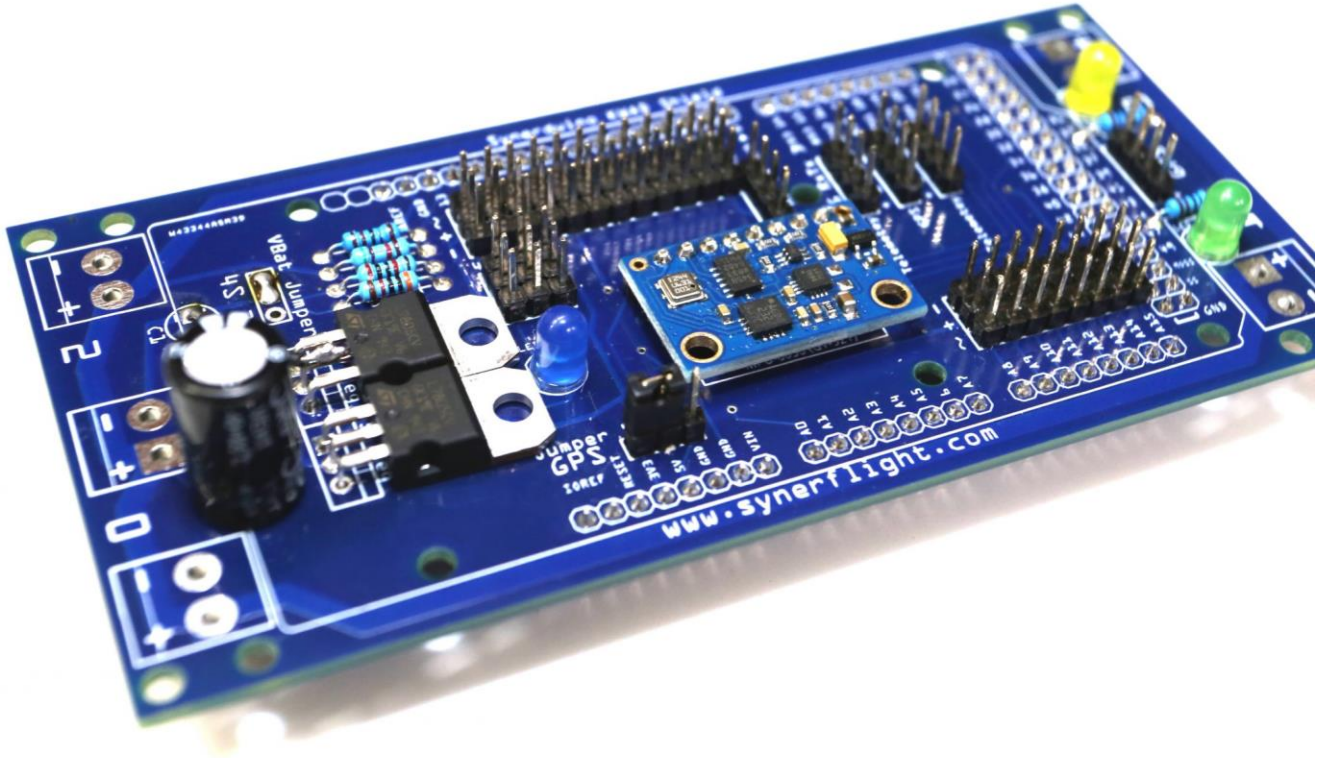
Synerduino Shield Logging and Data Gathering



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

Application Needed

ARDUINO IDE

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

ESC is Solder on Top side only

ESC / Servo PWM Out

Serial Pins

ESC is Solder on Top side only

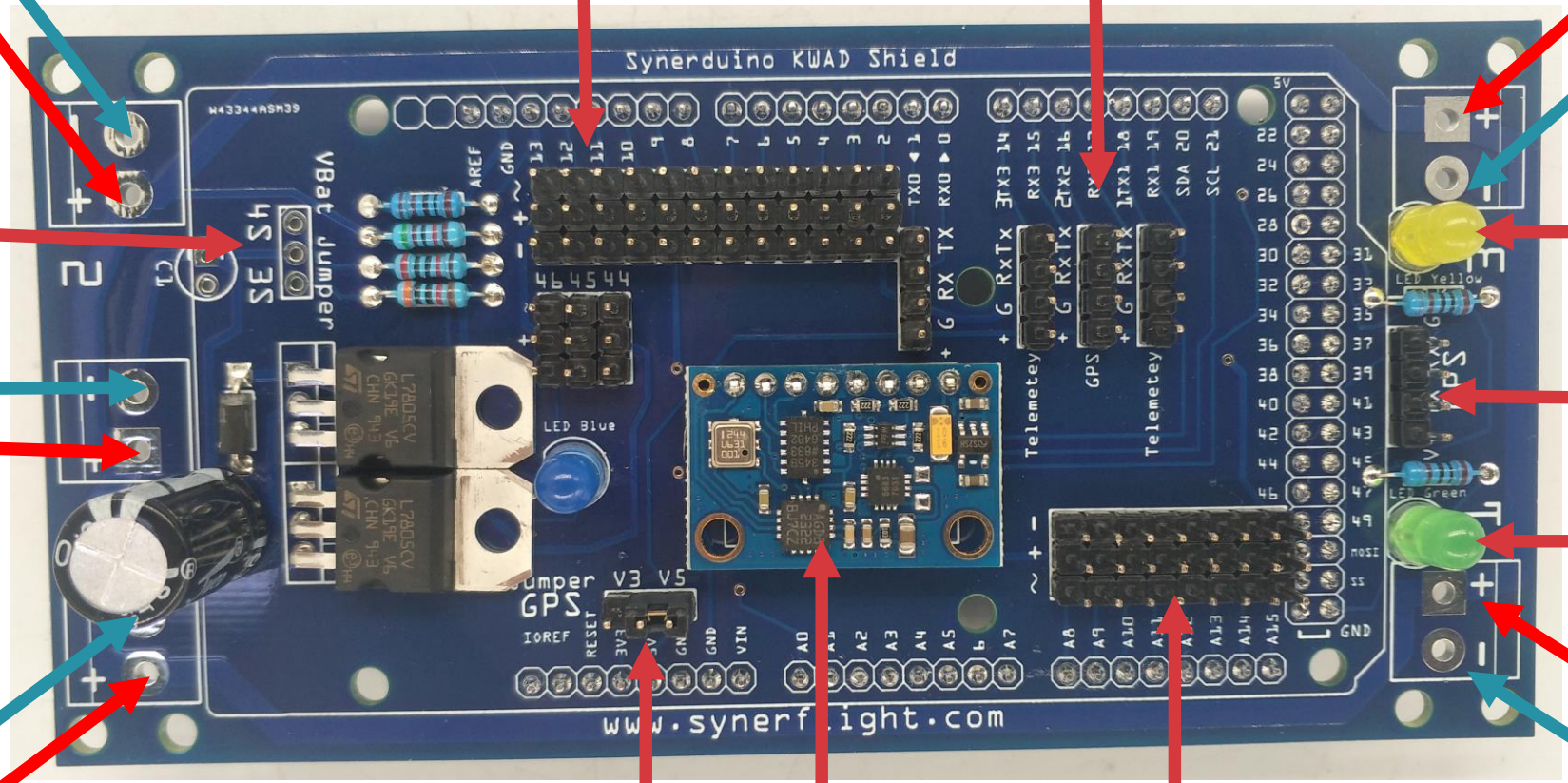
Set jumper to the Battery Cell count (Solded)

