

Quick Build Guide

Synerduino STM

VERSIONS: F405, F411, H743

For more Information:
www.synerflight.com



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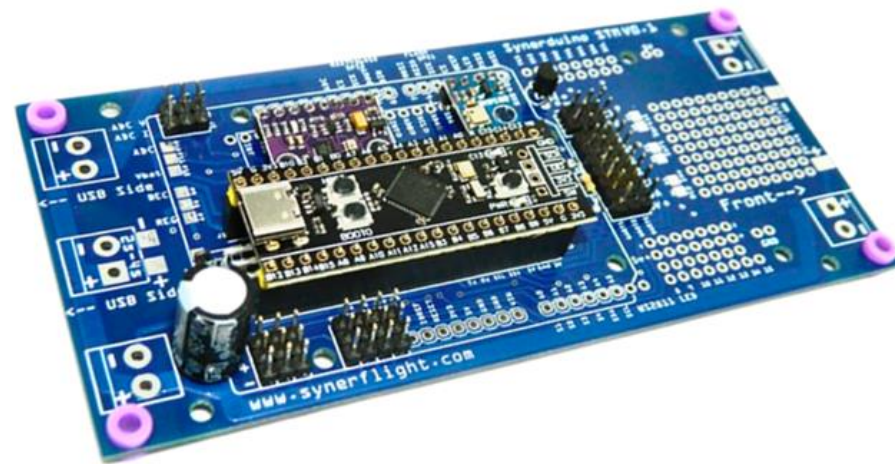
5 PRE-FLIGHT

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STM VERSIONS THROUGHOUT THE YEARS

F411



**SYNERDUINO
STM F411**

1

F405



**SYNERDUINO
STM F405**

2

H743



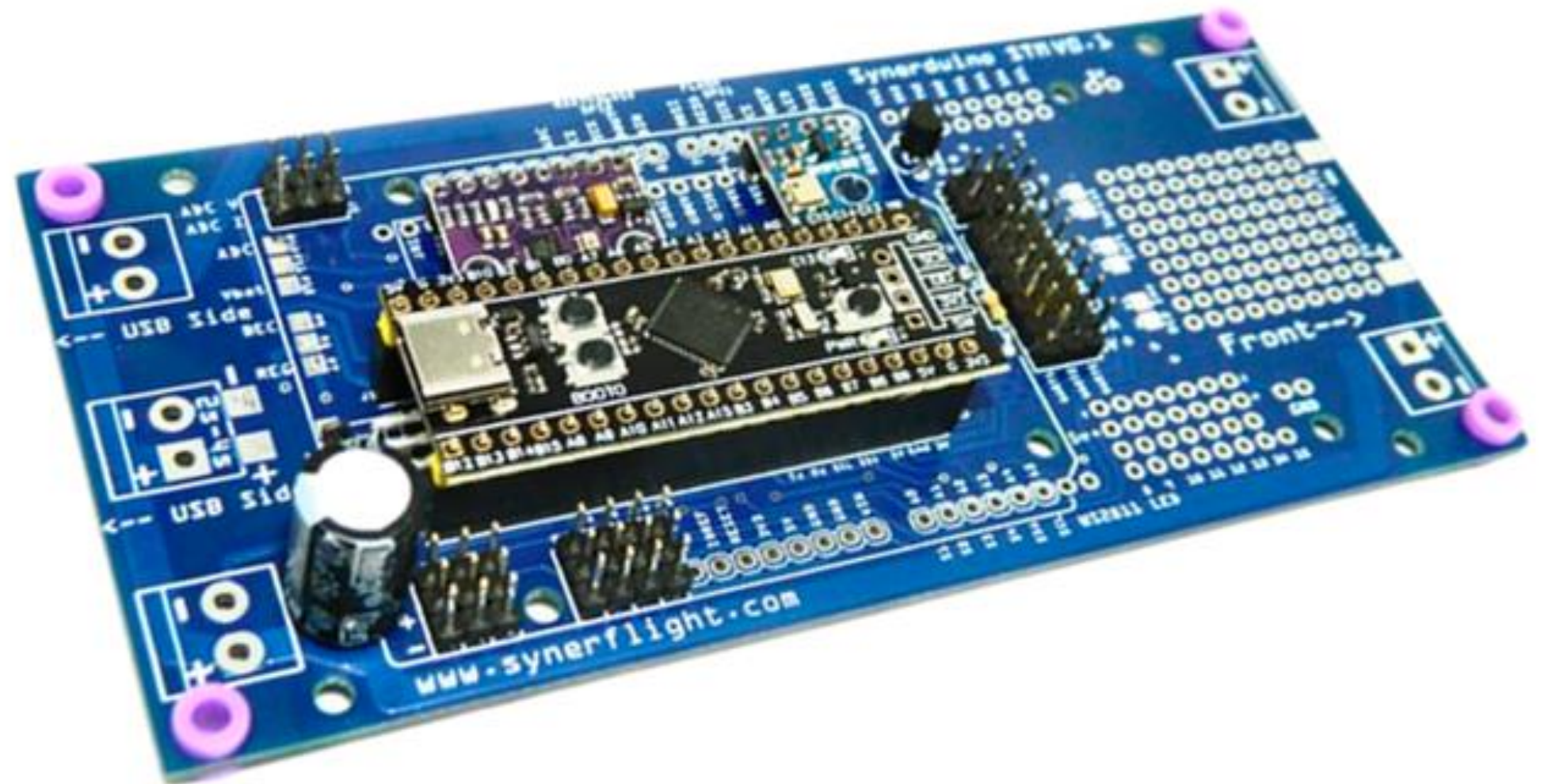
**SYNERDUINO
STM H743**

3

INTRODUCTION

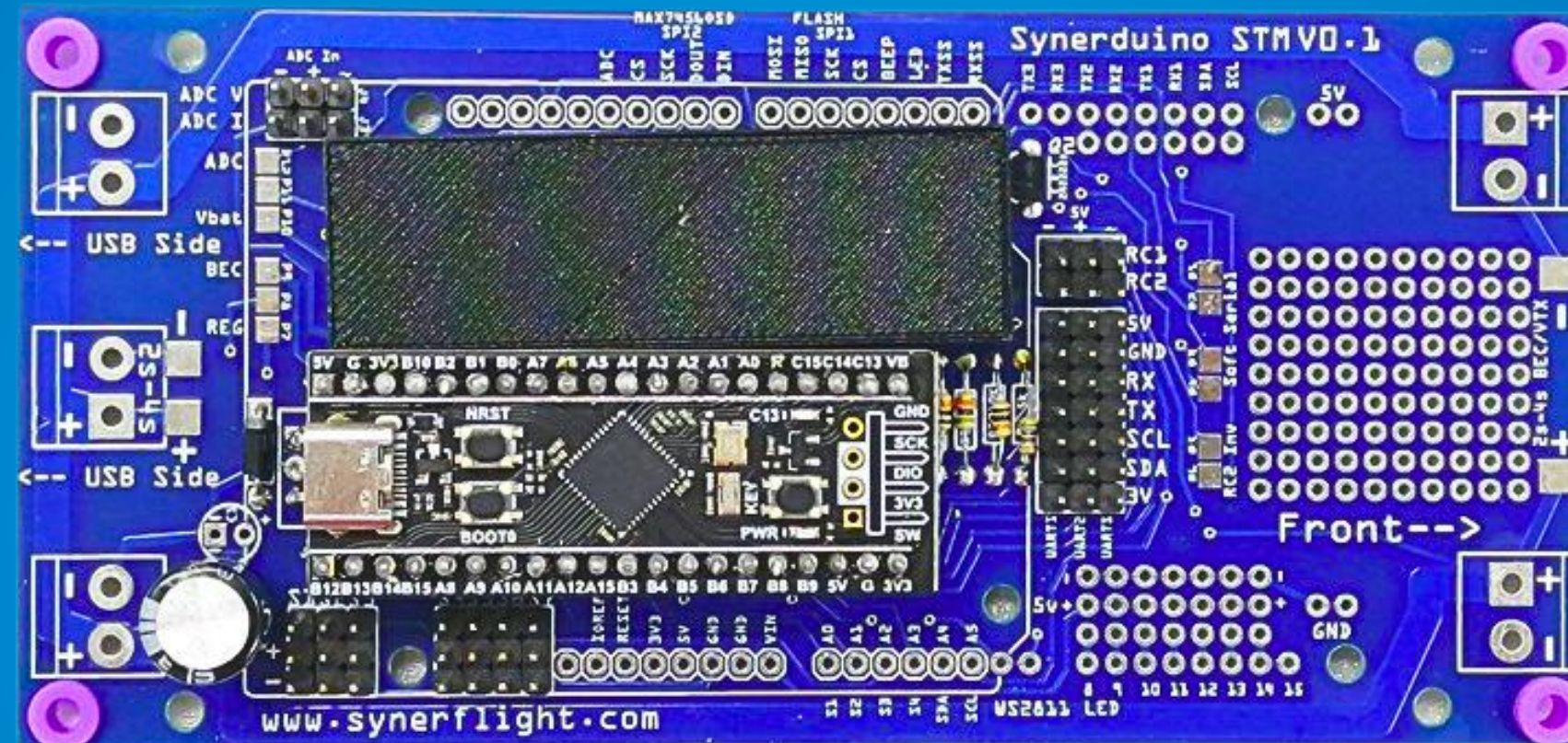
The Synerduino STM is a 32-bit version of the Synerduino shield family, designed to enhance the performance of your drone applications, making it an ideal tool for research developers in robotics and drone technology.

More details will be shared as they become available. The Synerduino STM shield is built on an STM32-based platform, offering advanced functionality for your drone projects while maintaining the classic Arduino form factor, ensuring compatibility with existing Arduino prototyping boards.



SYNERDUINO STM F411

ABOUT THE BOARD



Power

- WS2811 LED Power 5V 1.5A
- Serial Power Rail 5V 1.5A
- PWM Power Rail Regulated – 5V 1.5A
- Drone Power Input Voltage – 12.6V (3S) or 16.8V (4S)
- Power Distribution Lines – 12.6V-25.2V 80A

Properties

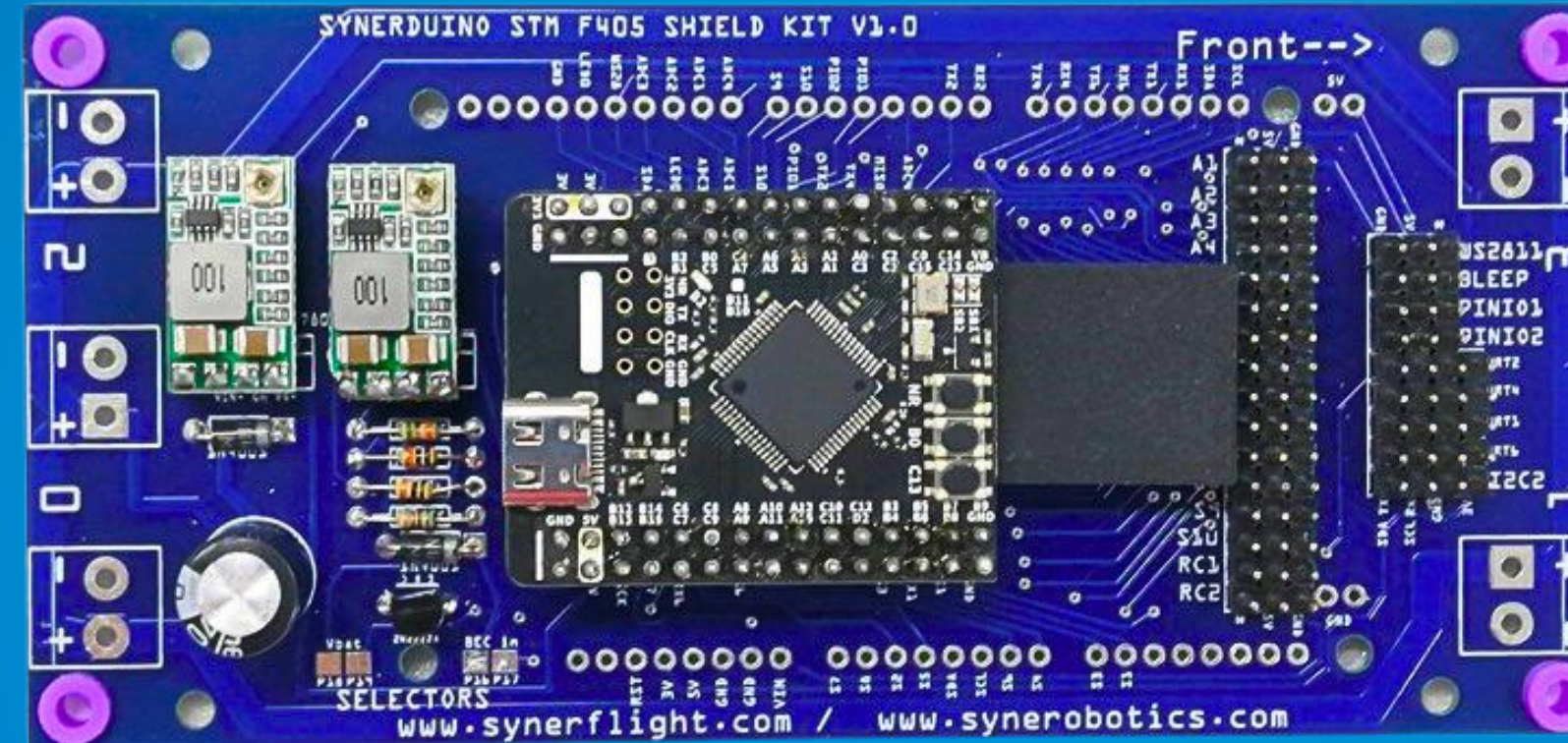
- Dimensions: 128 x 62 x 28 mm LWH / (V1.1)135mm x 62mm x 28mm
- Weight: 46.1g
- Arduino Prototyping Shield Footprint
- 4 Solder Pad set s for 4 ESCs and Motors
- DIY section for component addons
- 7 3-Pin PWM Headers S1-S7
- 2 3-Pin RC Headers w/ Sbus inverter
- 3 7-Pin Serial Headers
- 2 3pin ADC in (Voltage and Current)
- 2 RC Serial input Pin
- WS2811 LED output

Compatibility

- GYRO/ACC: BMI160 (Align CW 0)
- MAG: HMC5883/QMC5883 (Align CW 180)
- BARO: BMP180/280

SYNERDUINO STM F405

ABOUT THE BOARD



Power

- WS2811 LED Power 5V 3A
- Serial Power Rail – 3.3V 3A
- PWM Power Rail Regulated – 5V 3A
- Drone Power Input Voltage – 12.6V (3S) or 25.2V (6S)
- Power Distribution Lines – 12.6V-25.2V 80A

Properties

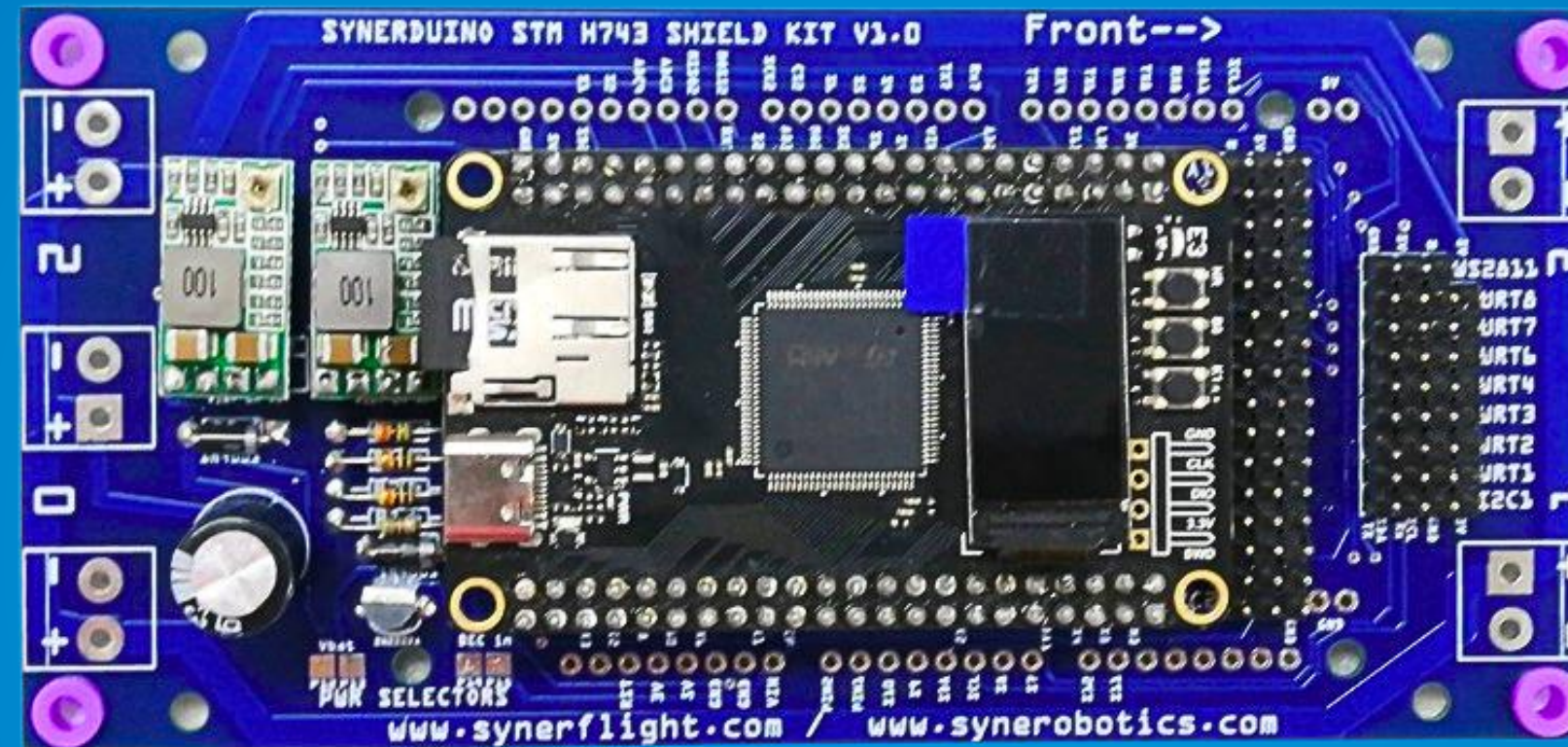
- Dimensions: 128 x 62 x 28 mm LWH / (V1.1)135mm x 62mm x 28mm
- Weight: 46.1g
- Arduino Prototyping Shield Footprint
- 4 Solder Pad set s for 4 ESCs and Motors
- DIY section for component addons
- 10 3-Pin PWM Headers S1-S10
- 2 3-Pin RC Headers w/ Sbus inverter
- 4 4-Pin Serial Headers
- 4 3pin ADC in (Voltage and Current)
- 2 RC Serial input Pin
- 1 WS2811 LED output
- 2 PIN IO (User Action)

Compatibility

- GYRO/ACC: BMI160 (Align CW 0)
- MAG: HMC5883/QMC5883 (Align CW 180)
- BARO: BMP180/280

SYNERDUINO STM H743

ABOUT THE BOARD



Power

- WS2811 LED Power 5V 3A
- Serial Power Rail – 3.3V 3A
- PWM Power Rail Regulated – 5V 3A
- Drone Power Input Voltage – 12.6V (3S) or 25.2V (6S)
- Power Distribution Lines – 12.6V-25.2V 80A
- Note: 8S – 12S Use External UBEC 5V to the main power input and external ESC Power distribution

Properties

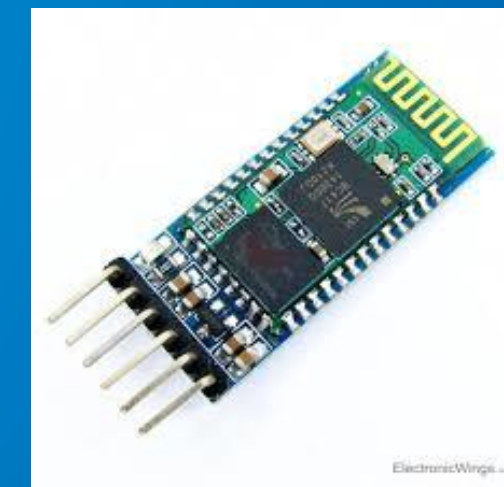
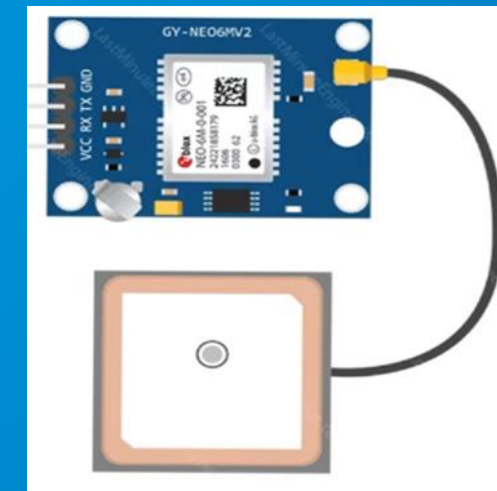
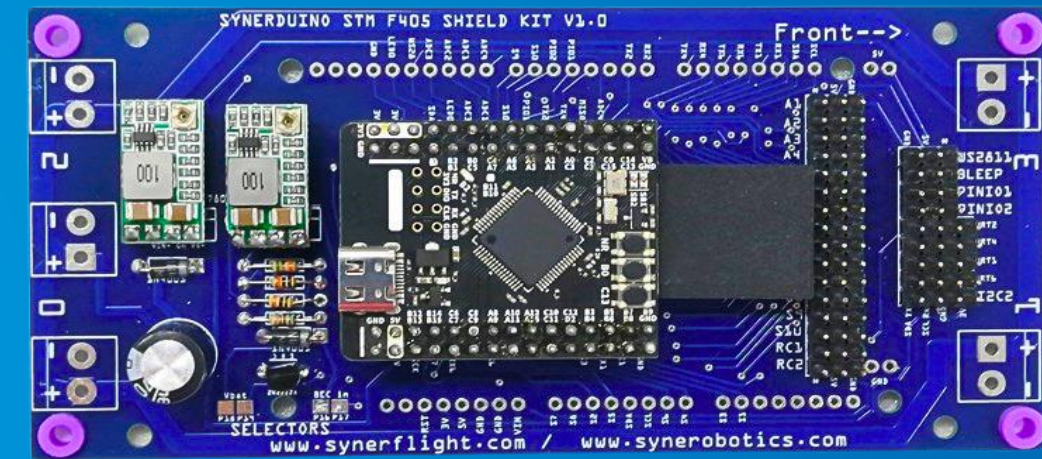
- Dimensions: 128 x 62 x 28 mm LWH / (V1.1)135mm x 62mm x 28mm
- Weight: 46.1g
- Arduino Prototyping Shield Footprint
- 4 Solder Pad sets for 4 ESCs and Motors
- DIY section for component addons
- 10 3-Pin PWM Headers S1-S10
- 2 Aux PWM Headers S11-S12
- 2 3-Pin RC Headers w/ Sbus inverter
- 7 4-Pin Serial Headers
- 4 3pin ADC in (Voltage and Current)
- 2 RC Serial input Pin
- 1 WS2811 LED output
- 2 Pin IO (User Action)

Compatibility

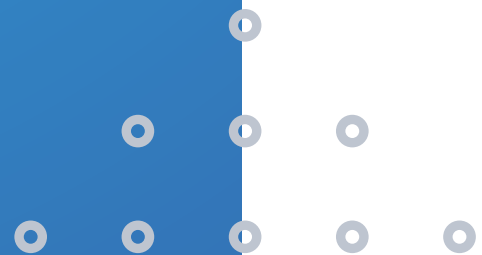
- GYRO/ACC: BMI160 (Align CW 0)
- MAG: HMC5883/QMC5883 (Align CW 180)
- BARO: BMP180/280

SYNERDUINO KIT COMPONENTS

Drone Kit + Synerduino Board



ASSEMBLY



TOOLS AND MATERIALS



PLIERS

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TAPES

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SOLDERING SET

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HEX DRIVER SET

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CUTTER

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ZIP TIES

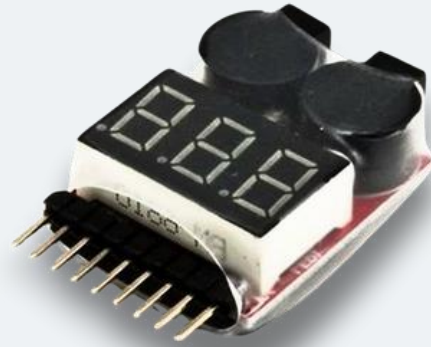
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TOOLS AND MATERIALS



LI-PO BATTERY

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BATTERY ALARM CHECKER

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LI-PO BATTERY CHARGER

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PVC GLUE

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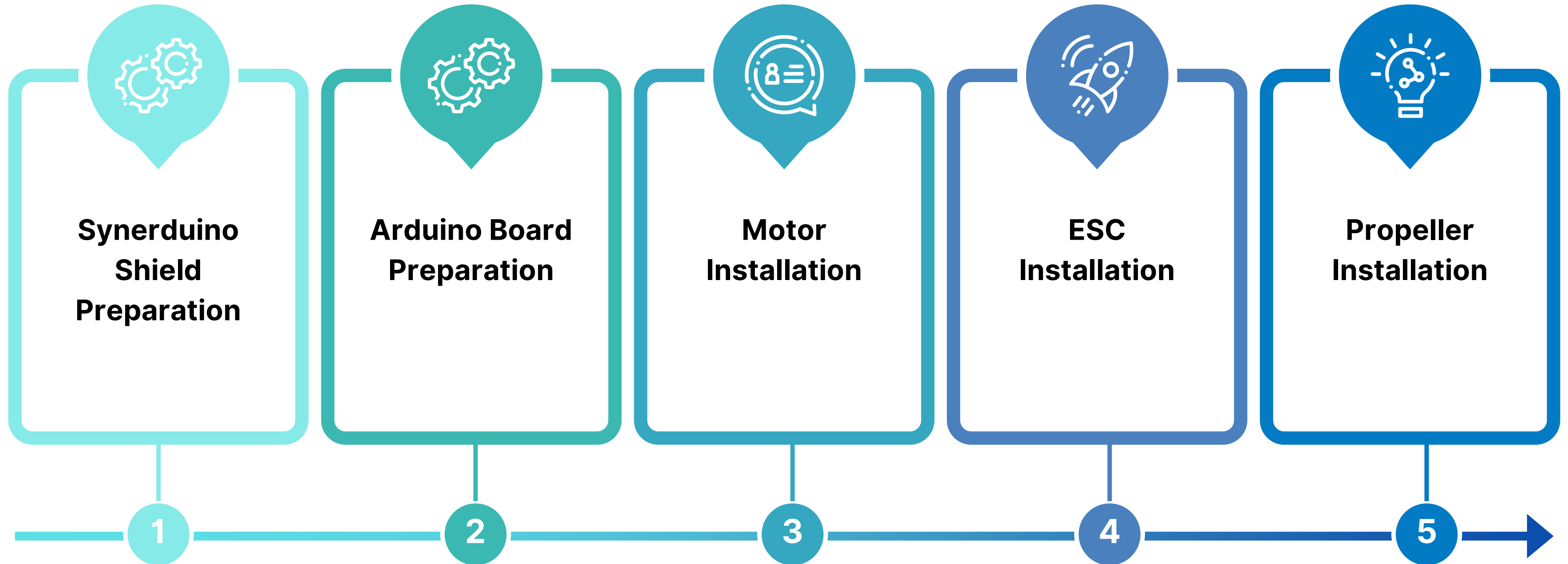


THREAD LOCKER PURPLE

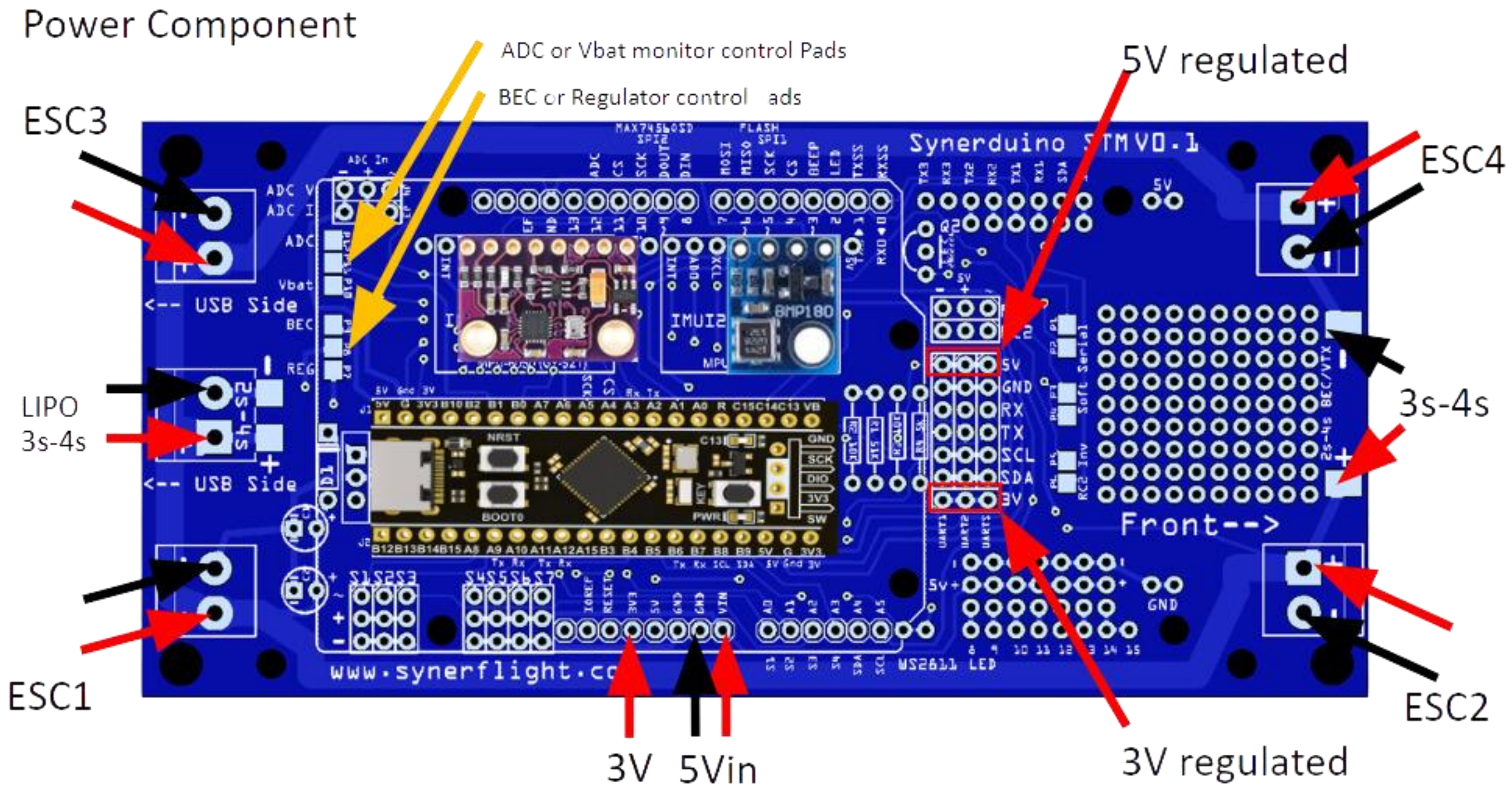
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ASSEMBLING PROCESS

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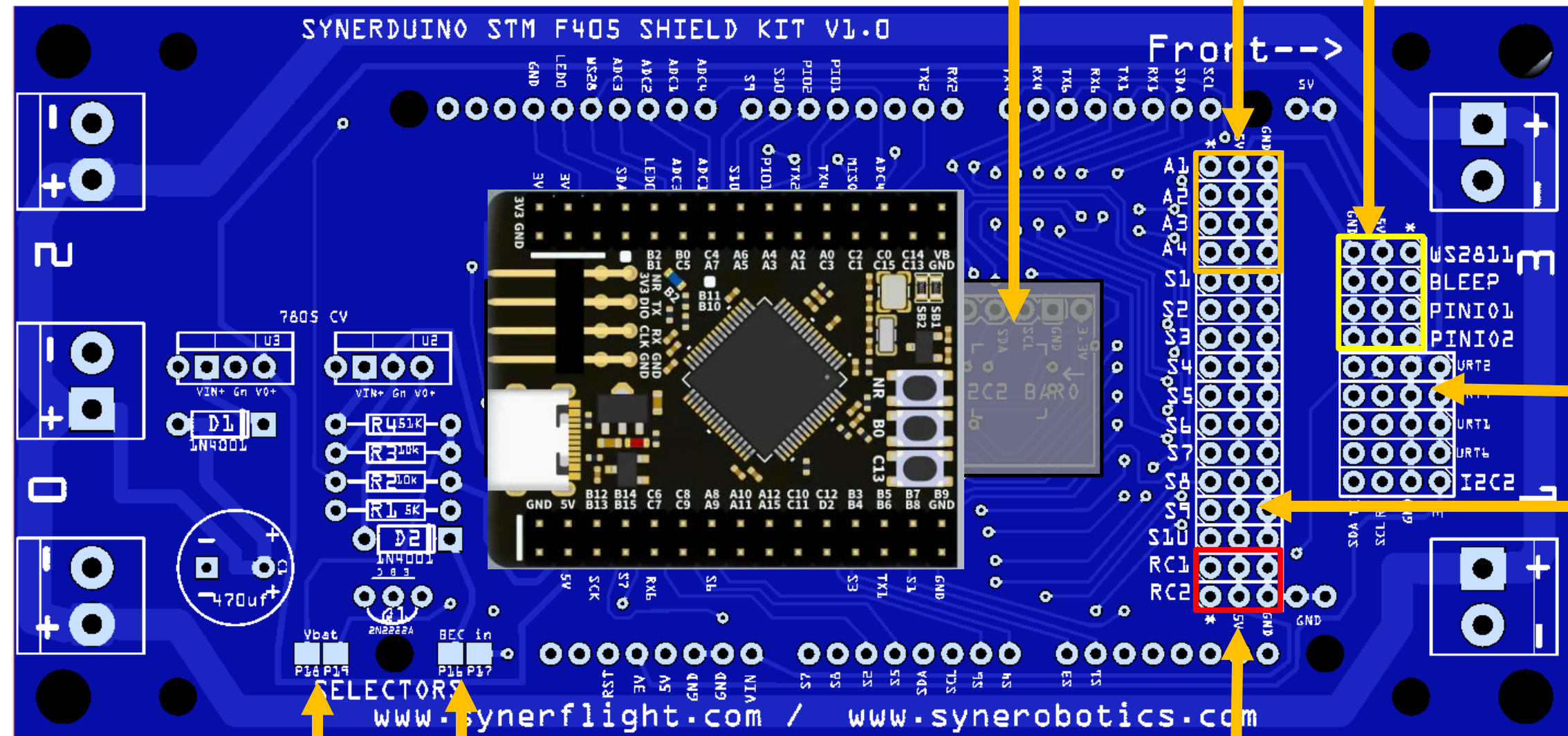
SYNERDUINO STM F411 SHIELD



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

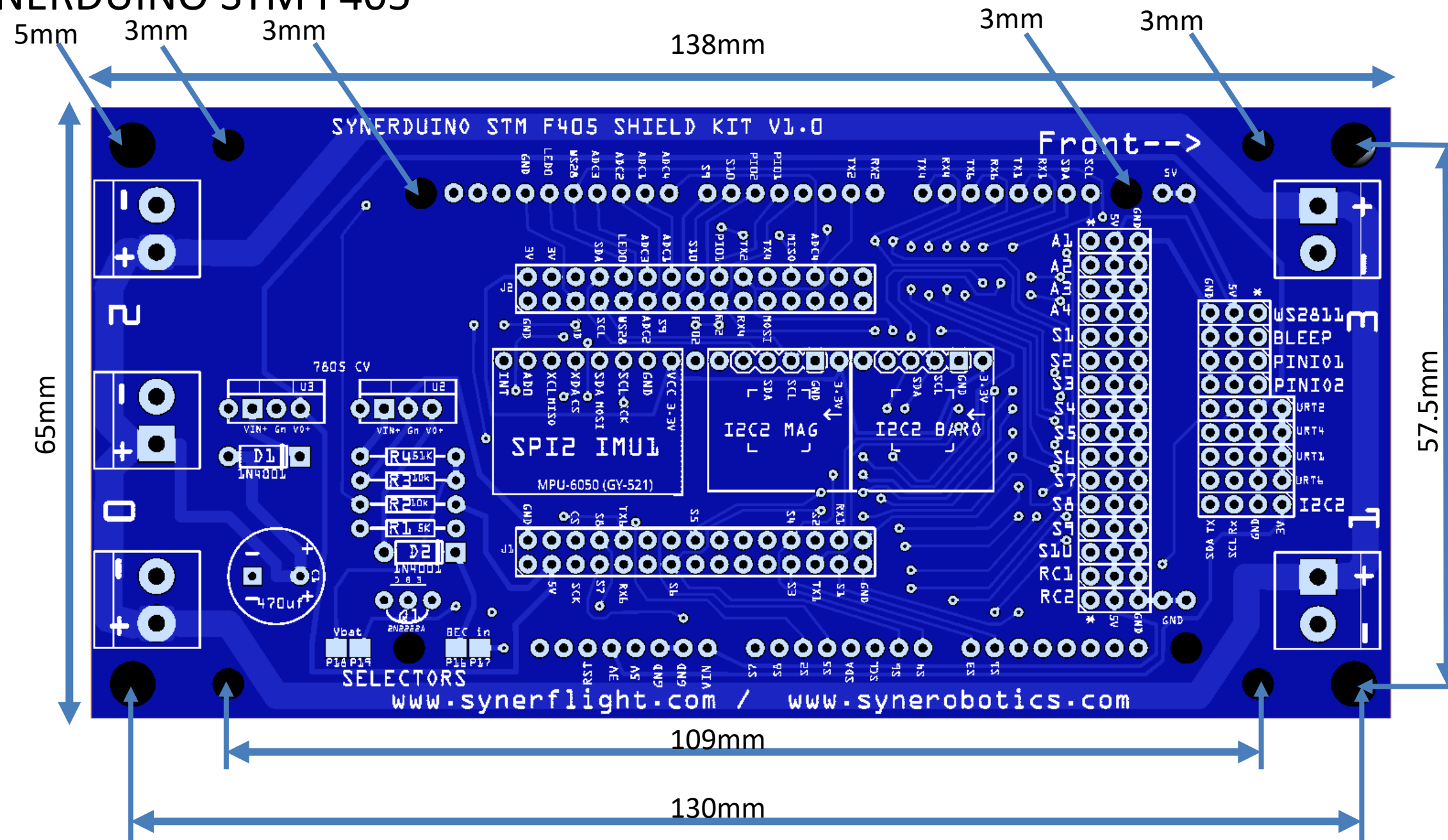
UBEC /Regulator Selection Pads

RC1 & RC2

ADC and Battery Monitoring

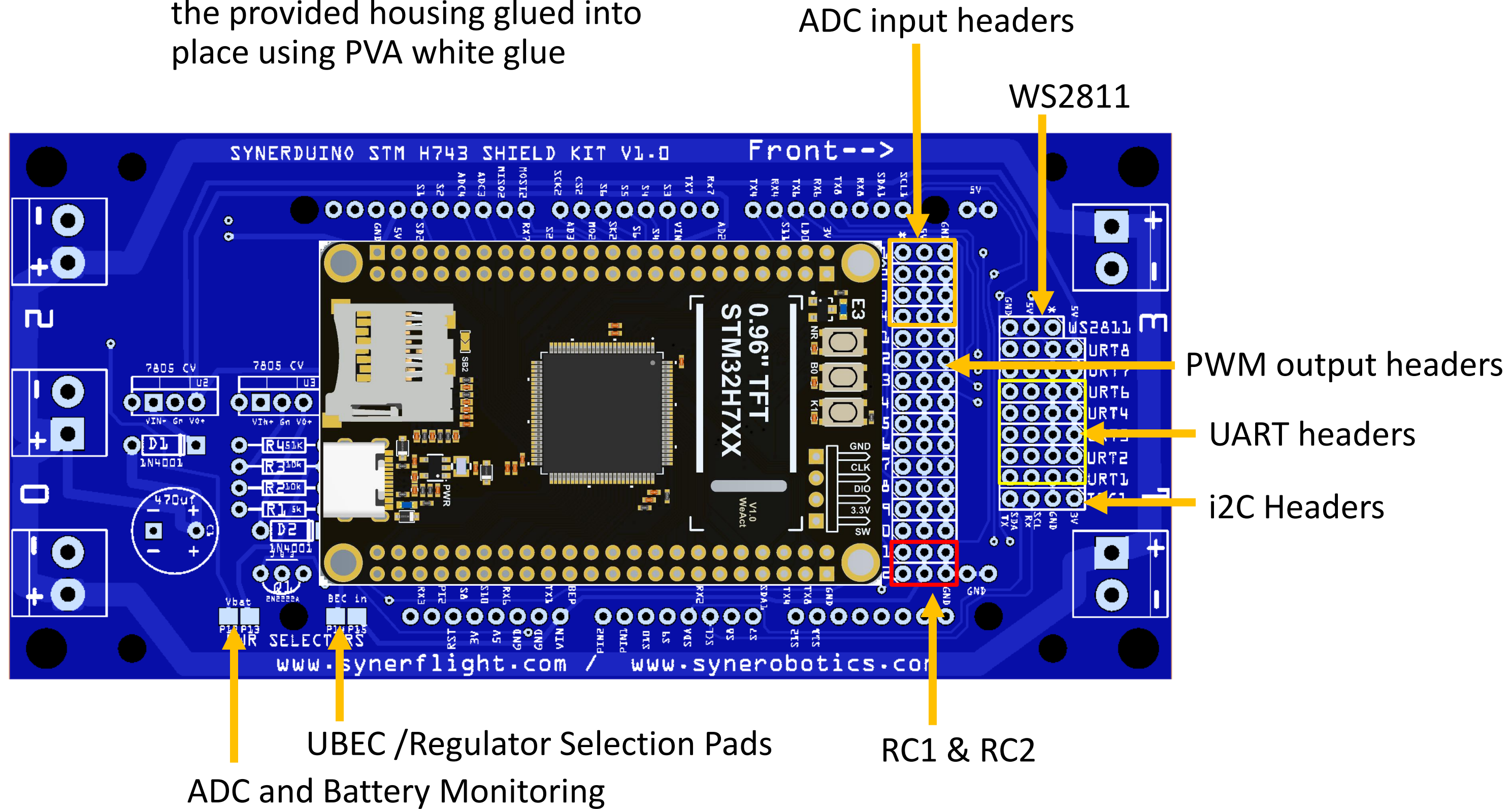
SYNERDUINO STM F405 SHIELD

SYNERDUINO STM F405

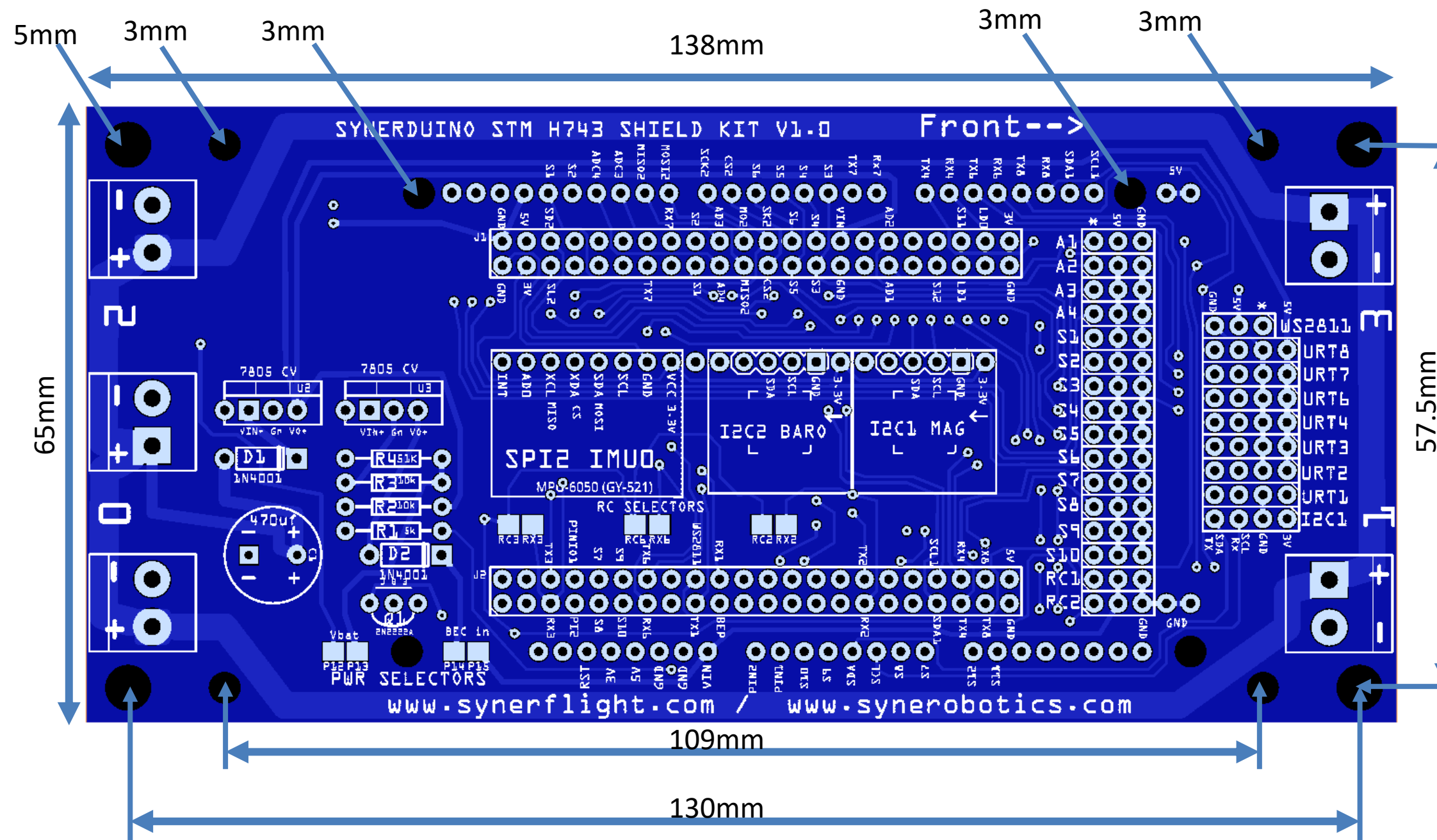


SYNERDUINO STM H743 SHIELD

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



SYNERDUINO STM H743 SHIELD



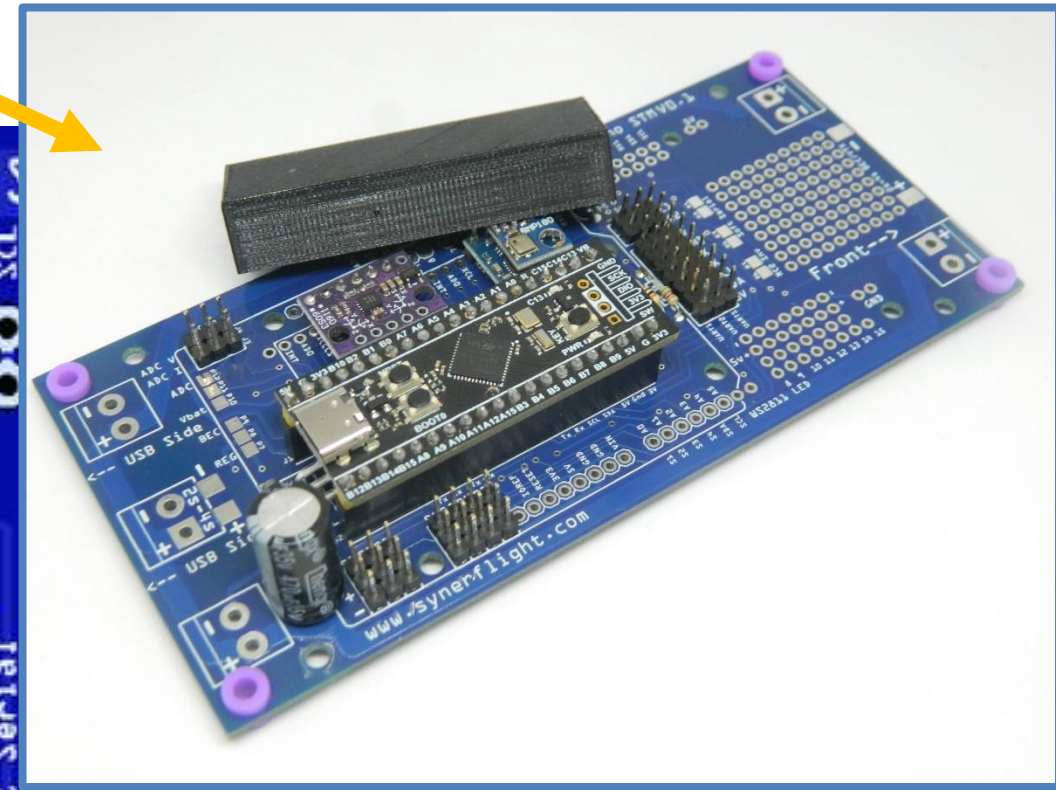
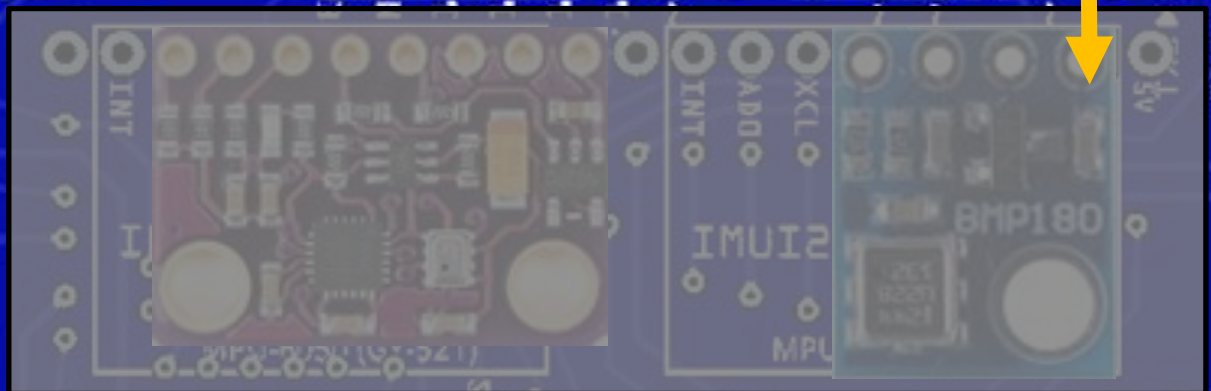
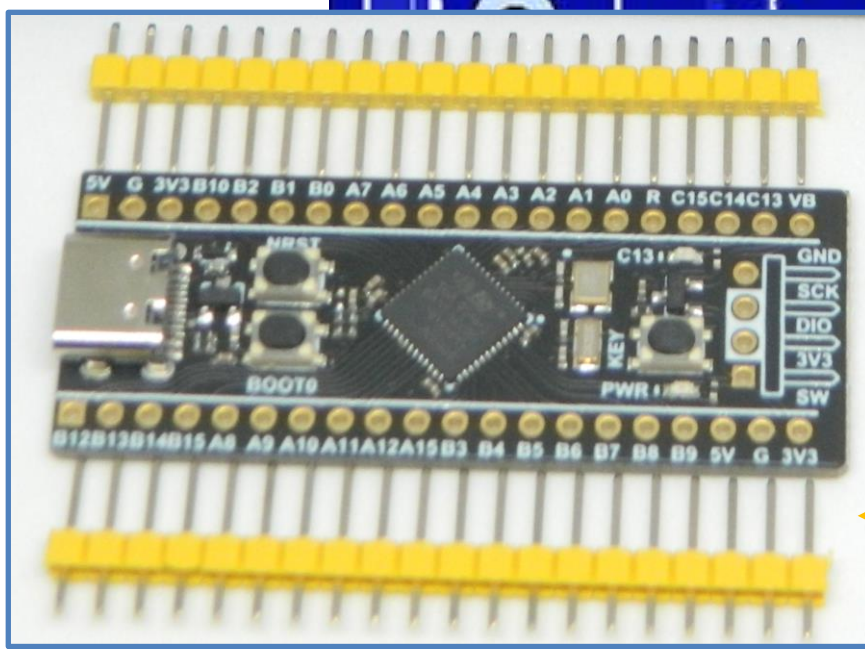
Board Preparations

