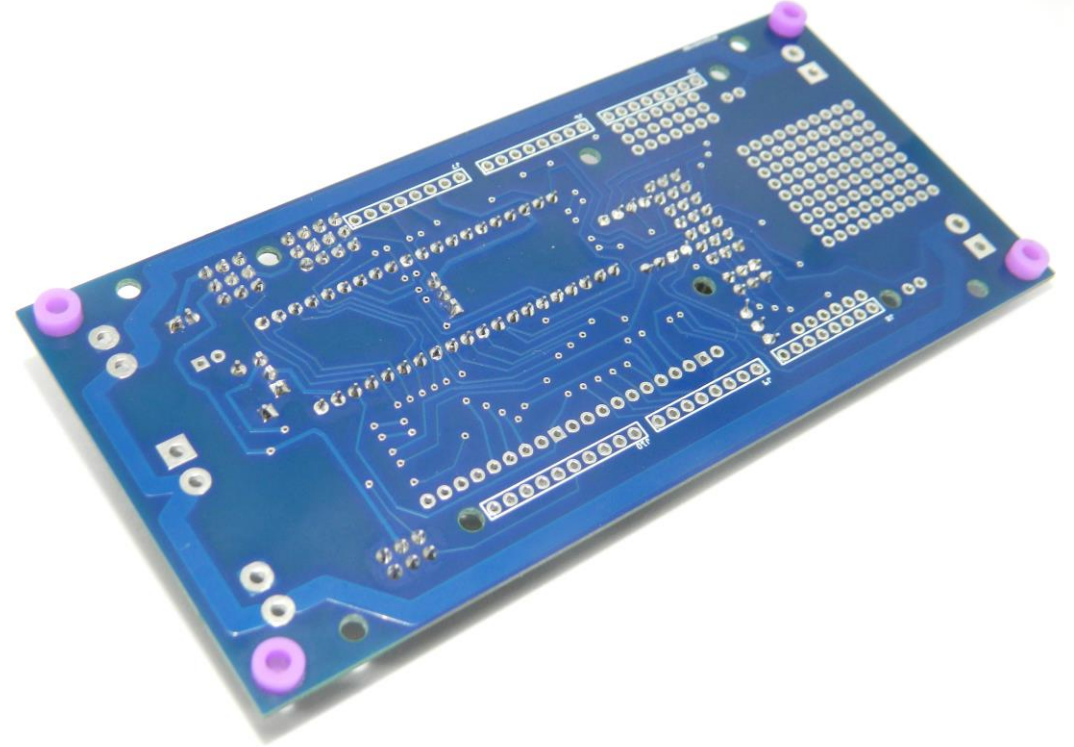
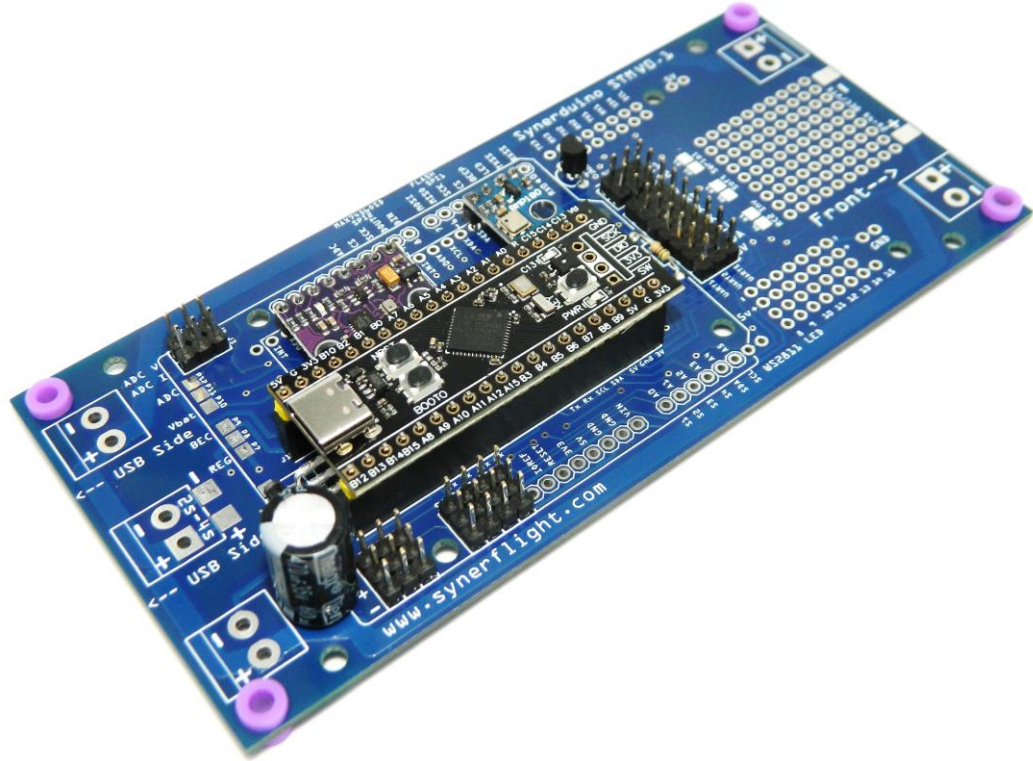


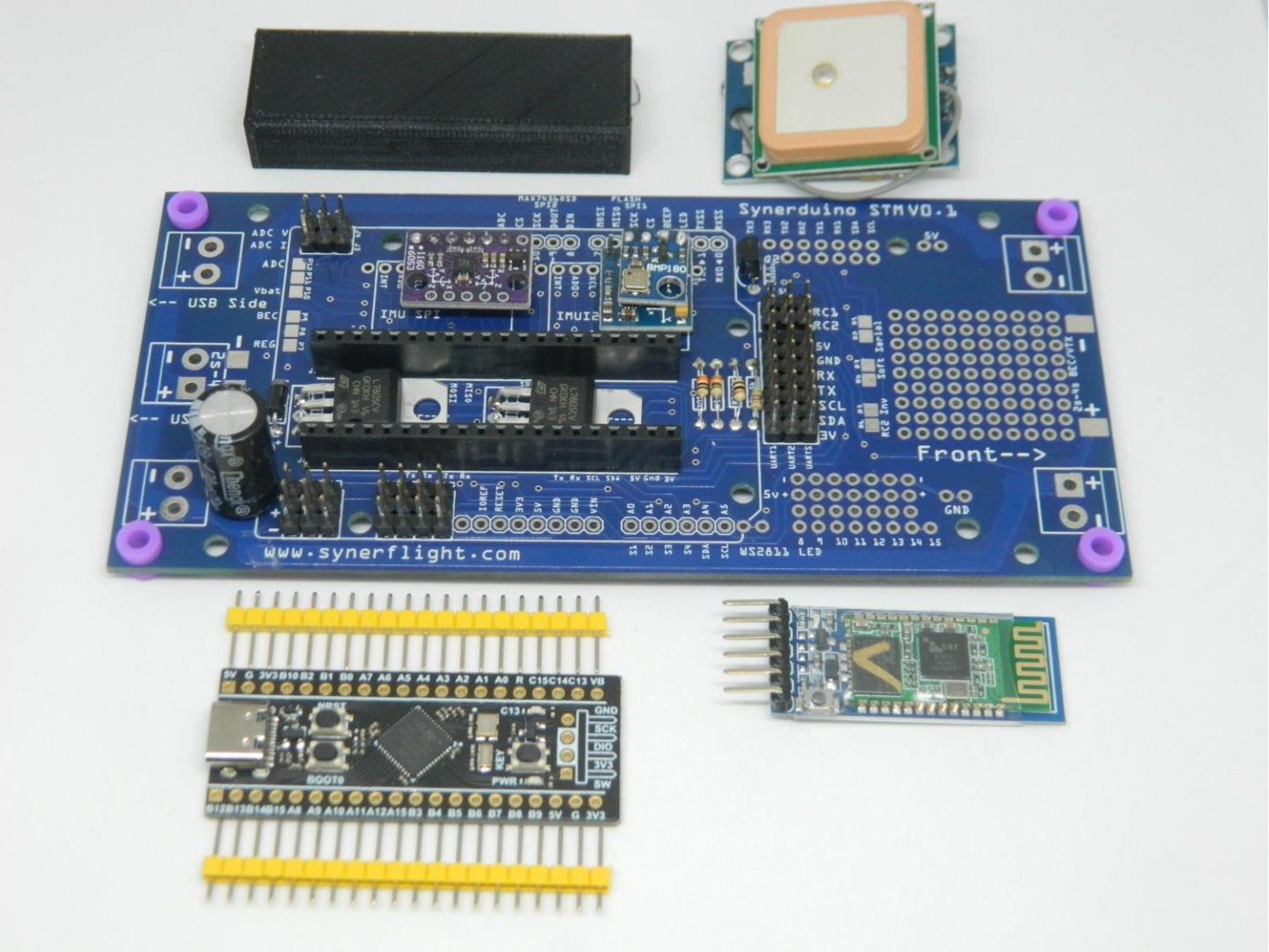
SYNERDUINO STM SHIELD

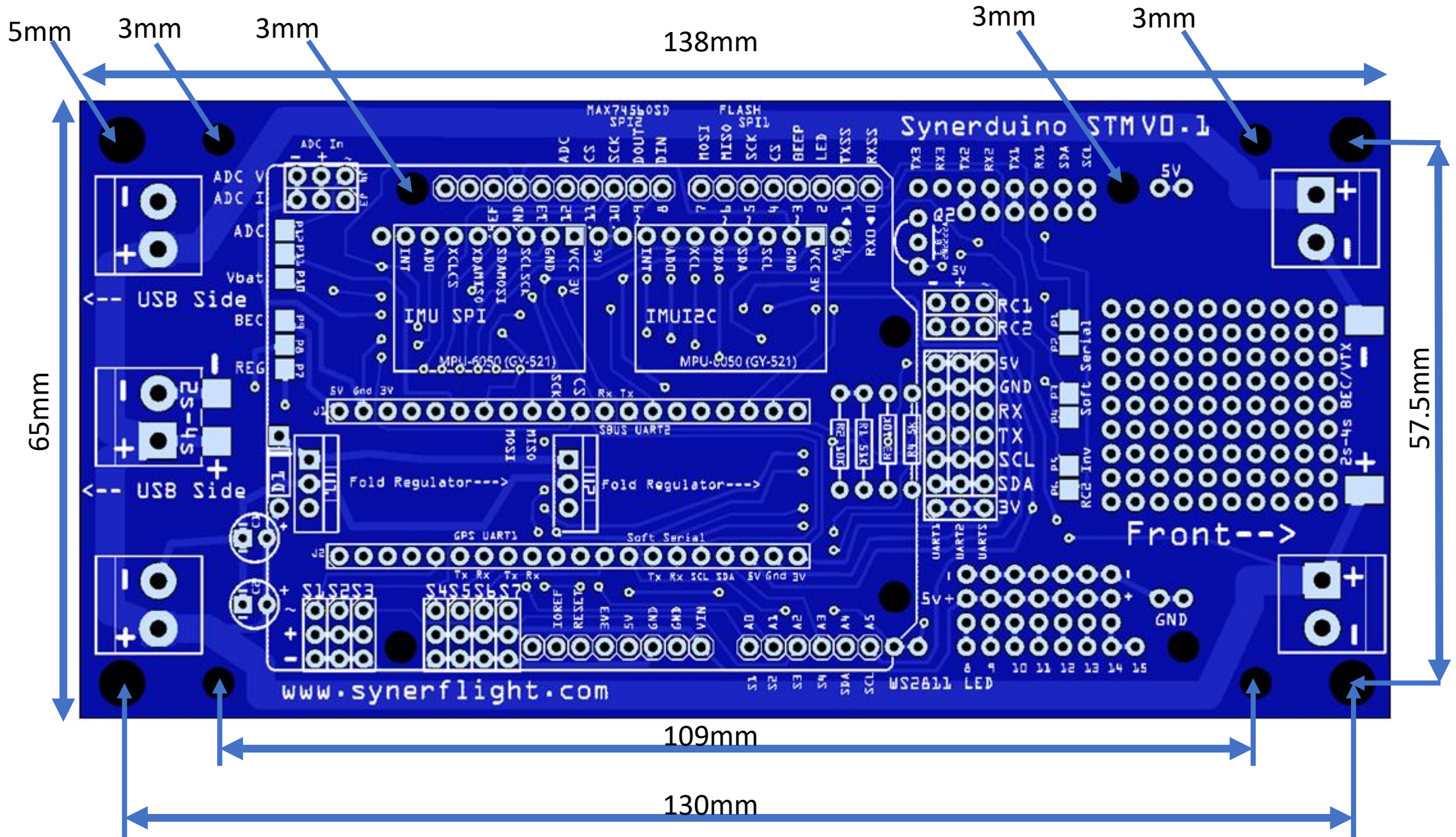
STM32F411 and Shield board Setup

SYNERDUINO STM BlackPill STM32F411CEU6



SYNERDUINO STM Kit





Power Component

ESC3

LIPO
3s-4s

ESC1

ADC or Vbat monitor control Pads

BEC or Regulator control Pads

5V regulated

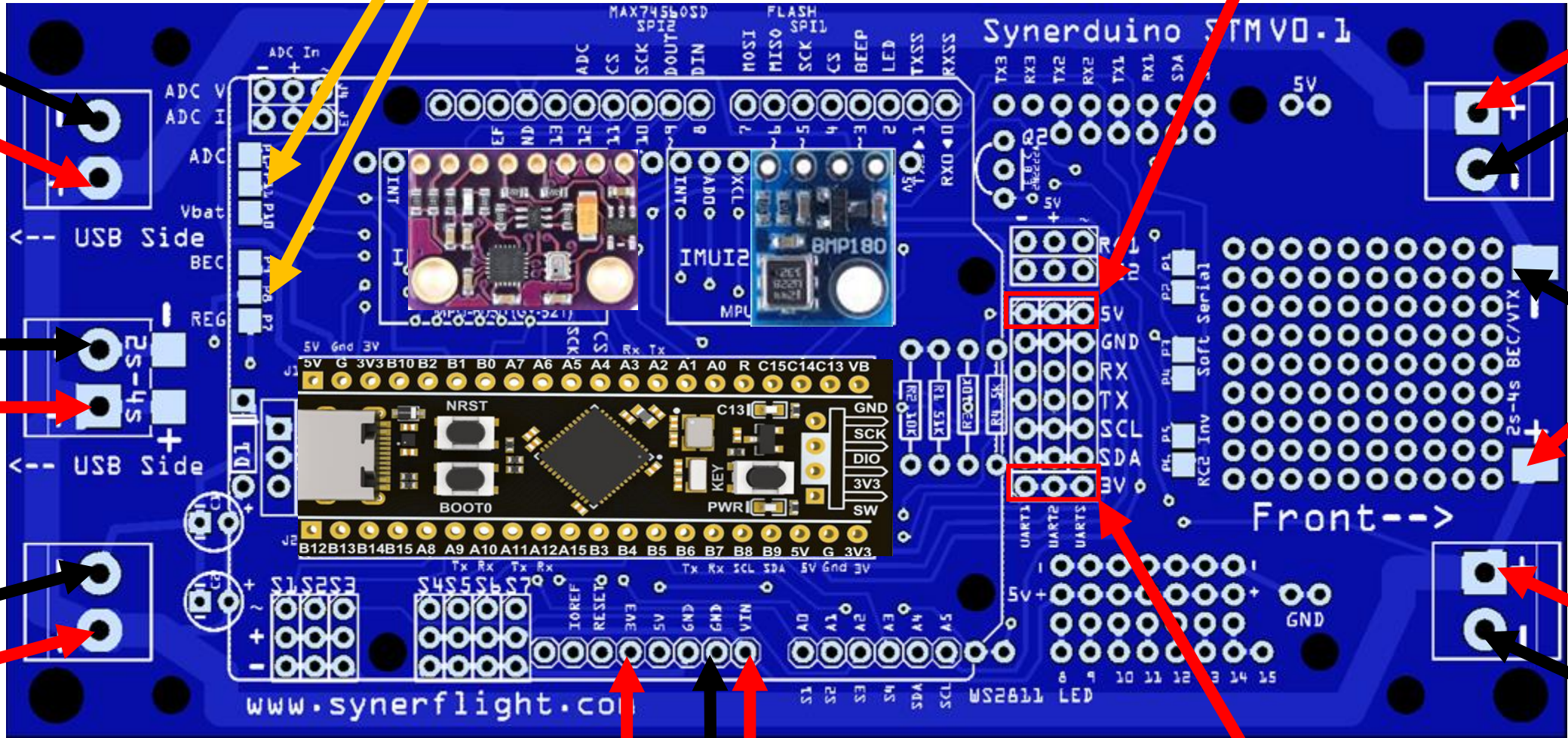
ESC4

3s-4s

ESC2

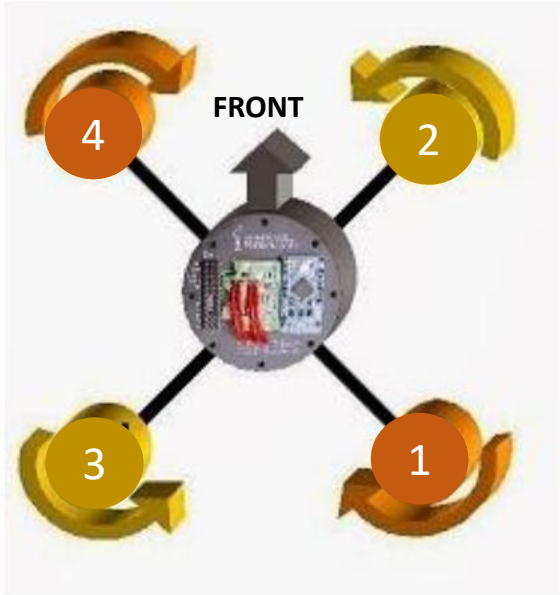
3V 5Vin

3V regulated



Electronic Speed Controller

Motor [4]



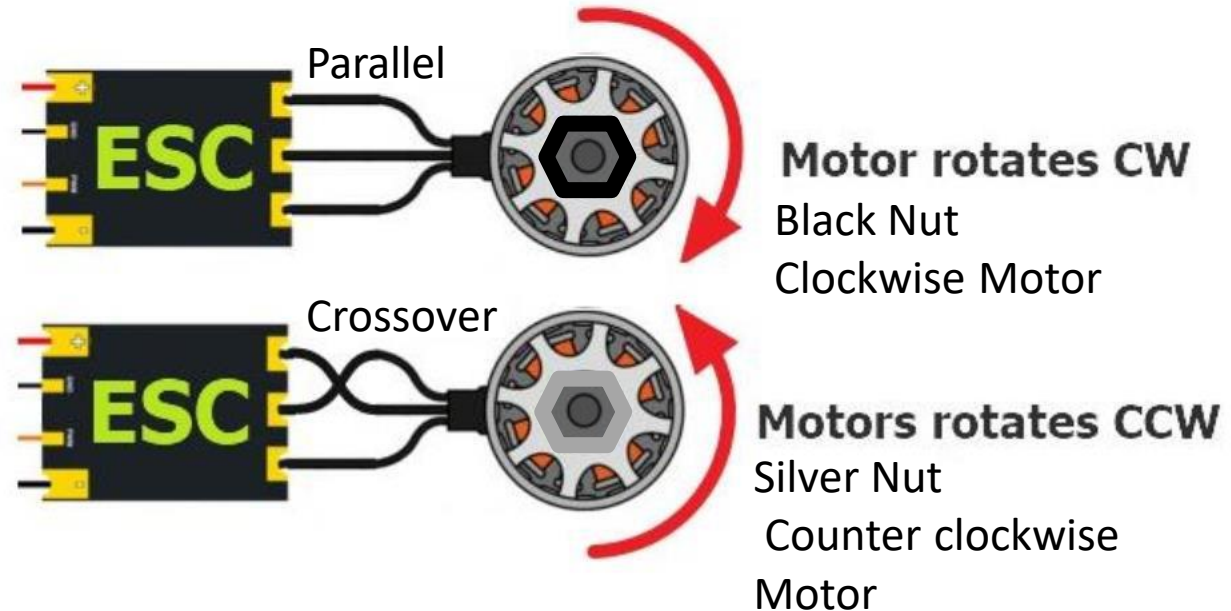
Motor [2]

Motor [1]

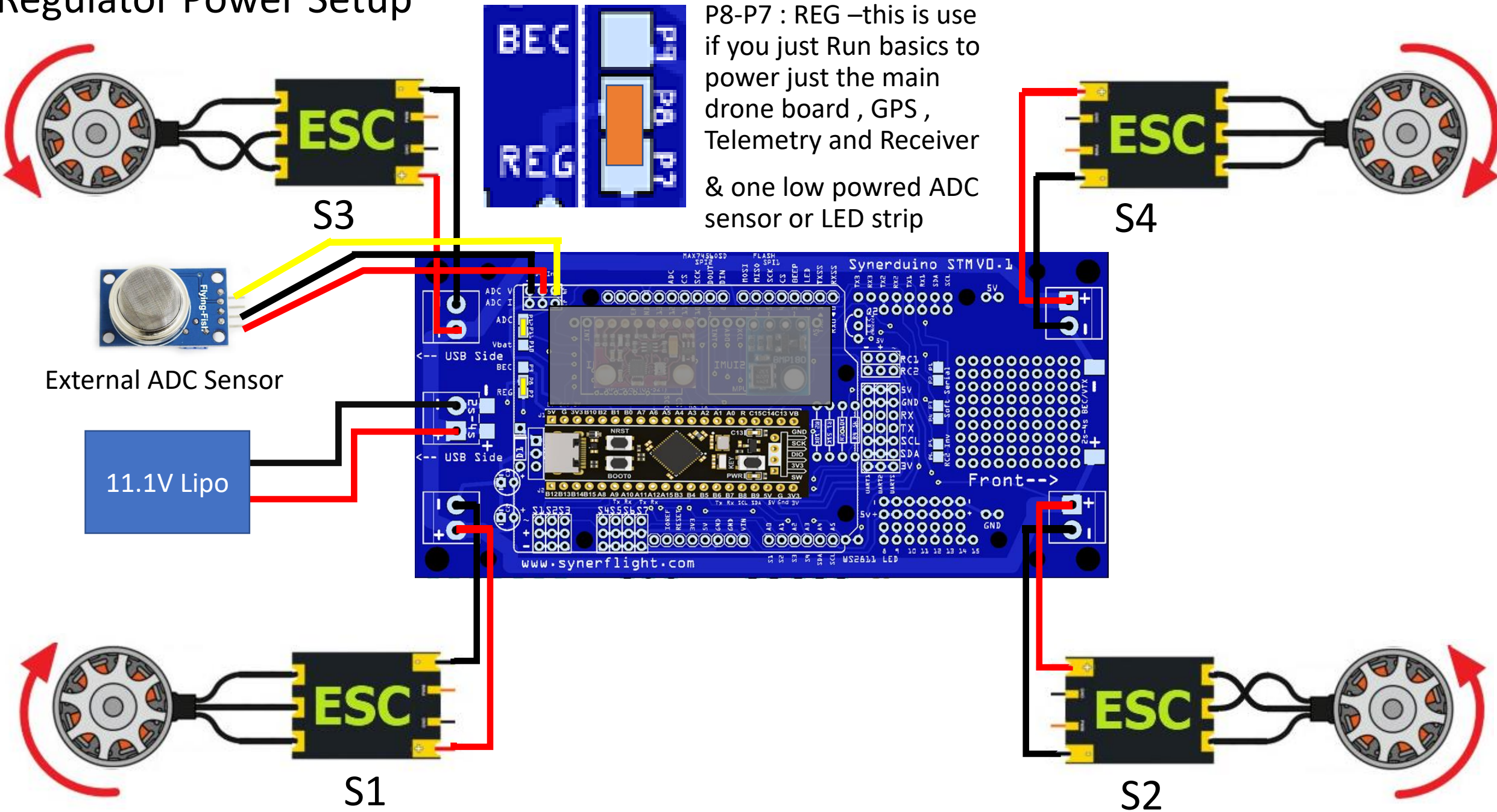
Motor [3]

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

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



Regulator Power Setup



P8-P7 : REG –this is use if you just Run basics to power just the main drone board , GPS , Telemetry and Receiver & one low powered ADC sensor or LED strip