GPS LED

Power input 3s 11.1V

GPS Serial Pins

Status LED



ESC is Solder on Top side only

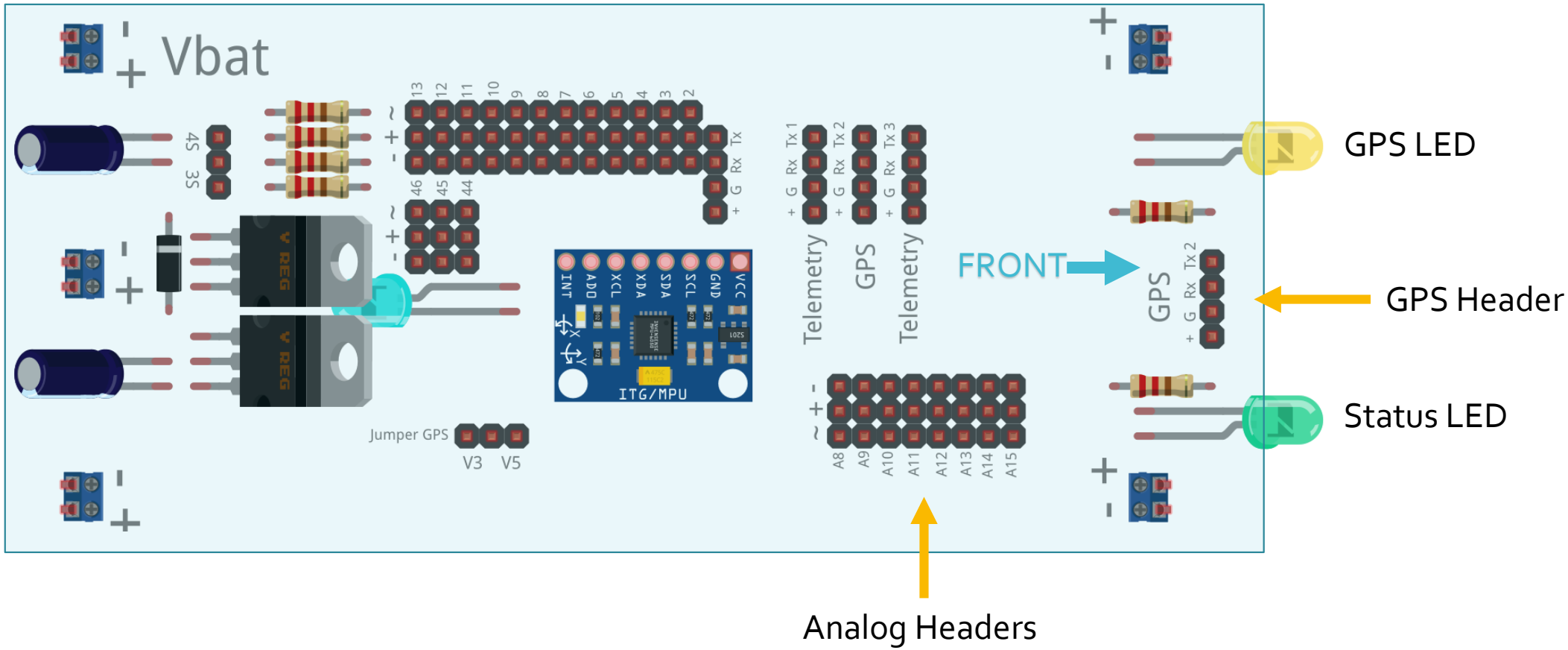
GPS Voltage Jumper

RC PWM in

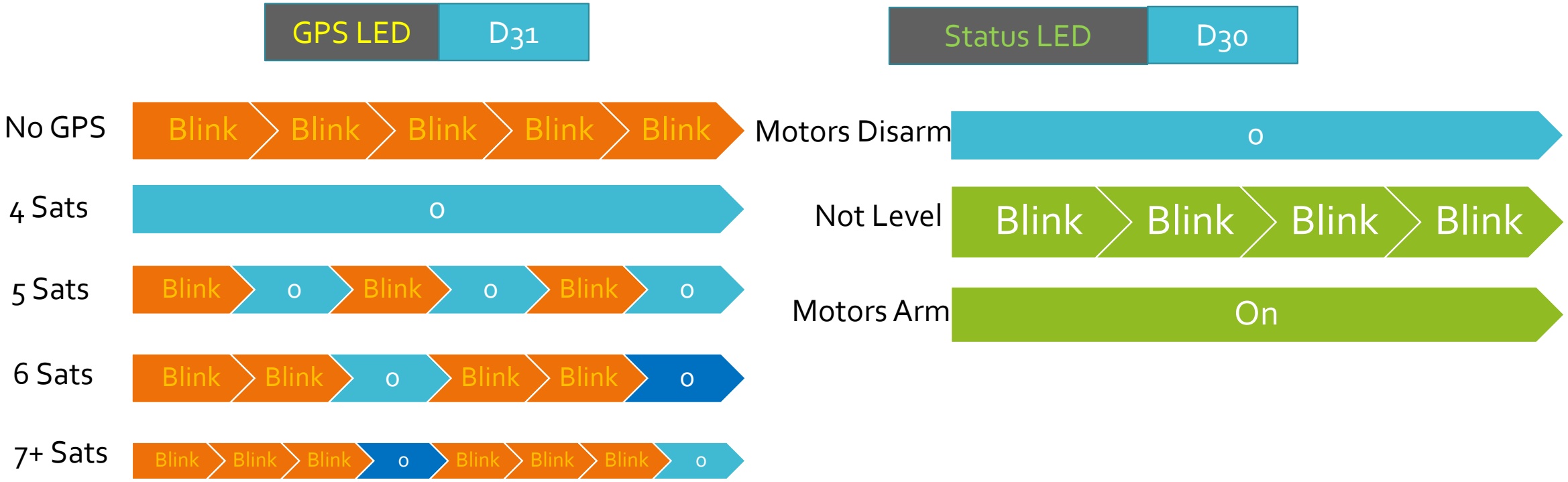
ESC is Solder on Top side only

For improve performance IMU must be protected from the Environment

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


Vbat
GPS LED
GPS Header
Status LED
FRONT
Analog Headers
Telemetry
GPS
Telemetry
GPS
Jumper GPS
V3 V5
ITG/MPU
V REG
V REG

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. >= 5 -> LED blinks, one blink for 5 sat, two blinks for 6 sat, three for 7 +