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

ADC and Battery Monitoring

UBEC /Regulator Selection Pads

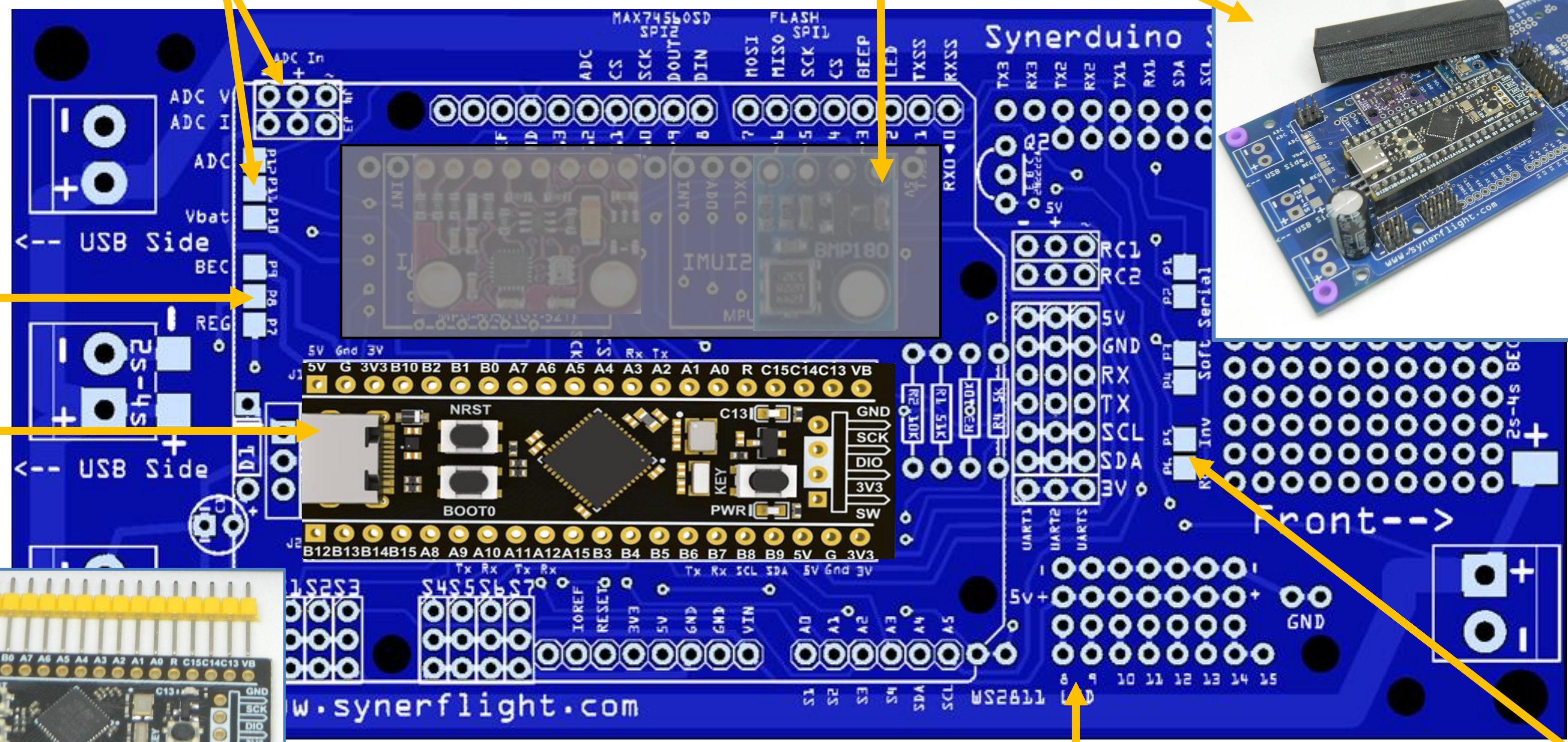
USB facing this side



Pins have to be solder on before installation

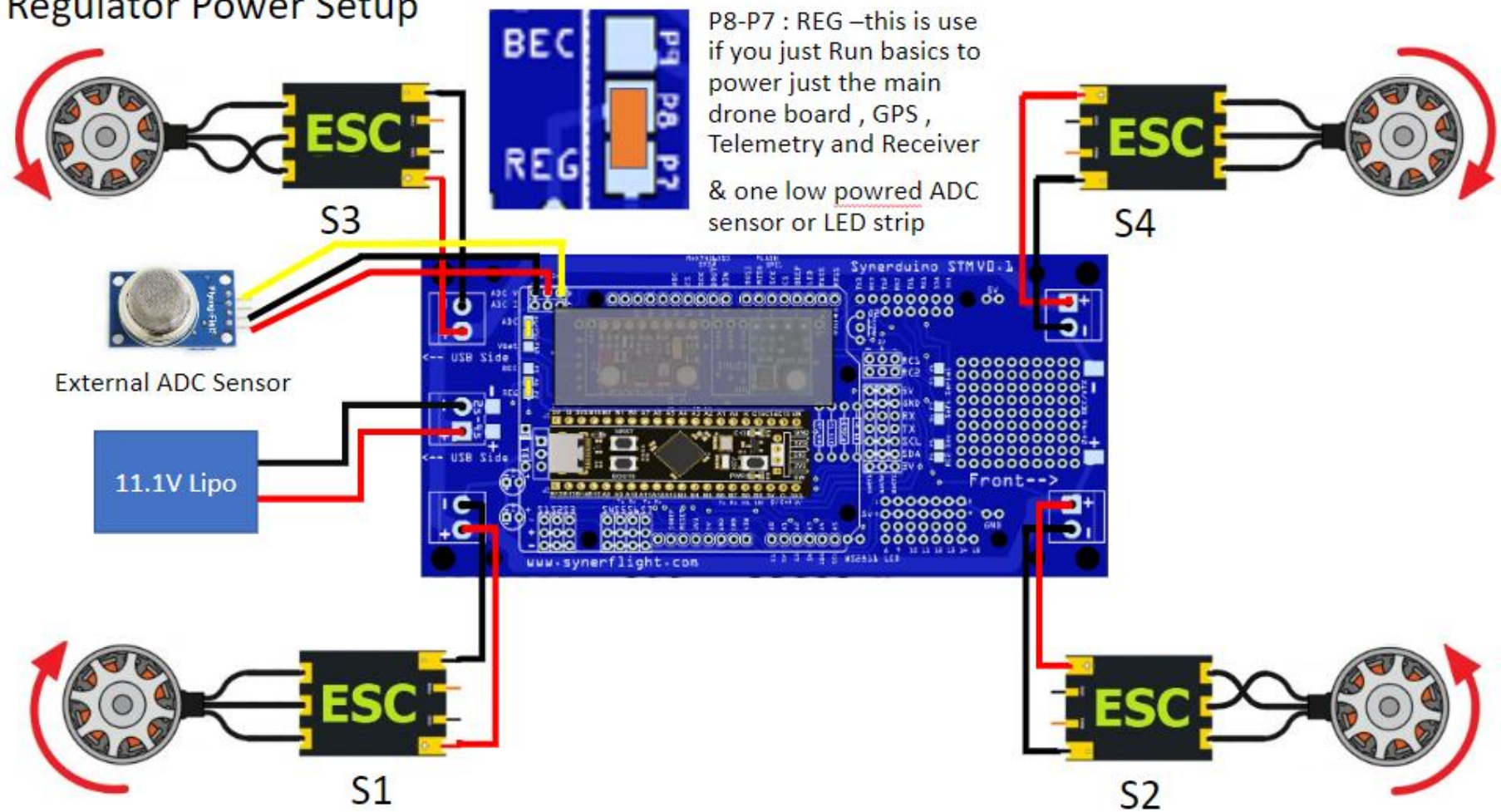
8-9 WS2811 LED out

RC2 inverted Sbus signal For those using PWMto SBUS converter

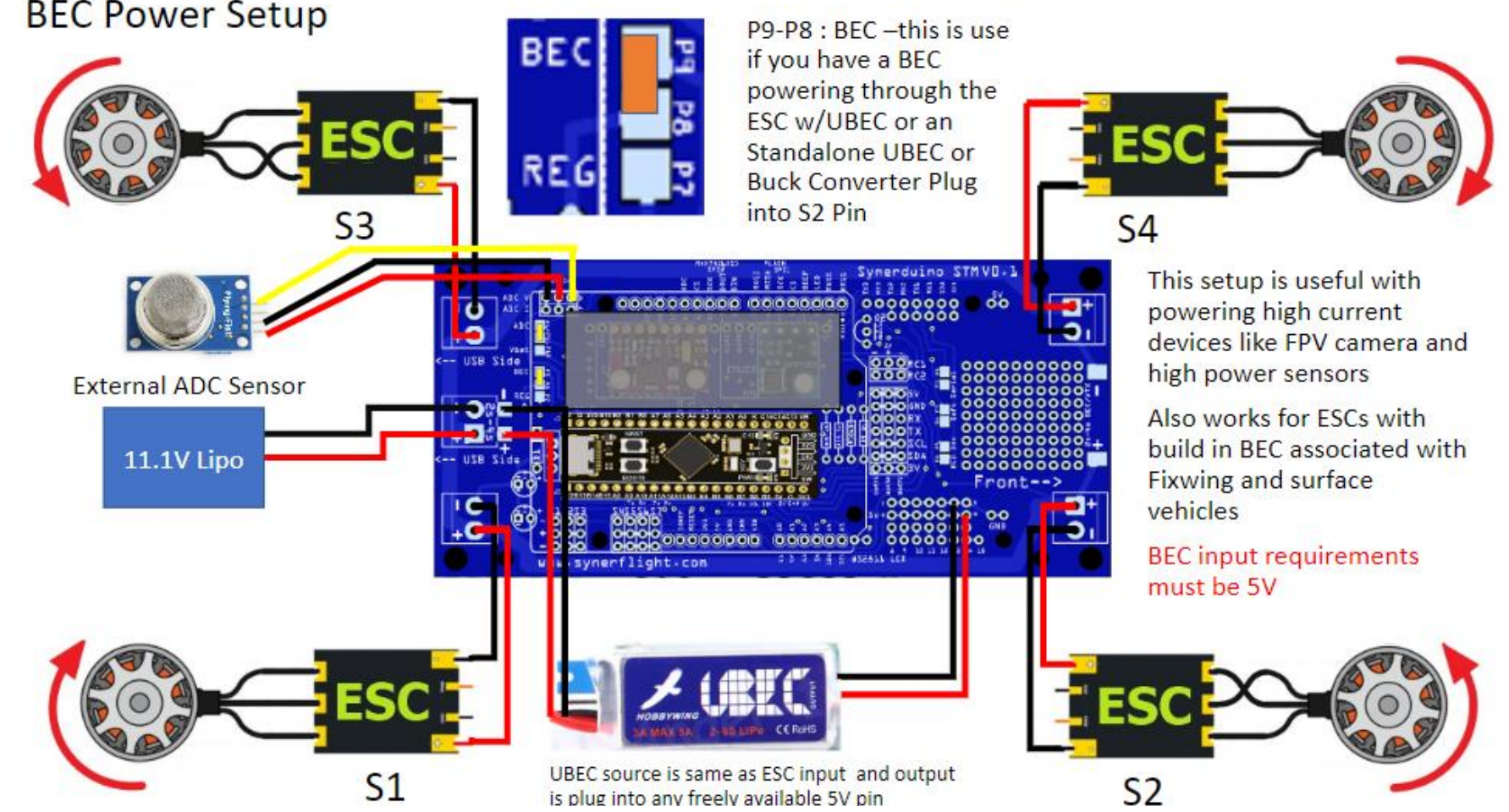


F411 POWER LAYOUT

Regulator Power Setup



BEC Power Setup



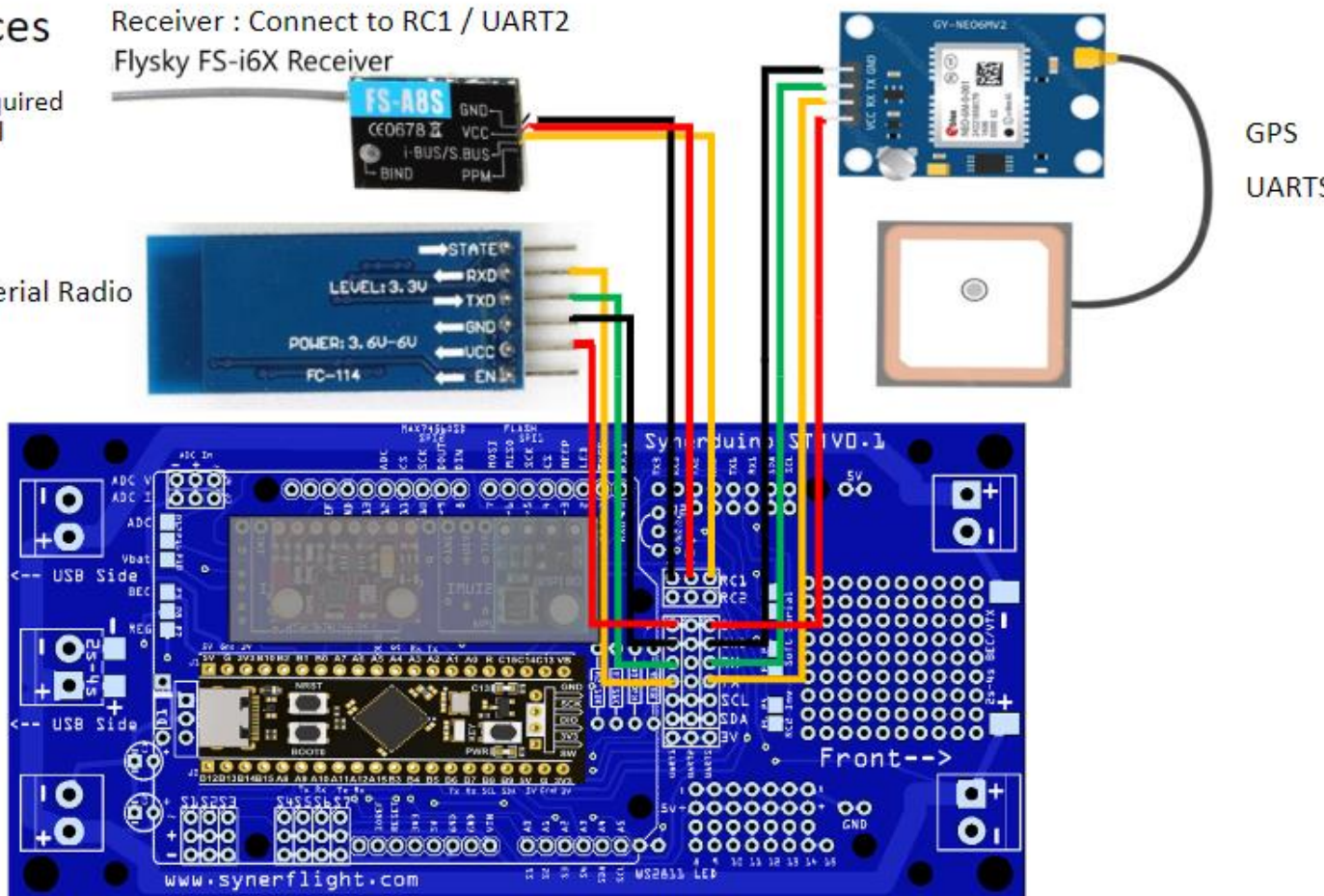
F411 RC RECEIVER & UARTS

UART Serial Devices

AS if INAV5 and INAV6 its Required Receiver supports SBUS Serial

Receiver : Connect to RC1 / UART2
Flysky FS-i6X Receiver

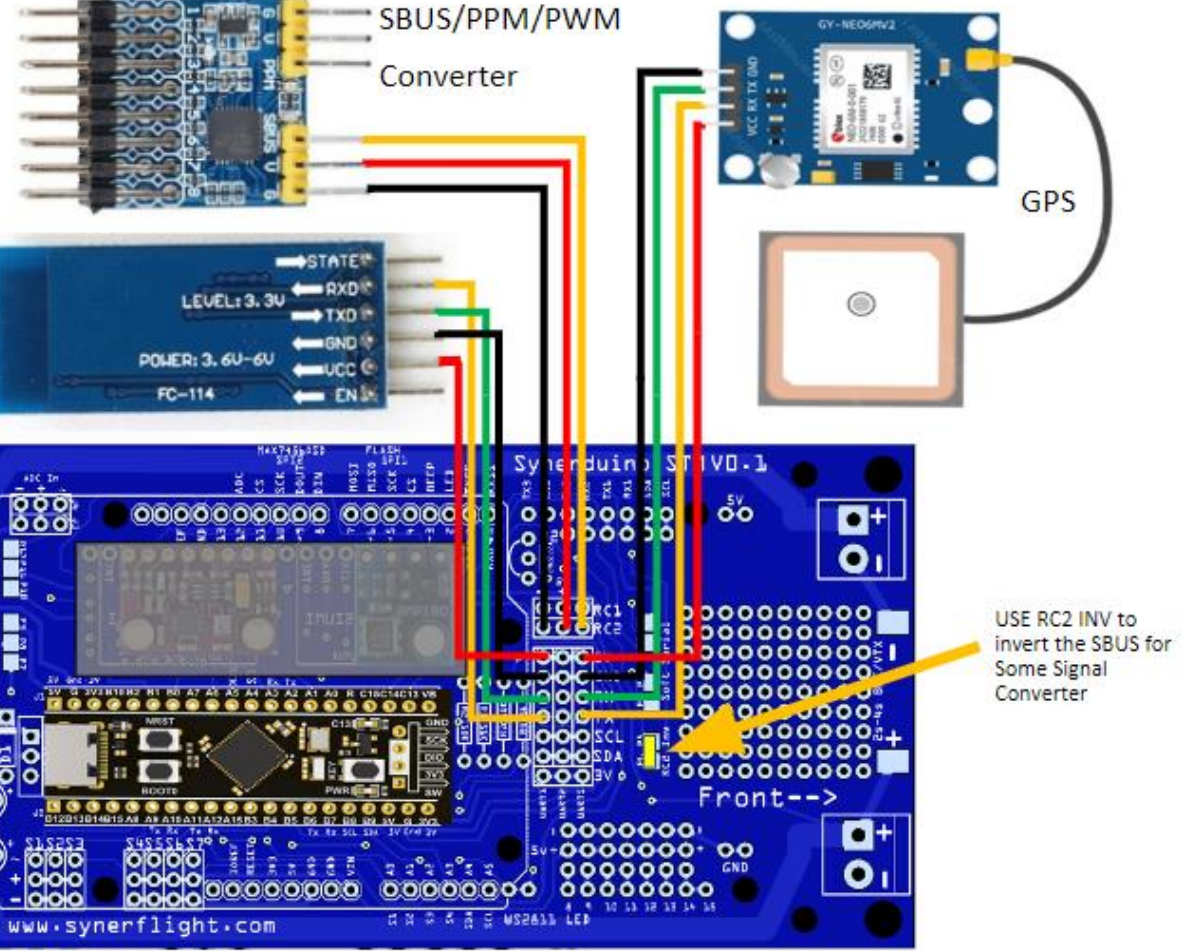
Bluetooth/Serial Radio
UART1



UART Serial Devices

For those who Uses PWM or PPM Receiver Require to add an Additional PWM/PPM/SBUS Converter to RC2/UART2

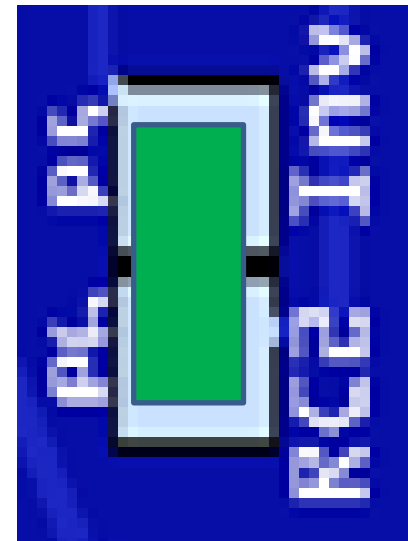
Bluetooth/Serial Radio



RECEIVER TYPES

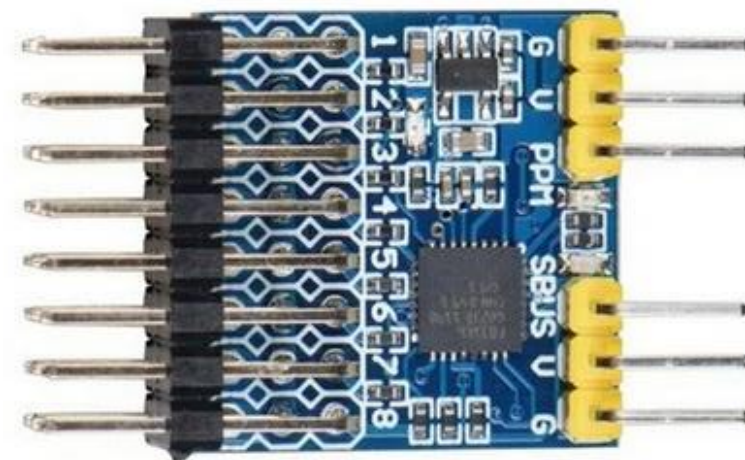


PPM AND PWM RECEIVER



The Invert Pads are only Present in the F411 boards .

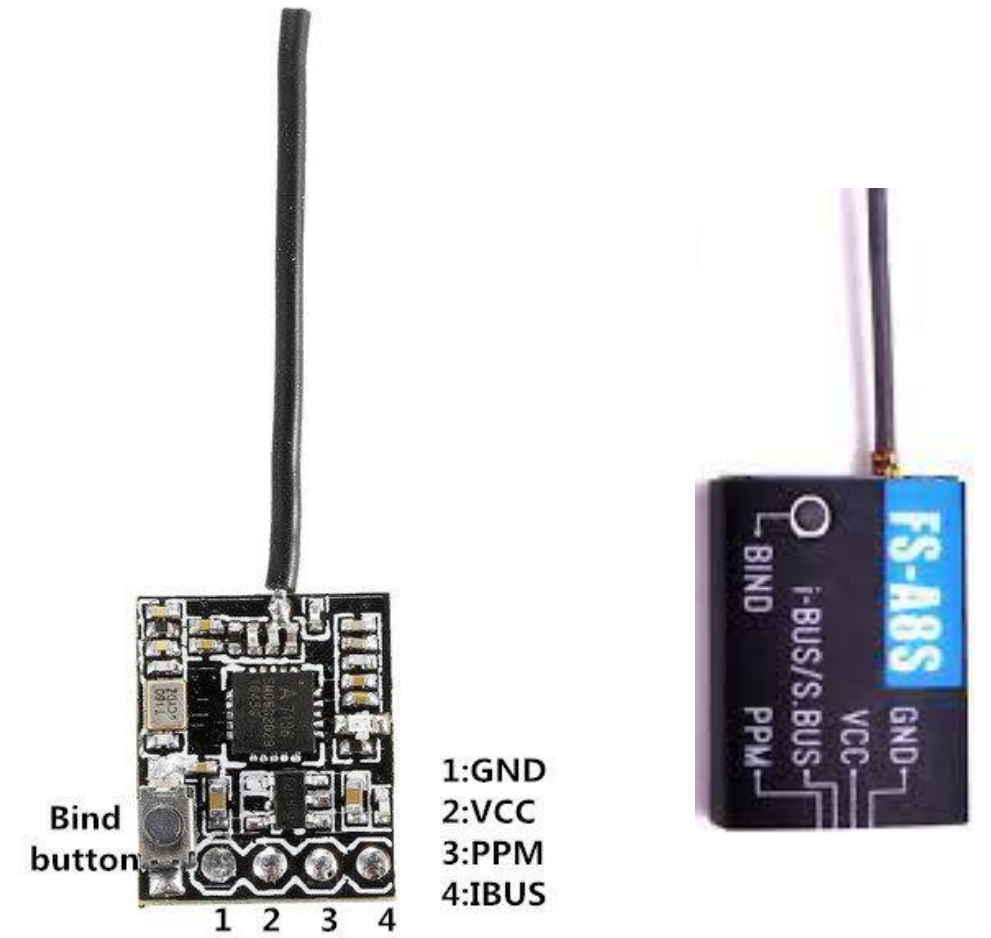
F405 and H743 boards does a way with this



PWM/PPM/SBUS CONVERTER

For those who Uses PWM or PPM Receiver Require to add an Additional PWM/PPM/SBUS Converter and connect it to RC2 to SBus

SERIAL RECEIVER



F405 RC RECEIVER & UARTS

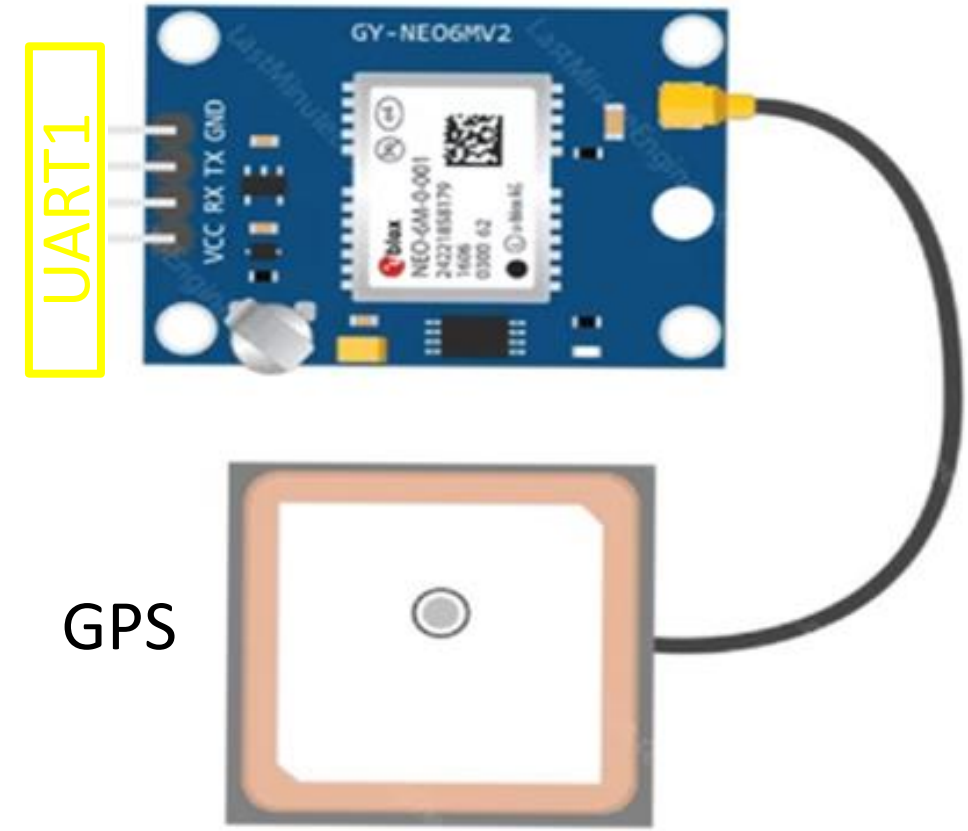
Flysky FS-i6X Receiver



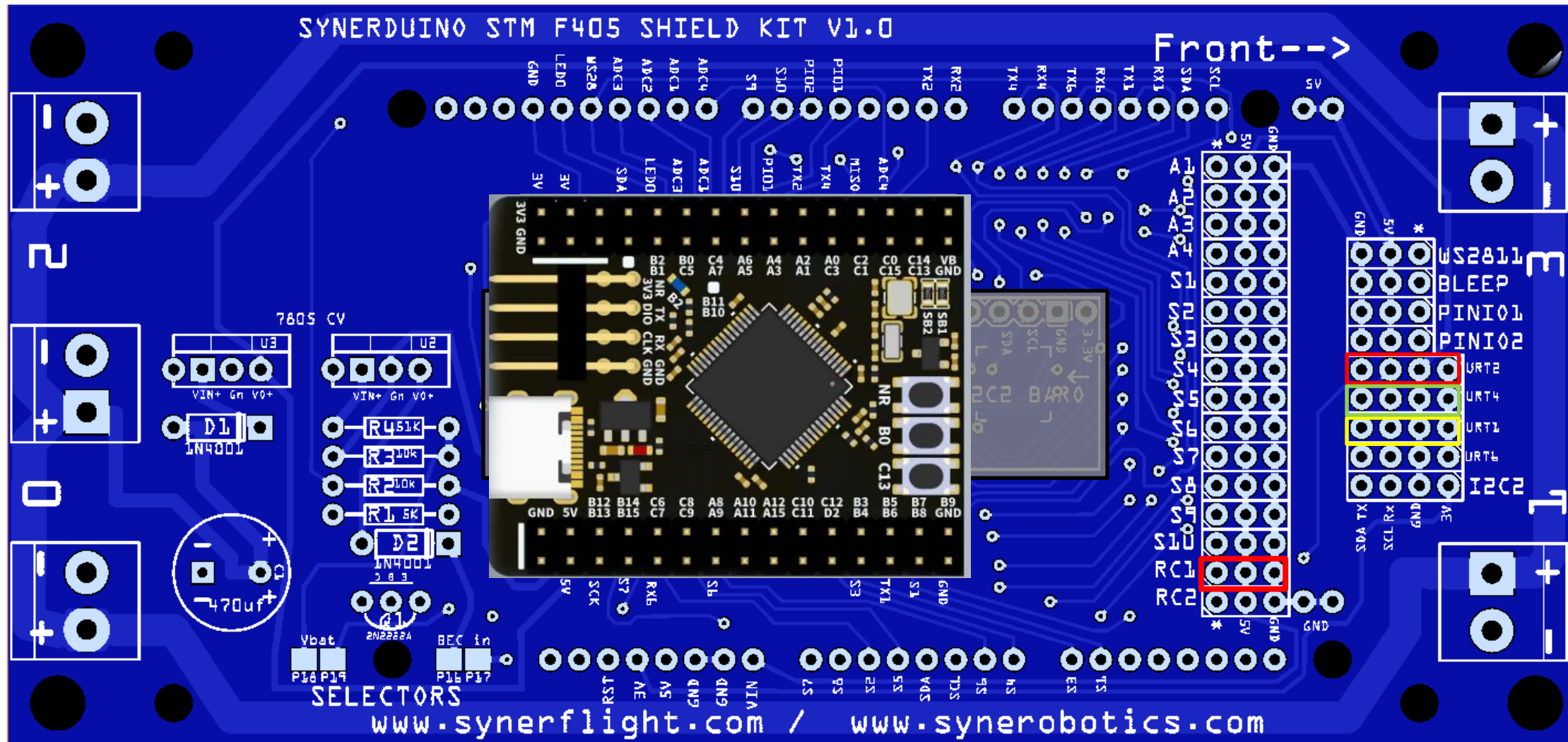
Receiver : Connect to RC1 / UART2



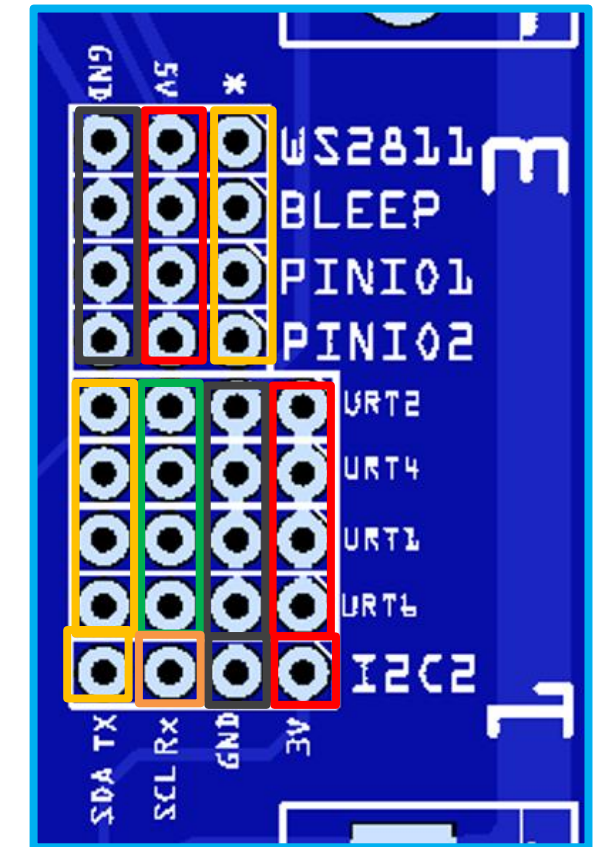
Bluetooth/Serial Radio



GPS



V+ Gn Dat



TX RX Gn V+

Check connection Polarity

STMF405

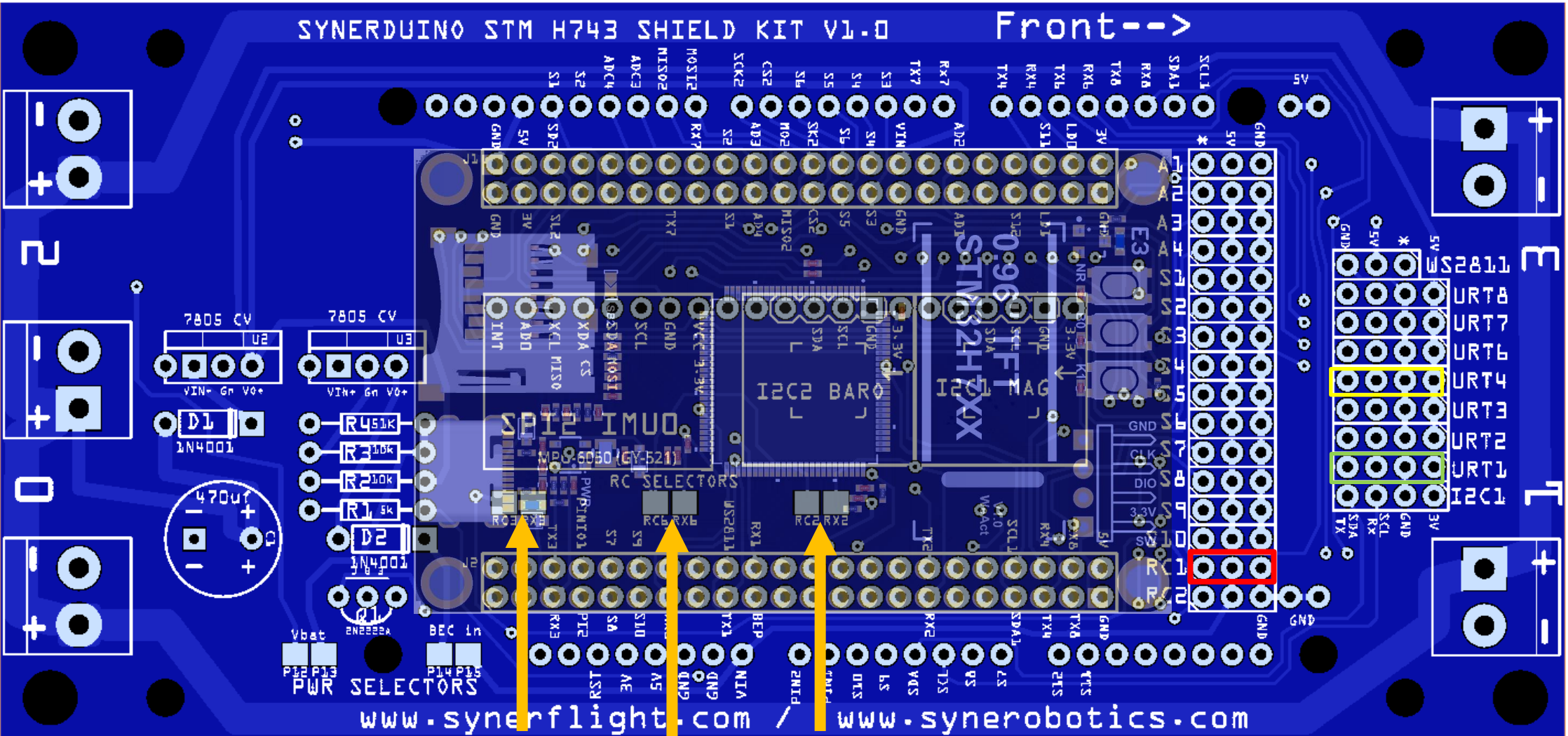
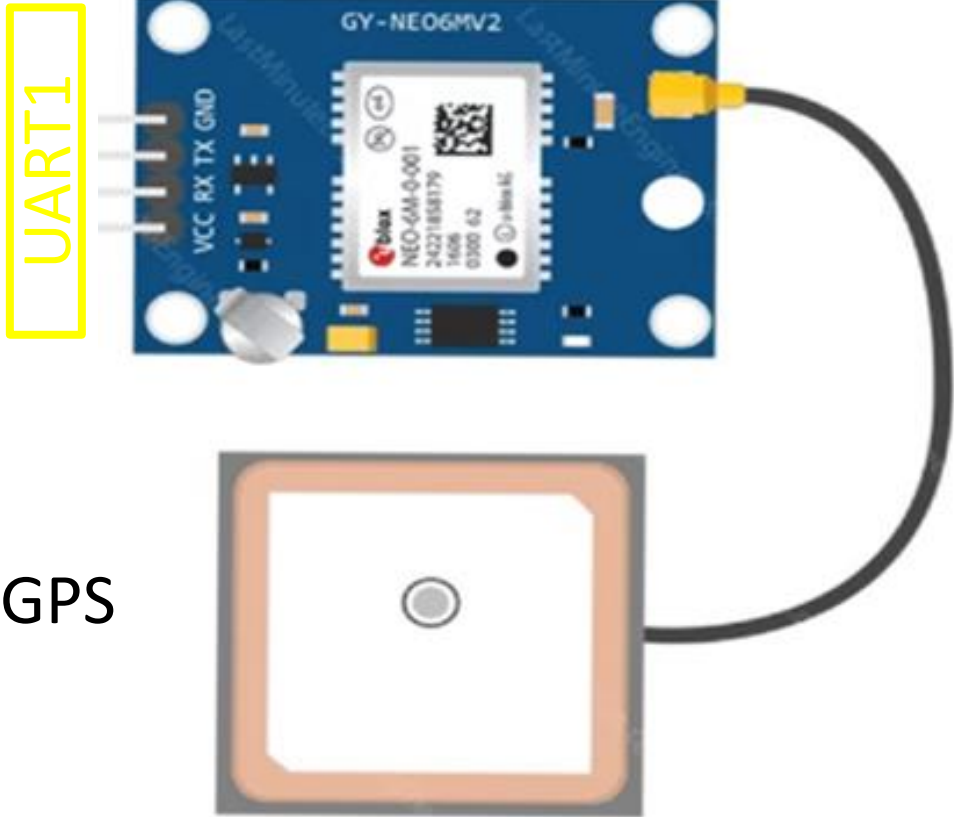
H743 RC RECEIVER & UARTS



Receiver : Connect to RC1 / UART2

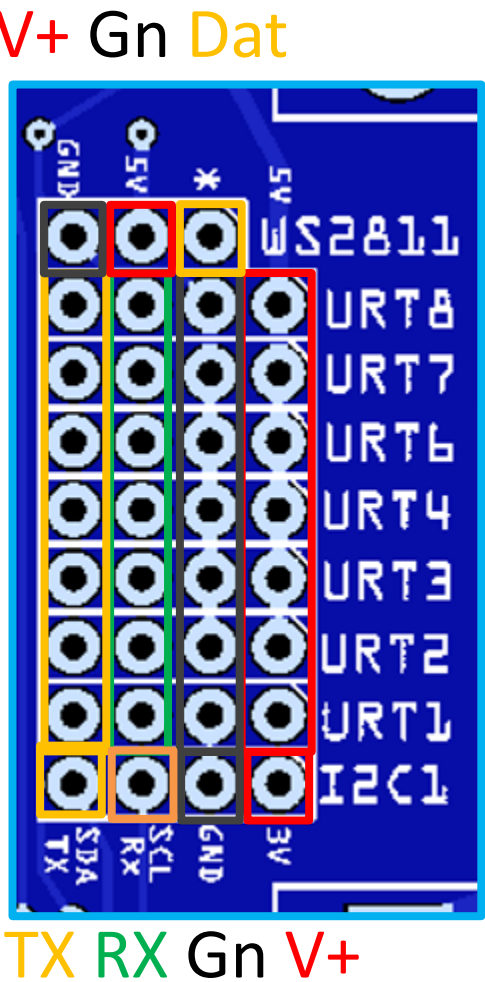


Bluetooth/Serial Radio



STMH743

RC UART selector you have 3 option where your RC receiver can be connected



F411 SELECTOR SELECTOR PADS

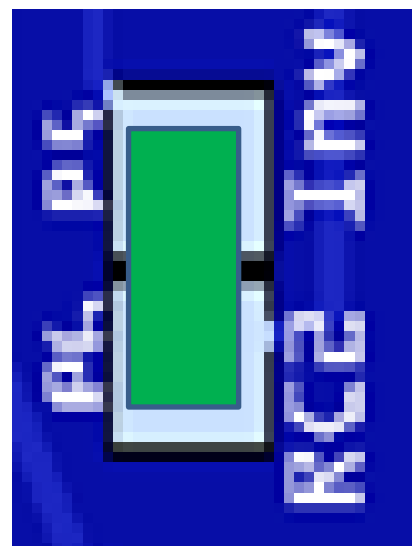
To Select two adjacent pads must be shorted with a solder blob



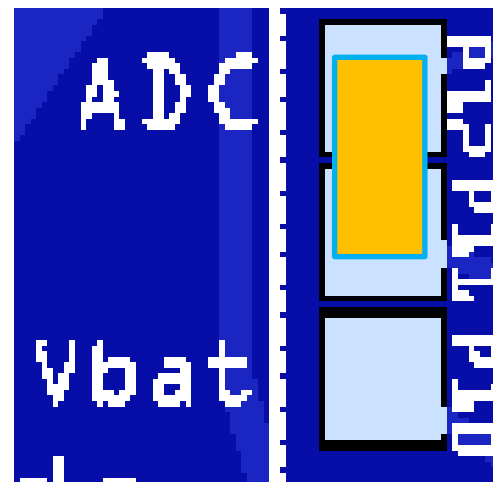
P9-P8 : BEC –this is use if you have a BEC powering through the ESC w/UBEC or an Standalone UBEC or Buck Converter Plug into S2 Pin **BEC input is 5V**



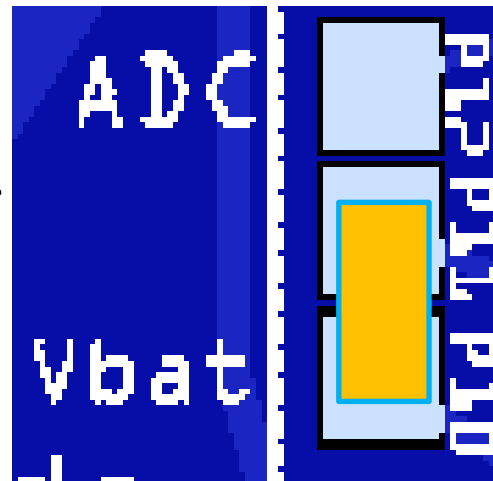
P8-P7 : REG –this is use if you just Run basics to power just the main drone board , GPS , Telemetry and Receiver



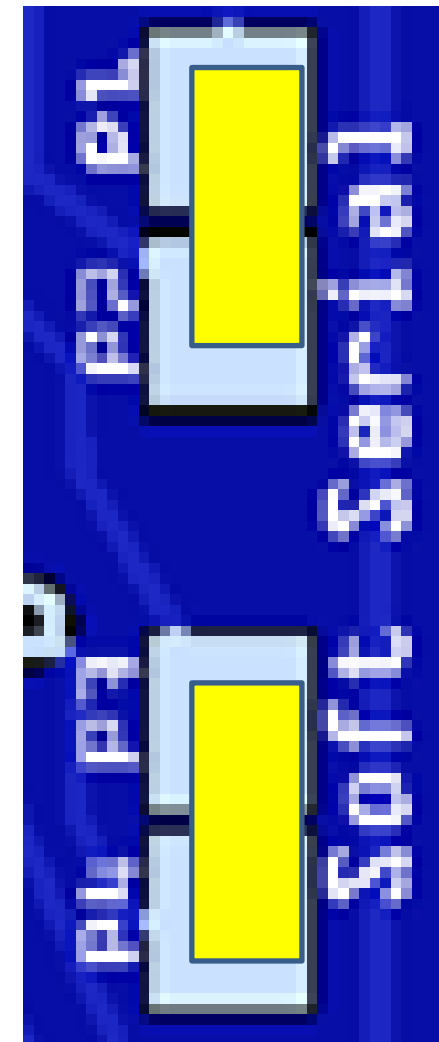
P5-P6 RC2 Inv : inverts the Sbus signals which activates the RC2 Sbus pin input to the UART2



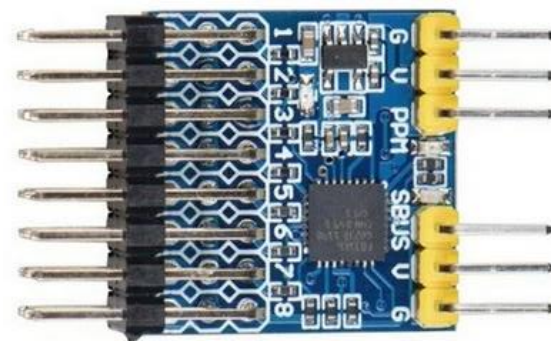
P12-P11 ADC Sensor Input



P11-P10 ADC Voltage Monitoring input



P1-P2 P3-P4 Softserial activates the TXSS and RXSS connection to the expansion pins for Prototyping board serial Connection



