration of the pulse in milliseconds.

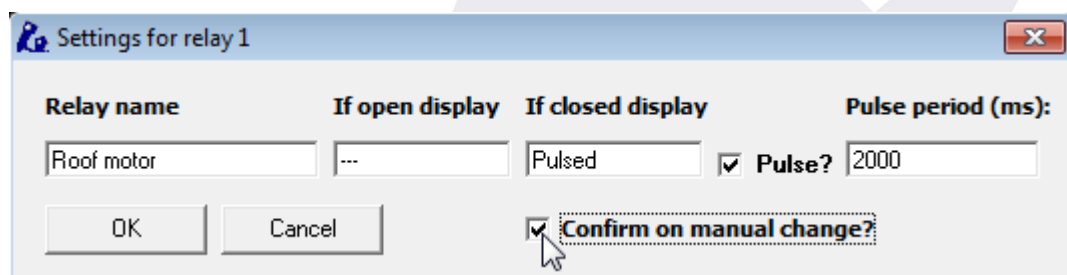
Keep naming relays (and ignoring the restrictions for the moment):



... please continue to do the same for the CCD power and observatory lights – don't forget the lights will be off if the relay is closed!



Last, and to avoid accidental clicks, get back to the roof motor relay settings; you can protect any relay selecting...



... the “confirm on manual change” option. This way, you'll be asked for confirmation if you click any of the buttons concerning that relay.

Now the relay panel should look like this:



Relay Status					
Relay Name	Status	Open	Close	Change	
1: Roof motor	---	O	C	chg	P !
2: Mount power	OFF	O	C	chg	
3: CCD power	OFF	O	C	chg	
4: Observatory lights	ON	O	C	chg	
5: Relay5	Open5	O	C	chg	
6: Relay6	Open6	O	C	chg	
7: Relay7	Open7	O	C	chg	
8: Relay8	Open8	O	C	chg	

Notice both the “P” and the “!” on the right side, roof relay; the “P” means it is pulsed, the “!” means you'll be asked for confirmation before any action takes place.

The same naming system applies to sensors:

**Settings for Sensor 1**

Sensor name	If open display	If closed display
Roof is OPEN	FALSE	YES - OPEN

☐ **Sensor is analog**

Analog settings:

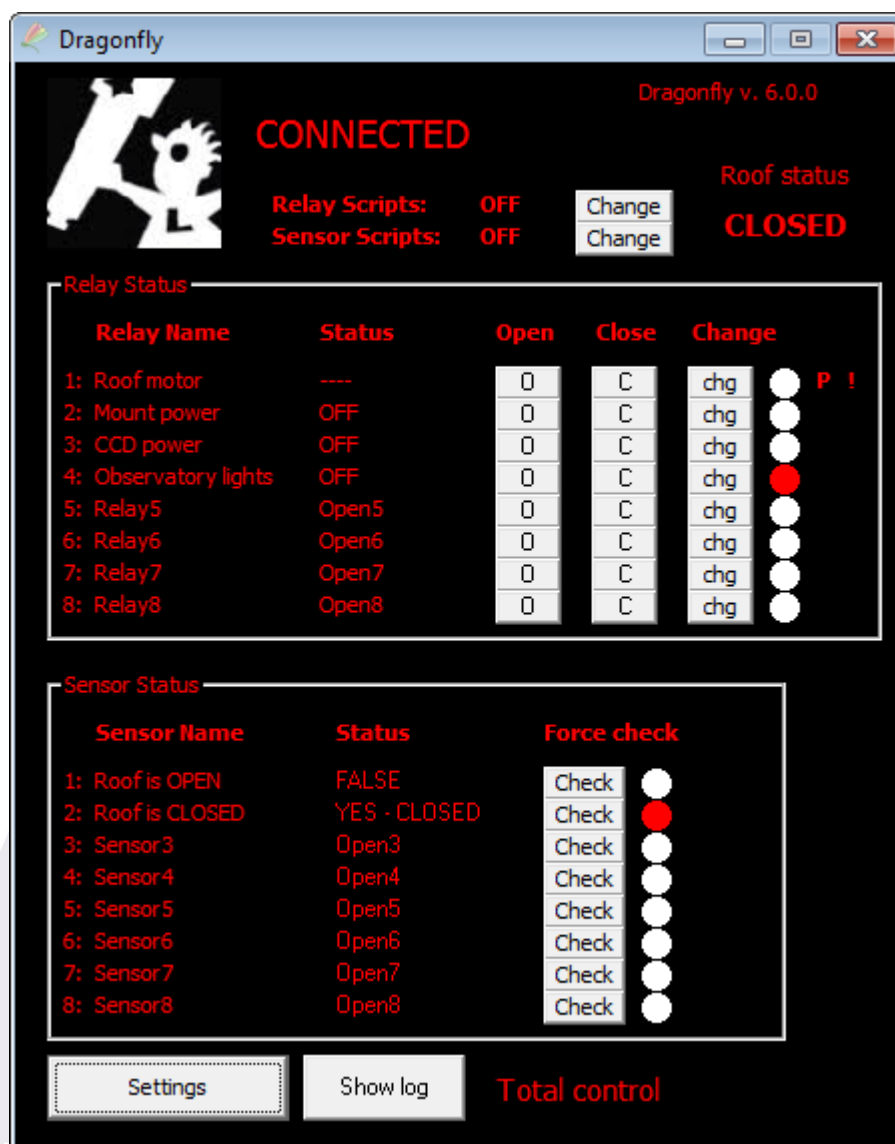
**Current reading:** N.A.

Sensor will become active (closed) if reading is within these values:

**Min:** 512 **Max:** 1024

For the roof (roll off roof) we suggest using two switches, one for signalling “open” and another one to signal “closed”, this way we will notice should the roof stop mid-travel.

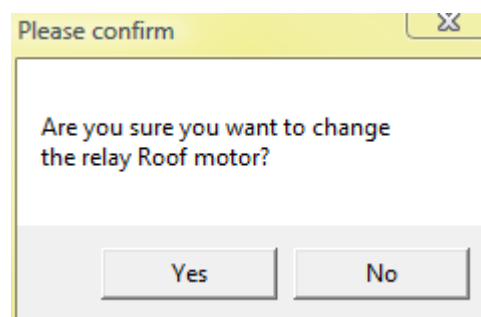
So before an imaging session, with our observatory roof closed, our window will look like this:



Lights enabled, Roof not opened – but closed, ccd and mount off. We are deliberately leaving the telescope park sensor for the moment. Great.