PWM SENSORS

A0 VBATT INPUT

- 0V-5V

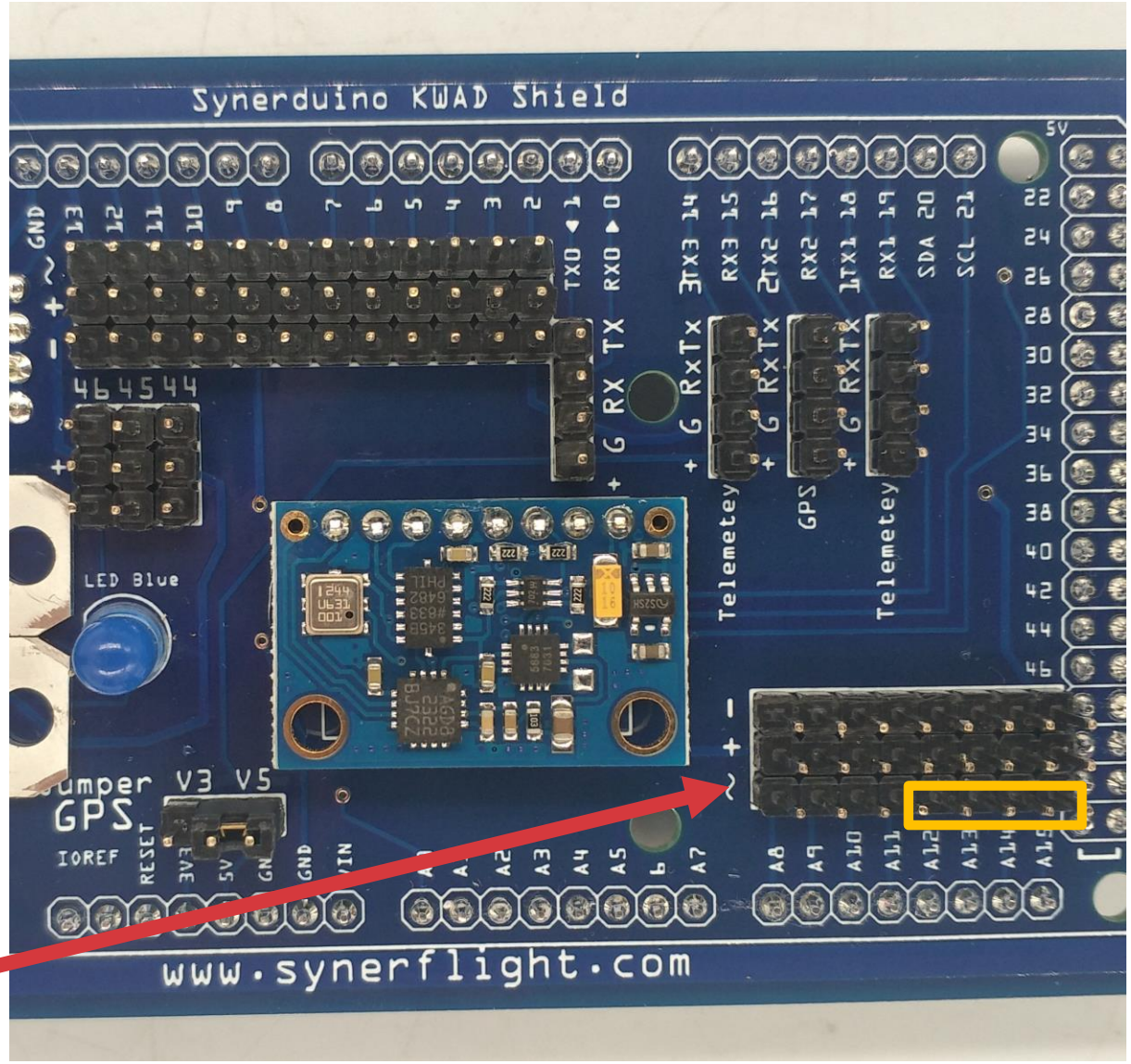
RESERVE FOR BATTERY MONITORING

A12-A15 PWM INPUT

- AUX1 - A12
- AUX2 - A13
- AUX3 - A14
- AUX4 - A15

A14 & A15 SERVE AS ADC IN FOR ANALOG SENSORS

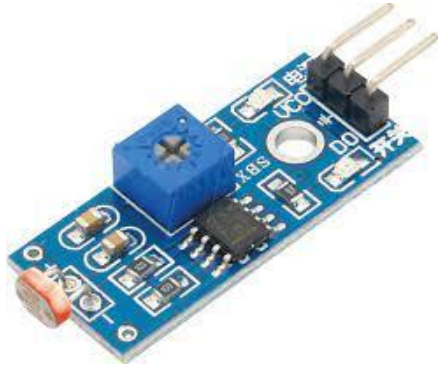
PWM-ADC IN



SENSORS

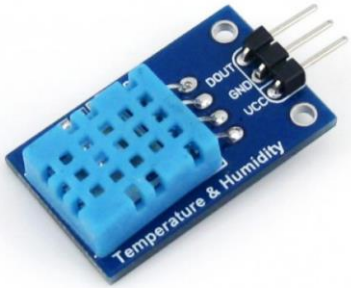
GAS SENSOR

LIGHT SENSOR

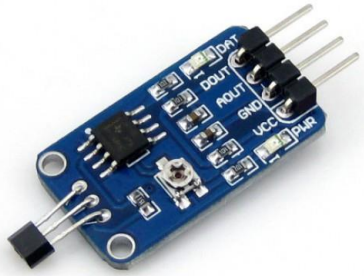


ULTRASONIC SENSOR

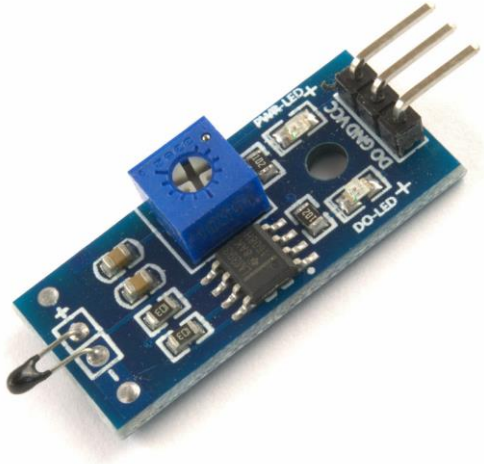
HUMIDITY SENSOR



HALL SENSOR



TEMPERATURE SENSOR

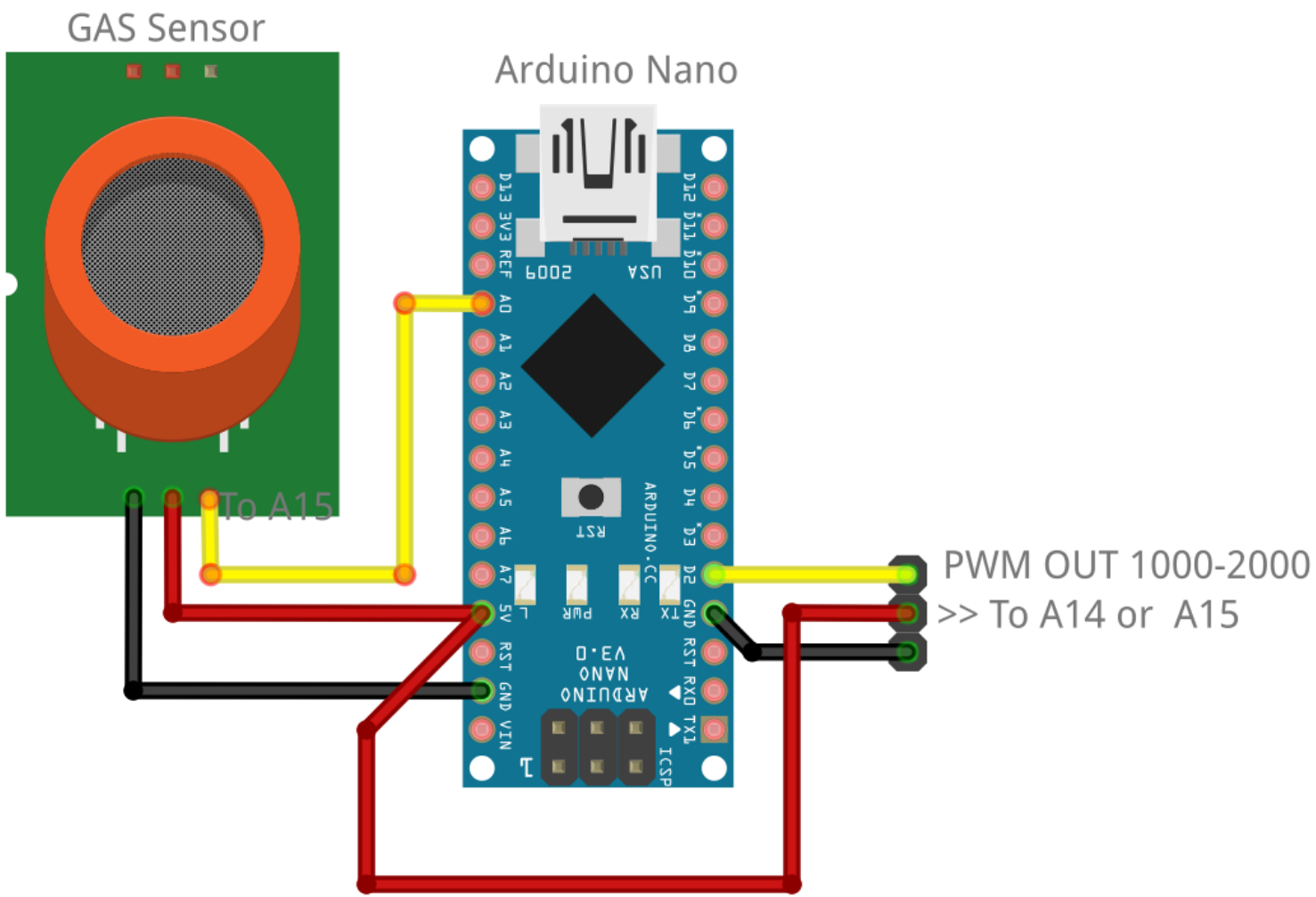


EXAMPLE

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

(O DEGREE TO 180 DEGREE)