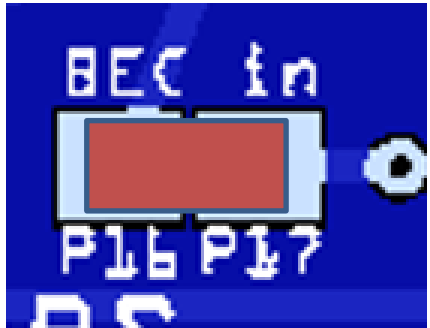
Primary use for PWM to SBUS Converters

Synerduino

Note: the power rails would support upto 4s safely

For 6s setup this would require an external UBEC to supply 5V

F405 & H743 SELECTOR PADS



P16-P17 : 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 **BEC input is 5V**



Default ADC1 input
P18-P19 ADC activate Battery monitoring

Default Onboard Regulator

Synerduino

Note: the power rails would support upto 4s safely

For 6s setup this would require an external UBEC to supply 5V

For ESCs with UBEC ensure it outputs 5V



(H743 Boards) Selectable UART for RC2 RX
RC2-RX2 is Default

To Select two adjacent pads must be shorted with a solder blob

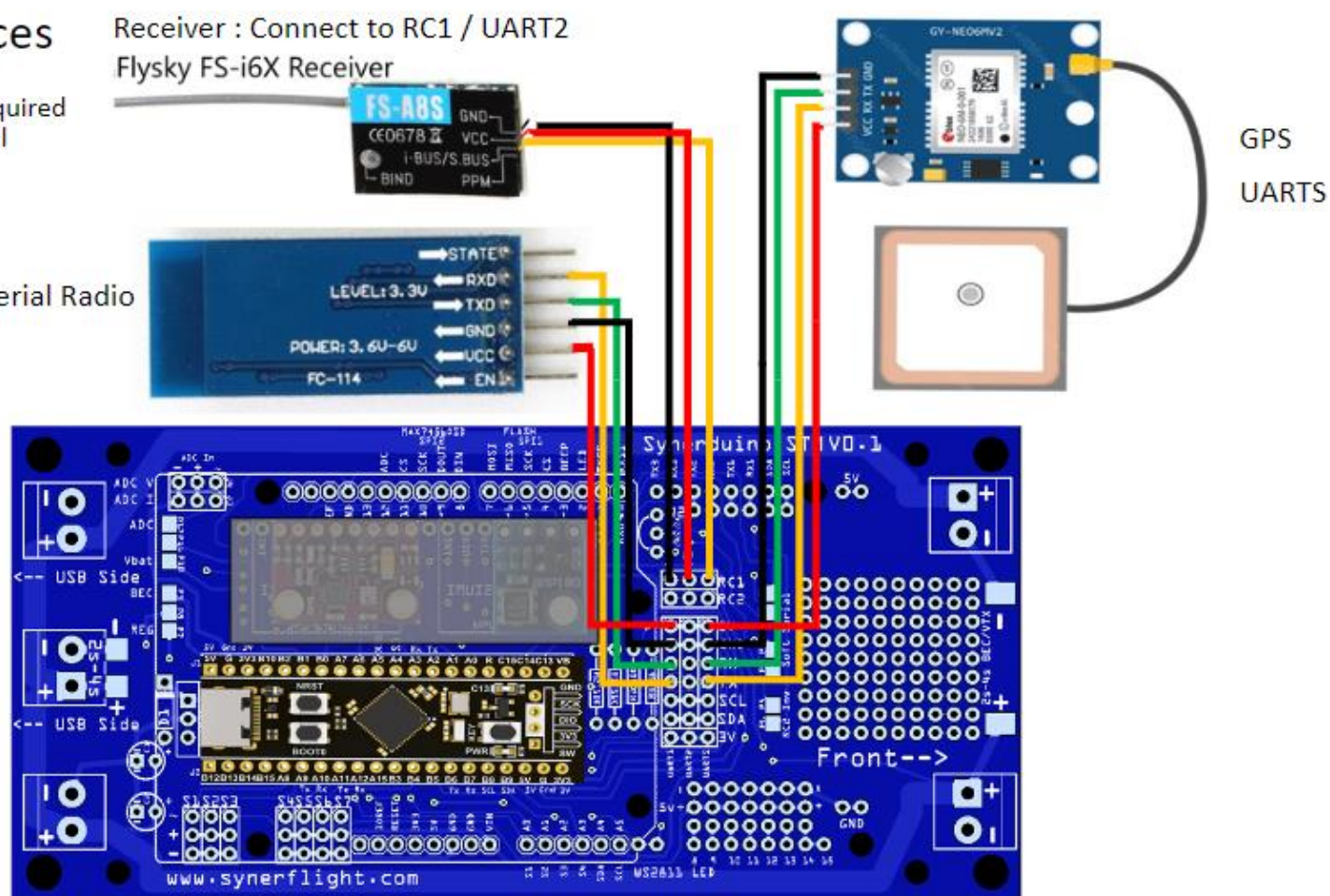
UART CONNECTIONS

UART Serial Devices

AS if INAV5 and INAV6 its Required Receiver supports SBUS Serial

Bluetooth/Serial Radio
UART1

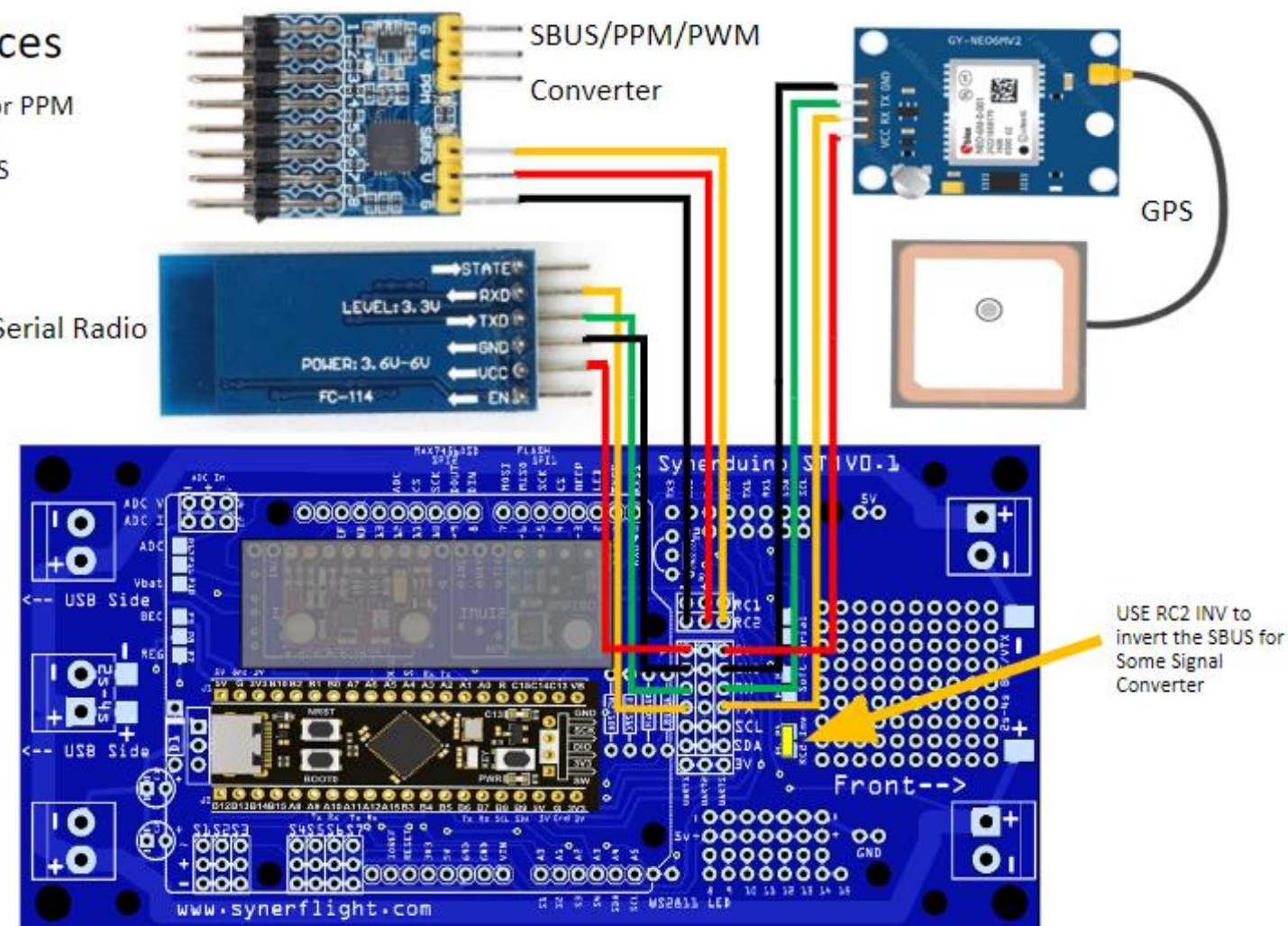
Receiver : Connect to RC1 / UART2
Flysky FS-i6X Receiver



UART Serial Devices

For those who Uses PWM or PPM Receiver Require to add an Additional PWM/PPM/SBUS Converter to RC2/UART2

Bluetooth/Serial Radio



F411 SPI CONNECTIONS

SPI2 Devices

These are optional addons

All Addon SPI devices can Access SPI2 Pins

CS - CS

DIN - MOSI

DOOUT - MISO

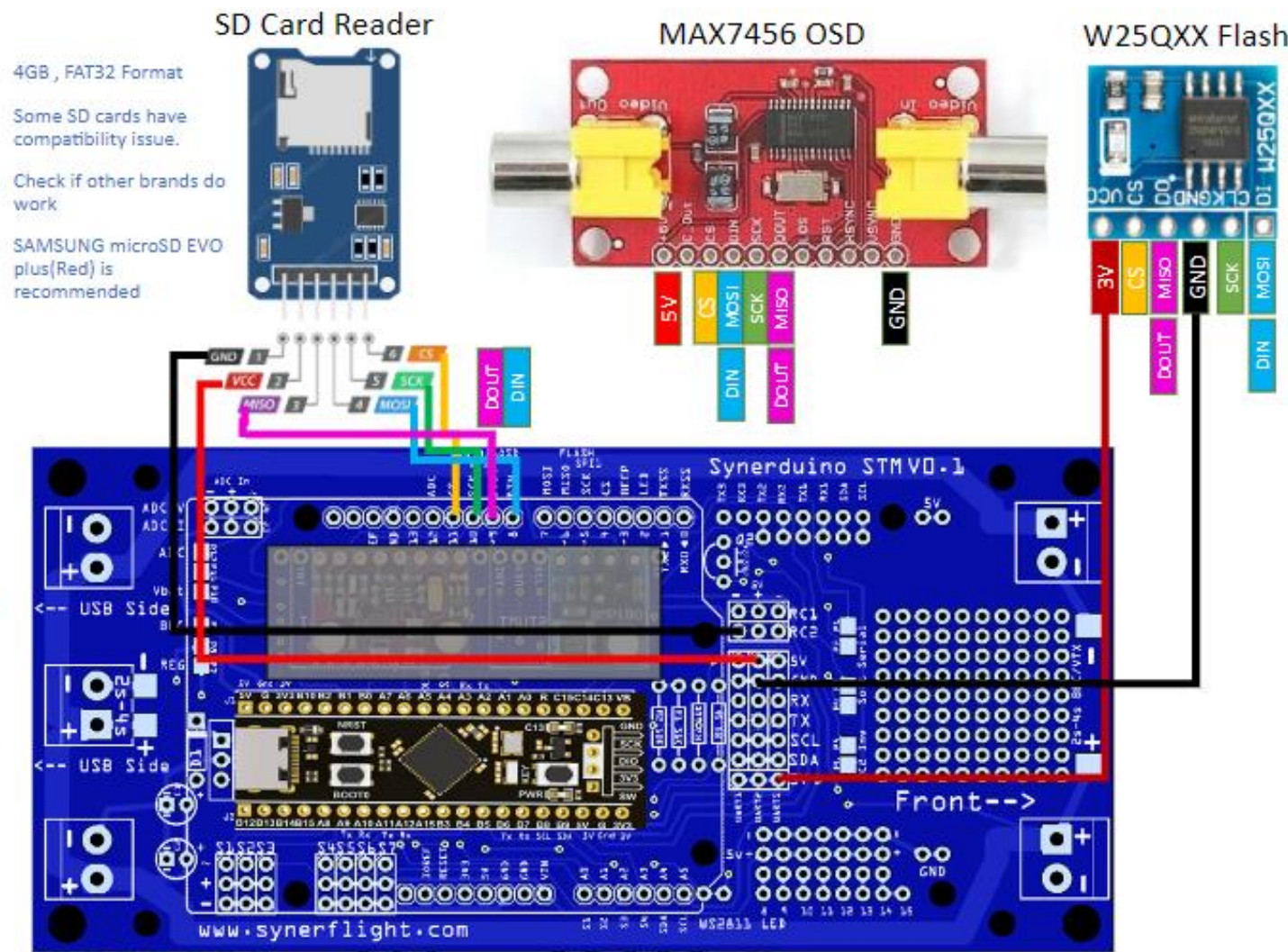
SCK - SCK

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



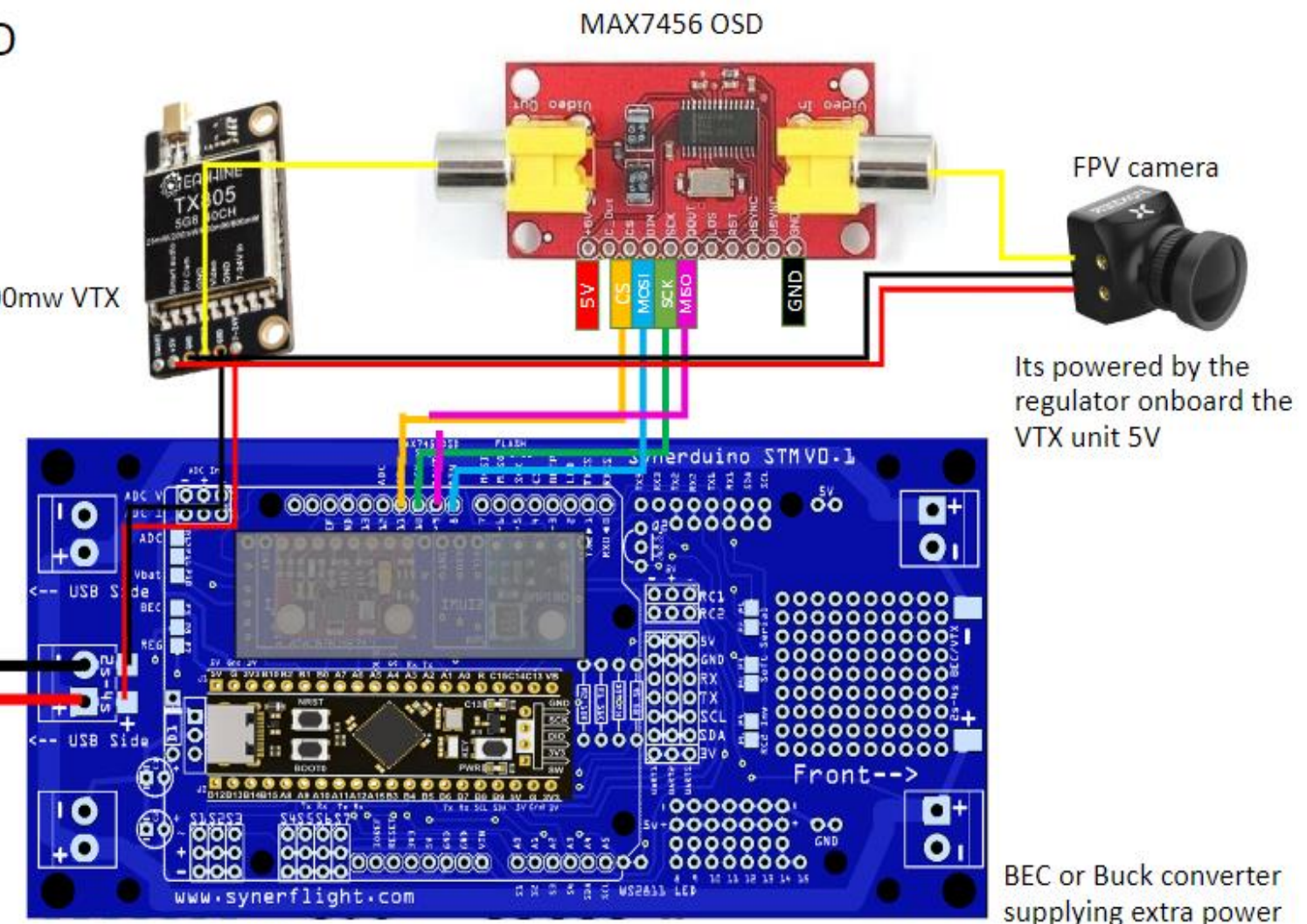
FPV with SPI OSD

The Telemetry can also use the SPI OSD module

Split VTX camera Setup

600mw to 800mw VTX

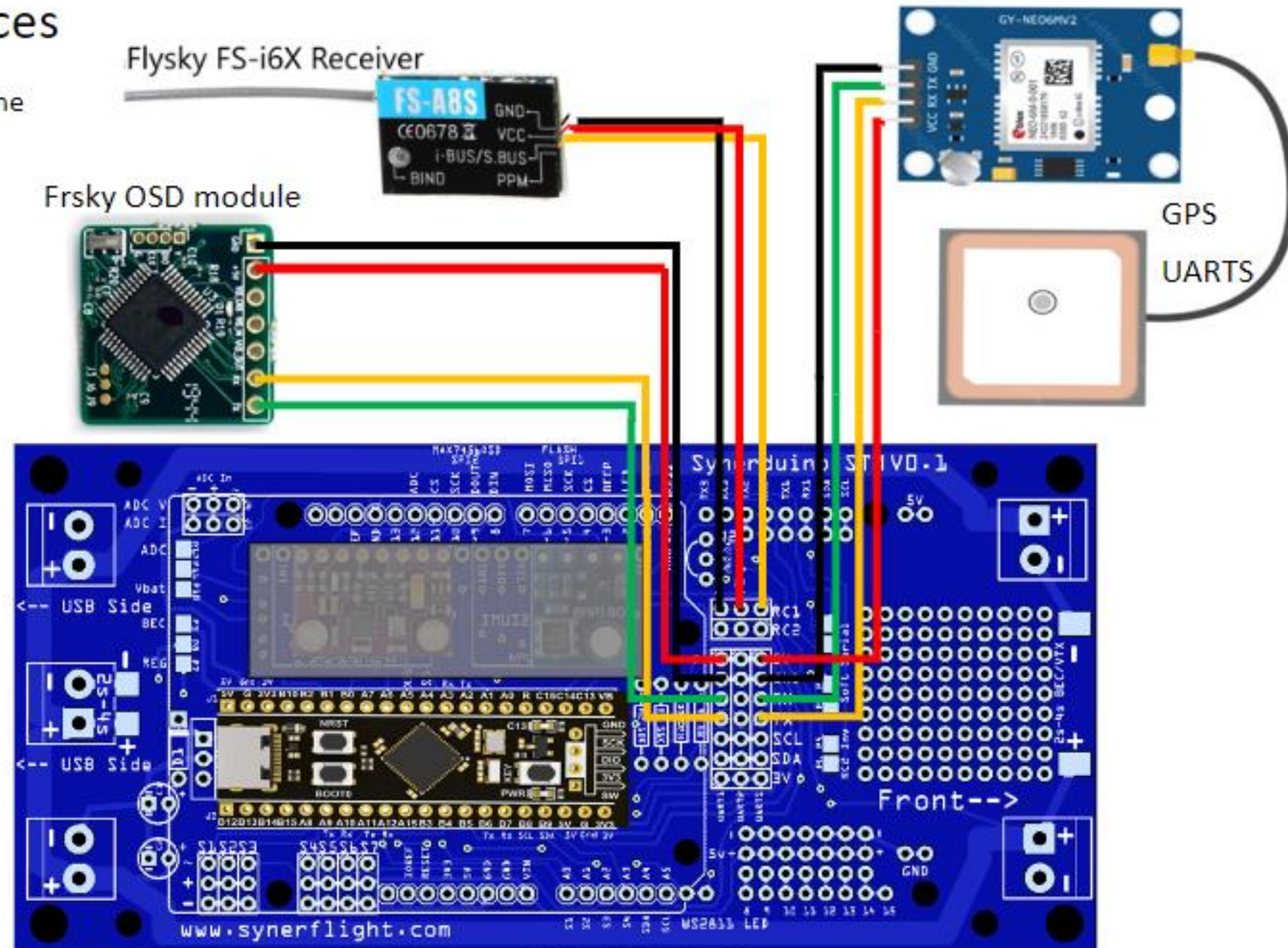
Battery 3s or 4s



F411 UART CONNECTIONS

UART Serial Devices

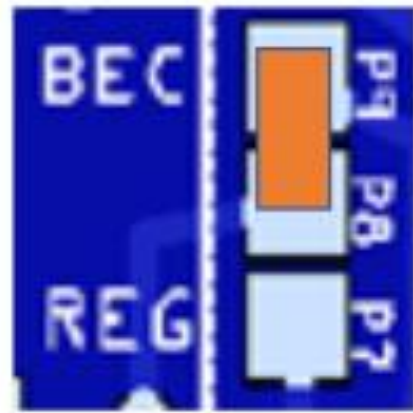
The Telemetry can also use the Serial OSD module



F411 FPV UART SETUP

FPV with SERIAL OSD

The Telemetry can also use the Serial OSD module



Power Pads is selected to BEC to use external BEC

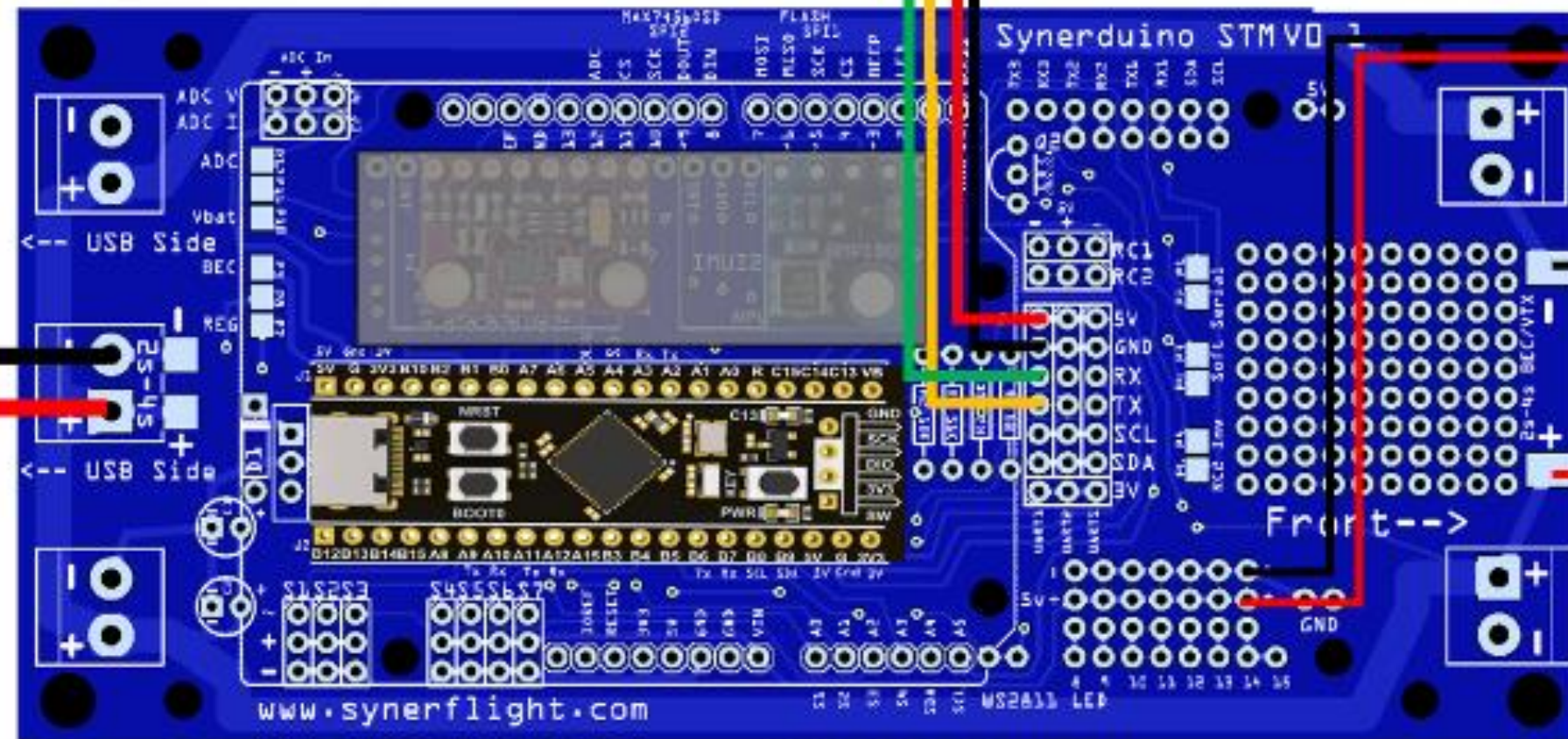
Battery 3s or 4s

UART 1 needs to be configure in Ports to OSD flysky serial

Frsky OSD module

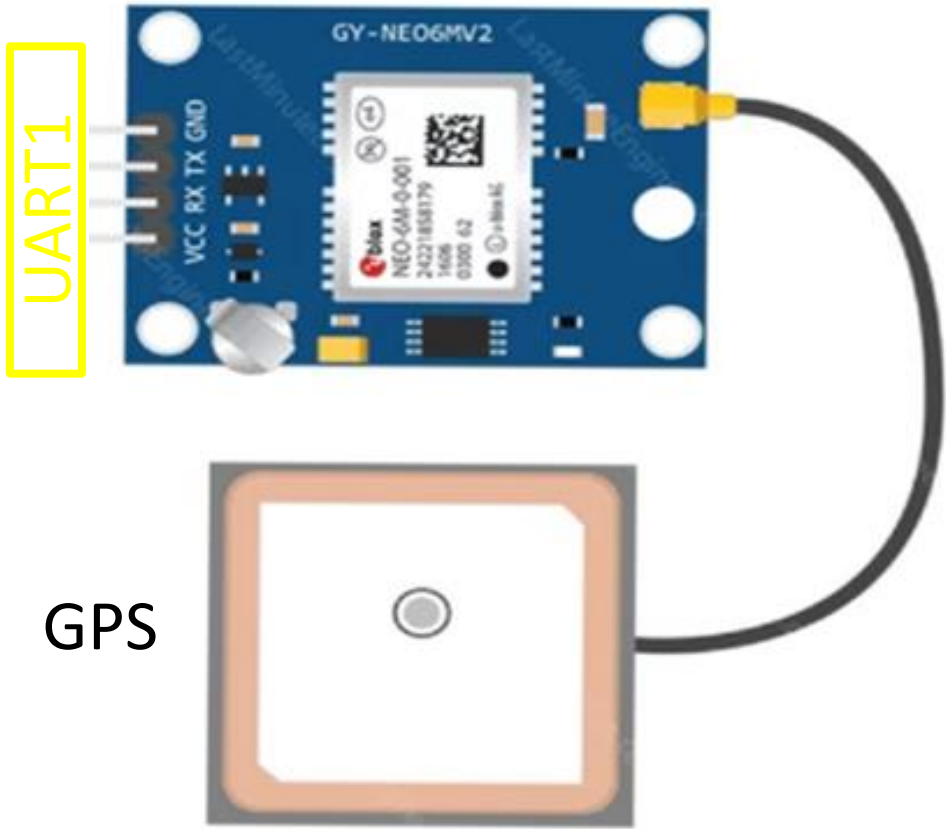
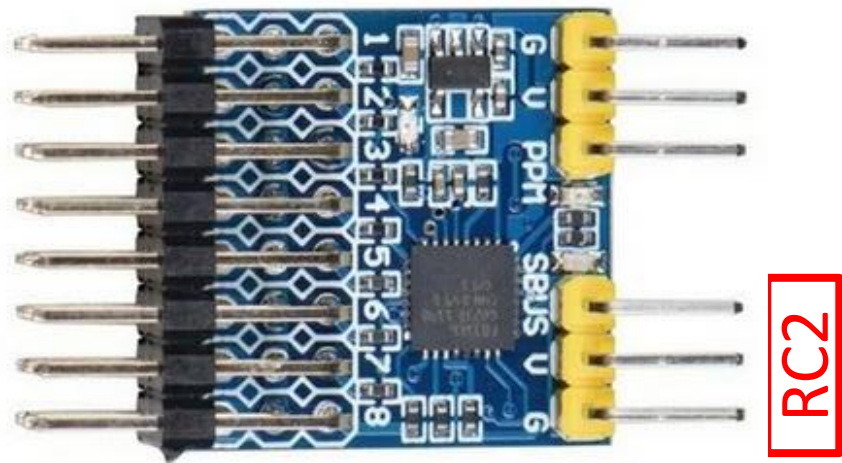


FPV camera 25mw Standalone



BEC or Buck converter supplying extra power

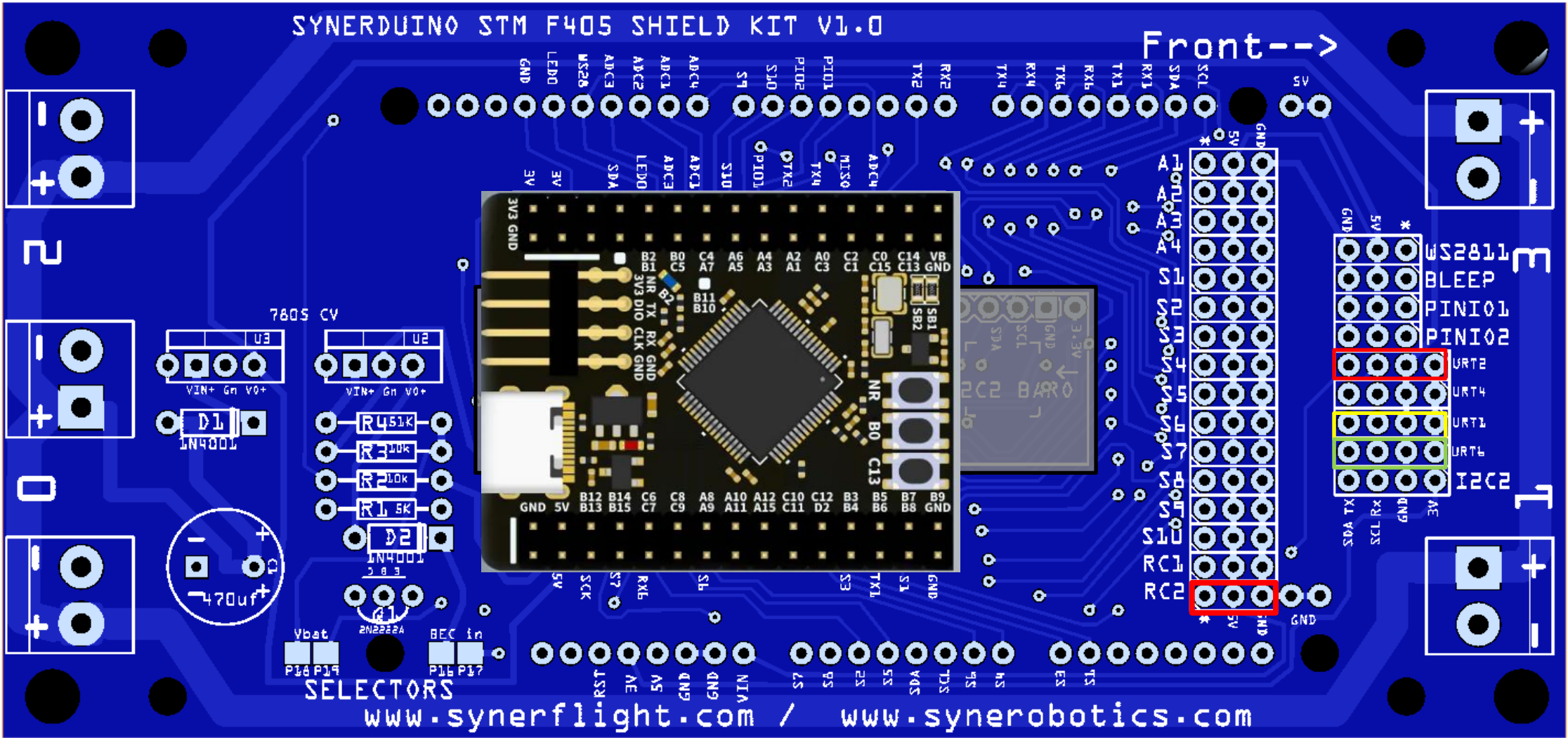
F405 FPV UART SETUP



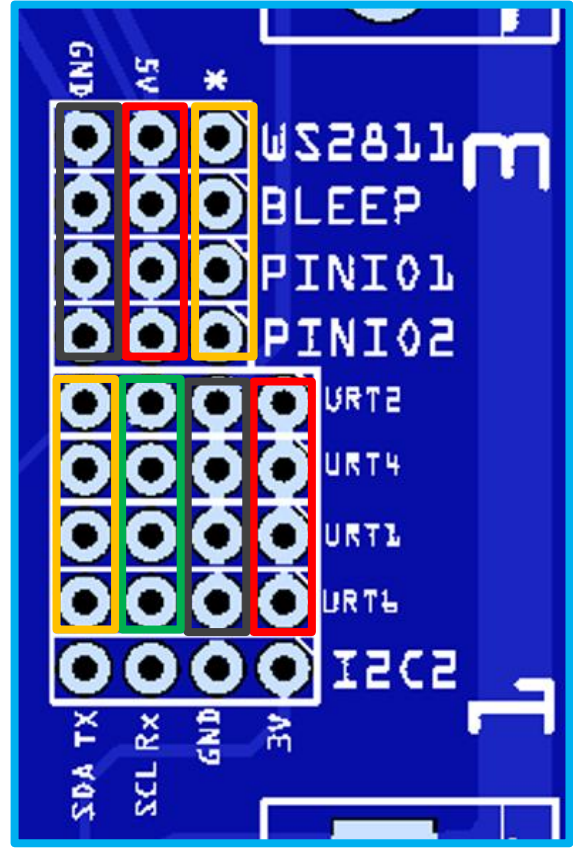
Frsky OSD module



Mavlink OSD module



V+ Gn Dat



Check connection Polarity

TX RX Gn V+

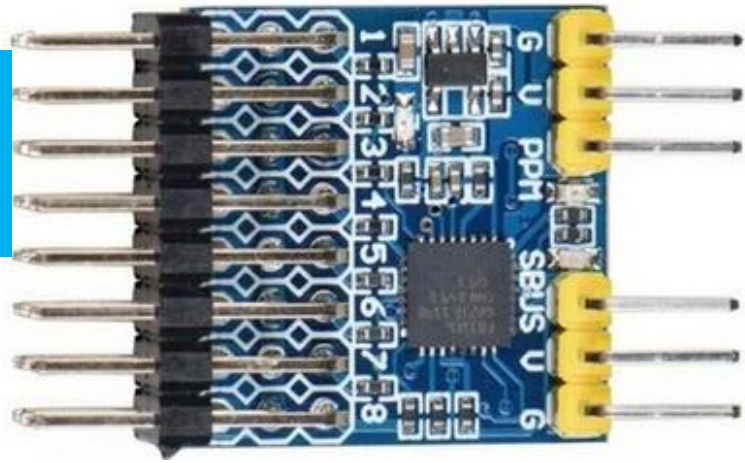
STM405

H743 FPV UART SETUP

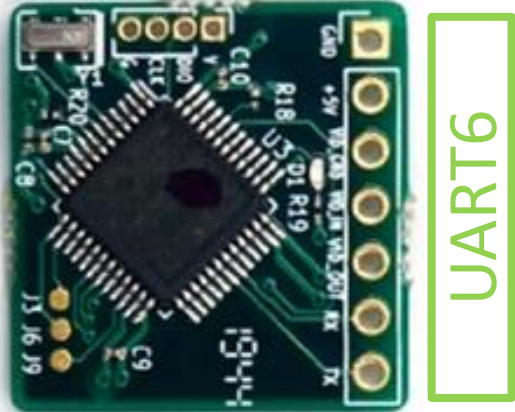


Frsky OSD module

Mavlink OSD module



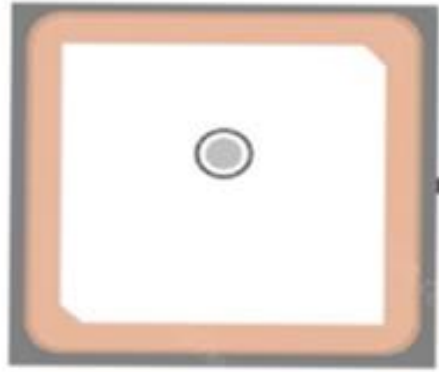
RC2



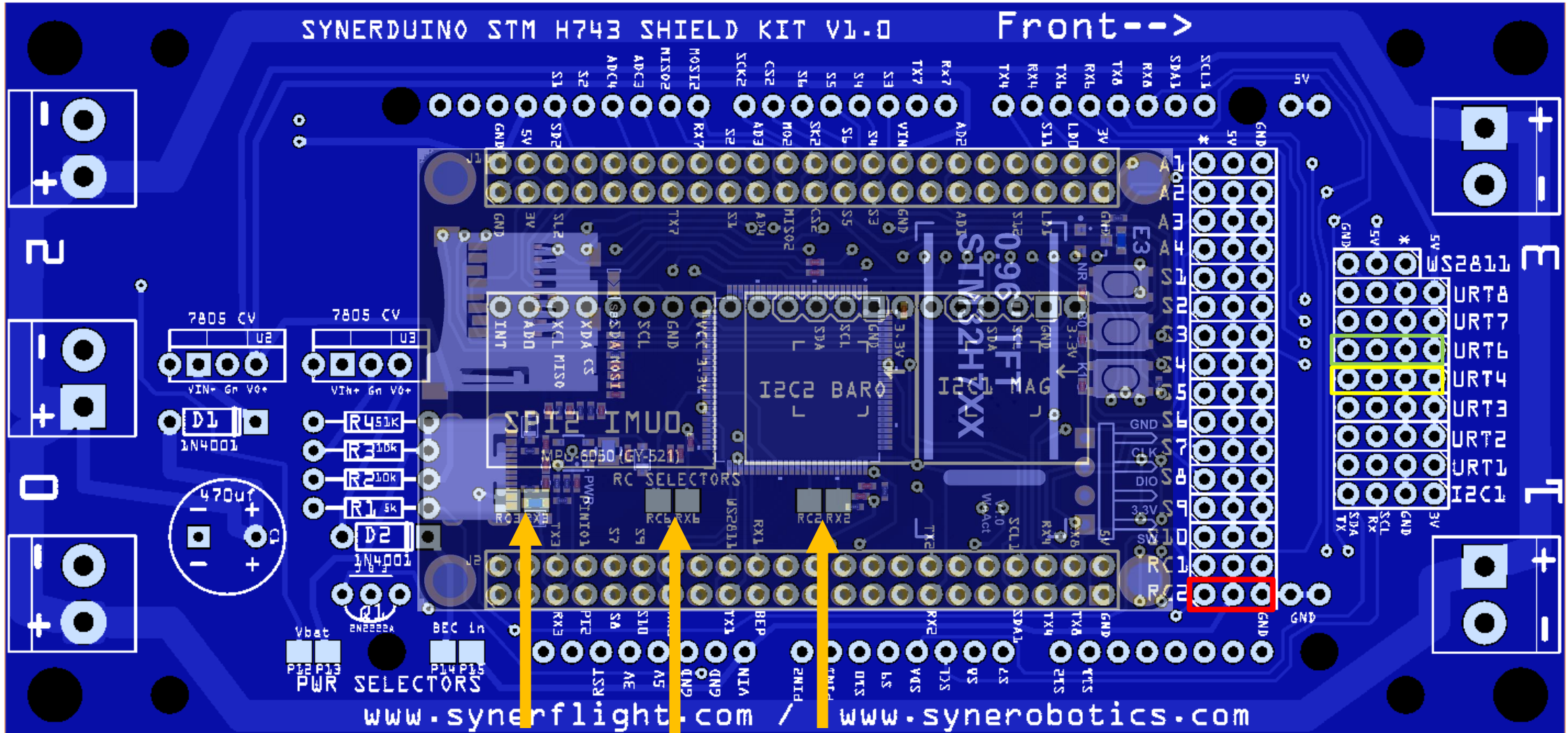
UART6



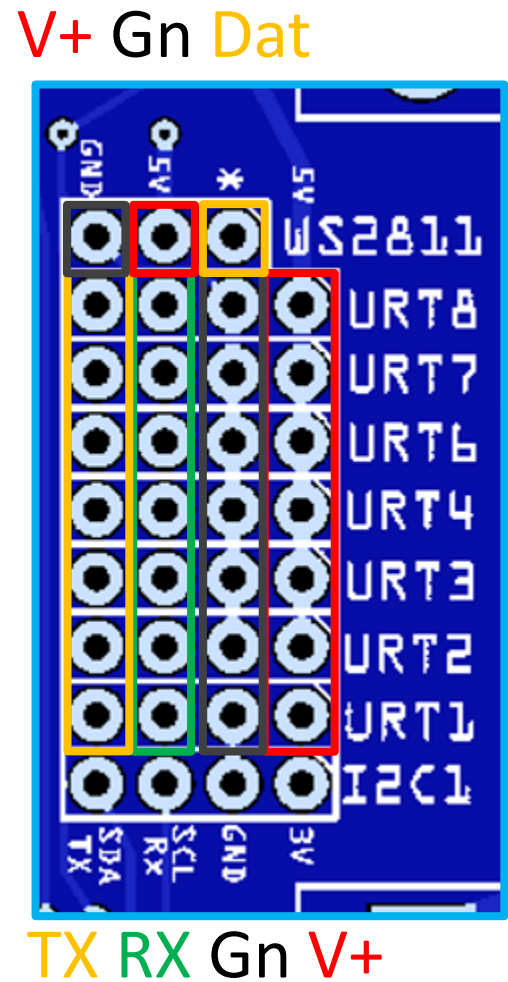
UART1



GPS



STMH743

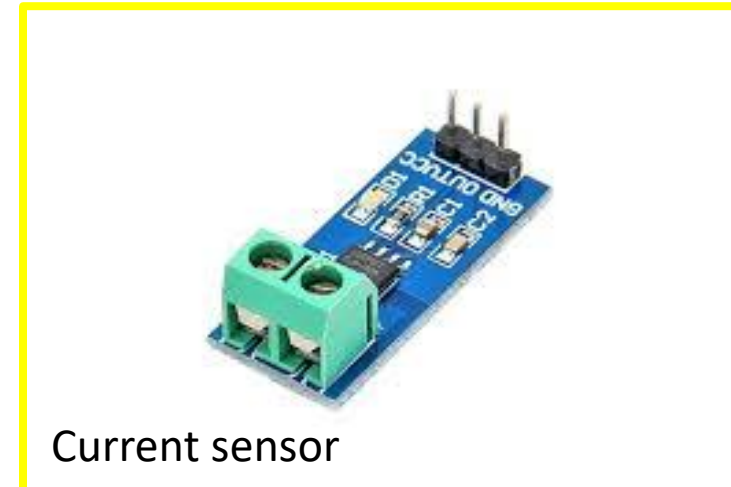
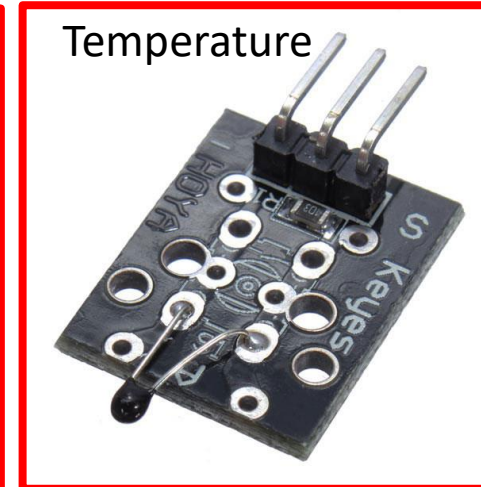