External ADC Sensor

11.1V Lipo

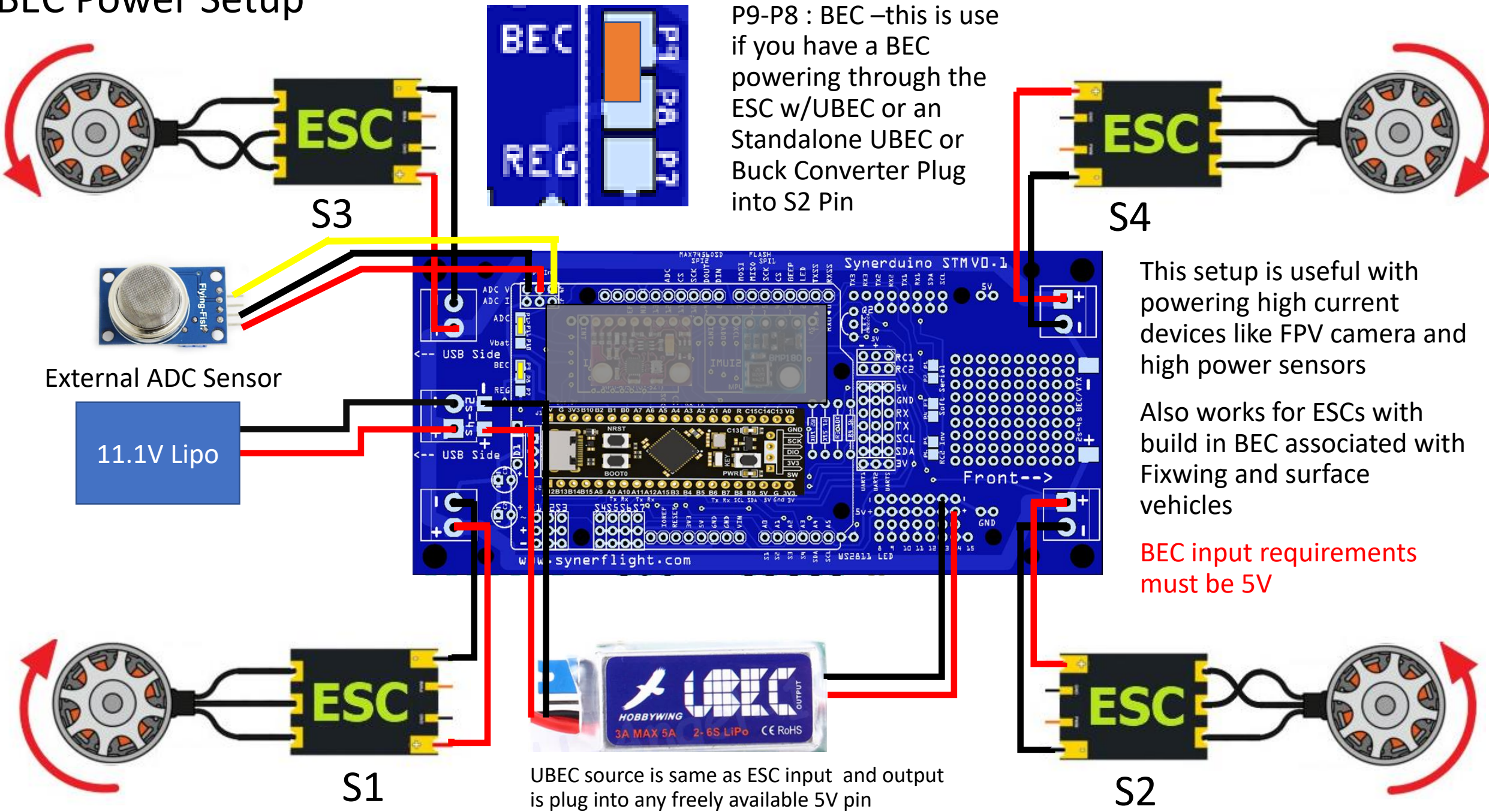
S3

S4

S1

S2

BEC Power Setup



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

This setup is useful with powering high current devices like FPV camera and high power sensors

Also works for ESCs with build in BEC associated with Fixwing and surface vehicles

BEC input requirements must be 5V

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

System Component

ADC and Battery Monitoring

SPI sensor

I2C sensor

UART 2 : Sbus RC1 and RC2(Invert)

Soft UART Output

SPI2

SPI1

Soft UART

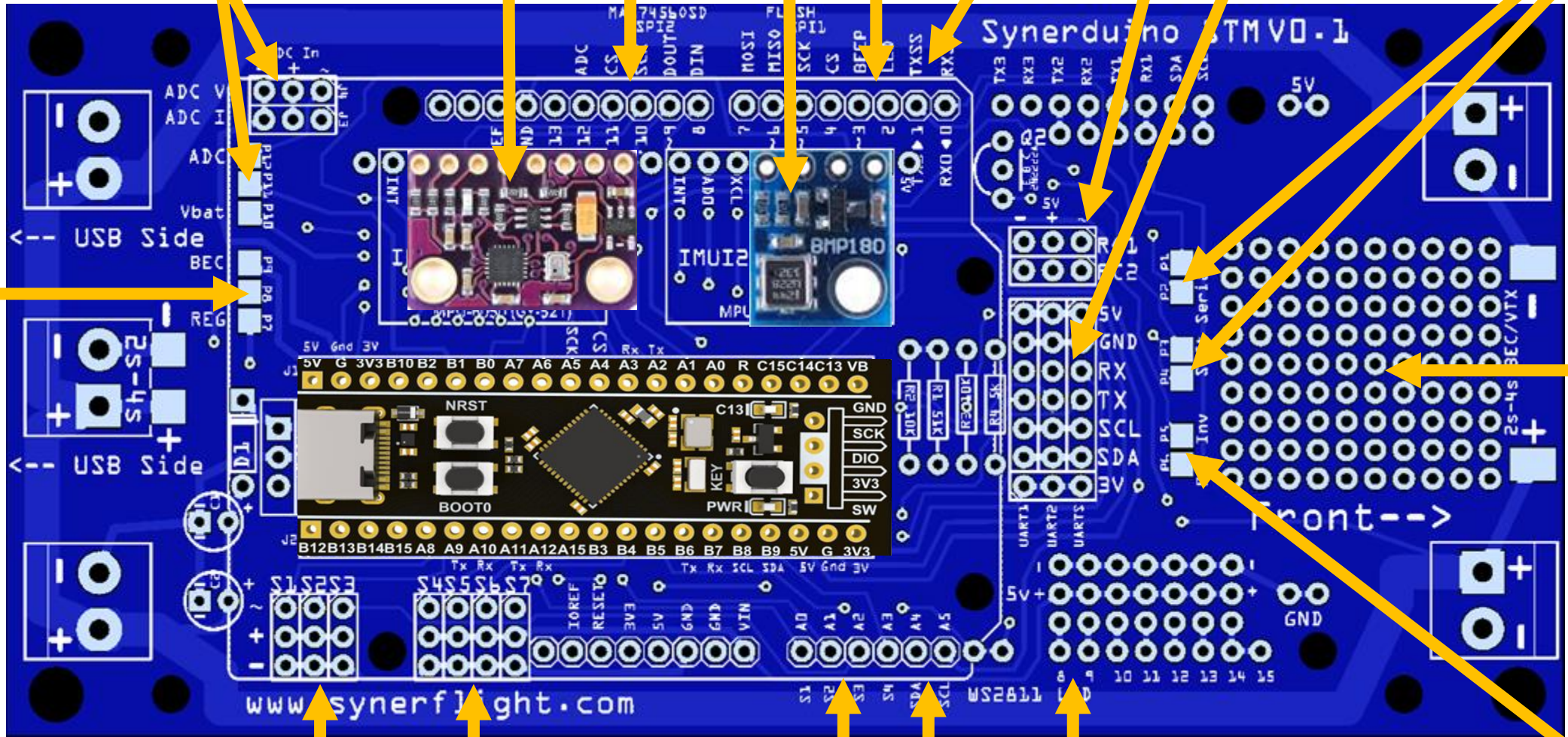
UART 1, 2, Soft

UBEC /Regulator Selection Pads

DIY Slot

Note: the power rails would support upto 4s safely

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



S1-S7 Motor/Servo

I2C Aux

8-9 WS2811 LED out

RC2 inverted Sbus signal

S1-S4 Motor/Servo Aux

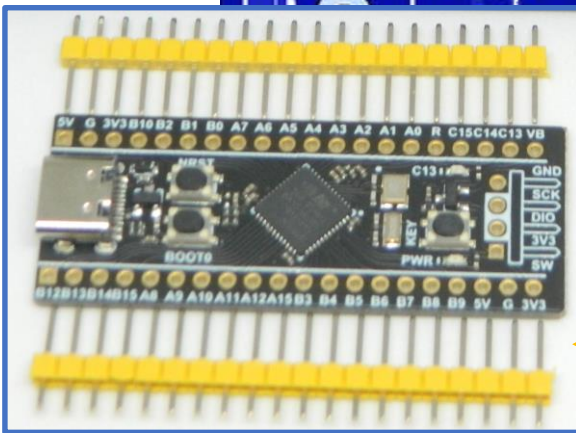
Board Preparations

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

ADC and Battery Monitoring

UBEC /Regulator Selection Pads

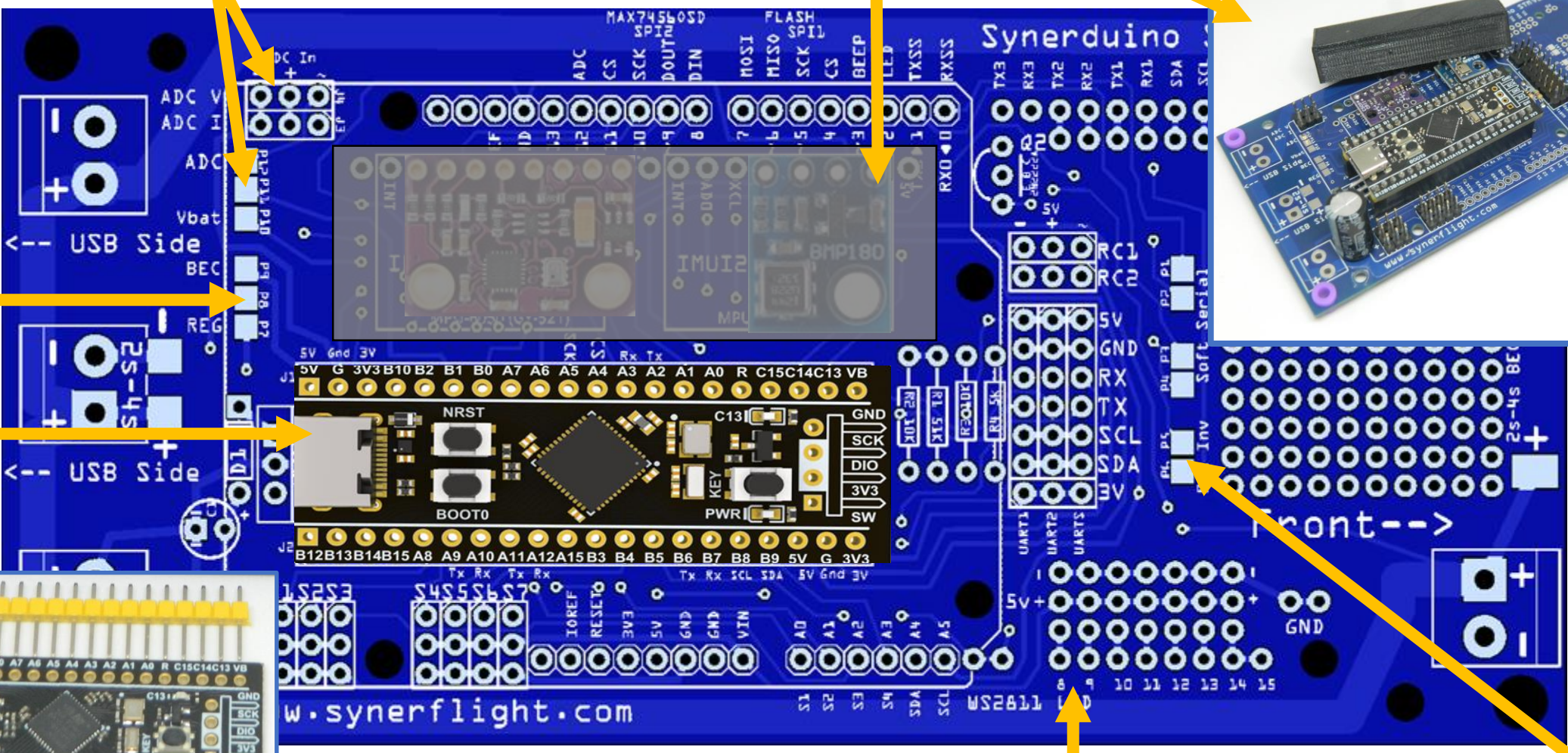
USB facing this side



Pins have to be solder on before installation

8-9 WS2811 LED out

RC2 inverted Sbus signal
For those using PWM to SBUS converter



Selector Pads

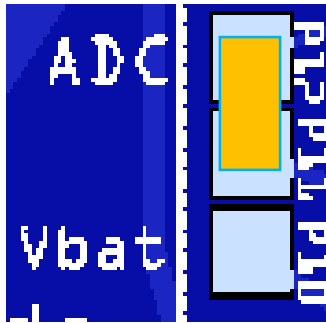
To Select two adjacent pads must be shorted with a solder blob



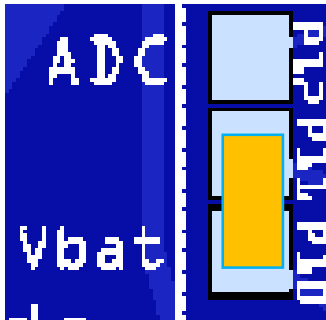
P9-P8 : BEC –this is use if you have a BEC powering through the ESC w/UBEC or an Standalone UBEC or Buck Converter Plug into S2 Pin **BEC input is 5V**



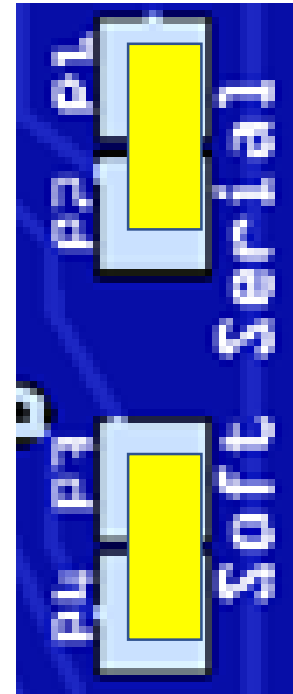
P8-P7 : REG –this is use if you just Run basics to power just the main drone board , GPS , Telemetry and Receiver



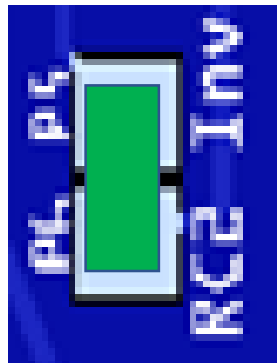
P12-P11 ADC Sensor Input



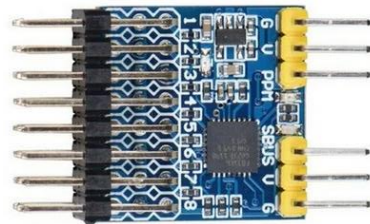
P11-P10 ADC Voltage Monitoring input



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



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



Primary use for PWM to SBUS Converters

Synerduino

Note: the power rails would support upto 4s safely

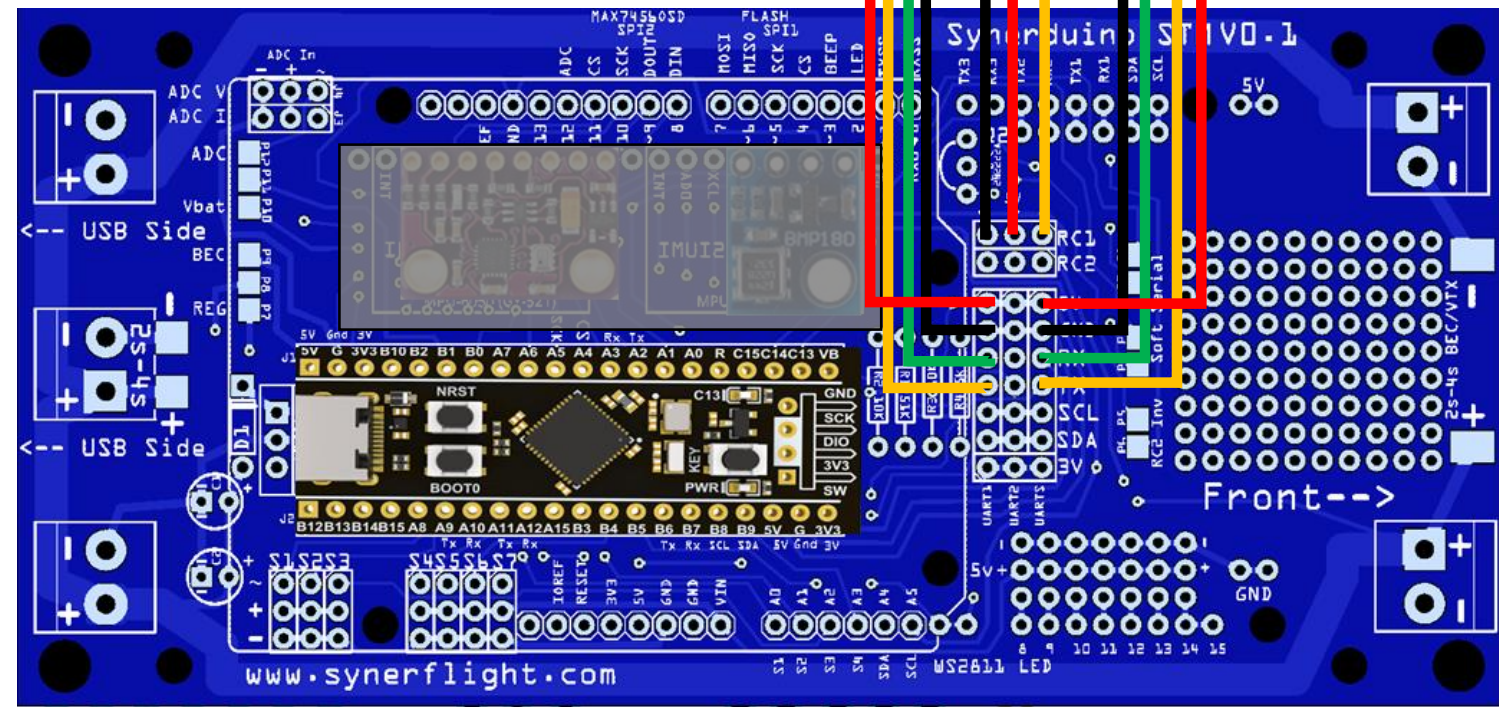
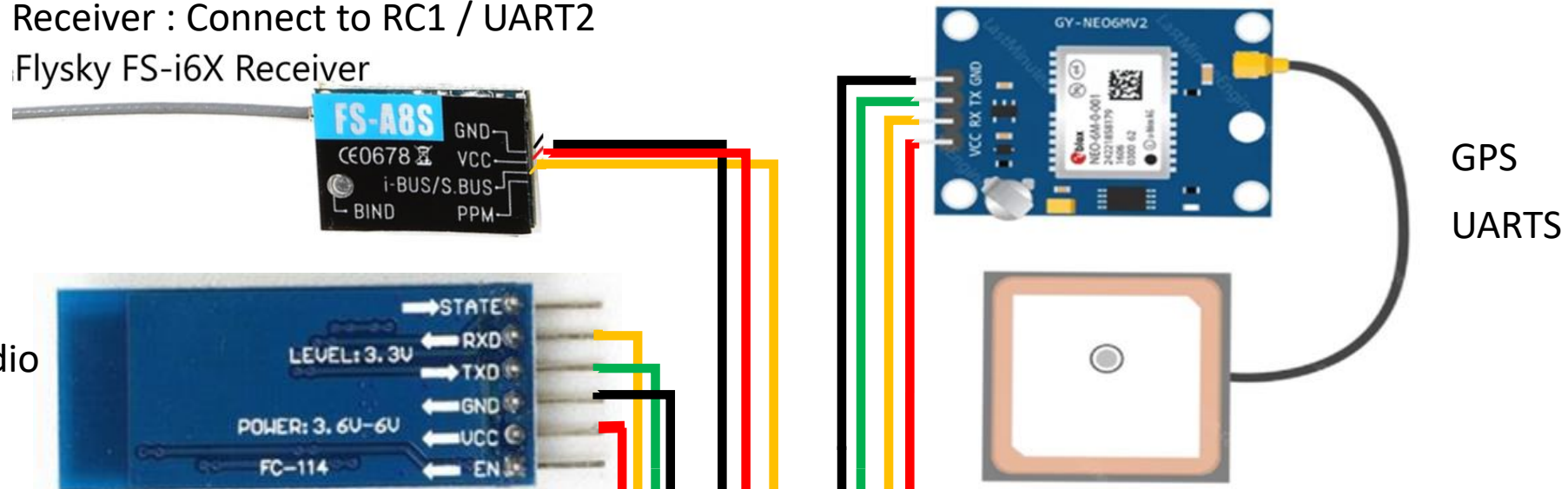
For 6s setup this would require an external UBEC to supply 5V

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

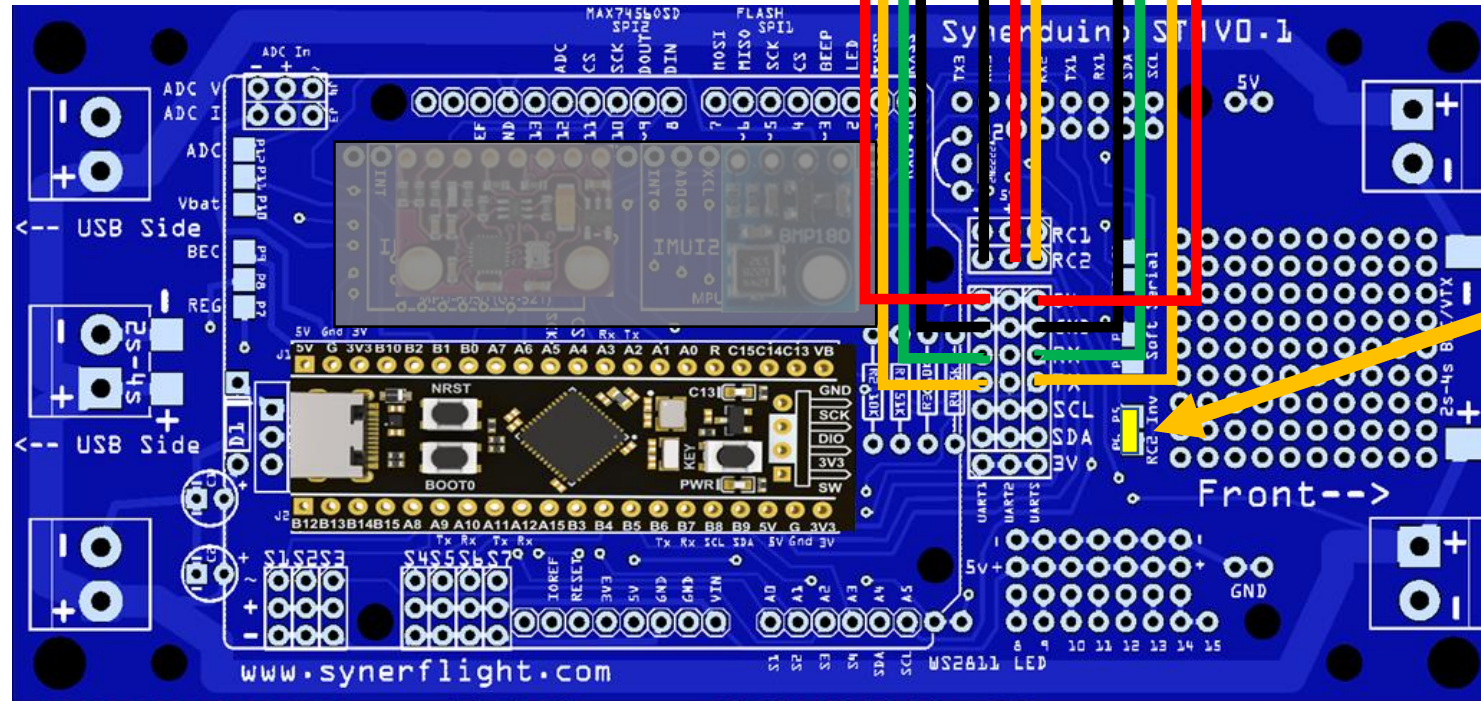
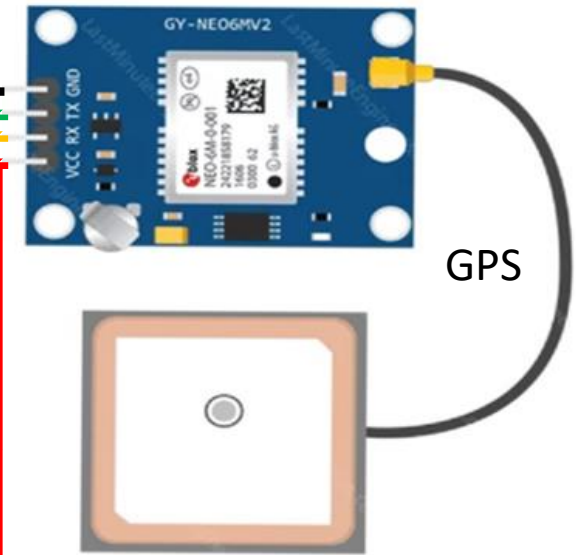
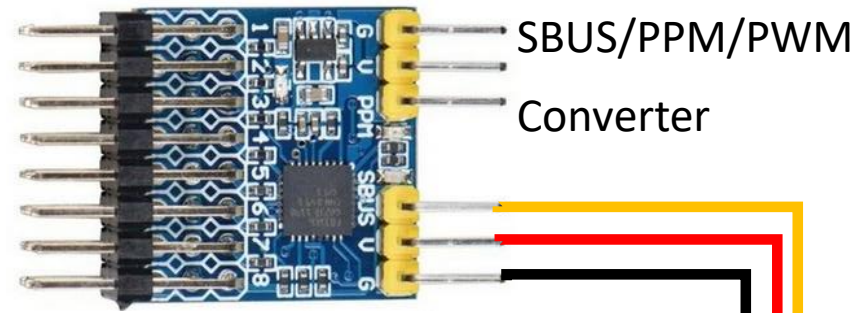


