Phantom 3 Drone Repair / Diagnosis

1   Overview

User reports drone is unable to sync to mobile phone. Upon testing drone, I find that the gimbal is not able to get a proper level base. It continously moves around.

2   Work Log

Unfortunately a lot of my work in not in notes, although I thought I had written it down, but in any case... I've looked at this drone a bit. The issues are likely in the camera / gimbal assembly. The price of a new assembly is $200 on ebay, and extremely expensive. The drone used is about $240 or $300 on ebay now (Jan - June 2019).

The pin connector that goes to the gimbal board from the drone is about 10 pins. Not bad. The ribbon connector on the gimbal, that goes to the camera is some obscene 50+ pin, double stacked monster. Not easy to decipher without schematics. There are a few motors on the camera board, which all seem to work. The issue is with the self test, at which point the drone never stabilizes. The user reported that he had a crash, but he also reported that he replaced the gimbal board.

2.1   Open Bench Logic Sniffer

Looking at this device in detail, it relies on a mobile phone app to work with the drone. This app doesn't work on my old phone. I tried an Ipad model one, and that didn't work either. The only phone I was able to get the app to work on was a more recent apple phone (that I do not own). So, right away we are having trouble interfacing to this device. The future doesn't bode well for this drone. What will 10 years in the future be like?

I've somewhat given up on any interest in repairing this. It's a black box, and cheaply made. Instead, I'm going to tap into the 8 wires going hetween the drone and the gimbal and just take a look. I've needed an excuse to use my Logic Analyzer for a while, and here's a good one. Let's see what / if we can learn, if anything.

2.1.1 Open Bench Logic Sniffer Setup

First off, I need a case for this board. It's exposed. I found two on thingi-verse. Let's fire up the 3d printer and get one of those made. Looking at the two cases, they are nothing more than bottoms for the boards. Helpful, but I would've liked a top on these. A bit too rushed. (see cad folder). I'll just throw some electrical tape on the bottom, just as good as these cases.

2.1.2 Abandoned Project?

The github[1] repo https://github.com/GadgetFactory/OpenBench-Logic-Sniffer/issues seems to be quiet. Is the project abandoned?

2.2 Setup Cont...

Let's get this thing. Running. On devuan ascii (d9), follow the quick start guide here:

http://dangerousprototypes.com/docs/Logic_Sniffer_quick_start_guide Linked from the main logic sniffer page.

It looks like the Sump program runs as a shell script (without any installation), so you can follow that page where they link to here:

http://www.lxtreme.nl/ols/

and download the latest client. Then extract, untar and run the programm. Unfortunately there is no verifcation of the tar files that I see. A bit shady. A package for a distribution is warranted here... Also looks like the Sump client is customized for Open Bench Logic Sniffer, and as a result, hasn't been updated as the project has been somewhat quiet...

2.3 Basic Test

The demonstrations section shows some basic tests. They use a bus pirate, but instead, you can just plug in an Arduino Uno (much easier). Here's what you do.

- Plug in Arduino, set it to Serial Read example, confirm that some data is being spit out.

- Plug in TX of UART on Uno to pin 0-7 of the OLS (open logic sniffer). Also, obviously you'll need to tie the grounds together. Do that too.

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[1]Not a fan

- Set the sampling frequency to be lower than the 200MHz default. Lower sampling frequency means longer sampling times, but less detail.

- Do a sample, then go into UART decode mode in the menus, choose auto detect speed, and run a sample, making sure to assign the TX pin of the UART decode to whatever your TX pin is connected to in OLS (this is somewhat obvious, so just fool around with the program until you get it).

- Note that what speed works for your given application may vary. With a 9600 baud UART, I can do 50KHz sampling and get everything, but 5KHz returns garbage (seems obvious). Again, lower the sampling rate, the longer the sample.

Should work. The decoding on the main time line view is poor, but the UART printout works reasonably well in its own menu.

Some things to do: enable side measurement window. And go to preferences - theme - Logic Sniffer. Looks better.

I think I've seen enough, let's try to connect it to the Drone.

3   Drone Logic Sniffing

I was looking at the feet of the drone, and noticed something I had not seen before. There are two wires (antennas or thermocouples) on two legs, and then on a third, there was a board, with four wires going to it. The wires appear to be synchronous SPI, as there is a GND, and an SDA, SCL wire. I plugged the OLS into this, and started recording, but then the battery died. I did realize that in order to get the sampling rate right, you'll have to first probe with an Oscilloscope, and at least look at the signal first. Then after you have an idea of what you are dealing with, you program OLS and go after decoding.

4   References

http://dangerousprototypes.com/docs/Open_Bench_Logic_Sniffer