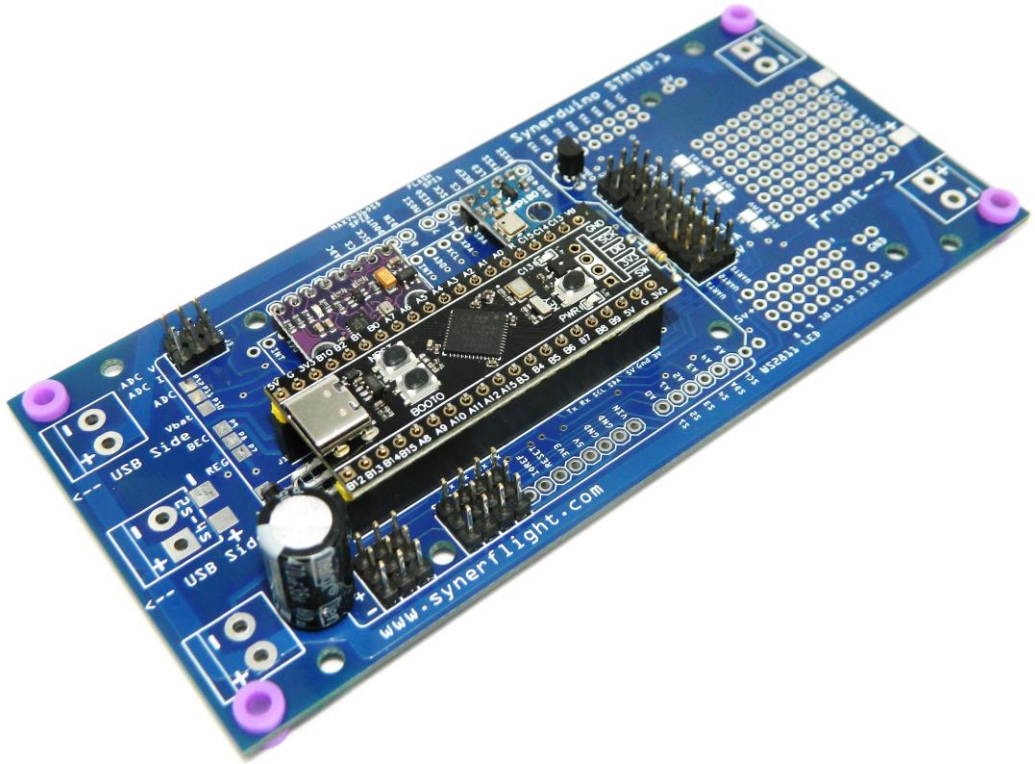
# ADC Sensors

## Synerduino STM

**VERSIONS: F405, F411, H743**

For more Information:
www.synerflight.com

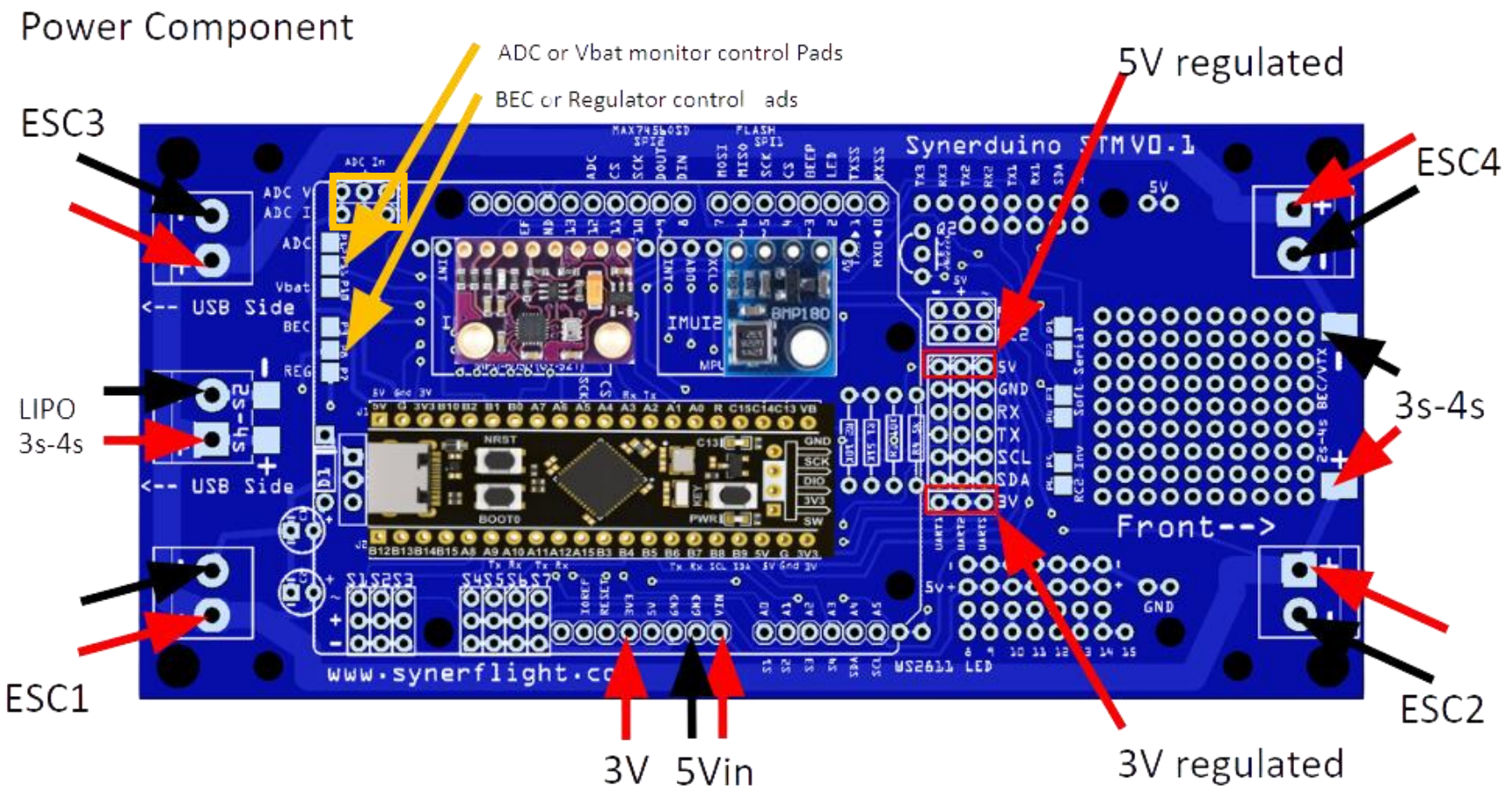
# INTRODUCTION



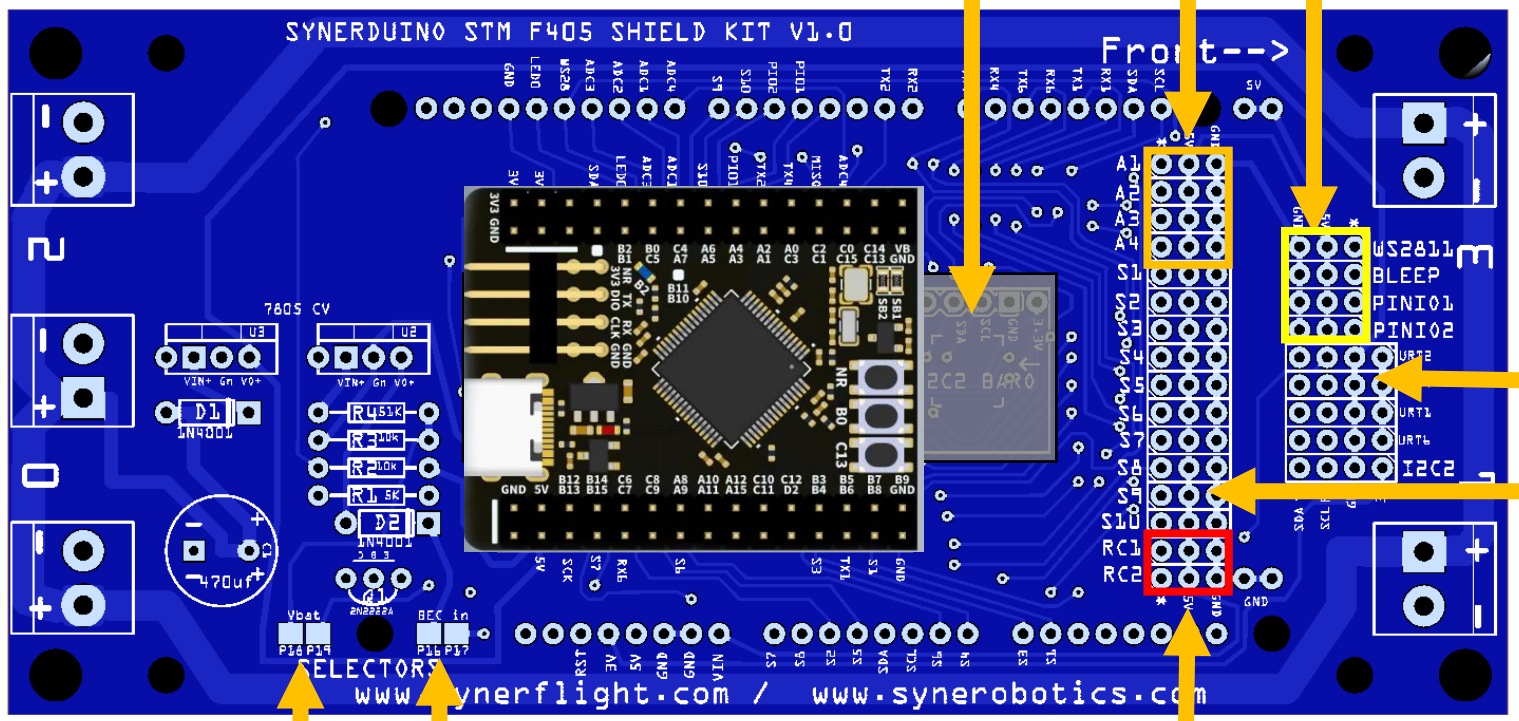

One of the highlighted feature both hardware and software is its flexibility into adding new function to a Drone  the combination of Synerduino hardware and INAV software makes this possible