GPS
UARTS

UART Serial Devices

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

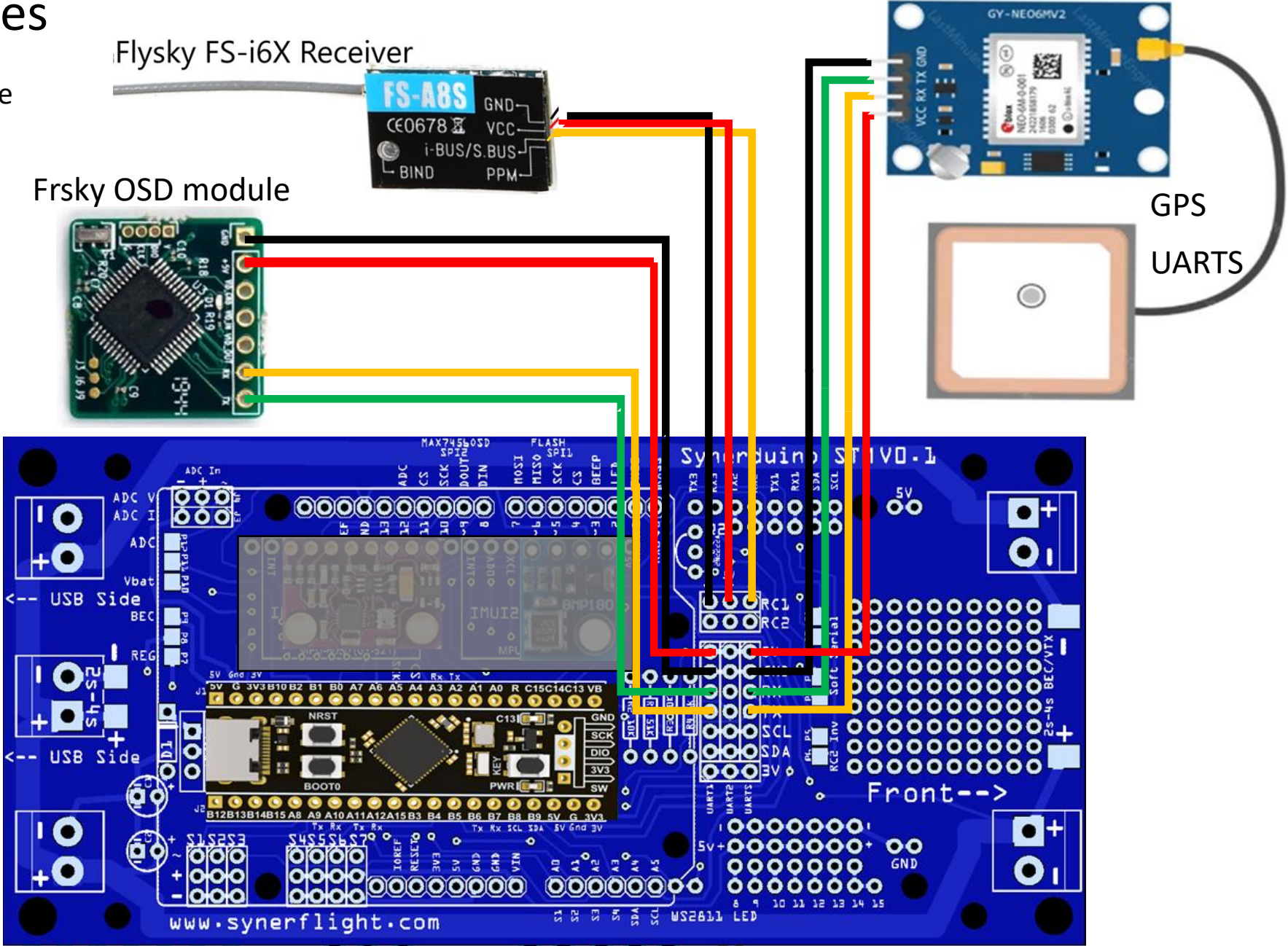
Bluetooth/Serial Radio



USE RC2 INV to invert the SBUS for Some Signal Converter

UART Serial Devices

The Telemetry can also use the Serial OSD module



SPI2 Devices

These are optional addons

All Addon SPI devices can Access SPI2 Pins

CS - CS

DIN - MOSI

DOUT - MISO

SCK - SCK

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

SD Card is Active Default for Synerduino STM firmwares:

Synerduino STM.HEX

Synerduino STM VS.HEX

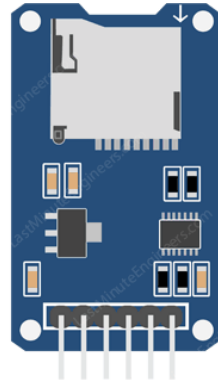
4GB , FAT32 Format

Some SD cards have compatibility issue.

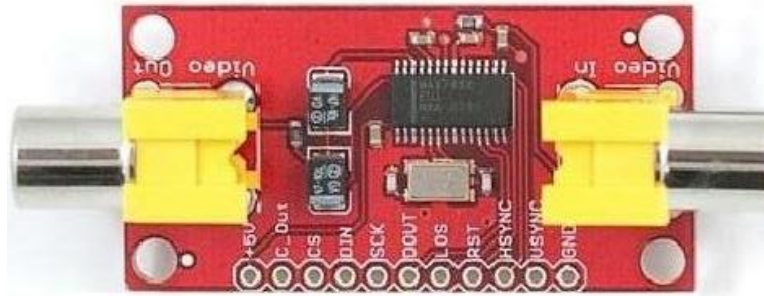
Check if other brands do work

SAMSUNG microSD EVO plus(Red) is recommended

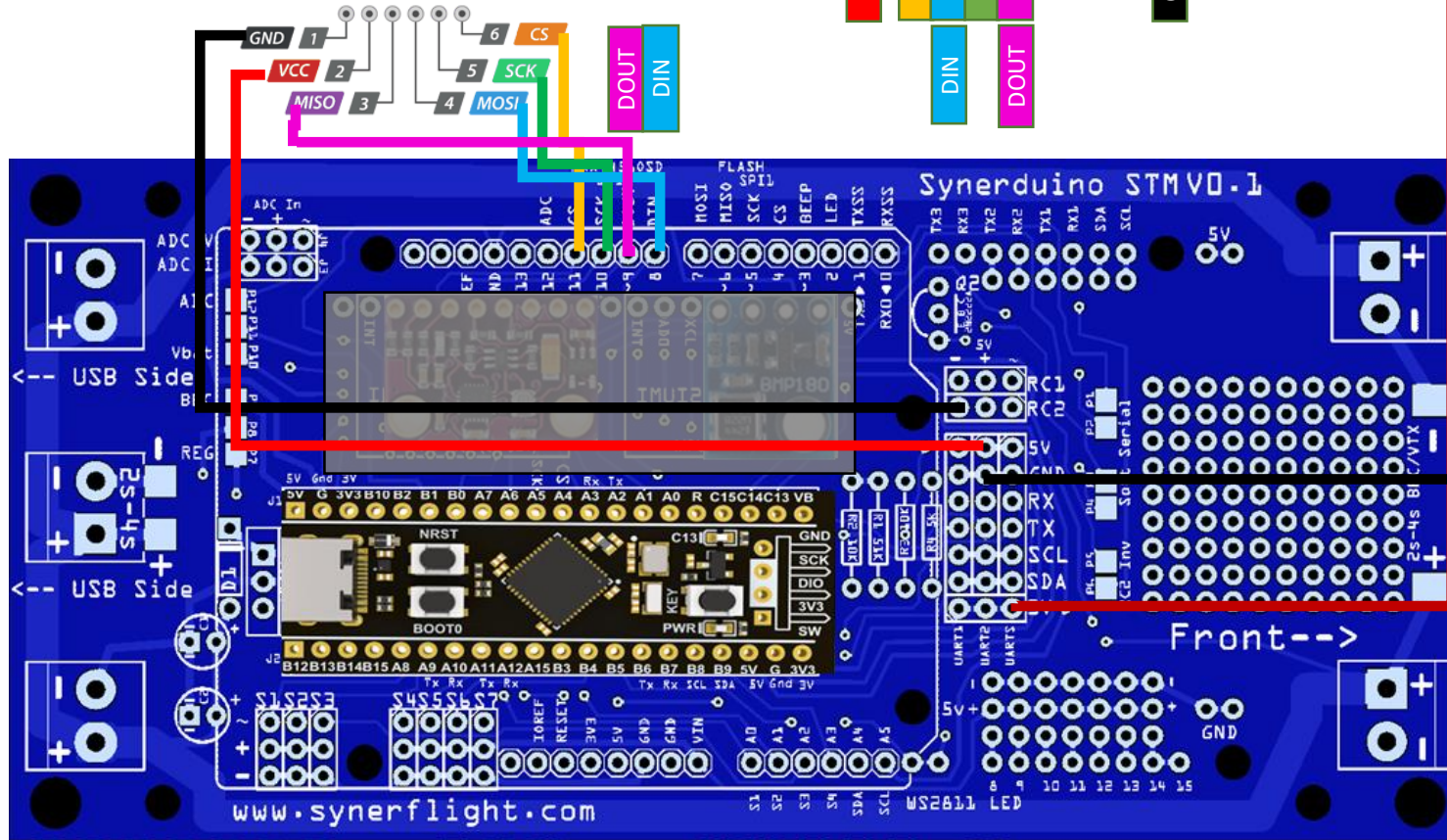
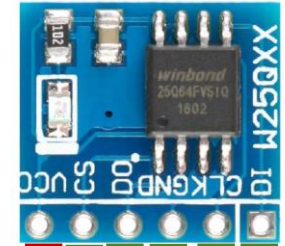
SD Card Reader



MAX7456 OSD



W25QXX Flash



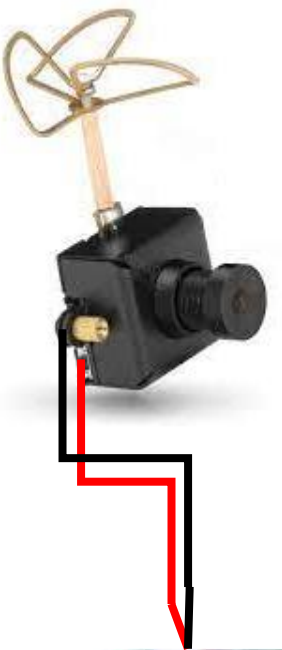
FPV Standalone

This requires no introduction as it uses a BEC to supply a standalone FPV25mw camera with integrated VTX

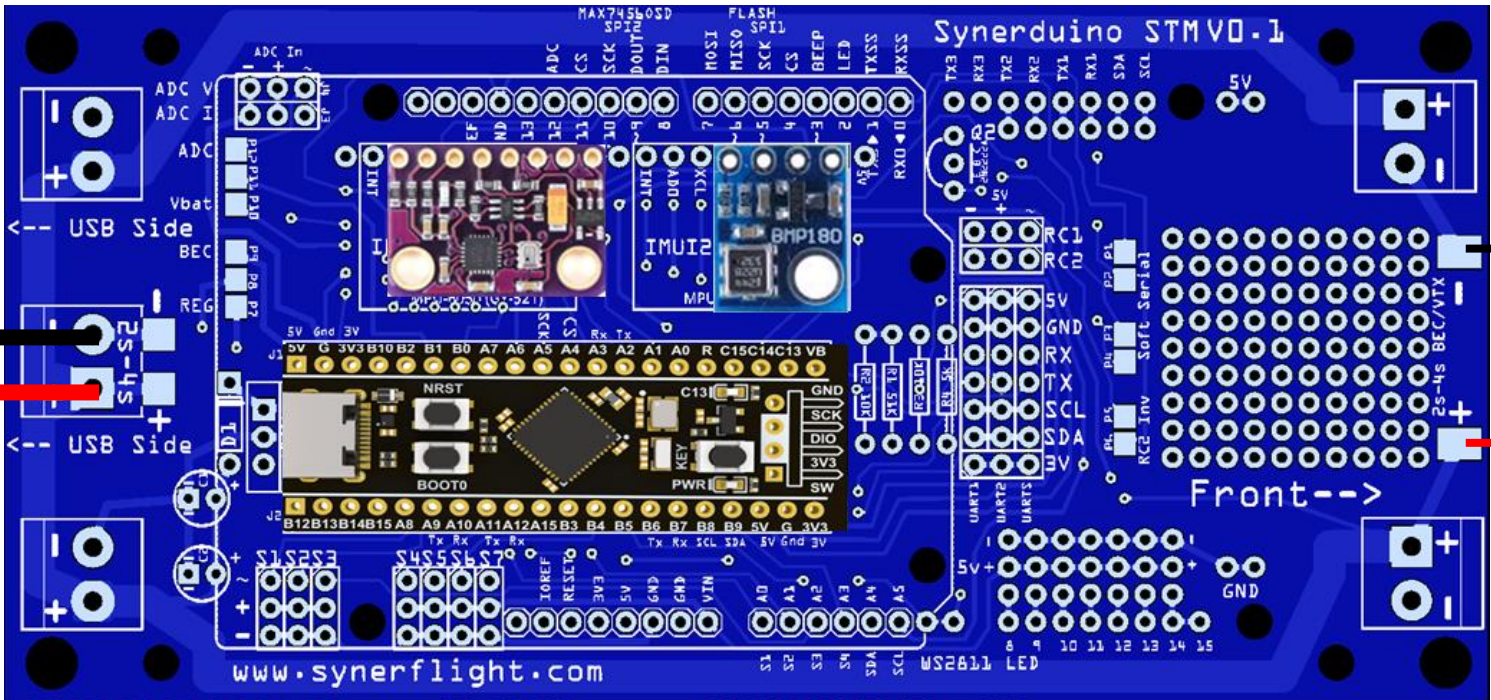
This also can be apply to split camera a VTX sets as well (some Standalone VTX can support 2s to 6s meaning they can directly hook up to the main batter Pads with requiring a BEC supplement)



FPV camera 25mw Standalone



Battery 3s or 4s



BEC or Buck converter supplying extra power

FPV with SPI OSD

The Telemetry can also use the SPI OSD module

Split VTX camera Setup

600mw to 800mw VTX

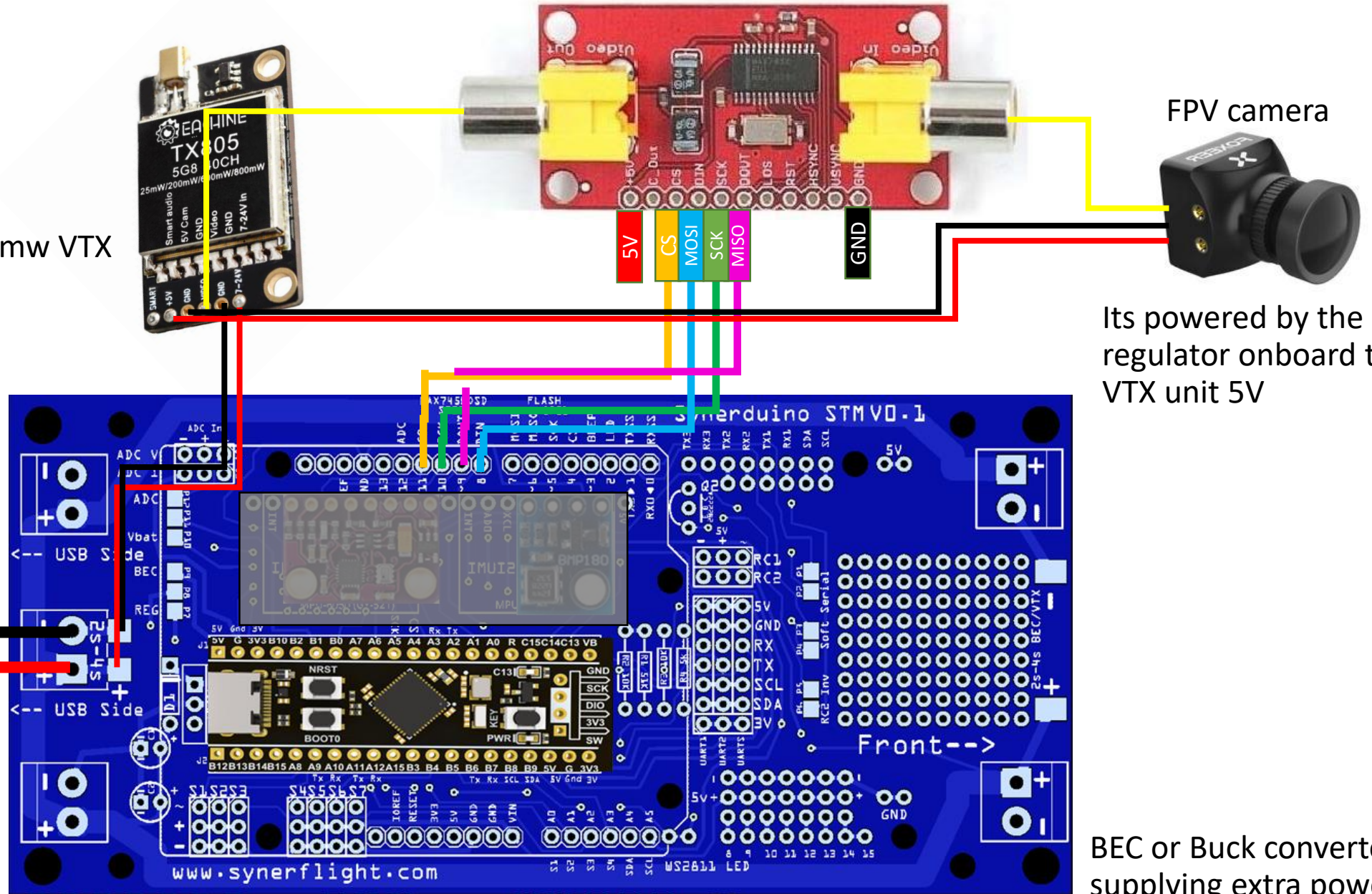
MAX7456 OSD

FPV camera

Its powered by the regulator onboard the VTX unit 5V

Battery 3s or 4s

BEC or Buck converter supplying extra power



FPV with SERIAL OSD

The Telemetry can also use the Serial OSD module

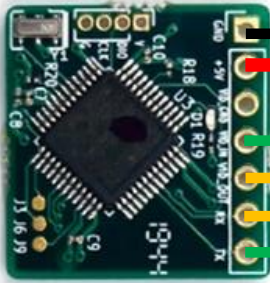


Power Pads is selected to BEC to use external BEC

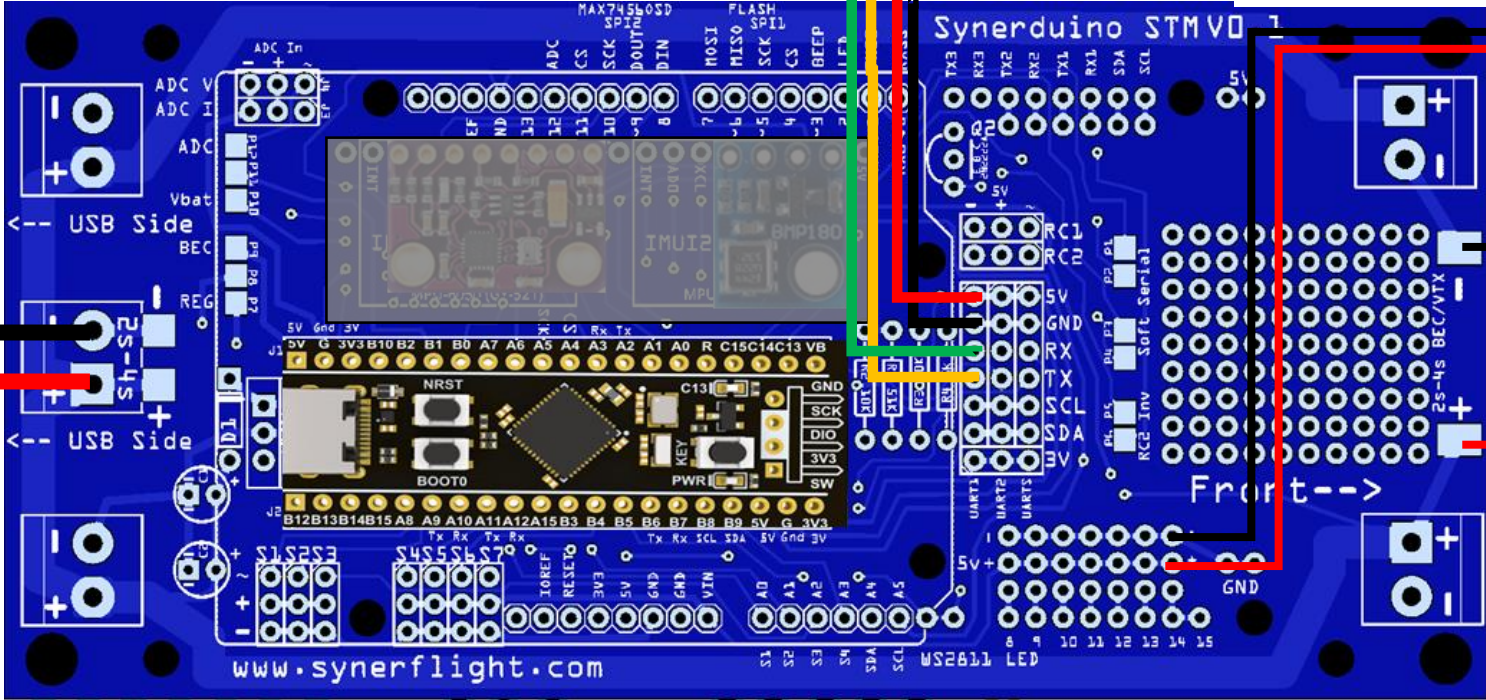
Battery 3s or 4s

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

LED Devices

These are optional addons

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

WS2811 or WS2812

DATA

5V

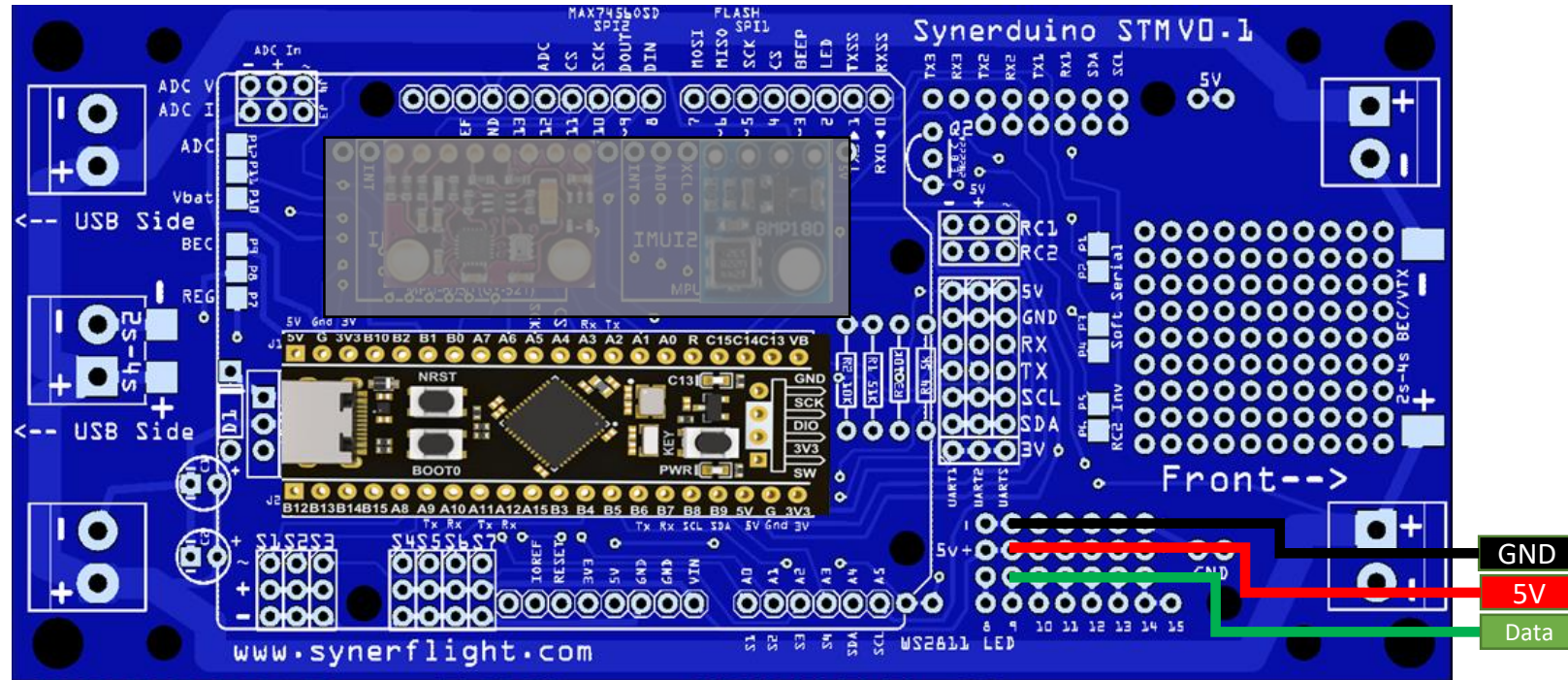
GND

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

Accessible on Pin 8 & 9

This also requires 3 Timers

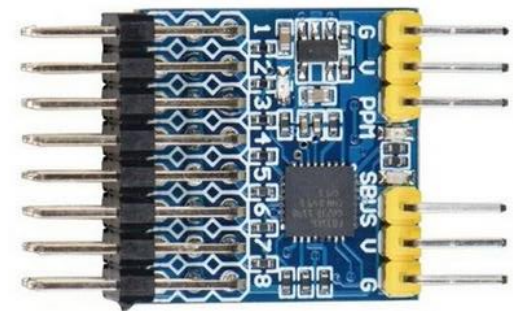
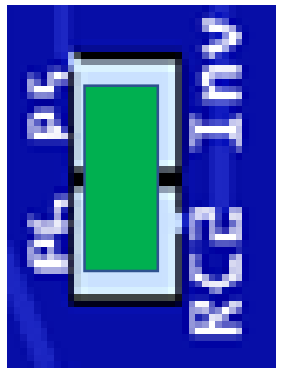
When activated only 5 PWM pins can be use for Motor/Servo