Check connection Polarity

RC UART selector you have 3 option where your RC receiver can be connected

F411 ADC SENSOR

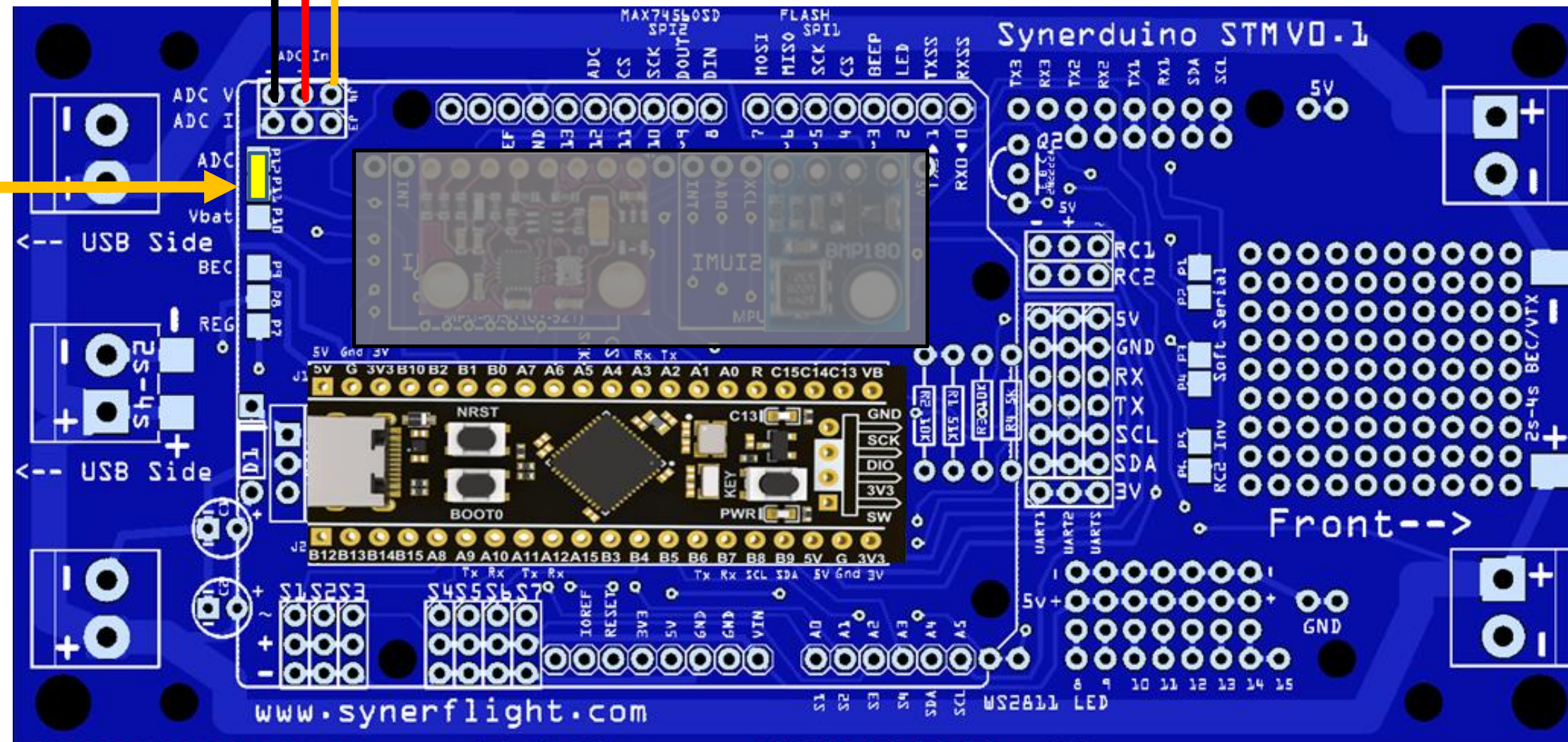
ADC External Sensor



Here you can switch to ADC sensor input or VBAT for Battery monitoring

ADC V – Voltage 0-5V

ADC I – Current 0-5V



F405 ADC SENSOR

Here you can switch to ADC sensor input or VBAT for Battery monitoring

A1 ADC V – Voltage 0-5V

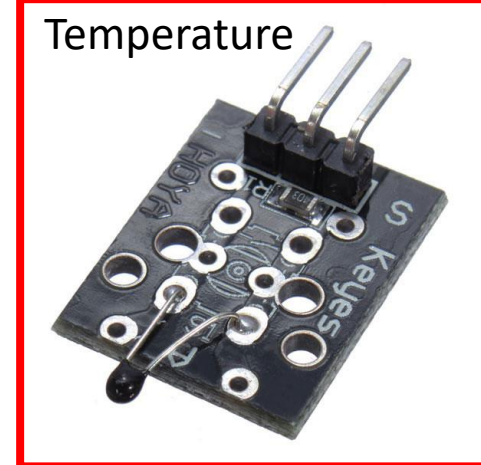
A2 ADC I – Current 0-5V

A3 ADC T – RSSI 0-5V

A4 ADC A – AIRSPEED 0-5V



PH sensor



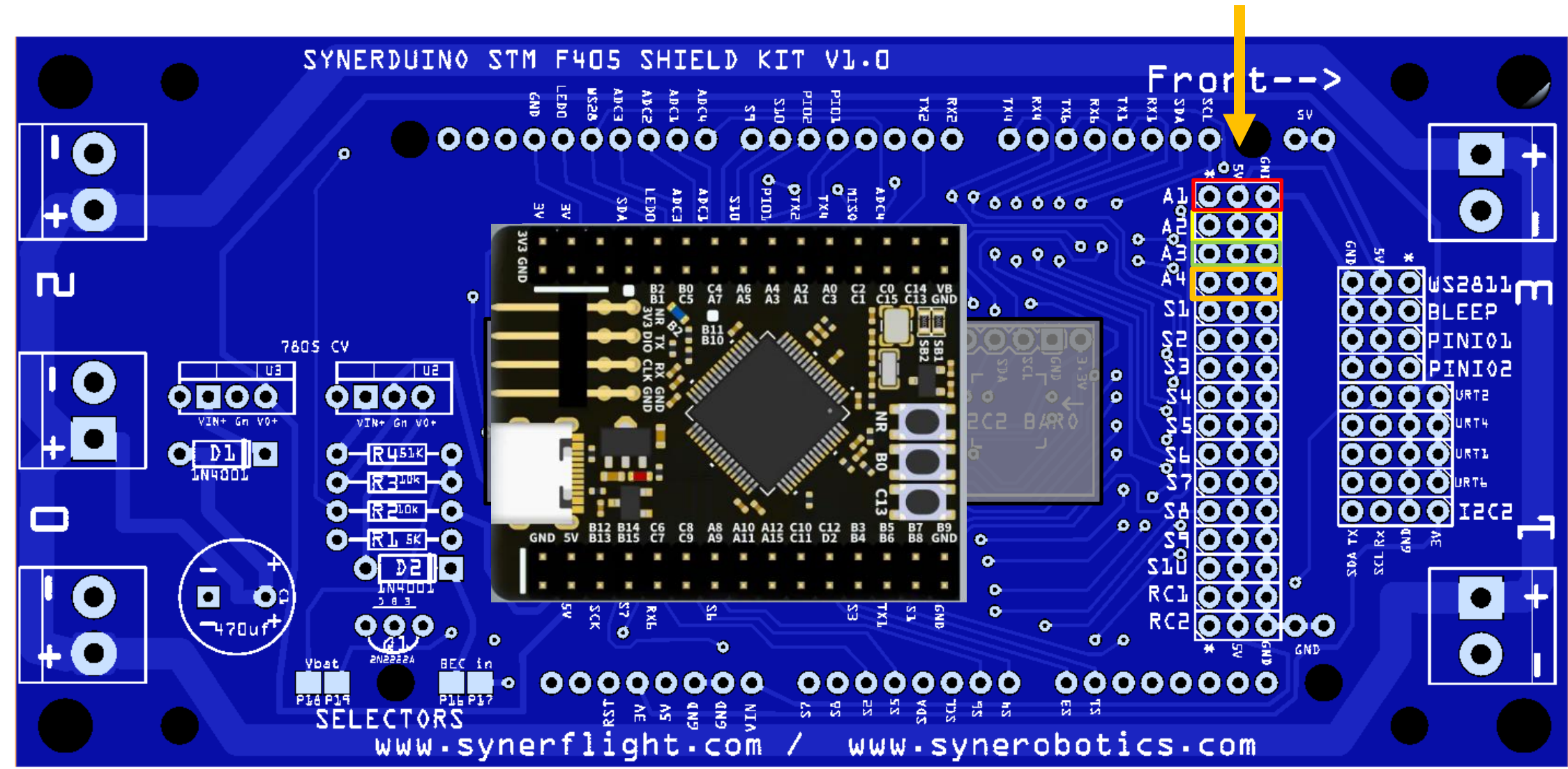
Temperature



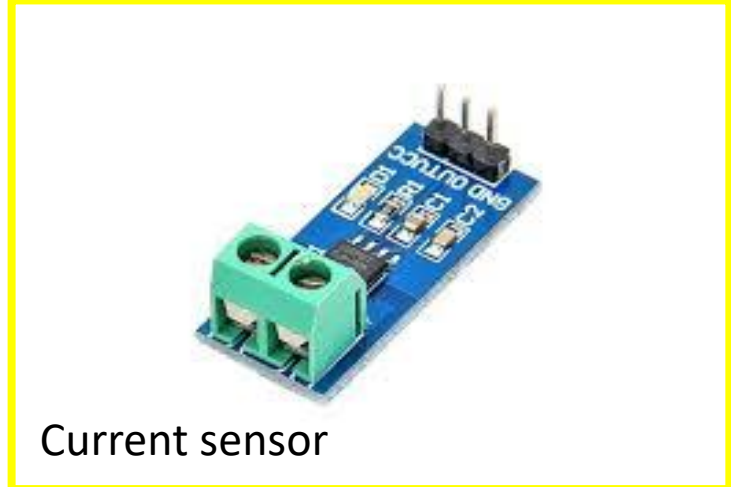
MQ Gas sensor



ASPD 7002 Analog Airspeed



PWM to Analog RSSI



Current sensor

STM F405

H743 ADC SENSOR

Here you can switch to ADC sensor input or VBAT for Battery monitoring

A1 ADC V – Voltage 0-5V

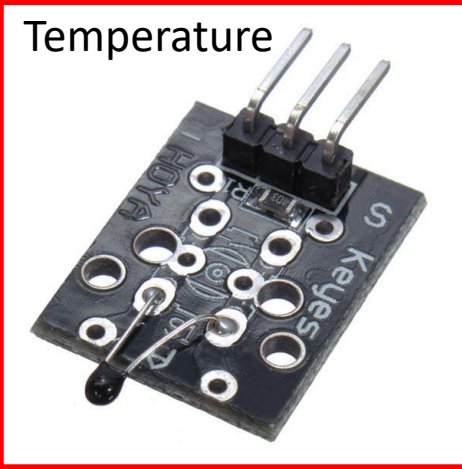
A2 ADC I – Current 0-5V

A3 ADC T – RSSI 0-5V

A4 ADC A – AIRSPEED 0-5V



PH sensor



Temperature



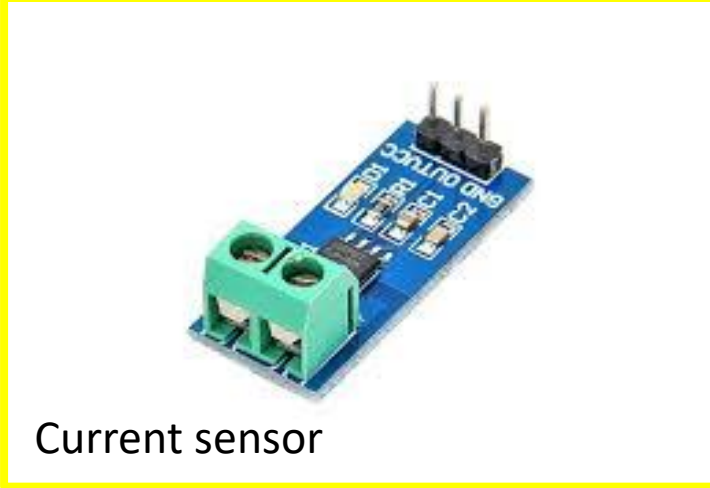
MQ Gas sensor



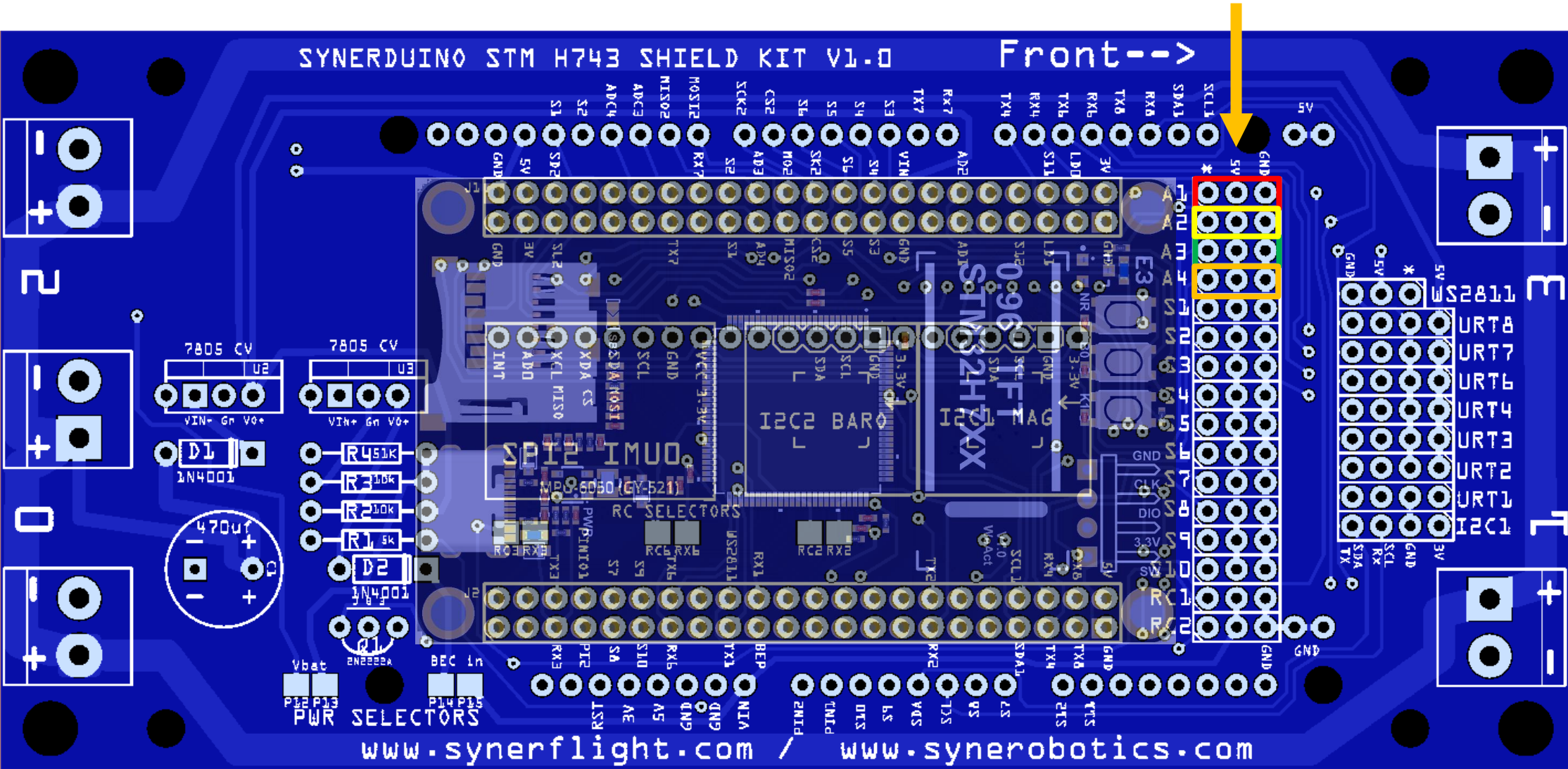
ASPD 7002 Analog Airspeed



PWM to Analog RSSI



Current sensor

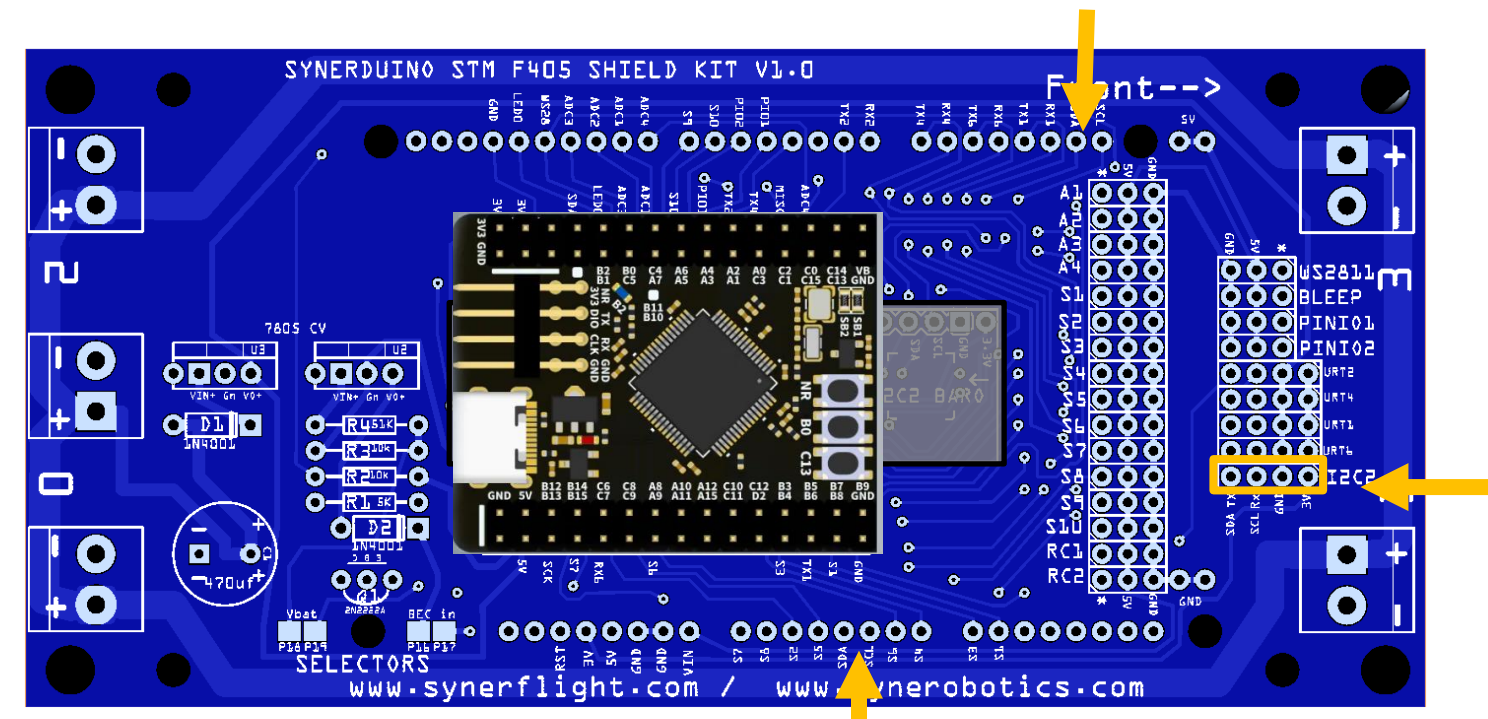
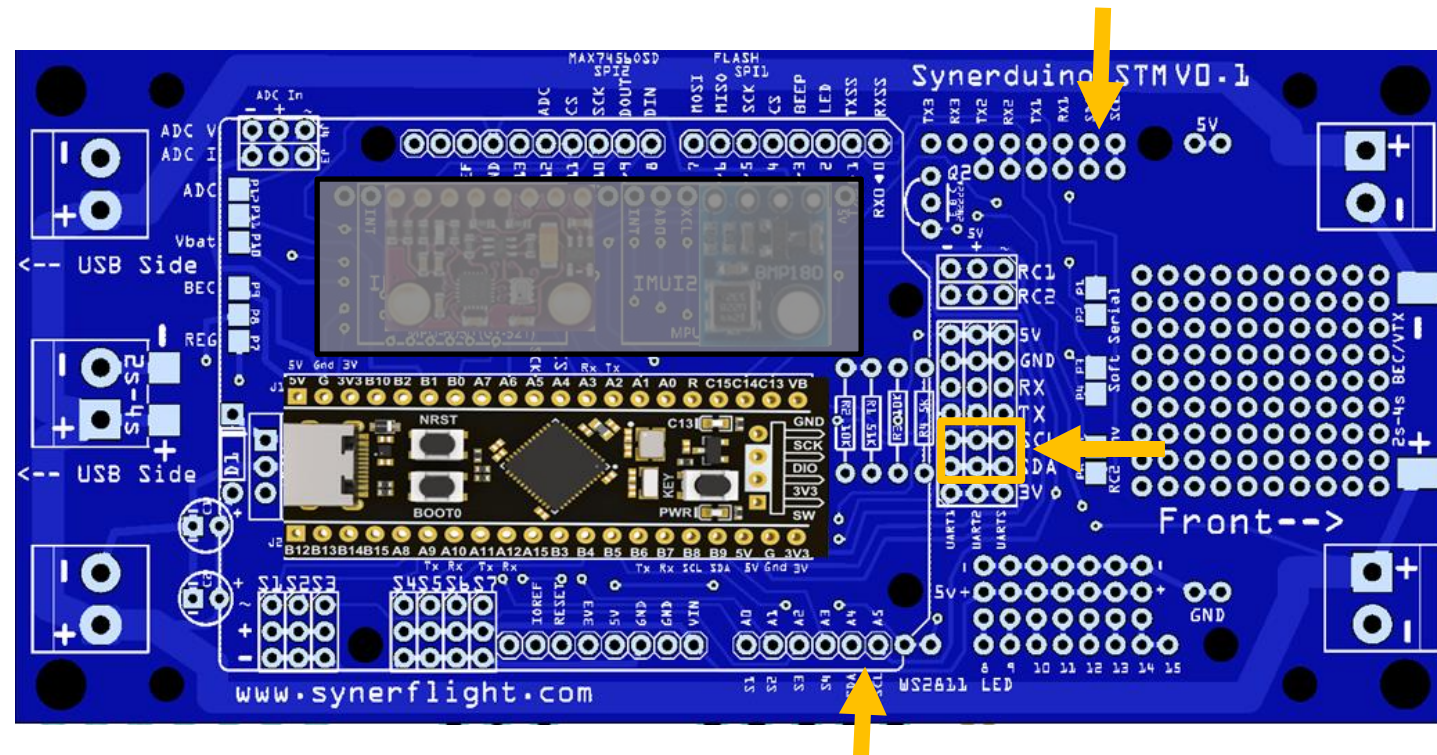


STMH743

www.synerflight.com / www.synerrobotics.com

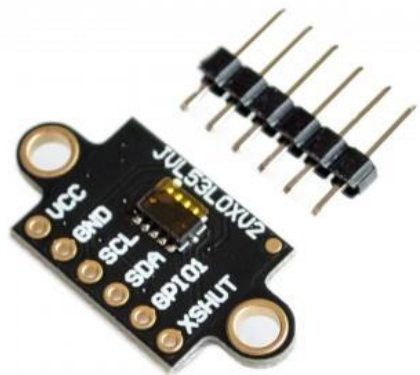
I2C SENSORS

I2C digital sensors expansion allows you to add a host of external sensors to the current board via i2C pin (SLC SDA)



Range Finder

- VL53L0X
- VL53L1X
- TOF10120



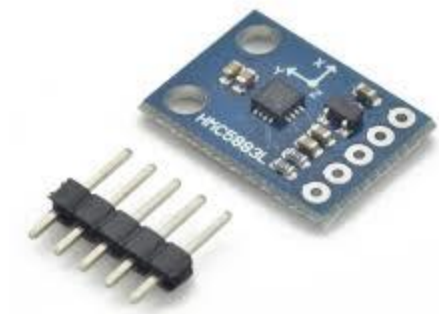
Airspeed sensor

- MS4525
- ASPD-DLVR L10D



Magnetometer

- HMC5883
- QMC5883
- IST8310
- MAG3110
- LIS3MDL
- MPU9250



F411 LED WS2811

LED Devices

These are optional
addons

Serves as Status indicator or
put up a heck of a light show

WS2811 or WS2812

DATA

5V

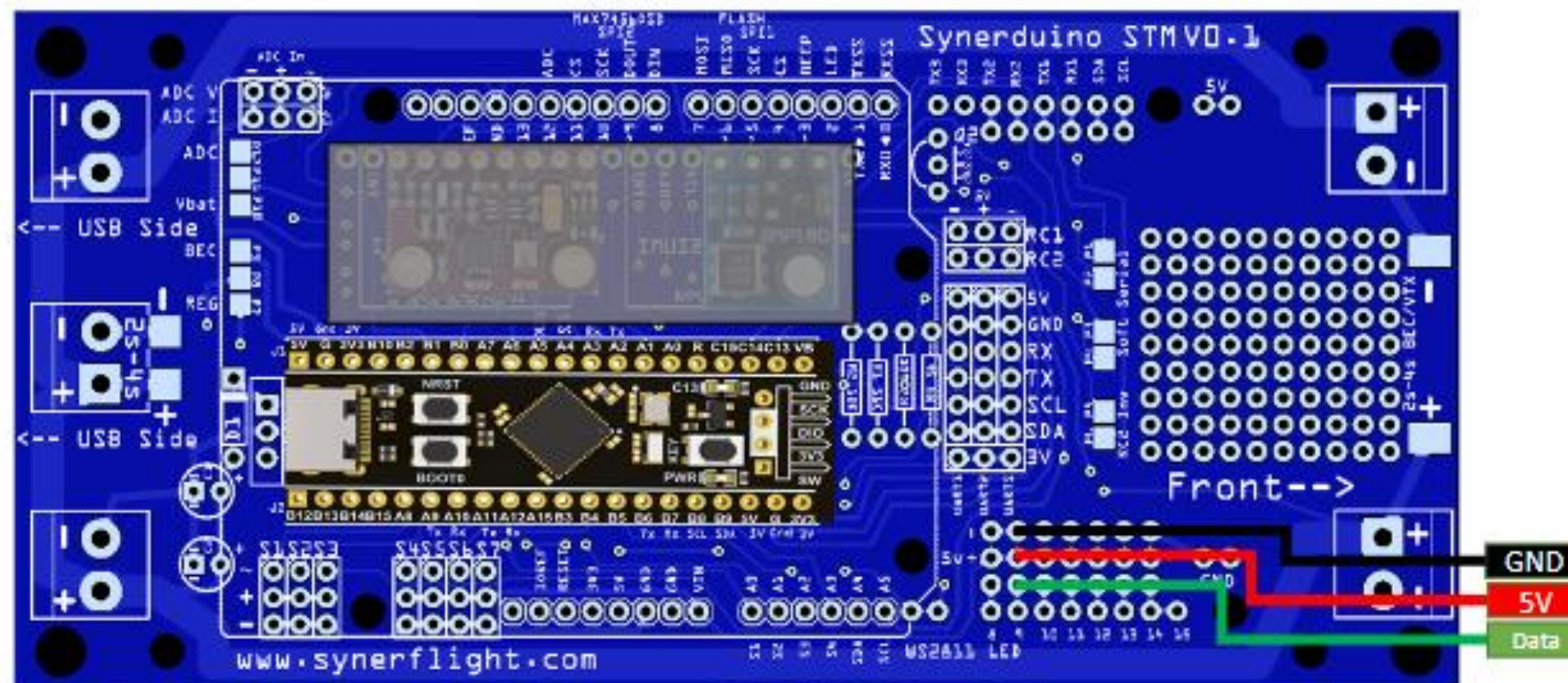
GND

WS2811 LED allows you to
add upto 32 LED strip or 5x5
Led Matrix

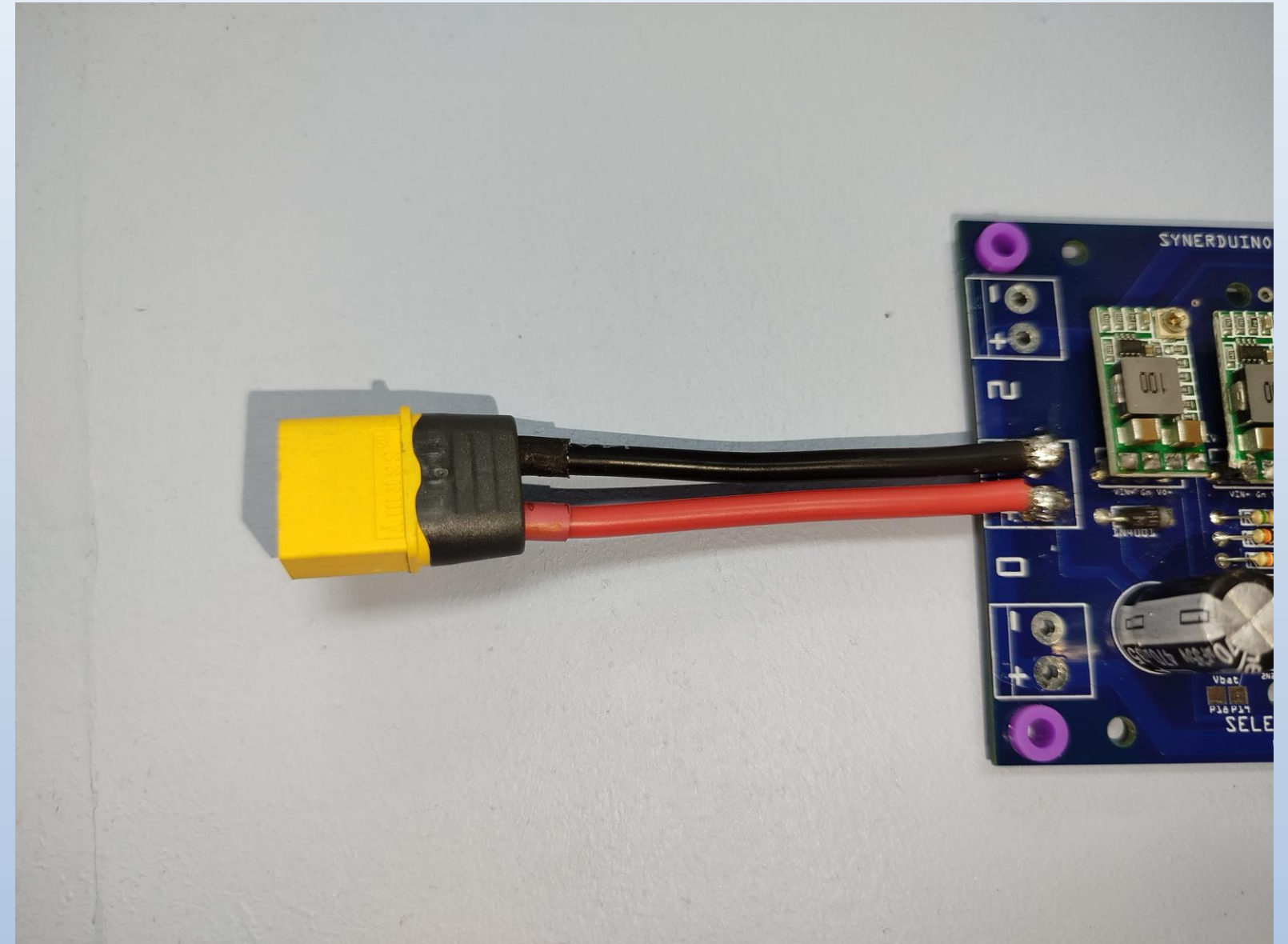
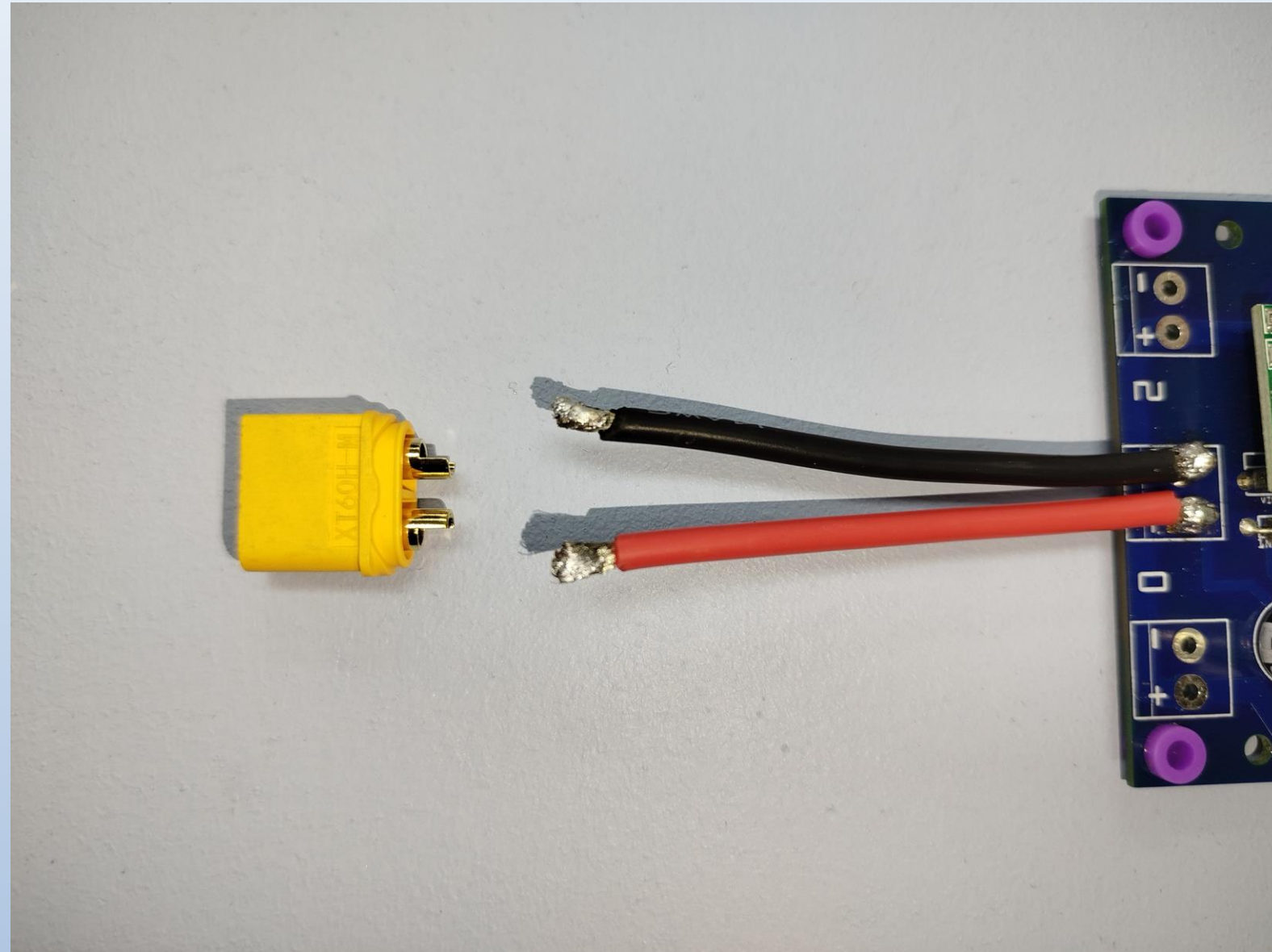
Accessible on Pin 8 & 9

This also requires 3 Timers

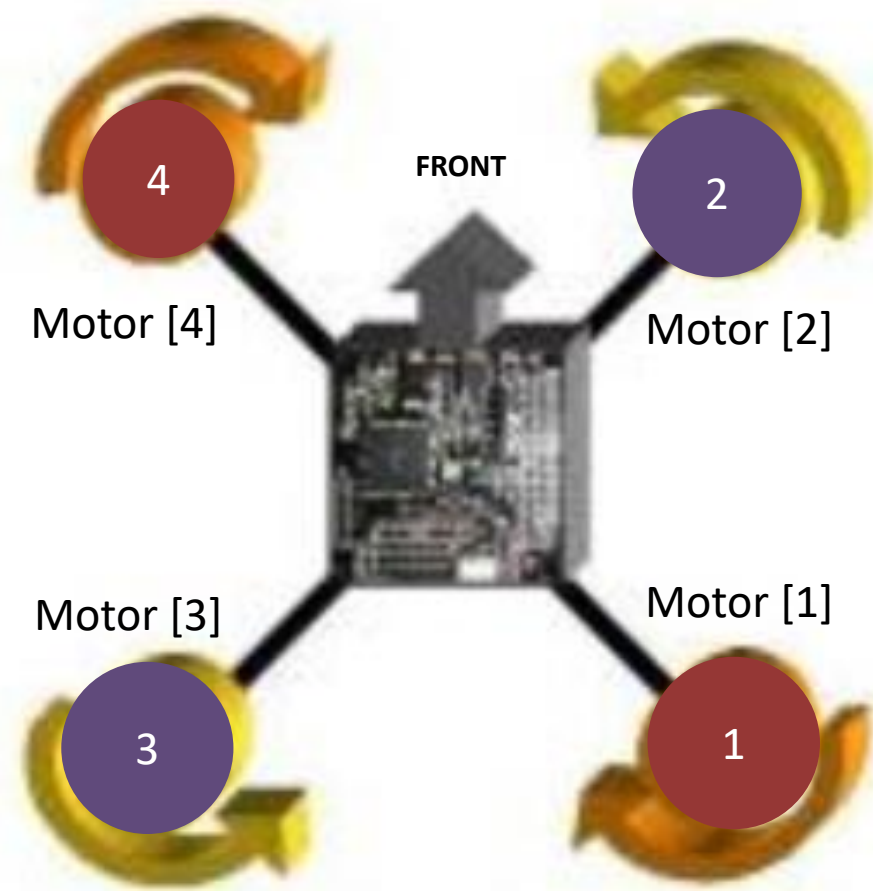
When activated only 5 PWM
pins can be use for
Motor/Servo



POWER

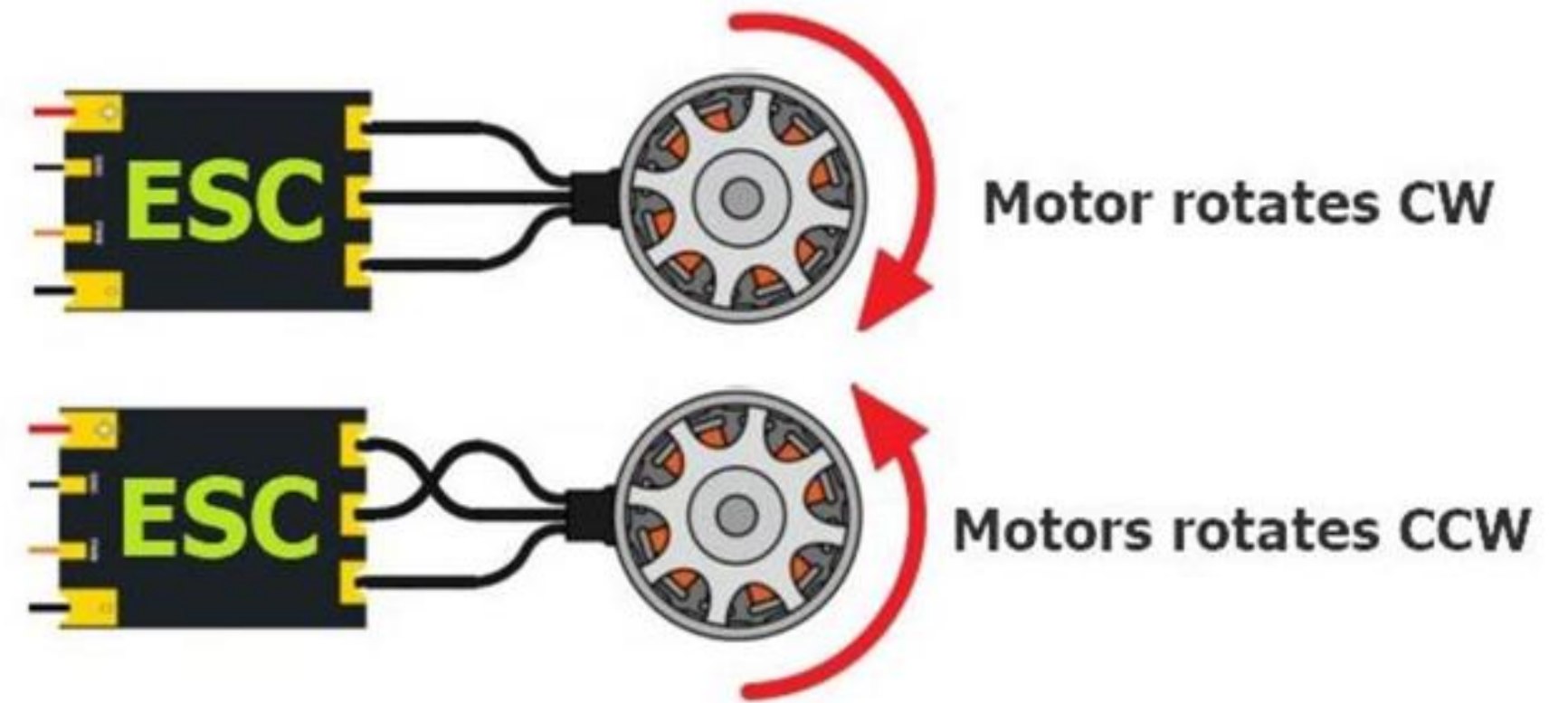


MOTOR, ESC, & PROPELLER INSTALLATION



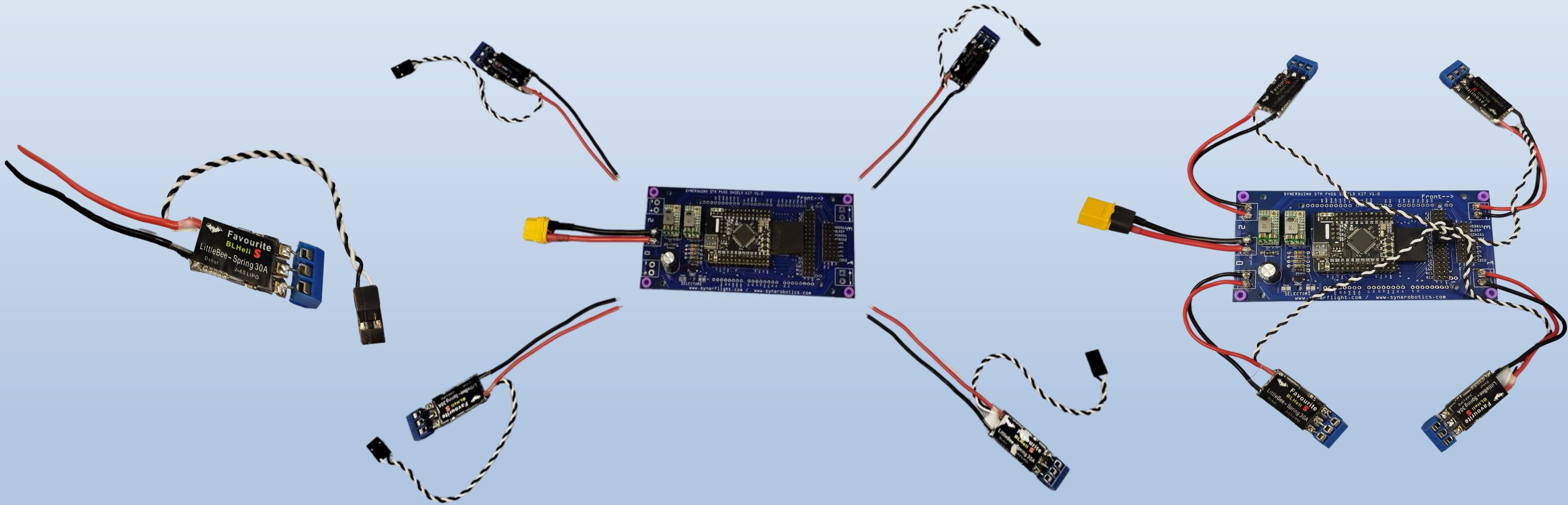
Note : you can pre solder the motor to the board and check for rotation before installing the propeller to ensure all motor rotations are correct

Electronic Speed Controller

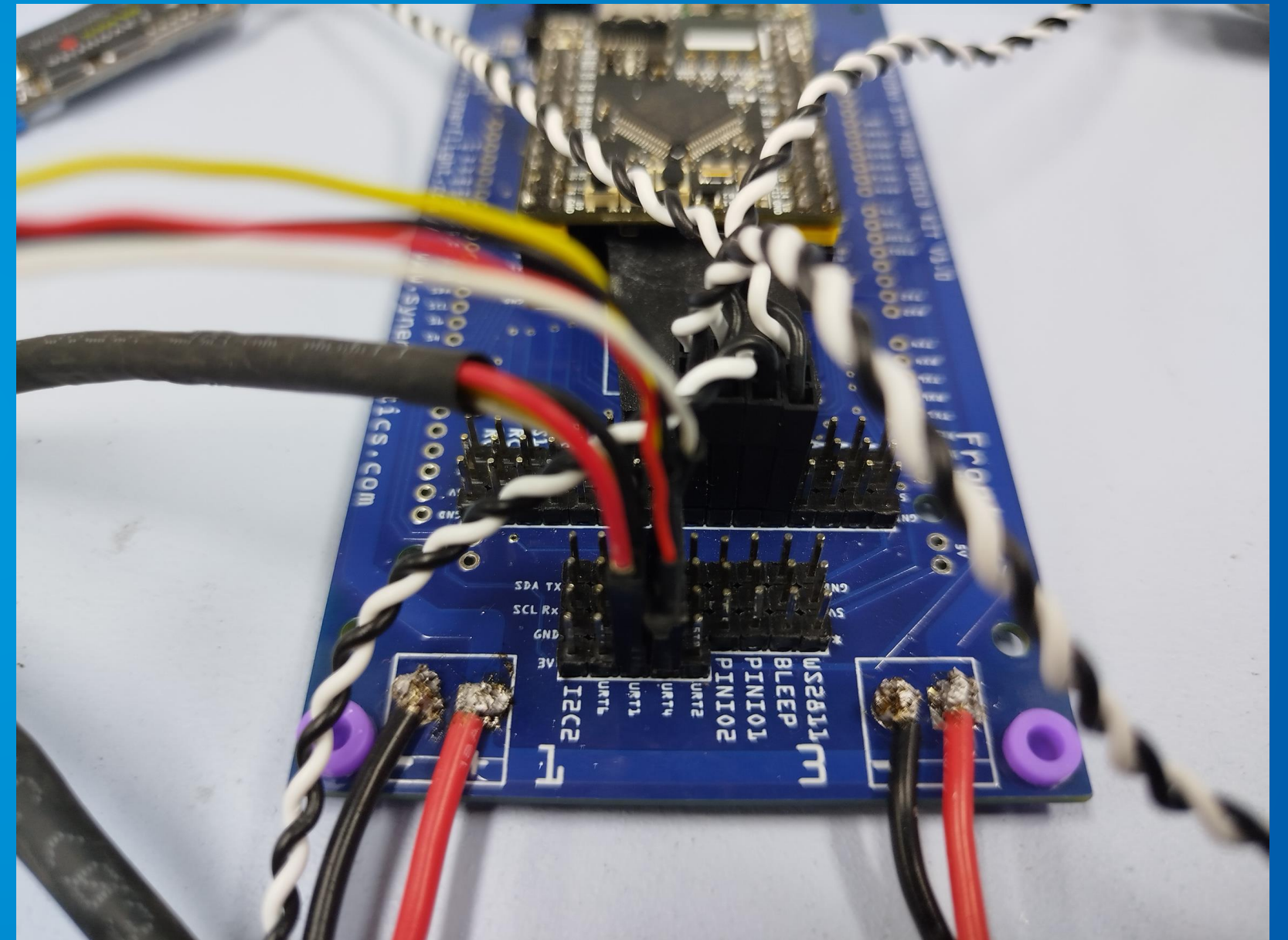
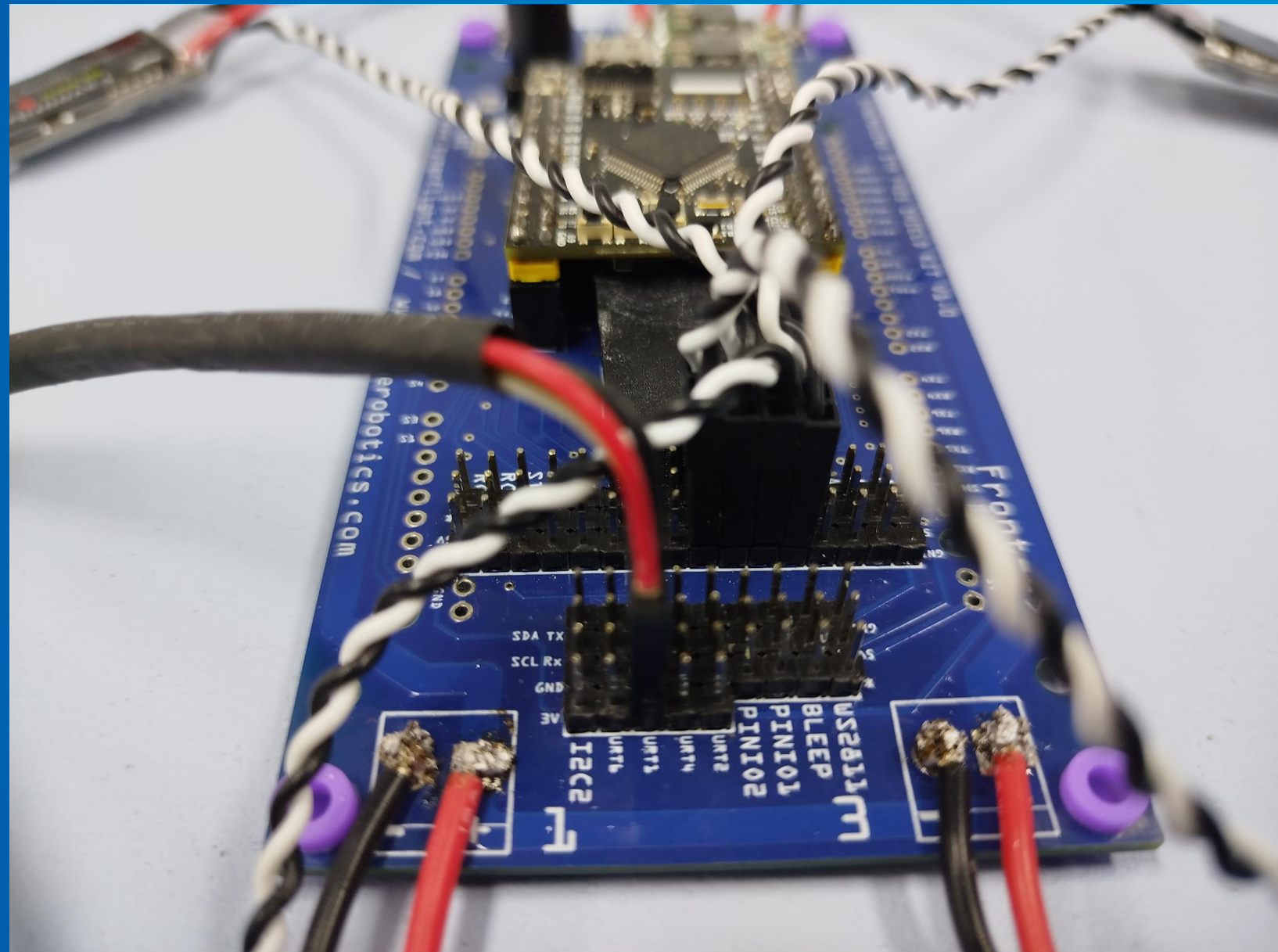


Note : on some brands of motor they may come in two different prop nuts color (Known as self tightening nuts)