ADC Sensor and Data Logging is not only useful in diagnosing drone internal condition but also external environment as well

# SYNERDUINO STM F411 SHIELD



# SYNERDUINO STM F405 SHIELD




Sensors must be covered with the provided housing glued into place using PVA white glue

ADC input headers

WS2811 & I/O

UART headers

PWM output headers

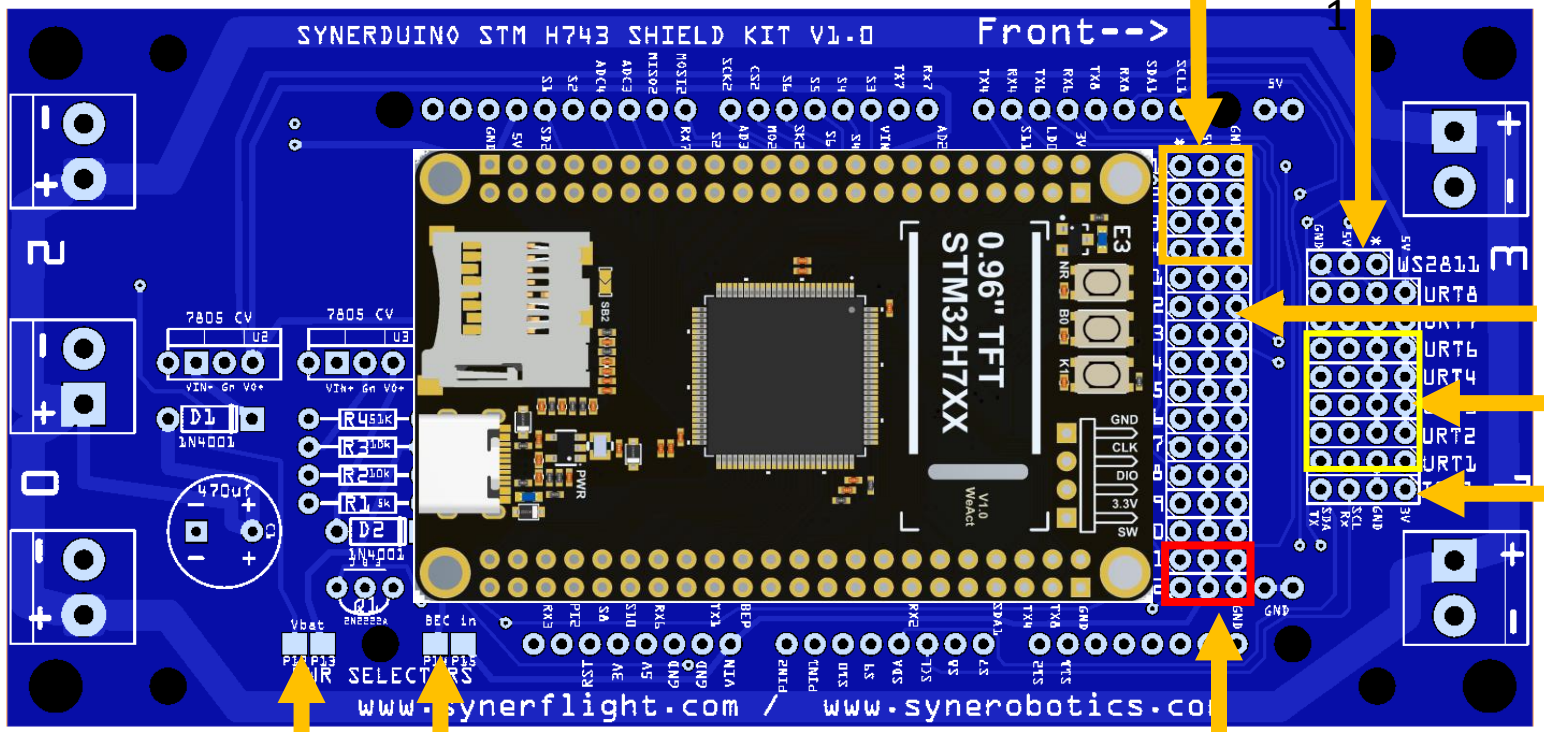
RC1 & RC2

UBEC /Regulator Selection Pads

ADC and Battery Monitoring

# SYNERDUINO STM H743 SHIELD

Sensors must be covered with the provided housing glued into place using PVA white glue




ADC input headers

WS281 1

PWM output headers

UART headers

i2C Headers

UBEC /Regulator Selection Pads

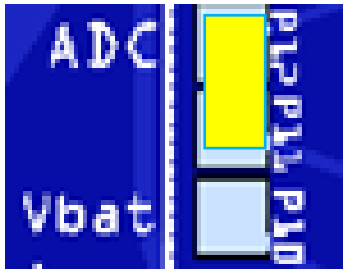
RC1 & RC2

ADC and Battery Monitoring

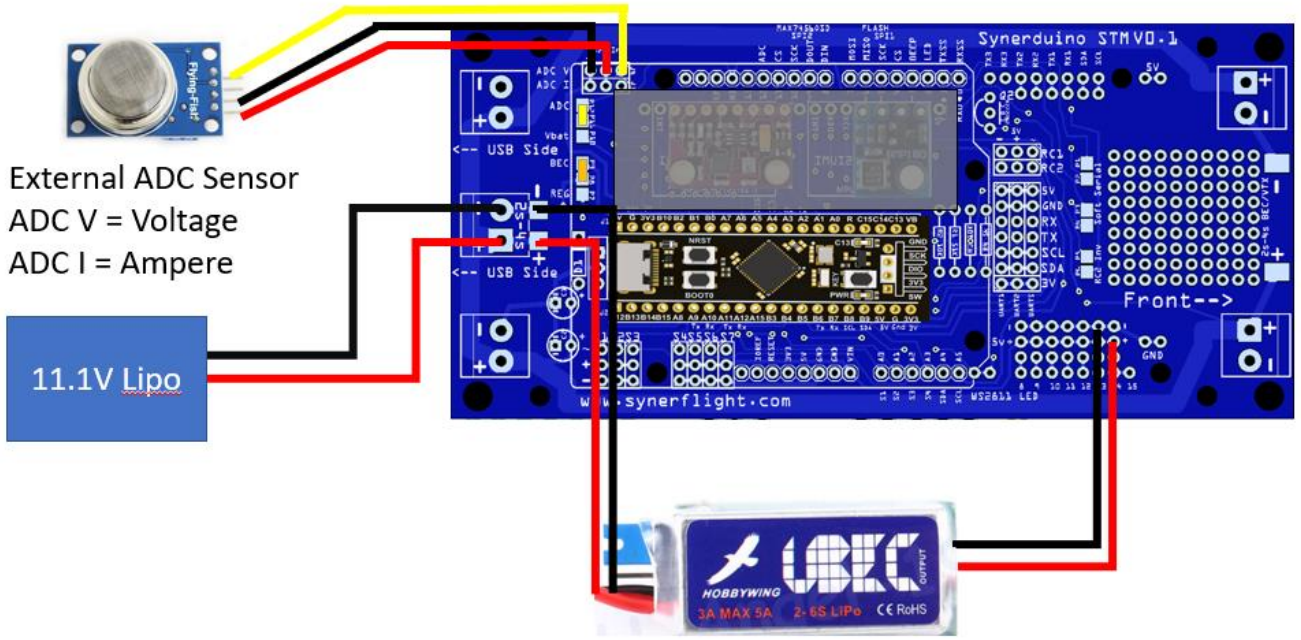
# Data Analytic Intervention

As the name suggest  if you know what you're looking for and you want the drone to intervene /Do something when it met a condition. doing the mission whether is triggering a payload or instrument when a potential positive value is match

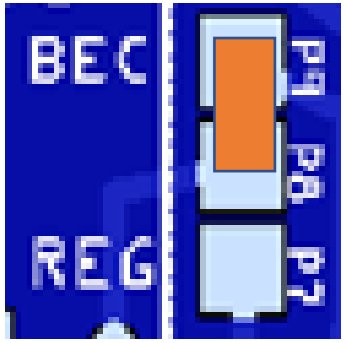
For this sample we Hook up a sensor into the ADC V or ADC I




P12-P11 : ADC –this is use for having an external Analog sensor installed as it reads 0V-5V for Synerduino to convert to a Global Variable

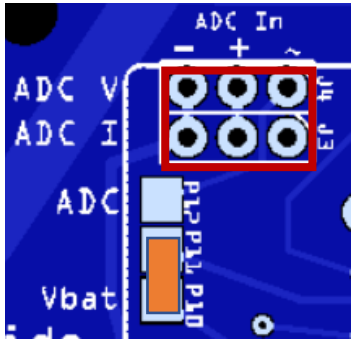



UBEC source is same as ESC input  and output is plug into any freely available 5V pin



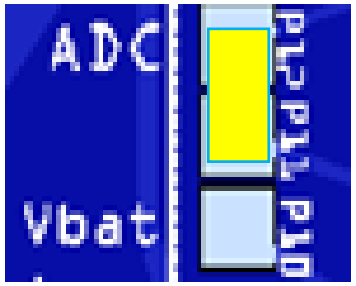

P9-P8 : BEC –this is use if you have a BEC powering through the ESC w/UBEC or an Standalone UBEC or Buck Converter Plug into S2 Pin

Note: when running exterdal devices and sensors may sometimes require the use of external UBEC and a means to provide extra current to what your running