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

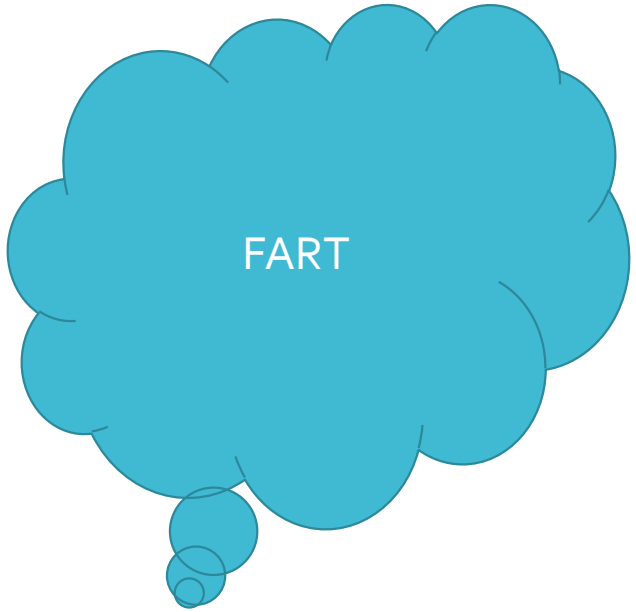


Sensors registered spike when gas is detected

PWM 1000 Sensor 0V

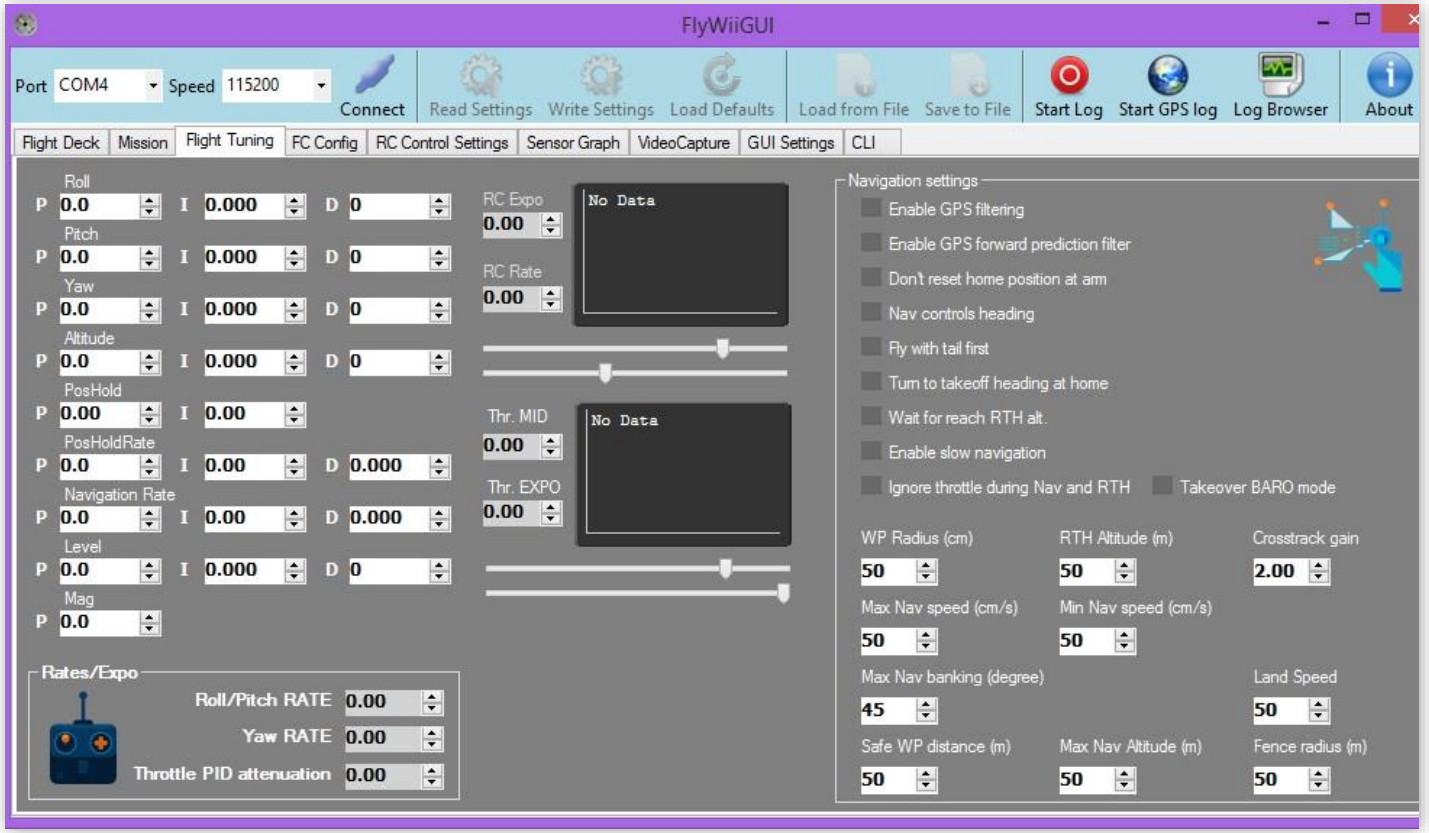
PWM 1800 Sensor 4.8V

PWM 1000 Sensor 0V



TELEMETRY LOG

FLYWII GUI



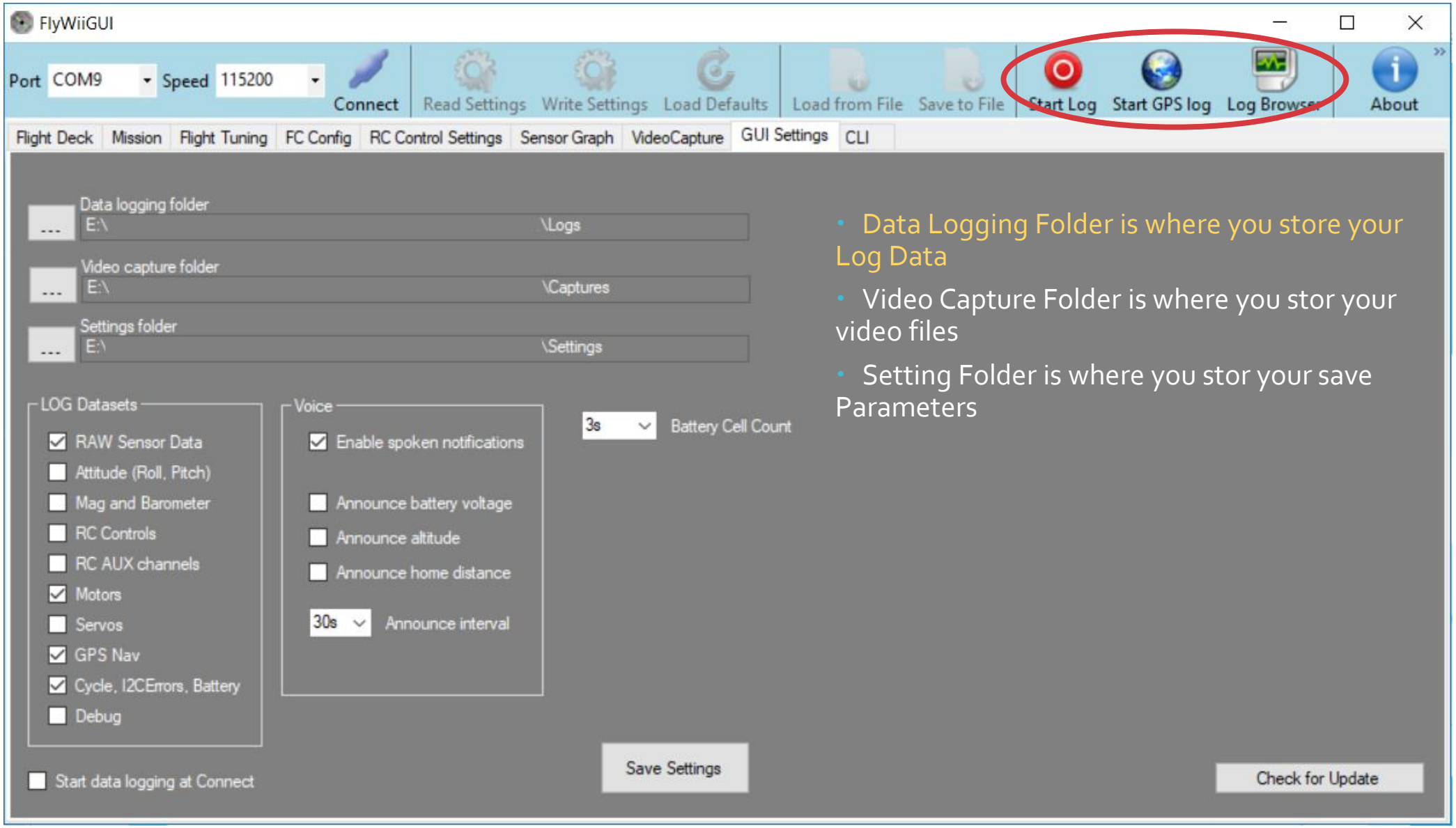
DEDICATED USER INTERFACE AS CONFIGURATOR AND GROUND STATION FOR THE ARDUINO DRONE

SETUP Telemetry Logging

On the GUI Settings TAB

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

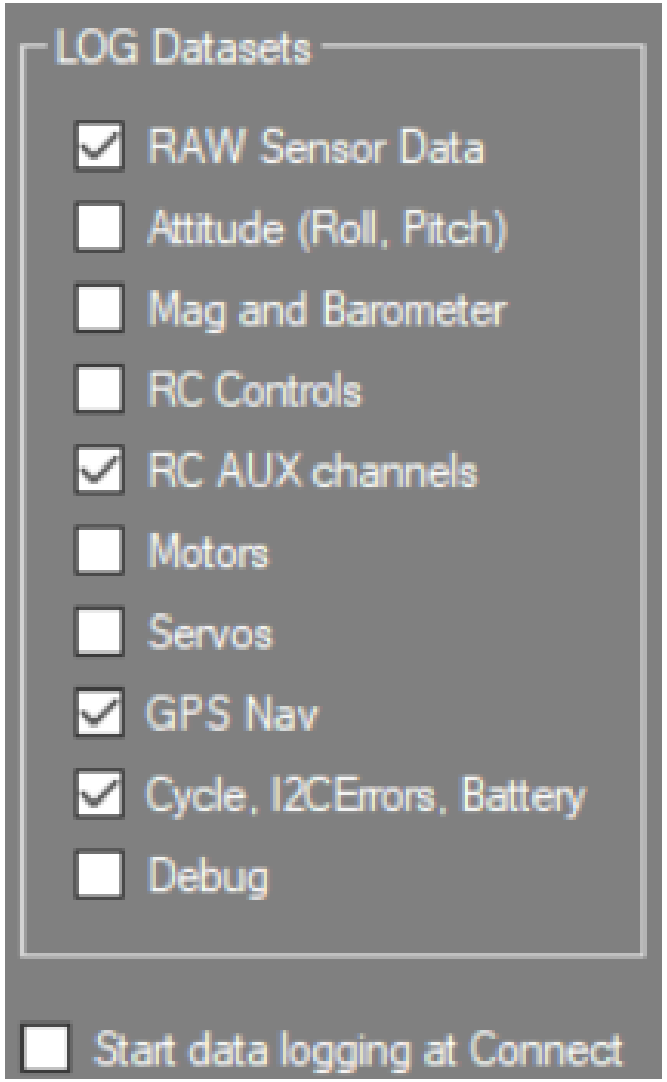
GUI Settings (where you save your PID ,Flight Logs and Video Logs)