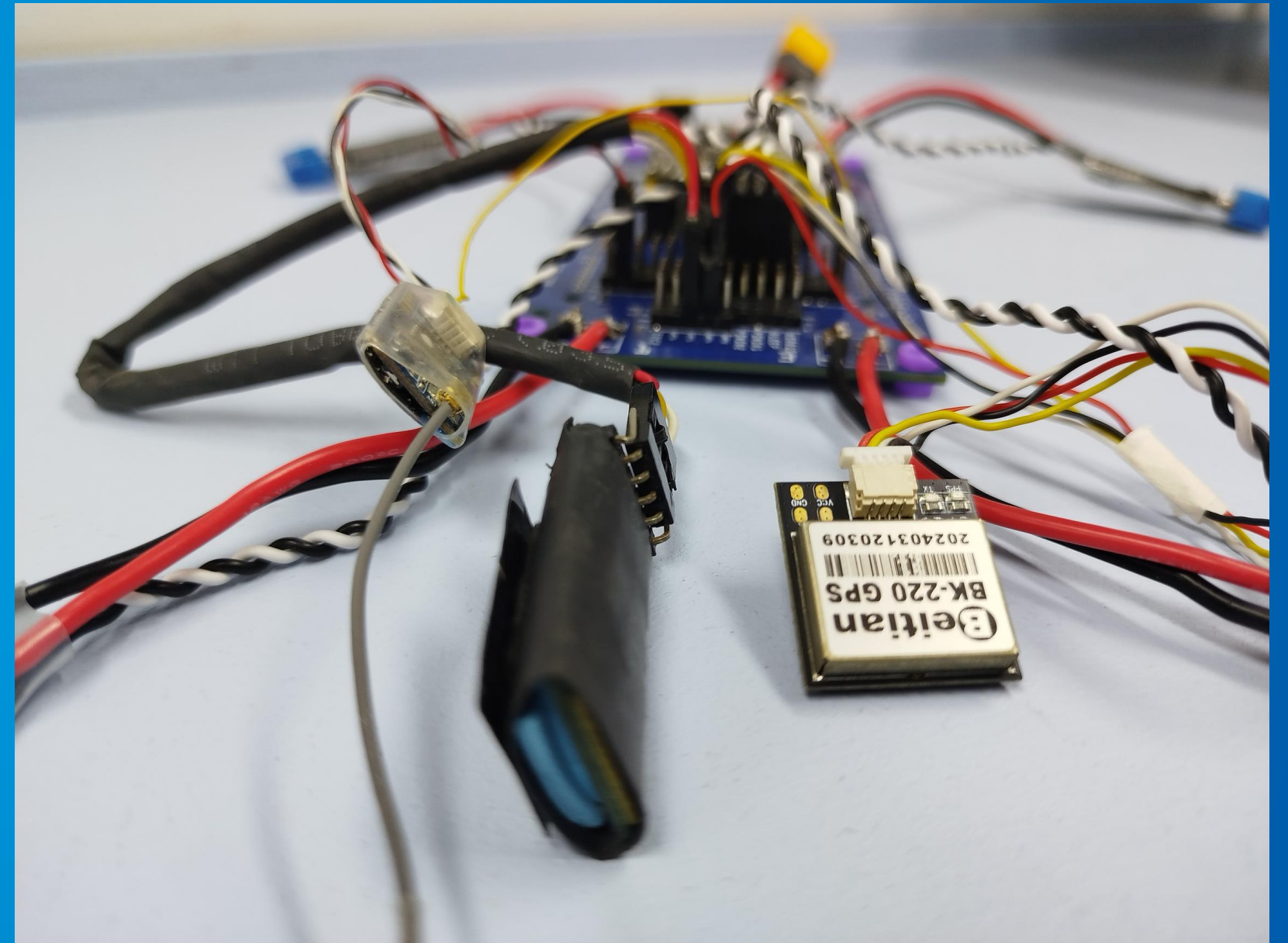
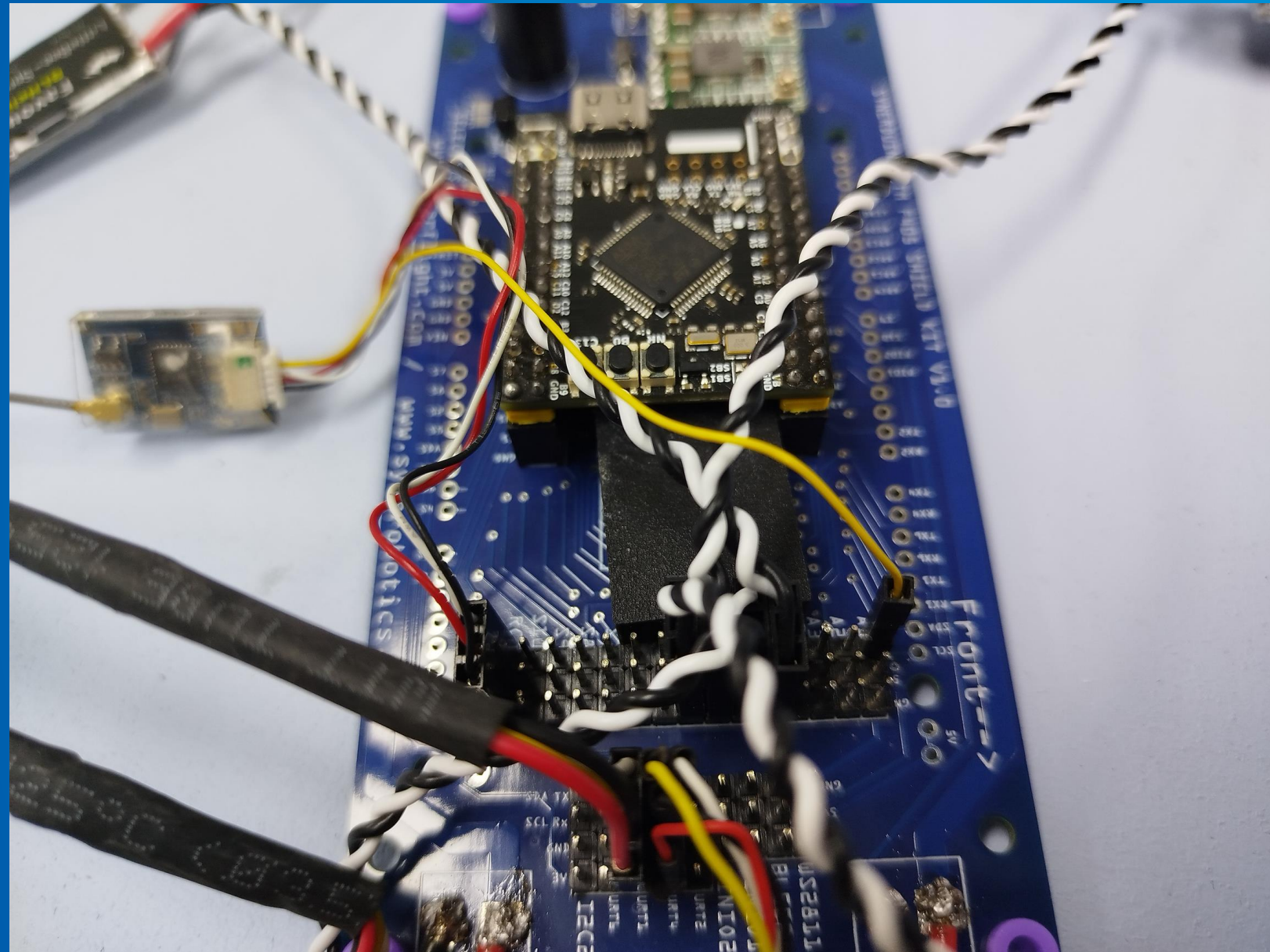
ESC INSTALLATION



ASSEMBLY



ASSEMBLY



MOTOR, INSTALLATION



Motor is Held in by 4pcs of 6mm Bolts and Washer set

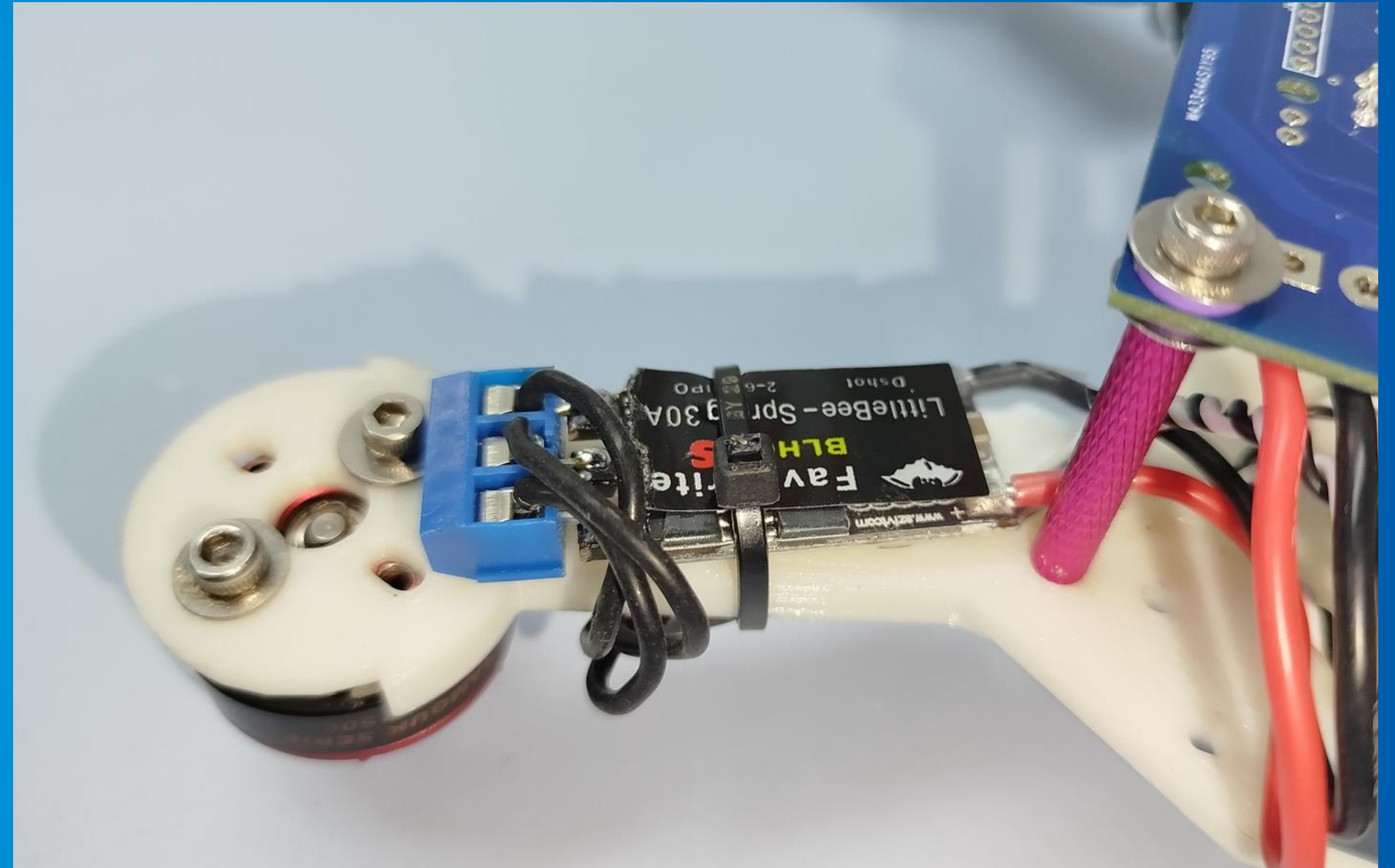
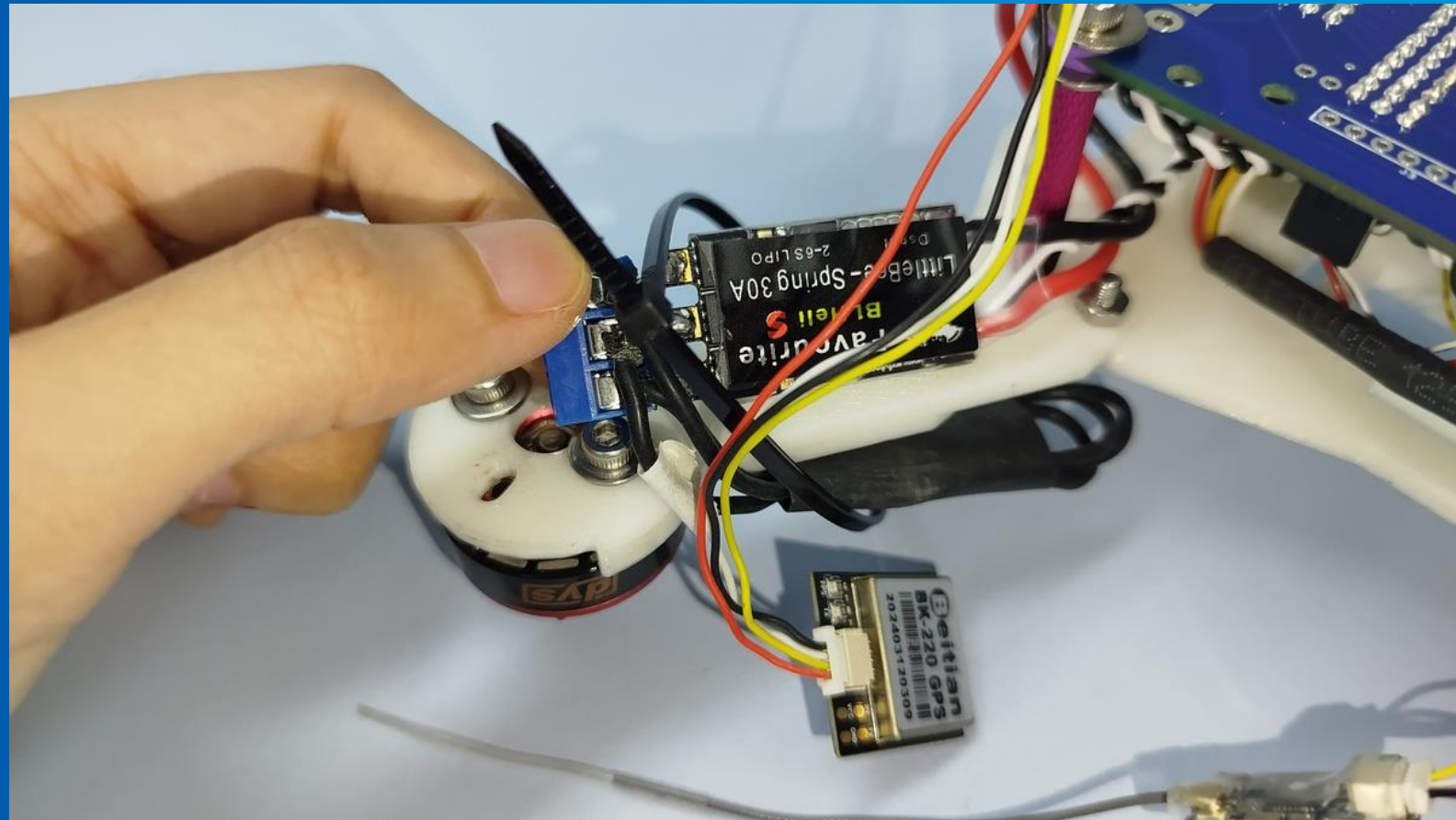
Bolt thread Must thread lock before installation to ensure it stay on

Thread Lock 242 blue or 222 Purple for light loads

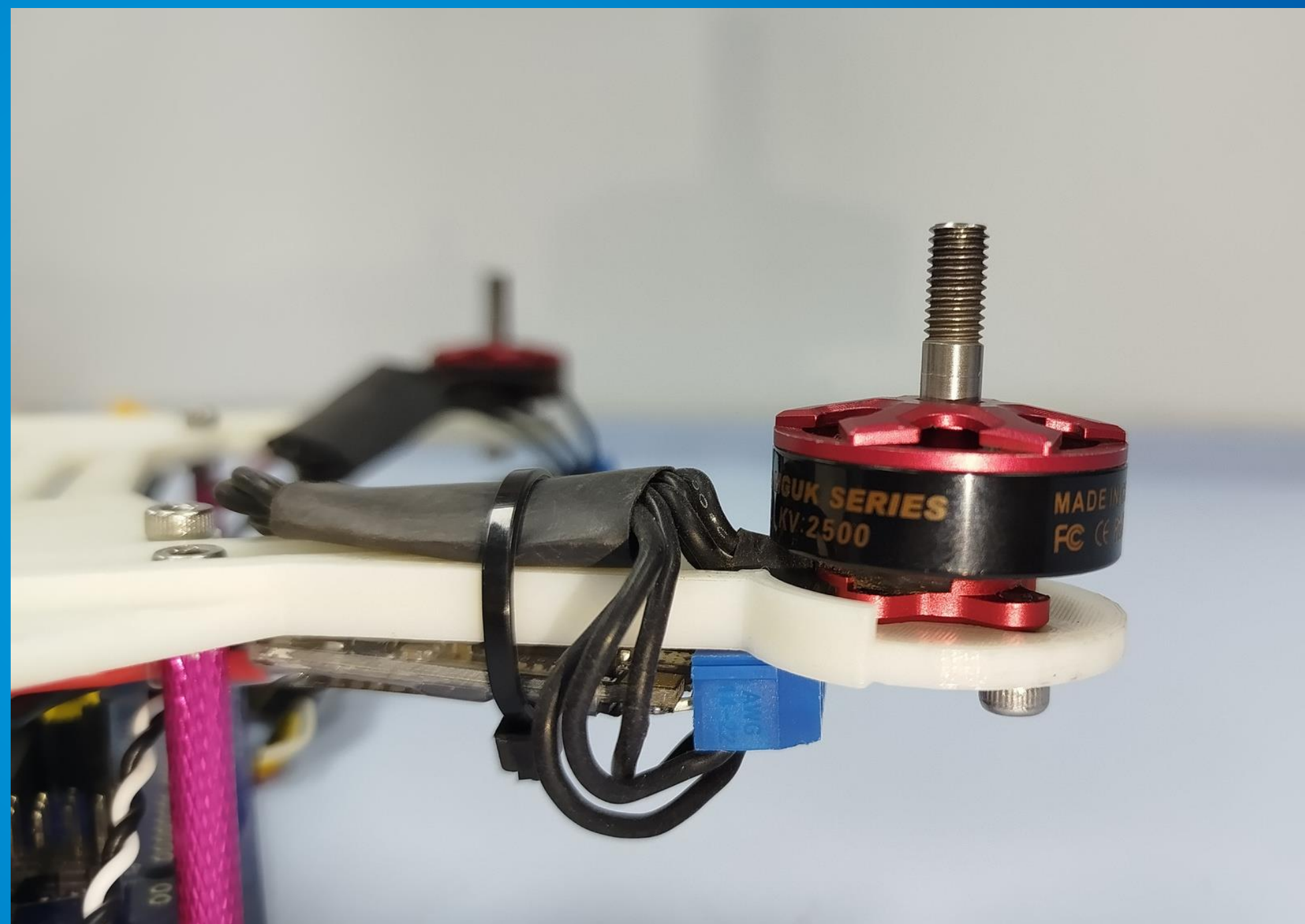
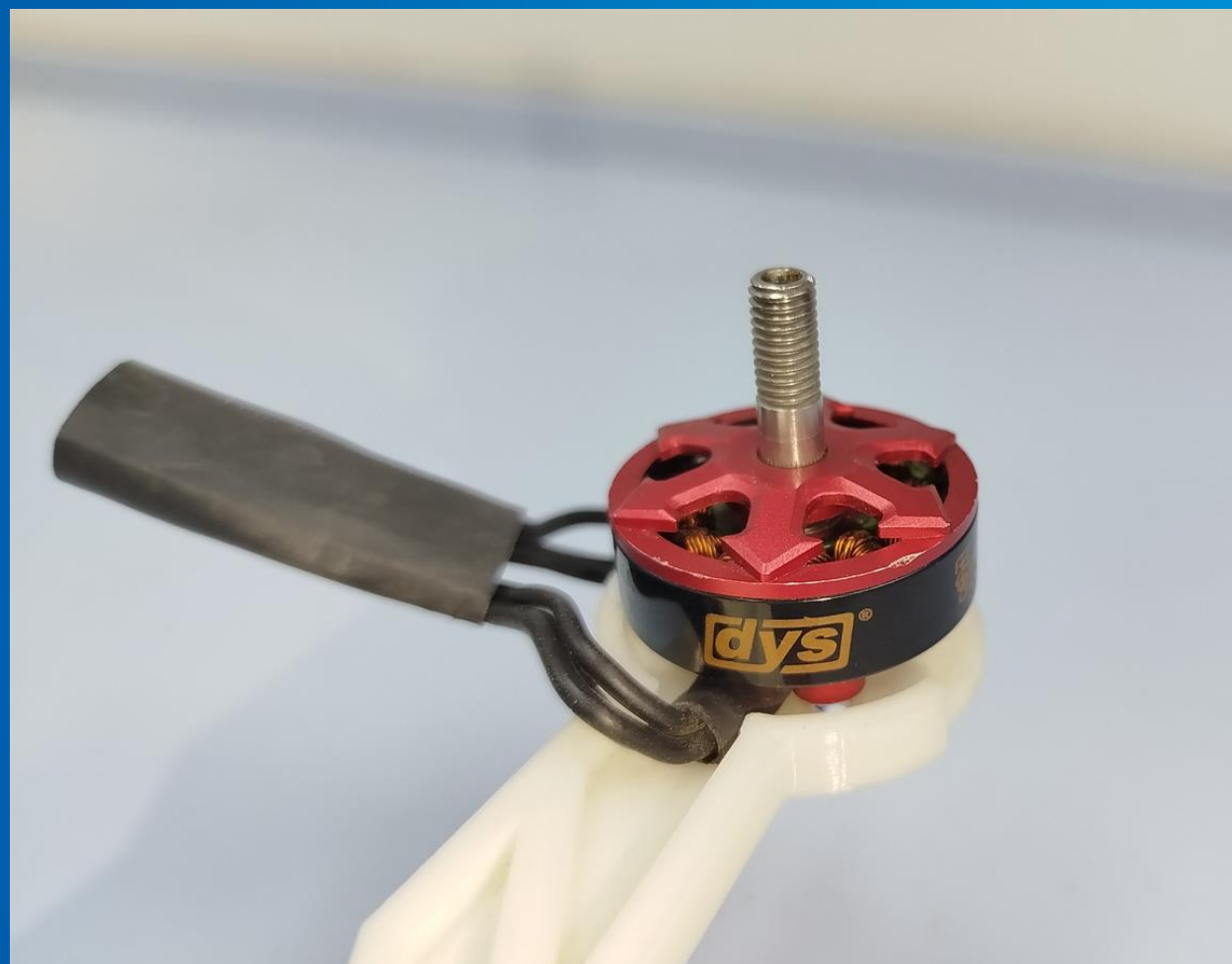
PVA White Glue



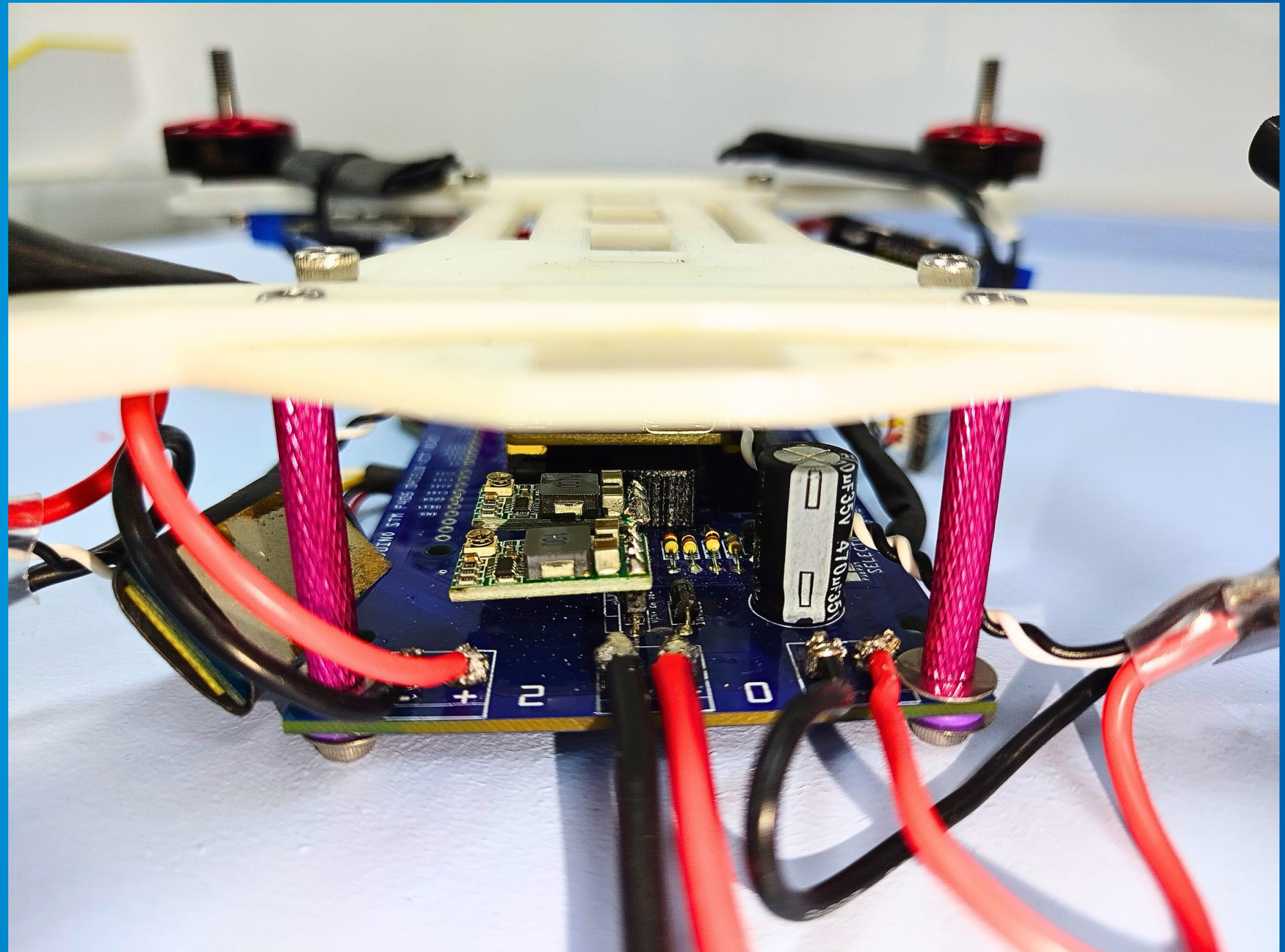
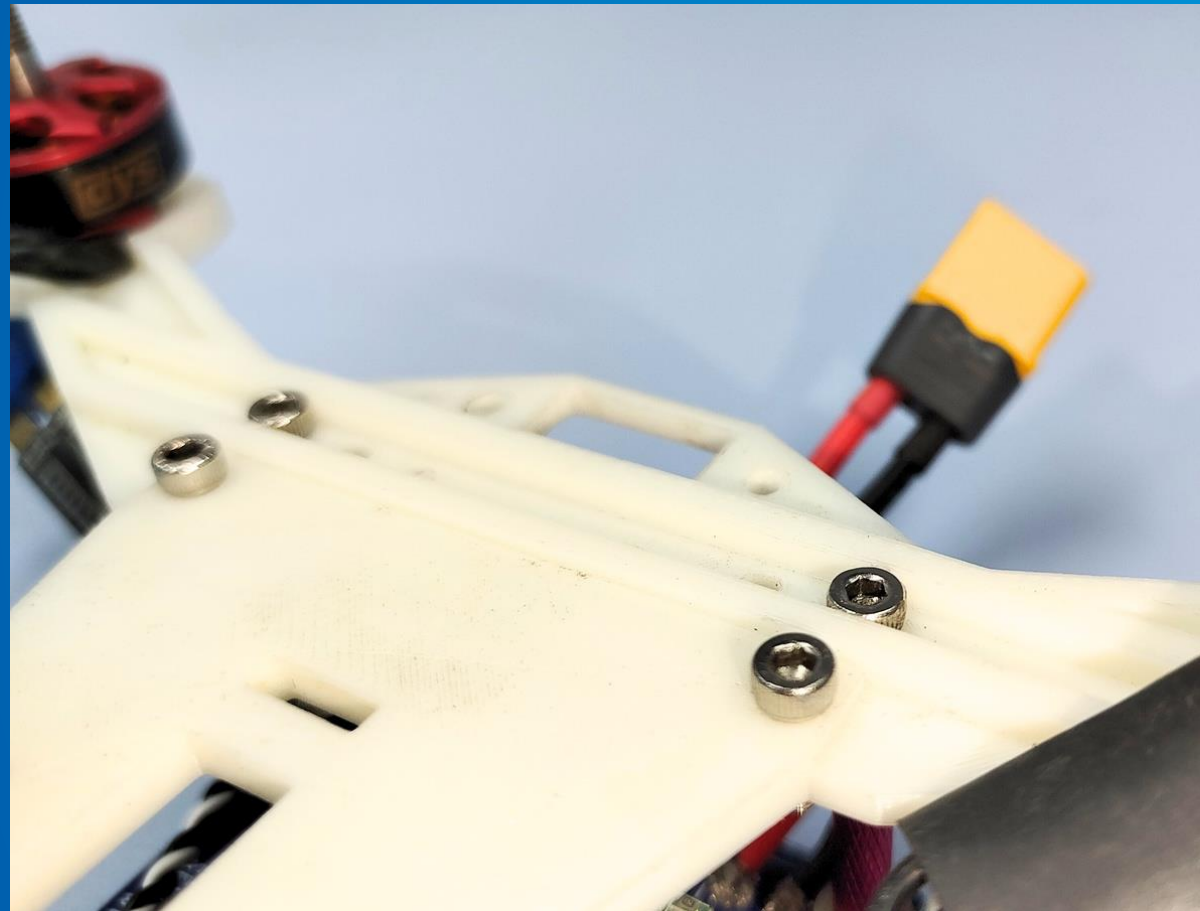
ASSEMBLY



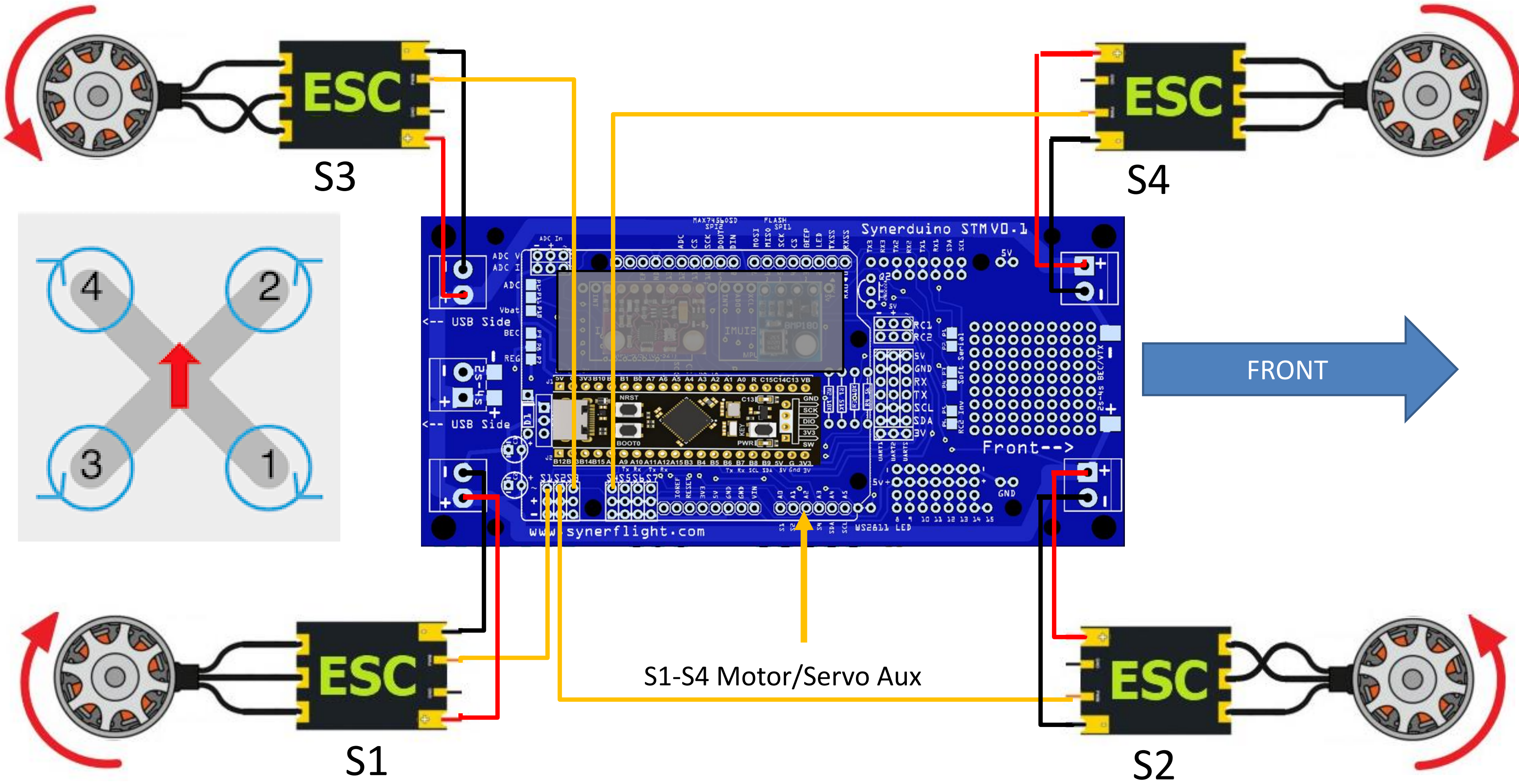
ASSEMBLY



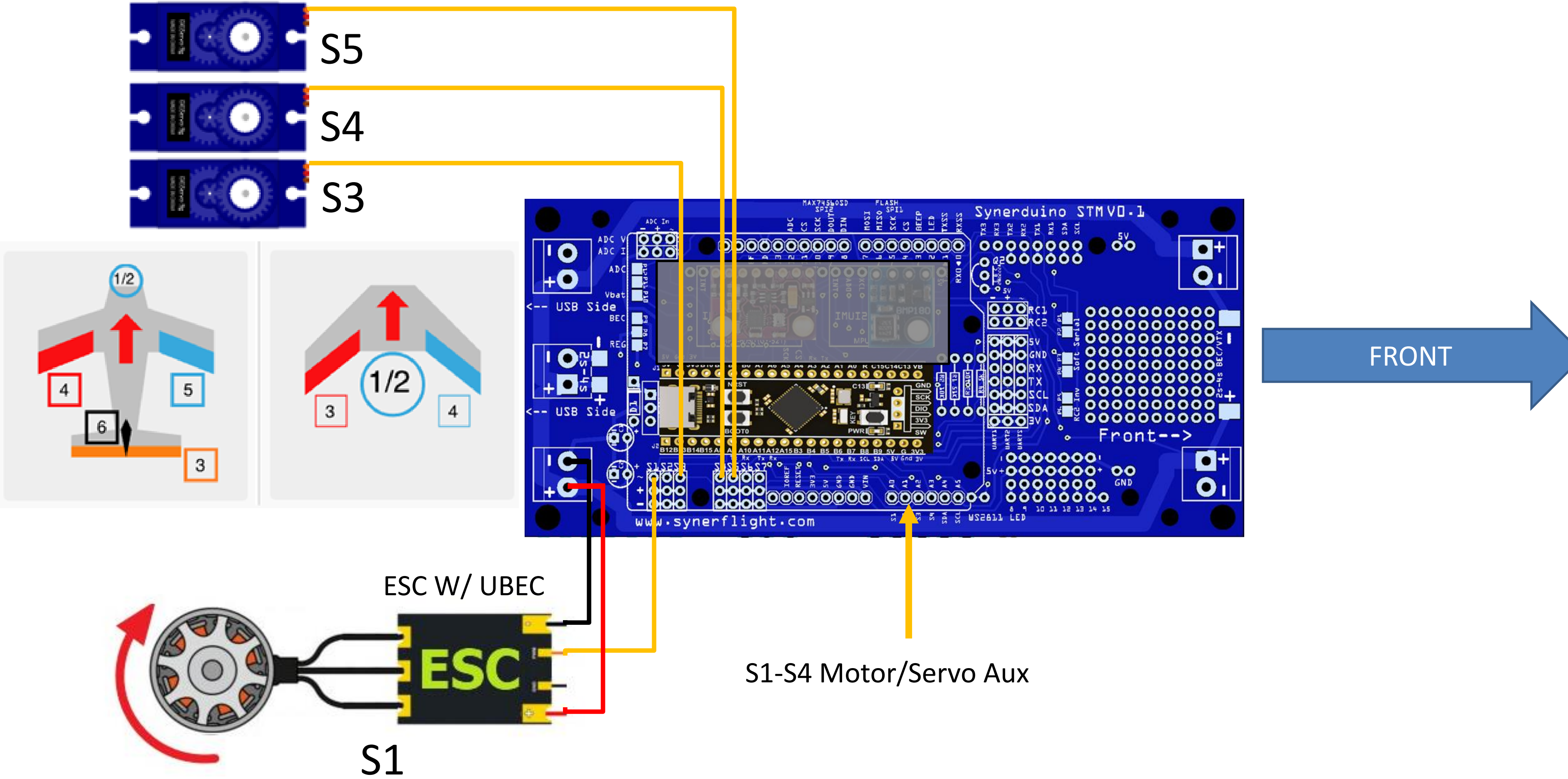
ASSEMBLY



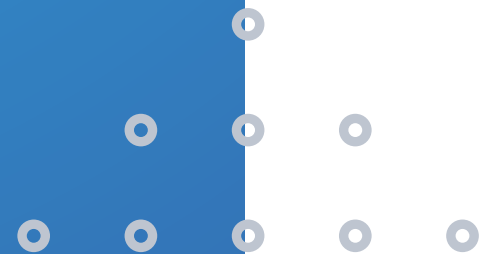
Multicopter Setup



Fixwing Setup

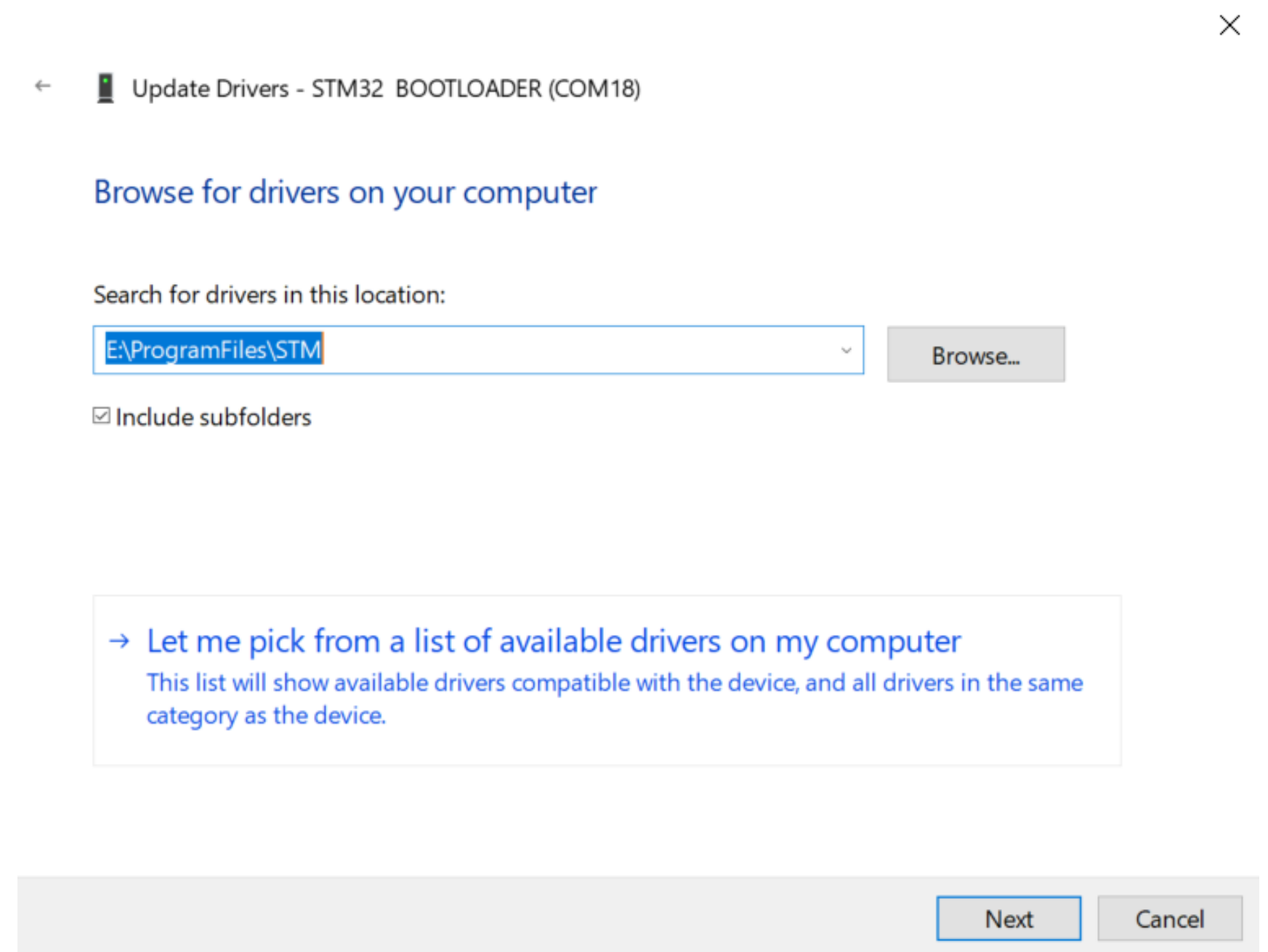
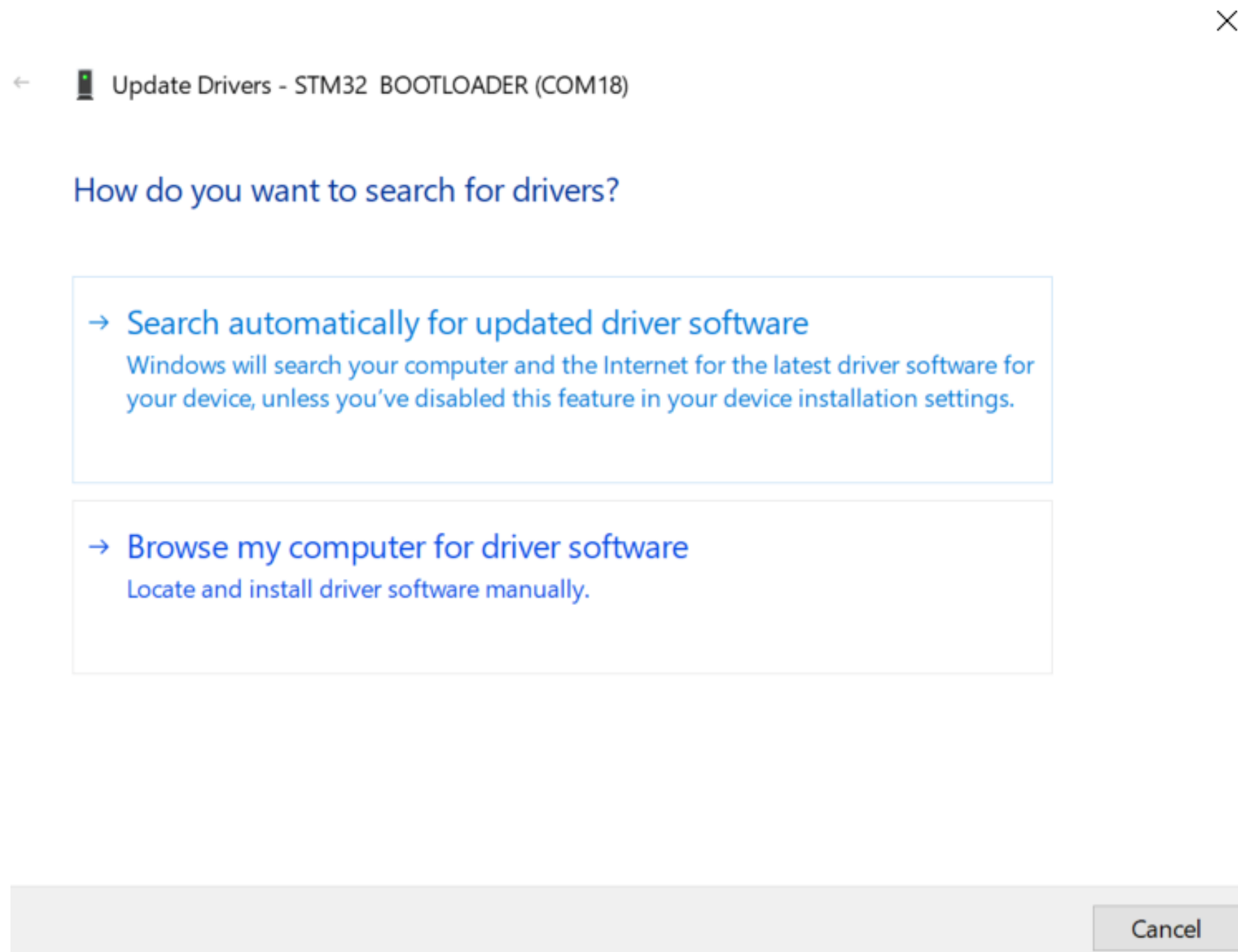


SOFTWARE SETUP



FIRMWARE INSTALLATION

- Browse my Computer for Driver
- Let Me Pick from List



FIRMWARE INSTALLATION

← Update Drivers - STM32 BOOTLOADER (COM18)

Select the device driver you want to install for this hardware.



Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

Show compatible hardware

Model

- STM Device in DFU Mode
- STM32 BOOTLOADER Version: 1.0.0.0 [17/01/2019]
- STM32 BOOTLOADER Version: 6.1.7600.16385 [02/06/2012]
- STM32 Bootloader**

This driver is digitally signed.

[Tell me why driver signing is important](#)

Have Disk...