P11 – P10 Vbat = Provides battery status data of voltage which can function as a form of failsafe or other battery function

P11- P12 ADC = Provides an option to add External ADC sensors to the Board for Environmental Data Analytics or signaling  application




ADC V = Voltage
ADC I = Amperage

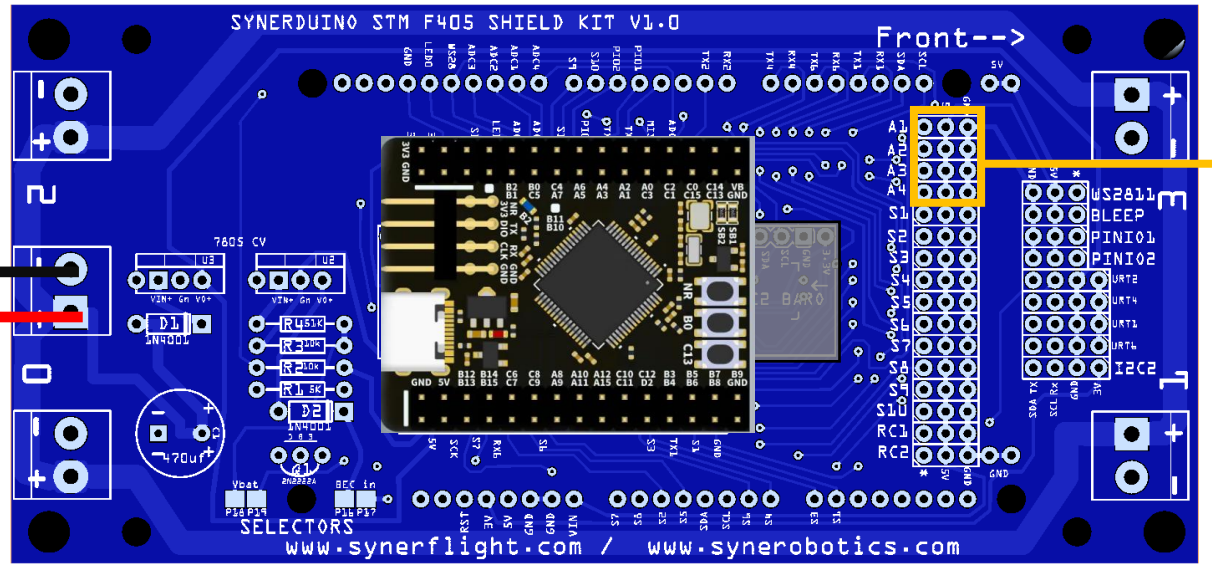
# Data Analytic Intervention

Primary with 4 ADC pins

- Voltage
- Current
- RSSI
- Airspeed

External ADC Sensor

11.1V Lipo




This can be reassign for any Analog sensors outputting 0V -5V

UBEC is Required for High current applications if it exceeded more than

- 3A for STMF405 and H743
- 1.5A for F411 of use when driving servos

BEC input requirements must be 5V

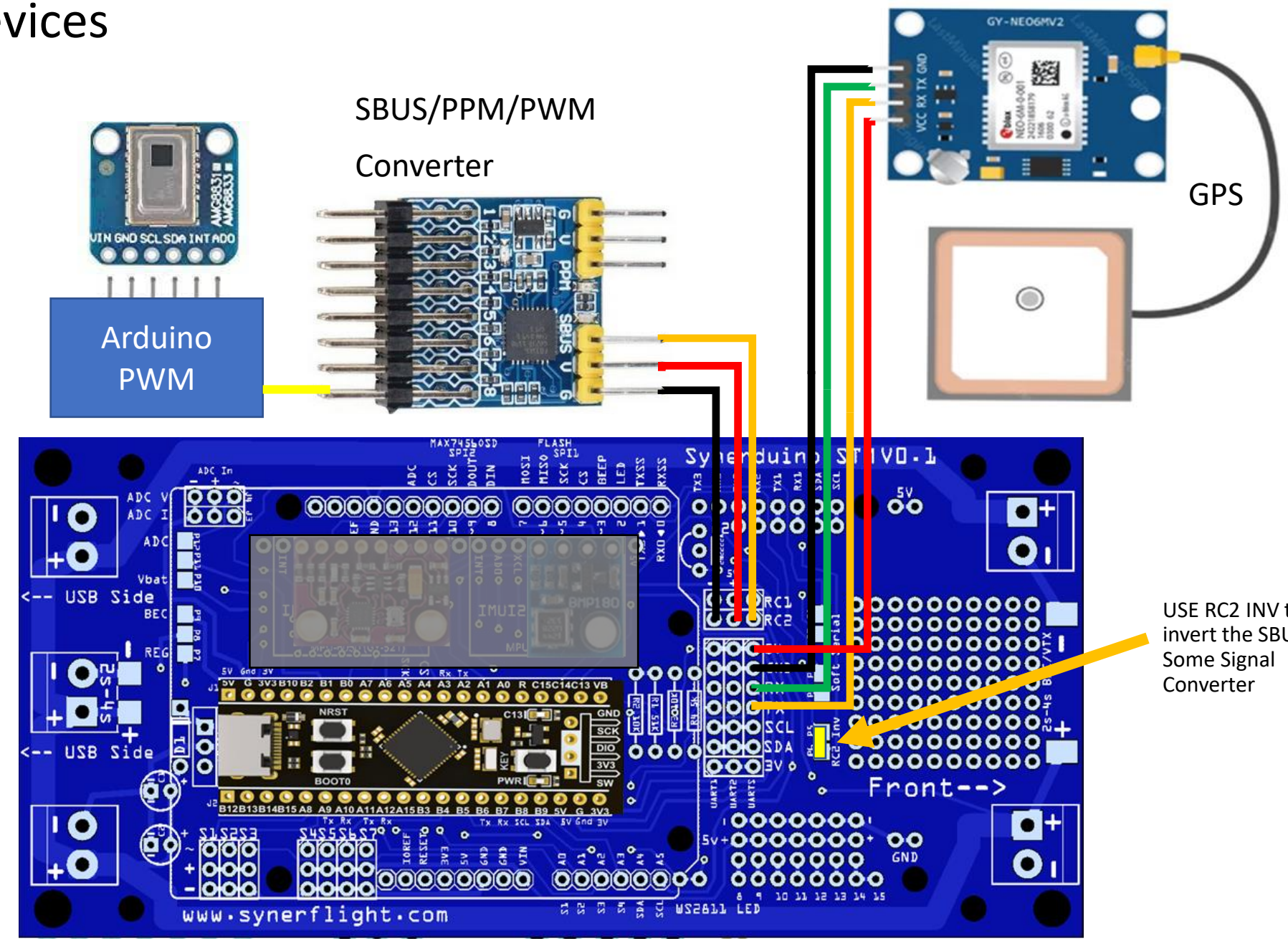

# Digital Sensor Devices

An SBUS/PPM/PWM converter can also take advantage on extra PWM input when building self constrain platform.

Utilizing an Arduino board as a companion controller to process sensor data into PWM

This is useful when you need to convert digital sensor data into PWM for synerduino to Read , process and transmit

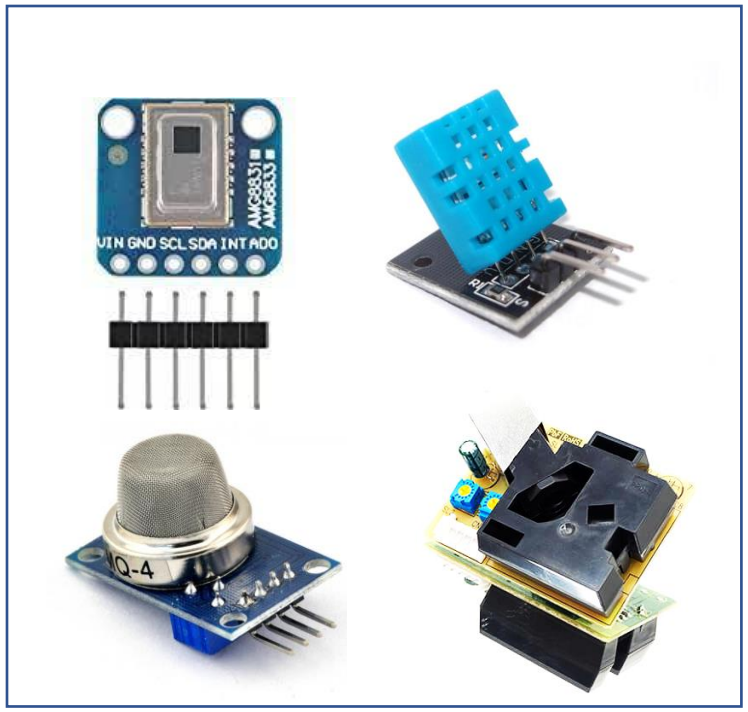
With those function available in Arduino projects