RECEIVER TYPES



PPM AND PWM RECEIVER



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

SBUS RECEIVER



- 1:GND
- 2:VCC
- 3:PPM
- 4:IBUS



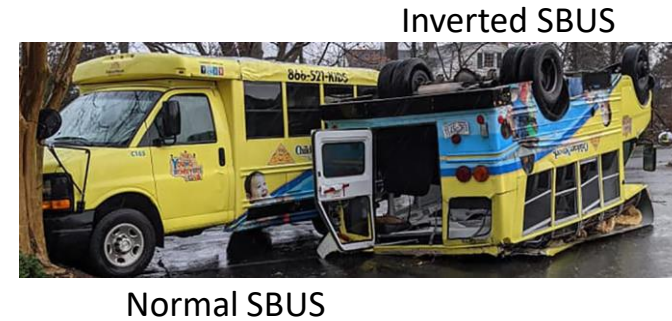
INAV like most modern Flight controllers now Supports Sbus to reduce the number of wires in build its advice to use Sbus Receiver for Synerduino STM as well

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
Throttle	Ch3	Ch1	Ch3	Pls Check the output pin from your Radio Rx manual
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	

We all get confused sometimes we plug the receiver or PPM/PWM/SBUS Converter in and it suppose to work but it doesn't

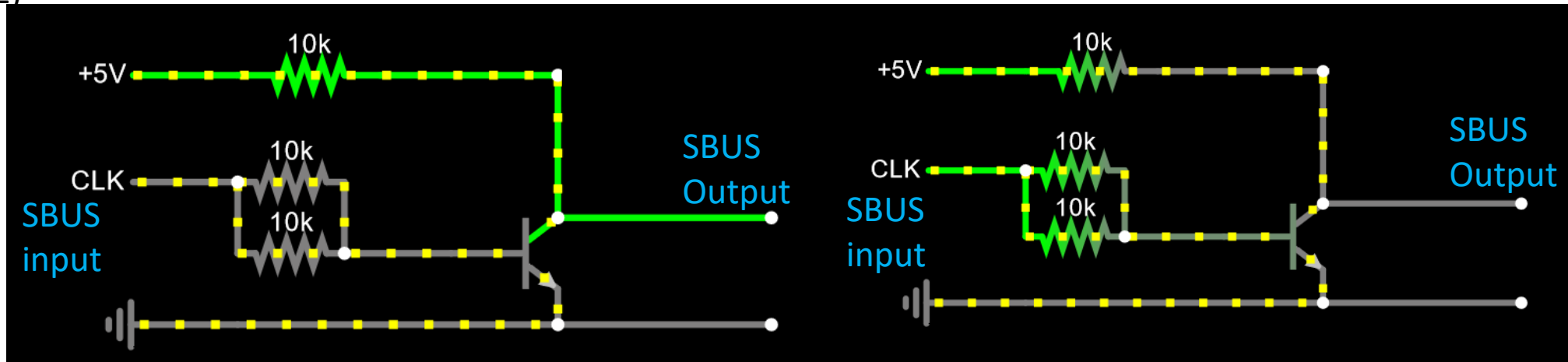
SBUS inversion depending on the Brand of Receiver or the PPM/PWM/SBUS Converter you have the SBUS signal can come as Forward Signal or Reverse Signal . This is crucial in getting a Good Receiver connection to the Synerduino STM

Fortunately Synerduino STM has a Reversing circuit you can depend on should this situation Arises. Via Solder Pads allows you to select Normal (RC1) or Inverted SBUS Signal (RC2)



Y U No Read SBUS

Most modern Receivers now comes with Serial Protocol as they than the old PWM or PPM standard and its now the Modern de Receiver to Flight Control Board communication



GPS

Beitian



UBLOX Protocol

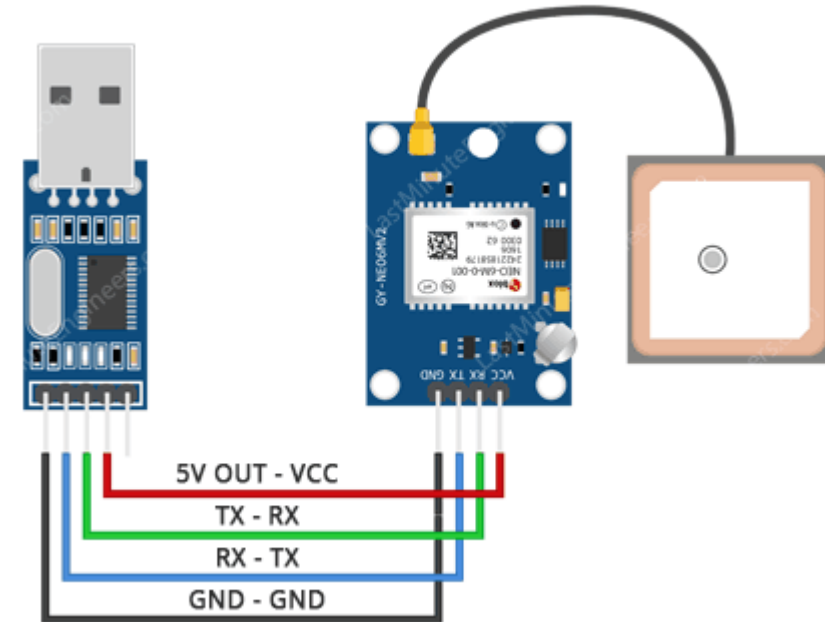
ublox



NMEA Protocol

NOTE: GPS CONFIGURING ONLY WORKS WHEN GPS MODULE COMES WITH EEPROM OR FLASH MEMORY. AS YOUR SELLER IF IT COMES WITH THOSE FUNCTIONS

GPS CONFIGURING



U BLOX NEO 6

PLUG IN TO SERIAL TX 2 RX 2

USB TTL TO PROGRAM THE GPS

THIS GOES SAME ON THE DRONE SHIELD

GPS CONFIGURING



PIN	PIN Name	I/O	Description
1	GND	G	Ground
2	TX	O	Serial Data Output.
3	RX	I	Serial Data Input.
4	VCC	I	DC 3.0V - 5.5V supply input, Typical: 5.0V

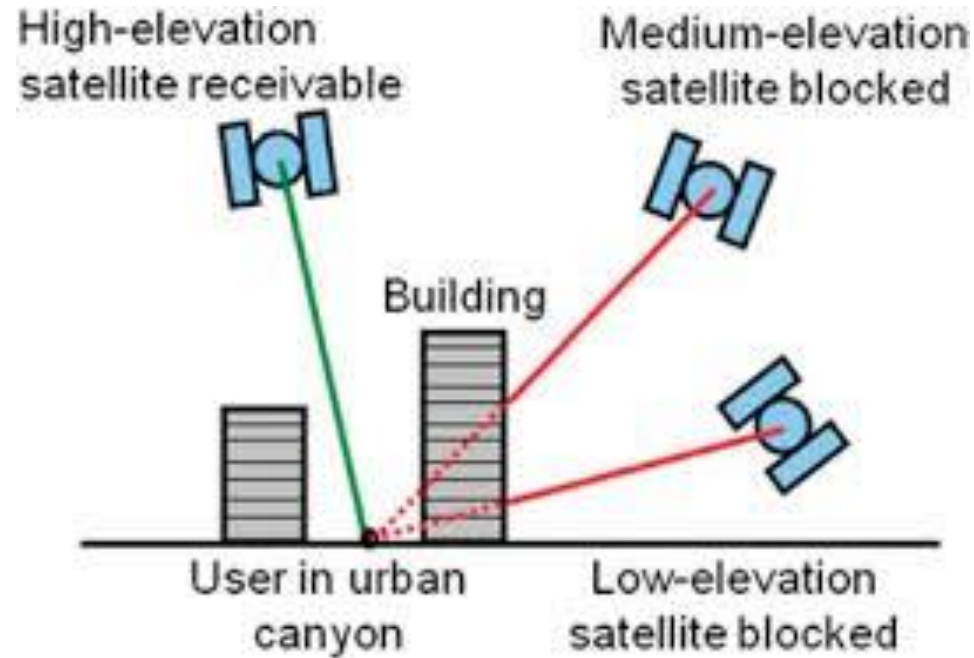


Pin Description:

PIN	PIN Name	I/O	Description
1	SDA	O	Compass SDA
2	GND	G	Ground
3	TX	O	Serial Data Output.
4	RX	I	Serial Data input.
5	VCC	I	3.0V~ 5.5V supply input, Typical: 5.0V
6	SCL	I	Compass SCL

GPS ONLY MODELS & GPS WITH COMPASS MODEL

GPS



Note : GPS require a clear open area to get a proper fix and accuracy minimum 7 satellites but 10+ are Ideal

Flying next to a building can distort satellite signal deteriorating accuracy

Which in this case its better to not use GPS modes and fly Manual



BLUETOOTH

Bluetooth setup with the USB TTL and Arduino IDE

Arduino IDE>Tools>Serial Monitor (Push Button Before Connecting the USB) Set (Baud 38400) (Both NL & C

AT : check the connection
AT+VERSION : Check Version

HC-05 (Recommended)

AT+NAME=ArduinoDrone
AT+PSWD=1234 (Version 2)
AT+PSWD="1234" (Version 3)
AT+UART=115200,1,0



HC-05 (Recommended)





Bluetooth setup with the USB TTL and Arduino IDE

Arduino IDE>Tools>Serial Monitor (hold the Button while Plugging USB) to go programming mode Set (Baud 38400) (Both NL & CR)

Hold Press when sending AT command (Version 5)

AT : check the connection

AT+VERSION : Check Version

HC-05 (Recommended)

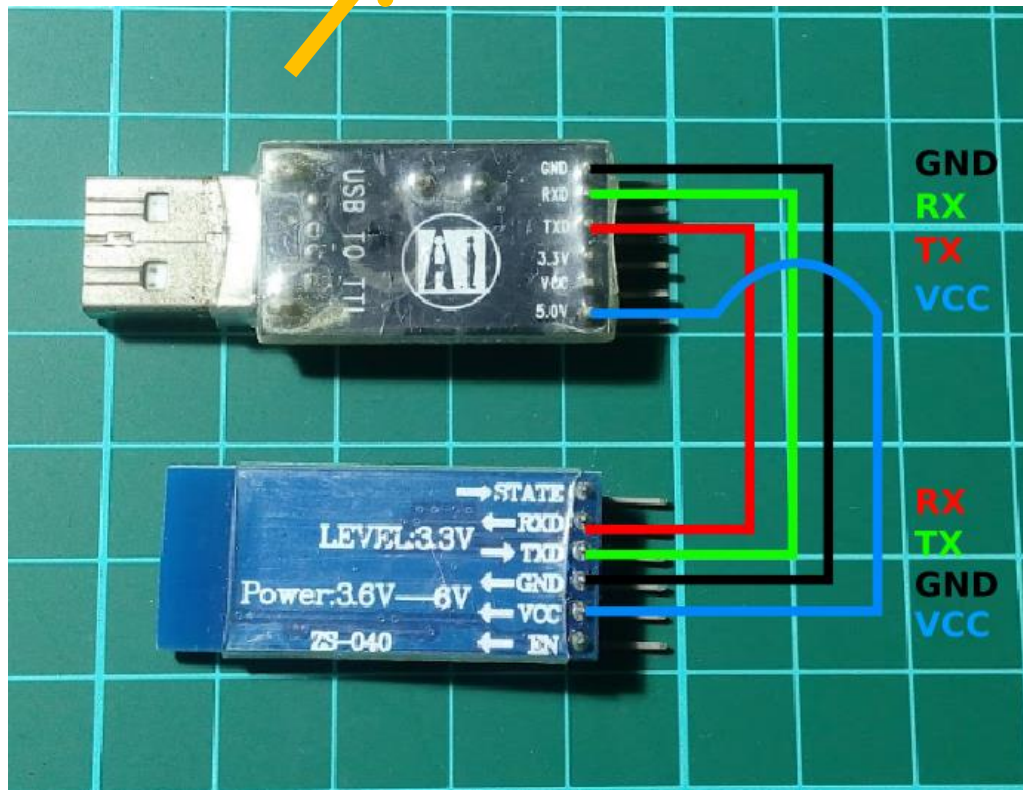
AT+NAME=Change name (Synerduino)

AT+PSWD=1234 (Version 2)

AT+PSWD="1234" (Version 3) (Possibly works on Version 5)

AT+UART=115200,1,0

(115200 FOR BLUETOOTH)



HC-06

AT+NAME: Change name

AT+PIN: change pin, xxxx is the pin, again, no space.

AT+BAUDX, where X=1 to 9

1 set to 1200bps, 2 set to 2400bps, 3 set to 4800bps

4 set to 9600bps (Default)

5 set to 19200bps, 6 set to 38400bps, 7 set to 57600bps

8 set to 115200bps

AT+UART=115200,1,0

Param1: Baud rate:

4800 -> 4800 bits/s

9600 -> 9600 bits/s

19200 -> 19200 bits/s

38400 -> 38400 bits/s

57600 -> 57600 bits/s

115200 -> 115200 bits/s

230400 -> 230400 bits/s

460800 -> 460800 bits/s

921600 -> 921600 bits/s

1382400 -> 1382400 bits/s

Param2: Stop bit:

0 -> 1 bit

1 -> 2 bits

Param3: Parity bit:

0 -> None

1 -> Odd parity

2 -> Even parity

AT+BAUD

1 set to 1200bps,

2 set to 2400bps,

3 set to 4800bps

4 set to 9600bps (Default)

5 set to 19200bps,

6 set to 38400bps,

7 set to 57600bps

8 set to 115200bps

AT+STOP Get/Set UART stop bit

0: One stop bit

1: Two stop bit

Default: 0 (One stop bit)

AT+PARI Get/Set UART parity bit

0:None

1:EVEN

2:ODD

Default: 0 (None)

HM-10 Bluetooth

Setup with FTDI + Arduino Serial Monitor + AT Command

AT+NAME? (Query name)

AT+ADDR? ((Query Mac address)

First you will need to Query the native MAC address using AT Command **AT+ADDR?** You will get something like this 20C38FF61DA1, each BLE has a unique MAC address.

Use **AT+CON[param1]** and **AT+ROLE[param1]** to pair to another device.

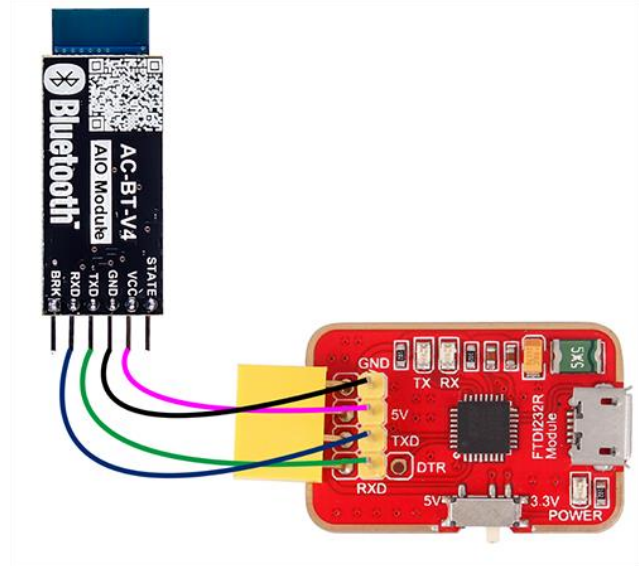
Example

BLE A has Mac Address 11C11FF11DA1, I used **AT+ADDR?** to figure it out BLE B has Mac Address 22C22FF22DA2, I used **AT+ADDR?** to figure it out

Send **AT+CON22C22FF22DA2** to BLE A Send **AT+CON11C11FF11DA1** to BLE B (Send the B address to A, A address to B)

Send **AT+ROLE0** to BLE A Send **AT+ROLE1** to BLE B (Doesn't matter which one)

Now it's ready to use on you ATMEGA 328P, Arduino or Attiny. **The red light will stay solid after the connection has been made on both BLE. This should take less than a second.**



HM-10 (Original)

AT (Check if new configuration is working)

AT+NAME (Query name)

AT+ADDR (Query Mac address)

AT+BAUD (Query Baud)

AT+PASS (Query current Pincode)

AT+PIN (Query current Pincode on some BL module)

AT+TYPE (Query authentication mode)

AT+ROLE (Query Peripheral (Slave) or Central (Master) mode)

AT+NAME **ArduinoDrone**

AT+BAUD**4** set baud to 115200 (we want this for high speed)

AT+BAUD**8** set baud to 115200 (on some BL module)

AT+PASS**123456** Set password to 123456

AT+PIN**123456** Set password to 123456 (on some BL module)

AT+TYPE**2**

AT+TYPE**1** (on Some BL modules)

AT+ROLE**0**

AT+TYPE

0:Not need PIN Code

1:Auth not need PIN

2:Auth with PIN

3:Auth and bond

AT+BAUD

0 – 9600:

1 – 19200

2 – 38400

3 – 57600 (Some BL its 4800)

4 – 115200

5 – 4800

6 – 2400

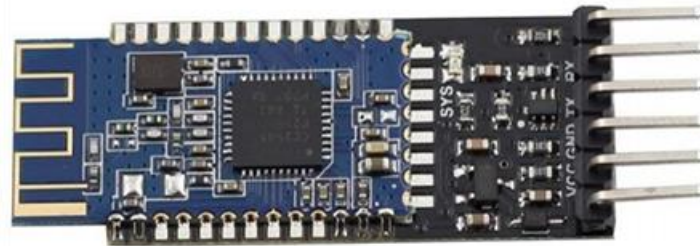
7 – 1200

8 – 230400 (Some BL its 115200)

AT+ROLE

0 = Slave or Peripheral

1 = Master or Central.



Front



Back

Note : there are several clones of this type in the market that can be very difficult to setup

BT05 V5.3

AT (Check if new configuration is working)

AT+NAME (Query name)

AT+ADDR (Query Mac address)

AT+BAUD (Query Baud)

AT+PASS (Query current Pincode)

AT+PIN (Query current Pincode on some BL module)

AT+TYPE (Query authentication mode)

AT+ROLE (Query Peripheral (0 Slave) or Central (1 Master) mode)

AT+PARI Get/Set UART parity bit. 0:None 1:EVEN 2:ODD Default: 0 (None)

AT+STOP Get/Set UART stop bit. 0: One stop bit 1: Two stop bit

AT+NAME **ArduinoDrone**

AT+BAUD**8** set baud to 115200 (on some BL module)

AT+PASS**123456** Set password to 123456

AT+PIN**123456** Set password to 123456 (on some BL module)

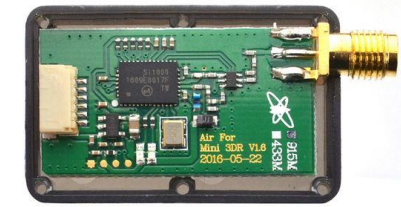
AT+STOP**0**

AT+PARI**0**

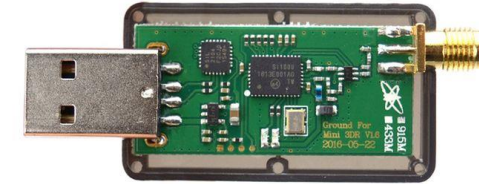
AT+ROLE**0**

SIK SERIAL RADIO

38400 OR 57600 FOR SIK
RADIO DEPENDING IF USES
433MHZ OR 900MHZ

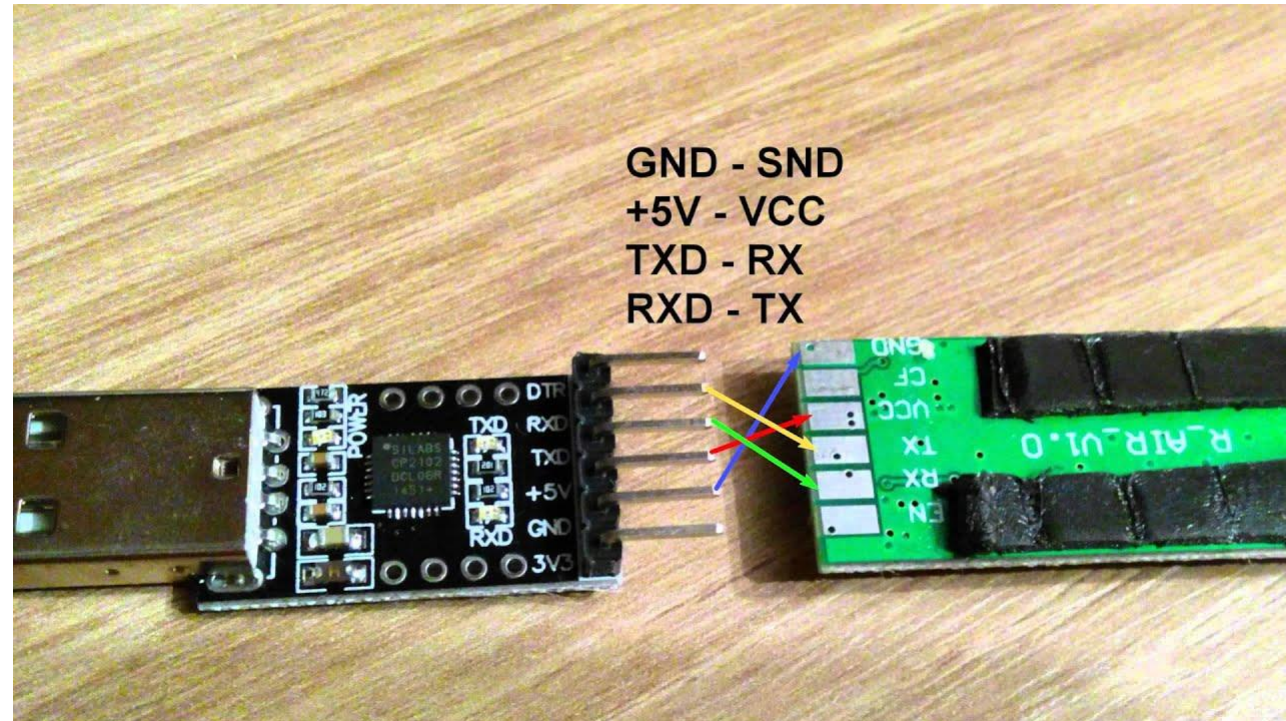


RadioTelemetry Air Module



RadioTelemetry Ground Module

Again to setup you require an USB-TTL
module to connect to the serial port
to configure both the module how
ever most likely you only need to do
this for the vehicle unit as the ground
unit has an USB build into