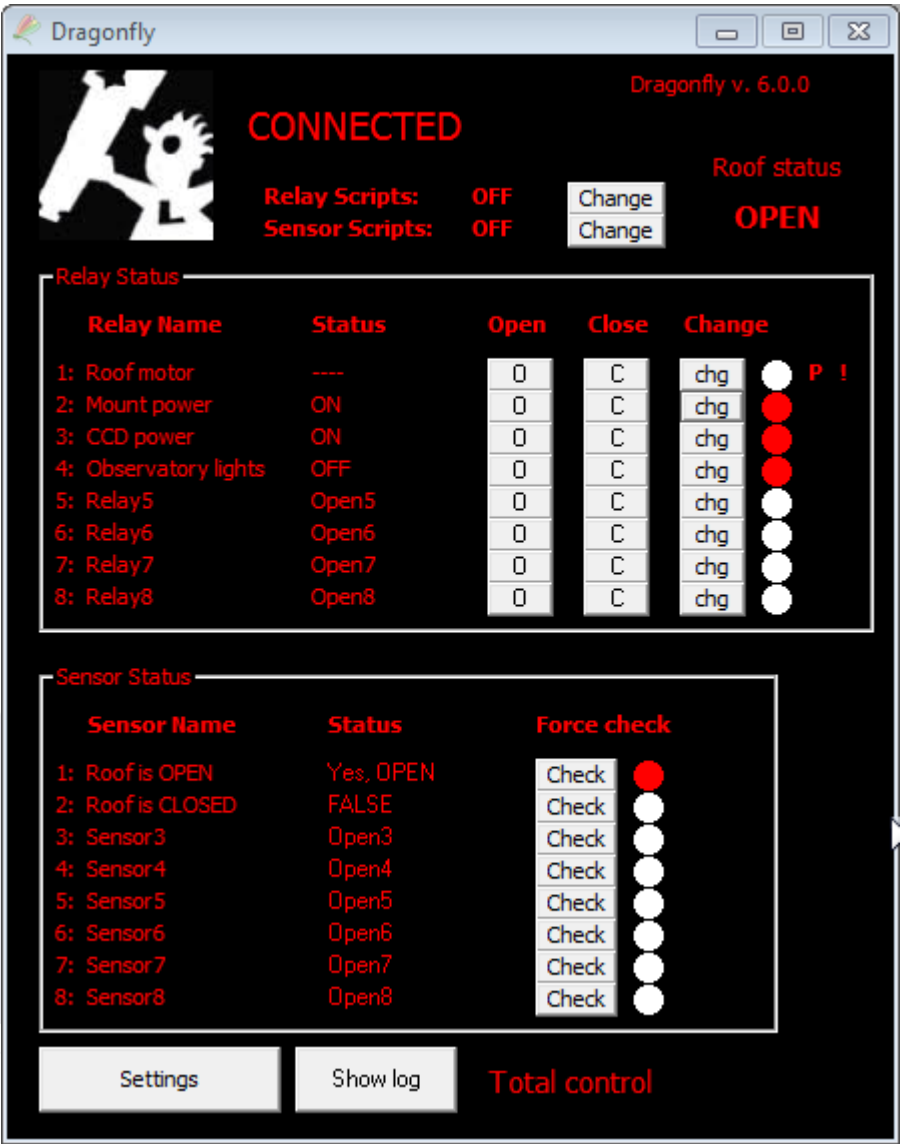
Switch off the lights (click “Close” in its row) and click “change” (chg) in the Roof motor row (NOTE: *the pulse we defined earlier will only work when **change** is clicked*).

As we also selected the “Confirm on manual change”, we'll get a confirmation window:



... select yes to proceed. You can now also power the mount and CCD Camera.

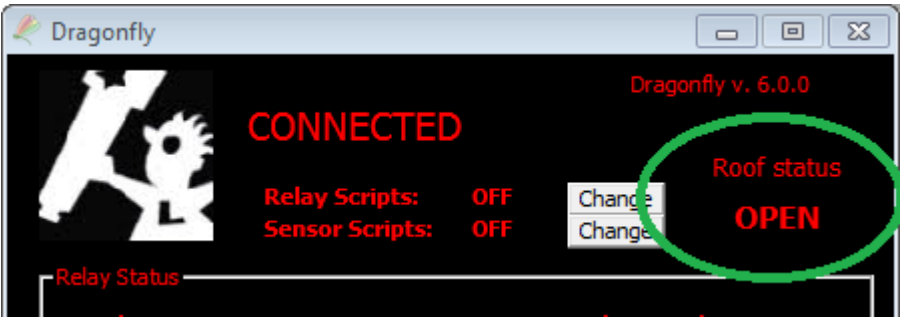
The roof will open, and, once fully opened, we'll have this:



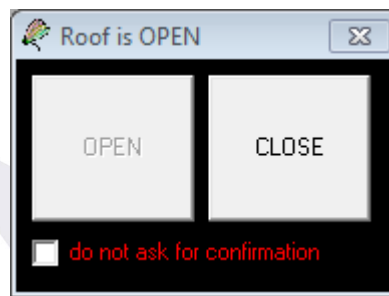
... as you can see, it reflects the current state of things.

Let's review now the things we've ignored for the moment...