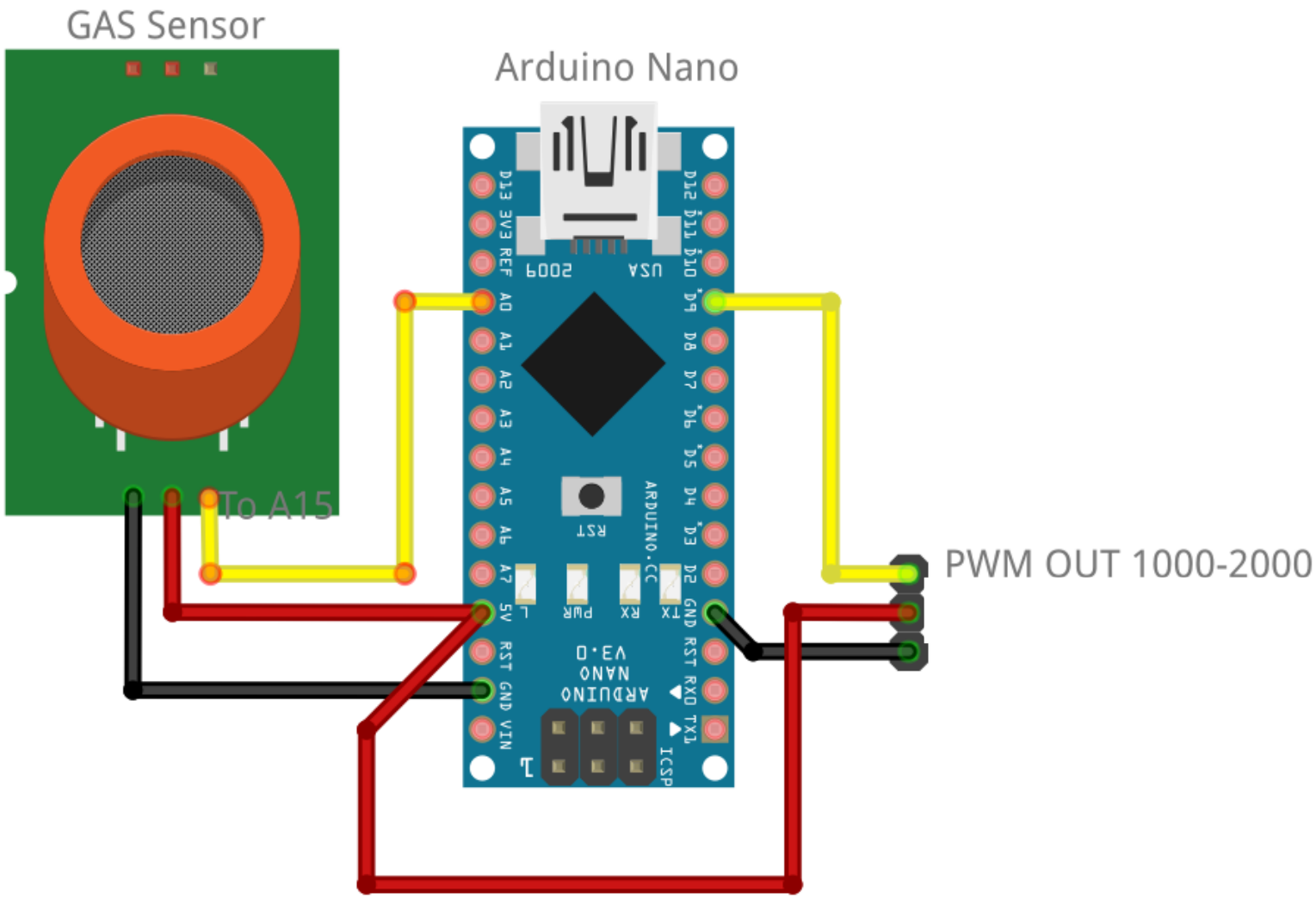


# Digital Sensor Devices

An Arduino can also be used as an Companion board to this application utilizing any unused PWM input by the Converter as an AUX

This can work for both digital and analog sensors a well

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# Data Logging

**These are optional addons**

All Addon SPI devices can Access SPI2 Pins

CS - CS

DIN – MOSI

DOUT - MISO

SCK – SCK

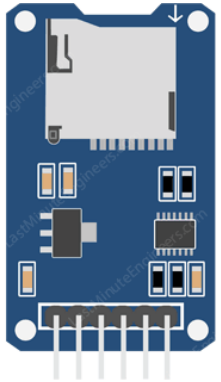
Power can be tap into any freely available 3V or 5V pin

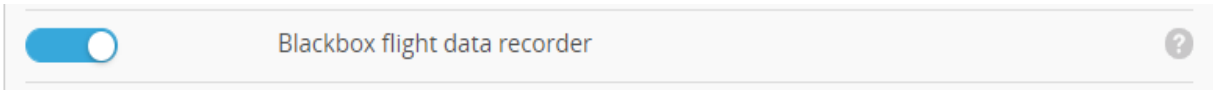
SD Card is Active Default for Synerduino STM firmwares:

Synerduino STM.HEX

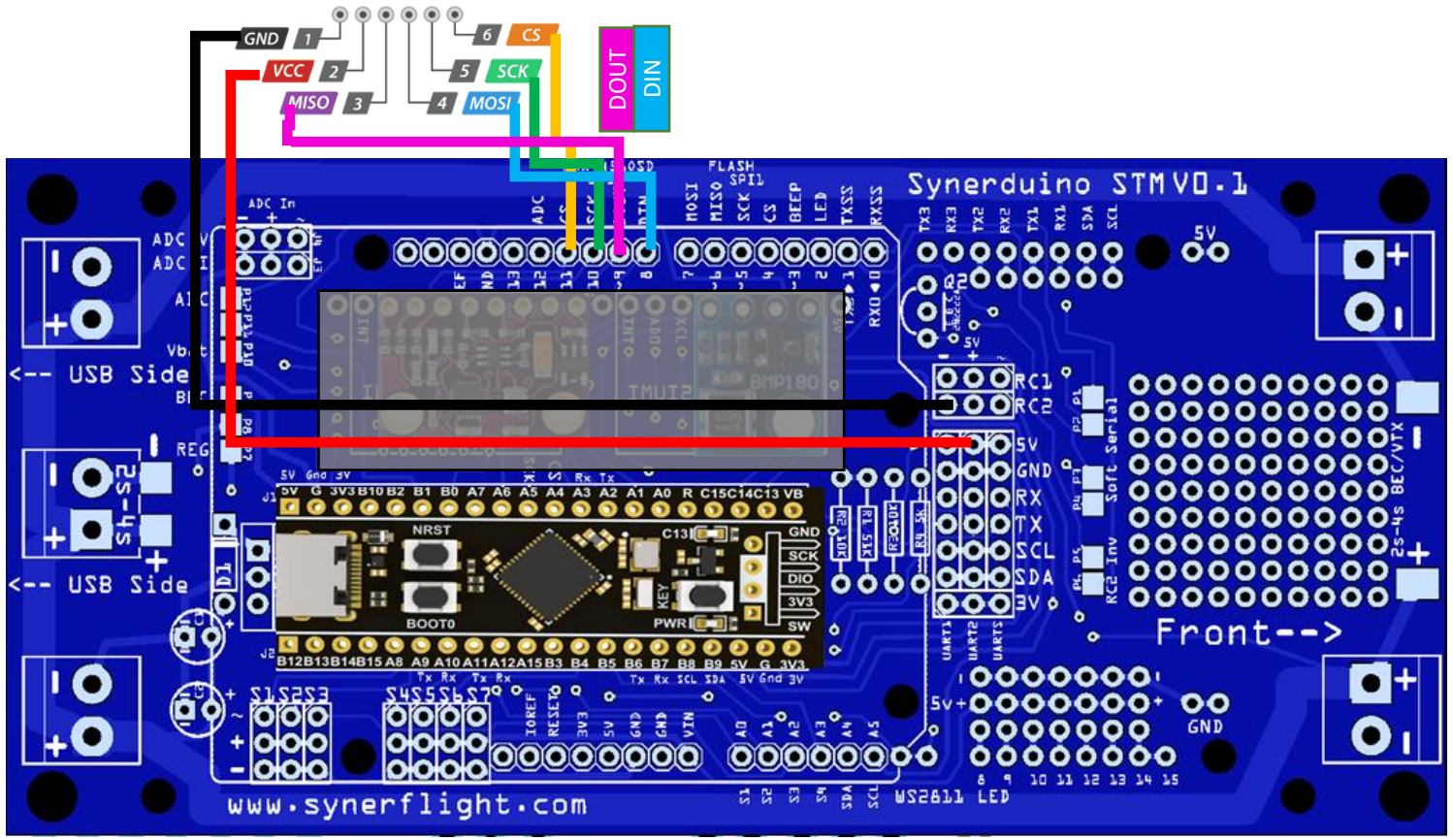
Synerduino STM VS.HEX

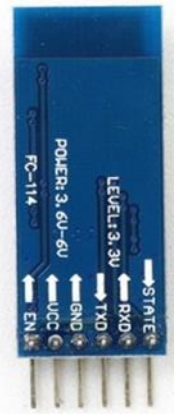
SD Card Reader






In Configuration Blackbox Flight data recorder can be set active should you have the SD card installed