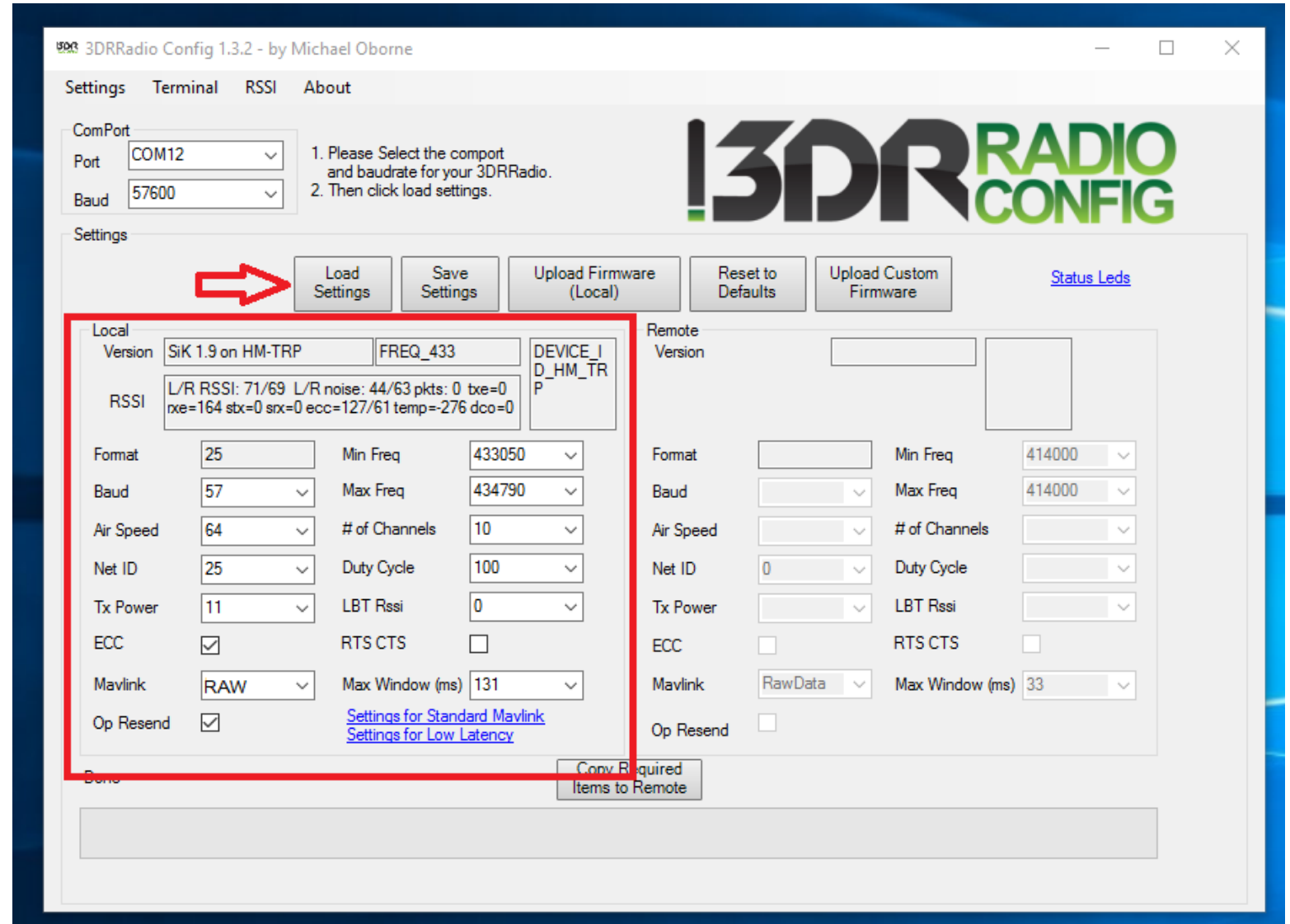
Manually configuring the telemetry kit for Synerduino uses the 3DR radio Config

<http://vps.oborne.me/3drradioconfig.zip>

Also available in the synerduino page

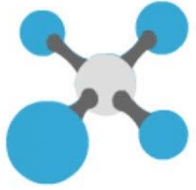
Both Vehicle and Ground station unit must have similar in the following

- Versions
- Frequency
- Baud (38400 or 57600 ensure)
- Airspeed
- Net ID (in cases you need to assign multiple drones each having their own ID)
- Tx power
- Mavlink (RAW –Synerduino STM uses Format)

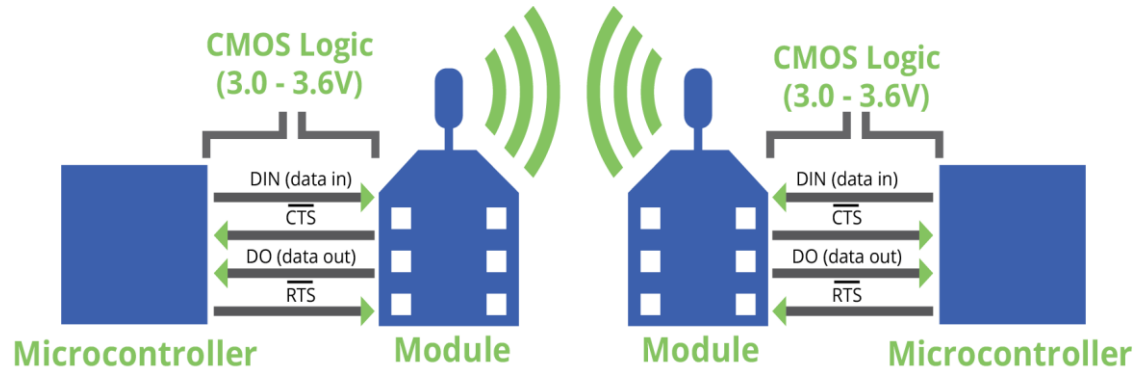




XBEE RADIO



GROUND STATION ROUTER
38400 8/N/1/N - AT



AIRCRAFT COORDINATOR 38400 8/N/1/N -
AT

Update firmware

Update the radio module firmware

Configure the firmware that will be flashed to the radio module.

Select the product family of your device, the new function set and the firmware version to flash:

Product family	Function set	Firmware version
XB24-B	ZigBee End Device Digital IO	22A7 (Newest)
XB24-SE	ZigBee End Device PH	22A0
XB24-ZB	ZigBee Router API	228C
	ZigBee Router AT	2270
	ZigBee Router AT (WALL RT)	2264
	ZigBee Router Sensor	2242
	ZigBee Router/End Device Analog IO	2241

Force the module to maintain its current configuration.

[View Release Notes](#)

[Select current](#)

[Update](#) [Cancel](#)

Update firmware

Update the radio module firmware

Configure the firmware that will be flashed to the radio module.

Select the product family of your device, the new function set and the firmware version to flash:

Product family	Function set	Firmware version
XB24-B	End Device - LTH	20A7 (Newest)
XB24-SE	ZigBee Coordinator API	20A0
XB24-ZB	ZigBee Coordinator AT	208C
	ZigBee End Device API	2070
	ZigBee End Device AT	2064
	ZigBee End Device Analog IO	2041
	ZigBee End Device Digital IO	2021

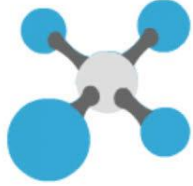
Force the module to maintain its current configuration.

[View Release Notes](#)

[Select current](#)

[Update](#) [Cancel](#)

GROUND STATION



XCTU



Radio Modules

Name: ZigBee Router AT
Function: ZigBee Router AT
Port: COM35 - 38400/8/N/1/N - AT
MAC: 0013A20040811A91



Radio Configuration [- 0013A20040811A91]

Parameter

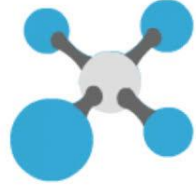
ID PAN ID	1234		
SC Scan Channels	FFFF	Bitfield	
SD Scan Duration	3	exponent	
ZS ZigBee Stack Profile	0		
NJ Node Join Time	FF	x 1 sec	
NW Network Watchdog Timeout	0	x 1 minute	
JV Channel Verification	Disabled [0]		
JN Join Notification	Disabled [0]		
OP Operating PAN ID	1234		
OI Operating 16-bit PAN ID	AD9F		
CH Operating Channel	14		
NC Number of Remaining Children	C		

Addressing
Change addressing settings

SH Serial Number High	13A200		
SL Serial Number Low	40811A91		
MY 16-bit Network Address	7FA4		
DH Destination Address High	13A200		
DL Destination Address Low	40811A7F		
NI Node Identifier			
NH Maximum Hops	1E		
BH Broadcast Radius	0		
AR Many-to-One Route Broadcast Time	FF	x 10 sec	
DD Device Type Identifier	30000		
NT Node Discovery Backoff	3C	x 100 ms	
NO Node Discovery Backoff			

Checking for Radio Firm... updates: (87%)

GROUND STATION



XCTU

Radio Modules

Name: ZigBee Router AT
Function: ZigBee Router AT
Port: COM35 - 38400/8/N/1/N - AT
MAC: 0013A20040811A91

Radio Configuration [- 0013A20040811A91]

Parameter

Security
Change security parameters

EE Encryption Enable	Disabled [0]	✓	✗
EO Encryption Options	0 Bitfield	✓	✗
KY Encryption Key		✓	✗

Serial Interfacing
Change modem interfacing options

BD Baud Rate	38400 [5]	✓	✗
NB Parity	No Parity [0]	✓	✗
SB Stop Bits	One stop bit [0]	✓	✗
RO Packetization Timeout	3 x character times	✓	✗
D7 DIO7 Configuration	CTS flow control [1]	✓	✗
D6 DIO6 Configuration	Disable [0]	✓	✗

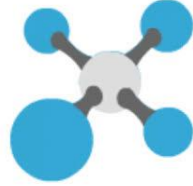
AT Command Options
Change AT command mode behavior

CT AT Command Mode Timeout	64 x 100ms	✓	✗
GT Guard Times	3E8 x 1ms	✓	✗
CC Command Sequence Character	2B Recommended: 0x20-0x7F (ASCII)	✓	✗

Sleep Modes
Configure low power options to support end device children

SM Sleep Mode	No Sleep (Router) [0]	✓	✗
SN Number of Cyclic Sleep Periods	1	✓	✗
SO Sleep Options	0	✓	✗
SP Cyclic Sleep Period	20 x 10 ms	✓	✗
ST Time before Sleep	1388 x 1 ms	✓	✗

AIRCRAFT



XCTU



Radio Modules

Name: ZigBee Coordinator AT
Function: ZigBee Coordinator AT
Port: COM36 - 38400/8/N/1/N - AT
MAC: 0013A20040811A7F

Radio Configuration [- 0013A20040811A7F]

Parameter

Networking
Change networking settings

ID PAN ID	1234	
SC Scan Channels	FFFF	Bitfield
SD Scan Duration	3	exponent
ZS ZigBee Stack Profile	0	
NJ Node Join Time	FF	x 1 sec
OP Operating PAN ID	1234	
OI Operating 16-bit PAN ID	AD9F	
CH Operating Channel	14	
NC Number of Remaining Children	A	

Addressing
Change addressing settings

SH Serial Number High	13A200	
SL Serial Number Low	40811A7F	
MY 16-bit Network Address	0	
DH Destination Address High	13A200	
DL Destination Address Low	40811A91	
NI Node Identifier		
NH Maximum Hops	1E	
BH Broadcast Radius	0	
AR Many-to-One Route Broadcast Time	FF	x 10 sec
DD Device Type Identifier	30000	
NT Node Discovery Backoff	3C	x 100 ms
NO Node Discovery Options	0	
NP Maximum Number of Transmission Bytes	54	



Batter Monitoring or ADC Sensor Devices

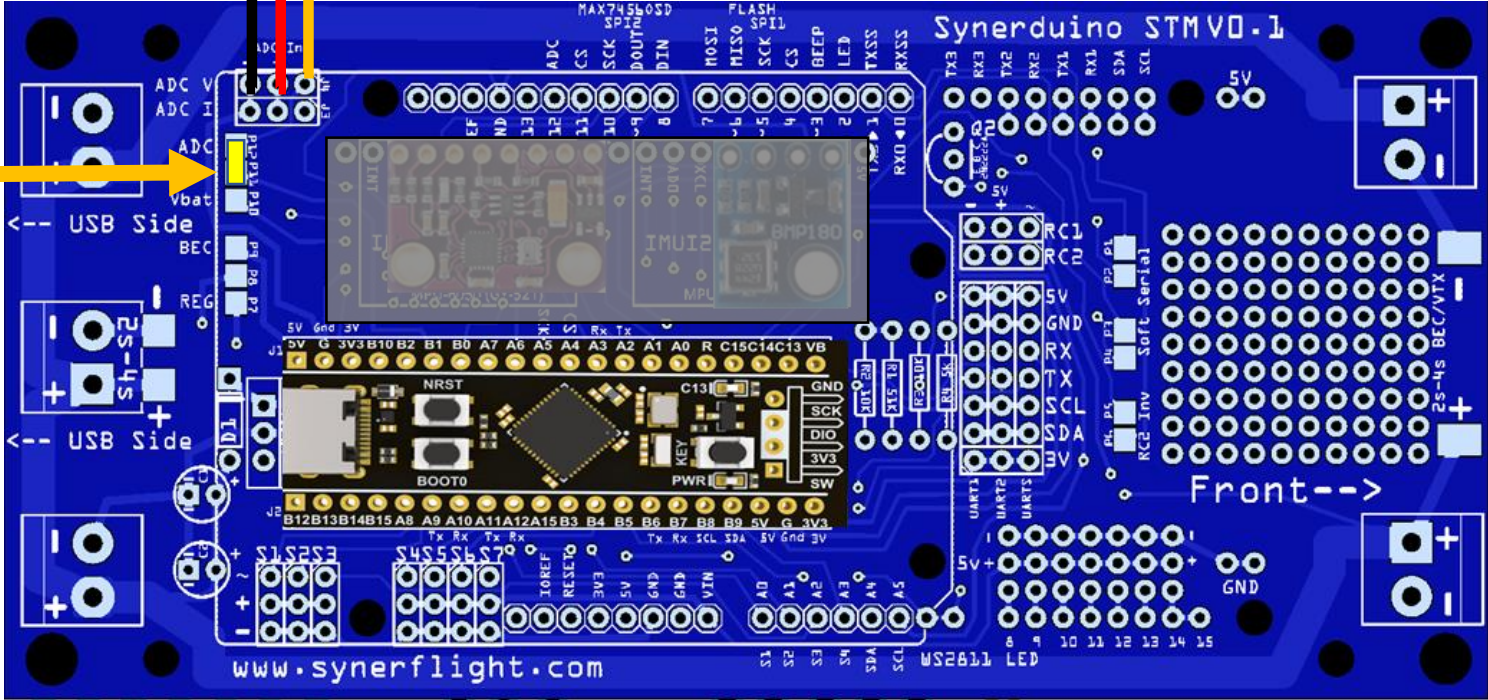
ADC External Sensor



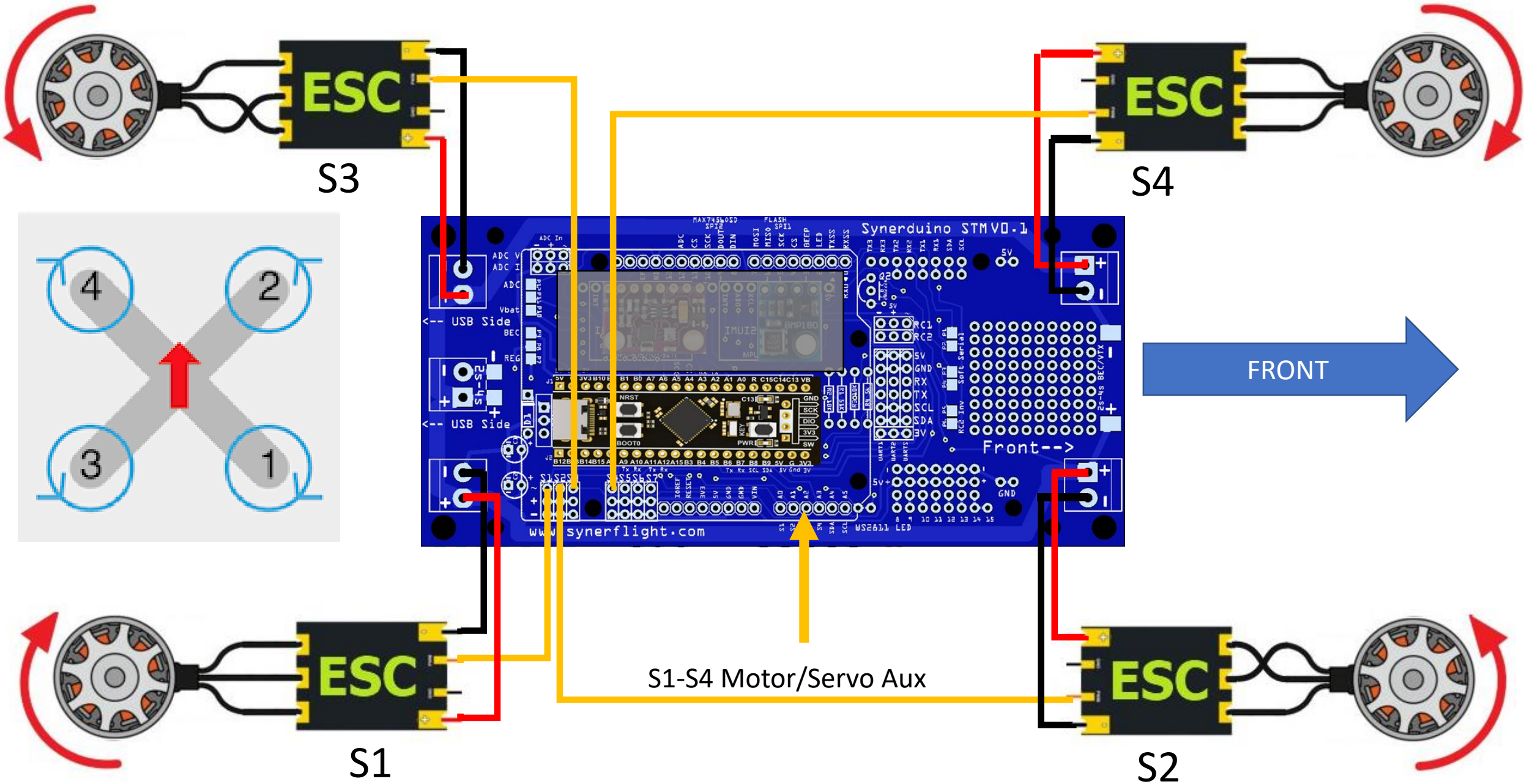
Here you can switch to ADC sensor input or VBAT for Battery monitoring

ADC V – Voltage 0-5V

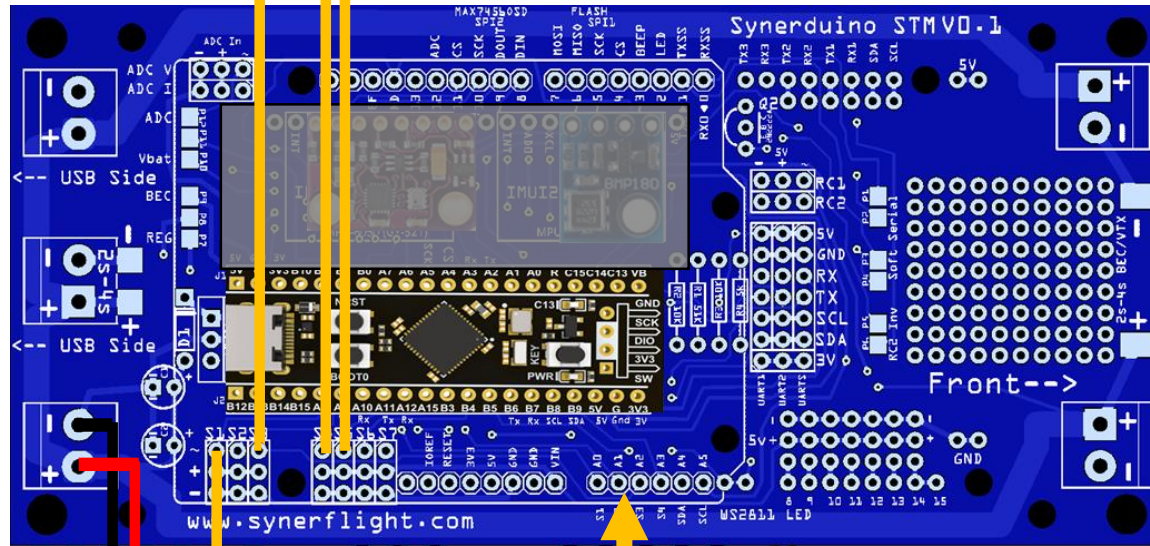
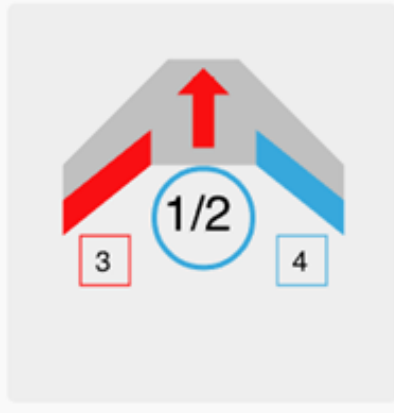
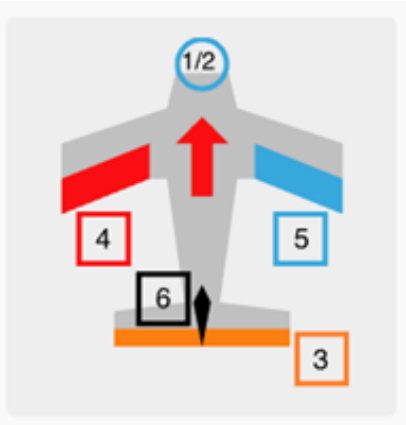
ADC I – Current 0-5V



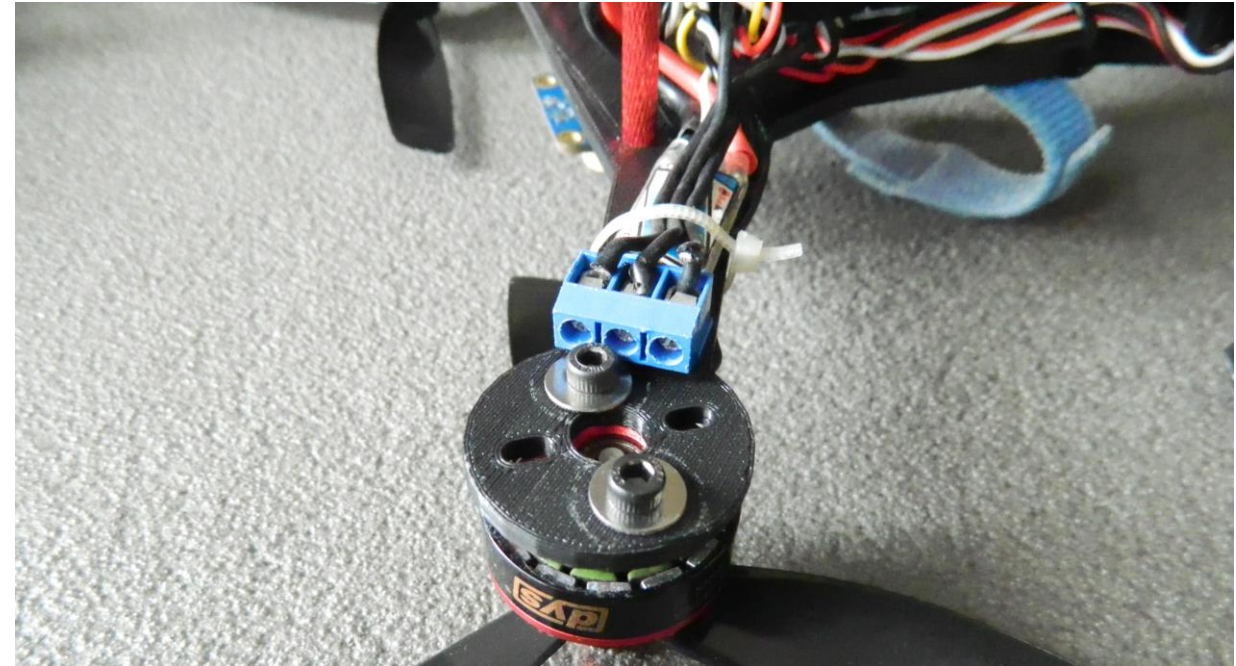
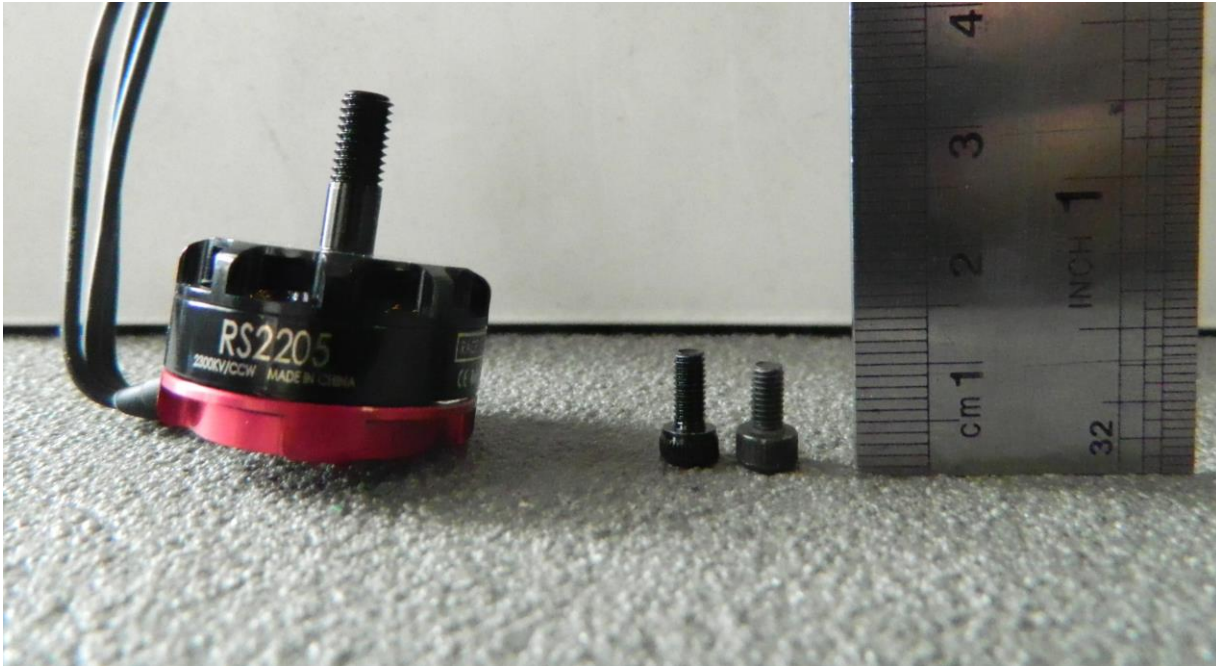
Multirotor Setup



