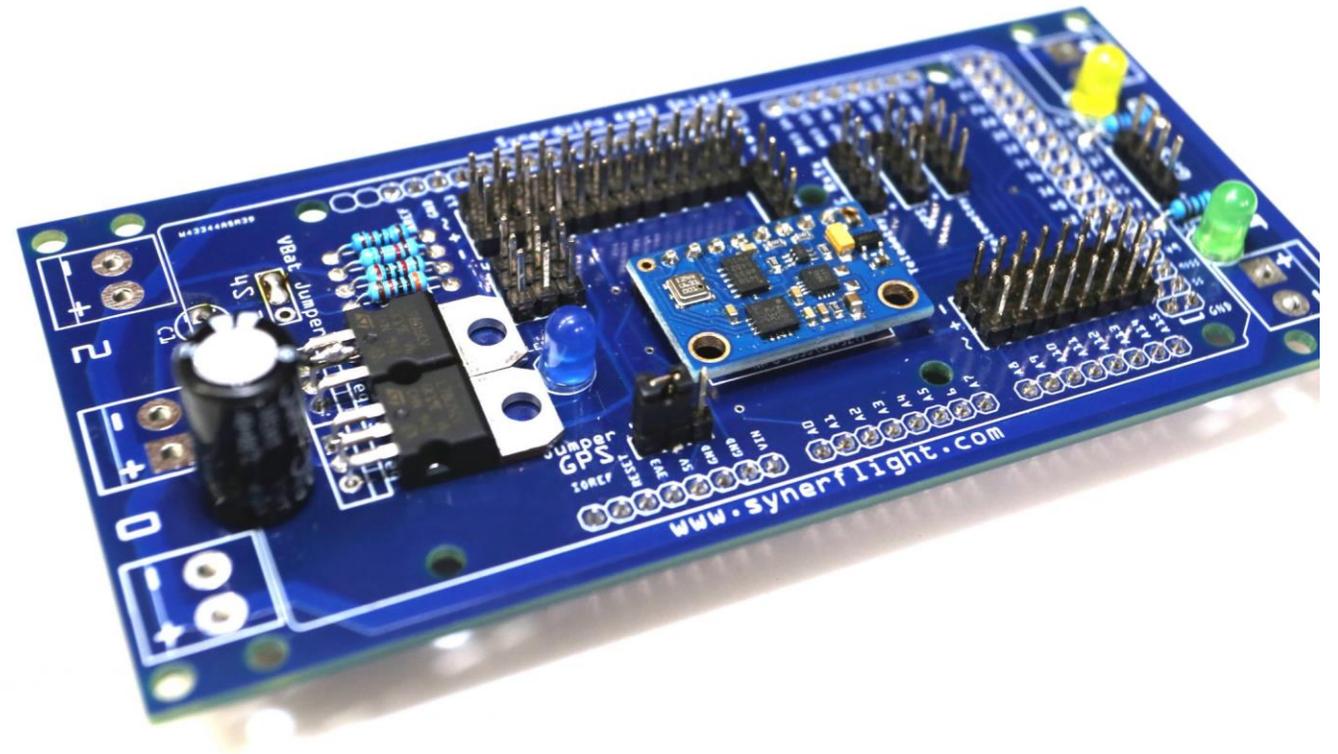


# Synerduino Shield Logging and Data Gathering



# Outline

Prerequisites that you know the Basics of Building an Arduino Vehicle now we need to Put that Vehicle to work , one of the important aspect in why we use robotics in industry is to gather data from Environment and the Vehicle itself.

## Prerequisites

- Completed and functioning Arduino Vehicle
- Functioning GPS With Telemetry communications
- Basic knowledge in Arduino in utilizing sensors controlling servos

## Hardware

- Synerduino Shield with GPS and Telemetry Comm
- Arduino2560 MEGA / Uno 328
- Vehicle Platform
- Analog Sensors / Digital Sensors