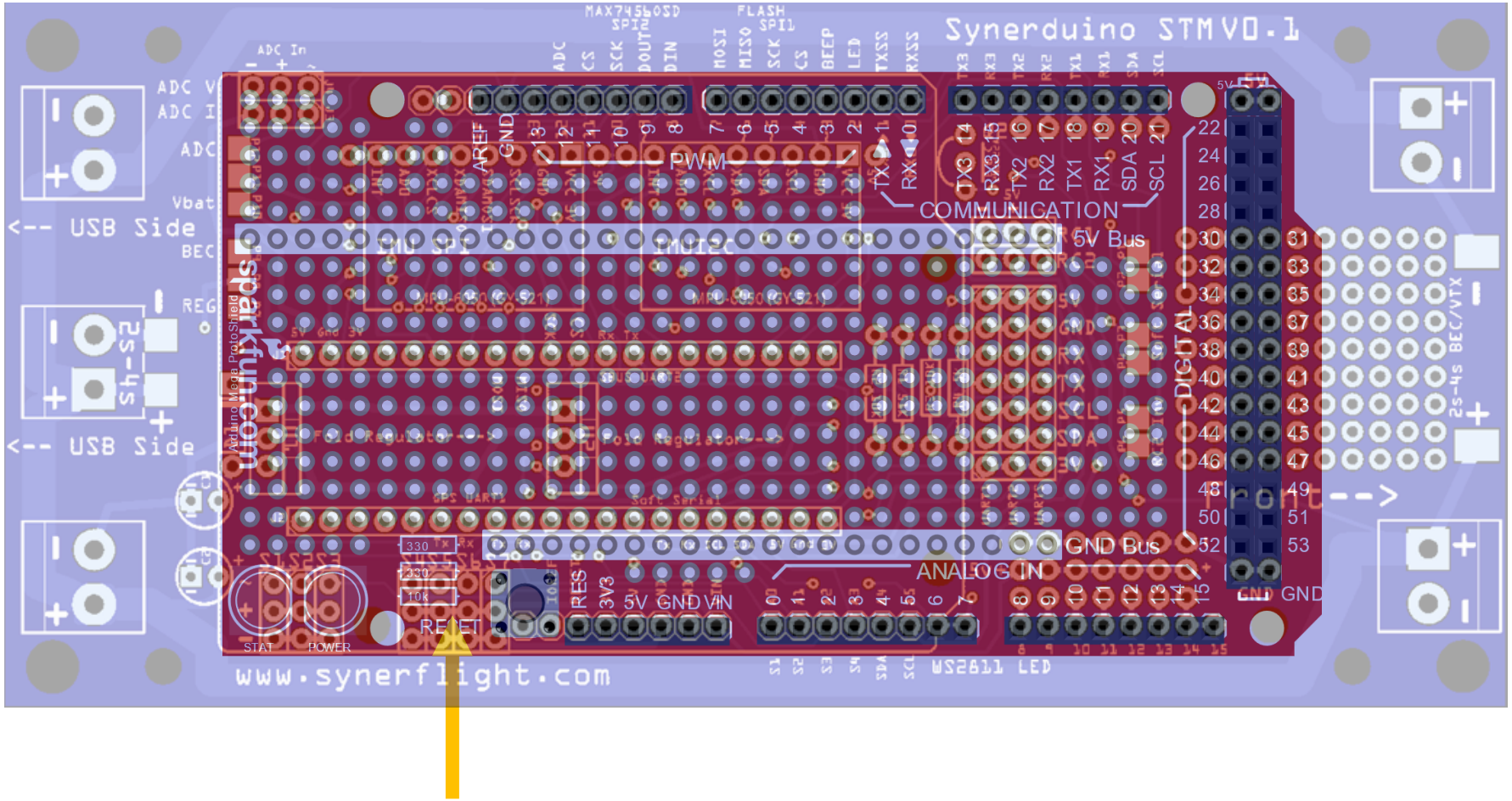


# SYNERDUINO STM and PROTOTYPING BOARDS

Since Synerduino is design as a shield board with an Arduino footprint its self means its compatible with a wide range of other shield prototyping board as well making it easy to fit custom or add on hardware reducing the need of additional wires and connectors

Male Headers are installed on the bottom of the board as required.

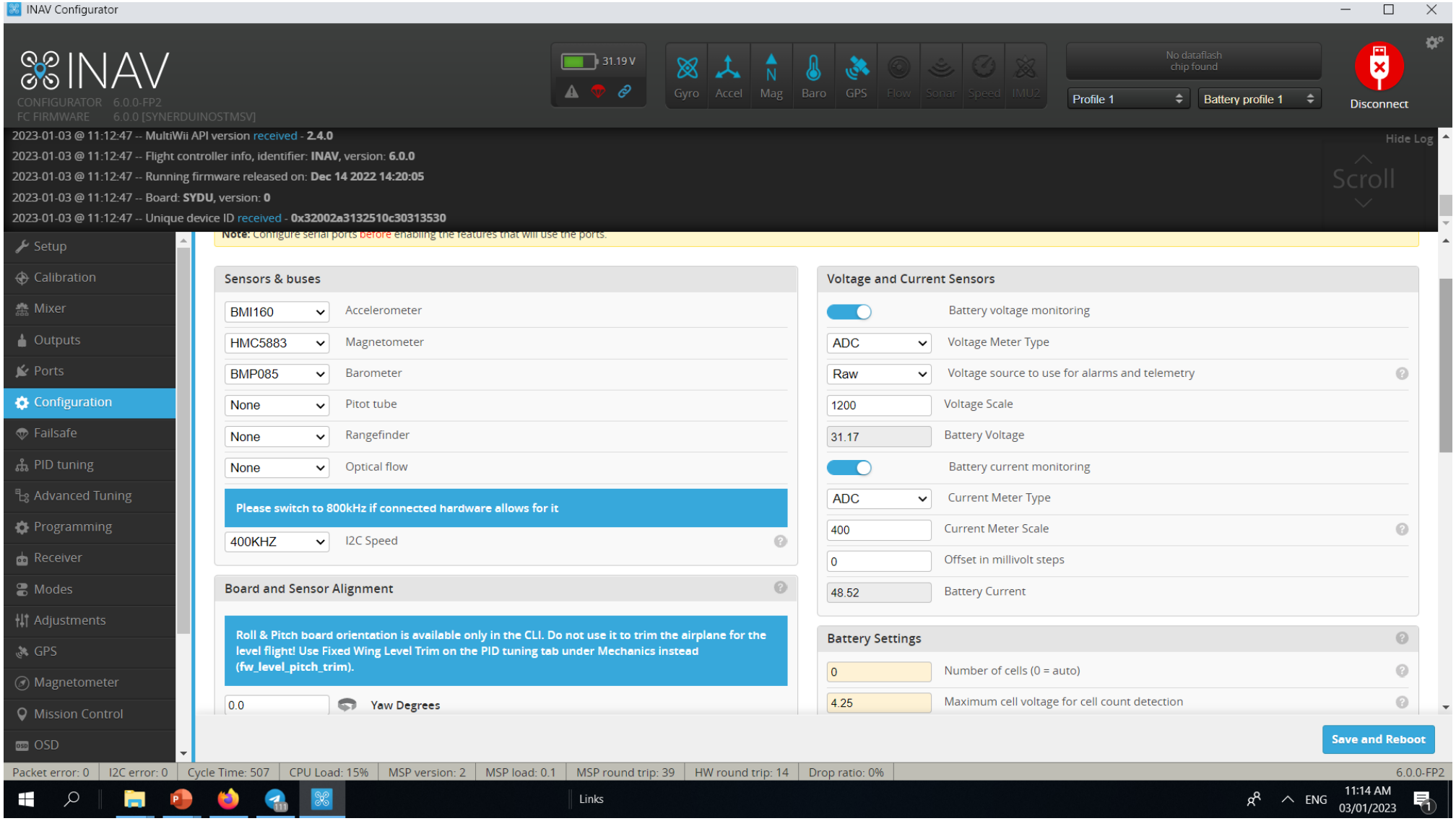



Prototyping Shield are to be place on the under side of the board

# Setting up INAV for ADC and Battery Monitoring

In configuration we have voltage and current sensors . This is the ADC configuration which you can adjust the Voltage and Current Scaling as well as offset adjustments

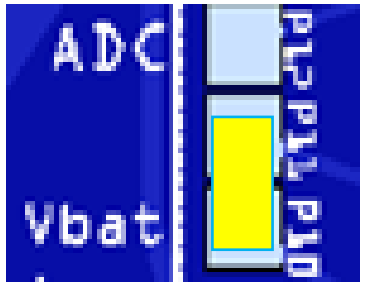
This works for battery monitoring and ADC sensor calibration methods

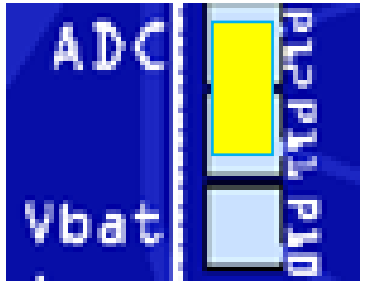


# Setting up INAV for ADC and Battery Monitoring

## Having an Active monitoring

Serves two purpose interchangeably  as ADC we can monitor power loading in two distinct ways




**VBAT**
P11 – P10 Vbat = Provides battery status data of voltage which can function as a form of Battery failsafe or other battery function

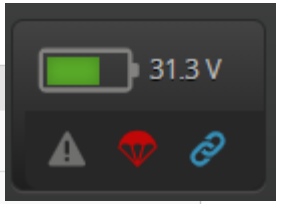
You can Adjust battery settings to the required configuration to match your battery output voltage and Cell count (this will also affect the Battery fail safe mode)

**ADC**
P11- P12 ADC = Provides an option to add External ADC sensors to the Board for Environmental Data Analytics or signaling  application

ADC V = Voltage
ADC I = Amperage

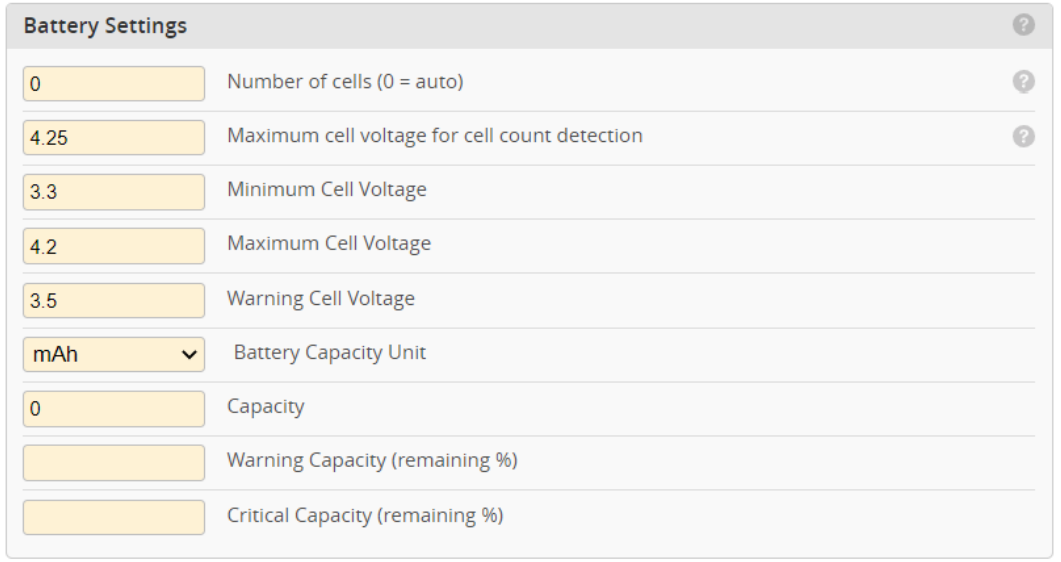
**Sensors needs to be calibrated and Adjusted**