The roof information zone:

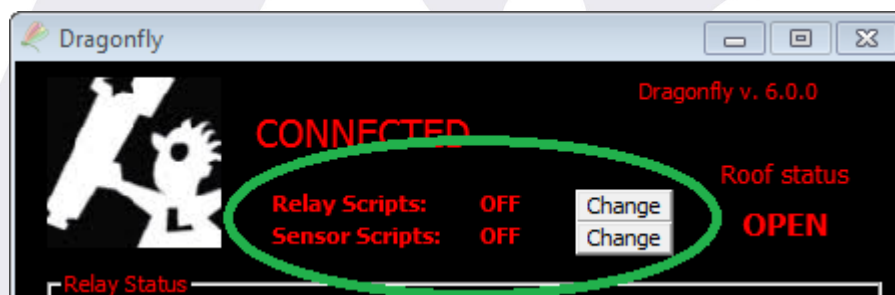


If you plan to use [ASCOM automation](#), then you'll have here the current status of the roof. Clicking on that area, you can command it to open and close conveniently:



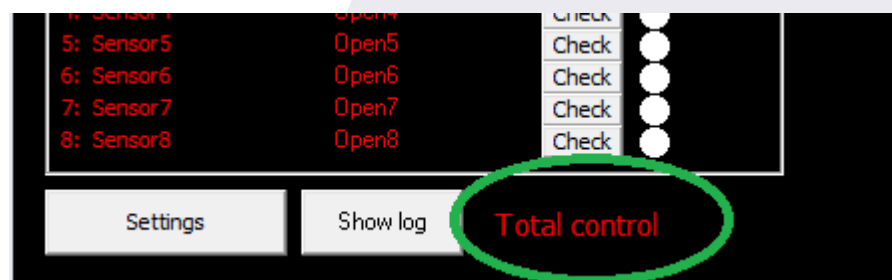
**Note:** You can disable this functionality by deleting the related roof scripts from the disk.

Here you can see the relay and sensor scripts, disabled for the moment.



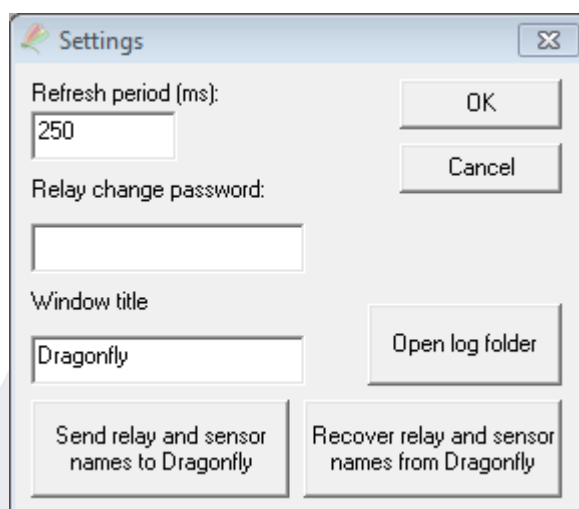
The software can execute a script every time a sensor or relay changes. Check the [Automated control – on / off scripts](#) section.

And maybe you've also noticed the “Total control” message:



The Dragonfly implements a 3-level access control system, designed to assist in shared environments, or hosted observatories, to add security. For an isolated observatory, this is usually not needed.

The last thing worth mentioning is the settings:



The refresh period establishes how often the sensors (and relays) will all be checked, one at a time. It can have any value between 100 and 60000 ms. For local area networks, 250ms or even faster is okay. If you will be connecting from far away, via internet, using a higher value (1000ms or so) may be better – you can always force the immediate check of a sensor by clicking on that sensor’s “Check” button.

Then you can see the password, which was explained earlier, and the window title – useful in case you're managing several Dragonflies.

“Open log folder” will open a Windows file explorer in the folder where the Dragonfly logs are being stored. These logs contain:

- Data relating to every relay change
- All the information shown in the log window, from scripts or from anywhere

Lastly, you are offered the possibility of storing all the relay and sensor settings (name, names when open and closed, if analog or pulsed, etc...) in the Dragonfly – and recover it from the Dragonfly.

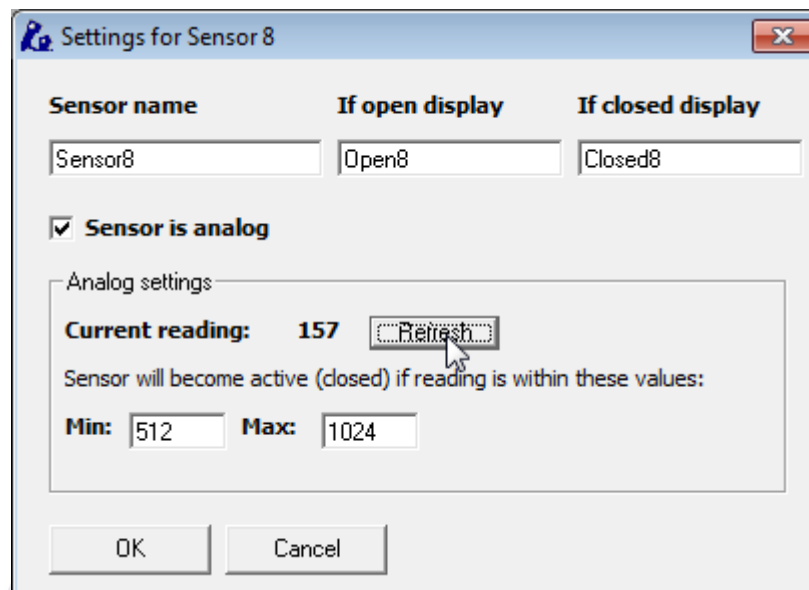
During normal operation, any changes you make are stored locally in your computer, and also inside your Dragonfly. If you install the software in a new computer, recovering the names from the Dragonfly will be useful to be set up in no time. If installing Dragonflies for other users, for example, forcing the sending of everything to the Dragonfly can also be a time saver.

## Addenda 1: analog sensors

Some sensors, such our IR distance measuring one, yield analog instead of digital values. This means the reading from the sensor, instead of just open or closed, will be a value between 0 and 1024.

You may want to [skip this section](#) if you're not going to use any analog sensors – just know you can use them if the need arises.