ARDUINO IDE

Application Needed

<https://www.arduino.cc/en/main/software>

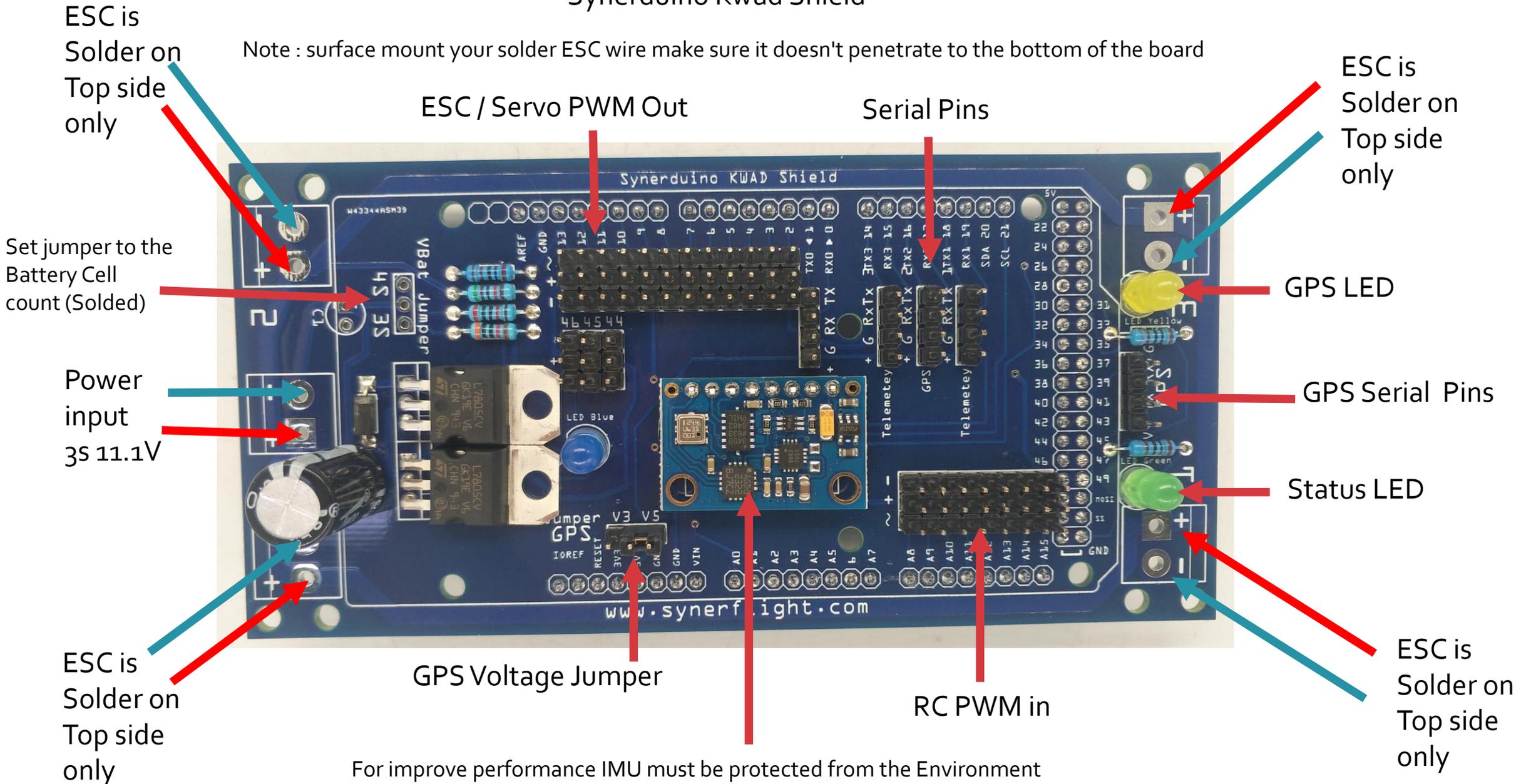


<http://synerflight.com/flywiigui/>

**FLYWII GUI & Arduino Drone Multiwii firmware**

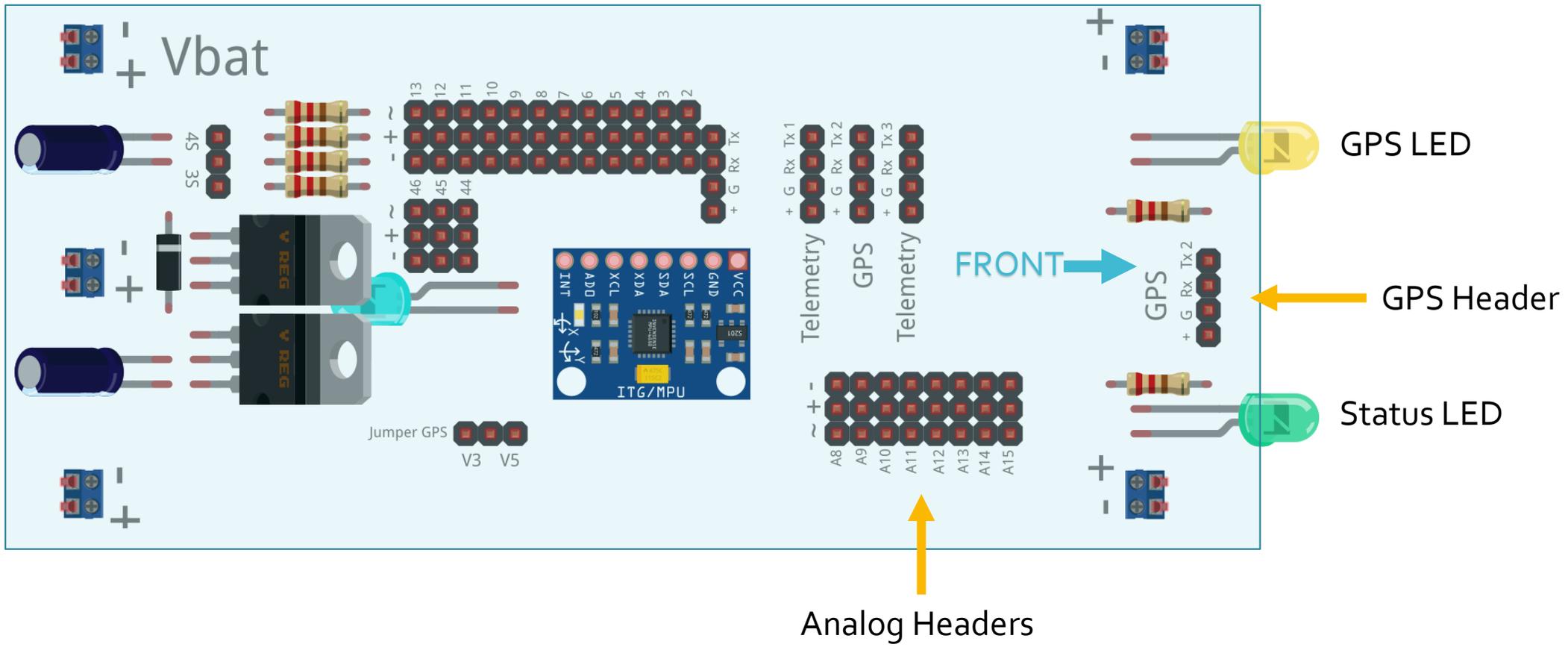
# Synerduino Kwad Shield

Note : surface mount your solder ESC wire make sure it doesn't penetrate to the bottom of the board

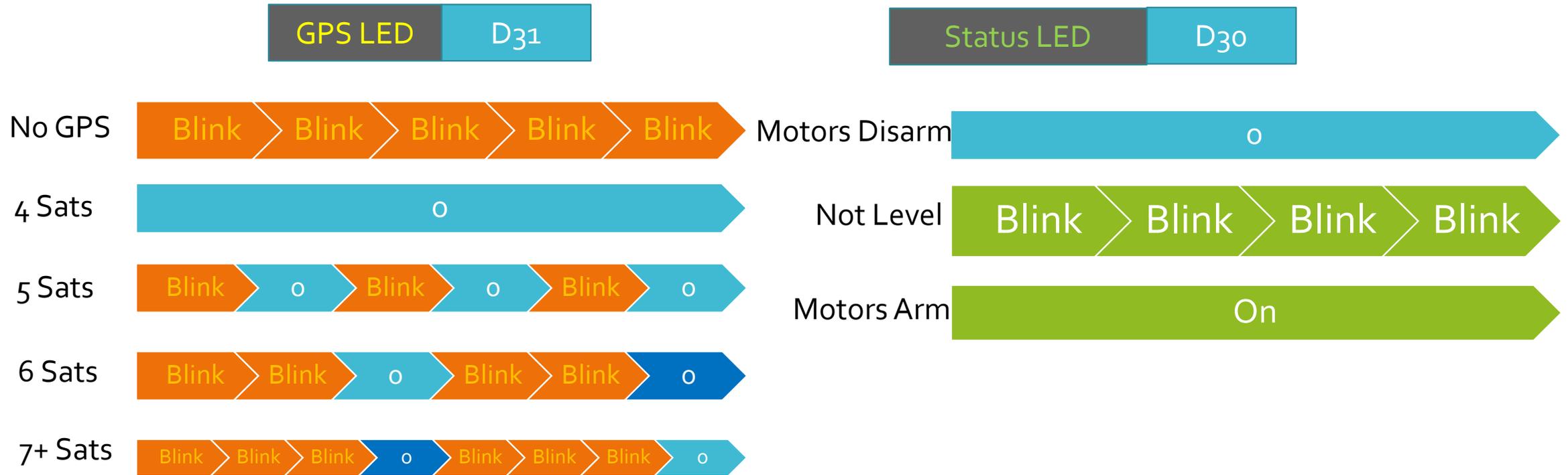


For improve performance IMU must be protected from the Environment

IMU : L3G4200D Gyro / ADXL345 Accelerometer / BMP180 – 85 Baro / MMC5883 Mag



## LED Indicator



indicate a valid GPS fix by flashing the LED

- led work as sat number indicator
- No GPS FIX -> LED blinks constant speed
- Fix and sat no. below 5 -> LED off
- Fix and sat no.  $\geq 5$  -> LED blinks, one blink for 5 sat, two blinks for 6 sat, three for 7 +