Voltage Scale =  adjust to V ADC input
Current Meter Scale =  adjust to I ADC input
Offser in Millivolt = offset the I ADC output









# Tethered Logging

Tethered logging support works for Telemetry function how ever this tab has to keep active for the duration of the flight for it to work

This can work as a supplement to live data logging

1. You can do an initial mission to monitor the drone prior to switching to Log mode on the 2nd flight

2. Use an OTG cable to hook the USB-C to a companion computer

MSP_RAW_GPS

GPS coordinates

MSP_ANALOG

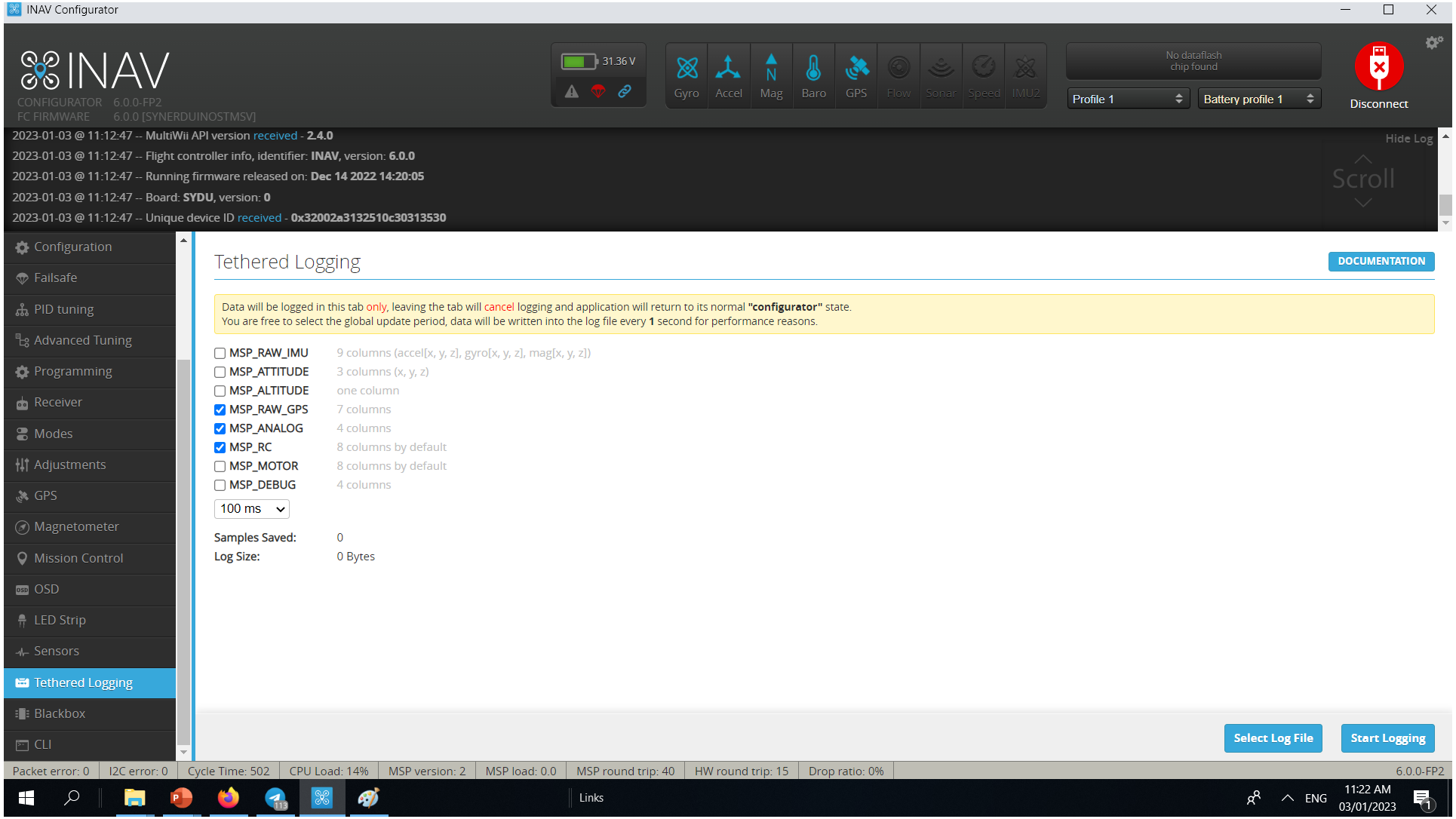
ADC data

MSP_RC

PWM data

MSP_ Motor

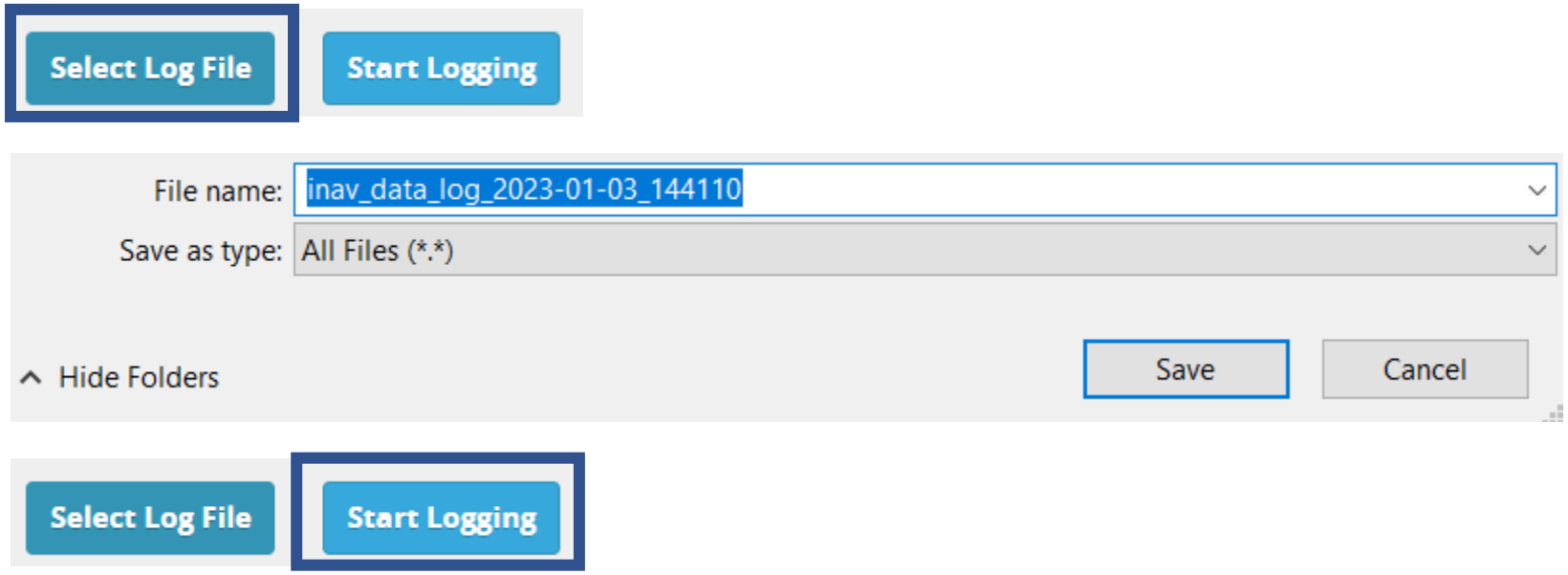
Motor Outputs



# Tethered Logging

Data will be logged in this tab only, leaving the tab will cancel logging and application will return to its normal "configurator" state.
You are free to select the global update period, data will be written into the log file every 1 second for performance reasons.