In order to use one of these, you'll have to configure it as analog (note that we're using sensor 8, keep reading please):



Settings for Sensor 8

Sensor name	If open display	If closed display
Sensor8	Open8	Closed8

☒ **Sensor is analog**

Analog settings

**Current reading:** 157

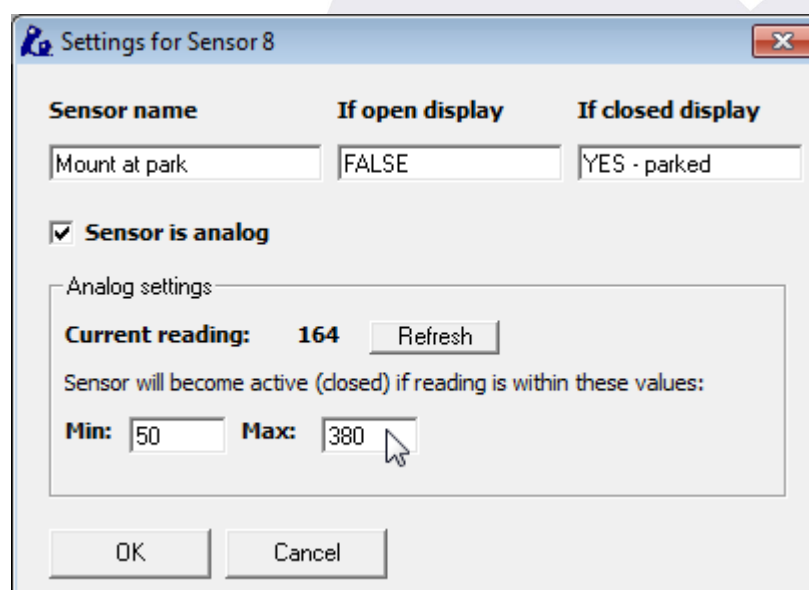
Sensor will become active (closed) if reading is within these values:

**Min:** 512 **Max:** 1024

... as the image shows. Clicking “refresh” will update the current reading. The goal is determining the range of values where we can consider the object is in its place. In our example, the mount is parked, so we could:

- unpark it: the sensor should read near 0 (less than 20) if properly placed, but other values could do, too;
- or move it toward the parking position, clicking refresh and taking note of the values

In a few tries, we'll be able to know in what range of values the mount is in a safe position; filling with these values the “Min” and “Max” fields:



Settings for Sensor 8

Sensor name	If open display	If closed display
Mount at park	FALSE	YES - parked

☒ **Sensor is analog**

Analog settings

**Current reading:** 164

Sensor will become active (closed) if reading is within these values:

**Min:** 50 **Max:** 380

... the main Dragonfly window will update its display accordingly to the current position of the mount. As seen, we've also filled the rest of the fields (sensor name etc), and used sensor number 8 as it is more convenient due to the ground plugs placement. There is a separate instruction sheet for wiring this kind of sensors, just check our website.

If you are going to use scripts with an analogue sensor, please read the corresponding [addenda](#).

## Addenda 2: relay restrictions

As requested by several users, we've added relay restrictions – meaning you can define certain conditions under which the relay won't open or close. This is performed from the relay settings window we partially saw a few pages ago:

Settings for relay 4

Relay name: Observatory lights    If open display: ON    If closed display: OFF    Pulse? ☐    Pulse period (ms): 2000

☐ Confirm on manual change?

Don't OPEN relay if:

Relay	1	2	3	4	5	6	7	8	Sensor	1	2	3	4	5	6	7	8
	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●

Don't CLOSE relay if:

Relay	1	2	3	4	5	6	7	8	Sensor	1	2	3	4	5	6	7	8
	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●

Legend:

- Relay / Sensor is ignored (default)
- Action blocked if relay / sensor is OPEN
- Action blocked if relay / sensor is CLOSED
- No comms (can't edit)

OK Cancel

Clicking on each small circle, we can block the relay action (upper row, blocks opening; lower row, blocks closing) on each condition – relay or sensor open or closed.

In the above window, the observatory lights relay won't close if sensor 1 (roof open) is active – **so if the roof is open, you won't be able to turn on the lights.**

Two important notes about this:

- These restrictions are global, and imposed internally by the Dragonfly firmware. So, they work even if the action is commanded from a script, ASCOM, the web interface, smartphone app, or an internal macro.



- You can, however, circumvent it, by repeating the action in the 3 seconds period after trying for the first time.
  - You click “close”, get the message “Ignored – restrictions”, click again, and then it will close.
  - From scripts or macros, you can force any action by duplicating it.



## 5-d) Automated control – ASCOM Dome & switch

*As previously mentioned, it is very important to be confident with the remote operation of the observatory before addressing any kind of automation.*

Complete automation requires a bit more of effort; apart from the Dragonfly, we'll need some automation software (there are many in the market), automated focusing support, etc. – and, most importantly, everything running smooth.

The ASCOM standard plays an important role here, as it enables different devices and programs to understand each other. In our case, the Dragonfly follows the ASCOM standard for domes, with its functionality reflecting that of a roll-off roof observatory, and also offers a switch interface.

### Switch

ASCOM's switch interface is a convenient way of accessing the relays and sensors (inputs) of your Dragonfly from a third-party software. Just select the Dragonfly in the ASCOM chooser and you are ready to control everything in a similar way as you'd do from the Dragonfly software, but from inside this 3<sup>rd</sup> party program.

### Dome control

Not so straightforward, but easy enough. Basically, thanks to the ASCOM standard, when our automation program wants to close the roof, the Dragonfly will be asked to do so. We will get three kinds of messages or requests from the automation program:

- Open the roof
- Close the roof
- Tell me the status of the roof

For each of these messages, the Dragonfly software will launch a script. All Dragonfly scripts are located in its home folder (usually “c:\program files\dragonfly”), under the “dfscripts” folder (that is, “c:\program files\dragonfly\dfscripts”). For 64-bit Windows editions, the correct folder is “c:\program files (x86)\dragonfly\dfscripts”.

#### **Scared? – Don't be!**

**Scripts can be very simple if the actions they command are simple. There are sample scripts with the Dragonfly software, and we can help, even write scripts for you if you're stuck!**

We have one script for each ASCOM message, so:

- Open the roof: OpenShutter.vbs
- Close the roof: CloseShutter.vbs
- Tell me the status of the roof: ShutterStatus.vbs

Programming the scripts can be a bit scary at first, but it is (or can be) simple indeed. Nevertheless, it implies thinking in advance and foreseeing possible situations.

On the plus side, scripts allow for **full customization**, and this is a big plus, worth the effort. For example, we can not only check if the mount is parked before closing or opening, but also command it to park issuing a few ASCOM calls from the script.

Let's work out the scripts for our sample observatory, leaving aside for the moment the park sensor, as it adds complexity and not everybody needs it.

So, what do we want the Dragonfly to do when requested to open or close the roof?

I'd say, for the open case:

- Check if it's already open, in that case we need don't need to do anything.
- If it's not, then we need to push the roof control button, and wait for a period of time until the roof opens.
- If the period expires and the roof is still closed, we should issue a warning.
- If the roof successfully opens, we probably want the CCD and mount powered, and the lights powered off.

