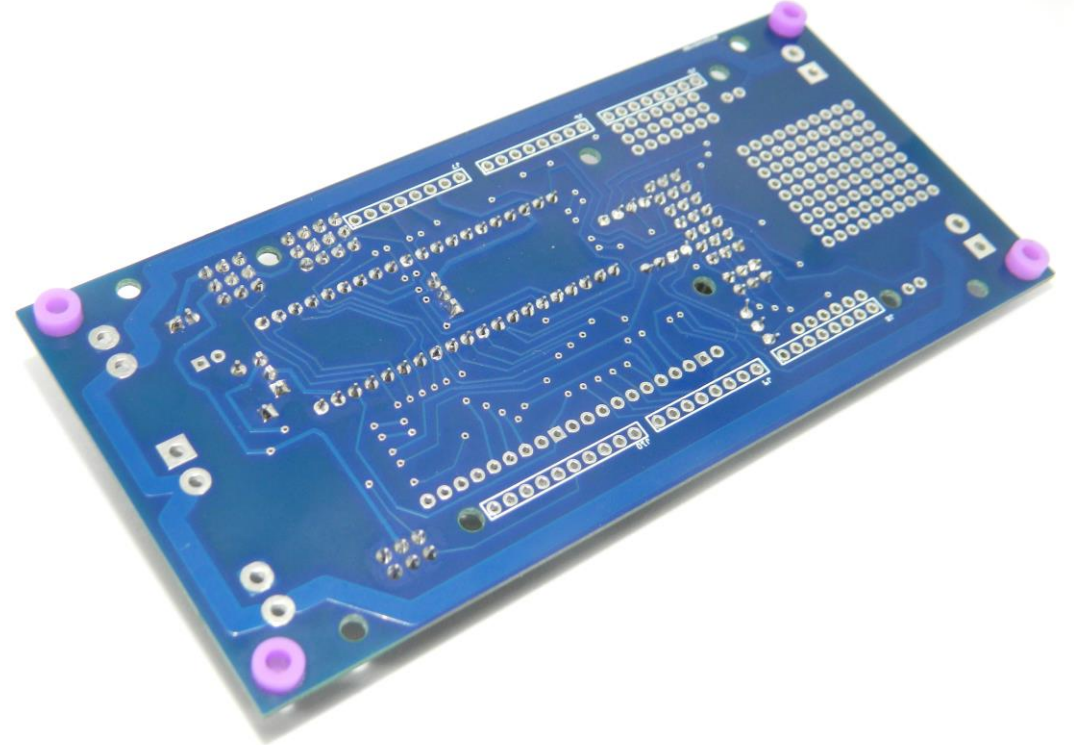
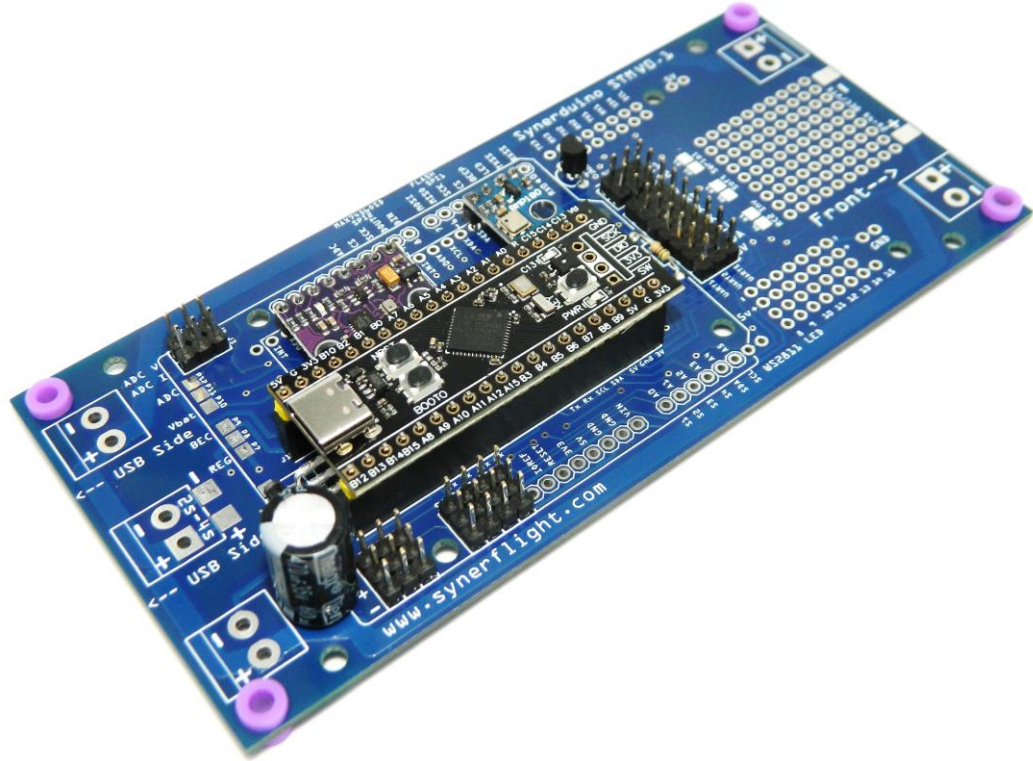


