DJi Phantom 4 to Emlid Reach Timing link.

Developed by Simon Allen, Spatial Analytics.

SOME ASSEMBLY REQUIRED

A short note on where this item fits in the spectrum between bespoke engineering and mass manufacturing.

A mass market instrument has a huge up-front cost, that is only justified by sales of millions of units over which these costs can be absorbed. A single bespoke instrument may cost many thousands to millions of dollars to build and is only justified when the instrument is unique and can do something unique, or is going somewhere special, satellite sensors for example. DJI drones are remarkably integrated packages at a remarkably low price, they do this by selling millions of their drones. RTK/PPK on a consumer drone is not a mass market, therefore I cannot expect millions of sales to recoup the tooling cost for mass manufacture. I have opted for small batch maker manufacture. The development has been undertaken and underwritten by me and I am hoping to slowly claw back some of the cost of my time in doing so. The upshot of this is you do not get a shiny polished mass manufacture product, but you get a rough around the edges, fit for purpose tool, a product differentiator, at a reasonable price that fits with the overall affordability of the DJI drones. I hope you enjoy the product.

Equipment list:

Number	item
9	Small tie wraps
2	Medium tie wraps
2	Large tie wraps
1	Chassis arm
1	Chassis body
1	Piece Velcro
1	Ground plane
1	Bolt
1	Nylon nut
2	Piece aluminium stick on foil
1	Reach box
1	Timing circuit
1	Reach box lid

A battery pack is not supplied, these can be picked up very easily locally and had resulted in the packages being returned on more than one occasion.

There is NO Reach module or Tallysman antenna supplied.

Assembly:

The timing equipment and reach carrier comes in two distinct parts:

The antenna carrier

The Reach carrier and timing chip.

The antenna carrier:

You get the bits on the left which go together to make the structure on the right (minus antenna, which you provide.)

1) Bolt the ground plane onto the top of the antenna carrier arm.
2) Stick then tie-wrap the antenna onto the centre of the ground plane.
3) Fit the antenna carrier arm onto the chassis bar and use a small tie wrap through the holes to secure in place. YOU may wish to use acetone/glue/hot glue to make the join even more secure.
4) Secure the spare antenna cable around the antenna carrier arm as shown.
5) Secure the battery pack in place with a medium sized tie-wrap. Again you can glue it, but this does limit your options to have a second battery to swap out if needed. Mine is just tie-wrapped in and appears secure.
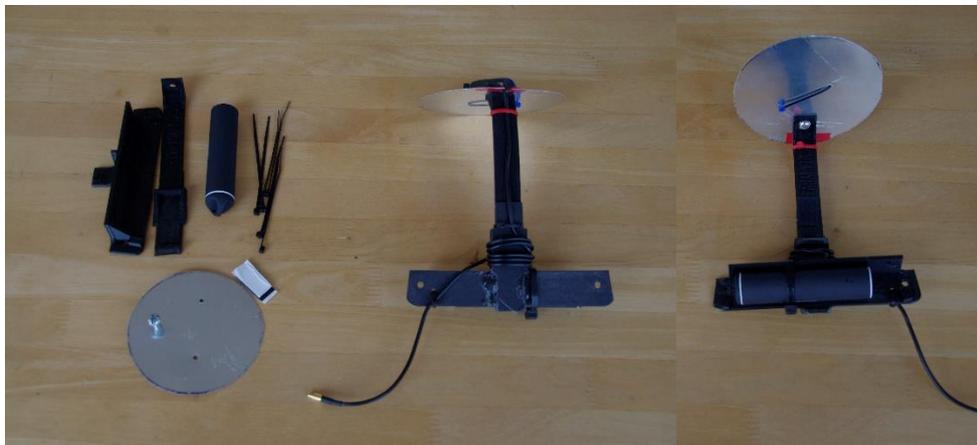
6) The two big tie-wraps form bumpers for the chassis to sit on. Do them up tight around the legs as high up as they can go with the chassis in place. I put a blob of glue gun glue on them to keep them there.
7) Put the loop piece of Velcro in the horizontal centre of the battery and the hook piece at the same height on the antenna arm so that they stick together when the antenna arm is in place.
8) Secure the chassis in place with two small tie-wraps

CAUTION : You now have an antenna arm that should pass between the rear two rotors. Clearly if it is loose in any way you run the risk of contact with the rotors and your drone falling from the sky. I

have flown many hours with the antenna installed in this way and if it is installed with care, there is no risk. To change the battery you need only snip and replace the right hand tie-wrap.

The Reach Carrier

1) Use one of the supplied aluminium tape pieces to line the Reach Carrier. You are creating a Faraday cage to protect the sensitive GNSS receiver from all that WIFI signal. Also put tape on the inside of the lid.