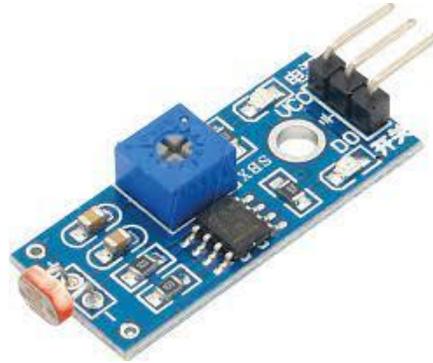


## SENSORS

### GAS SENSOR



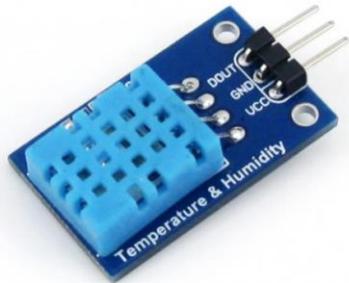
### LIGHT SENSOR



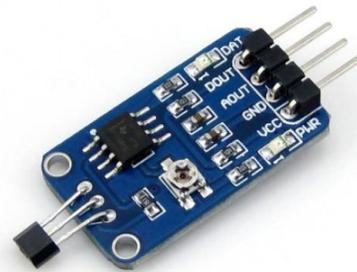
### ULTRASONIC SENSOR



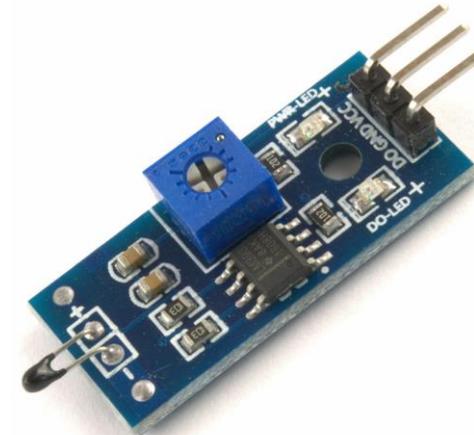
### HUMIDITY SENSOR



### HALL SENSOR



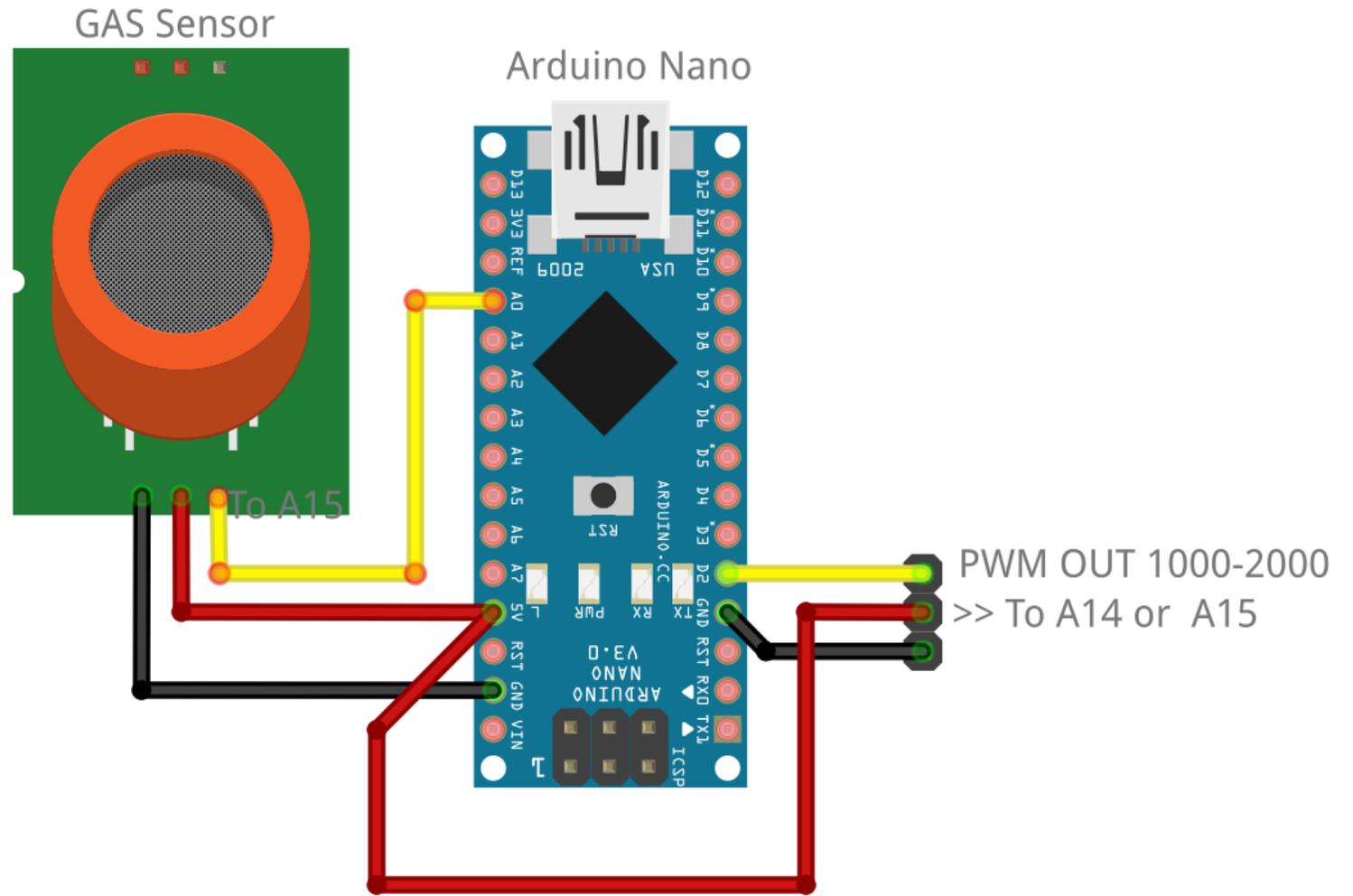
### TEMPERATURE SENSOR



## EXAMPLE

ANALOG SENSOR INPUT  
0V-5V WOULD TRANSLATE TO  
PWM 1000 – 2000 SERVO DATA  
(0 DEGREE TO 180 DEGREE )

THE PWM SENSOR INPUT  
HAS A 2<sup>ND</sup> ADVANTAGE  
MEANING YOU CAN DO A  
COMBINATION OF ANALOG  
OR DIGITAL SENSORS HOOK  
UP ON THOSE RESERVE  
ANALOG PINS





PWM 1000 Sensor 0V



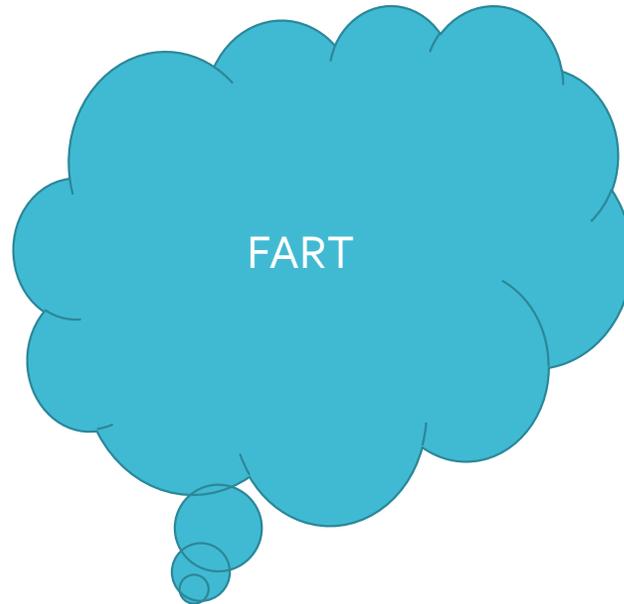
Sensors registered spike when gas is detected