... for closing the roof it is of course very similar.

Before going on, please bear in mind:

- We can't teach how to program in this manual; we will, however, explain things as clearly as possible so at the very least you can understand and modify the supplied scripts.
- Scripts are programs, usually simple ones but programs;
- your computer will read the scripts line by line, taking actions as per the script commands.

If you are an accomplished programmer, well, you'll know what to do. There's a reference section a bit further in the manual.

**If you need help, we will gladly assist to get your scripts running, and can even write them for you, as a free-of-charge service for our customers.**

## So let's start...

We just have to program (most probably we'll just use one of the examples, and maybe modify it) two scripts; one for opening, the other for closing the roof.

The one for opening is to be called “SyncOpenShutter”.

Here's a simple (slightly stripped down version of the script you'll find installed) but useful program; *the lines in blue, indented to the right, are not present in the script, just added documentation here.*

All lines starting with a single quote ' are considered comments Write anything after the quote for documentation purposes	
' Dragonfly SyncOpenShutter script ' (c) Lunatico 2016, 2023 ' ' This will work “out of the box” if you follow the setup in the users' manual: ' - you have 2 sensors for open (sensor 1) and closed (sensor 2) roof ' - the roof motor is activated by a pulse, and its control is attached to relay 1 ' ' Only thing you may want to adjust is the time allotted for the roof moving, currently at 120 secs ' The pulse for the motor is set at 2 secs (2000 miliseconds) and should work in any setup	
To avoid nasty errors, any variable we use should be declared first, so...	
Option Explicit	
Now we define a few numbers, that is, we give them a name, so the script is easier to understand The relay and sensor numbers match the ones in the example we've been working through	
' ASCOM Shutter State const ShutterStatus_Open = 0 ' values from ASCOM standard, cannot be changed! const ShutterStatus_Closed = 1 const ShutterStatus_Opening = 2 const ShutterStatus_Closing = 3 const ShutterStatus_Error = 4  ' Own constants ' define your own constants here  const Sens_OpenRoof = 1 const Sens_ClosedRoof = 2 const Rel_Roof = 1  const Timeout_OpenClose = 120000 ' 120 secs time for the roof to move const RoofPulseLenght = 2000 ' 2 secs pulse for the roof "button"	
...here we declare the variable Dfly (only one in this program) and set it as a Dragonfly “Help” object	
Dim Dfly set Dfly = CreateObject("Dragonfly.Help")	
We'll use the “Dfly” object to “talk” with the Dragonfly. Important: first thing to actually do is notify we're opening the roof	
df.AscomShutterStatus = ShutterStatus_Opening ' opening	

Now we'll check if it is already open
' check if already open  if ( df.SensorDigRead( Sens_OpenRoof ) ) then ' sensor marks roof as open df.AscomShutterStatus = ShutterStatus_Open ' notify it is already open df.LogAddLine( "Already open!" ) ' nothing else will be done else
... in any other case – we assume it is closed, and simply go on
Call Dfly.RelayPulse( Rel_Roof, RoofPulseLenght ) ' pulse to the roof
... sending a pulse to the roof.
wscript.sleep( Timeout_OpenClose )
... and wait a reasonable amount of time (20 seconds) before checking if it has opened.
if ( Dfly.SensorDigRead( Sens_OpenRoof ) ) then Dfly.AscomShutterStatus = ShutterStatus_Open else Dfly.AscomShutterStatus = ShutterStatus_Error end if
Now we have checked the “open” sensor if it's opened, update ASCOM to open, else to error
end if
And that's all!

And that's all needed to have our simple observatory automated using ASCOM. With these scripts, any ASCOM-aware program will be able to open, close, and report roof status.

### Very important

The Dragonfly software will execute the scripts found in its install folder, “dfscripts” subfolder.

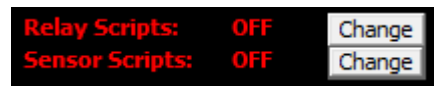
If you program your own SyncOpenShutter.vbs and SyncCloseShutter.vbs scripts, you have to copy them to that folder, **along with the supplied “OpenShutter.vbs”, “CloseShutter.vbs” and “ShutterStatus.vbs” scripts.**

Also, if you don't follow the “roof open is sensor 1, closed is sensor 2” standard, you'll have to also tweak the “ShutterStatus.vbs”

The optional scripts for Relays and Sensor, explained next, also have to be placed in the same folder.

## 5-e) Automated control – on / off scripts

Additionally, more scripts can be programmed for the Dragonfly to launch, adding versatility. As you may have noticed in the control panel:



... you can enable / disable relay and sensor scripts. When enabled, and a change in the state of a relay or sensor is detected, the corresponding script will be launched.

These scripts complement the internal “macros” you can define using the Dragonfly Configurator. The main differences are:

- these scripts need this software (we're discussing here) running
- scripts can access other software on the computer – they can command the mount to park, for example, or launch programs, etc
- macros, however, will be active as long as the Dragonfly is powered and can be triggered by a variety of conditions
- macros actions are limited to changes in relays and a few network operations: sending emails and pushbullets, waking a computer via WOL, ...

Check the Dragonfly Configurator manual or our [short tutorial videos](#) for more information on the macro capabilities.

Back to the scripts, the naming convention is as follows:

RelayClose1.vbs ... RelayClose8.vbs: *scripts to be executed when the given relay changes to closed.*

RelayOpen1.vbs ... RelayOpen8.vbs: *same, when it changes to open*

SensorOn1.vbs ... SensorOn8.vbs: *when the sensor changes to ON*

SensorOff1.vbs ... SensorOff8.vbs: *... and to OFF.*

Only existing scripts will be taken into consideration, missing ones will not result in any kind of error – meaning if you want a script to run when sensor 4 becomes ON, you just have to write that one (SensorOn4.vbs) and enable sensor scripts. No problem at all with the missing scripts for other sensors.

A simple but powerful application is to have a physical button terminate the session – park the scope, close the roof, switch off the computer. Another possibility is to use one sensor input to detect power failures; there's an article explaining this on our website.

Important considerations:

—The scripts will be executed when (or if) a change is detected. Very fast or spurious changes may not be detected at all (will depend on the refresh period configured).

They will be executed **just once** for each change.