2) Install your Reach module as shown below. The Reach connector (DF13-6P) goes into the Header on the side of the Reach with no USB connector. I put a small piec of aluminium tape over the hole to hold the wires neatly and reduce RF incursion.

3) Use some more of the aluminium foil to line the inside of the lefthand loop of the legs. This will have a slight negative effect on the WIFI range, and is a bit belt and braces. So you are welcome to skip this step if you want and see how it goes.

4) Secure the Reach carrier in the lower left rear corner of the airframe with three small tie-wraps as shown the cover/lid can be secured with a tie-wrap or a strong elastic band. If you want to utilise the reach WIFI to check on status or feed in rtk corrections prior to launch then the elastic band (or two) is a good idea.
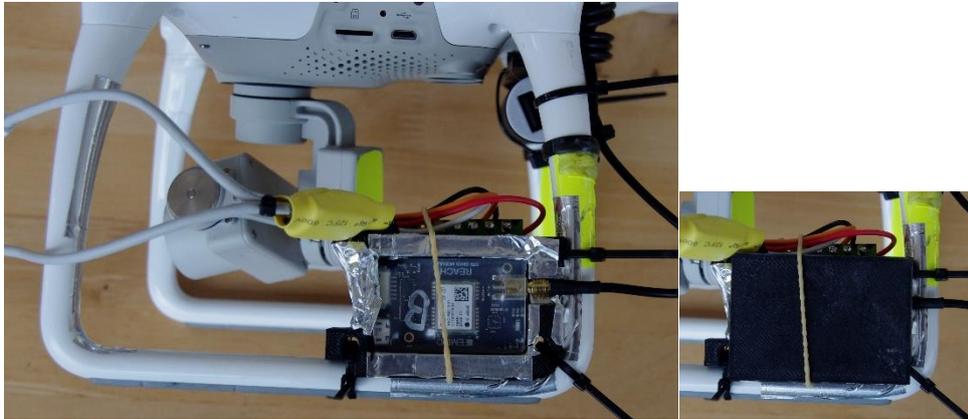
The Sensor

1) In DJI GO ensure that the switch for 'turn off front LED's while filming' is set to on.
2) Go around the outside of the front left LED light with a black permanent marker
3) Place the sensor cap under the LED and secure with (you guessed it) another tie-wrap. No light (or very little) should leak out when the front LED's are on. The sensor detects the 'blip' of the LED's going off for a photo and the arduino converts it into a single signal acceptable to the Reach as a trigger event.

Once installed and powered up the Arduino will show:
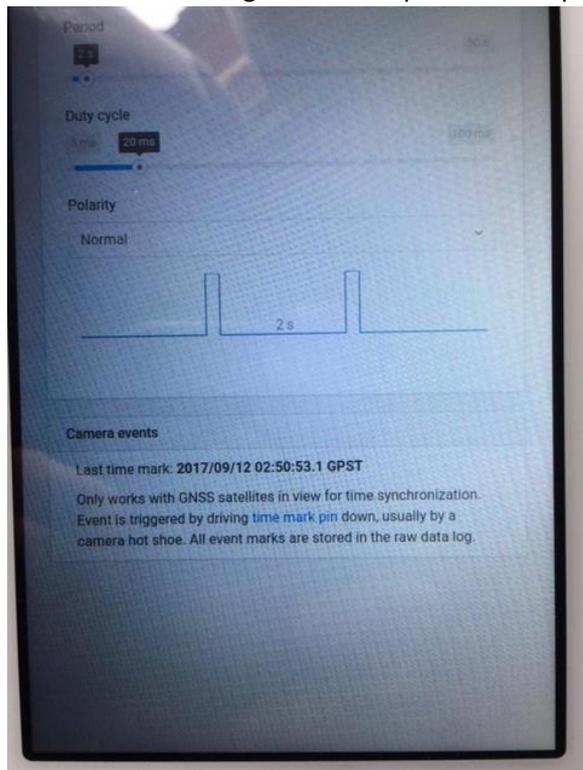
2 LED's on permanently when the drone is turned off

1 LED lit when the drone is powered on

The second LED will flash on for 1 second when a photo is taken, or remain on permanently if you are filming.

In reachview on your android or iphone, or computer, if you navigate to the cameras page you will see a section called camera events.

Once the reach has a position fix, if the drone is turned off you will see the last time mark increment each second. When you turn the drone on and the front LED's turn on the timing marks will stop. When you take a picture and the front LED's blink the last time mark will update. This will have put an event into the raw logfile which is pulled out in post processing onto an XXXXXXXX_events.pos

file.

Processing notes to come…..