PWM 1800 Sensor 4.8V



PWM 1000 Sensor 0V





# TELEMETRY LOG

Packet's sent 0  
Packet's received 0  
Packet CRC error 0

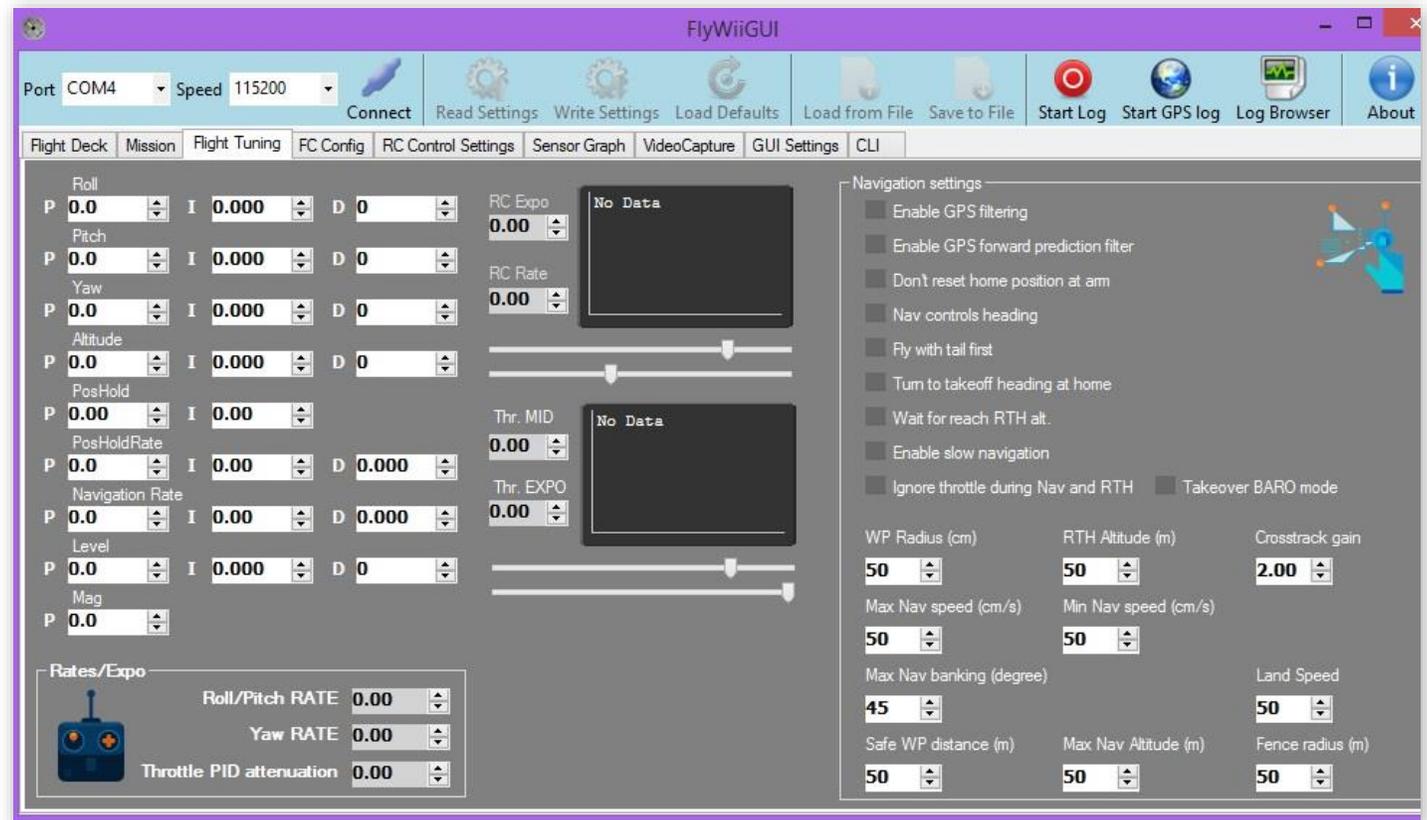


Telemetry link info  
RSSI  no data  
Noise  no data



PC Error count:  
Battery Voltage:  
Power Sum:

# FLYWII GUI



**DEDICATED USER INTERFACE  
AS CONFIGURATOR AND  
GROUND STATION FOR THE  
ARDUINO DRONE**

## SETUP Telemetry Logging On the GUI Settings TAB

Logging only works when the  
Vehicle Telemetry is connected  
to the ground station

The screenshot displays the FlyWiiGUI software interface. At the top, the window title is "FlyWiiGUI". Below the title bar, there is a menu bar with options: "Disconnect", "Read Settings", "Write Settings", "Load Defaults", "Load from File", "Save to File", "Start Log", "Start GPS log", and "Log Browser". The main interface is divided into several sections:

- Top Bar:** Shows "Port COM31" and "Speed 115200". It also includes a "Refresh Rate" dropdown set to "5 Hz", a "Pause" button, and buttons for "Calibrate ACC" and "Calibrate Mag". A "Bind Spektrum" button is also present. The "Cycle Time" is displayed as "3076 µs".
- Flight Deck:** Contains several circular gauges and indicators:
  - A heading indicator showing "163°".
  - A speedometer showing "00000" meters.
  - A heading indicator showing "1.63°".
  - A "Dir. to home" indicator showing "000°".
  - A "Distance to home" indicator showing "0000 m".
  - A "vertical speed" indicator showing "up" and "down" directions.
  - An "AUX SENSOR" indicator showing "1.8v".
- Control Panel:** A grid of buttons for various functions: "ARM", "ANGLE", "HORIZON", "BARO", "MAG", "CAMSTAB", "CAMTRIG", "GPS HOME", "GPS HOLD", "PASSTHRU", "MISSION", and "LAND".
- Airplane View:** A central diagram of an airplane with various sensors and values:
  - THROTTLE: 1000
  - WING1: 1520
  - WING2: 1480
  - RUDDER: 1250
  - ELEVATOR: 1441
- Active Sensors:** A row of buttons for "ACC", "GPS", "BARO", "MAG", "OPTIC", and "SONAR".
- Telemetry link info:** Shows "Packet's sent: 7025", "Packet's received: 7024", and "Packet CRC error: 0". It also includes "RSSI" and "Noise" indicators.
- Bottom Right:** Shows "FC Error count: 0", "Battery Voltage: 1.8 volts", and "Power Sum: 0".