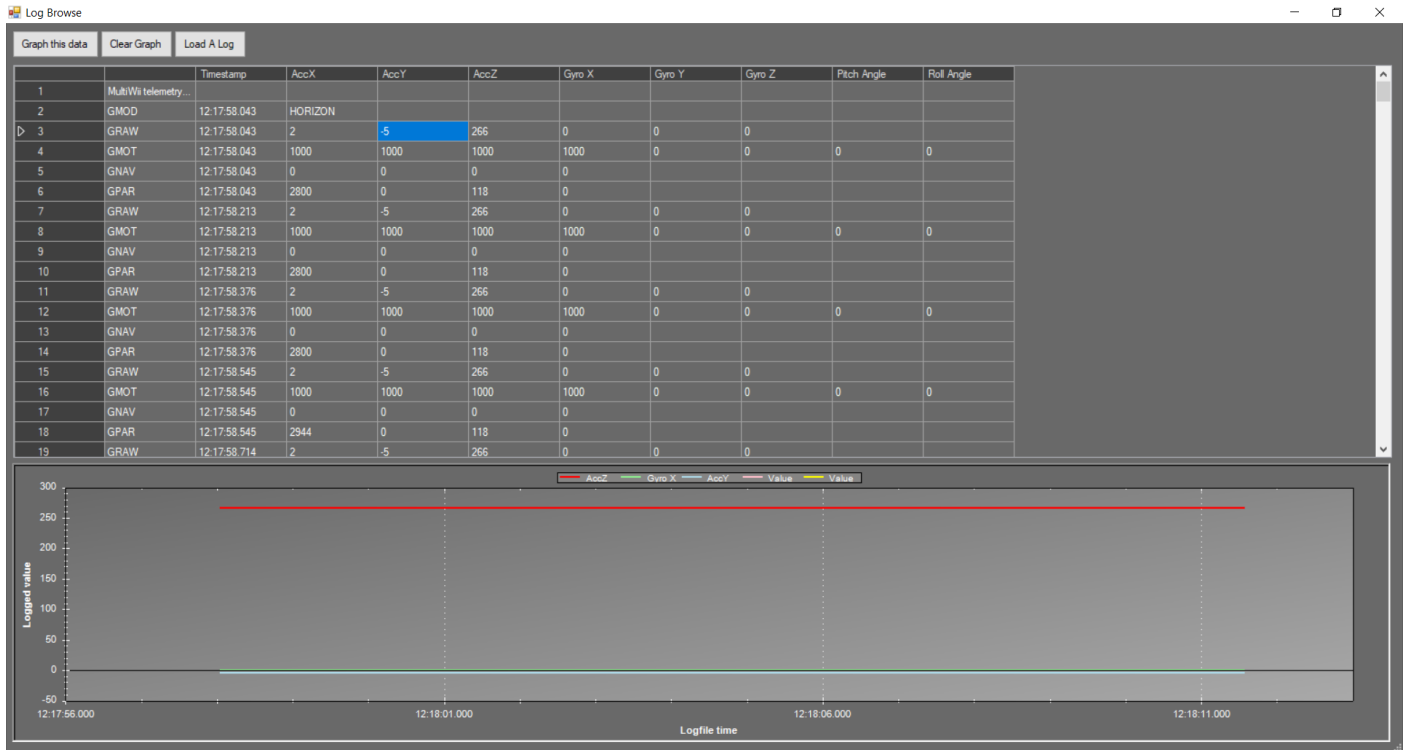


- Data Logging Folder is where you store your Log Data
- Video Capture Folder is where you stor your video files
- Setting Folder is where you stor your save Parameters

- 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



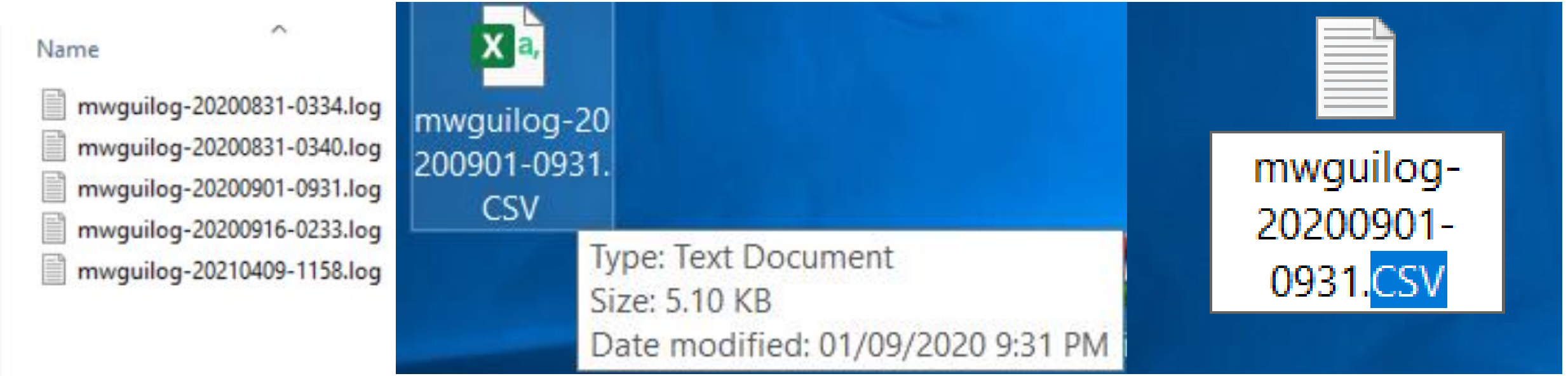


		Timestamp	AccX	AccY	AccZ	Gyro X	Gyro Y	Gyro Z	Pitch Angle	Roll Angle
1	MultiWii telemetry...									
2	GMOD	12:17:58.043	HORIZON							
3	GRAW	12:17:58.043	2	-5	266	0	0	0		
4	GMOT	12:17:58.043	1000	1000	1000	1000	0	0	0	0
5	GNAV	12:17:58.043	0	0	0	0				
6	GPAR	12:17:58.043	2800	0	118	0				
7	GRAW	12:17:58.213	2	-5	266	0	0	0		
8	GMOT	12:17:58.213	1000	1000	1000	1000	0	0	0	0
9	GNAV	12:17:58.213	0	0	0	0				
10	GPAR	12:17:58.213	2800	0	118	0				
11	GRAW	12:17:58.376	2	-5	266	0	0	0		
12	GMOT	12:17:58.376	1000	1000	1000	1000	0	0	0	0
13	GNAV	12:17:58.376	0	0	0	0				
14	GPAR	12:17:58.376	2800	0	118	0				
15	GRAW	12:17:58.545	2	-5	266	0	0	0		
16	GMOT	12:17:58.545	1000	1000	1000	1000	0	0	0	0
17	GNAV	12:17:58.545	0	0	0	0				
18	GPAR	12:17:58.545	2944	0	118	0				
19	GRAW	12:17:58.714	2	-5	266	0	0	0		