Next

Cancel

← Update Drivers - STM32 BOOTLOADER

Windows has successfully updated your drivers

Windows has finished installing the drivers for this device:

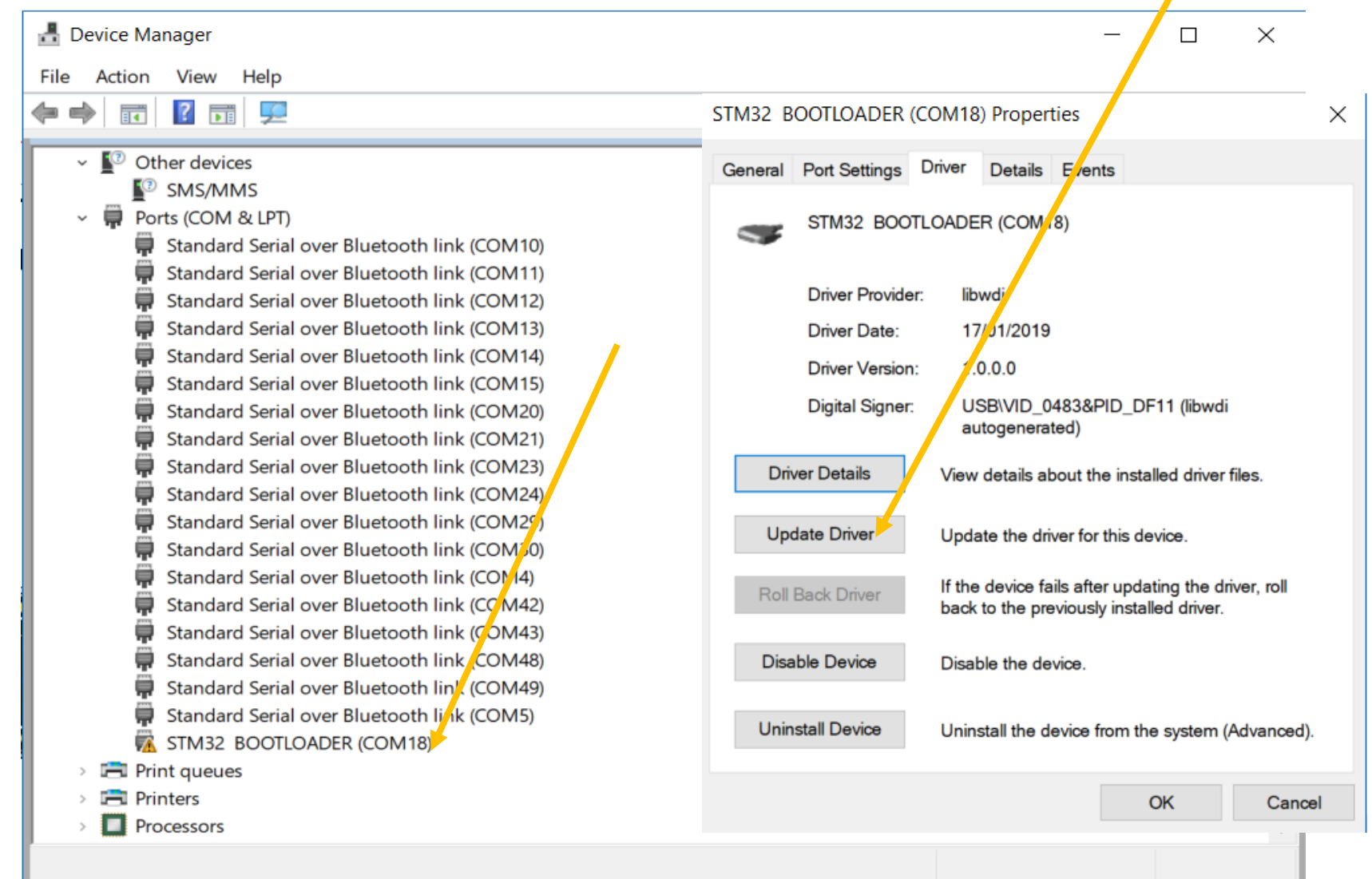
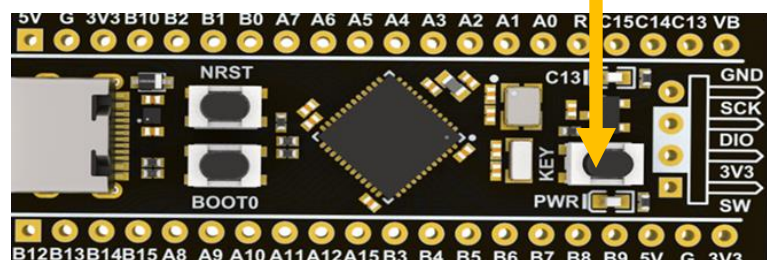
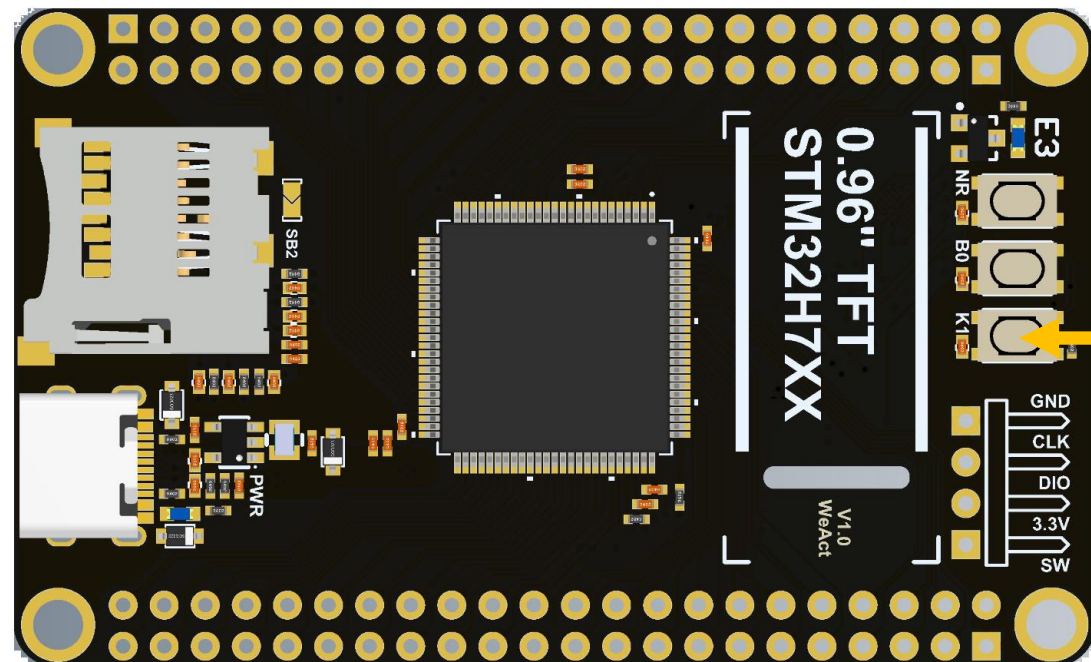
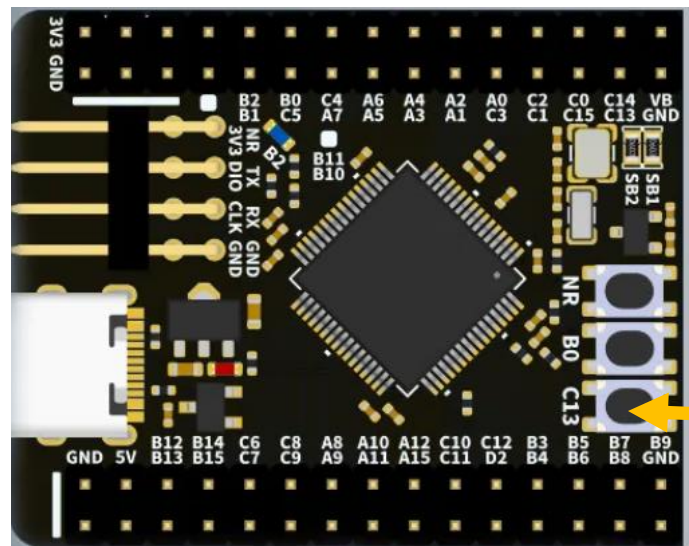


STM32 Bootloader

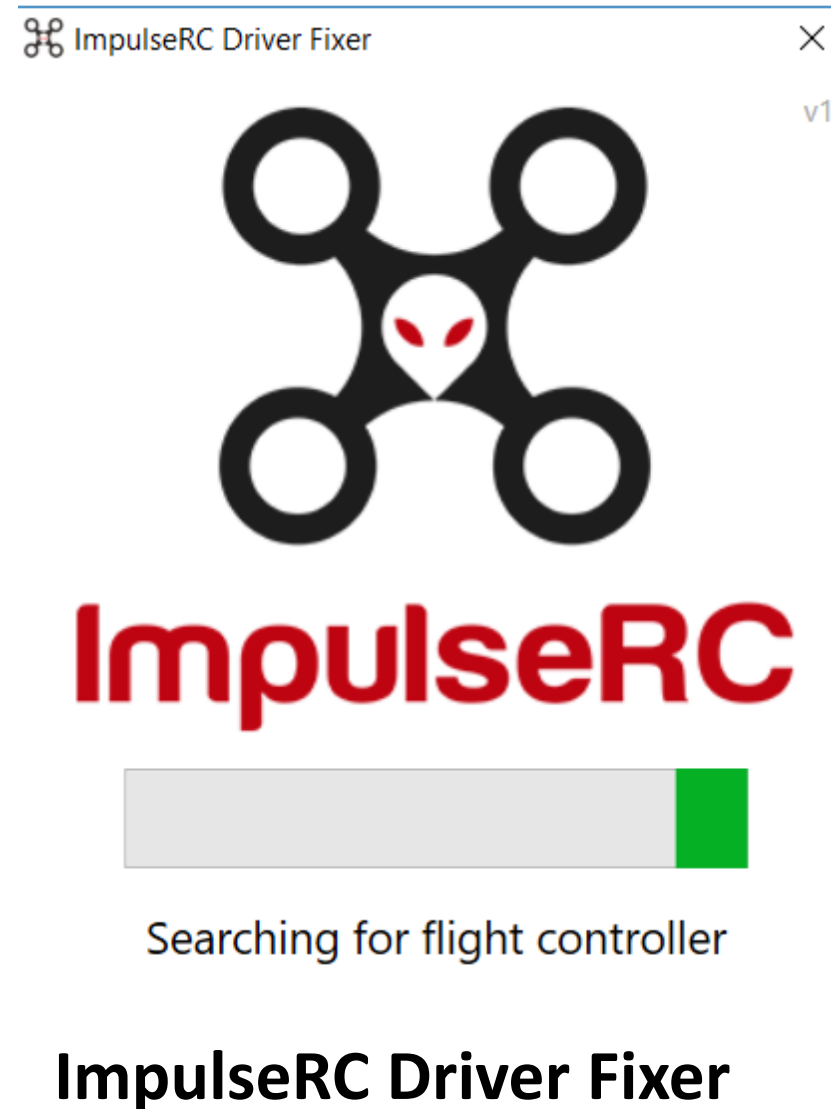
Close

FIRMWARE INSTALLATION

- Plug in USB you see Blue Led fading in and out
- Hold the Key Button for 3seconds till the blue light flashes and goes out
- In device manager the STM32 Bootloader (Com should show up)
- Note : this is for Brand new boards that were not flash with firmware , skip this for Synerduino package kits as they are preflashed for your convenience



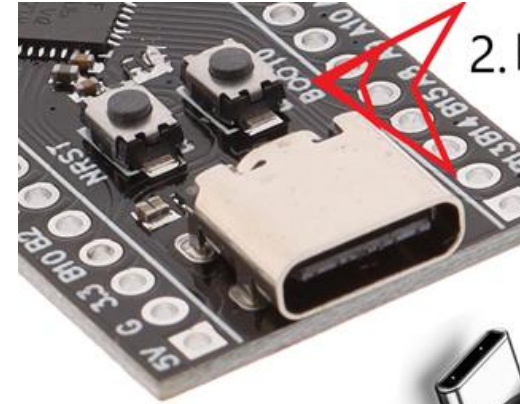
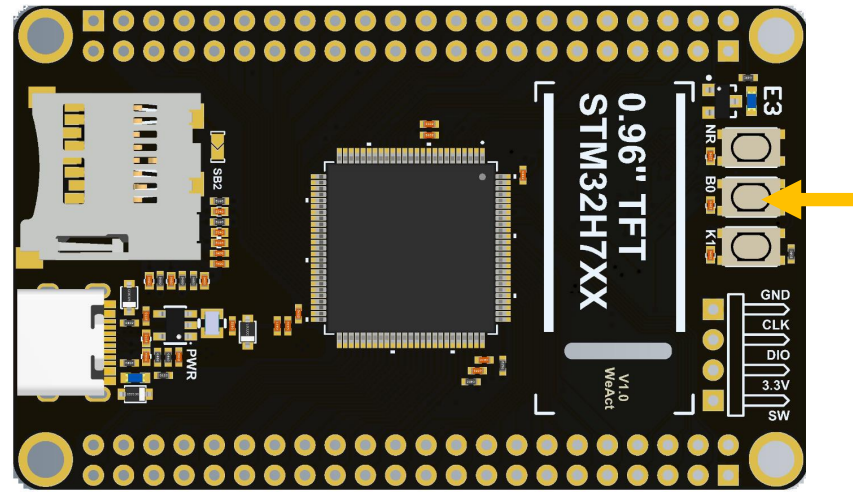
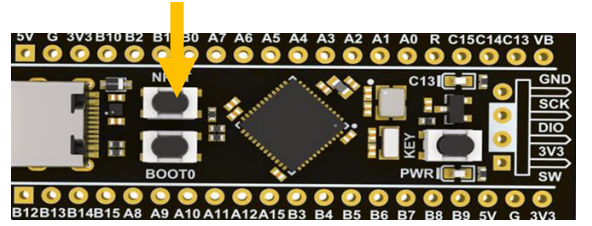
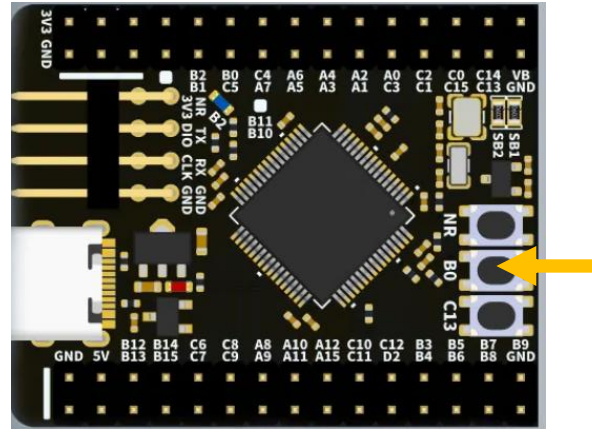
FIRMWARE INSTALLATION



https://impulserc.blob.core.windows.net/utilities/ImpulseRC_Driver_Fixer.exe

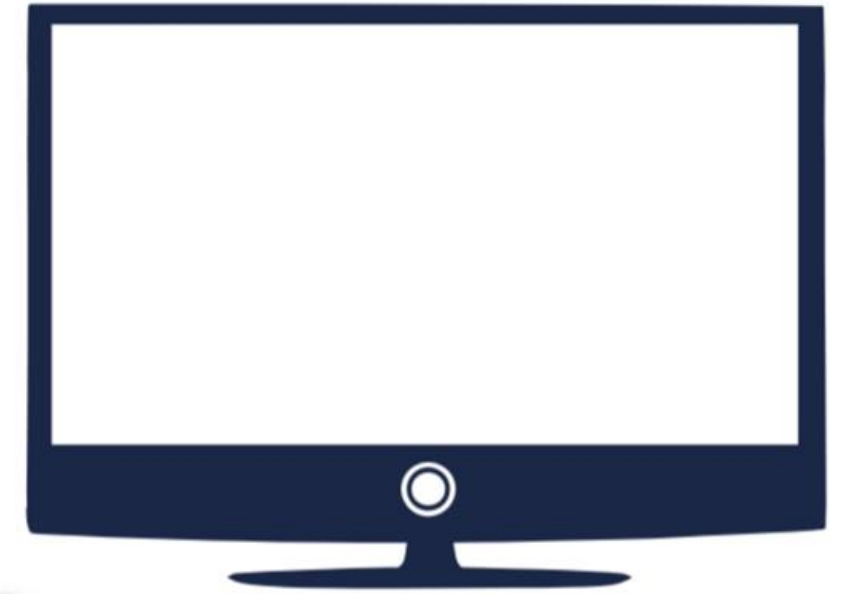
- Start ImpluseRC Driver Fixer
- Connect the FC USB to the PC While On DFU mode . (DO NOT power on FC via external 5V or Vbat)
- The ImpulseRC Driver Fixer should then see and load the proper driver

FIRMWARE INSTALLATION



2. Hold down the boot0 button.

1. Connect TYPE-C
usb to Board



3. Connect to USB to PC



After Flashed Processor setup

This can also be done by holding down the boot button while pressing the NRST button to reset the board . This is just like unplugging and plugging the USB (only to be use on a pre flashed blackpill)

F411 DFU mode can sometimes take several attempts as Windows may not recognize the device mode Its require to preheat heat the chip to 25c with your finger for some Reason.

Synerduino STMF411board a preheat can be made by running the board with the battery for 1 min

FIRMWARE INSTALLATION



- Start INAV configurator
- Connect the FC USB to the PC while holding the boot button in.
- INAV configurator should show it's connected in DFU mode in the top right corner (DO NOT click the CONNECT button)
- Choose the latest hex file for your FC and then "Load Firmware local". Once loaded, click "Flash Firmware".

Download Configurator for Windows platform (win32 or win64 is present) Extract ZIP archive Run INAV Configurator app from unpacked folder Configurator is not signed, so you have to allow Windows to run untrusted application. There might be a monit for it during first run

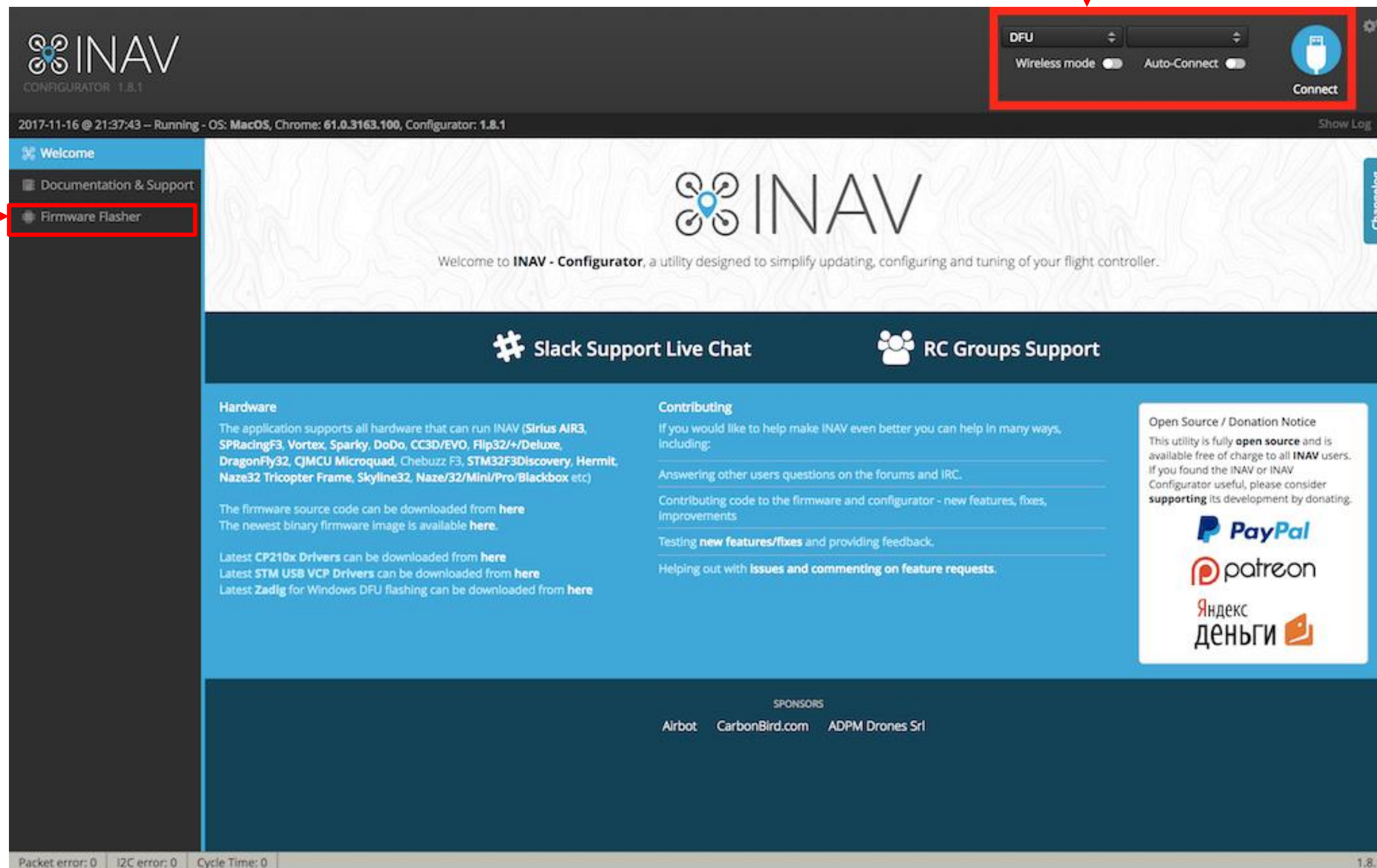
FIRMWARE INSTALLATION

When you've successfully connected, the Configurator will recognize a device in DFU mode – which will be reflected in the port selection tab at the top. **(Do Not Connect at this point)**

Next, click on the Firmware Flasher tab

DFU (**Device Firmware Update**) mode is an incredibly useful feature on modern microcontrollers. It allows for quick and easy updates to a device's firmware without the need of extra piece of hardware.

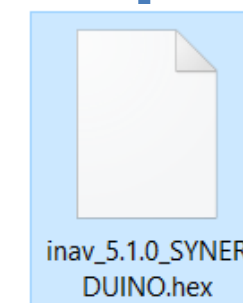
Typical **Boot Button** or **Jumper** is required to turn on the microcontroller into DFU mode



FIRMWARE INSTALLATION

Packet error: 0 | I2C error: 0 | Cycle Time: 0

Synerduino STM Hex files are available at Downloads Tab



Next, click on the Firmware Flasher tab and select your correct board and the latest release of the firmware, make sure “Full Chip Erase” is selected and click Load Firmware Local and Select the hex File that matches the version of your configurator and Shield Board

Once this process is Done and Rebooted you can now select your Serial Com port and Connect to the Synerduino STM Shield

Load Firmware [Local]

Look for the

INAV 5.1.0 – INAV8.0.0
SynerduinoSTMF411.hex
SynerduinoSTMF405.hex
SynerduinoSTMH743.hex

SETTING UP YOUR DRONE

SETUP

After the Firmware installation you may connect normally to the board using the Com and baud assign to it (115600) default baud

This is where you check the Status of your drone

Frame type ,orientation and other important information

Ensure all Pre-Arming checks are in the Green otherwise pls check the configuration or hardware of issue

The Tab on top indicates the Sensors and status

Red means it has issue
Blue is Active
Grey out is not available

The screenshot displays the INAV Configurator software interface. At the top, there's a status bar with a battery level of 8.88 V and a 'No dataflash chip found' warning. Below this, a log shows system messages like 'MultiWii API version received - 2.5.0' and 'Flight controller info, identifier: INAV, version: 7.0.0'. The main 'Setup' page features a 'Reset Settings' button and a central 3D drone model with green arrows indicating orientation. On the right, a 'Pre-arming checks' section lists several items, all marked with green checkmarks, indicating they are active or successful. Below this, an 'Info' section provides details about the battery, such as 'Battery detected cell count: 3' and 'Battery voltage: 8.88 V'. The bottom status bar shows various system metrics like 'Cycle Time: 516', 'CPU Load: 27%', and 'MSP version: 2'. The Windows taskbar at the very bottom shows the time as 12:19 PM on 28/03/2024.

SETTING UP YOUR DRONE

CALIBRATION

Before the controller goes into the airframe it has to be first calibrated

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.93 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). The main window is titled "INAV CONFIGURATOR 7.0.0-RC2" and "FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]". A log window on the left shows system messages, including "MultiWii API version received - 2.5.0" and "Flight controller info, identifier: INAV, version: 7.0.0".

The central area is divided into six calibration steps, each with a drone icon and a checkmark:

- Step 1: Gyro calibration
- Step 2: Accelerometer calibration
- Step 3: Magnetometer calibration
- Step 4: Gyro calibration
- Step 5: Accelerometer calibration
- Step 6: Magnetometer calibration

Below the steps is an "Accelerometer Values" table:

| Value | X | Y | Z |
|----------|------|------|------|
| Acc Zero | -40 | 16 | -76 |
| Acc Gain | 4098 | 4097 | 4085 |

On the right side, there are two calibration panels:

- Compass Calibration:** Includes a "Calibrate Compass" button and input fields for Zero X (-24), Zero Y (33), Zero Z (-24), Gain X (1351), Gain Y (1317), and Gain Z (1249).
- Optic Flow Calibration:** Includes a "Calibrate Optic Flow sensor" button and a Scale input field (10.5).

A "Save and Reboot" button is located at the bottom right. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 527, CPU Load: 28%, MSP version: 2, MSP load: 0.7, MSP round trip: 107, HW round trip: 38, Drop ratio: 0%, Arming Flags: -. The system version is 7.0.0-RC2. The Windows taskbar at the bottom shows the time as 12:20 PM on 28/03/2024.

SETTING UP YOUR DRONE

MIXER (INAV5-6)

Airframe or
Vehicle type
Preset and mix
selection

Load and apply
when selected
then Save
Reboot

- Multirotor
- Airplane
- Tricopter
- Rover
- Boat
- Others

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.97V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main content area is titled "Mixer" and includes a "Platform configuration" section with a dropdown menu set to "Multirotor". Below this is a "Mixer preset" section with a "Quad X" dropdown and a diagram of a quadcopter with motors numbered 1-4. The "Output Mapping" section shows a table with columns for outputs S1-S7 and their functions. The "Motor Mixer" section contains a table for configuring motor outputs.

| Output | S1 | S2 | S3 | S4 | S5 | S6 | S7 |
|----------|---------|---------|---------|---------|----|----|----|
| Function | Motor 1 | Motor 2 | Motor 3 | Motor 4 | - | - | - |

| Motor | Throttle [T] | Roll [A] | Pitch [E] | Yaw [R] |
|-------|--------------|----------|-----------|---------|
| 1 | 1 | -1 | 1 | -1 |

Buttons for "Mixer wizard", "Load and apply", "Load mixer", and "Save and Reboot" are visible. The bottom status bar shows system metrics like Packet error: 0, I2C error: 0, CPU Load: 90%, and MSP version: 2.

SETTING UP YOUR DRONE

MIXER Applicable for (INAV5-INAV6)

Note INAV5-INAV6 SynerduinoSTM has Two Firmware with different output arrangement for different vehicle types , (You can get creative in mixing for custom frame designs)

SYNERDUINOSTM.Hex (Default Loaded)

```
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S1
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S2
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S3
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S4
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S5
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S6
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S7
```

Vehicle Preset Mix

```
QUAD X           FlyingWing
QUAD +           Airplane
QUAD A-Tail     Airplane No Rudder
Y4              Airplane V-Tail 2 Aileron Servo
Y6              Airplane V-Tail 1 Aileron Servo
Hex X           Other Stuff
Hex +
Hex H
```

SYNERDUINOSTMSV.Hex

```
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S1
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S2
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S3
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S4
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S5
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S6
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S7
```

Vehicle Preset Mix

```
Quad X W/ Gimbal  FlyingWing Differential thrust
Quad + W/ Gimbal  Airplane Differential Thrust
Single Copter     Airplane V-Tail Differential Thrust
Bi-Copter         Other Stuff
Tricopter
Rover
Boat
Camera Gimbal
```


SETTING UP YOUR DRONE

MIXER (INAV7-8)

Airframe or Vehicle
time Preset and mix
selection

Load and apply when
selected then Save
Reboot

- Multicopter
- Airplane
- Tricopter
- Rover
- Boat
- Others

Mixing is now color
coded to timer
availability

INAV Configurator

8.96 V

INAV CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0
2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26
2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Setup
Calibration
Mixer
Outputs
Ports
Configuration
Failsafe
Ez Tune
PID tuning
Advanced Tuning
Programming
Receiver
Modes
Adjustments
GPS
Alignment tool
Mission Control

Mixer

Platform configuration

Multirotor Platform type

Normal motor direction / Props In configuration

PID Profile will use same index as Mixer Profile index

Timer outputs

AUTO Timer 1
AUTO Timer 2
AUTO Timer 3
AUTO Timer 4
AUTO Timer 5

Output Mapping

| Output (timer) | S1 (Timer 1) | S2 (Timer 2) | S3 (Timer 2) | S4 (Timer 2) | S5 (Timer 5) | S6 (Timer 3) | S7 (Timer 3) | S8 (Timer 4) |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Function | Motor 1 | Motor 2 | Motor 3 | Motor 4 | - | - | - | - |

Mixer preset

Quad X

Mixer wizard Load and apply Load mixer

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 759 CPU Load: 29% MSP version: 2 MSP load: 1.1 MSP round trip: 102 HW round trip: 45 Drop ratio: 0% Arming Flags: - 7.0.0-RC2

12:20 PM 28/03/2024

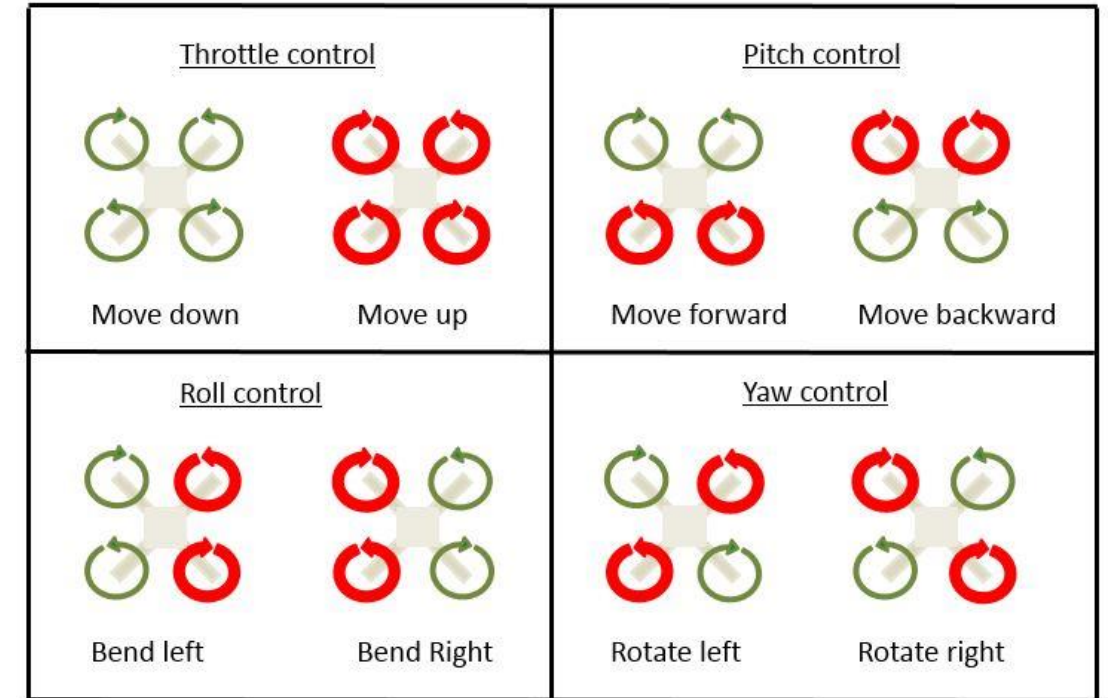
This allows you to assign motor and servo function to your custom drone frame or payload requirement this eliminates the need to recompile a new firmware for custom frame types

SETTING UP YOUR DRONE

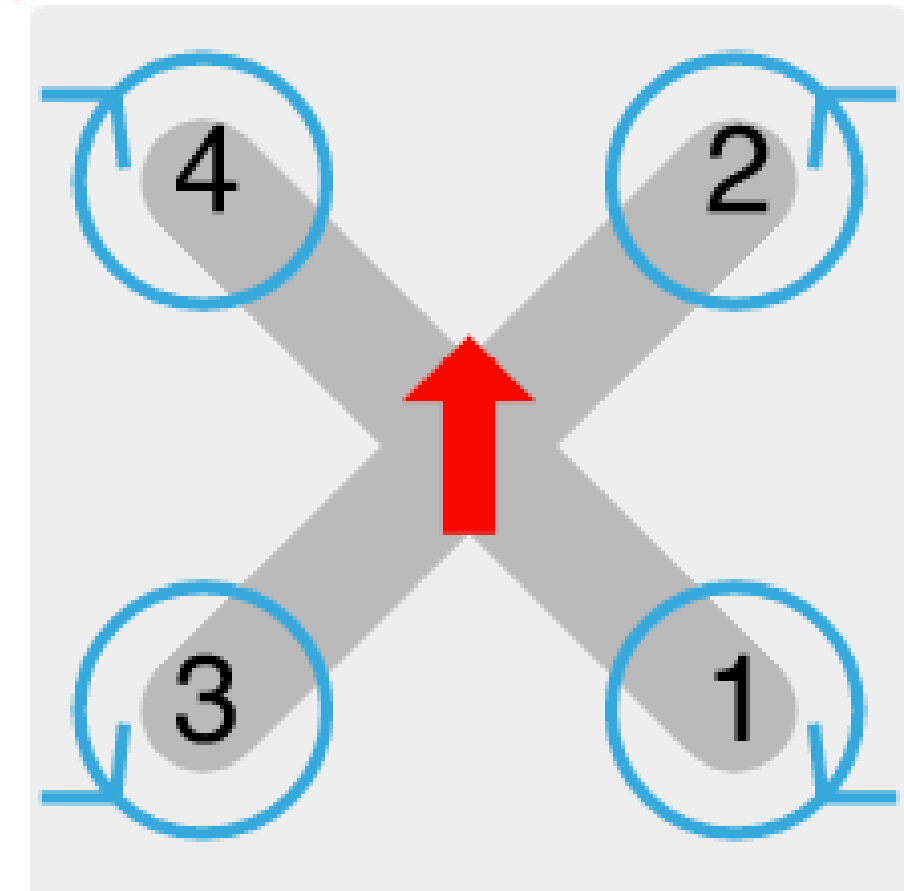
MOTOR MIX FOR QUAD X (INAV 5-6)

THROTTLE – SPOOL UP
AILERON - ROLL RIGHT
ELEVATOR - PITCH FORWARD
RUDDER - YAW RIGHT

(-) REDUCE RPM
(+) INCREASE RPM



○ Normal Speed
○ High Speed



| Output | S1 | S2 | S3 | S4 | S5 | S6 | S7 |
|----------|---------|---------|---------|---------|---------|----|----|
| Function | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Servo 1 | - | - |

| Motor | Throttle [T] | Roll [A] | Pitch [E] | Yaw [R] | |
|-------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| 1 | <input type="text" value="1"/> | <input type="text" value="-1"/> | <input type="text" value="1"/> | <input type="text" value="-1"/> | Delete |
| 2 | <input type="text" value="1"/> | <input type="text" value="-1"/> | <input type="text" value="-1"/> | <input type="text" value="1"/> | Delete |
| 3 | <input type="text" value="1"/> | <input type="text" value="1"/> | <input type="text" value="1"/> | <input type="text" value="1"/> | Delete |
| 4 | <input type="text" value="1"/> | <input type="text" value="1"/> | <input type="text" value="-1"/> | <input type="text" value="-1"/> | Delete |

[Add new mixer rule](#)

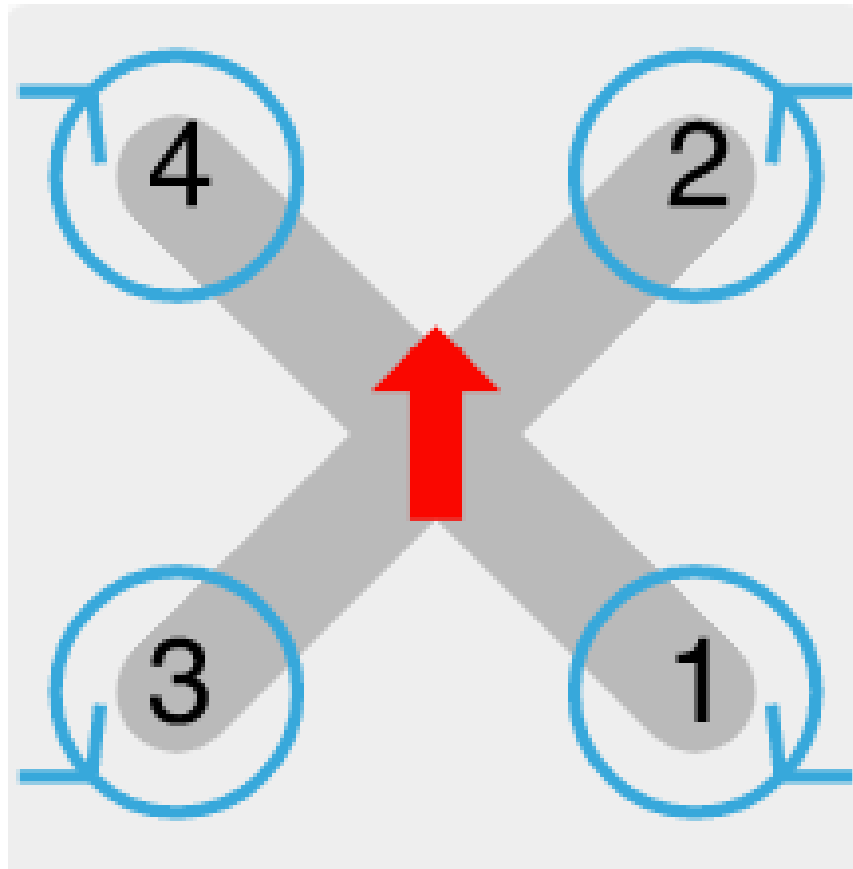
| Servo | Input | Weight (%) | Speed (10µs/s) | Active | |
|--------------------------------|--------------|----------------------------------|--------------------------------|--------|--------|
| <input type="text" value="1"/> | RC Channel 6 | <input type="text" value="100"/> | <input type="text" value="0"/> | Always | Delete |

[Logic conditions](#) [Add new mixer rule](#)

SETTING UP YOUR DRONE

MOTOR MIX FOR QUAD X (INAV 7-8)

THROTTLE – SPOOL UP
AILERON - ROLL RIGHT
ELEVATOR - PITCH FORWARD
RUDDER - YAW RIGHT



The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 7.0.0-RC2, and various system status indicators like battery voltage (8.93 V) and sensor status (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). The left sidebar contains navigation options: Setup, Calibration, Mixer (selected), Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, and Mission Control. The main content area is titled 'Motor Mixer' and contains a table for configuring motor outputs and a section for servo mixers.

| Output (timer) | S1 (Timer 1) | S2 (Timer 2) | S3 (Timer 2) | S4 (Timer 2) | S5 (Timer 5) | S6 (Timer 3) | S7 (Timer 3) | S8 (Timer 4) |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Function | Motor 1 | Motor 2 | Motor 3 | Motor 4 | - | - | - | - |

| Motor | Throttle [T] | Roll [A] | Pitch [E] | Yaw [R] | |
|-------|--------------|----------|-----------|---------|--------|
| 1 | 1 | -1 | 1 | -1 | Delete |
| 2 | 1 | -1 | -1 | 1 | Delete |
| 3 | 1 | 1 | 1 | 1 | Delete |
| 4 | 1 | 1 | -1 | -1 | Delete |

Buttons: Add new mixer rule, Save and Reboot

Bottom status bar: Packet error: 0, I2C error: 0, Cycle Time: 516, CPU Load: 29%, MSP version: 2, MSP load: 0.0, MSP round trip: 387, HW round trip: 41, Drop ratio: 0%, Arming Flags: -, 7.0.0-RC2

SETTING UP YOUR DRONE

OUTPUT

This Tab is use to calibrate and Test ESC, Motors and Servos assignment

Enable Motor and Servo Output must be on

ESC Protocol

- STANDARD
- STANDARD
- ONESHOT125
- MULTISHOT
- BRUSHED
- DSHOT150
- DSHOT300
- DSHOT600

Servo Refresh rate

- 50Hz
- 50Hz
- 60Hz
- 100Hz
- 160Hz
- 330Hz

The screenshot shows the INAV Configurator interface. The 'Outputs' tab is selected in the left sidebar. The 'Enable motor and servo output' toggle is turned on. The 'ESC protocol' is set to 'STANDARD' and the 'Servo refresh rate' is set to '50Hz'. A green banner provides a tip: 'For analog protocols, IDLE can be lowered below 10% if motors are working smooth without stuttering. If a drone wobbles after pulling throttle low, try increasing IDLE to tune this behavior out.' The 'Motors' section shows four motor channels, each at 0% throttle. A diagram of a quadcopter shows motor 1 at the front-right, motor 2 at the front-left, motor 3 at the back-right, and motor 4 at the back-left. The status bar at the bottom shows 'Voltage [V] 8.94', 'Current [A] 0.00', and 'Acc. noise RMS 0.0030'. The system status bar at the very bottom shows 'CPU Load: 102%', 'MSP version: 2', 'MSP load: 2.6', 'MSP round trip: 54', 'HW round trip: 14', and 'Drop ratio: 21%'.

SETTING UP YOUR DRONE

OUTPUT

This Tab is use to calibrate and Test ESC, Motors and Servos assignment

Calibrate ESC:

Remove all props

1. Activate motor Test mode
2. Master throttle up 100%
3. Plug in Battery and wait for the calibration Tune
4. Master throttle down 0%
5. Deactivate motor Test mode
6. Test the motor again by reactivating test motor test mode after the boot up tune start slowly throttling up

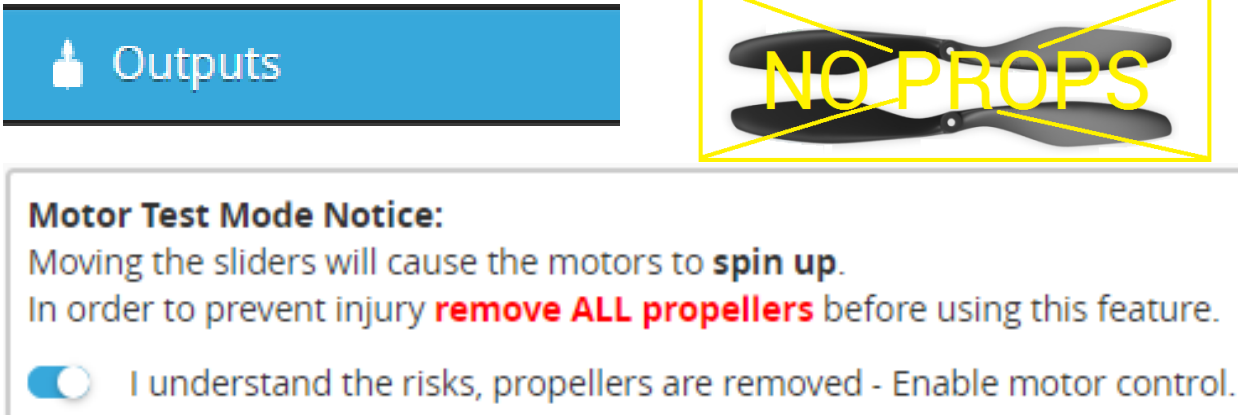
The screenshot displays the INAV Configurator software interface. At the top, the INAV logo and version information (CONFIGURATOR 6.0.0-FP2, FC FIRMWARE 6.0.0 [SYNERDUINOSTMSV]) are visible. The battery level is shown as 8.99 V. A sidebar on the left contains various configuration tabs such as Configuration, Failsafe, PID tuning, and Programming. The main area shows the 'Motors' section with four motor channels (1-4) each set to 100% throttle. A 'Master' slider is also present. A 'Motor Test Mode Notice' is displayed, warning that moving sliders will cause motors to spin up and advising to remove all propellers. A table on the right shows 'Acc. noise RMS' at 0.0013, 'Current [A]' at 20.50, and 'Voltage [V]' at 8.99. The bottom status bar shows system metrics like Packet error, I2C error, Cycle Time, CPU Load, and MSP version. The Windows taskbar at the bottom indicates the time is 12:51 PM on 16/12/2022.

SETTING UP YOUR DRONE

Electronic Speed Controller CALIBRATION

Its required that all speed controllers must be calibrated in order the motors to spool up at the same RPM and improve stability of the vehicle and the ease of tuning.

1. Plug Synerduino in with USB and Connect INAV Configurator
2. Go to Output Tab
3. Activate motor Test mode (Remove Props)
4. move Master throttle up 100%
5. Plug in Battery and wait for the calibration Tune
6. After the Program tune completed move Master throttle down 0%
7. Allow ESC to exit Programming mode with a Bleep
8. Test the motor again to ensure all motors start running at the same time and speed
9. Then Deactivate Motor Test mode an Disconnect Battery
10. Calibration complete




Outputs

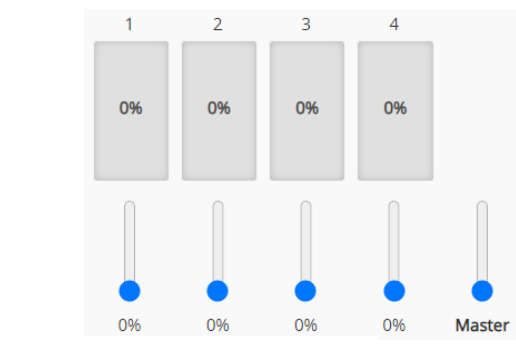

Motor Test Mode Notice:
Moving the sliders will cause the motors to **spin up**.
In order to prevent injury **remove ALL propellers** before using this feature.

I understand the risks, propellers are removed - Enable motor control.


1 2 3 4
100% 100% 100% 100%
100% 100% 100% 100% Master



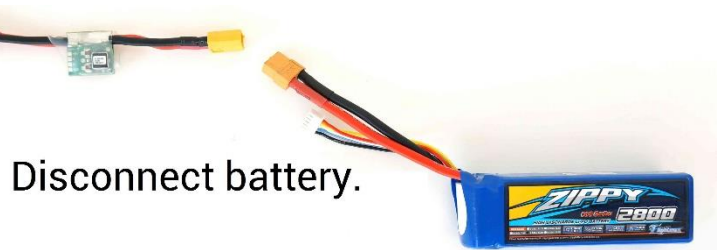
Connect battery to power module.



1 2 3 4
0% 0% 0% 0%
0% 0% 0% 0% Master



Disconnect battery.



SETTING UP YOUR DRONE

PORTS

The Number of Ports is relation to the specification of the Synerduino Board. Pls see data sheet

Dont Touch USB VCP connection for the STM board . Leave MSP On 115200 (changing this would disconnect the Board and Require Reflashing firmware to fix)

INAV Configurator

CONFIGURATOR 5.0.0
FC FIRMWARE 5.1.0

2022-10-14 @ 15:06:32 -- MultiWii API version received - 2.4.0
2022-10-14 @ 15:06:32 -- Flight controller info, identifier: INAV, version: 5.1.0
2022-10-14 @ 15:06:32 -- Running firmware released on: Sep 11 2022 13:15:57
2022-10-14 @ 15:06:32 -- Board: SYDU, version: 0
2022-10-14 @ 15:06:32 -- Unique device ID received - 0x4400273037510e36363538

5.48 V

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

Hide Log

Scroll

Ports [DOCUMENTATION](#)

Note: not all combinations are valid. When the flight controller firmware detects this the serial port configuration will be reset.
Note: Do NOT disable MSP on the first serial port unless you know what you are doing. You may have to reflash and erase your configuration if you do.

| Identifier | Data | Telemetry | RX | Sensors | Peripherals |
|-------------|--|---------------|---|-----------------|-----------------|
| USB VCP | <input checked="" type="checkbox"/> MSP 115200 | Disabled AUTO | <input type="checkbox"/> Serial RX | Disabled 115200 | Disabled 115200 |
| UART1 | <input checked="" type="checkbox"/> MSP 38400 | Disabled AUTO | <input type="checkbox"/> Serial RX | Disabled 115200 | Disabled 115200 |
| UART2 | <input type="checkbox"/> MSP 115200 | Disabled AUTO | <input checked="" type="checkbox"/> Serial RX | Disabled 115200 | Disabled 115200 |
| SOFTSERIAL1 | <input type="checkbox"/> MSP 57600 | Disabled AUTO | <input type="checkbox"/> Serial RX | GPS 57600 | Disabled 115200 |

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 660 CPU Load: 23% MSP version: 2 MSP load: 0.2 MSP round trip: 56 HW round trip: 16 Drop ratio: 0% 5.0.0

Links ENG 3:06 PM 14/10/2022

USB
Telemetry
Sbus RC
GPS / Flow Sensor

UART1 use for MSP Telemetry as it removes the extra CPU load

Bluetooth (115200)
SIK Serial Radio (57600)

UART2 can be use for Serial RC receiver by switching On Serial RX Baud 115200 Telemetry AUTO

SOFT SERIAL 1 / UART3 can be use for GPS (57600) Optical Flow (19200)

BN 880 GPS / Baud 57600

CXFO Optical Flow / Baud 19200

Bluetooth / Baud 115200

SIK Radio / Baud 75600

SETTING UP YOUR DRONE

CONFIGURATION

Sensors would depend on the board installation
Synerduino support the following

ACC – MPU9250 or BMI160

MAG – MPU9250 , HMC5883 or QMC5883

BARO – BMP180 or BMP280

PitotTube – AirSpeed sensor both ADC and i2C

RangeFinder – Ultrasonic and Lidar

Optical Flow - Option installation CXFO Sensor

I2C speed 400hz

Board and Sensor alignment

0.0 Yaw Degrees

CW180 Mag Alignment

Features (Synerduino STM)

Enable CPU based serial ports

GPS for navigation and telemetry

Telemetry output

Multi-color RGB LED strip support

Enable motor and servo output

This also Contains the Multiplier setting for the Battery Voltage and Current and can be utilize for External ADC sensors applications

The screenshot displays the INAV Configurator web interface. The top navigation bar includes a battery status indicator (5.46 V), a 'No dataflash chip found' warning, and a 'Disconnect' button. The main content area is divided into several sections:

- Sensors & buses:** Lists various sensors with dropdown menus for selection: Accelerometer (MPU9250), Magnetometer (MPU9250), Barometer (BMP085), Pitot tube (None), Rangefinder (None), and Optical flow (None). A blue banner prompts the user to switch to 800kHz I2C speed if hardware allows. The I2C Speed is currently set to 400KHZ.
- Board and Sensor Alignment:** Contains a warning about CLI usage for roll and pitch orientation. It features input fields for 'Yaw Degrees' (set to 0.0) and 'MAG Alignment' (set to CW 180°).
- Voltage and Current Sensors:** Includes toggle switches for 'Battery voltage monitoring' and 'Battery current monitoring'. It also has dropdowns for 'Voltage Meter Type' (ADC) and 'Current Meter Type' (ADC). Input fields show 'Voltage Scale' (1100), 'Battery Voltage' (5.46), 'Current Meter Scale' (400), and 'Battery Current' (15.60).
- Battery Settings:** Features input fields for 'Number of cells' (0), 'Maximum cell voltage for cell count detection' (4.25), and 'Minimum Cell Voltage' (3.3).

The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 511, CPU Load: 16%, MSP version: 2, MSP load: 0.0, MSP round trip: 119, HW round trip: 43, Drop ratio: 0%, and version 5.0.0. The Windows taskbar at the very bottom shows the time as 8:10 PM on 17/08/2022.