An file needs to be created in order to save the logs onto it



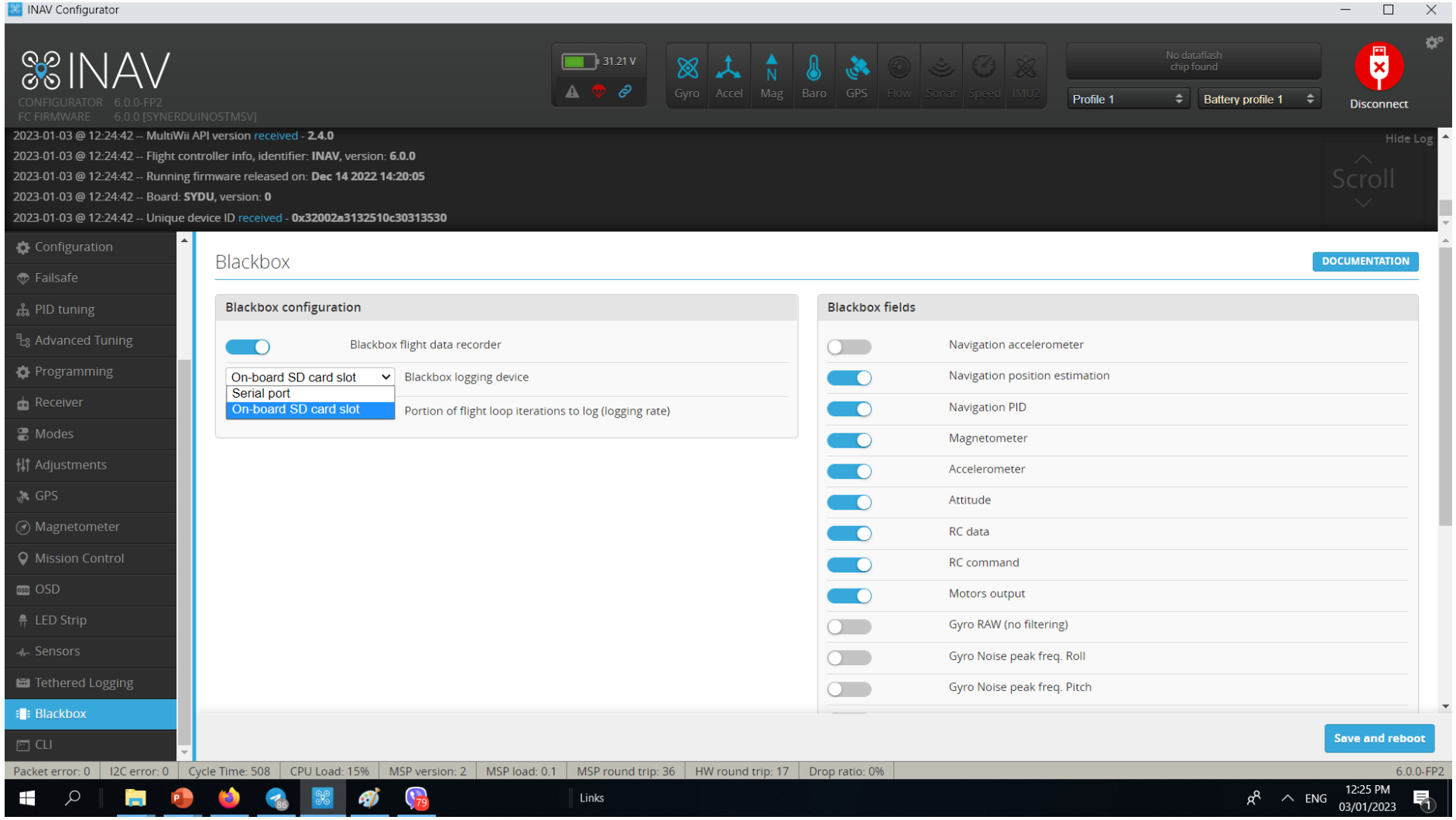
# Black Box

Black Box function support for SD card add on

SD card slot is on SPI2 as indicated on the hardware setup page

The Black Box Field indicate the figures you wish to Log

The SD card can also be extracted for later logging

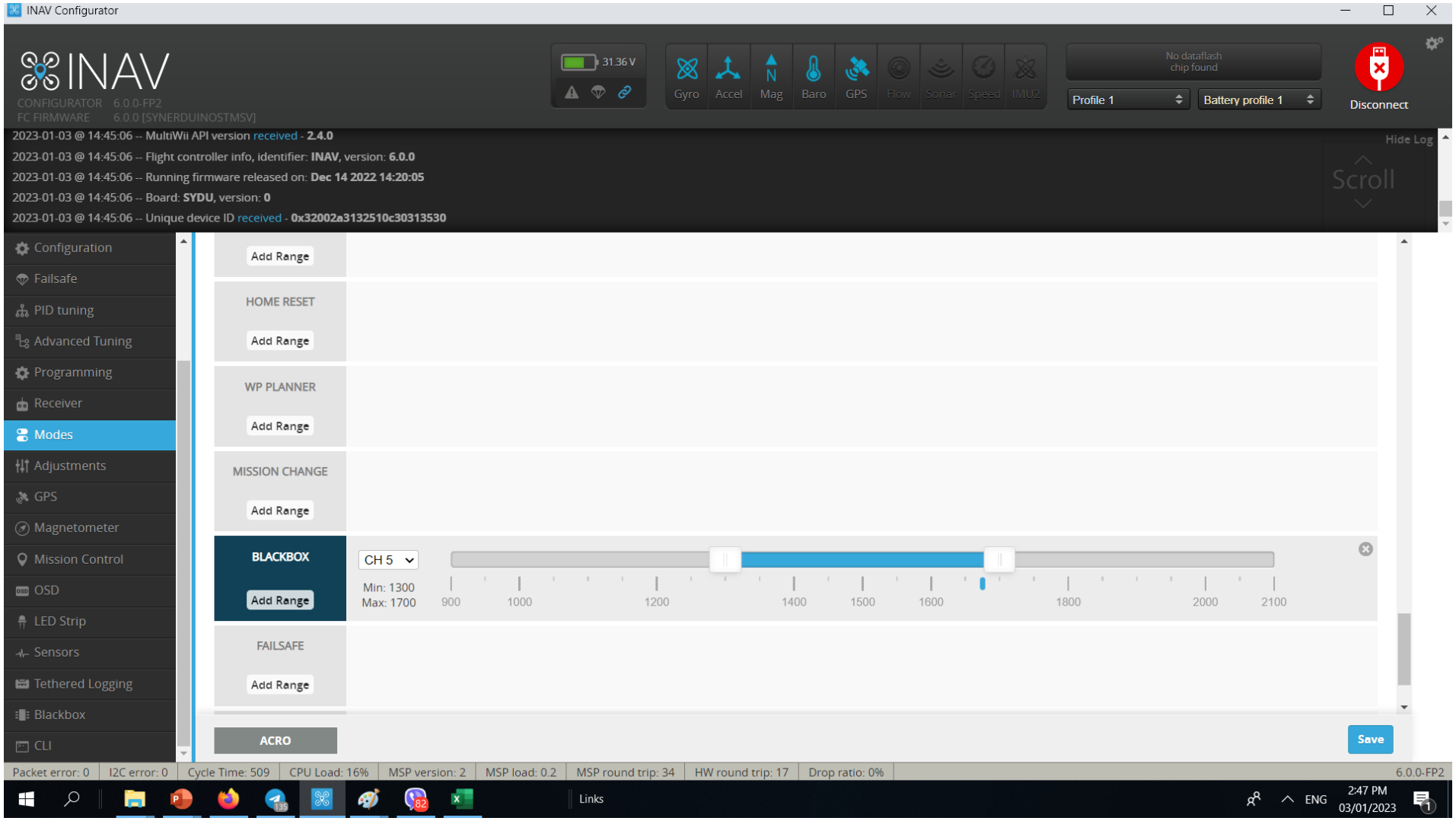


# Black Box

In MODES

The  Black Box function is active in a switch

Every activation of this generates a new file in the SD card

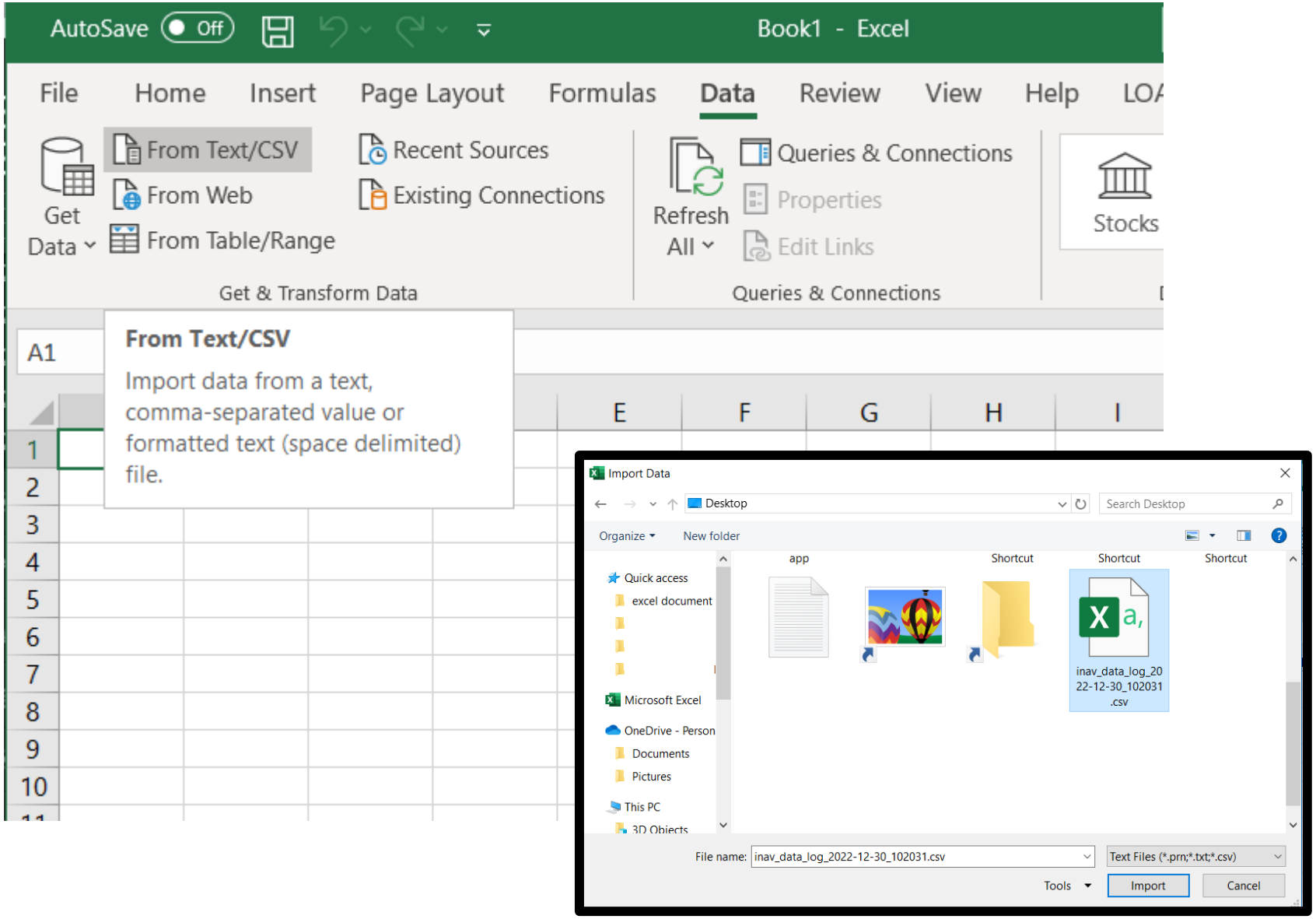


# Exporting to Excel

Excel

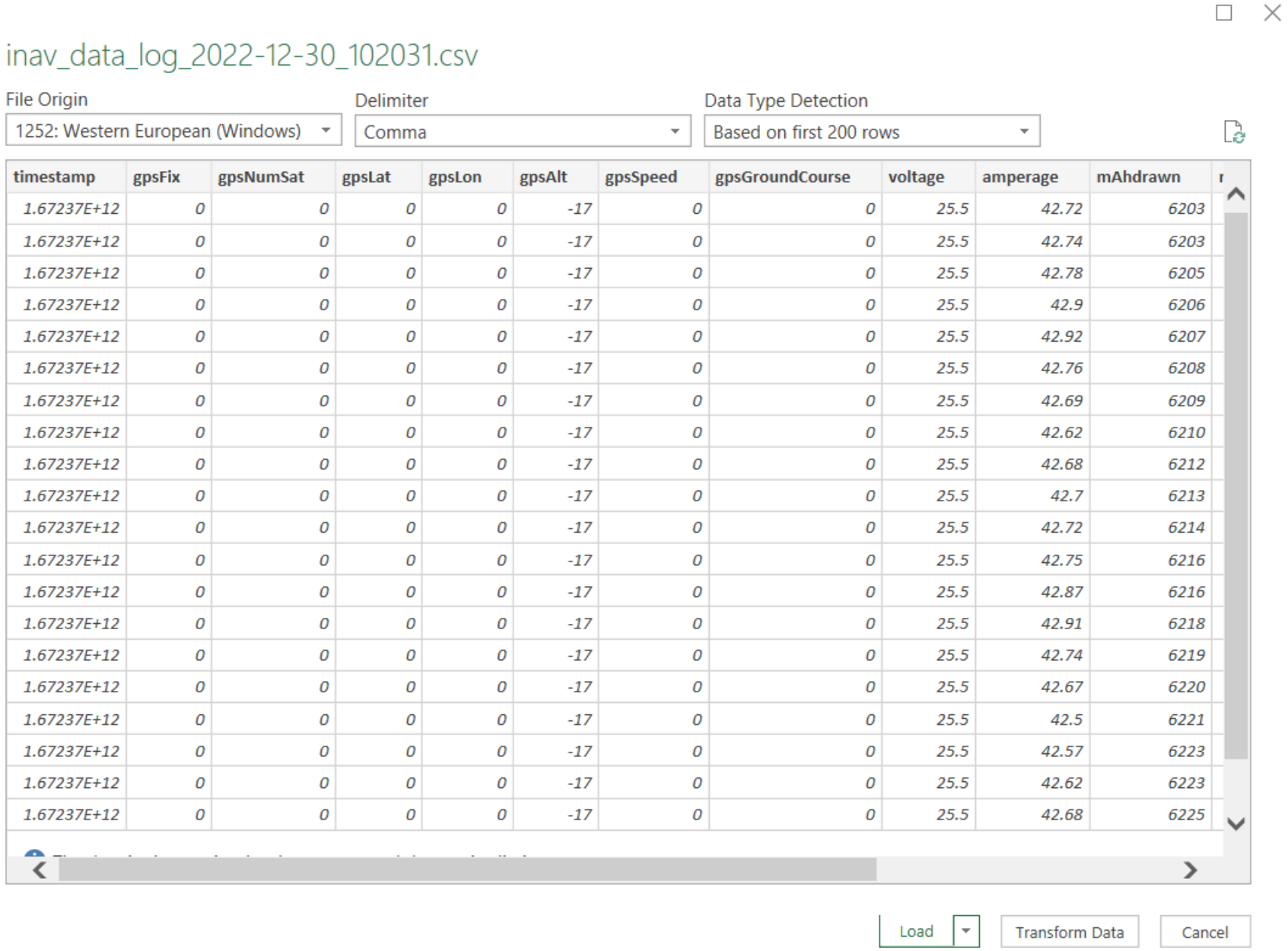
In the Data Tab go to Text/CSV

And open the Inav_data file as CSV (this can be rename as well if extension doesn't exist)



# Exporting to Excel

Once your happy with the results click the Load button to load the data into excel

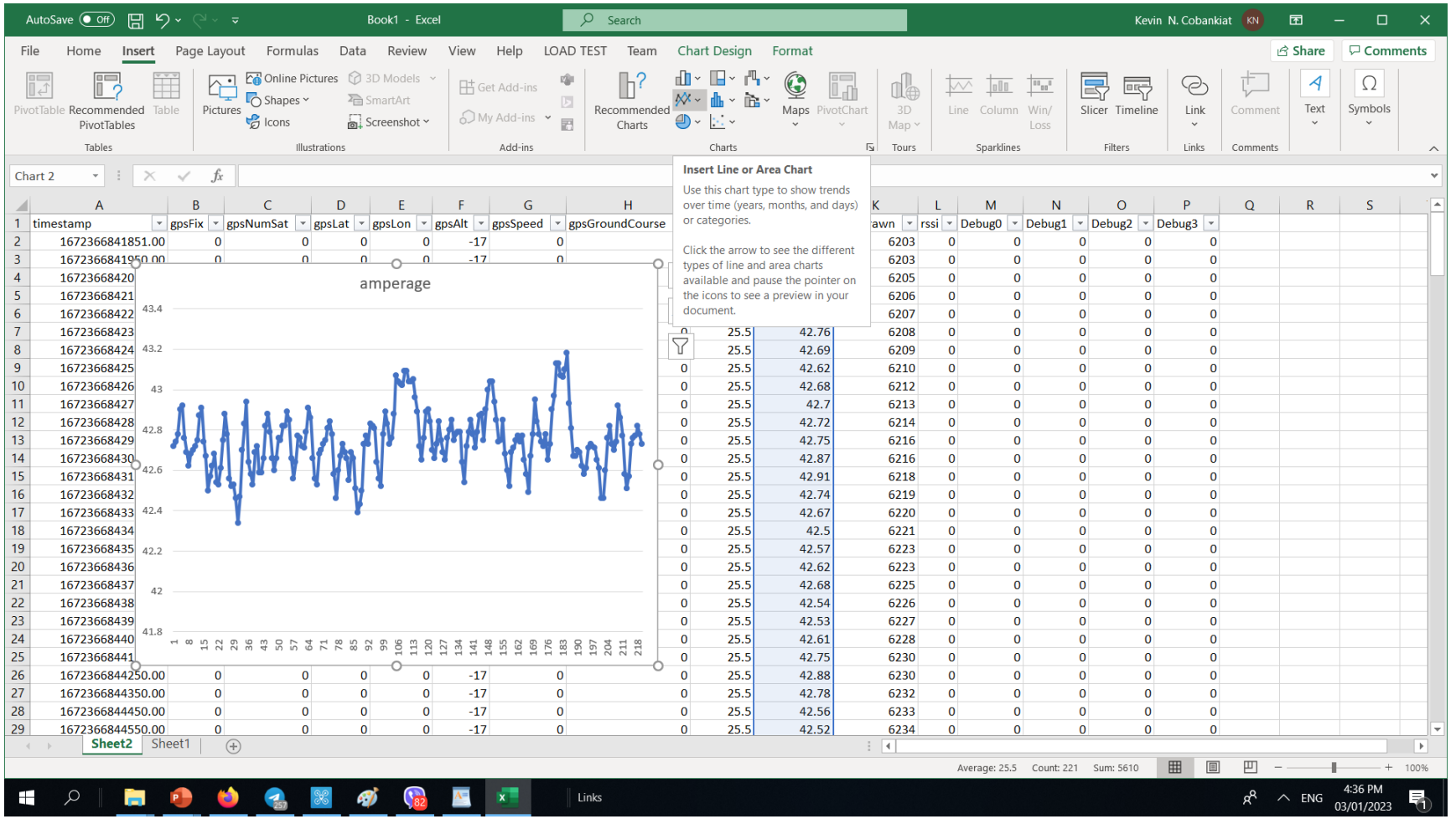



| timestamp | gpsFix | gpsNumSat | gpsLat | gpsLon | gpsAlt | gpsSpeed | gpsGroundCourse | voltage | amperage | mAhdrawn |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.72 | 6203 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.74 | 6203 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.78 | 6205 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.9 | 6206 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.92 | 6207 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.76 | 6208 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.69 | 6209 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.62 | 6210 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.68 | 6212 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.7 | 6213 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.72 | 6214 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.75 | 6216 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.87 | 6216 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.91 | 6218 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.74 | 6219 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.67 | 6220 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.5 | 6221 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.57 | 6223 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.62 | 6223 |
| 1.67237E+12 | 0 | 0 | 0 | 0 | -17 | 0 | 0 | 25.5 | 42.68 | 6225 |

# Exporting to Excel

From the Insert Tab Charts and Graphs can be created for Data Analytics off the Drone.

Feel free to configure both the sensor ,chart and drone system to suite your data requirements



# Thank you

| E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|
| 1500 | 1500 | 24 | 878 | 1206779240 | 152540312 | 10000000 | 12 |
| 1500 | 1500 | 24 | 894 | 1206779500 | 152540410 | 10000000 | 1 |
| 1500 | 1500 | 25 | 894 | 1206779676 | 152540477 | 10000000 | 120 |
| 1500 | 1500 | 25 | 888 | 1206779940 | 152540581 | 10000000 | 12 |
| 1500 | 1500 | 26 | 775 | 1206781444 | 152541934 | 10000000 | 120 |
| 1500 | 1500 | 26 | 775 | 1206781385 | 152541977 | 10000000 | 120 |