Fixwing Setup



S1-S4 Motor/Servo Aux



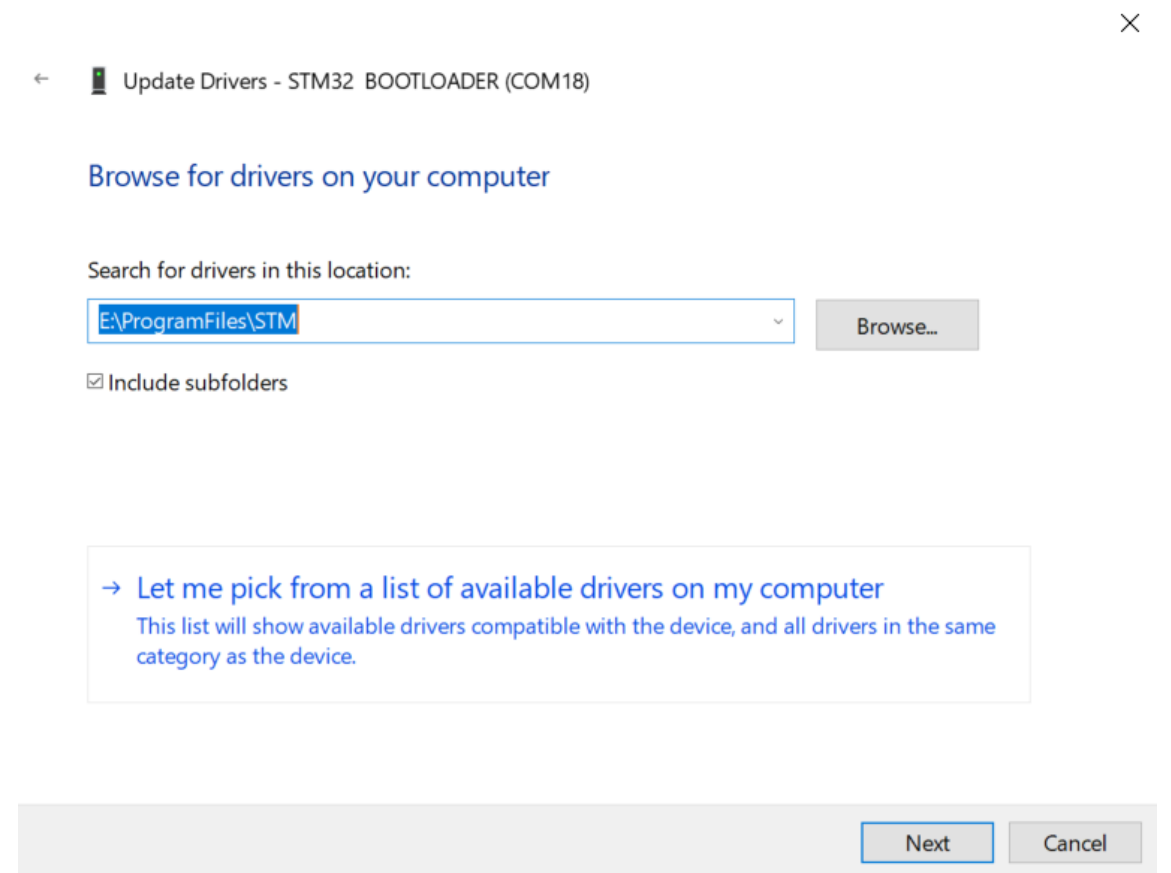
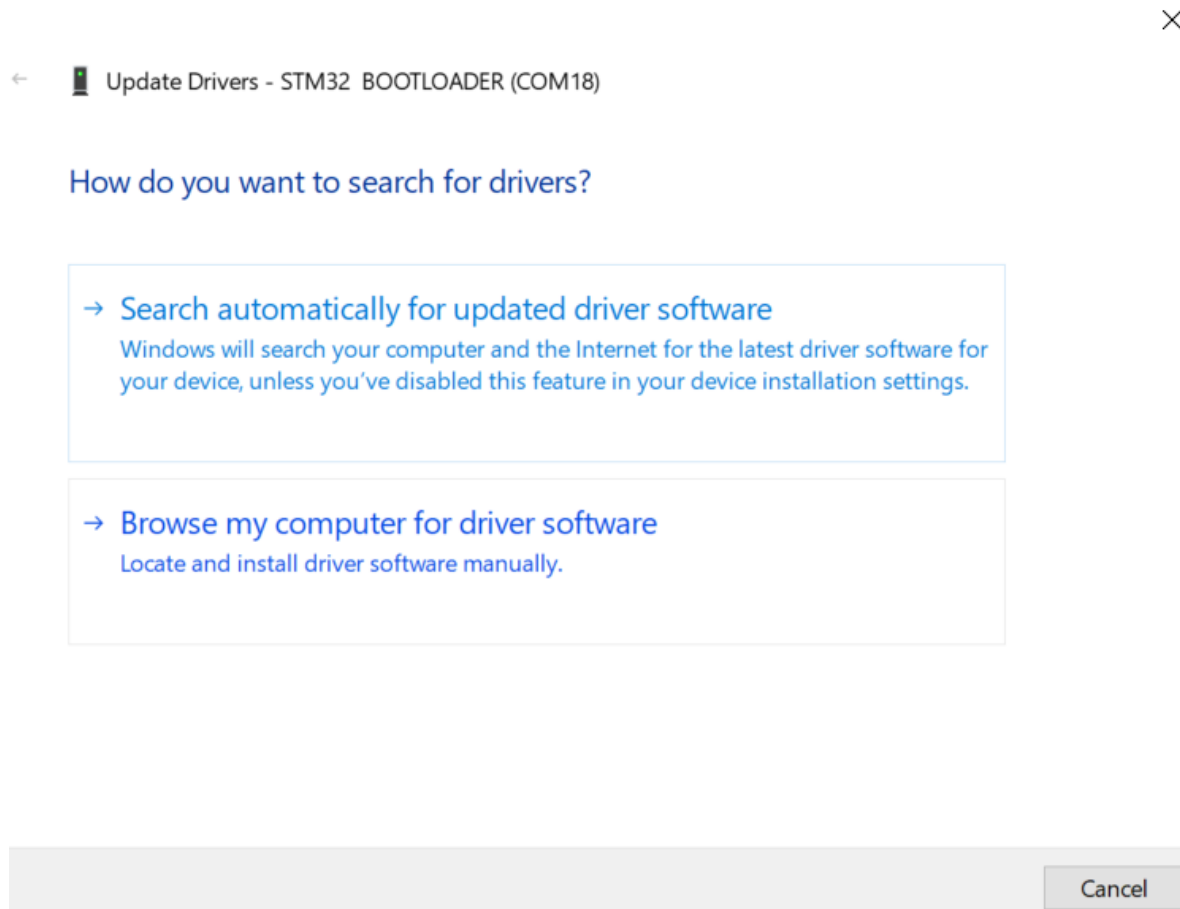
Frames are design to use the 6mm M3 Bolt for motor and must be thread lock with PVA glue in place to prevent it from going loose

SYNERDUINO STM SHIELD

INAV Flash firmware installation and Synerduino Setup

(you may skip the firmware Flash if you wish to use the default preloaded on to the board 6.0.0)

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



← 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:

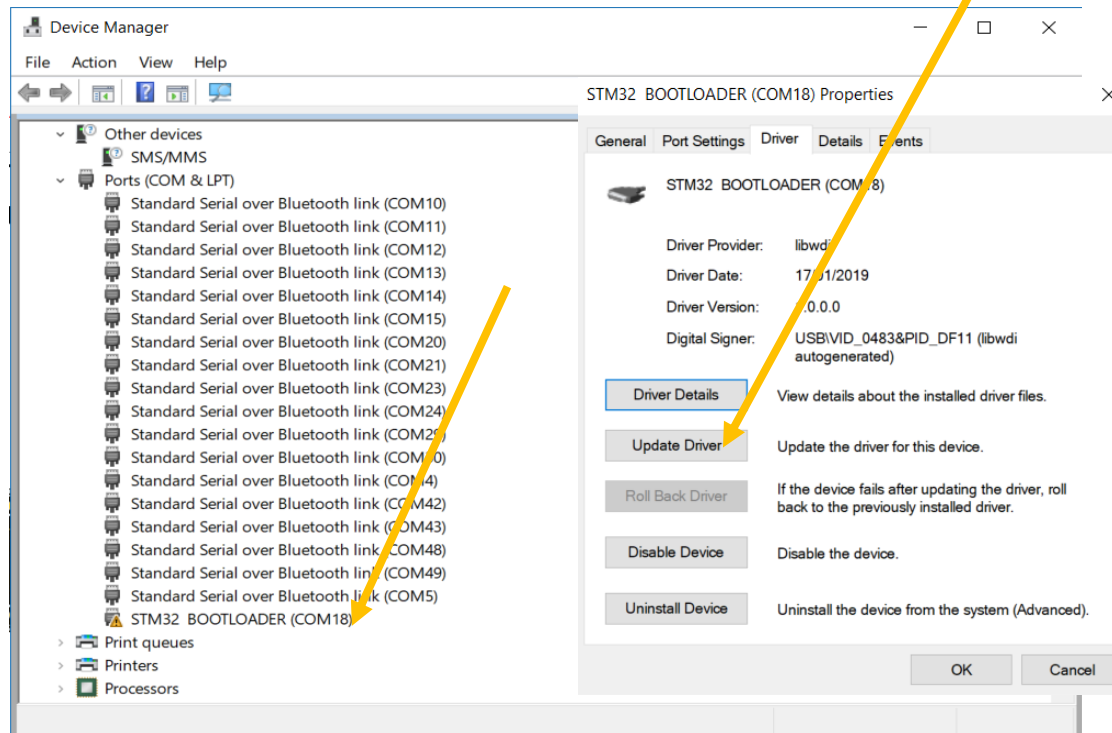
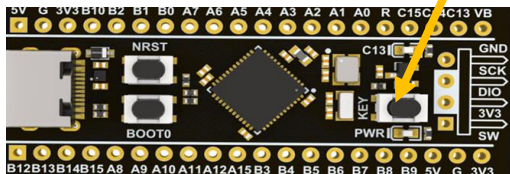


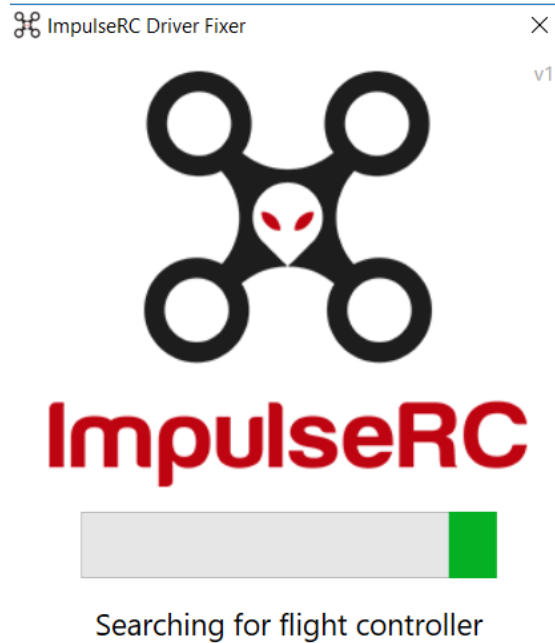
STM32 Bootloader

Close

Brand new Blackpill STM32F411 setup

- 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



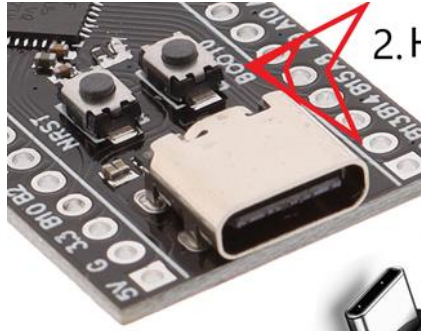


ImpulseRC Driver Fixer

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

After Flashed Blackpill STM32F411 setup



2. Hold down the boot0 button.



1. Connect TYPE-C
usb to Board



3. Connect to USB to PC

In the Black pill 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)

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.

If the Blackpill is plug into the Synerduino board a preheat can be made by running the board with the battery for 1 min



- 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

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

2017-11-16 @ 21:37:43 – Running - OS: MacOS, Chrome: 61.0.3163.100, Configurator: 1.8.1

Welcome to **INAV - Configurator**, a utility designed to simplify updating, configuring and tuning of your flight controller.

Hardware

The application supports all hardware that can run INAV (Sirius AIR3, SPRacingF3, Vortex, Sparky, DoDo, CC3D/EVO, Flip32/+Deluxe, DragonFly32, CJMcu Microquad, Chebuz F3, STM32F3Discovery, Hermit, Naze32 Tricopter Frame, Skyline32, Naze/32/Mini/Pro/Blackbox etc)

The firmware source code can be downloaded from [here](#)
The newest binary firmware image is available [here](#).

Latest CP210x Drivers can be downloaded from [here](#)
Latest STM USB VCP Drivers can be downloaded from [here](#)
Latest Zadlg for Windows DFU flashing can be downloaded from [here](#)

Contributing

If you would like to help make INAV even better you can help in many ways, including:

- Answering other users questions on the forums and IRC.
- Contributing code to the firmware and configurator - new features, fixes, improvements
- Testing **new features/fixes** and providing feedback.
- Helping out with **issues and commenting on feature requests**.

Open Source / Donation Notice

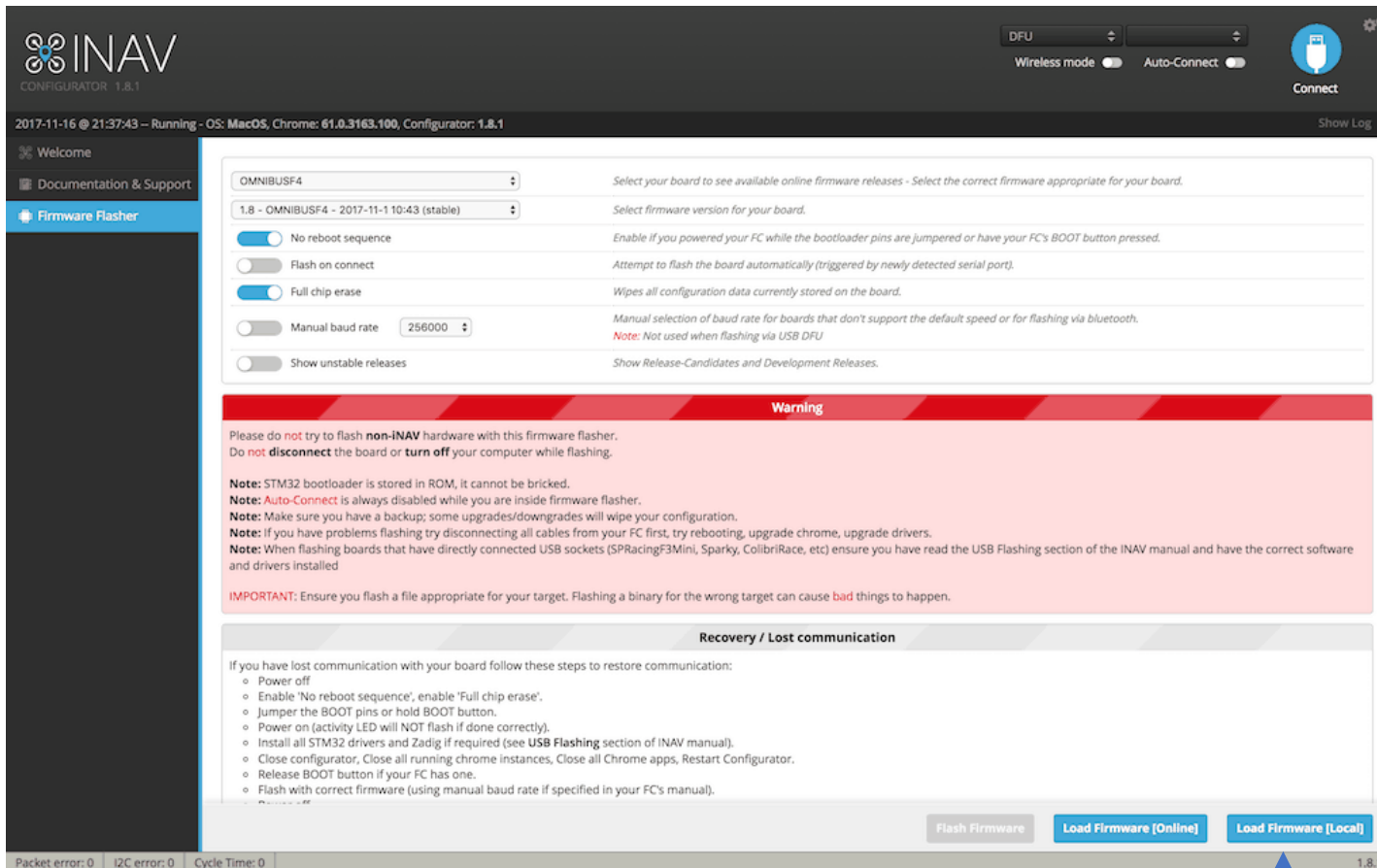
This utility is fully **open source** and is available free of charge to all **INAV** users. If you found the INAV or INAV Configurator useful, please consider **supporting** its development by donating.

PayPal
patreon
Яндекс ДЕНЬГИ

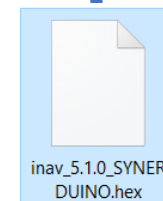
SPONSORS

Airbot CarbonBird.com ADPM Drones Srl

Packet error: 0 I2C error: 0 Cycle Time: 0 1.8.1



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 STM32F411CE.hex that matches the version of your configurator

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 / INAV6.0.0 Synerduino.hex
Synerduino2.hex

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

INAV Configurator

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

8.93 V

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

2022-07-23 @ 17:53:05 -- MultiWii API version received - 2.4.0
2022-07-23 @ 17:53:05 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-23 @ 17:53:05 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-23 @ 17:53:05 -- Board: ST41, version: 0
2022-07-23 @ 17:53:05 -- Unique device ID received - 0x4400273037510e36363538

Setup

Reset Settings Restore settings to default

Heading: 345 deg
Pitch: -41 deg
Roll: 1.2 deg

Reset Z axis, offset: 0 deg

Pre-arming checks

UAV is levelled	✖
Run-time calibration	✔
CPU load	✔
Navigation is safe	✔
Compass calibrated	✔
Accelerometer calibrated	✔
Settings validated	✔
Hardware health	✔

Info

Battery detected cell count:	3
Battery voltage:	8.97 V
Battery left:	0 %
Battery remaining capacity	NA
Battery full when plugged in	false
Battery use cap thresholds	false

Packet error: 0 I2C error: 0 Cycle Time: 3260 CPU Load: 91% MSP version: 2 MSP load: 0.3 MSP round trip: 36 HW round trip: 14 Drop ratio: 0%

5.0.0

Links ENG 6:02 PM 23/07/2022

CALIBRATION

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

The screenshot displays the INAV Configurator software interface. At the top, the INAV logo and version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0) are visible. A status bar shows a battery level of 8.97 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A 'Disconnect' button is present in the top right corner. The main content area is titled 'Accelerometer Calibration' and includes a note: 'Note: If the flightcontroller is mounted in another angle or upside down, do the calibration steps with the flightcontroller pointing as shown in the pictures, not the quad (otherwise calibration won't work)'. Below the note are six steps, each with a diagram of a drone in a specific orientation and a blue checkmark indicating completion. A 'Calibrate Accelerometer' button is located to the right of the steps. To the right of the main content area is the 'Compass Calibration' section, which includes a 'Calibrate Compass' button and input fields for Zero X (6), Zero Y (50), Zero Z (-75), Gain X (1401), Gain Y (1318), and Gain Z (1310). Below this is the 'Optic Flow Calibration' section with a 'Calibrate Optic Flow sensor' button. A 'Save and Reboot' button is located at the bottom right of the main content area. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 3307, CPU Load: 90%, MSP version: 2, MSP load: 0.0, MSP round trip: 55, HW round trip: 17, Drop ratio: 0%, and the version 5.0.0. The Windows taskbar at the bottom shows the time as 6:03 PM on 23/07/2022.

MIXER

Airframe or
Vehicle time
Preset and mix
selection

Load and apply
when selected
then Save
Reboot

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

The screenshot shows the INAV Configurator software interface. The top bar displays system status: 8.97 V battery, and various sensors (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 for "Multirotor" (selected). Below this is an "Output Mapping" table and a "Motor Mixer" table.

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

The interface also features a "Mixer preset" section with a "Quad X" diagram and buttons for "Mixer wizard", "Load and apply", and "Load mixer". A "Save and Reboot" button is located at the bottom right. The bottom status bar shows system metrics like "Packet error: 0", "Cycle Time: 3246", "CPU Load: 90%", and the time "6:07 PM 23/07/2022".