Beware of script – script, and script – program interaction, for example:

If your automation program is in charge of monitoring the weather, do not just close the roof if a sensor detects unsafe weather – but instead you can set it up so it closes if, after a safeguard period, it's still open.

If you want to switch off the lights (or the dehumidifier) when the roof starts to open, do it in a single place, either at the ASCOM OpenShutter script (it will work only when opening via ASCOM) or with a sensor script when the sensor indicating “roof closed” changes to open (it will work as long as the Dragonfly software is running).

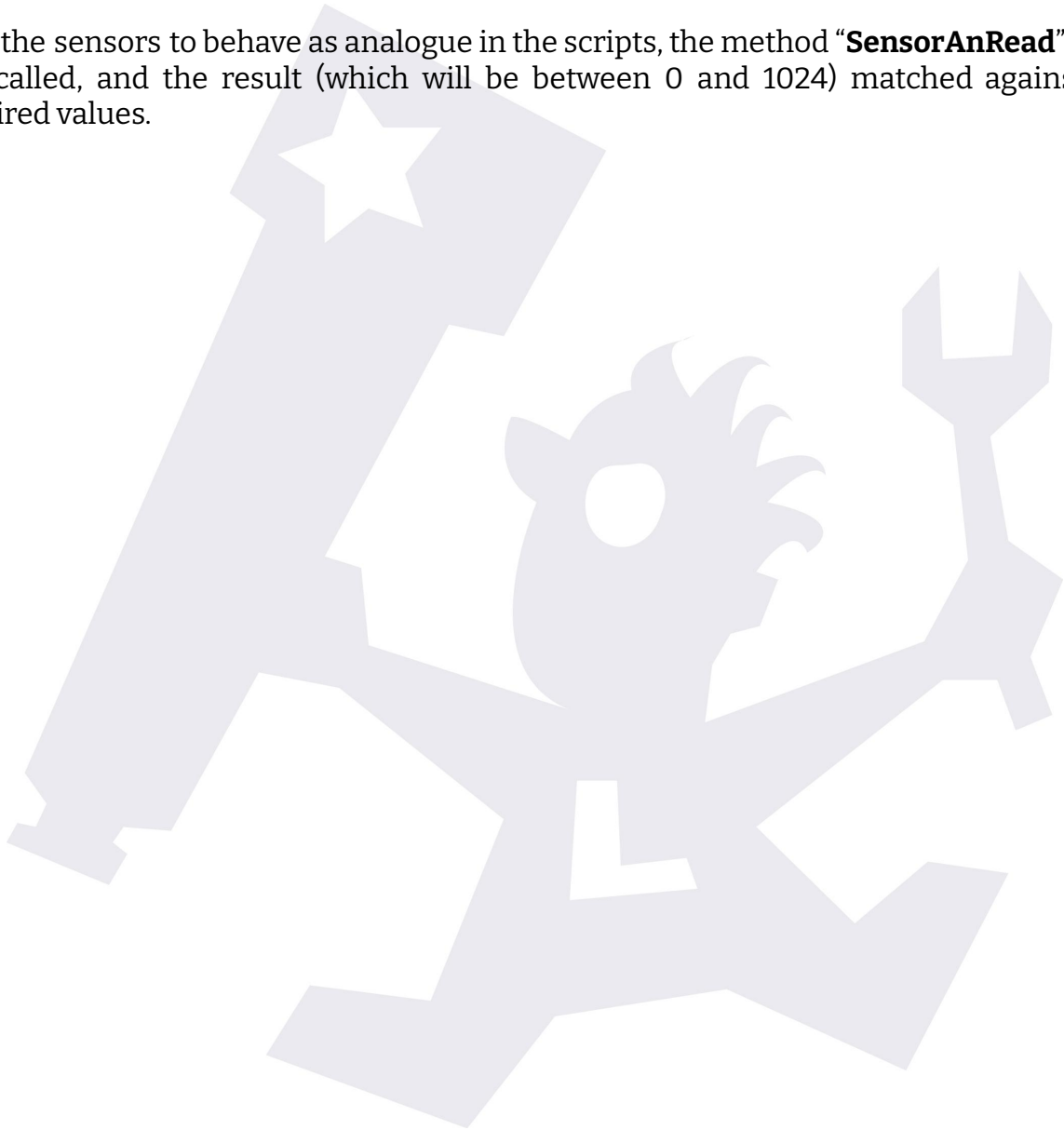
Don't forget that your scripts can do many more things than just handling the Dragonfly's inputs and outputs – they can launch external programs, access any ASCOM objects (such as the mount), command Windows to switch off...



## Addenda 1: analog sensors

Even if you have properly configured the analogue sensor settings as explained in the preceding section, that configuration will only affect the remote control panel (main window) of the Dragonfly.

For the sensors to behave as analogue in the scripts, the method “**SensorAnRead**” must be called, and the result (which will be between 0 and 1024) matched against the desired values.



## 6. Dragonfly functions (they are properly called methods and properties)

All the examples assume the Dragonfly object was created using:

```
dim df
set df = CreateObject( "Dragonfly.Help" )
```

5.1: functions to handle the relays and read the sensors:

Function	Description	Example(s)
RelayOpen( relayNumber )	opens the given relay	df.RelayOpen(1)
RelayClose( relayNumber )	closes the given relay	df.RelayClose(1)
RelayChange( relayNumber )	changes the relay status, opens it if closed and closes it if open; if configured as a pulsed relay, it will pulse following that configuration.	df.RelayChange( 3 )
RelayPulse( relayNumber, period )	Pulses the given relay for the specified number of milliseconds. Pulses it regardless of the control panel configuration.	Call df.RelayPulse( 2, 1500 )
RelayRead( relayNumber )	Reads if the given relay is energized / closed (TRUE) or not (FALSE)	If df.RelayRead( 1 ) then ...
SensorDigRead( sensorNumber )	Reads the given sensor digitally, that is, returns TRUE or FALSE.	If df.SensorDigRead( 2 ) then ...
SensorAnRead( sensorNumber )	Reads the given sensor analog, that is, returns a number between 0 and 1024.	If df.SensorAnRead( 3 ) < 524 then...

5.2: functions to control the log output (useful to know what's going on!)