SETTING UP YOUR DRONE

CONFIGURATION

OTHER FEATURES

- **Stop motors on low throttle** – no Idle speed motor is shut off on throttle down
- **Enable CPU based serial ports** – Activate Serial 1 , 2 , Soft serial
- **GPS for navigation and telemetry** – Activate GPS navigation function
- **Telemetry output** – activate MSP protocol for Telemetry use
- **Reversible motors mode** - for use with reversible ESCs)
- **Analog RSSI input** – signal strength of your radio
- **Multi-color RGB LED strip support** – support for WS2811 LED
Note : it would reduce useable PWM output to 5
- **OLED Screen Display** – small screen support
- **Blackbox flight data recorder** - use with Flash or SD Card SPI to save log flight and sensor data
- **Enable motor and servo output** – activate all PWM pins (Required)
- **CPU based SPI** – to use the CPU to added extra processing to ISP
- **OSD** – Screen Display
- **Permanently enable AIRMODE** - allows motor idle to control the aircraft (Multirotor)
- **Permanently enable Launch Mode for Fixed Wing** – allows to Autolaunch
- **Profile selection with TX stick command** – Stick command profile
- **Throttle voltage compensation** – throttle compensator to power fluctuation
- **Automatic battery profile selection** – Battery Profile setup
- **Continuously trim servos on Fixed Wing** – Automatic Trim to the aircraft Level flight

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 6.0.0-FP2, and FC FIRMWARE 6.0.0 [SYNERDUINOSTMSV]. The main content area is titled 'Other Features' and contains a list of configuration options with toggle switches:

- Stop motors on low throttle (disabled)
- Enable CPU based serial ports (enabled)
- GPS for navigation and telemetry (enabled)
- Telemetry output (enabled)
- Reversible motors mode (for use with reversible ESCs) (disabled)
- Analog RSSI input (disabled)
- Multi-color RGB LED strip support (enabled)
- OLED Screen Display (disabled)
- Blackbox flight data recorder (disabled)
- Enable motor and servo output (enabled)
- CPU based SPI (disabled)
- OSD (disabled)
- Permanently enable AIRMODE (disabled)
- Permanently enable Launch Mode for Fixed Wing (disabled)

On the right side, there are input fields for 'Warning Cell Voltage' (3.5), 'Battery Capacity Unit' (mAh), 'Capacity' (0), 'Warning Capacity (remaining %)', and 'Critical Capacity (remaining %)'.

The bottom status bar shows various system metrics: Packet error: 0, I2C error: 0, Cycle Time: 513, CPU Load: 17%, MSP version: 2, MSP load: 0.1, MSP round trip: 37, HW round trip: 19, Drop ratio: 0%, and the version 6.0.0-FP2. The Windows taskbar at the bottom shows the time as 12:16 PM on 15/12/2022.

SETTING UP YOUR DRONE

CONFIGURATION

Voltage and Current sensors

Battery Voltage monitoring (Vbat)

$RAW = ADC \cdot V - Voltage$ 0-5V

Voltage scale= this is adjusted to calibrate your actual battery voltage to the GUI as identify by the Battery voltage indicator

Battery Current Monitoring (Current)

$RAW = ADC \cdot I - Current$ 0-5V

Current meter scale this is adjusted to calibrate your actual battery Current to the GUI as identify by the Battery Current indicator

Battery Settings

This is the base battery parameters it should match the specs of your battery

The screenshot displays two configuration panels. The top panel, 'Voltage and Current Sensors', has two sections. The first section, 'Battery voltage monitoring', is enabled (toggle on) and includes: 'Voltage Meter Type' set to 'ADC' (indicated by a yellow arrow), 'Voltage source to use for alarms and telemetry' set to 'Raw', 'Voltage Scale' set to '450', and 'Battery Voltage' displayed as '11.66'. The second section, 'Battery current monitoring', is also enabled (toggle on) and includes: 'Current Meter Type' set to 'ADC' (indicated by a yellow arrow), 'Current Meter Scale' set to '400', 'Offset in millivolt steps' set to '0', and 'Battery Current' displayed as '48.40'. The bottom panel, 'Battery Settings', includes: 'Number of cells (0 = auto)' set to '3', 'Maximum cell voltage for cell count detection' set to '4.25', 'Minimum Cell Voltage' set to '3.3', 'Maximum Cell Voltage' set to '4.2', 'Warning Cell Voltage' set to '3.5', 'Battery Capacity Unit' set to 'mAh', 'Capacity' set to '0', 'Warning Capacity (remaining %)' (empty), and 'Critical Capacity (remaining %)' (empty).

SETTING UP YOUR DRONE

PID Tuning

Synerduino Mini Kwad

Proportion Integral
Derivative tuning
section to tune your
drone stability in
different flight mode
and sensor feedback
loop

PITCH
Proportion 15
Integral 30
Derivative 15
Feedforward 87

ROLL
Proportion 15
Integral 30
Derivative 15
Feedforward 60

YAW
Proportion 35
Integral 80
Derivative 0

ANGLE/HORIZON
Strength 40
LPF Cutoff (Hz) 10
Transition (Horizc

The screenshot shows the INAV Configurator interface with the PID tuning section selected. The interface displays sliders for Roll, Pitch, and Yaw, each with its respective Proportional, Integral, Derivative, and FeedForward values. The Roll section is highlighted in light blue, Pitch in light purple, and Yaw in light pink. The status bar at the bottom shows system metrics like CPU load and MSP version.

| Name | Proportional | Integral | Derivative | FeedForward |
|---------------------------------------|-----------------|------------------------|------------|-----------------------------|
| Barometer & Sonar/Altitude | | | | |
| Position Z | | 50 | 0 | 0 |
| Velocity Z | | 100 | 50 | 10 |
| Magnetometer/Heading | | | | |
| Heading Hold | | 60 | | |
| Nav Heading | | 0 | 0 | 0 |
| Angle/Horizon | | | | |
| | Strength | LPF cutoff (Hz) | | Transition (Horizon) |
| Level | 40 | 10 | | 75 |

SETTING UP YOUR DRONE

ADVANCE PID CONTROLLERS

Synerduino Mini KWAD PID

Show advanced PID controllers

| Name | Proportional | Integral | Derivative | FeedForward |
|---------------------------------------|-----------------|------------------------|-----------------------------|-------------|
| Barometer & Sonar/Altitude | | | | |
| Position Z | 50 | 0 | 0 | |
| Velocity Z | 100 | 50 | 10 | |
| Magnetometer/Heading | | | | |
| Heading Hold | 60 | | | |
| Nav Heading | 0 | 0 | 0 | |
| GPS Navigation | | | | |
| Position XY | 46 | | | |
| Velocity XY | 40 | 15 | 100 | 40 |
| Surface | 0 | 0 | 0 | |
| Angle/Horizon | | | | |
| | Strength | LPF cutoff (Hz) | Transition (Horizon) | |
| Level | 25 | 15 | 75 | |

This is the Main Flight mode tuning

Barometer & Sonar / Altitude

- Position -Vertical tuning strength
- Velocity - how much responds and the duration of that respond to hold an altitude

Magnetometer / Heading

- Heading hold
- Nav Heading

GPS Navigation

- Position XY – this is the strength of the responds to hold position (too high it would over correct , too low it would under responds)
- Velocity XY – how fast it would respond to the deviation
- Surface XY – works with optical sensor

Angle / horizon

- Level – how quick the drone returns to level flight

SETTING UP YOUR DRONE

PID TUNING

Filters adjustment for Sensor respond rate

The screenshot displays the INAV Configurator interface, specifically the 'Filters' tab. The software version is 5.0.0, and the board is identified as ST41. The interface includes a top status bar with battery level (8.97V) and various sensor status icons. The main content area is divided into sections for different filter types, each with numerical input fields and corresponding sliders.

| Section | Parameter | Value |
|------------------|--|-------|
| Gyro filters | Main gyro filter cutoff frequency | 110 |
| | Matrix Filter Min Frequency | 120 |
| | Matrix Filter Q Factor | 250 |
| | Unicorn Filter Q Factor | 200 |
| D-term filters | D-term LPF cutoff frequency | 100 |
| Gyro RPM filters | Gyro RPM filter (requires ESC telemetry) | Off |
| | Gyro RPM filter min. frequency | 100 |

At the bottom of the interface, there is a status bar showing system metrics: Packet error: 0, I2C error: 0, Cycle Time: 2674, CPU Load: 68%, MSP version: 2, MSP load: 0.4, MSP round trip: 96, HW round trip: 30, Drop ratio: 0%. The bottom right corner shows the date and time: 9:10 AM, 30/07/2022.

SETTING UP YOUR DRONE

Rate and Expo pertain to the sensitivity on each behavior and limits set on each flight modes

This can set for Aggressive for sport flying

Or

Relax for beginner training to mission-oriented flight

INAV Configurator

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

2022-07-29 @ 09:52:21 -- MultiWii API version received - 2.4.0
2022-07-29 @ 09:52:21 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-29 @ 09:52:21 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-29 @ 09:52:21 -- Board: ST41, version: 0
2022-07-29 @ 09:52:21 -- Unique device ID received - 0x4400273037510e36363538

0V

Gyro Accel Mag Baro GPS Flow Sonar Speed IMU2

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

Hide Log

Scroll

PID gains Rates & Expo Filters Mechanics DOCUMENTATION

Rates & Expo

| | | |
|-------------------------|-----|--------------|
| ROLL rate | 600 | ° per second |
| PITCH rate | 600 | ° per second |
| YAW rate | 600 | ° per second |
| Roll & Pitch Expo | 75 | % |
| Yaw Expo | 75 | % |
| Max. ROLL angle | 30 | ° |
| Max. PITCH angle | 30 | ° |
| Heading Hold rate limit | 90 | ° per second |
| Manual ROLL rate | 100 | % |
| Manual PITCH rate | 100 | % |
| Manual YAW rate | 100 | % |

Refresh Save

Packet error: 0 I2C error: 0 Cycle Time: 2050 CPU Load: 73% MSP version: 2 MSP load: 8.6 MSP round trip: 800 HW round trip: 49 Drop ratio: 99% 5.0.0

Links ENG 9:53 AM 29/07/2022

Roll, Pitch, Yaw Rate = Horizon mode on how fast the drone rotate on its axis (can cause drone to flip mid flight if set too high)

Roll, Pitch, Yaw Manual = this is much basic stabilize mode (none self leveling)

Roll, Pitch, Yaw Angle = in Angle mode sets the max limit on the drone Tilt from level axis (self leveling)

SETTING UP YOUR DRONE

EZ PID Tuning

Synerduino Mini KWAD PID

Introduced in INAV7 allows easier configuration of your PID and Filter function

When Enabled it automatically overrides the standard PID process associated to the older INAV 5 and 6

Descriptions are listed

However this is still a work in progress it works well for small drones

Large drones may or may not tune correctly with this, due to widely varied inertias and weight.

Recommend to use conventional PID tuning method

The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version information (CONFIGURATOR 7.0.0-RC2, FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]), and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). A battery level indicator shows 8.94 V. The main content area is titled "Ez Tune" and includes a disclaimer, an "Enabled" toggle switch, and two sliders: "Filter Hz" (set to 90) and "Axis ratio" (set to 110). On the right side, there are two preview tables: "PID preview" and "Rate preview".

Disclaimer: Ez Tune is an experimental function. It is not guaranteed to work on all UAVs. It is not guaranteed to work with all frame types. It is not guaranteed to work with all propellers. All computations and tuning result can change in future versions of INAV. We still encourage you to check it out and share your experience on INAV Discord in the [#ez-tune](#) channel

When enabled, **Ez Tune** will override multiple INAV setting to simplify the tuning process. Instead of setting each PID and filtering setting independently, you only have to work with 7 sliders. Ez Tune will automatically adjust all other settings to match your needs. Ez Tune is a great starting point for new users and a great way to quickly tune a new UAV. It is not recommended to use Ez Tune on advanced builds, as it will override all your settings and you will not be able to fine tune your UAV. When Ez Tune is enabled, settings from the **PID tuning** tab will be overridden by EzTune.

Enabled

This sets the base cutoff frequency for all INAV gyro and D-term filters. Higher values will result in lower filter delay and better stabilization, but more noise will go through the filters and motors will get hot, UAV might oscillate and be unflyable. Your goal is to increase this value as high as possible before any negative effects appear. Negative effects include: hot motors, audible oscillations, UAV rapidly shaking, UAV gaining altitude by itself. Usual starting points for 'Filter Hz' are: **3-inch props:** 90, **5-inch props:** 110, **7-inch props:** 90, **10-inch props:** 75, **12-inch props:** 60. Use Blackbox and common sense to find a value that is most suited for your UAV.

Filter Hz: 90

Describes the weight/moment of inertia distribution of your UAV. The longer the frame (more mass on the front-back axis) more Axis Ratio is required. Perfect X frame is ratio 100. Most modern frames should fit somewhere between 110 and 130. Default 110 is a good starting point.

Axis ratio: 110

PID preview

| | P | I | D | FF |
|-------|----|----|----|-----|
| Roll | 40 | 75 | 23 | 100 |
| Pitch | 44 | 82 | 25 | 110 |
| Yaw | 45 | 80 | 0 | 100 |

Rate preview

| Axis | Rate | Expo |
|-------|---------|------|
| Roll | 600 dps | 70% |
| Pitch | 600 dps | 70% |
| Yaw | 500 dps | 70% |

Save and Reboot

Packet error: 0 | I2C error: 0 | Cycle Time: 517 | CPU Load: 29% | MSP version: 2 | MSP load: 0.0 | MSP round trip: 110 | HW round trip: 38 | Drop ratio: 0% | Arming Flags: - | 7.0.0-RC2

SETTING UP YOUR DRONE

The screenshot displays the INAV Configurator software interface. At the top, the INAV logo and version information (CONFIGURATOR 7.0.0-RC2, FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]) are shown. A status bar indicates a battery level of 8.94 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). A log window shows system messages, including MultiWii API version received (2.5.0), flight controller info (INAV, version: 7.0.0), and board info (SYND, version: 0). The main interface is divided into a left sidebar with navigation options (Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, Mission Control) and a central content area. The 'Ez Tune' section is active, showing five adjustable parameters: Axis ratio (110), Response (100), Damping (100), Stability (100), and Aggressiveness (100). Each parameter has a text description and a slider control. A 'Save and Reboot' button is located at the bottom right of the main content area. The bottom status bar displays system metrics: Packet error: 0, I2C error: 0, Cycle Time: 516, CPU Load: 29%, MSP version: 2, MSP load: 0.6, MSP round trip: 110, HW round trip: 38, Drop ratio: 0%, Arming Flags: -. The Windows taskbar at the bottom shows the time as 12:24 PM on 28/03/2024.

INAV Configurator

INAV
CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.94 V

No dataflash chip found

Mixer profile 1 PID profile 1 Battery profile 1

Disconnect

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0
2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26
2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Setup
Calibration
Mixer
Outputs
Ports
Configuration
Failsafe
Ez Tune
PID tuning
Advanced Tuning
Programming
Receiver
Modes
Adjustments
GPS
Alignment tool
Mission Control

Describes the weight/moment of inertia distribution of your UAV. The longer the frame (more mass on the front-back axis) more Axis Ratio is requires. Perfect X frame is ratio 100. Most modern frames should fit somewhere between 110 and 130. Default 110 is a good starting point.

Axis ratio 110

This setting defines how fast the UAV will react to stick movements and gyro signal. Higher values will result in faster reaction, but also in more overshoots and oscillations. If UAV feels sluggish or has a slow wobble, increase the Response. If it has hot motors, audibly oscillates, overshoots or feels too nervous, decrease the Response. Most modern quads should beefy motors will fly best with Response below 80. Should be tuned together with Damping. It is a P-term equivalent.

Response 100

Describes the strengths of a force that opposes any rotation speed change. It dampens roll and pitch acceleration and causes smoother and more stable flight. Your task during tuning is to find out how much you can increase it before any negative symptoms appear: hot motors, audible oscillations, overshoot. Most modern quads should accept 'Damping' up to 150-180. It is a D-term equivalent.

Damping 100

Defines long-term stabilization strength. Most modern quads should tolerate 'Stability' even up to 120-130. Usually does not have to be tuned at all. If UAV suffers from heavy propwash during vertical descent, lowering 'Stability' might help. It is a I-term equivalent.

Stability 100

Defines how fast your UAV will react to fast stick movements. Higher 'Aggressiveness' results in snappier fast maneuvers. It does not affect stabilization, only stick feeling. It is a FF-term equivalent.

Aggressiveness 100

Yaw 500 dps 70%

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 516 CPU Load: 29% MSP version: 2 MSP load: 0.6 MSP round trip: 110 HW round trip: 38 Drop ratio: 0% Arming Flags: -

Links

ENG 12:24 PM 28/03/2024

SETTING UP YOUR DRONE

The screenshot displays the INAV Configurator software interface. At the top, the INAV logo is visible along with version information: CONFIGURATOR 7.0.0-RC2 and FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]. A battery status indicator shows 8.94 V. A row of icons represents various sensors: Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, and Speed. On the right, there are dropdown menus for Mixer profile 1, PID profile 1, and Battery profile 1, along with a Disconnect button and a 'No dataflash chip found' warning.

The main content area is titled 'Ez Tune' and contains five adjustable parameters, each with a numerical input field and a slider:

- Damping:** Describes the strengths of a force that opposes any rotation speed change. It dampens roll and pitch acceleration and causes smoother and more stable flight. Your task during tuning is to find out how much you can increase it before any negative symptoms appear: hot motors, audible oscillations, overshoot. Most modern quads should accept 'Damping' up to 150-180. It is a D-term equivalent. Value: 100.
- Stability:** Defines long-term stabilization strength. Most modern quads should tolerate 'Stability' even up to 120-130. Usually does not have to be tuned at all. If UAV suffers from heavy propwash during vertical descent, lowering 'Stability' might help. It is a I-term equivalent. Value: 100.
- Aggressiveness:** Defines how fast your UAV will react to fast stick movements. Higher 'Aggressiveness' results in snappier fast manoeuvres. It does not affect stabilization, only stick feeling. It is a FF-term equivalent. Value: 100.
- Rate:** Defines how fast your UAV will rotate around roll, pitch and yaw axis. Higher 'Rate' results in faster rotation. Value of 0 is the equivalent of 300dps, 100 is the equivalent of 600dps, 200 is the equivalent of 900dps. Value: 100.
- Expo:** Defines expo of the RC input. Lower values result in more sensitive stick in the center. Higher values result in less sensitive center and more rapid response at the end of the stick. Value of 0 is the equivalent of 0 expo, 100 is the equivalent of 0.7 expo, 200 is the equivalent of 1.0 expo. Value: 100.

A 'Save and Reboot' button is located at the bottom right of the Ez Tune section. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 518, CPU Load: 28%, MSP version: 2, MSP load: 0.0, MSP round trip: 110, HW round trip: 38, Drop ratio: 0%, Arming Flags: -, and the version 7.0.0-RC2. The Windows taskbar at the very bottom shows the time as 12:25 PM on 28/03/2024.

SETTING UP YOUR DRONE

The screenshot displays the INAV Configurator software interface. The top header shows the INAV logo, version information (CONFIGURATOR: 7.0.0-RC2, FC FIRMWARE: 7.0.0 [SYNERDUINOSTM_F411]), and system status (8.91 V battery, No dataflash chip found). A sidebar on the left contains navigation options: Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning (selected), Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, and Mission Control. The main content area is titled 'PID gains' and includes tabs for Rates & Expo, Filters, and Mechanics. It features three sections for Roll, Pitch, and Yaw, each with sliders for Proportional, Integral, Derivative, and FeedForward gains. The status bar at the bottom shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 521, CPU Load: 28%, MSP version: 2, MSP load: 0.0, MSP round trip: 115, HW round trip: 40, Drop ratio: 0%, Arming Flags: -. The Windows taskbar at the bottom shows the time as 12:25 PM on 28/03/2024.

| Axis | Parameter | Value |
|-------|--------------|-------|
| Roll | Proportional | 40 |
| | Integral | 75 |
| | Derivative | 26 |
| | FeedForward | 60 |
| Pitch | Proportional | 44 |
| | Integral | 85 |
| | Derivative | 28 |
| | FeedForward | 60 |
| Yaw | Proportional | 40 |

SETTING UP YOUR DRONE

ADVANCE TUNING

Advance tuning for all navigational settings

Recommended changes for Synerduino 250mm Quad

300cm/s Nav speed

1000cm/s Max Nav speed

500cm/s Max Cruise Speed

30 Degree Max bank Angle MC

Mid throttle Alt hold only use if you intend to use a mid stick throttle radio , pls set Null point on your radio.

1400us Hover Throttle (Althold mode)

Slow down when approaching Waypoint

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 5.43 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main content area is divided into several sections:

- Multicopter Navigation Settings:**
 - ATTI (User Control Mode)
 - 300 cm/s Default navigation speed
 - 1000 cm/s Max. navigation speed
 - 500 cm/s Max. CRUISE speed
 - 30 Multirotor max. banking angle
 - Use mid. throttle for ALTHOLD (disabled)
 - 1400 uS Hover throttle
 - Slow down when approaching waypoint (enabled)
- Multicopter braking mode configuration:**
 - 100 cm/s Min. speed threshold
 - 75 cm/s Braking disengage speed
 - 2000 ms Max. braking duration
 - 100 Boost factor
 - 750 ms Max. braking boost duration
 - 150 cm/s Boost min. speed threshold
 - 100 cm/s Braking boost disengage speed
 - 40 Max. bank angle
- Generic settings:**
 - RTH settings:**
 - AT_LEAST RTH altitude mode
 - 1000 cm RTH altitude
 - 0 cm RTH Home altitude
 - ON Climb before RTH
 - General Navigation Settings:**
 - 200 cm/s Max. Alt-hold climb rate
 - 500 cm/s Max. navigation climb rate

The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 517, CPU Load: 16%, MSP version: 2, MSP load: 1.0, MSP round trip: 115, HW round trip: 42, Drop ratio: 0%, and version 5.0.0. The system clock shows 8:17 PM on 17/08/2022.

SETTING UP YOUR DRONE

RECEIVER

Serial Receiver as SBUS

Be aware of your radio format

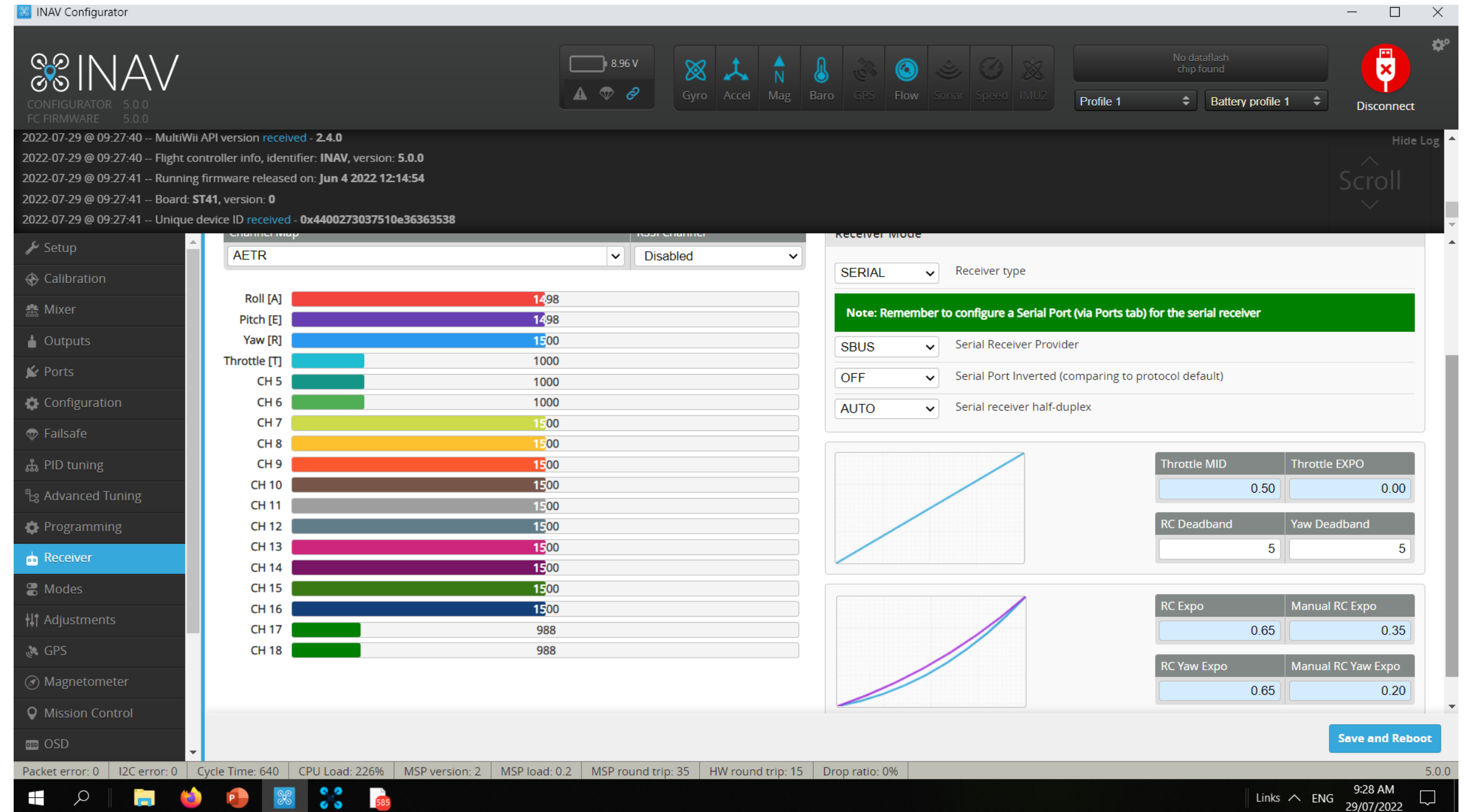
AETR = Futaba format

TAER = JR format

EATR = Walkera Format

This is to check if there is signal coming from the receiver

Also to adjust the Expo rate of your RC controls



INAV Configurator

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

2022-07-29 @ 09:27:40 -- MultiWii API version received - 2.4.0
2022-07-29 @ 09:27:40 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-29 @ 09:27:41 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-29 @ 09:27:41 -- Board: ST41, version: 0
2022-07-29 @ 09:27:41 -- Unique device ID received - 0x4400273037510e36363538

Channel map

| Channel | Value |
|--------------|-------|
| Roll [A] | 1498 |
| Pitch [E] | 1498 |
| Yaw [R] | 1500 |
| Throttle [T] | 1000 |
| CH 5 | 1000 |
| CH 6 | 1000 |
| CH 7 | 1500 |
| CH 8 | 1500 |
| CH 9 | 1500 |
| CH 10 | 1500 |
| CH 11 | 1500 |
| CH 12 | 1500 |
| CH 13 | 1500 |
| CH 14 | 1500 |
| CH 15 | 1500 |
| CH 16 | 1500 |
| CH 17 | 988 |
| CH 18 | 988 |

Receiver mode

SERIAL Receiver type

Note: Remember to configure a Serial Port (via Ports tab) for the serial receiver

SBUS Serial Receiver Provider

OFF Serial Port Inverted (comparing to protocol default)

AUTO Serial receiver half-duplex

Throttle MID: 0.50, Throttle EXPO: 0.00

RC Deadband: 5, Yaw Deadband: 5

RC Expo: 0.65, Manual RC Expo: 0.35

RC Yaw Expo: 0.65, Manual RC Yaw Expo: 0.20

Save and Reboot

Packet error: 0, I2C error: 0, Cycle Time: 640, CPU Load: 226%, MSP version: 2, MSP load: 0.2, MSP round trip: 35, HW round trip: 15, Drop ratio: 0%

9:28 AM, 29/07/2022

RECEIVER FORMAT

INAV like most modern Flight controllers now Supports Sbus to reduce the number of wires in build its advice to use Sbus Receiver for Synerduino STM as well

| RX > SBUS input | Futaba Format (AETR) | JR Format (TAER) | Walkera Format (EATR) | SBUS/PPM/PWM Converter may be required if your receiver don't support SBUS Pls Check the output pin from your Radio Rx manual |
|-----------------|----------------------|------------------|-----------------------|--|
| Throttle | Ch3 | Ch1 | Ch3 | |
| Aileron | Ch1 | Ch2 | Ch2 | |
| Elevator | Ch2 | Ch3 | Ch1 | |
| Rudder | Ch4 | Ch4 | Ch4 | |
| Aux1 | Ch5 | Ch5 | Ch5 | |
| Aux2 | Ch6 | Ch6 | Ch6 | |
| Aux3 | Ch7 | Ch7 | Ch7 | |
| Aux4 | Ch8 | Ch8 | Ch8 | |

SETTING UP YOUR DRONE

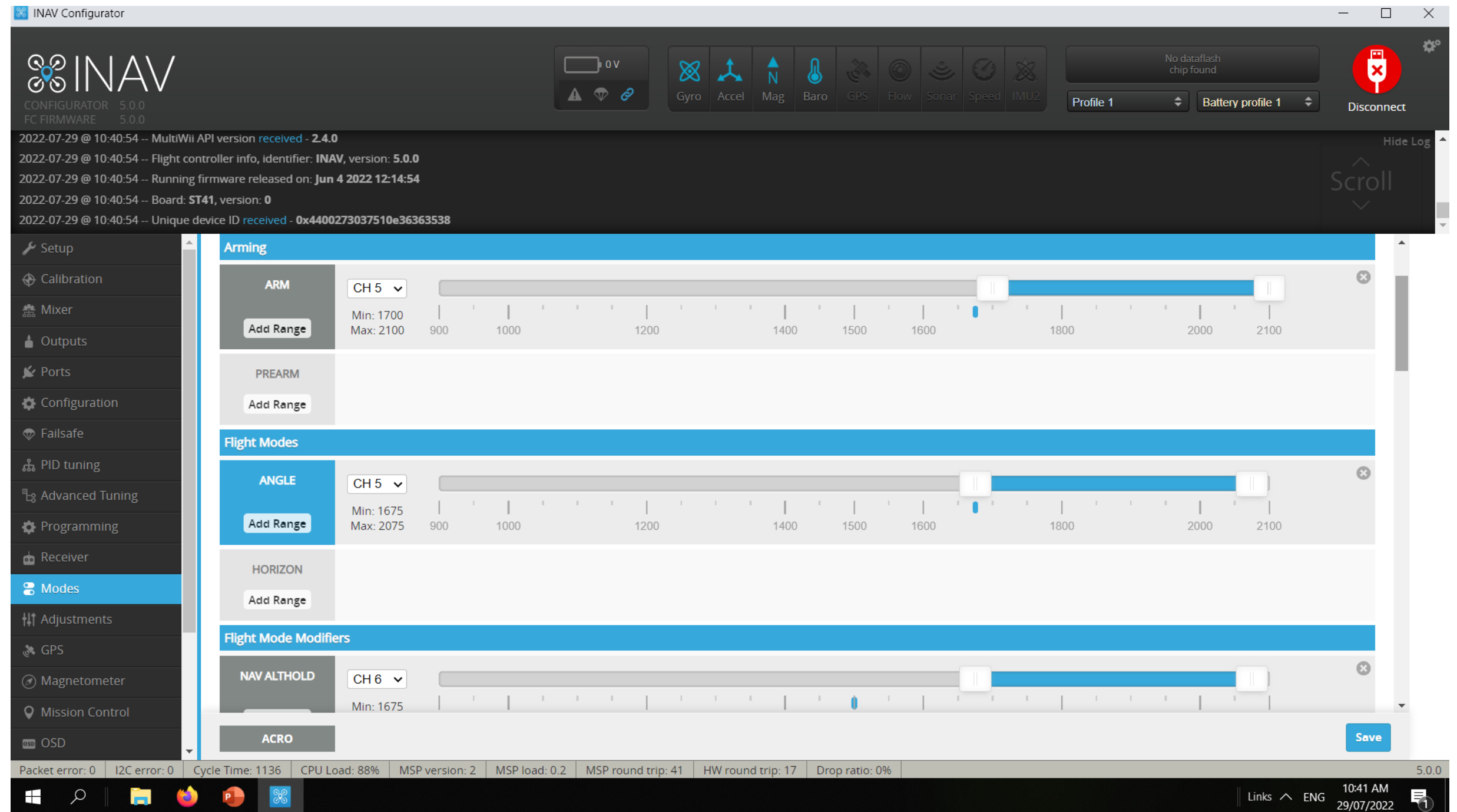
MODES

Flight modes

This is where you set the Aux switch on your transmitter commands

For Beginners we advice to have Turn **ANGLE Flight Mode on**

- [NAV ALTHOLD - Altitude hold](#)
- [NAV POSHOLD - Horizontal position hold](#)
- [NAV COURSE HOLD - Fixed Wing Heading Hold](#)
- [NAV CRUISE - Fixed Wing Heading + Altitude Hold](#)
- [NAV RTH - Return to home](#)
- [NAV WP - Autonomous waypoint mission planner](#)
- [WP PLANNER - On the fly waypoint mission planner](#)
- [GCS NAV - Ground control station](#)



ADJUSTMENTS

Configure adjustment switches. See the 'in-flight adjustments' section of the manual for details. The changes that adjustment functions make are not saved automatically. There are 4 slots. Each switch used to concurrently make adjustments requires exclusive use of a slot.

Examples

- Use Slot 1 and a 3POS switch on CH5 to select between Pitch/Roll P, I and D and another 3POS switch on CH6 to increase or decrease the value when held up or down.
- Use Slot 2 and a 3POS switch on CH8 to select enable Rate Profile Selection via the same 3POS switch on the same channel.

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 1.99 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). The main content area is titled 'Adjustments' and contains a yellow informational box with the following text: 'Configure adjustment switches. See the 'in-flight adjustments' section of the manual for details. The changes that adjustment functions make are not saved automatically. There are 4 slots. Each switch used to concurrently make adjustments requires exclusive use of a slot. Examples: Use Slot 1 and a 3POS switch on CH5 to select between Pitch/Roll P, I and D and another 3POS switch on CH6 to increase or decrease the value when held up or down. Use Slot 2 and a 3POS switch on CH8 to select enable Rate Profile Selection via the same 3POS switch on the same channel.' Below this, there are four identical adjustment rows. Each row has an 'If enabled' toggle switch, a 'when channel' dropdown menu set to 'CH 5', a range slider with a value of approximately 1700, a 'then apply' dropdown menu set to 'No changes', a 'using slot' dropdown menu set to 'Slot 1', and a 'via channel' dropdown menu set to 'CH 5'. The bottom status bar shows system metrics: Packet error: 0, I2C error: 50, Cycle Time: 501, CPU Load: 1%, MSP version: 2, MSP load: 0.2, MSP round trip: 249, HW round trip: 35, Drop ratio: 0%, Arming Flags: ARMING_DISABLED_RC_LINK, and version 7.1.0.

GPS

GPS settings

Note: Remember to configure a Serial Port (via Ports tab) when using GPS feature

Here is where you setup your GPS base off the GPS module function.

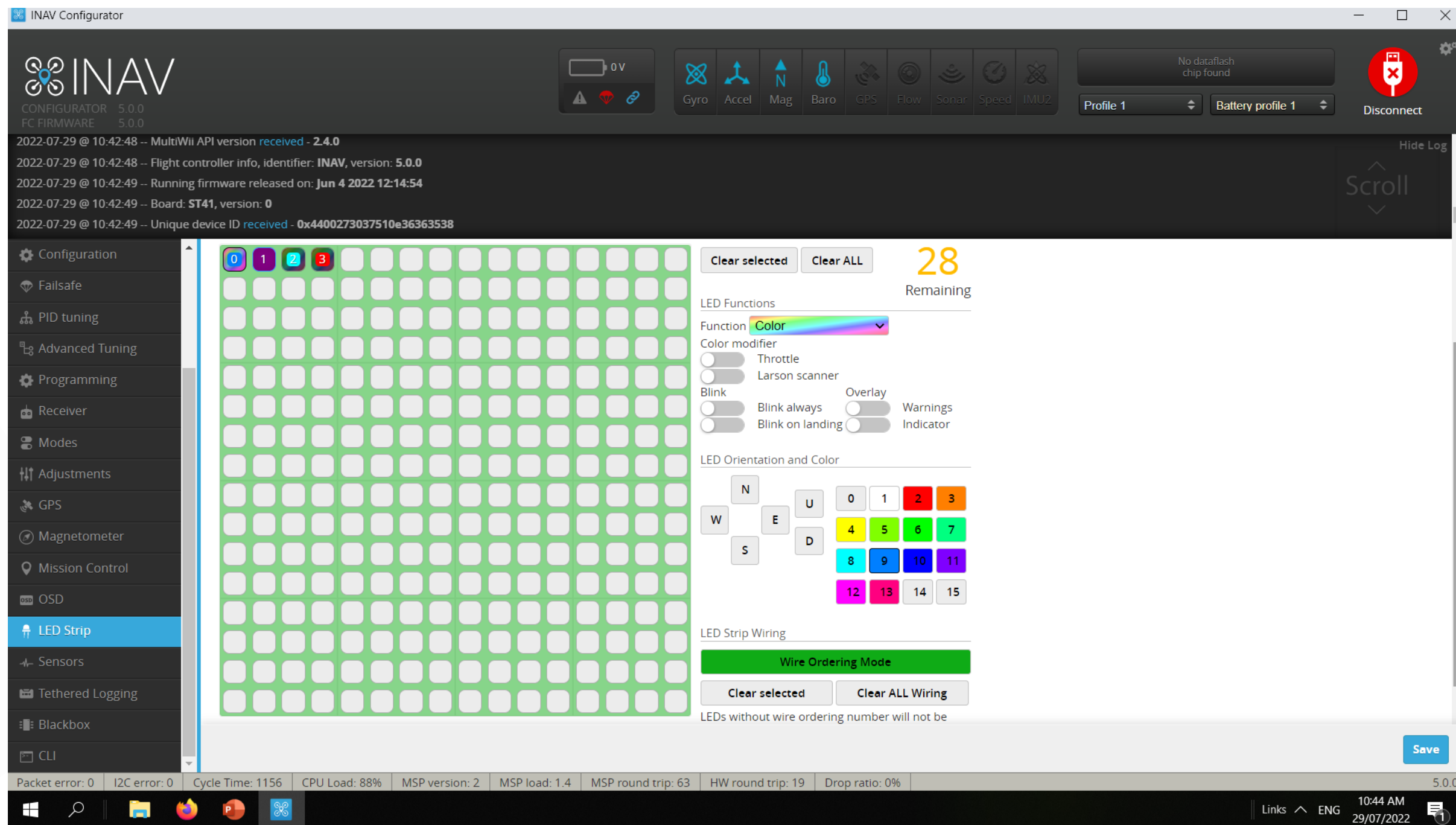
Its also to check if GPS is working correctly

The screenshot displays the INAV Configurator software interface. The top bar shows system status: 2.08 V, Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, and Speed. The main content area is divided into a left sidebar with navigation options (Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, Mission Control) and a central settings panel. The GPS settings panel includes a note: "Remember to configure a Serial Port (via Ports tab) when using GPS feature." Below this, there are several configuration options: "GPS for navigation and telemetry" (checked), "Protocol" (UBLOX), "Ground Assistance Type" (Disabled), "Gps use Galileo Satellites (EU)" (unchecked), "Gps use BeiDou Satellites (CN)" (unchecked), "Gps use Glonass Satellites (RU)" (unchecked), "Timezone Offset" (00:00), and "Automatic Daylight Savings Time" (OFF). A "Position" section shows: Fix type: None, Altitude: -17 m, Latitude: 0.0000 deg, Longitude: 0.0000 deg, and Speed: 0 cm/s. On the right, a world map is visible with a "Center" button. The bottom status bar shows: Packet error: 0, I2C error: 50, Cycle Time: 502, CPU Load: 1%, MSP version: 2, MSP load: 0.4, MSP round trip: 104, HW round trip: 38, Drop ratio: 0%, Arming Flags: ARMING_DISABLED_RC_LINK, and version 7.1.0. A "Save and Reboot" button is located at the bottom right.

SETTING UP YOUR DRONE

LED STRIP

WS2811/WS2812 – Led strip programming upto 32 LEDs



The screenshot shows the INAV Configurator software interface. The main window displays a grid of 32 LED positions (4 rows by 8 columns). The first four LEDs in the top row are numbered 0, 1, 2, and 3. The interface includes a sidebar with various configuration options, a top status bar with battery and sensor information, and a bottom status bar with system metrics. The LED Strip configuration screen is active, showing options for LED Functions, Color modifier, Blink, and LED Orientation and Color. A 'Wire Ordering Mode' button is visible, and a 'Save' button is in the bottom right corner.

WS2811 – Led strip this needs to be activated on the Configure Tab before you can use this function

Note: this will reduce the PWM availability to just 5 Pins removes S6 and S7 (this is because it requires 2 Timers to run the WS2811)

SETTING UP YOUR DRONE

MAGNETOMETER (INAV5-6)

This is where you set the orientation of your Mag sensor, should you use the GPS with a build in MAG

Also the Mag orientation can vary from Flight controller to Flight controller. Pls be aware of this

This can be verified from the setup Tab look at heading it should follow when the Drone is pointing toward a heading

0 Degrees = North
90 Degrees = East
180 Degrees = South
270 Degrees = West

INAV Configurator

8.95 V

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

2022-07-29 @ 09:22:30 -- MultiWii API version received - 2.4.0
2022-07-29 @ 09:22:30 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-29 @ 09:22:30 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-29 @ 09:22:30 -- Board: ST41, version: 0
2022-07-29 @ 09:22:30 -- Unique device ID received - 0x4400273037510e36363538

Setup
Calibration
Mixer
Outputs
Ports
Configuration
Failsafe
PID tuning
Advanced Tuning
Programming
Receiver
Modes
Adjustments
GPS
Magnetometer
Mission Control
OSD

Packet error: 0 I2C error: 0 Cycl

Select a preset or create a custom configuration moving the sliders

CW 90° Orientation presets

Magnetometer Element to show

| Axis | Slider | Value [degree] |
|-------|--------|----------------|
| Pitch | 0 | 0 |
| Roll | 180 | 180 |
| Yaw | 180 | 180 |

Synerduino STM V0.1 uses the HMC5883 orientation is Pitch 0, Roll 180, Yaw 180

SETTING UP YOUR DRONE

ALIGNMENT TOOL (INAV7-8)

This replaces the old magnetometer Tab with the addition of Board Orientation

In an situation you needed to Reorientation of the Flight controller to fit your vehicle

This can be verified From the setup Tab look at heading it should follow when the Drone is pointing toward a heading

Mag relationship

0 Degrees = North

90 Degrees = East

180 Degrees = South

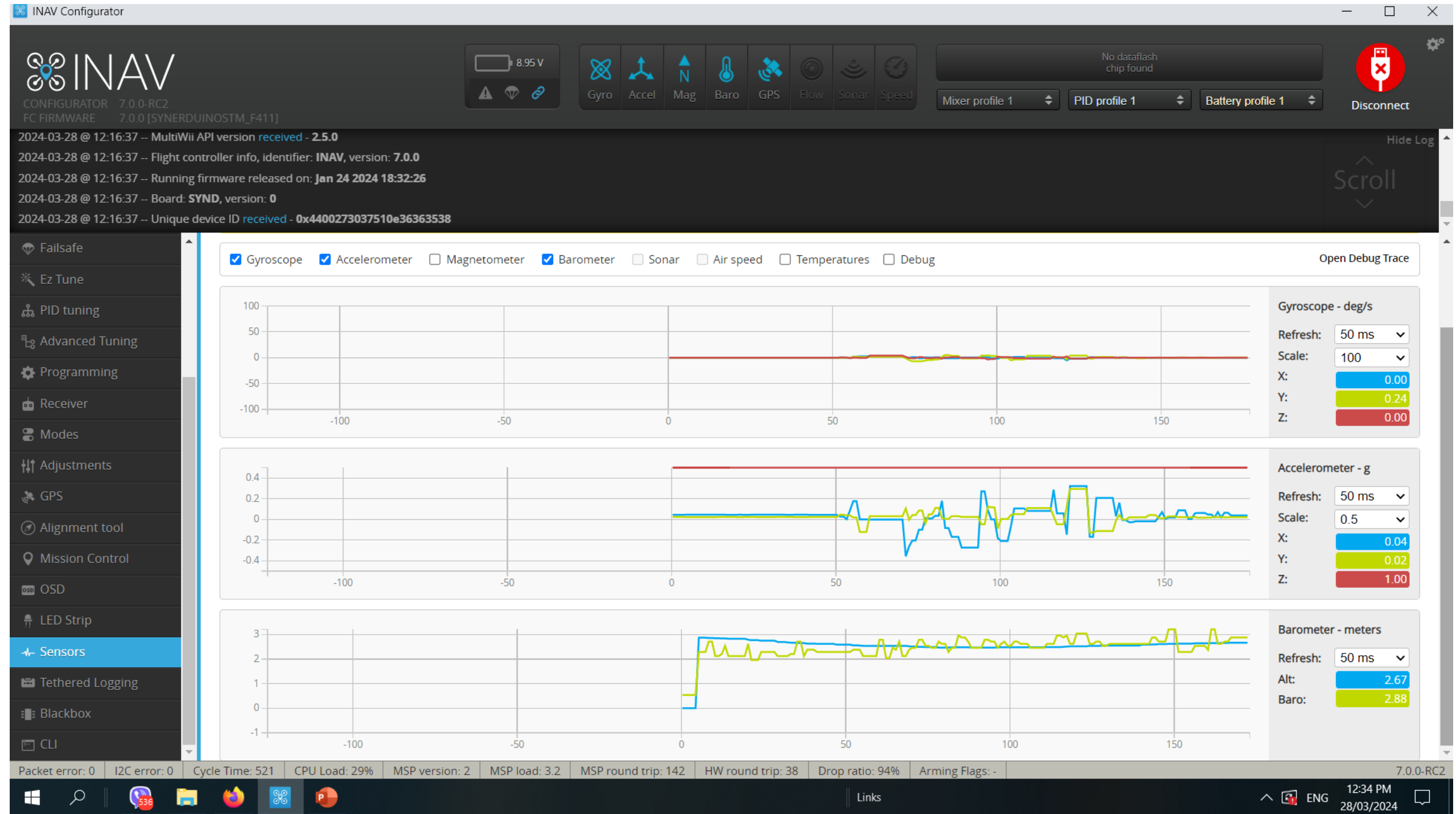
270 Degrees = West

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.93 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Solar, Speed). The main content area is divided into a left sidebar with navigation options (Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, Mission Control) and a central workspace. The workspace is currently showing the 'Alignment tool' tab, which includes a 3D model of a drone with a green arrow indicating its heading. To the right of the model, there are three sliders for adjusting the flight controller alignment: Roll (set to -1 degree), Pitch (set to 0 degrees), and Yaw (set to 1 degree). Below the sliders, there are two sections for selecting a preset or creating a custom configuration. The first section is titled '1. Select Flight Controller alignment' and the second is '2. Select a preset (align_mag) or create a custom configuration using the sliders'. The status bar at the bottom shows system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and Arming Flags. The Windows taskbar at the very bottom shows the date and time as 12:32 PM on 28/03/2024.

SETTING UP YOUR DRONE

SENSORS

This is to visualize your Sensors input and aid for orientation



SETTING UP YOUR DRONE

MISSION CONTROL

NAV Configurator allows to choose between OpenStreetMap, Bing Maps, and MapProxy map providers. INAV Configurator is shipped **WITHOUT** API key for Bing Maps. That means: every user who wants to use Bing Maps has to create own account, agree to all *Terms and Conditions* required by Bing Maps and configure INAV Configurator by himself.

The screenshot displays the INAV Configurator software interface. At the top, there's a status bar with various system indicators like voltage (5.49 V) and sensor status (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). Below this, a log window shows system messages. The main 'Mission Control' panel includes an 'Action Menu' with icons for file operations, a 'Total information' section with fields for filename, distance (3522.9 m), available points (117/120), and a 'Mission valid' status with a red error icon. Below that are 'Default settings' for altitude (5 cm), speed (2 cm/s), and radius (1 m). The central map shows a satellite view of a city area with several waypoints (WP 1, WP 2, WP 3) connected by a blue line. The bottom status bar displays system metrics: Packet error: 0, I2C error: 0, Cycle Time: 521, CPU Load: 23%, MSP version: 2, MSP load: 0.1, MSP round trip: 33, HW round trip: 15, Drop ratio: 0%, and version 5.0.0. The Windows taskbar at the bottom shows the time as 9:21 PM on 17/10/2022.

SETTING UP YOUR DRONE

How to choose Map provider

1. Click **Settings** icon in the top-right corner of INAV Configurator
2. Choose provider: OpenStreetMap, Bing, or MapProxy
3. In the case of Bing Maps, you have to provide your own, personal, generated by you, Bing Maps API key
4. For MapProxy, you need to provide a server URL and layer name to be used

The screenshot displays the INAV Configurator application window. The main interface includes a sidebar with navigation options like 'Welcome', 'Documentation & Support', 'Mission Control', and 'Firmware Flasher'. The central area shows a satellite map of a region with various barangays labeled, such as BARANGAY 113, MALIBAY, and MAGALLANES VILLAGE. On the right side, an 'Application Options' dialog box is open, showing settings for the map provider. The 'Map Provider' is set to 'Bing Maps'. Below this, there are input fields for 'Map API key', 'MapProxy URL' (containing 'http://192.168.1.222/mappr'), and 'MapProxy Layer' (containing 'your_proxy_layer_name'). There are also checkboxes for 'Receive desktop notification when application updates', 'Send anonymous usage data to the developer team', and 'Highlight parameters that change when switching battery or control profiles'. At the bottom of the dialog, there are 'Configurator rendering options' with a dropdown set to 'Imperial'.