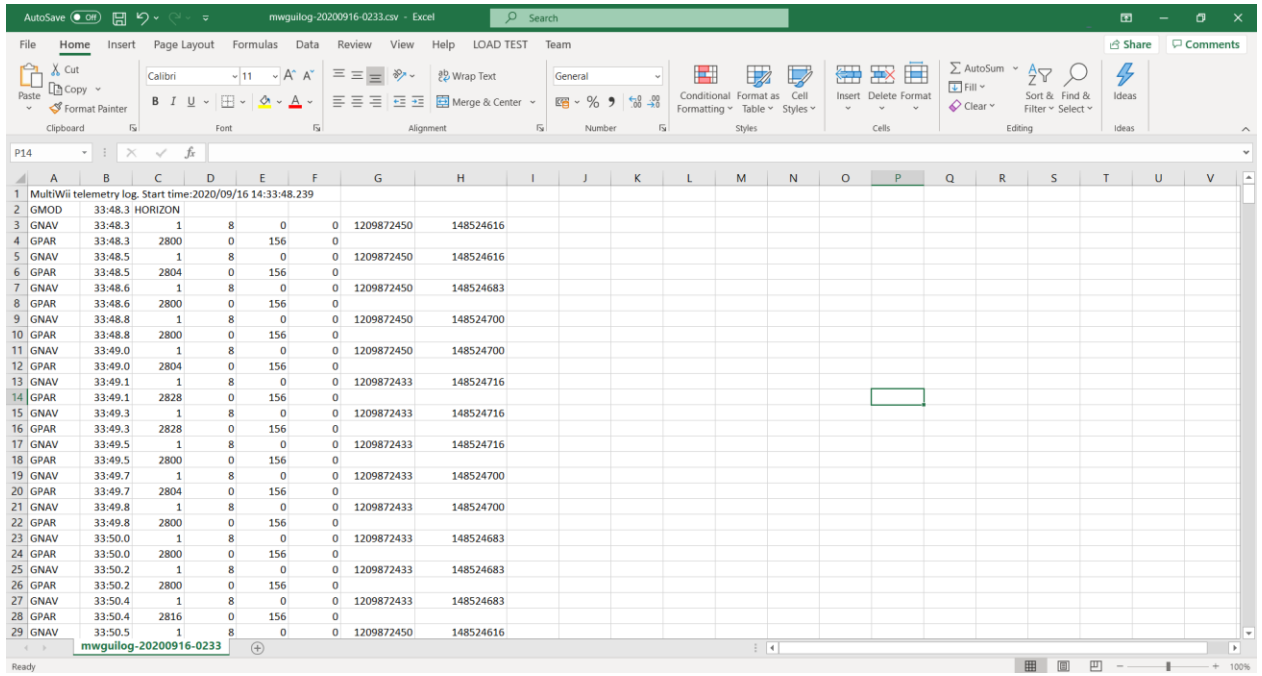
Log Browser can be open with log browser icon and selecting a log document

Tips and tricks into log data

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

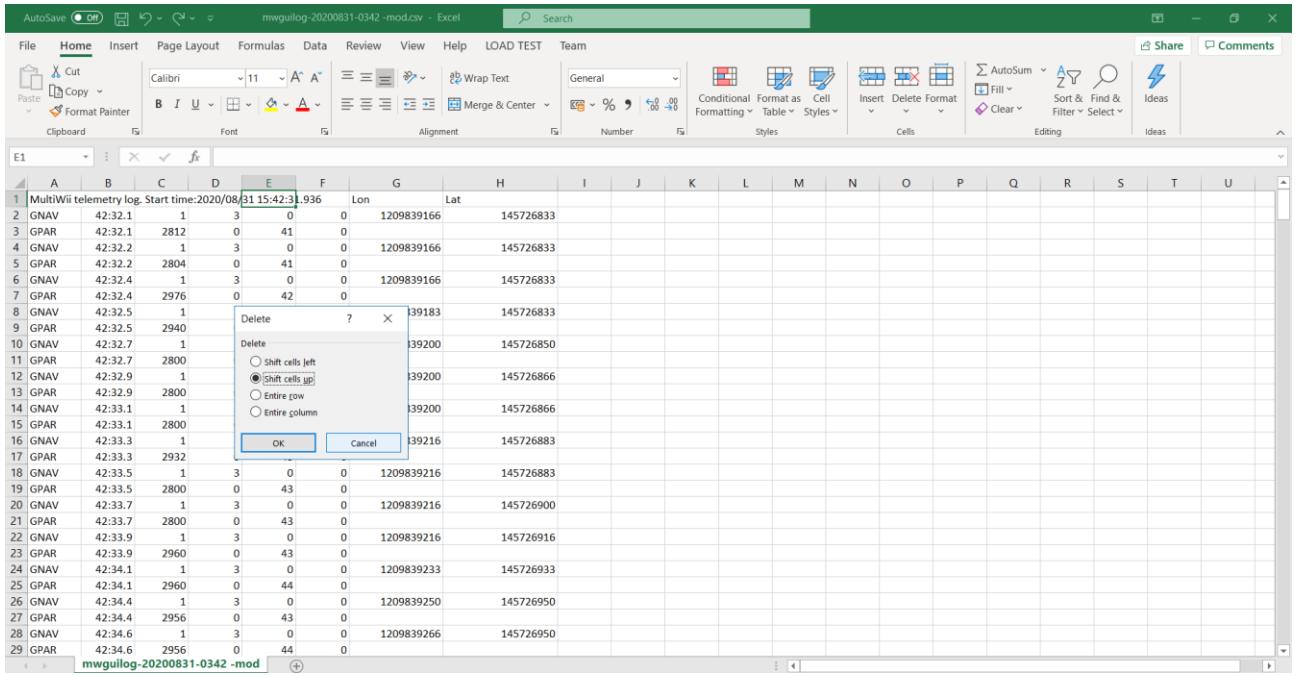


Renaming the LOG file as CSV allows you to access the data in Microsoft Office Excel

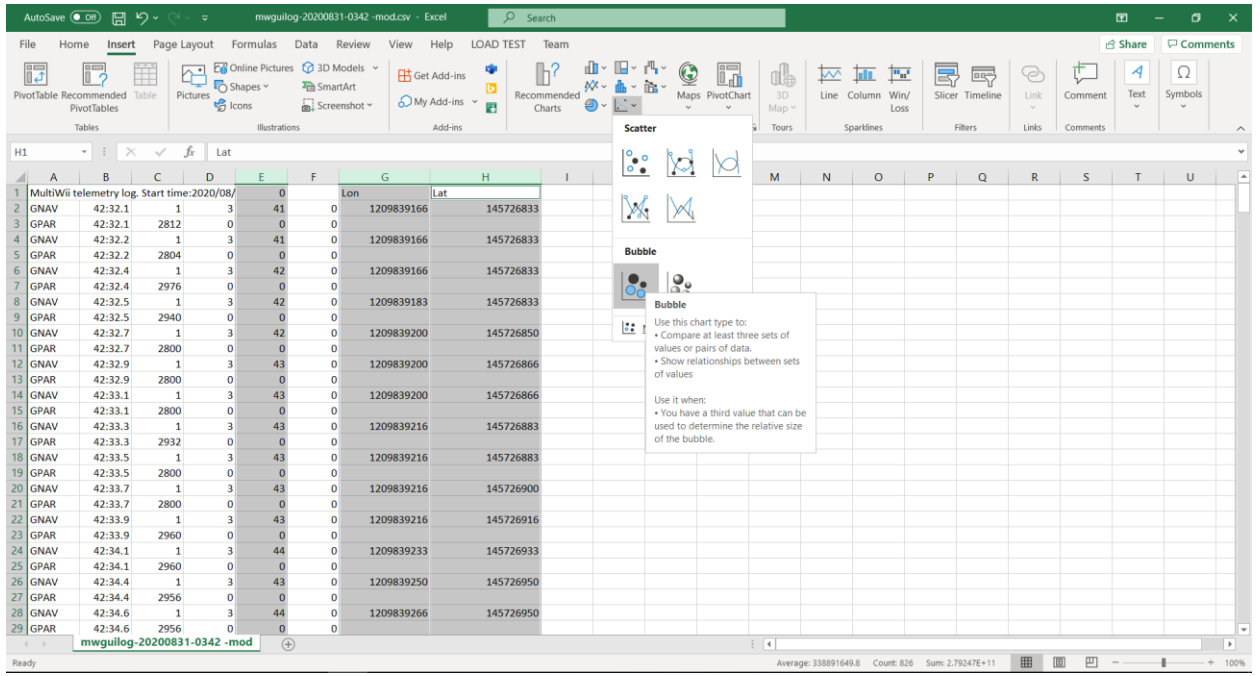


	A	B	C	D	E	F	G	H
1	MultiWii telemetry log. Start time:2020/09/16 14:33:48.239							
2	GMOD	33:48.3	HORIZON					
3	GNAV	33:48.3	1	8	0	0	1209872450	148524616
4	GPAR	33:48.3	2800	0	156	0		
5	GNAV	33:48.5	1	8	0	0	1209872450	148524616
6	GPAR	33:48.5	2804	0	156	0		
7	GNAV	33:48.6	1	8	0	0	1209872450	148524683
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