MIXER

Note 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
```

MOTOR MIX FOR QUAD X

THROTTLE – SPOOL UP

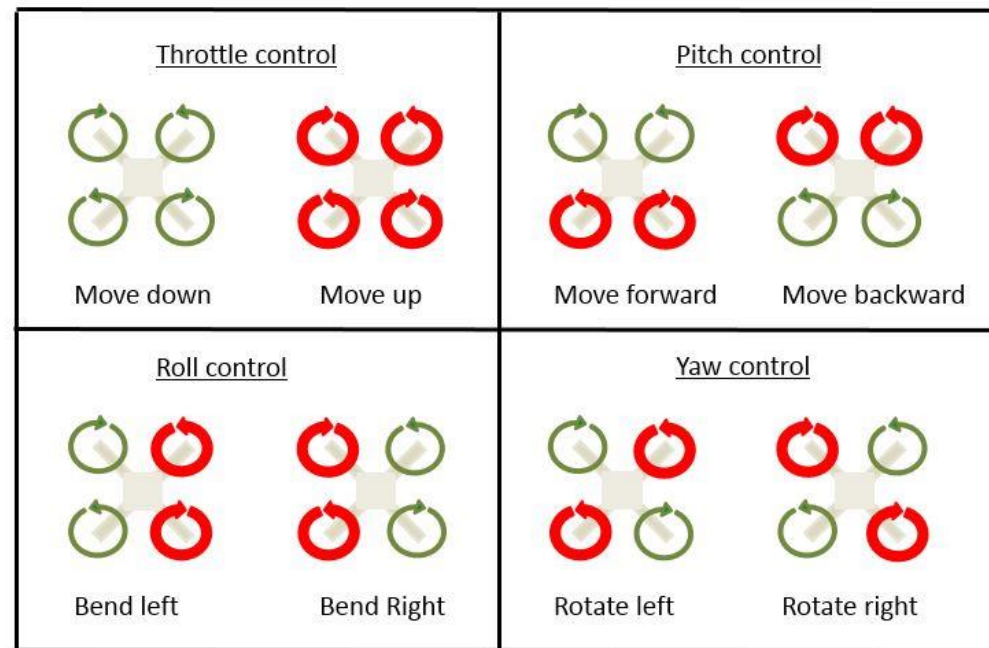
AILERON - ROLL RIGHT

ELEVATOR - PITCH FORWARD

RUDDER - YAW RIGHT

(-) REDUCE RPM

(+) INCREASE RPM



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

Motor Mixer

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

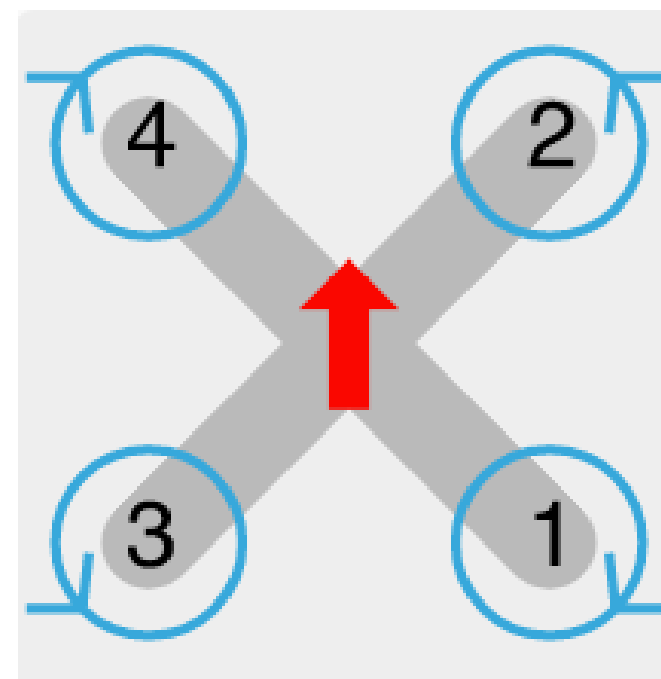
Add new mixer rule

Servo mixer

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



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 main area displays the 'Enable motor and servo output' toggle, which is turned on. Below it, 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 assignments: 1 (front-right), 2 (front-left), 3 (rear-left), and 4 (rear-right). The status bar at the bottom shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 3517, CPU Load: 102%, MSP version: 2, MSP load: 2.6, MSP round trip: 54, HW round trip: 14, Drop ratio: 21%. The bottom right corner shows the date and time: 6:09 PM, 23/07/2022.

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 status bar shows a battery level of 8.99 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main content area is divided into several sections:

- Configuration:** Shows the number of motor poles (14) and the Reversible motors mode (disabled).
- Motors:** Displays four motor channels (1, 2, 3, 4) with 100% throttle and a Master throttle slider at 0%. A motor test mode notice is present, stating: "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." A checkbox "I understand the risks, propellers are removed - Enable motor control." is checked.
- Servos:** Shows 15 servo channels, all currently disabled.
- Acc. noise RMS:** 0.0013
- Current [A]:** 20.50
- Voltage [V]:** 8.99

At the bottom, the status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 503, CPU Load: 16%, MSP version: 2, MSP load: 0.8, MSP round trip: 32, HW round trip: 17, Drop ratio: 0%. The bottom right corner shows the date and time: 12:51 PM 16/12/2022.

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

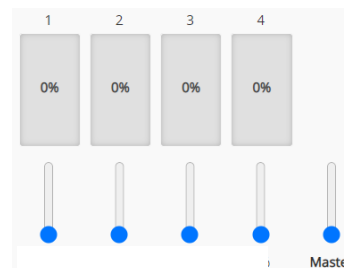
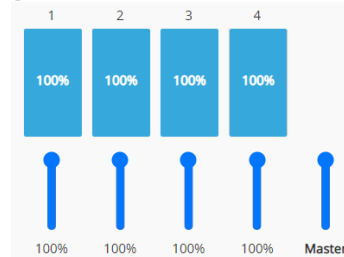


Motor Test Mode Notice:

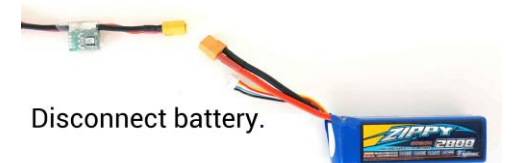
Moving the sliders will cause the motors to **spin up**.

In order to prevent injury **remove ALL propellers** before using this feature.

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



Connect battery to power module.



Disconnect battery.

PORTS

INAV Configurator

INAV 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

Ports

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% FW version: 5.0.0



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)

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 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

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

Optional Optical Flow installation CXFO

I2C speed 400hz

Board and Sensor alignment

0.0 Yaw Degrees

CW180 Mag Alignment

Features (Synerduino STM BlackPill)

Enable CPU based serial ports

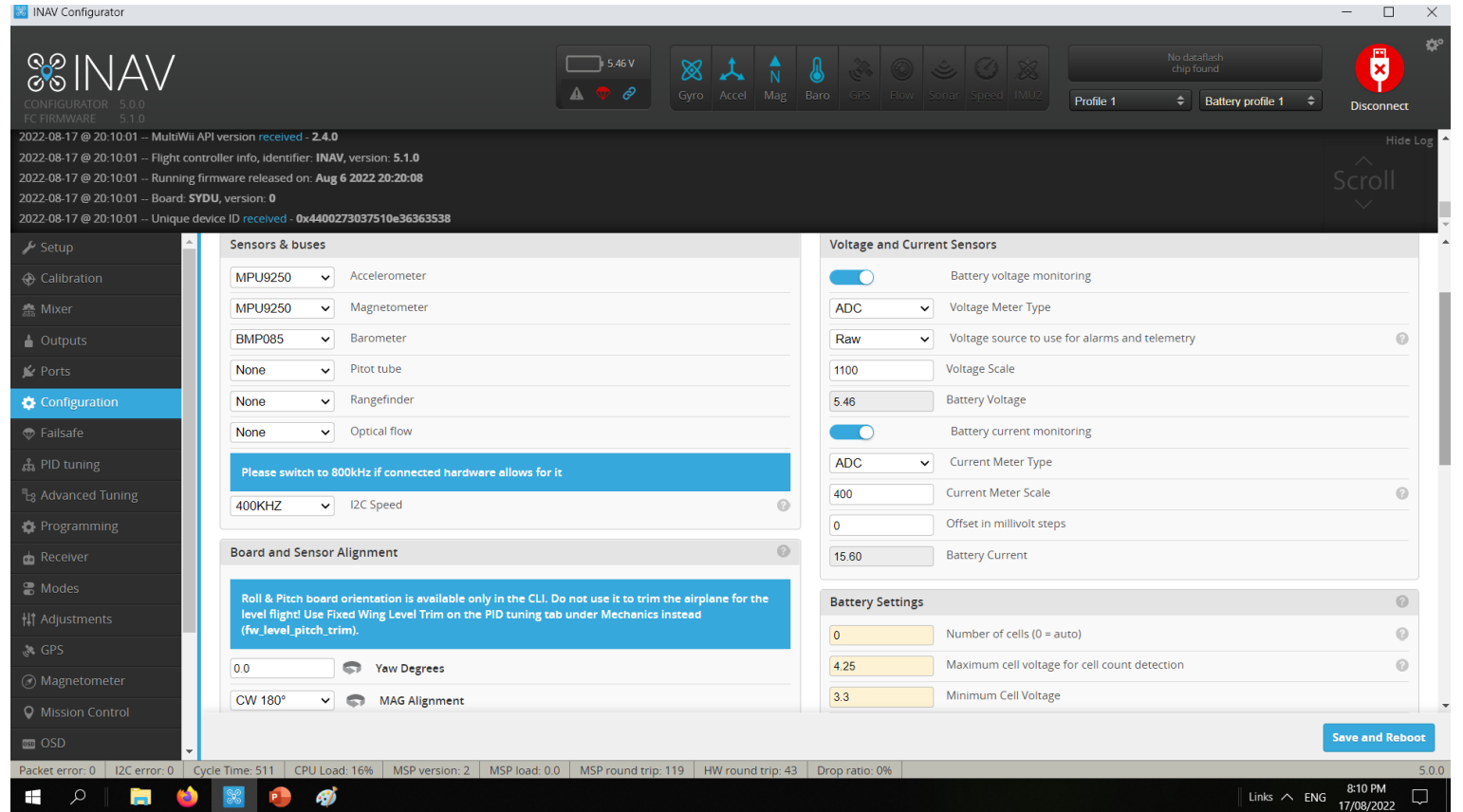
GPS for navigation and telemetry

Telemetry output

Multi-color RGB LED strip support

Enable motor and servo output

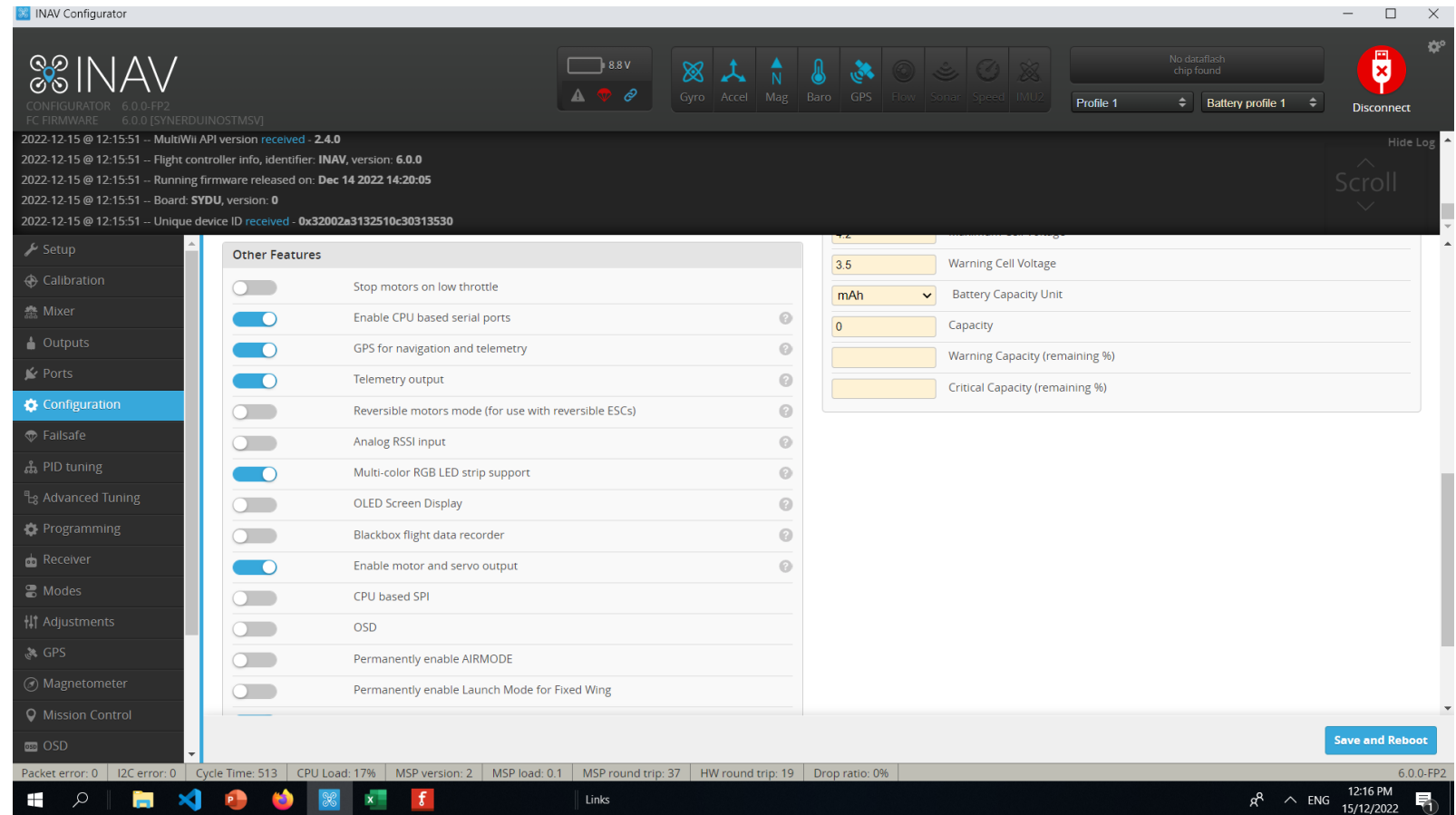
Profile selection with TX stick command



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



CONFIGURATION

Voltage and Current sensors

Battery Voltage monitoring (Vbat)

RAW = ADC 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 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

Voltage and Current Sensors	
<input checked="" type="checkbox"/>	Battery voltage monitoring
ADC	Voltage Meter Type
Raw	Voltage source to use for alarms and telemetry
450	Voltage Scale
11.66	Battery Voltage
<input checked="" type="checkbox"/>	Battery current monitoring
ADC	Current Meter Type
400	Current Meter Scale
0	Offset in millivolt steps
48.40	Battery Current

Battery Settings	
3	Number of cells (0 = auto)
4.25	Maximum cell voltage for cell count detection
3.3	Minimum Cell Voltage
4.2	Maximum Cell Voltage
3.5	Warning Cell Voltage
mAh	Battery Capacity Unit
0	Capacity
	Warning Capacity (remaining %)
	Critical Capacity (remaining %)

INERTIAL MEASURING UNIT MEASURING UNIT

Pls see the Board Specs Data sheets for the installed IMUs onboard

This is the heart of every flight controller AKA the Main 4 ,

- Gyro – stabilization on Roll Pitch Yaw Axis
- Acc - Horizontal and Vertical stabilization XYZ
- Baro – Altitude hold control
- Mag – Heading and Compass

Each sensor has a corresponding address registry set by manufacturer

You can find it on sensors.ccp tab



Magnetometer



Barometer



Accelerometer



Gyroscope

PID Tuning

Synerduino Mini KWAD PID

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 (Horizon) 75

The screenshot shows the INAV Configurator interface. The top bar displays the INAV logo, version 5.0.0, and FC firmware 5.1.0. A battery level of 5.46V is shown. The main area is titled 'PID gains' and contains three sections: Roll (blue), Pitch (purple), and Yaw (pink). Each section has sliders for Proportional, Integral, Derivative, and FeedForward gains. Below these is a table of controller parameters.

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

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

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	
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 strenght of the responds to hold position (too thigh 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

PID TUNING

Filters adjustment for Sensor respond rate

The screenshot shows the INAV Configurator interface with the 'Filters' tab selected. The interface includes a top status bar with battery level (8.97 V) and various sensor icons. A left sidebar contains navigation options like Configuration, Failsafe, PID tuning, and Advanced Tuning. The main area displays the following filter settings:

Filter Category	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 with 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 system version is 5.0.0, and the date/time is 9:10 AM on 30/07/2022.

PID TUNING

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

The screenshot shows the INAV Configurator software interface. The main window displays the 'Rates & Expo' configuration page. The left sidebar contains a navigation menu with options like Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, PID tuning (highlighted), Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD. The main content area shows a table of parameters for Rates & Expo:

Parameter	Value	Unit
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	%

The bottom status bar shows system information: 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%, and version 5.0.0. The system clock shows 9:53 AM on 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)

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 5.43V 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): dropdown menu
 - 300 cm/s (Default navigation speed)
 - 1000 cm/s (Max. navigation speed)
 - 500 cm/s (Max. CRUISE speed)
 - 30 ° (Multicopter max. banking angle)
 - Use mid. throttle for ALTHOLD: toggle switch (off)
 - 1400 uS (Hover throttle)
 - Slow down when approaching waypoint: toggle switch (on)
- 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)
- Waypoint Navigation Settings:** (Section header visible)

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%. The system tray includes Windows taskbar icons and a system clock showing 8:17 PM on 17/08/2022.

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

The screenshot shows the INAV Configurator software interface. The top bar displays system status: 8.96 V battery, and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main window is divided into several sections:

- Log:** Shows system boot logs, including MultiWii API version received (2.4.0), flight controller info (INAV, version 5.0.0), and board info (ST41, version 0).
- Receiver Mode:** Configured for SERIAL. A green note states: "Remember to configure a Serial Port (via Ports tab) for the serial receiver". The provider is set to SBUS, inverted is OFF, and half-duplex is AUTO.
- Signal Strength:** A table shows signal strength for various channels. Roll [A], Pitch [E], and Yaw [R] are at 1498. Throttle [T] and channels CH 5 through CH 15 are at 1000. Channels CH 16 through CH 18 are at 988.
- Adjustments:** Includes 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), and Manual RC Yaw Expo (0.20).
- Bottom Bar:** Displays system statistics: 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%.

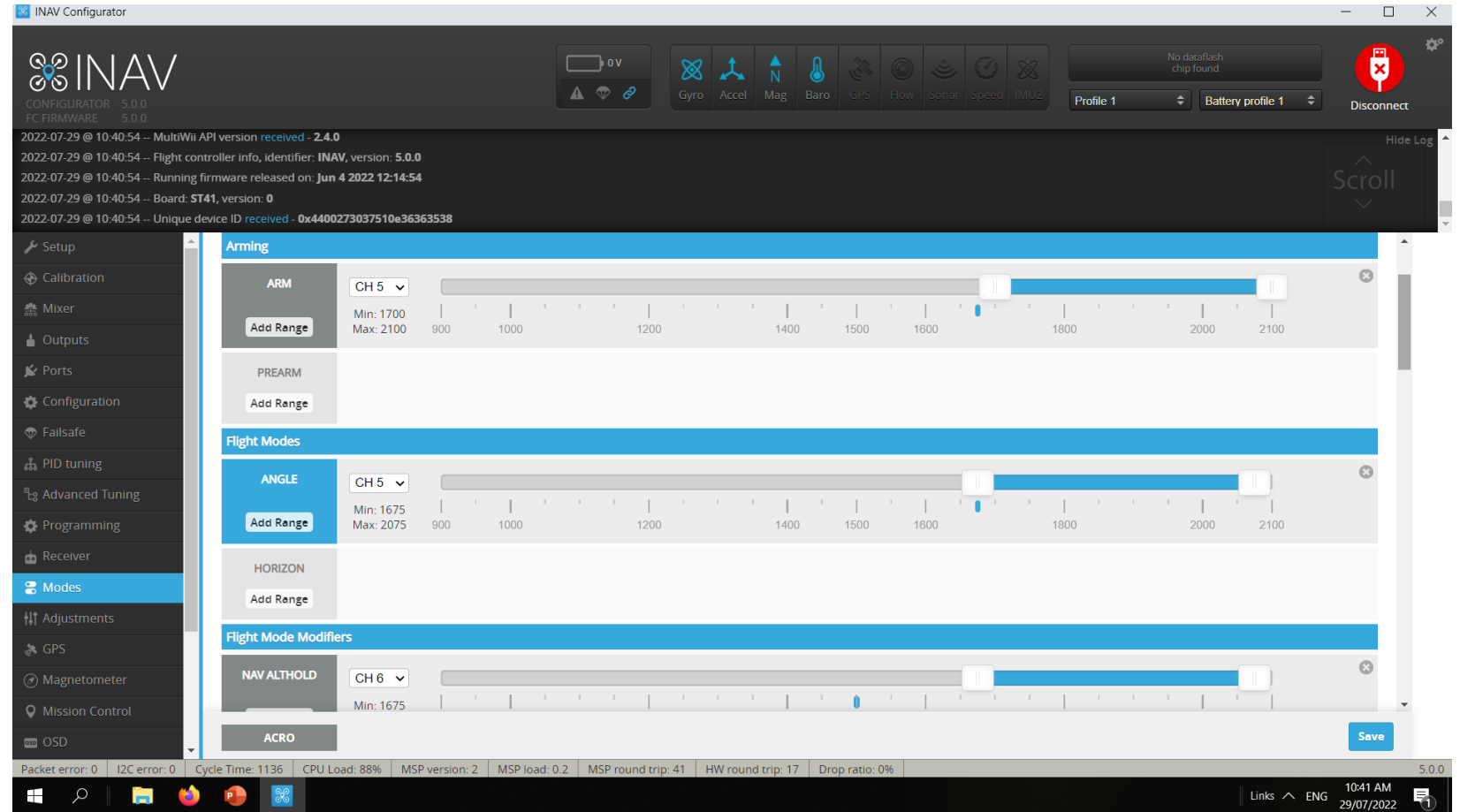
MODES

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](#)
- [WP PLANNER - On the fly waypoint mission planner](#)
- [GCS NAV - Ground control station](#)



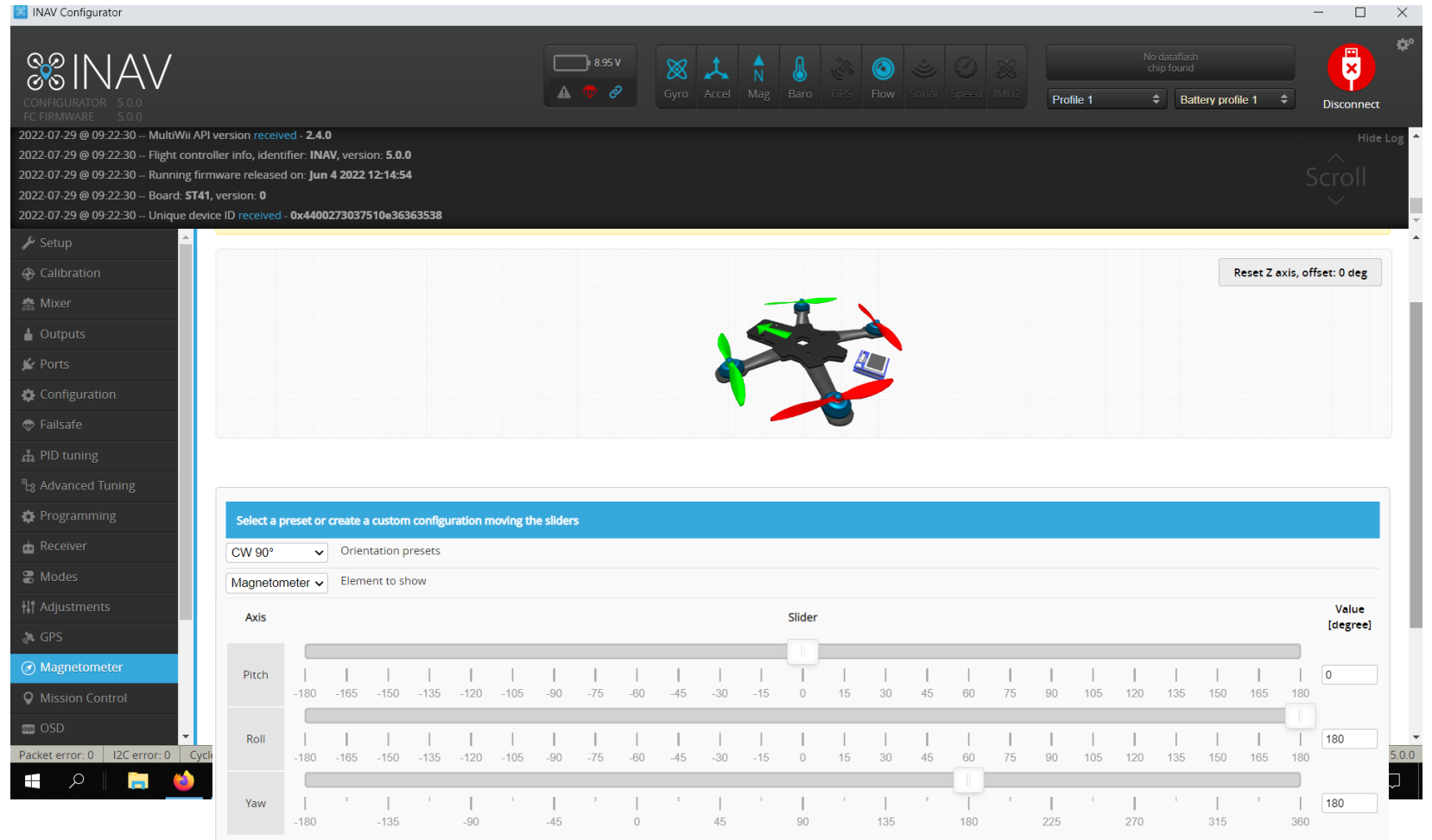
MAGNETOMETER

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 vari 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

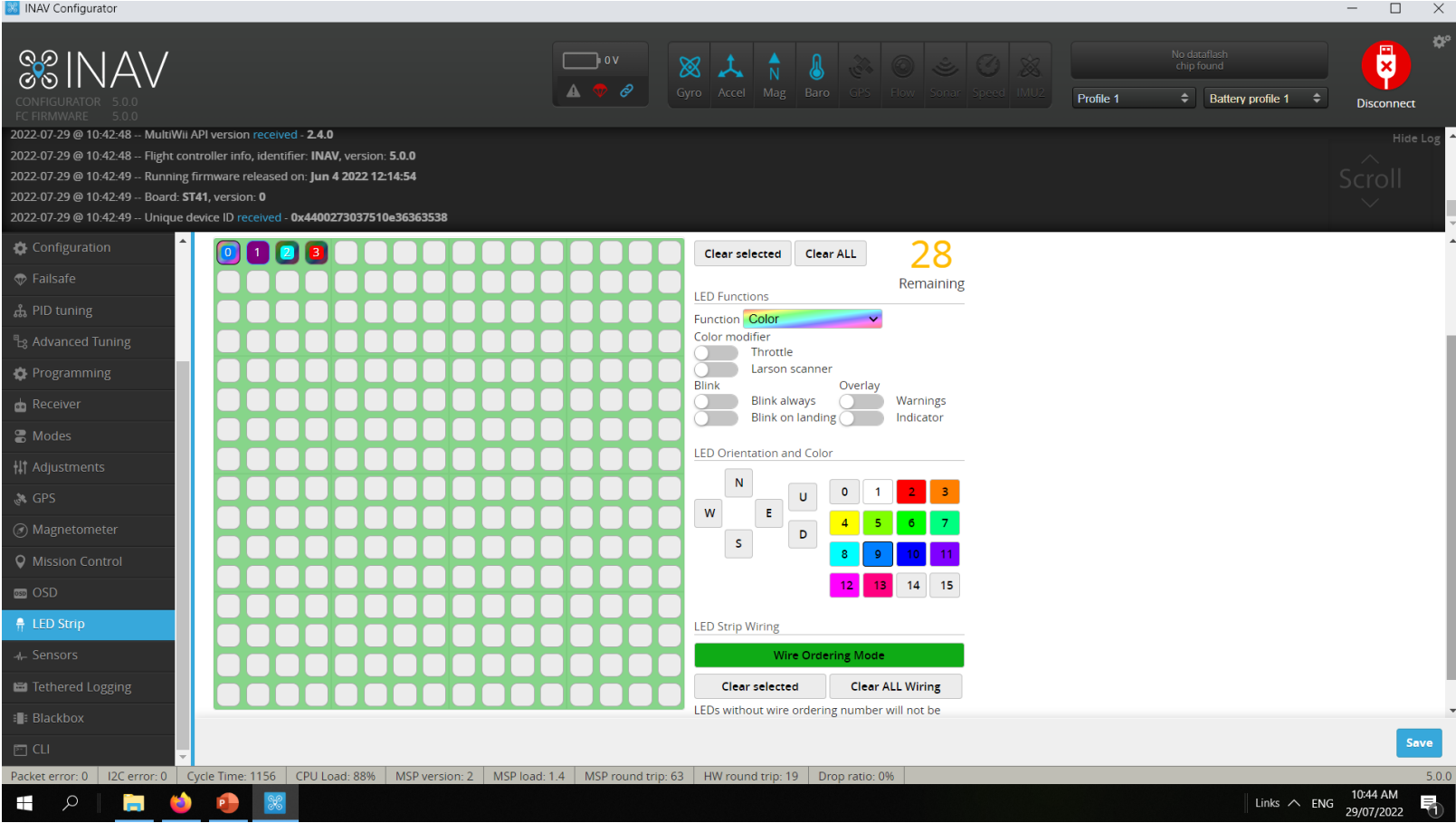
0 Degrees = North
90 Degrees = East
180 Degrees = South
270 Degrees = West



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

LED STRIP

WS2811/WS2812 – Led strip programming upto 32 LEDs



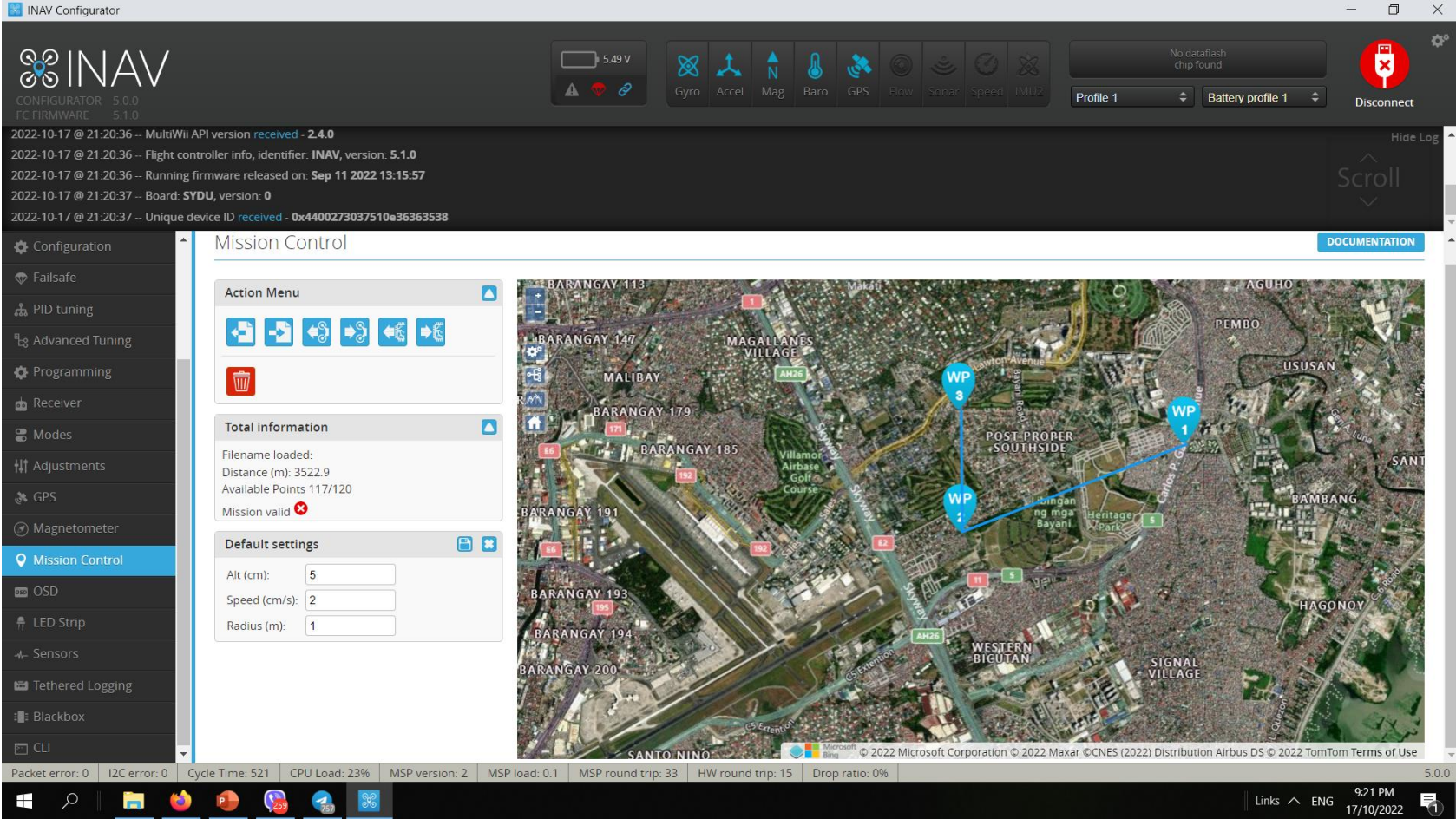
The screenshot shows the INAV Configurator interface. The top bar includes the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), and system status (0V, No dataflash chip found). The main content area displays the LED Strip configuration screen. On the left, a sidebar menu lists various configuration options, with 'LED Strip' selected. The main area features a grid of 28 LEDs, with the first four LEDs (0, 1, 2, 3) highlighted in green. To the right of the grid, there are controls for 'Clear selected', 'Clear ALL', and 'Remaining' (28). Below this, there are sections for 'LED Functions' (Function: Color, Color modifier, Blink, Blink always, Blink on landing, Overlay, Warnings, Indicator), 'LED Orientation and Color' (a grid of 16 LEDs with color-coded numbers 0-15), and 'LED Strip Wiring' (Wire Ordering Mode, Clear selected, Clear ALL Wiring). A 'Save' button is located at the bottom right. The bottom status bar shows system metrics like Packet error: 0, I2C error: 0, Cycle Time: 1156, CPU Load: 88%, MSP version: 2, MSP load: 1.4, MSP round trip: 63, HW round trip: 19, Drop ratio: 0%, and the version 5.0.0.

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)

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.



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 shows the INAV Configurator application window. The title bar reads "INAV Configurator". The interface includes a sidebar with "Welcome", "Documentation & Support", "Mission Control", and "Firmware Flasher". The main area displays "Mission Control" with an "Action Menu" and "Total information" section. A map of a city area is visible. An "Application Options" dialog box is open, showing the following settings:

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

Map Provider: Bing Maps

.....	Map API key
http://192.168.1.222/mapproxy	MapProxy URL
your_proxy_layer_name	MapProxy Layer

Configurator rendering options

Imperial Set how the units render on the configurator only

A green arrow points to the Settings icon in the top-right corner of the application window.

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		/mappr	MapProxy URL
MapProxy			MapProxy Layer
year_proxy_layer_name			

Configurator rendering options

Imperial ▼ Set how the units render on the configurator only

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 shows the INAV Configurator interface. At the top, there's a status bar with battery level (5.48V) and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). Below that, a log window shows system messages. The main area is titled 'Logic Conditions' and features a table of 8 Global Variables (GVAR) and a table of logic conditions.

#	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
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
5	<input checked="" type="checkbox"/>	Override RC Channel	Value	6	Value	55	Logic Condition 4
6	<input type="checkbox"/>	True					
7	<input type="checkbox"/>	True					
8	<input type="checkbox"/>	True					

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/GP S or Flow

And to identify errors

The screenshot shows the INAV Configurator software interface. The top bar includes the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), a battery status indicator (8.97 V), and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A 'Disconnect' button is visible on the right. The main content area displays a log of system messages and a CLI window. The CLI window shows the output of the '# tasks' command, which lists various tasks and their resource usage. 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.'