How to get Bing Maps API key

1. Go to the Bing Maps Dev Center at

<https://www.bingmapsportal.com/>.

1. If you have a Bing Maps account, sign in with the Microsoft account that you used to create the account or create a new one. For new accounts, follow the instructions in [Creating a Bing Maps Account](#).

2. Select **My keys** under **My Account**.

3. Select the option to create a new key.

4. Provide the following information to create a key:

1. Application name: Required. The name of the application.
2. Application URL: The URL of the application. This is an optional field which is useful in helping you remember the purpose of that key in the future.
3. Key type: Required. Select the key type that you want to create. You can find descriptions of key and application types [here](#).
4. Application type: Required. Select the application type that best represents the application that will use this key. You can find descriptions of key and application types [here](#).

5. Click the **Create** button. The new key displays in the list of available keys. Use this key to authenticate your Bing Maps application as described in the documentation for the Bing Maps API you are using.

Application Options

- Receive desktop **notification** when application updates
- Send anonymous usage data to the developer team
- Highlight parameters that change when switching battery or control profiles

| | | |
|---------------|---------|----------------|
| Bing Maps | ▼ | Map Provider |
| OpenStreetMap | | Map API key |
| Bing Maps | /mappro | MapProxy URL |
| MapProxy | name | MapProxy Layer |

Configurator rendering options

Imperial ▼ Set how the units render on the configurator only

SETTING UP YOUR DRONE

Programming

This is the definitive feature of INAV combine with the Synerduino Shield .

This PLC function allows you to program upto 8 GVAR and instructions from timer to sensor conditions to trigger a Flight mode action or control action of your Drone

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.1.0), and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A battery level indicator shows 5.48 V. The main content area is titled 'Logic Conditions' and features a table for configuring 8 Global Variables (GVAR 0-7). Each GVAR has a value displayed in a blue box: GVAR 0 is 8, GVAR 1 is 549, and GVAR 2-7 are 0. Below this is a table with columns for #, Enabled, Operation, Operand A, Operand B, Active, Flags, and Status. The table contains 8 rows of configuration data. A 'Save' button is located at the bottom right of the configuration area. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 517, CPU Load: 22%, MSP version: 2, MSP load: 2.0, MSP round trip: 66, HW round trip: 17, Drop ratio: 7%, and version 5.0.0. The Windows taskbar is visible at the very bottom.

| # | Enabled | Operation | Operand A | Operand B | Active | Flags | Status |
|---|-------------------------------------|---------------------|-------------------|-------------------------------------|-------------------|-------|----------------------------------|
| 0 | <input checked="" type="checkbox"/> | Increase GVAR | Value 0 | Value 1 | Always | | |
| 1 | <input checked="" type="checkbox"/> | Greater Than | Global Variable 0 | Value 55 | Always | | <input type="radio"/> |
| 2 | <input checked="" type="checkbox"/> | Set GVAR | Value 0 | Value 0 | Logic Condition 1 | | |
| 3 | <input checked="" type="checkbox"/> | Set GVAR | Value 1 | Flight Vbat [centi-Volt] [1V = 100] | Always | | |
| 4 | <input checked="" type="checkbox"/> | Greater Than | Global Variable 1 | Value 545 | Always | | <input checked="" type="radio"/> |
| 5 | <input checked="" type="checkbox"/> | Override RC Channel | Value 6 | Value 55 | Logic Condition 4 | | <input checked="" type="radio"/> |
| 6 | <input type="checkbox"/> | True | | | | | |
| 7 | <input type="checkbox"/> | True | | | | | |
| 8 | <input type="checkbox"/> | True | | | | | |

SETTING UP YOUR DRONE

CLI Command Line – Aircraft Status

This is where you can import PID setting, check status or Adjust parameters

Open the CLI command line. Enter the command below.

Tasks – check if everything is with in CPU load should be with in 70%

Status – Check if all systems are active, Gyro/ACC/MAG/BARO/GPS or Flow

And to identify errors

The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 5.0.0, and various system status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A battery level indicator shows 8.97 V. The main window is divided into a left sidebar with navigation options (Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox, CLI) and a main content area. The CLI tab is active, showing a terminal window with the following output:

```
# taks
### ERROR: Unknown command, try 'help'
# tasks
Task list
0 - SYSTEM 9 12 0 0.5% 0.5% 228
1 - PID 316 66198 176 2092.3% 6.0% 2995
2 - GYRO 3906 66447 232 25954.6% 91.1% 41256
3 - RX 49 63 48 0.8% 0.7% 126
4 - SERIAL 97 102220 4 992.0% 0.5% 199
5 - BATTERY 49 40041 11 196.7% 0.5% 67
6 - TEMPERATURE 98 7 1 0.5% 0.5% 7
7 - BEEPER 98 14 7 0.6% 0.5% 33
8 - GPS 49 154 21 1.2% 0.6% 54
9 - COMPASS 9 197 187 0.6% 0.6% 95
10 - BARO 36 153 136 1.0% 0.9% 411
14 - TELEMETRY 448 25 3 1.6% 0.6% 131
18 - CMS 49 4 2 0.5% 0.5% 3
21 - VTXCTRL 4 2 1 0.5% 0.5% 0
22 - PROGRAMMING 9 32 21 0.5% 0.5% 10
24 - AUX 98 10 3 0.5% 0.5% 14
25 - SPORT MASTER 480 12 1 1.0% 0.5% 22
Task check function 4 1 3
Total (excluding SERIAL) 28253.4% 105.0%
```

Below the terminal output, there is a text input field labeled "Write your command here" and several buttons: EXIT, SAVE SETTINGS, MSC, Copy to clipboard, Clear output history, Load from file, and Save to File. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 3028, CPU Load: 90%, MSP version: 2, MSP load: 0.0, MSP round trip: 34, HW round trip: 17, Drop ratio: 0%, and version 5.0.0. The Windows taskbar is visible at the bottom of the screen.

| Reason (CLI Mnemonic) | Bit Mask (Hex) | Explanation |
|-----------------------|----------------|---|
| FS | 00000080 | The RX is not recognised as providing a valid signal |
| ANGLE | 00000100 | The vehicle is not level as defined by the CLI small_angle setting |
| CAL | 00000200 | The pre-arm sensor calibration has not completed. The barometer is somewhat susceptible to lengthy calibration, which may be mitigated by the CLI setting baro_cal_tolerance, e.g. set baro_cal_tolerance = 500 (find a suitable value by experimentation). |
| OVRLD | 00000400 | The CPU load is excessive. May be caused by too an aggressive loop time setting. |
| NAV | 00000800 | Where the CLI setting nav_extra_arming_safety = ON is used, this may be caused by reasons shown in the table below |
| COMPASS | 00001000 | The compass is not calibrated. Perform the calibration procedure |
| ACC | 00002000 | The accelerometer is not calibrated. Perform the 6 point calibration procedure |
| ARMSW | 00004000 | The arm switch was engaged as the FC booted |
| HWFAIL | 00008000 | A required hardware device has failed / is not recognised (e.g. GPS, Compass, Baro) |
| BOXFS | 00010000 | A failsafe switch is engaged |
| KILLSW | 00020000 | A kill switch is engaged |
| RX | 00040000 | The RC link is not detected (RX not detected) |
| THR | 00080000 | The throttle setting is not a minimum |
| CLI | 00100000 | The CLI is active (note: you will always /unavoidably see this when in the CLI) |
| CMS | 00200000 | The CMS menu is active |
| OSD | 00400000 | The OSD menu is active |
| ROLL/PITCH | 00800000 | Roll and/or pitch is not centred |
| AUTOTRIM | 01000000 | Servo autotrim is engaged |
| OOM | 02000000 | The FC is out of memory |
| SETTINGFAIL | 04000000 | A CLI setting is out of range. The erroneous setting should be indicated in a CLI dump. If you can't then reset the offending setting, reflash with full chip erase and reapplying settings from scratch may help. |
| PWMOUT | 08000000 | PWM output error. Motor or servo output initialization failed. (cause by insufficient timers available : turn off unused function like LED strip or SPI device) |
| NOPREARM | 10000000 | PREARM is enabled and timed out |

INAV will refuse to arm for the following reasons (e.g. from cli status):

Type Status on the CLI to find the cause

SETTING UP YOUR DRONE

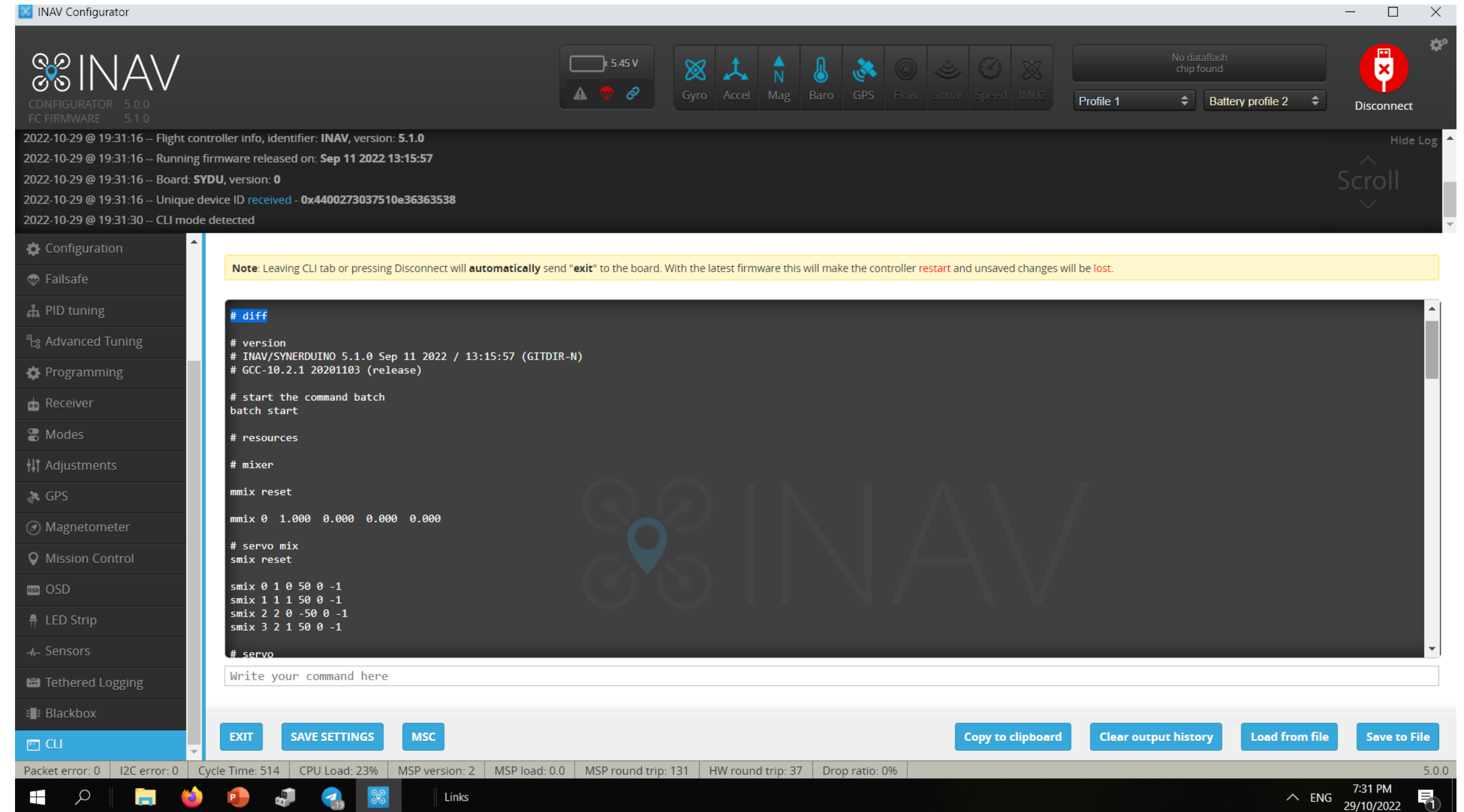
CLI Command Line Saving and Loading Parameters

You can download the Preset DIFF for the Synerduino STM Synerduino STM page

- DIFF - command to dump only those settings that differ from their default values (those that have been changed).
- DUMP – CLI Dump configuration

Then save the output on a notepad

The same output can be paste on the CLI and press ENTER to upload the Configuration , Save Settings then Reboot



The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 5.0.0, and FC FIRMWARE 5.1.0. The main window shows the CLI output of the 'diff' command, which lists various settings that differ from default values. The output includes version information, board details, and mixer/servo configurations. The interface also shows a sidebar with navigation options like Configuration, Failsafe, PID tuning, and Programming. A status bar at the bottom displays system metrics like CPU load and MSP version.

```
# diff
# version
# INAV/SYNERDUINO 5.1.0 Sep 11 2022 / 13:15:57 (GITDIR-N)
# GCC-10.2.1 20201103 (release)

# start the command batch
batch start

# resources

# mixer
mmix reset
mmix 0 1.000 0.000 0.000 0.000

# servo mix
smix reset
smix 0 1 0 50 0 -1
smix 1 1 1 50 0 -1
smix 2 2 0 -50 0 -1
smix 3 2 1 50 0 -1

# servo
```

Note: that we offer the Synerduino STM Diff .txt file available for those who wanted to use the pre-set for the 250mm synerduino drone

SETTING UP YOUR DRONE

Sometimes no matter how well you calibrate

Your aircraft may drift when your on neutral sticks

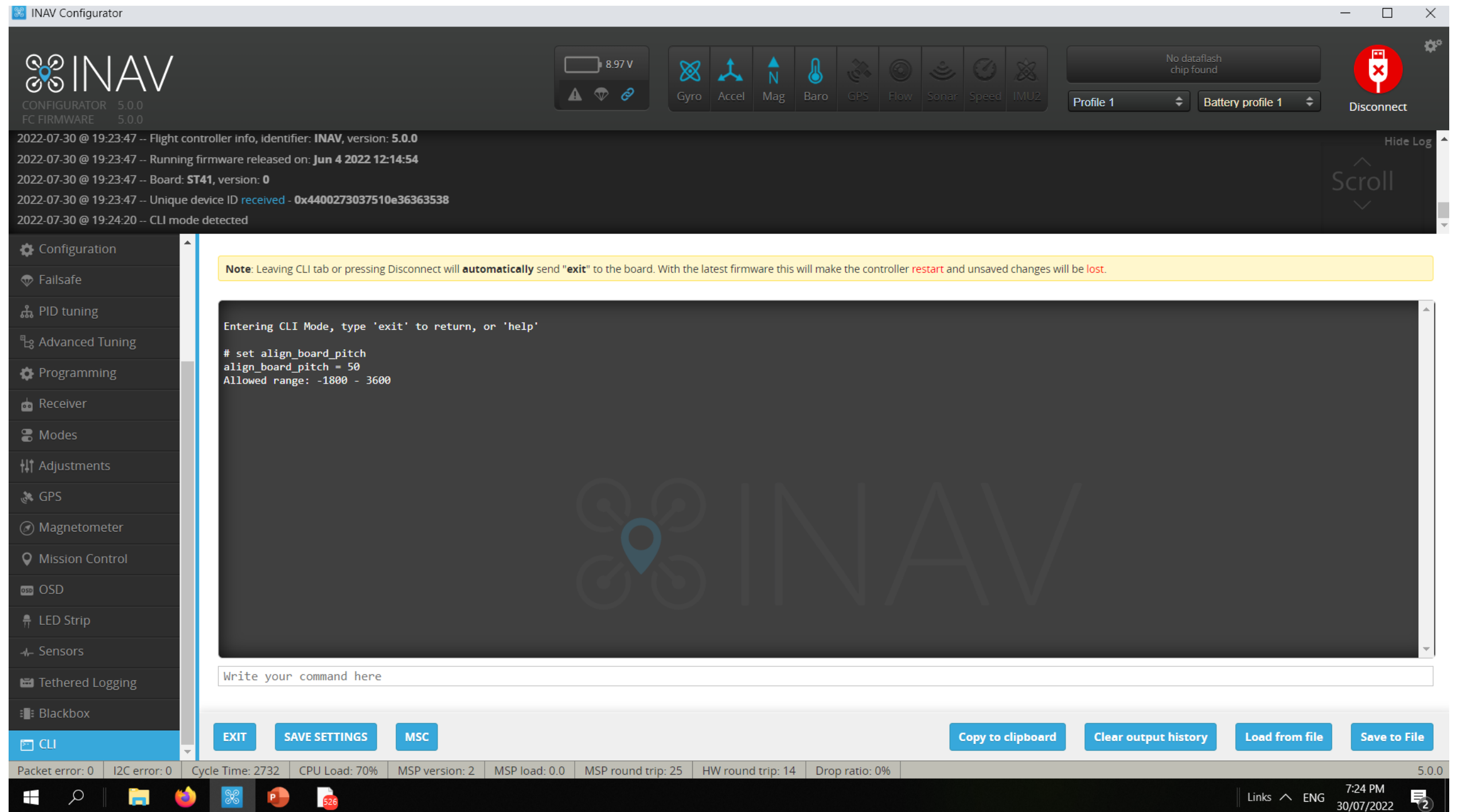
your ACC its not always perfect . You may need to trim your board for a good stability in flight

```
# set align_board_pitch  
set align_board_pitch = #  
Allowed range: -1800 – 3600
```

```
# set align_board_roll  
set align_board_roll = #  
Allowed range: -1800 – 3600
```

Pitch + # is Trim to the Back
Pitch - # is Trim to the Forward
Roll + # is Trim Left
Roll - # is Trim Right

CLI Command Line Trimming the Roll and Pitch Alignment



The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 5.0.0, and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main window is divided into a left sidebar with navigation options (Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox) and a central CLI window. The CLI window shows the following text:

```
Entering CLI Mode, type 'exit' to return, or 'help'  
  
# set align_board_pitch  
align_board_pitch = 50  
Allowed range: -1800 - 3600
```

Below the CLI window is a text input field labeled "Write your command here" and several buttons: EXIT, SAVE SETTINGS, MSC, Copy to clipboard, Clear output history, Load from file, and Save to File. The bottom status bar shows system information: Packet error: 0, I2C error: 0, Cycle Time: 2732, CPU Load: 70%, MSP version: 2, MSP load: 0.0, MSP round trip: 25, HW round trip: 14, Drop ratio: 0%, and the version 5.0.0. The system tray at the bottom right shows the date and time: 7:24 PM, 30/07/2022.

SETTING UP YOUR DRONE

CLI Command Line Landing setting

What your drone would do when Landing or RTH command is present

[nav_disarm_landing](#)

This shuts off the motor after touch down or contact solid . Means drone has no movement for 3 seconds or what ever you set it to

[nav_emerg_landing_speed](#)

The speed it descends on emergency

[nav_rth_allow_landing](#)

Should the drone land after reaching RTH

Note: Leaving CLI tab or pressing Disconnect will automatically send "exit" to t

```
Entering CLI Mode, type 'exit' to return, or 'help'  
  
# get landing  
nav_disarm_on_landing = OFF  
Allowed values: OFF, ON  
  
nav_emerg_landing_speed = 500  
Allowed range: 100 - 2000  
  
nav_rth_allow_landing = ALWAYS  
Allowed values: NEVER, ALWAYS, FS_ONLY
```

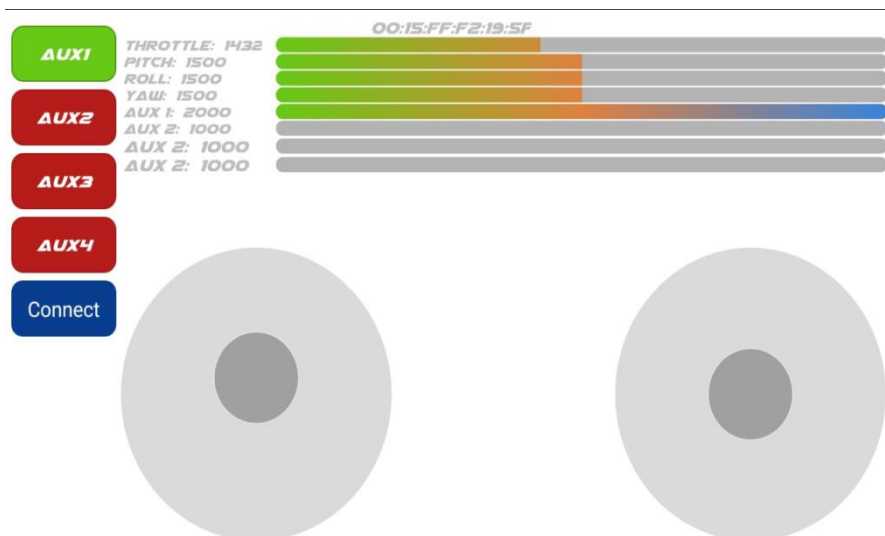

SETTING UP YOUR DRONE

`set rx_min_usec = 790`

Because the Synerduino App sets RX min as 800 to accommodate Multiwii Serial RC switching

The INAV equivalent is to reduce the RC min to 790 to accommodate this buttons

This allows the use of the AUX buttons on the Left



For users who wish to control this drone using the Synerduino APP

```
INAV Configurator
INAV
CONFIGURATOR 6.0.0-FP2
FC FIRMWARE 6.0.0 [SYNERDUINOSTMSV]
2.4V
Gyro Accel Mag Baro GPS Flow Sonar Speed IMU2
Profile 1 Battery profile 1 Disconnect
2023-03-17 @ 12:11:03 -- Flight controller info, identifier: INAV, version: 6.0.0
2023-03-17 @ 12:11:03 -- Running firmware released on: Jan 10 2023 17:26:02
2023-03-17 @ 12:11:03 -- Board: SYDU, version: 0
2023-03-17 @ 12:11:03 -- Unique device ID received - 0x32002a3132510c30313530
2023-03-17 @ 12:12:13 -- CLI mode detected
Configuration
Failsafe
PID tuning
Advanced Tuning
Programming
Receiver
Modes
Adjustments
GPS
Magnetometer
Mission Control
OSD
LED Strip
Sensors
Tethered Logging
Blackbox
CLI
Note: Leaving CLI tab or pressing Disconnect will automatically send "exit" to the board. With the latest firmware this will make the controller restart and unsaved changes will be lost.
Entering CLI Mode, type 'exit' to return, or 'help'
# set rx_min_usec = 790
rx_min_usec set to 790
set rx_min_usec = 790
EXIT SAVE SETTINGS MSC Copy to clipboard Clear output history Load from file Save to File
Packet error: 0 I2C error: 0 Cycle Time: 509 CPU Load: 25% MSP version: 2 MSP load: 0.0 MSP round trip: 31 HW round trip: 15 Drop ratio: 0% 6.0.0-FP2
```

SETTING UP YOUR DRONE

Its important to set this correctly to ensure proper GPS flights

Set `ahrs_gps_yaw_windcomp = ON`

Set `gps_provider = UBLOX7`

Allowed values: NMEA, UBLOX, UBLOX7, MSP

Set `gps_sbas_mode = AUTO`

Allowed values: AUTO, EGNOS, WAAS, MSAS, GAGAN, NONE

Set `gps_dyn_model = PEDESTRIAN`

PEDESTRIAN – multicopter hover or Slow Flg

AIR_1G – airplane slow to mid speed

AIR_4G – airplane fast speed

`gps_auto_config = ON`

Config GPS on bootup

`gps_auto_baud = ON`

`gps_ublox_use_galileo = OFF`

turn on only if GPS supports Galileo in your area

`gps_min_sats = 6`

Minimum sats to arm gps flight mode

`inav_use_gps_velned = ON`

`inav_use_gps_no_baro = OFF`

turning this on would make your drone rely on GPS altitude instead of Baro – measure above sea level instead relative to bootup

CLI Command Line GPS setting

The screenshot shows the INAV Configurator interface with the CLI tab selected. The CLI window displays the following settings:

```
# set gps
ahrs_gps_yaw_windcomp = ON
Allowed values: OFF, ON

gps_provider = UBLOX7
Allowed values: NMEA, UBLOX, UBLOX7, MSP

gps_sbas_mode = AUTO
Allowed values: AUTO, EGNOS, WAAS, MSAS, GAGAN, NONE

gps_dyn_model = PEDESTRIAN
Allowed values: PEDESTRIAN, AIR_1G, AIR_4G

gps_auto_config = ON
Allowed values: OFF, ON

gps_auto_baud = ON
Allowed values: OFF, ON

gps_ublox_use_galileo = OFF
Allowed values: OFF, ON

gps_min_sats = 6
Allowed range: 5 - 10
```

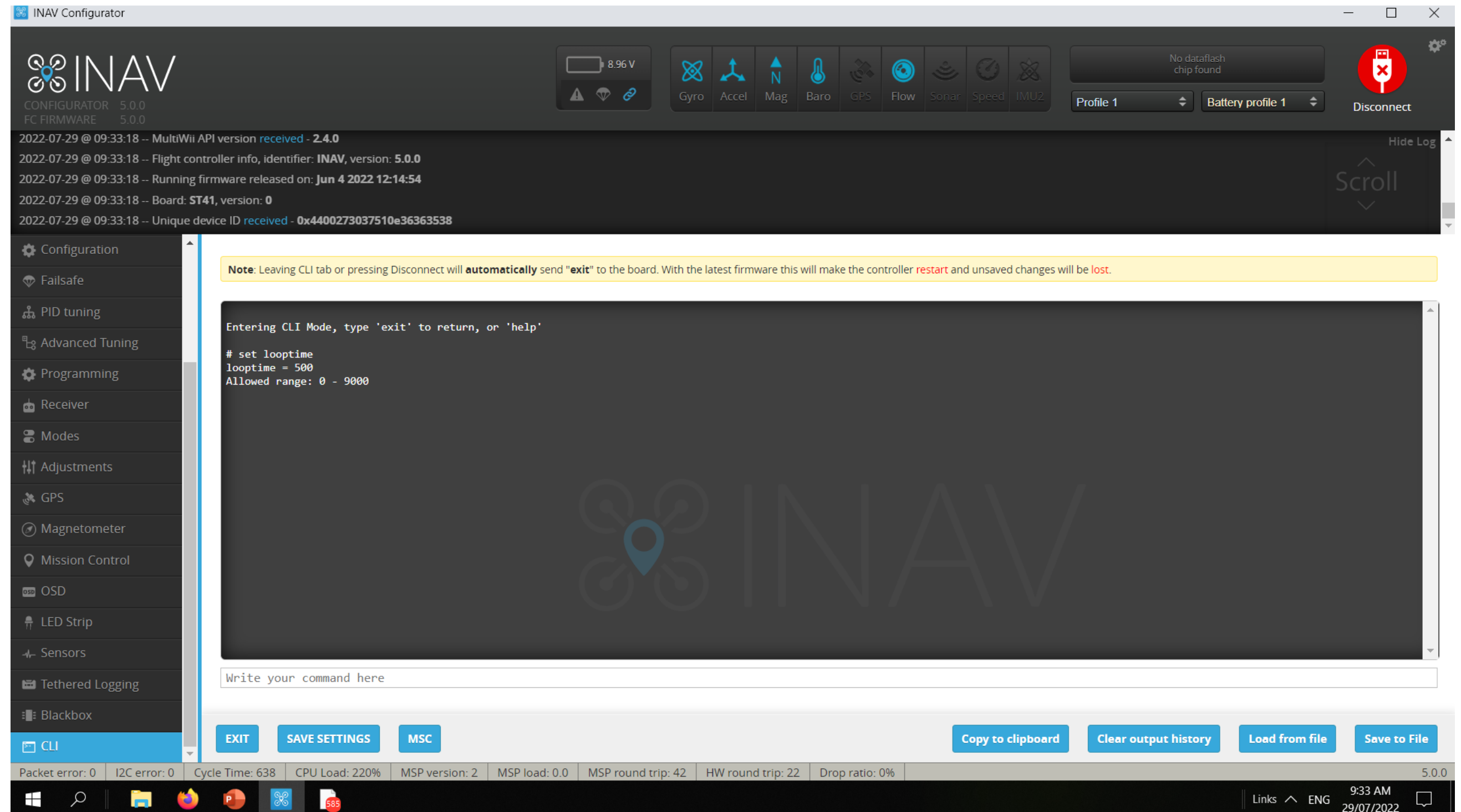
The interface also shows a status bar at the bottom with various system metrics: Packet error: 0, I2C error: 0, Cycle Time: 510, CPU Load: 18%, MSP version: 2, MSP load: 0.0, MSP round trip: 33677, HW round trip: 18, Drop ratio: 0%, and the version number 6.0.0. The system clock shows 4:03 PM on 23/04/2023.

SETTING UP YOUR DRONE

CLI Command Line – Looptime and CPU Speed

LoopTime is the speed of processing allocation, this is adjusted depending on the sensors used or the number of peripherals

Looptime – Default 500 but you can get as slow as 2000 in worst case scenario



The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 5.0.0, and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A battery level indicator shows 8.96 V. The main area is divided into a left sidebar with navigation options (Configuration, Failsafe, PID tuning, etc.) and a central CLI window. The CLI window shows the following text:

```
Entering CLI Mode, type 'exit' to return, or 'help'  
# set looptime  
looptime = 500  
Allowed range: 0 - 9000
```

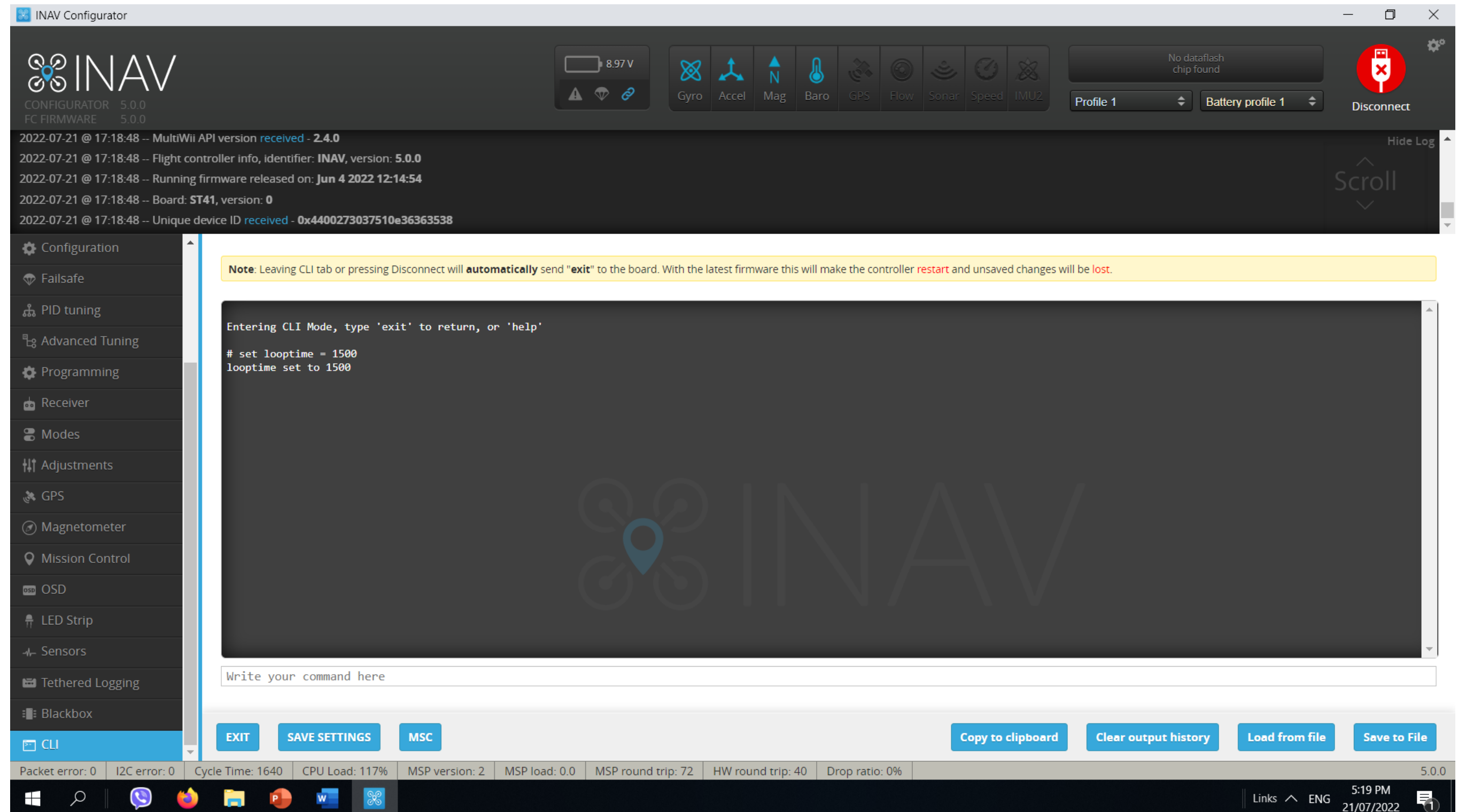
Below the CLI window is a text input field labeled "Write your command here". At the bottom of the interface, there are buttons for "EXIT", "SAVE SETTINGS", "MSC", "Copy to clipboard", "Clear output history", "Load from file", and "Save to File". The status bar at the very bottom shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 638, CPU Load: 220%, MSP version: 2, MSP load: 0.0, MSP round trip: 42, HW round trip: 22, Drop ratio: 0%, and the version number 5.0.0. The system tray at the bottom right shows the time 9:33 AM on 29/07/2022.

SETTING UP YOUR DRONE

Open the CLI command line.
Enter the command below.
Default: set looptime = 500 or
Synerduino: set looptime =
2800 - 3500 this would slow
down the refresh rate of the
gyro to give it enough time for
the cpu to load aswell as
reduce the sensitivity of Gyros
to Noise (Vibrations) that can
cause the drone to flip
Then save it by typing the
following command. save

This Adjust the sensor
Refresh rate to better
regulate the CPU Load
Speed , If CPU is above
100% its overloaded and
the failsafe would kick in
. The drone will not Arm

CLI Command Line – Looptime and CPU speed



The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 5.0.0, and various system status indicators including battery level (8.97V) and sensor status (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A yellow warning banner at the top of the CLI window states: "Note: Leaving CLI tab or pressing Disconnect will automatically send 'exit' to the board. With the latest firmware this will make the controller restart and unsaved changes will be lost." The CLI window shows the following text: "Entering CLI Mode, type 'exit' to return, or 'help'", "# set looptime = 1500", and "looptime set to 1500". Below the CLI window is a text input field labeled "Write your command here". The bottom status bar displays system metrics: Packet error: 0, I2C error: 0, Cycle Time: 1640, CPU Load: 117%, MSP version: 2, MSP load: 0.0, MSP round trip: 72, HW round trip: 40, Drop ratio: 0%, and version 5.0.0. The Windows taskbar at the bottom shows the time as 5:19 PM on 21/07/2022.

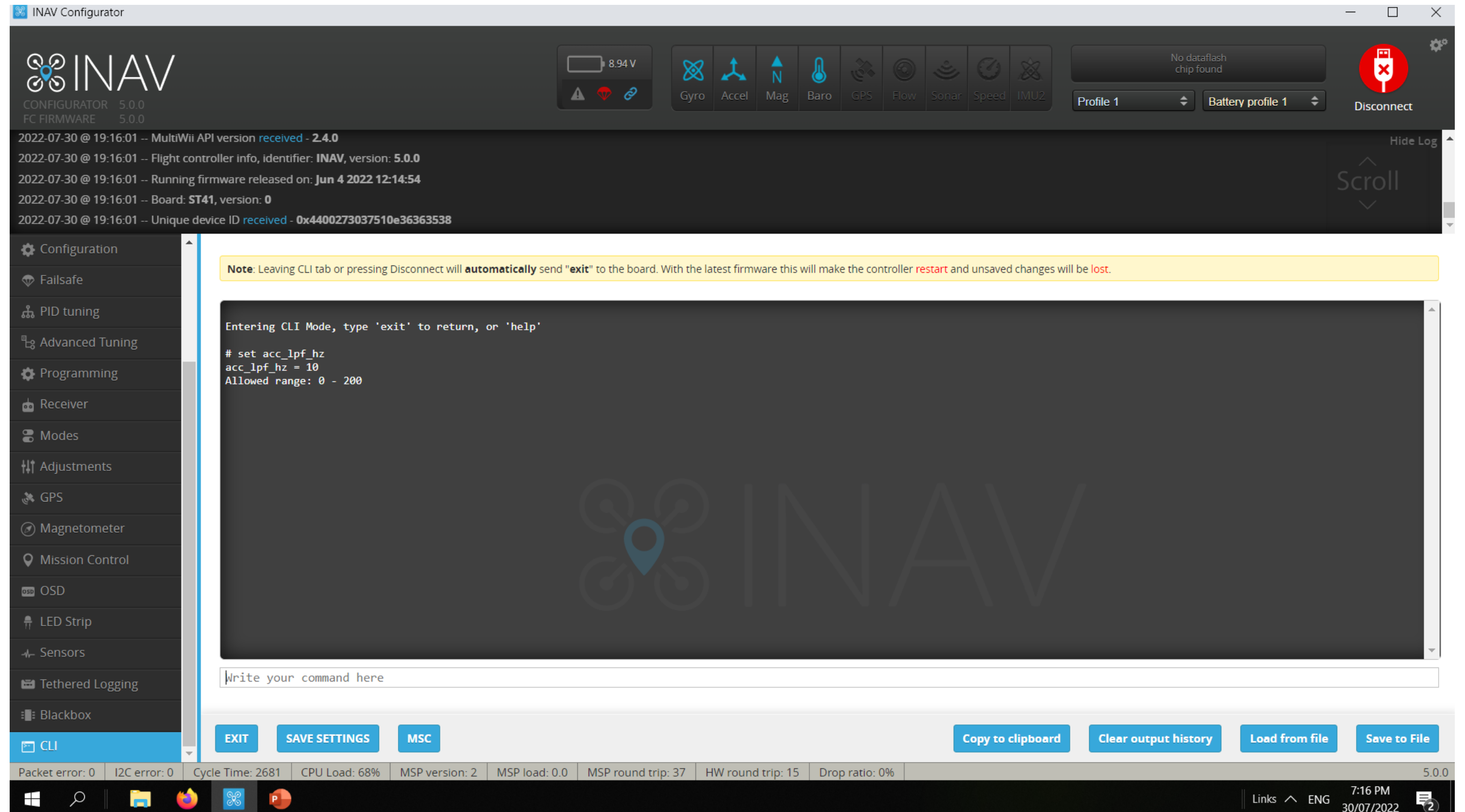
SETTING UP YOUR DRONE

CLI Command Line – Low Pass Filter

set acc_lpf_hz = 10 –

lower the number the less the sensitivity of the Acc to vibration cause by the motor , this may give a sluggish respond but it would settle the strange hiccups of INAV for Drifting Horizons

set acc_lpf_hz = 20 is Default



The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), and various system status indicators like battery level (8.94 V) and sensor status (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A central log window shows system messages, including "MultiWii API version received - 2.4.0" and "Flight controller info, identifier: INAV, version: 5.0.0". The left sidebar contains a menu of configuration options, with "CLI" selected at the bottom. The main CLI window shows the command prompt "Entering CLI Mode, type 'exit' to return, or 'help'", followed by the command "# set acc_lpf_hz" and the response "acc_lpf_hz = 10" and "Allowed range: 0 - 200". A yellow warning banner at the top of the CLI window states: "Note: Leaving CLI tab or pressing Disconnect will automatically send 'exit' to the board. With the latest firmware this will make the controller restart and unsaved changes will be lost." The bottom status bar displays system metrics such as "Packet error: 0", "I2C error: 0", "Cycle Time: 2681", "CPU Load: 68%", "MSP version: 2", "MSP load: 0.0", "MSP round trip: 37", "HW round trip: 15", "Drop ratio: 0%", and the version "5.0.0". The Windows taskbar at the bottom shows the time as 7:16 PM on 30/07/2022.

SETTING UP YOUR DRONE

Set `nav_mc_althold_throttle = MID_STICK`
Allowed values: STICK, MID_STICK, HOVER

Sometimes users preference or Radio Transmitter would determine what constitute an Altitude hold

STICK = this would rely on the hover throttle as set in ADVANCE PID to determine the hover with dead band +/-

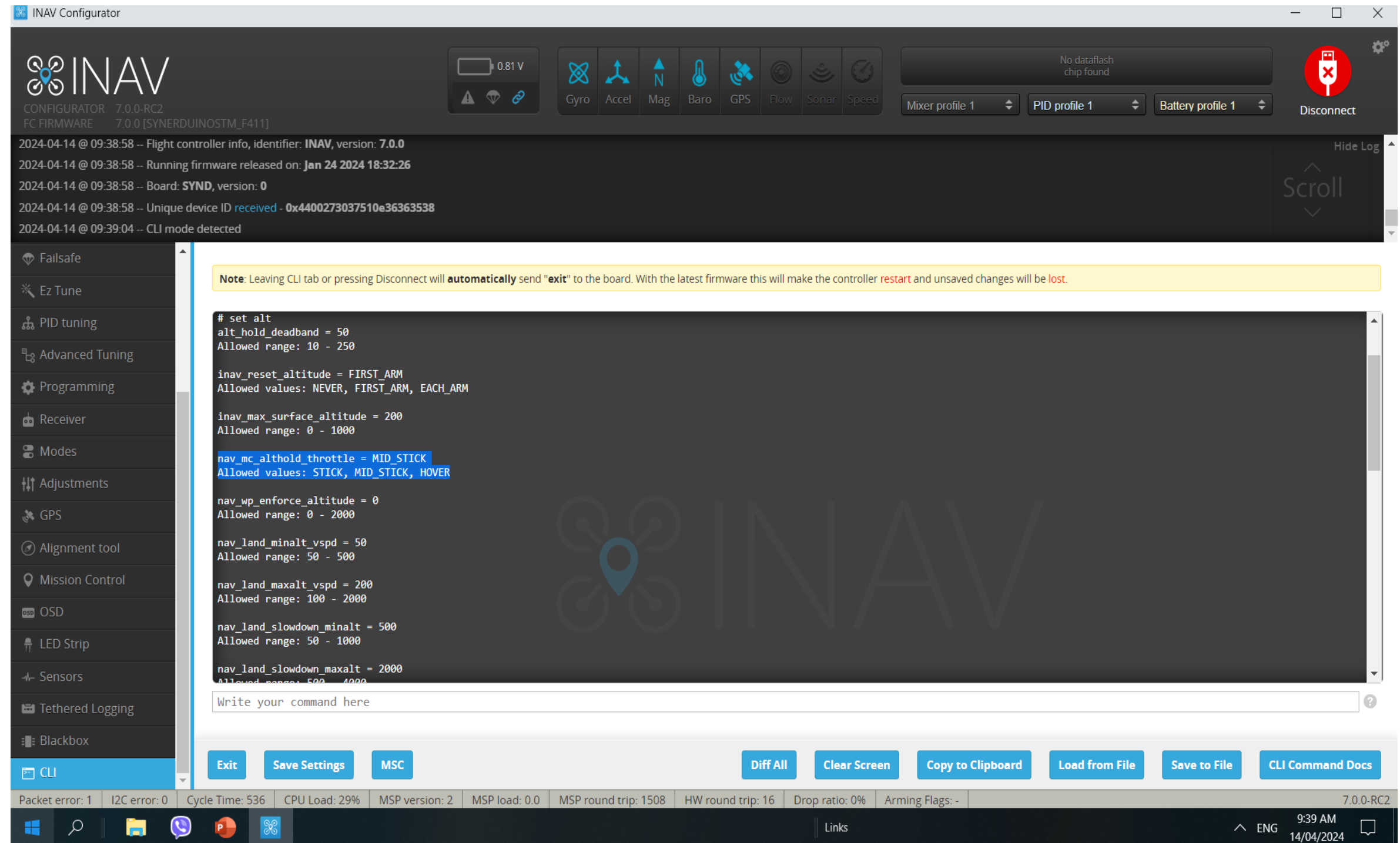
MID_STICK = this is common for Radios with throttle stick at center position with PWM 1500, means then throttle stick is at the center Altitude hold is active

HOVER = again is is Hover throttle Related

Set `alt_hold_deadband = 50`
Allowed range: 10 – 250

This is Dead band related it gives a deadregion in your throttle mid stick like 1450 to 1550 as MID stick position

Altitude hold



The screenshot shows the iNAV Configurator interface. The top bar displays the INAV logo, version 7.0.0-RC2, and various system status icons like battery (0.81V), Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, and Speed. The main content area shows the CLI tab with the following configuration commands:

```
# set alt
alt_hold_deadband = 50
Allowed range: 10 - 250

inav_reset_altitude = FIRST_ARM
Allowed values: NEVER, FIRST_ARM, EACH_ARM

inav_max_surface_altitude = 200
Allowed range: 0 - 1000

nav_mc_althold_throttle = MID_STICK
Allowed values: STICK, MID_STICK, HOVER

nav_wp_enforce_altitude = 0
Allowed range: 0 - 2000

nav_land_minalt_vspd = 50
Allowed range: 50 - 500

nav_land_maxalt_vspd = 200
Allowed range: 100 - 2000

nav_land_slowdown_minalt = 500
Allowed range: 50 - 1000

nav_land_slowdown_maxalt = 2000
Allowed range: 500 - 4000
```

The interface also includes a sidebar with navigation options like Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, and Blackbox. The bottom status bar shows system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, Arming Flags, and the current version (7.0.0-RC2).

<https://github.com/iNavFlight/inav/discussions/8933>

SETTING UP YOUR DRONE

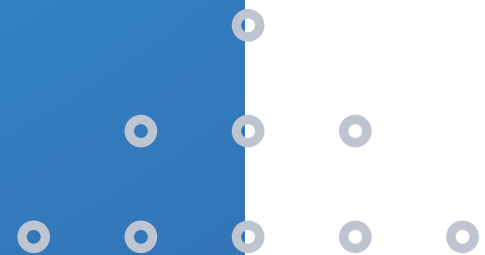
Finishing Note:

Should you use the Preset DIFF in CLI

You may need to check again the following

- Calibration
- PID Tuning
- PORTS – if the correct port selected depending on your serial hardware
- Receiver - RC mapping to match your radio
- Modes – Flight modes switch
- Configuration - Sensor Orientation /Mag Orientation
- Magnetometer - Orientation
- GPS – configuration should it match your GPS type
- CLI – Task and Status to make sure you didn't miss anything or having conflict
- INAV is a Active development and should be check for Updates from time to time

TESTING



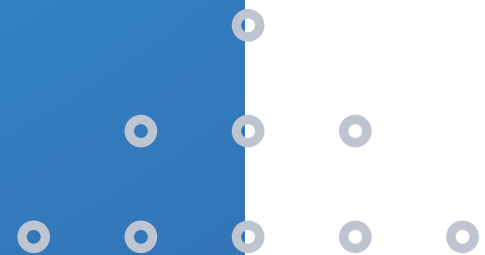
SYSTEM CHECKS

NOTE:

- Ensure all Pre-Arm checks are in the green
- Sensor Status are Blue
- Heading is Oriented correctly
0 North 90 East 180 South 270 West
- Pitch and Roll at 0
- Any Error in this should check their Respective Menu
- CLI Terminal type STATUS should show if there are any misconfigurations

The screenshot displays the INAV Configurator software interface. At the top, the INAV logo and version information (CONFIGURATOR 7.0.0-RC2, FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]) are visible. A battery voltage indicator shows 8.88 V. A row of sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed) is shown, with a blue arrow pointing to the Mag icon. The main area is titled 'Setup' and contains a 'Reset Settings' button and a 'Restore settings to default' option. Below this, a table displays orientation data: Heading: 163 deg, Pitch: 13.3 deg, and Roll: 2.2 deg. A green arrow points to a 'Reset Z axis, offset: 0 deg' button. On the right, a 'Pre-arming checks' section lists several items, all with green checkmarks: UAV is levelled, Run-time calibration, CPU load, Navigation is safe, Compass calibrated, Accelerometer calibrated, Settings validated, and Hardware health. Below this is an 'Info' section with battery-related data: Battery detected cell count: 3, Battery voltage: 8.88 V, Battery left: 0 %, Battery remaining capacity: NA, Battery full when plugged in: false, and Battery use cap thresholds: false. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and Arming Flags. The Windows taskbar at the bottom shows the time as 12:19 PM on 28/03/2024.

PRE-FLIGHT

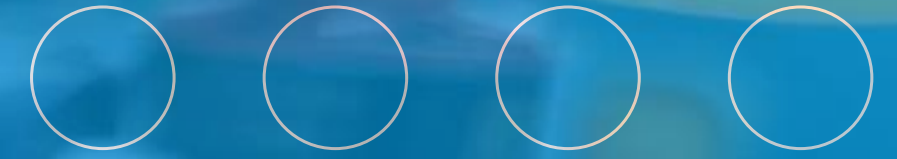


PREFLIGHT

NOTE:

- *Check Batteries fully Charge*
- *Motors and Connections in Good shape*
- *Radio Failsafe Active*
- *Communication with Ground station working*
- *Flight modes setup correctly*





QUICK BUILD GUIDE

SYNERDUINO

STM BOARD