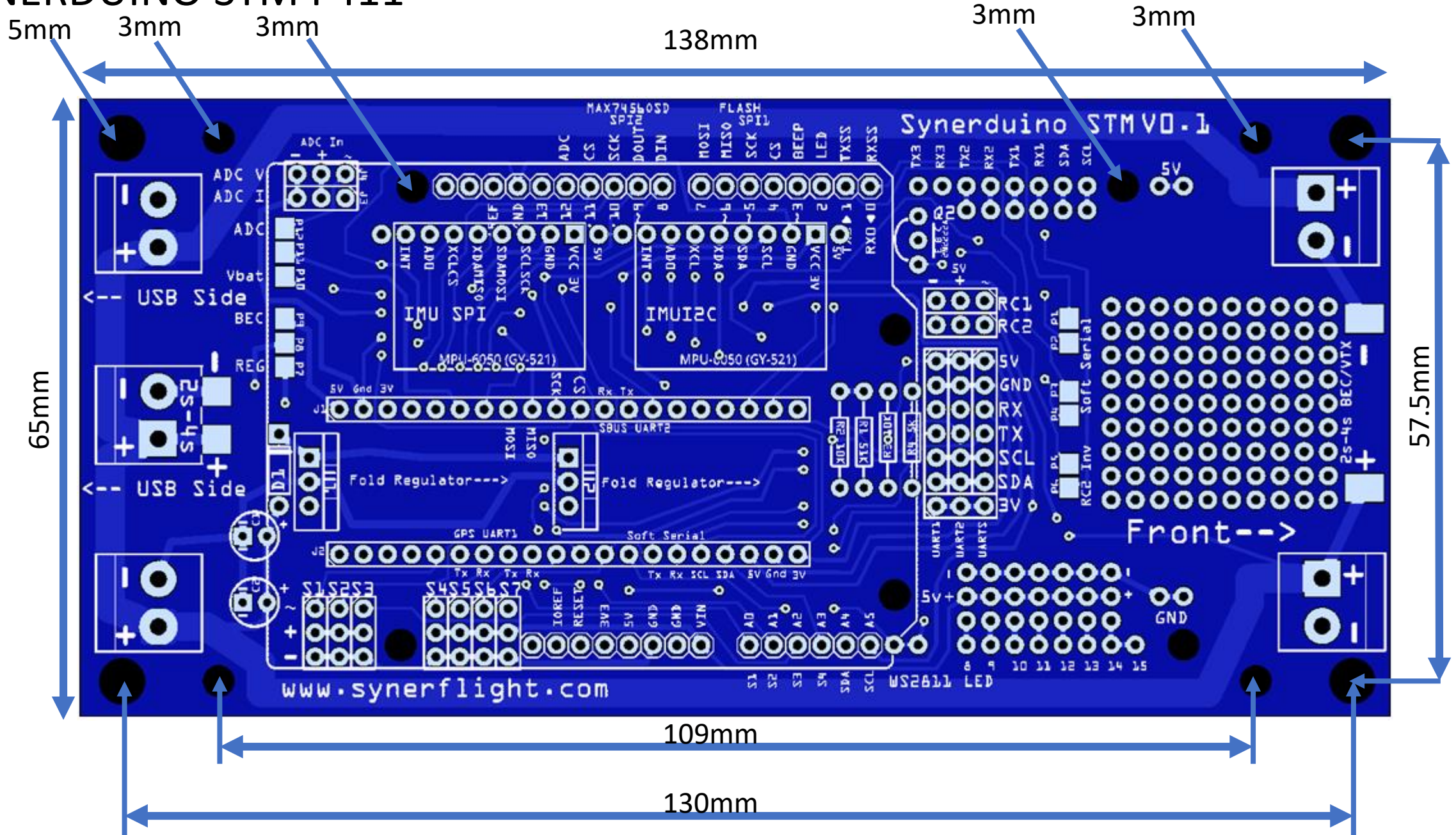
SYNERDUINO STM SHIELD

STM32F411 / STM32F405 / STM32H743 