Function	Description	Example(s)
LogShow	Shows the log window	df.LogShow
LogHide	Hides the log window	df.LogHide
LogClear	Erases the log window contents	df.LogClear
LogAddLine( text )	Adds the given line to the log window	df.LogAddLine( "Closing the roof!" )
LogAddToLine( moreText )	Appends the given text to the last written line	df.LogAddLine( "... closed" )

LogUpdateLine( newtext )	Changes the contents of the last line of text	df.LogUpdateLine( "Problem closing the roof" )
LogSetBold( TRUE or FALSE)	Sets or unsets the last line as Bold characters	df.LogSetBold( true )
LogSetForeColor( color )	Sets the color of the text written in the last line	df.LogSetForeColor( &H0FF& )
LogSetBackColor( color )	Sets the background color of the text written in the last line	df.LogBackForeColor( &H0FF& )

... the colors are RGB values, expressed as hexadecimal values, this way:  
&H00BBGGRR&

Very much the same that happens with a 3 color astroimage. Values go from 00 to FF, &H00FF0000& being a 100% blue color, &H0000FF00& 100% green, etc.

### 5.3: the only ASCOM function – report the status of the roof

Function	Description	Example(s)
AscomShutterStatus( status )	Sets or reads the status of the shutter – this is accessible to other ASCOM programs.	df.AscomShutterStatus = 2

### 5.4: advanced functions for asynchronous scripts. Most likely not needed.

Function	Description	Example(s)
timer( timerNumber )	Reads or sets a countdown timer in milliseconds. Will stop counting when $\leq 0$ . It also sets "timerActive( timerNumber ) to TRUE" – but will not set it to FALSE when 0 is reached!	Timer( 1 ) = 5000 if ( Timer( 1 ) > 0 ) then ' count not finished... .... end if
timerActive( timerNumber )	Gets or sets the active status of a given timer. Set to TRUE if the timer is started to count	TimerActive( 1 )
flag( flagNumber )	User flag; can be read or written, to true or false	Flag( 3 ) = TRUE if ( flag( 4 ) ) then ... end if
UserVar( varNumber )	Same as flags, but with integer (numeral) values	UserVar( 7 ) = 435

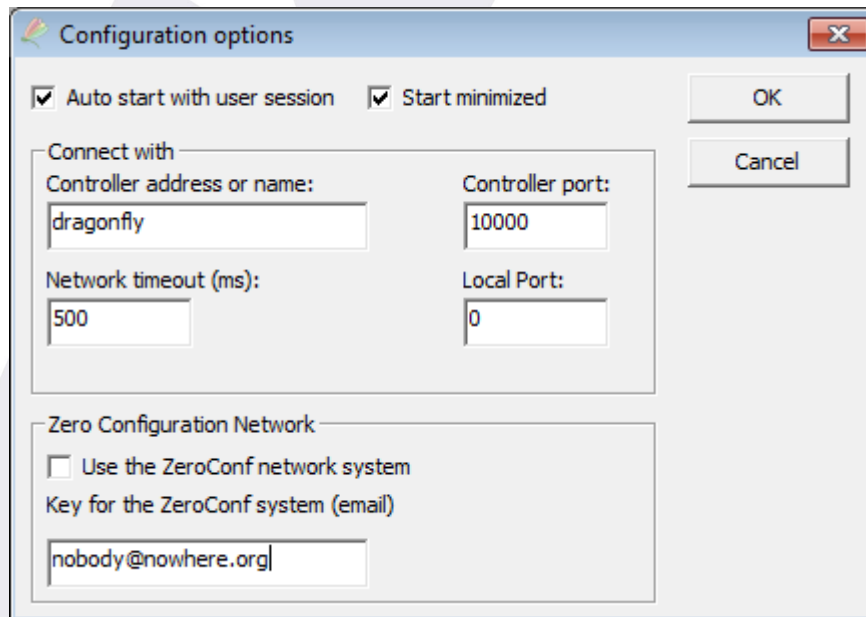
*Please take a look at the included sample scripts (explore your software folder, ffscripts, for a “samples” folder) for well documented, clearly written ones.*



## 7. Network configuration

As received from the factory, the network settings will work in almost any case. Both the program and the Dragonfly are configured to take an automatic network address and work with it.

Anyway, go ahead and press configuration from the window you minimized long ago and is now waiting in the lower left of the screen; you'll see these options:



Basically:

—*auto start with user session*: check this option if you want the software to be launched (and connected to the Dragonfly) as soon as your Windows session is started

—*start minimized*: this will simply collapse this program to the notification area, just as we did before, so it will not occupy space in our screen.

—*Controller address or name*: just as any computer in your observatory network, the dragonfly has a name and an address. By default, its name is “Dragonfly” and its address will be assigned automatically. More on this later.

—*Controller port*: unless there's a problem, this should not be changed. You can think of ports as “channels” within the computer or controller – so the controller will be listening at channel (port) 10000.