## GUI Settings (where you save your PID ,Flight Logs and Video Logs )

Port COM9 Speed 115200

Connect Read Settings Write Settings Load Defaults Load from File Save to File Start Log Start GPS log Log Browse About

Flight Deck Mission Flight Tuning FC Config RC Control Settings Sensor Graph VideoCapture GUI Settings CLI

Data logging folder  
E:\ \Logs

Video capture folder  
E:\ \Captures

Settings folder  
E:\ \Settings

LOG Datasets

- RAW Sensor Data
- Attitude (Roll, Pitch)
- Mag and Barometer
- RC Controls
- RC AUX channels
- Motors
- Servos
- GPS Nav
- Cycle, I2CErrors, Battery
- Debug

Voice

- Enable spoken notifications
- Announce battery voltage
- Announce altitude
- Announce home distance
- 30s Announce interval

3s Battery Cell Count

Start data logging at Connect

Save Settings Check for Update

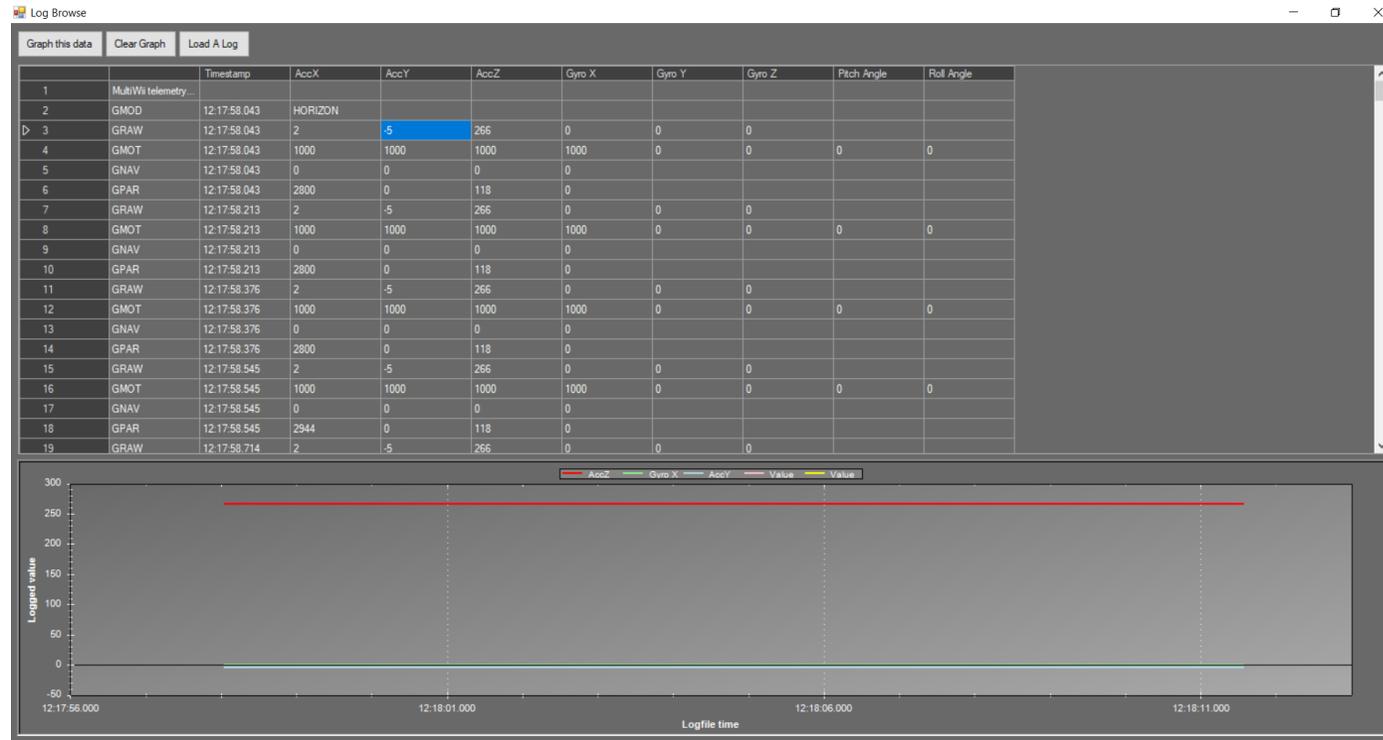
- Data Logging Folder is where you store your Log Data
- Video Capture Folder is where you store your video files
- Setting Folder is where you store your save Parameters

- Log Datasheet
- By setting this you can select what information you like to be recorder when you start the Log process with the Log red button
- Raw Sensor Data – Gyro and Acc
- Attitude – Degrees of roll and Pitch
- Mag and Barometer – Heading and Altitude
- RC controls - PWM data of Throttle Aileron Elevator Rudder
- RC Aux Channels – PWM Aux 1-4
- Motors – PWM Data to ESCs
- Servos – PWM data to Servos
- GPS Nav – GPS fix ,Num sat , Dir to home , Dist to home ,Lat ,Lon
- Cycle – I2c error and Battery power
- Debug data