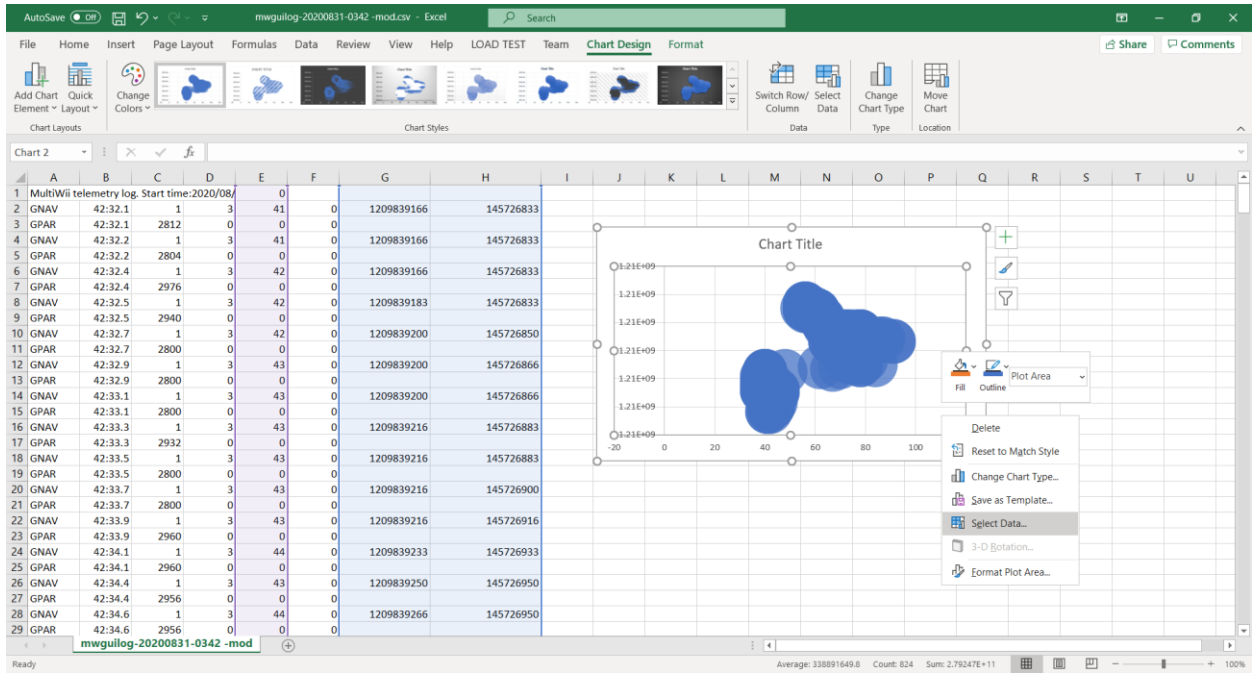
Graphs can be made out of the data by selecting the state with the Lat ,Lon of the GNAV data



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 PWM ADC mode)



The selected Data of GPAR=Vbatt (GRCX =Aux3 or Aux 4),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

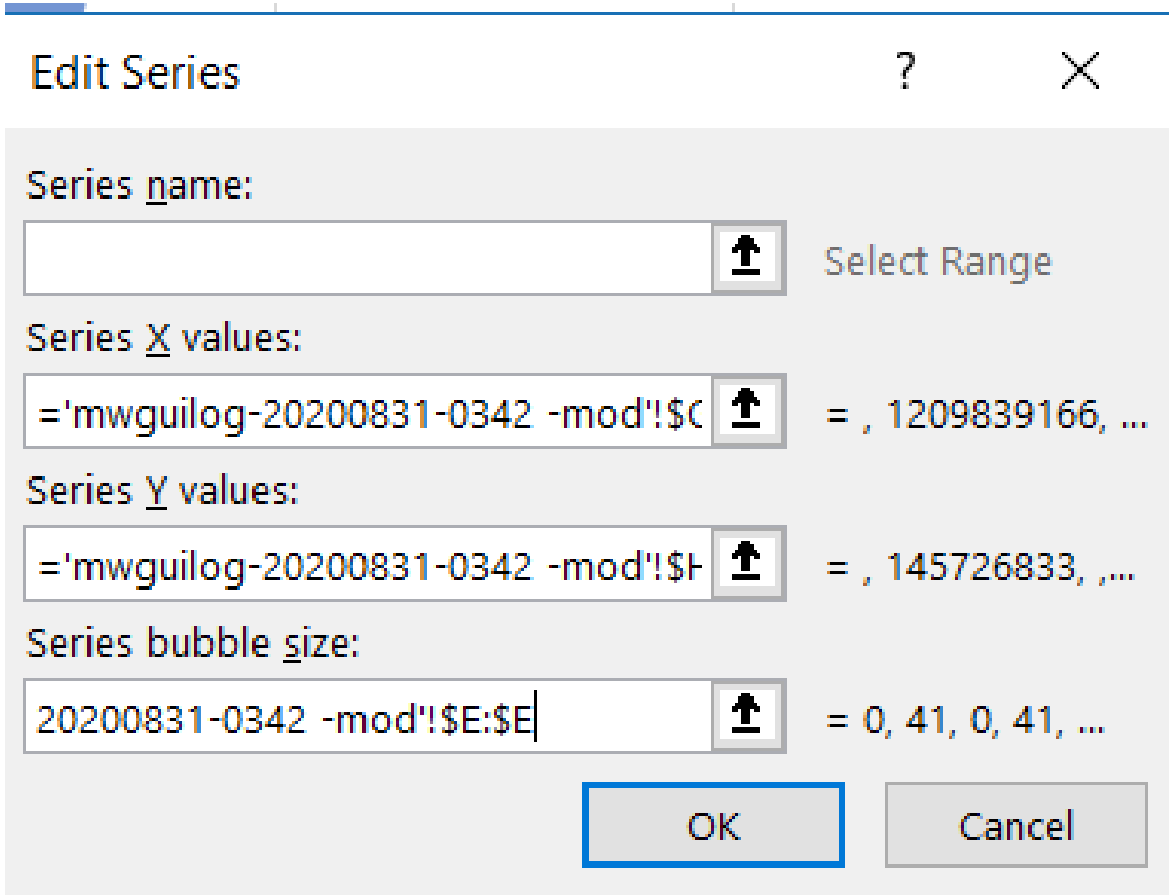


The result of the chart is still incoherent so select data is needed to fix this

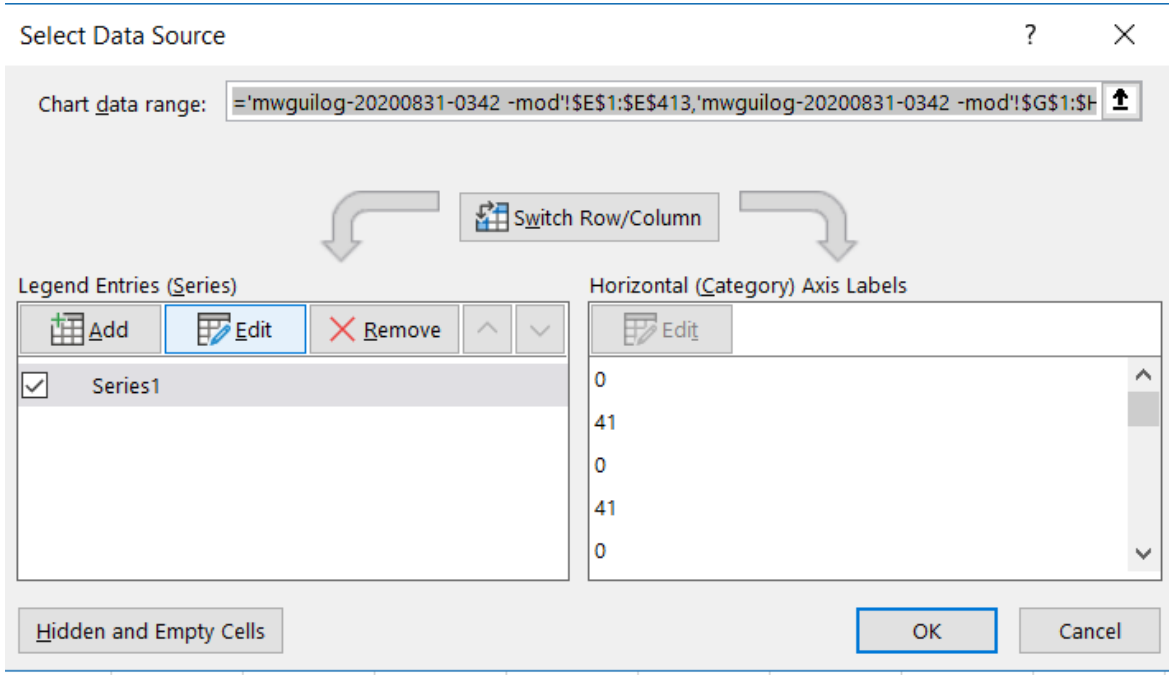
We want the Lat on the vertical and Lon on the horizontal of the graphs