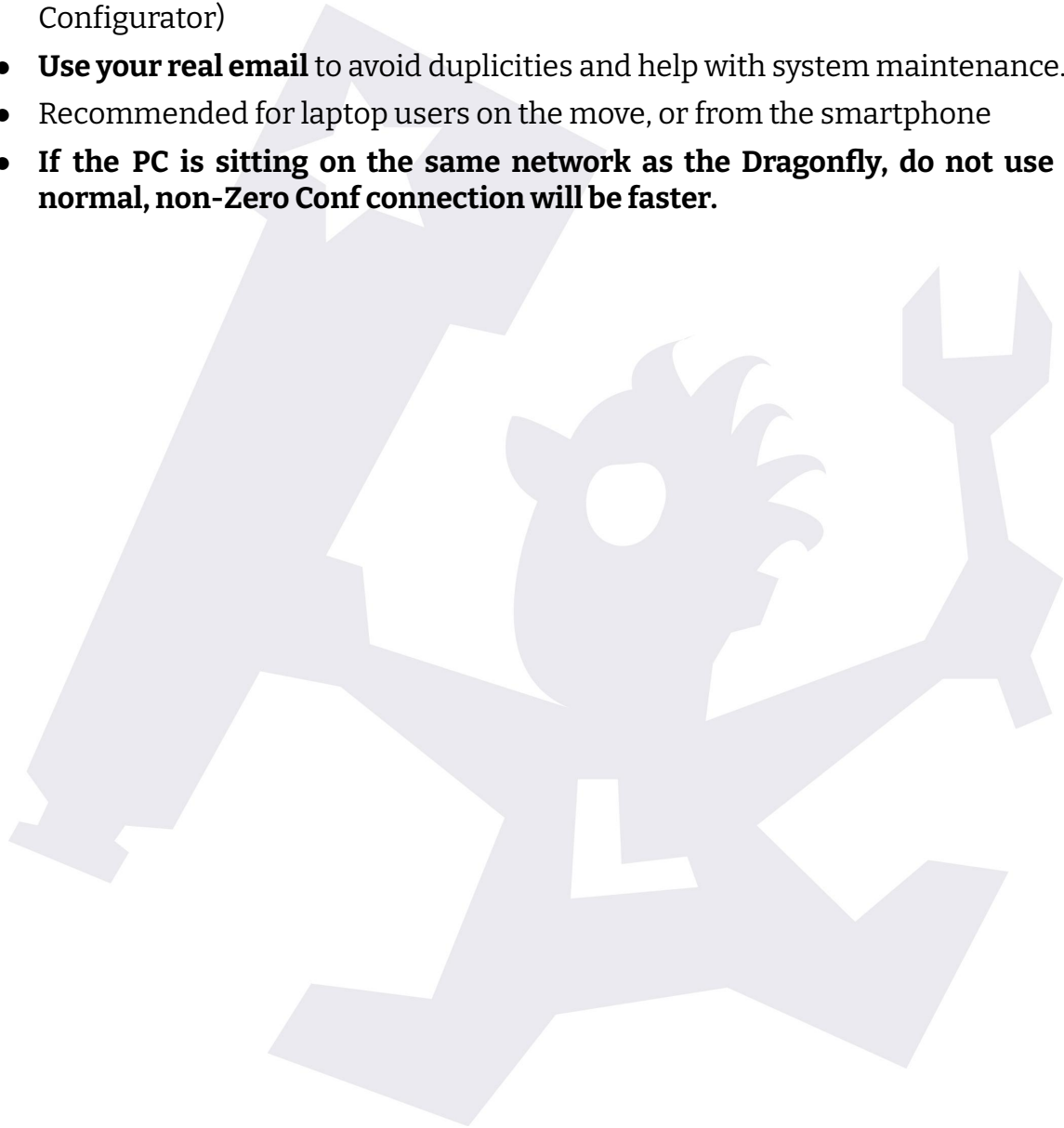
—*Local port*: conversely, the port used by the computer. Leave it at 0 and a suitable one will be picked. You can force a specific value for special cases.

The same applies to *Network timeout (ms)*, this being the time the program will wait for

a network response before assuming there's a problem.

—*Zero Configuration Network*: if you are using this software from a different network than the Dragonfly is sitting on, you can connect to our cloud server to, in turn, establish the connection to the Dragonfly.

- The Dragonfly has to have been configured to connect itself (from the Configurator)
- **Use your real email** to avoid duplicities and help with system maintenance.
- Recommended for laptop users on the move, or from the smartphone
- **If the PC is sitting on the same network as the Dragonfly, do not use it – a normal, non-Zero Conf connection will be faster.**



## 8. Zero Configuration Network

It works in the following way:

Your Dragonfly, if so configured, will connect with our server and inform it of its network address. It will do this every 30 seconds.

Your software, windows, smartphone, whatever, may connect to the server and ask for the address of your Dragonfly, in which case:

- first, a direct connection will be attempted (same network)
- if this fails, a remote but point to point one (different network, but with well-behaved routers)
- and if this doesn't work either, the cloud server will set up a relayed conversation, that is, it will sit in the middle and redirect all messages in both directions.

**—These relayed conversations are quite costly – please reserve them for short connections (connect, check, open, close, etc, disconnect, a few minutes at most).**

**—We reserve the right to abort long relayed sessions, or even completely disable the relay system.**



## 9. Final control tips

Never use fluorescent lights! They are one of the strongest sources of electrical noise.

Reed (magnetic) proximity switches are very useful to check for roof and mount position. Any will work with the Dragonfly. The inexpensive ones we've found reliable, are the ones available from RS components with ref. 289-7783 (don't forget to get the magnet, ref. 289-7812).

If using push-buttons to detect roof position (such as RS ref. 746-8605), the usual way is to place the push-buttons in a fixed position (wall), and the part that will press them – a plastic angle is suggested, as it can bend and won't damage the push-button – in the moving roof.

The above sensor suggestions are some we've tested and confirmed worked fine under normal conditions. Also, properly configured, you'll get an error from the software in most failure cases. **It may however be reasonable to go for high-quality ones in truly remote observatories or with very expensive equipment.** It is difficult nowadays to separate the good quality from the not so good, but no doubt very good sensors are readily available.

Plan carefully, be redundant if at all possible, and have a UPS strong enough to close the observatory in case of power failure.

A simple external relay can be used to detect power failures and maybe force closing the observatory. These and many more useful tips are available on our “[more information](#)” webpages.

Every Dragonfly has an internal web – it can be used to get system information, check sensors and change relays, and to update the system in the case of the Dragonfly 2. It can be accessed by simply pointing your internet browser to the dragonfly address, by default: <http://dragonfly>

## 10. Appendix

### Dragonfly technical specifications:

- Power requirements: 12V dc, center positive, standard 5.5 – 2.1mm power jack, less than 1A drawn.
- External interface: 10/100 Mbit ethernet – TCP/IP v4
- Microcontroller: AT91SAM7XC256 + a model B Raspberry Pi for Dragonfly 2.
- Relays (8):
  - Nominal switching capacity: 10A @ 125V/250V y 6A @ 277V
  - Max. switching voltage: 250 V AC, 100 V DC
  - Max. switching current: 10 A (AC), 5 A (DC)
  - Model Panasonic JS1-5V-F
- Inputs (8):
  - protected with Littelfuse 600R160UR resettable PTC
  - all 8 capable of analogue and digital readout
- Aluminium folded box, connected to earth via any of the 16 earth plugs.

## 11. Edition history

- 1.2** Initial public release
- 1.3** Improved explanations in the properties and methods section
- 1.4** Added this history section
- 1.5** Fixed the power jack specifications
- 2.0** Added Dragonfly 2, and software 6.0 – many changes
- 2.1** General corrections