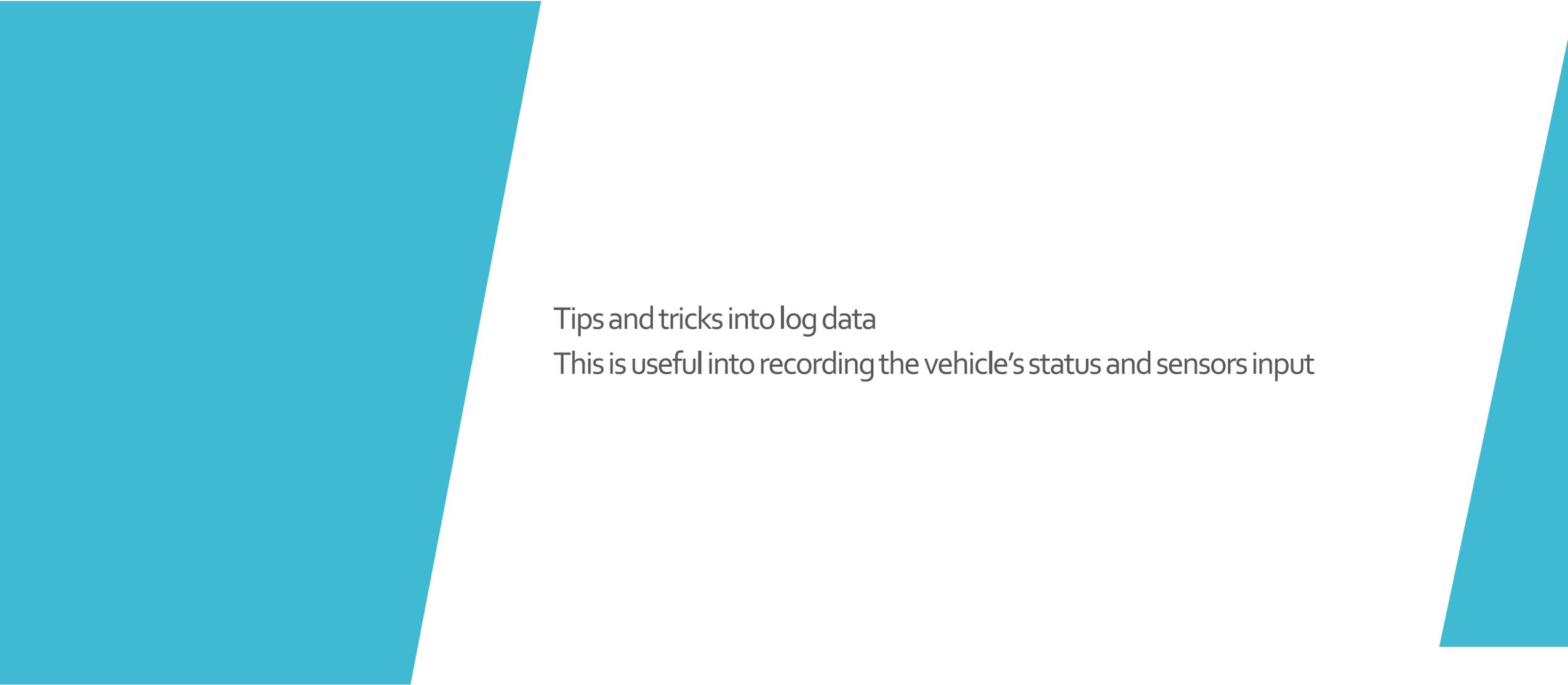
LOG Datasets

- RAW Sensor Data
- Attitude (Roll, Pitch)
- Mag and Barometer
- RC Controls
- RC AUX channels
- Motors
- Servos
- GPS Nav
- Cycle, I2CErrors, Battery
- Debug

Start data logging at Connect



Log Browser can be open with log browser icon and selecting a log document



Tips and tricks into log data

This is useful into recording the vehicle's status and sensors input

Name

- mwguilog-20200831-0334.log
- mwguilog-20200831-0340.log
- mwguilog-20200901-0931.log
- mwguilog-20200916-0233.log
- mwguilog-20210409-1158.log



mwguilog-20200901-0931.CSV

Type: Text Document  
Size: 5.10 KB  
Date modified: 01/09/2020 9:31 PM



mwguilog-20200901-0931.CSV

Renaming the LOG file as CSV allows you to access the data in Microsoft Office Excel

AutoSave ON | mwgullog-20200916-0233.csv - Excel

File Home Insert Page Layout Formulas Data Review View Help LOAD TEST Team

Clipboard Font Alignment Number Styles Cells Editing Ideas

Share Comments

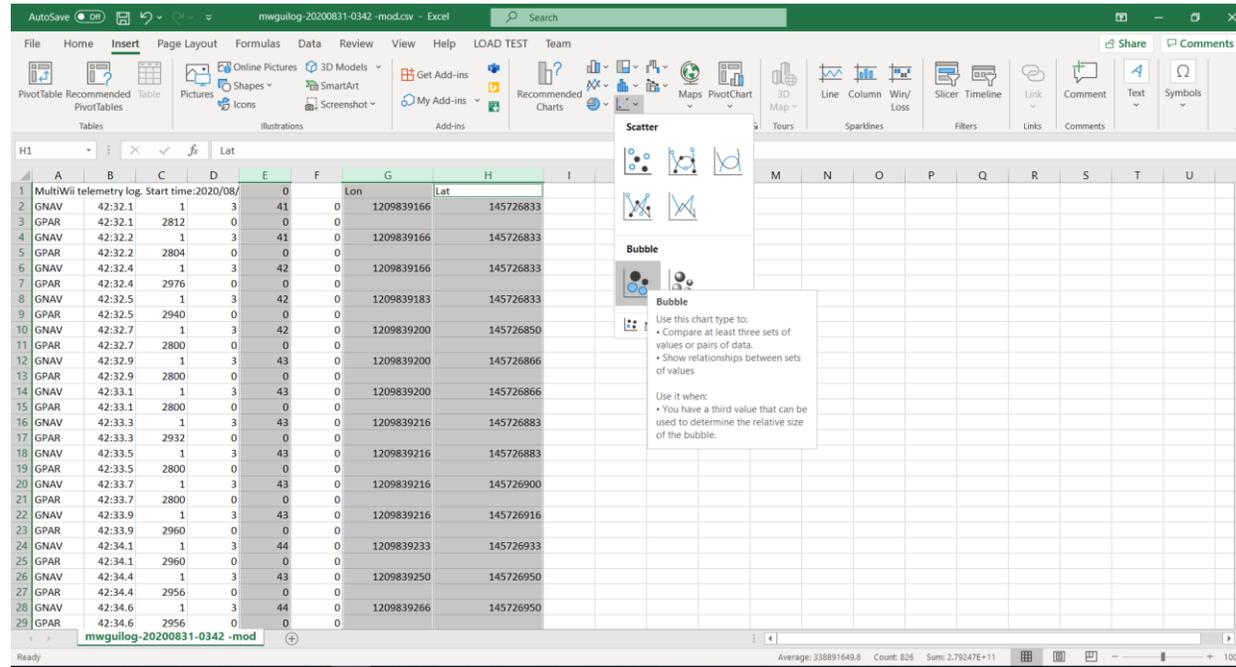
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	MultiWii telemetry log. Start time:2020/09/16 14:33:48.239																					
2	GMOD	33:48.3	HORIZON																			
3	GNAV	33:48.3	1	8	0	0	1209872450	148524616														
4	GPAR	33:48.3	2800	0	156	0																
5	GNAV	33:48.5	1	8	0	0	1209872450	148524616														
6	GPAR	33:48.5	2804	0	156	0																
7	GNAV	33:48.6	1	8	0	0	1209872450	148524683														
8	GPAR	33:48.6	2800	0	156	0																
9	GNAV	33:48.8	1	8	0	0	1209872450	148524700														
10	GPAR	33:48.8	2800	0	156	0																
11	GNAV	33:49.0	1	8	0	0	1209872450	148524700														
12	GPAR	33:49.0	2804	0	156	0																
13	GNAV	33:49.1	1	8	0	0	1209872433	148524716														
14	GPAR	33:49.1	2828	0	156	0																
15	GNAV	33:49.3	1	8	0	0	1209872433	148524716														
16	GPAR	33:49.3	2828	0	156	0																
17	GNAV	33:49.5	1	8	0	0	1209872433	148524716														
18	GPAR	33:49.5	2800	0	156	0																
19	GNAV	33:49.7	1	8	0	0	1209872433	148524700														
20	GPAR	33:49.7	2804	0	156	0																
21	GNAV	33:49.8	1	8	0	0	1209872433	148524700														
22	GPAR	33:49.8	2800	0	156	0																
23	GNAV	33:50.0	1	8	0	0	1209872433	148524683														
24	GPAR	33:50.0	2800	0	156	0																
25	GNAV	33:50.2	1	8	0	0	1209872433	148524683														
26	GPAR	33:50.2	2800	0	156	0																
27	GNAV	33:50.4	1	8	0	0	1209872433	148524683														
28	GPAR	33:50.4	2816	0	156	0																
29	GNAV	33:50.5	1	8	0	0	1209872450	148524616														