```
# tasks
### 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
Total (excluding SERIAL)          28253.4% 105.0%    3

# set looptime = 3500
looptime set to 3500
```

At the bottom of the CLI window, 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 at the very bottom shows the time as 5:39 PM on 21/07/2022.

Reason (CLI Mnemonic)	Bit Mask (Hex)	Explanation
FS	0000080	The RX is not recognised as providing a valid signal
ANGLE	0000100	The vehicle is not level as defined by the CLI <code>small_angle</code> setting
CAL	0000200	The pre-arm sensor calibration has not completed. The barometer is somewhat susceptible to lengthy calibration, which may be mitigated by the CLI setting <code>baro_cal_tolerance</code> , e.g. set <code>baro_cal_tolerance = 500</code> (find a suitable value by experimentation).
OVRLD	0000400	The CPU load is excessive. May be caused by too an aggressive loop time setting.
NAV	0000800	Where the CLI setting <code>nav_extra_arming_safety = ON</code> 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
DSHOTBEEPER	20000000	DSHOTBEEPER is enabled and is active

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

Type Status on the CLI to find the cause

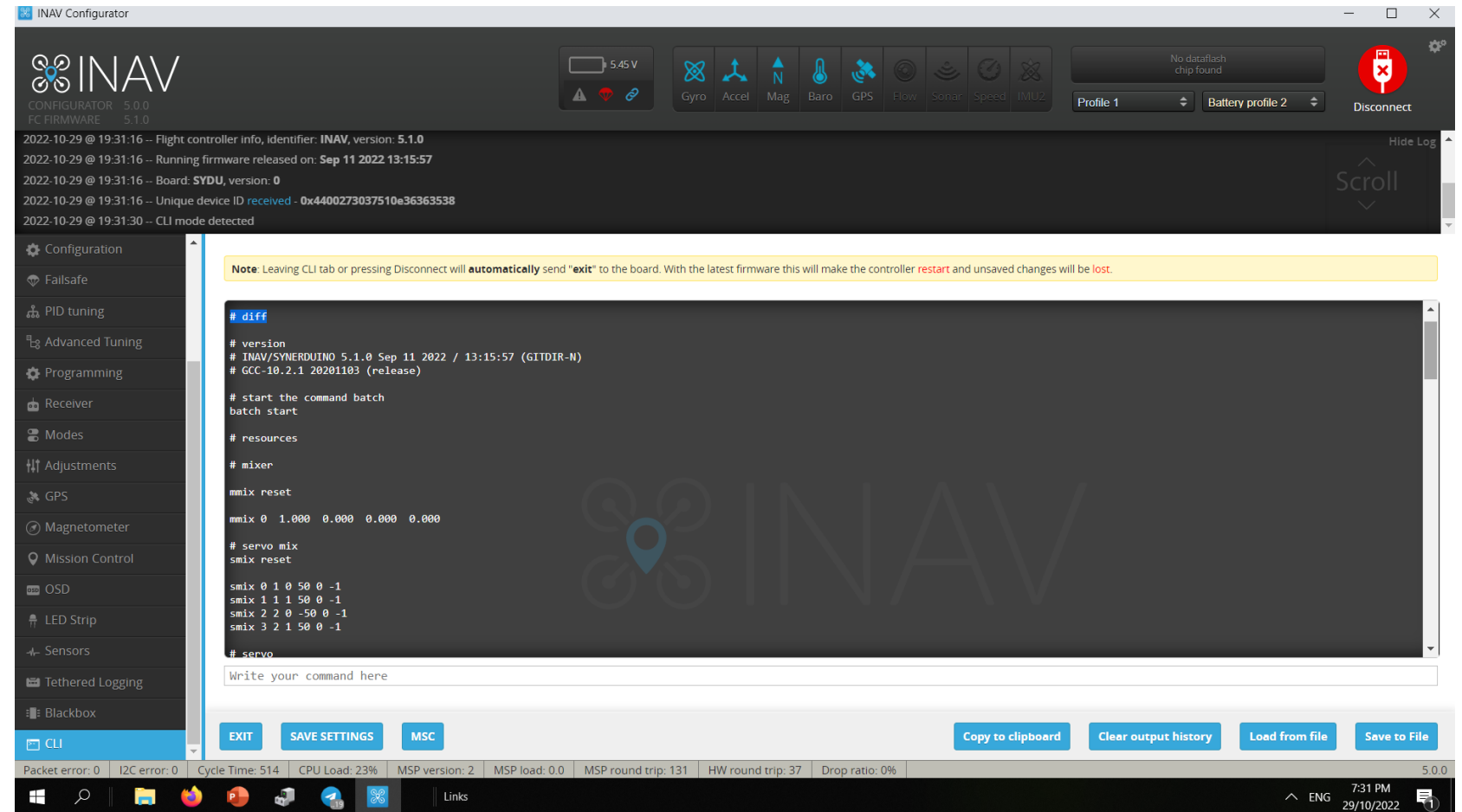
CLI Command Line Saving and Loading Parameters

You can download the Preset DIFF for the Synerduino STM Synerduino STM page [Synerduino DIFF 6.0.0](#) [Synerduino diff all-5.1.0](#)

- 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



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

CLI Command Line Trimming the Roll and Pitch Alignment

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

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). A battery level indicator shows 8.97 V. The main window is divided into a left sidebar with configuration categories (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 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 buttons for "EXIT", "SAVE SETTINGS", and "MSC". At the bottom of the interface, there are buttons for "Copy to clipboard", "Clear output history", "Load from file", and "Save to File". The status bar at the very bottom shows system metrics like "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 Windows taskbar at the bottom right shows the time "7:24 PM" and date "30/07/2022".

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
```

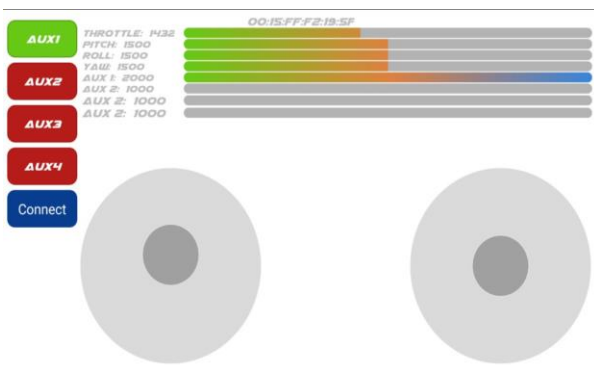
For users who wish to control this drone using the Synerduino APP

`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



INAV Configurator

2.4V

No dataflash chip found

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

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

12:12 PM 17/03/2023

CLI Command Line GPS setting

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

Set `gps_auto_config = ON`

Config GPS on bootup

Set `gps_auto_baud = ON`

Set `gps_ublox_use_galileo = OFF`

turn on only if GPS supports Galileo in your area

Set `gps_min_sats = 6`

Minimum sats to arm gps flight mode

Set `inav_use_gps_velned = ON`

Set `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

The screenshot shows the INAV Configurator software interface. The top bar displays system status: 2.12V battery, No dataflash chip found, Profile 1, and Battery profile 1. The main window 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 commands and their allowed values:

```
# 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

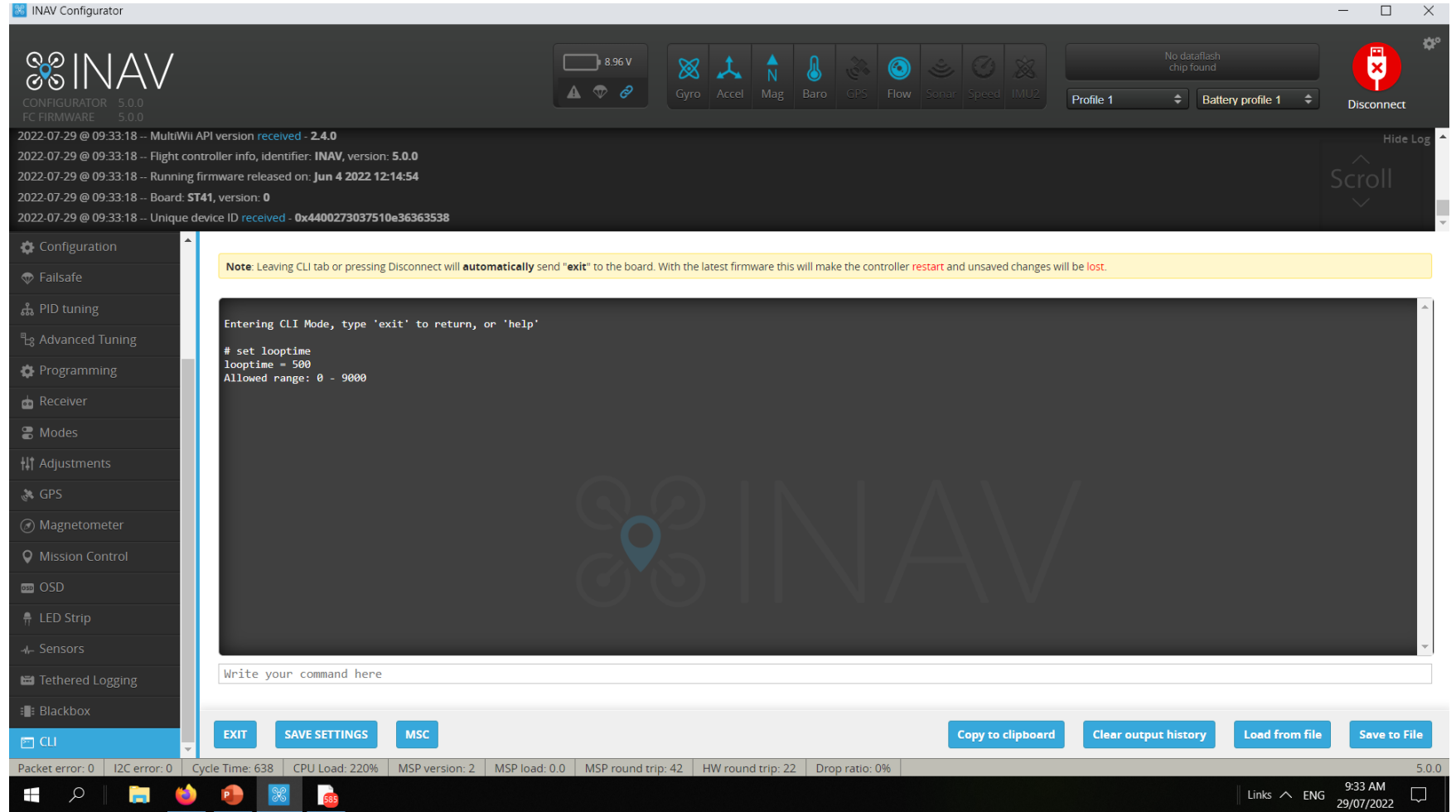
gps_min_sats = 6
Allowed range: 5 - 10
```

At the bottom of the CLI window, 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, Save to File, and CLI Command Docs. The bottom status bar shows 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 version 6.0.0. The system clock shows 4:03 PM on 23/04/2023.

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 and version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0). A status bar at the top right indicates a battery level of 8.96 V and a 'No dataflash chip found' warning. The main content 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:

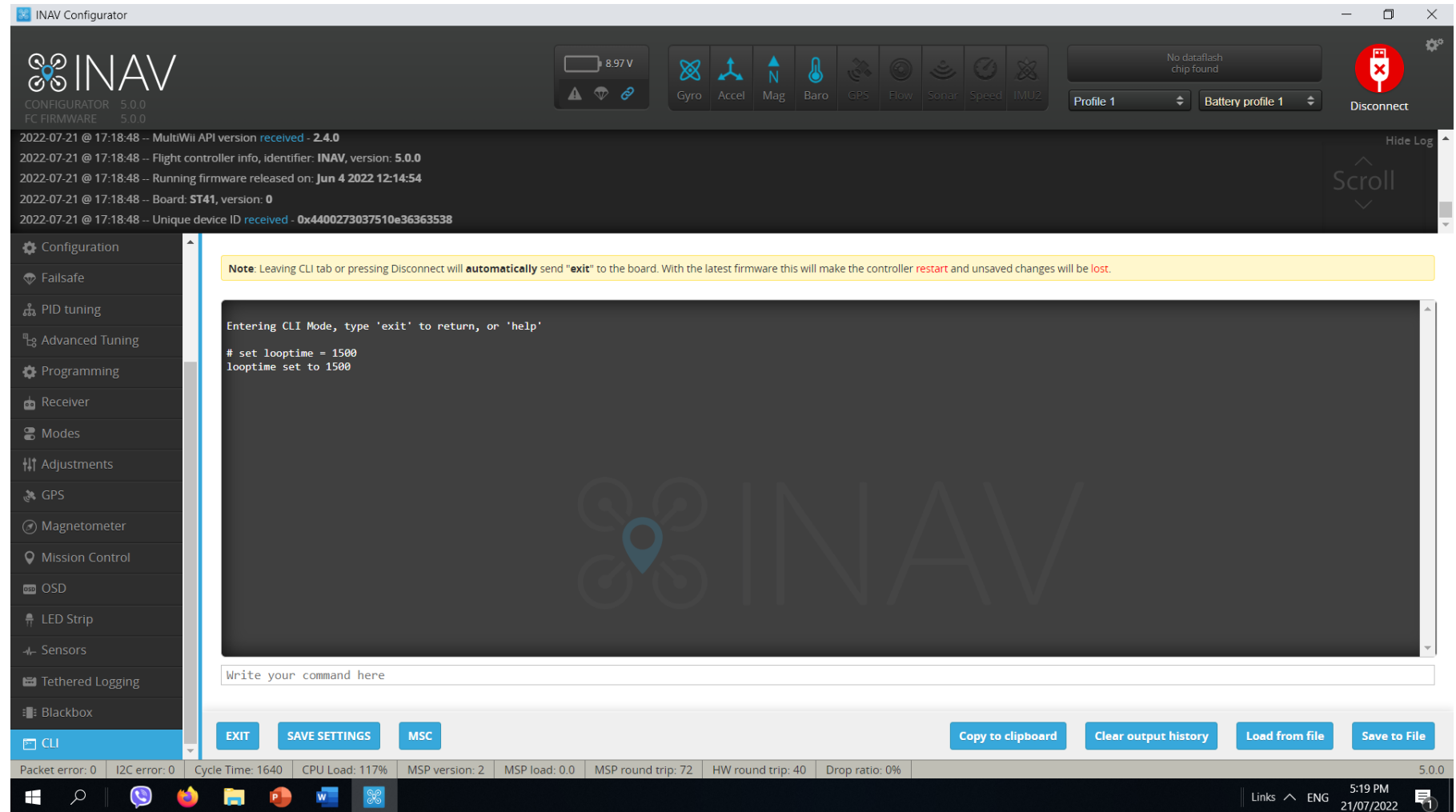
```
Entering CLI Mode, type 'exit' to return, or 'help'  
  
# set looptime  
looptime = 500  
Allowed range: 0 - 9000
```

Below the CLI window is a text input field labeled 'Write your command here' and several action buttons: EXIT, SAVE SETTINGS, MSC, Copy to clipboard, Clear output history, Load from file, and Save to File. The bottom status bar displays various 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 Windows taskbar at the very bottom shows the time as 9:33 AM on 29/07/2022.

CLI Command Line – Looptime and CPU speed

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



The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.97 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main window is divided into a left sidebar with configuration categories (Configuration, Failsafe, PID tuning, etc.) and a central CLI terminal. The terminal shows the command `# set looptime = 1500` and the response `looptime set to 1500`. A yellow warning box above the terminal 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: 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%. The system tray at the bottom right shows the time as 5:19 PM on 21/07/2022.

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 shows the INAV Configurator software interface. The top bar displays the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), and system status (8.94 V, No dataflash chip found). The left sidebar contains a menu with options like Configuration, Fallsafe, PID tuning, and CLI. The main window shows a terminal output with the command `# set acc_lpf_hz` and `acc_lpf_hz = 10` being entered. A yellow warning bar at the top of the terminal area 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 shows system metrics like Packet error: 0, I2C error: 0, Cycle Time: 2681, CPU Load: 68%, and MSP version: 2. The Windows taskbar at the bottom shows the time as 7:16 PM on 30/07/2022.

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