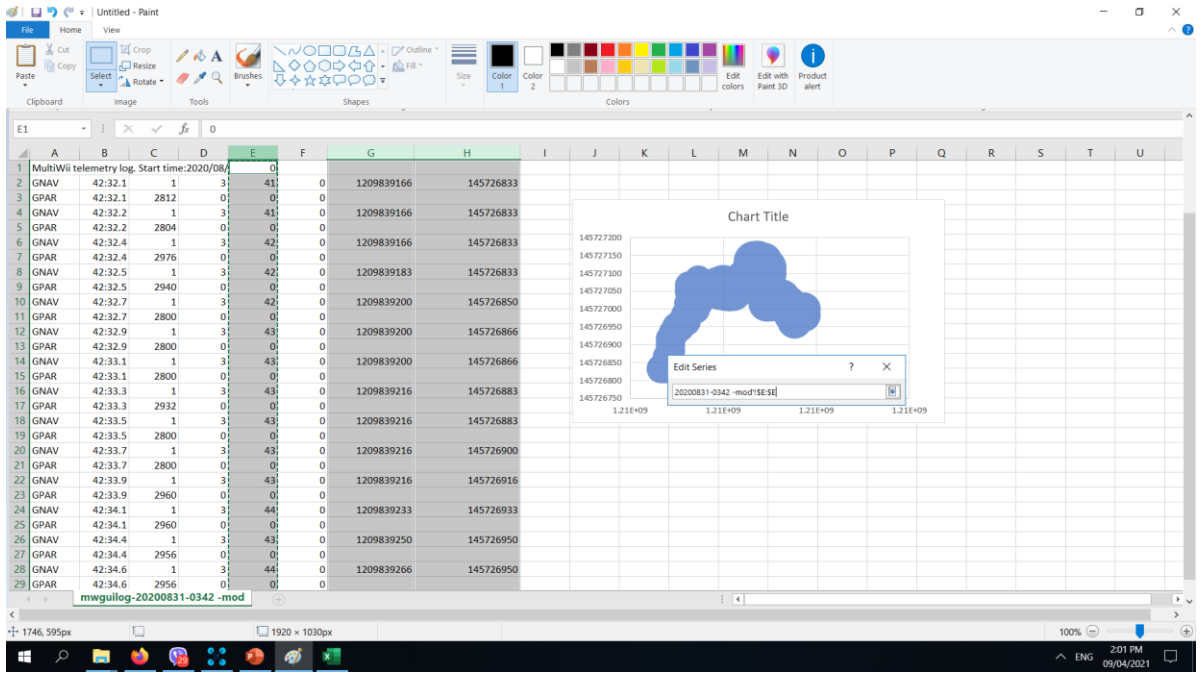
This leaves the GPAR= Vbatt (GRCX =Aux3 or Aux 4) place in intensity by the size of the bubble

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



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



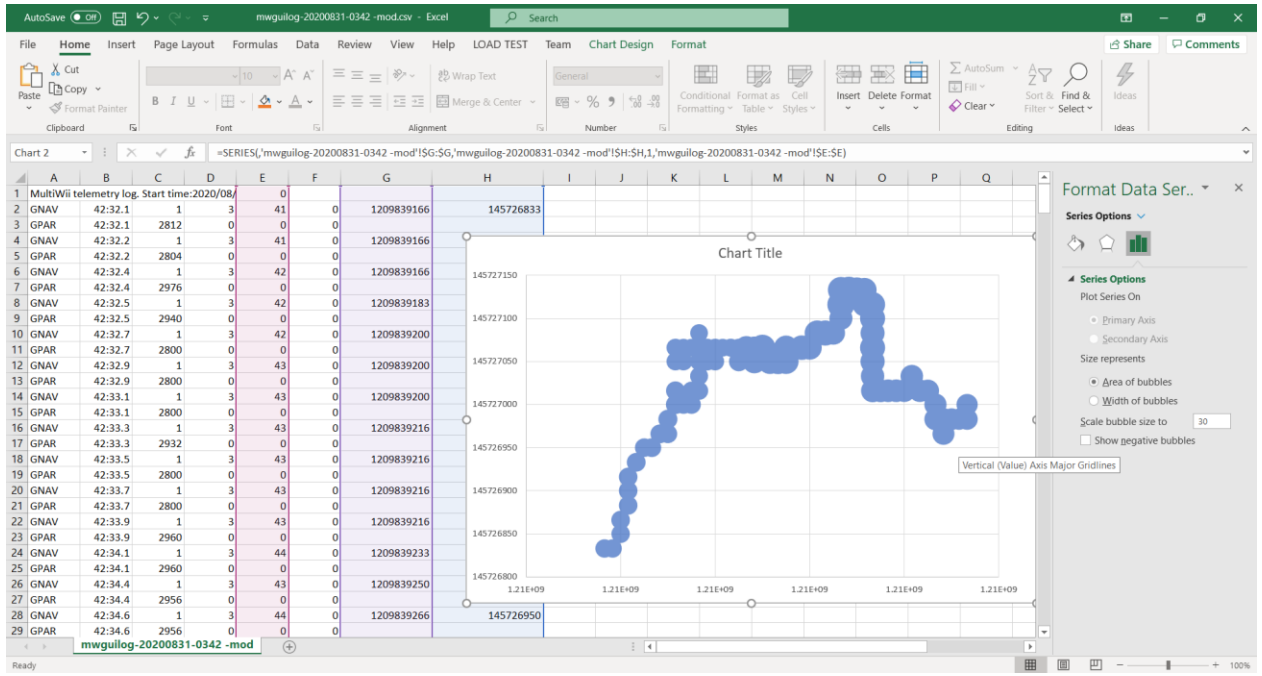


This is where we select the whole column to be assign t the designated chart

X= G column as Lon

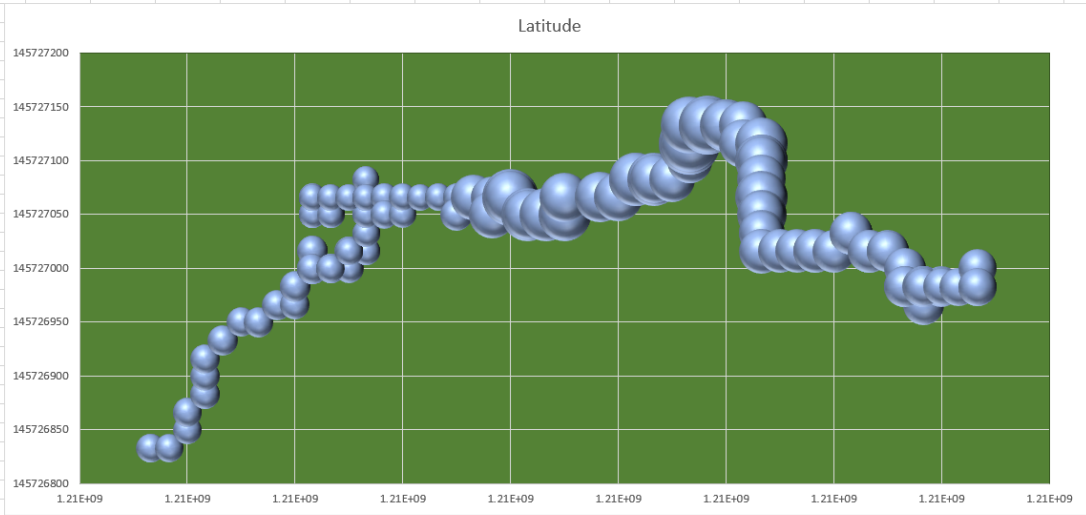
Y = H column as Lat

Intensity = E column as GPAR=Vbatt, (GRCX =Aux3 or Aux 4)



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

	Longtitude	Latitude	Fart intensity
2	1209839166	145726833	41
3			0
4	1209839166	145726833	41
5			0
6	1209839166	145726833	42
7			0
8	1209839183	145726833	42
9			0
10	1209839200	145726850	42
11			0
12	1209839200	145726866	43
13			0
14	1209839200	145726866	43
15			0
16	1209839216	145726883	43
17			0
18	1209839216	145726883	43
19			0
20	1209839216	145726900	43
21			0
22	1209839216	145726916	43
23			0
24	1209839233	145726933	44
25			0
26	1209839250	145726950	43
27			0
28	1209839266	145726950	44
29			0
30	1209839283	145726966	44
31			0
32	1209839300	145726966	43
33			0
34	1209839300	145726983	43
35			0



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 "