Ready

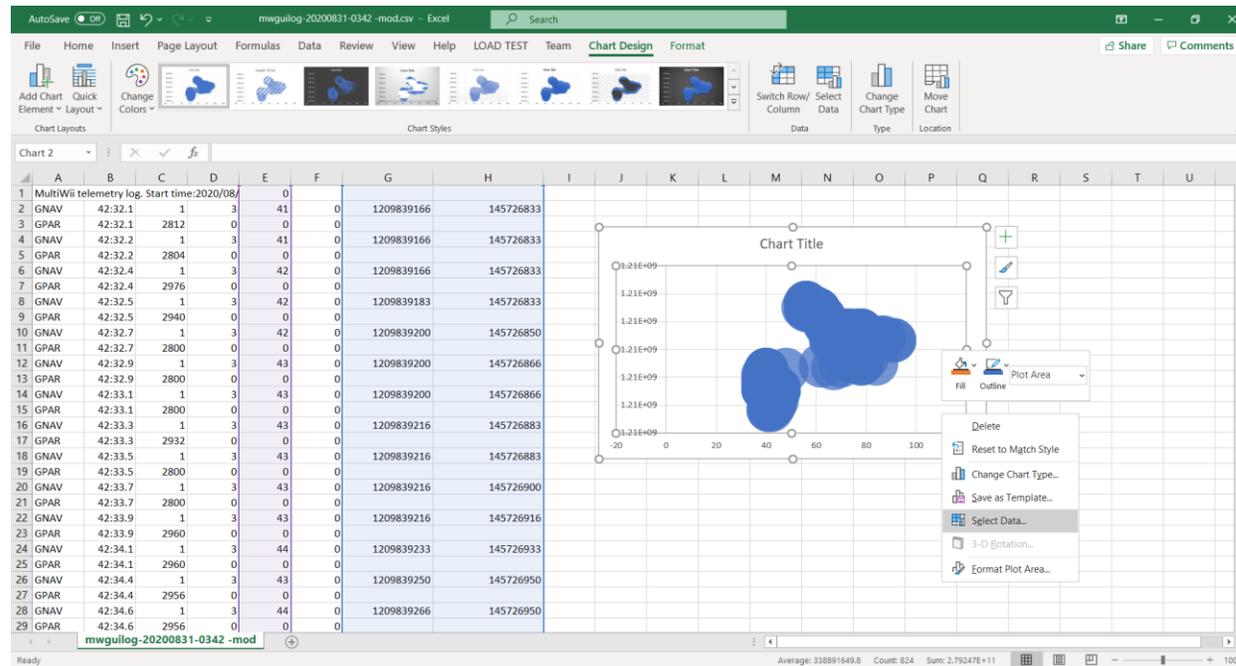
Graphs can be made out of the data by selecting the state with the Lat, Lon of the GNAV data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	MultiWii telemetry log. Start time:2020/08/31 15:42:31.936						Lon	Lat													
2	GNAV	42:32.1	1	3	0	0	1209839166	145726833													
3	GPAR	42:32.1	2812	0	41	0															
4	GNAV	42:32.2	1	3	0	0	1209839166	145726833													
5	GPAR	42:32.2	2804	0	41	0															
6	GNAV	42:32.4	1	3	0	0	1209839166	145726833													
7	GPAR	42:32.4	2976	0	42	0															
8	GNAV	42:32.5	1				139183	145726833													
9	GPAR	42:32.5	2940																		
10	GNAV	42:32.7	1				139200	145726850													
11	GPAR	42:32.7	2800																		
12	GNAV	42:32.9	1				139200	145726866													
13	GPAR	42:32.9	2800																		
14	GNAV	42:33.1	1				139200	145726866													
15	GPAR	42:33.1	2800																		
16	GNAV	42:33.3	1				139216	145726883													
17	GPAR	42:33.3	2932																		
18	GNAV	42:33.5	1	3	0	0	1209839216	145726883													
19	GPAR	42:33.5	2800	0	43	0															
20	GNAV	42:33.7	1	3	0	0	1209839216	145726900													
21	GPAR	42:33.7	2800	0	43	0															
22	GNAV	42:33.9	1	3	0	0	1209839216	145726916													
23	GPAR	42:33.9	2960	0	43	0															
24	GNAV	42:34.1	1	3	0	0	1209839233	145726933													
25	GPAR	42:34.1	2960	0	44	0															
26	GNAV	42:34.4	1	3	0	0	1209839250	145726950													
27	GPAR	42:34.4	2956	0	43	0															
28	GNAV	42:34.6	1	3	0	0	1209839266	145726950													
29	GPAR	42:34.6	2956	0	44	0															

In this sample the first cell of the E column was deleted and shifted up to align the GPAR data to the GNAV data this was done so the graphs generated would match the Sensor input data with the GPS data , the sensor data was GPAR=Vbatt in this case we stick an gas sensor up the Ao pin where the battery monitor should have been. (dis can also be replace with the (GRCX=Aux3 or Aux 4) Data when its on PWMADC mode)



The selected Data of GPAR=Vbatt (GRCX =Aux<sub>3</sub> or Aux<sub>4</sub>), Lat and Lon therefor crating a chart for it . Now we choose the bubble in this case to visualize the 3 data set as intensity ,Lat and Lon



The result of the chart is still incoherent so select data is needed to fix this  
 We want the Lat on the vertical and Lon on the horizontal of the graphs  
 This leaves the GPAR=Vbatt (GRCX=Aux3 or Aux4) place in intensity by the size of the bubble

## Edit Series



Series name:



Select Range

Series X values:



= , 1209839166, ...

Series Y values:



= , 145726833, ,...

Series bubble size:



= 0, 41, 0, 41, ...

OK

Cancel

This is where we arrange which column represent the chart visual data

In the Select Data source open the Edit button to access the Charts Data set

## Select Data Source



Chart data range:



Switch Row/Column

Legend Entries (Series)

<input checked="" type="checkbox"/>	Series1			

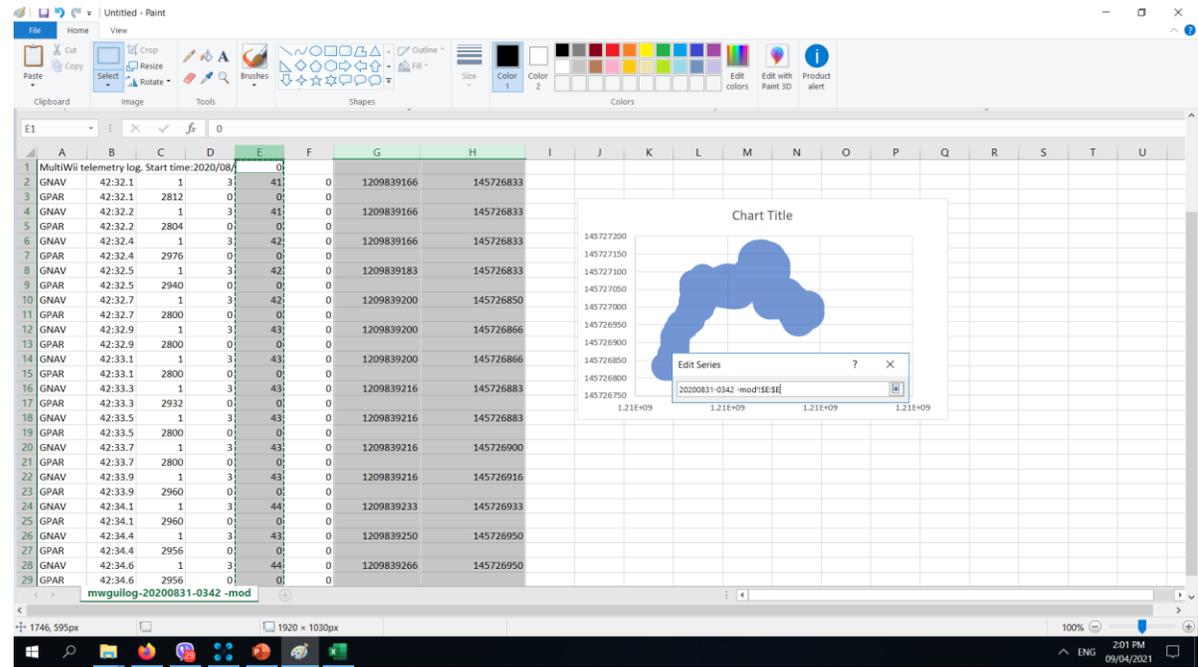
Horizontal (Category) Axis Labels

0
41
0
41
0

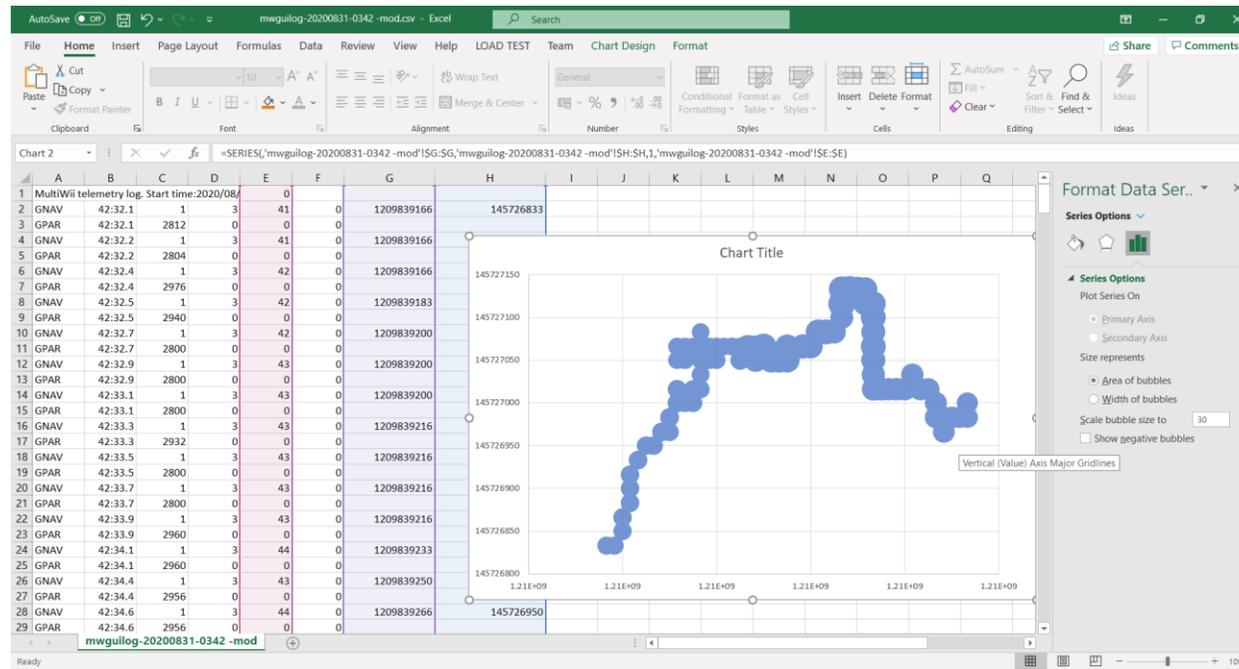
Hidden and Empty Cells

OK

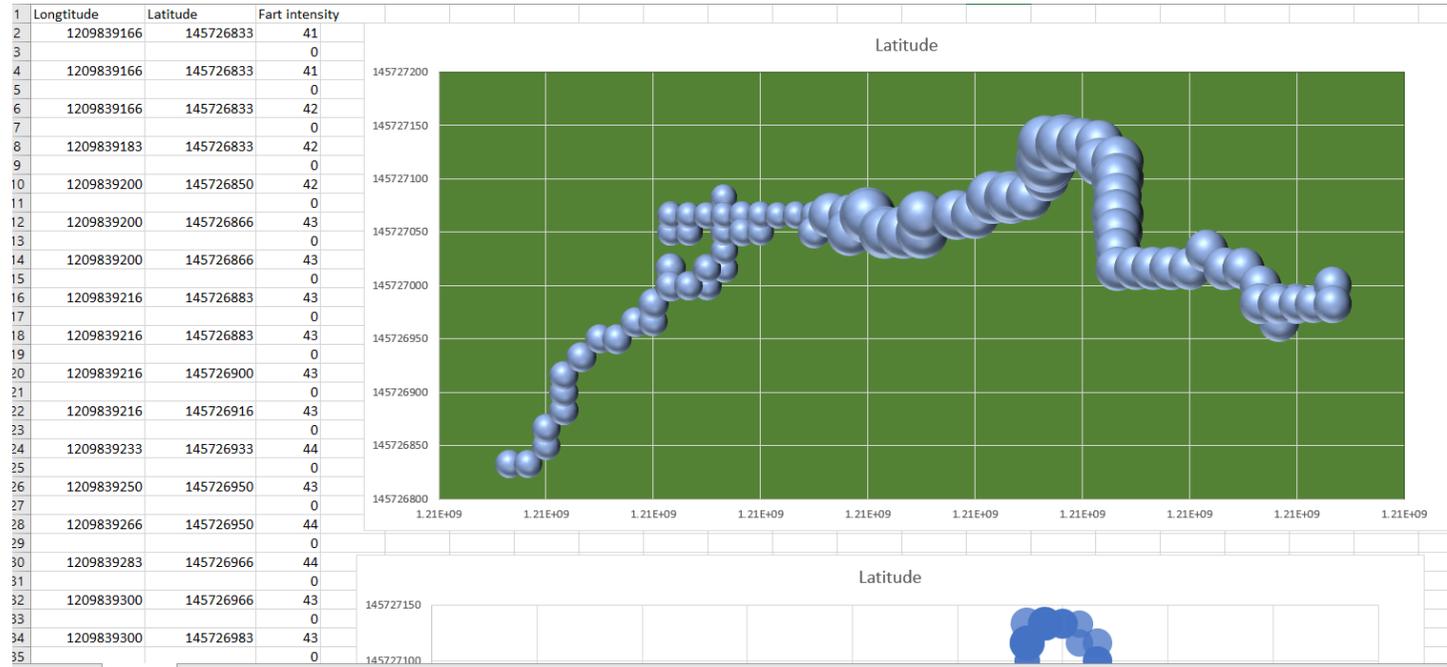
Cancel



This is where we select the whole column to be assigned to the designated chart  
 X= G column as Lon  
 Y= H column as Lat  
 Intensity= E column as GPAR=Vbatt, (GRCX=Aux3 or Aux4)



We can always adjust the format of the bubbles to better represent data



## FART DRONE

Presentation can go like this “with the installation of a gas sensor onboard the drone we were able to measure Fart concentration on a given area representing the size of the bubble . The GPS coordinate pertains to where the concentrations are detected”