Shield board Setup and INAV 5-8

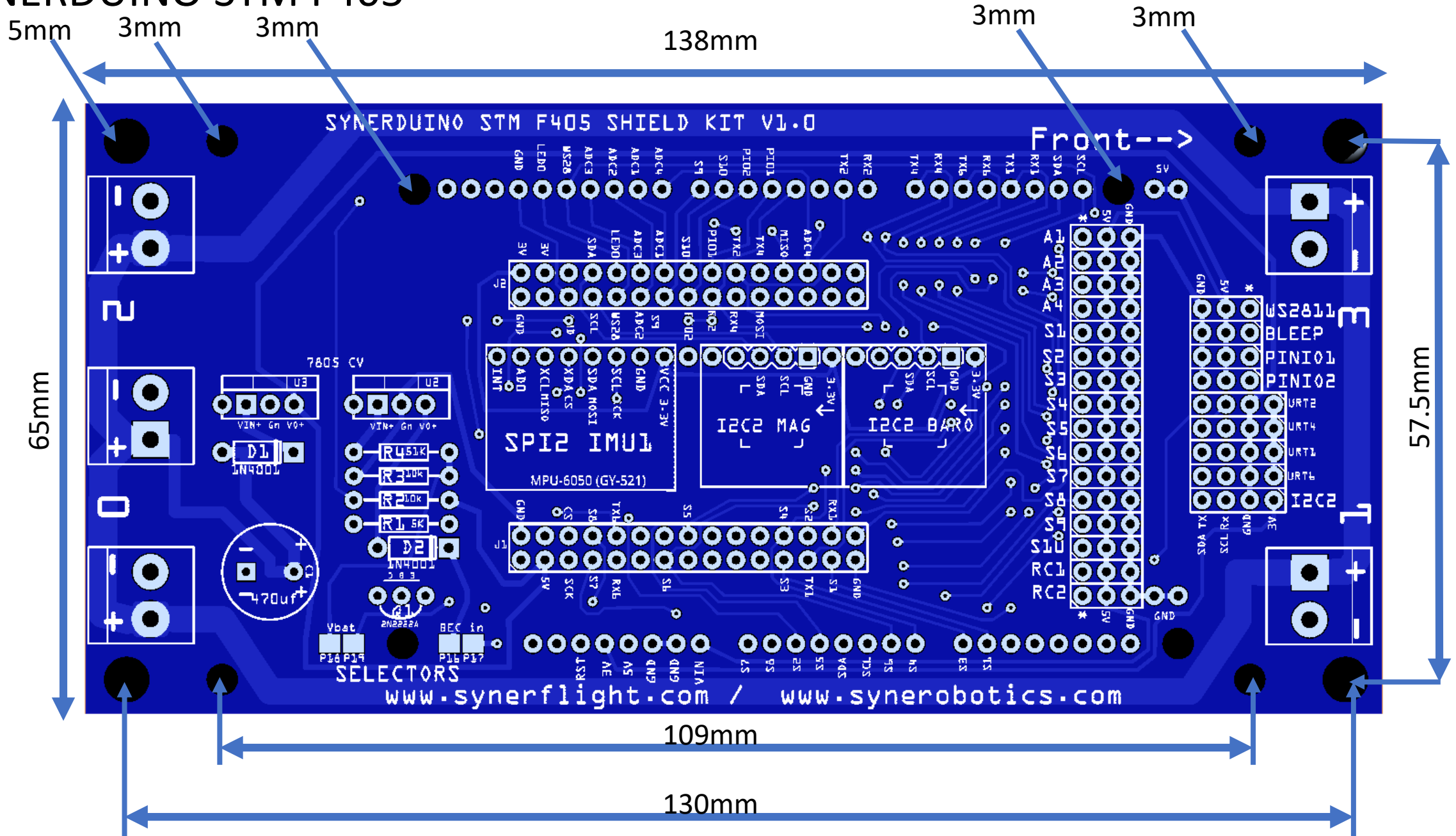
SYNERDUINO STM



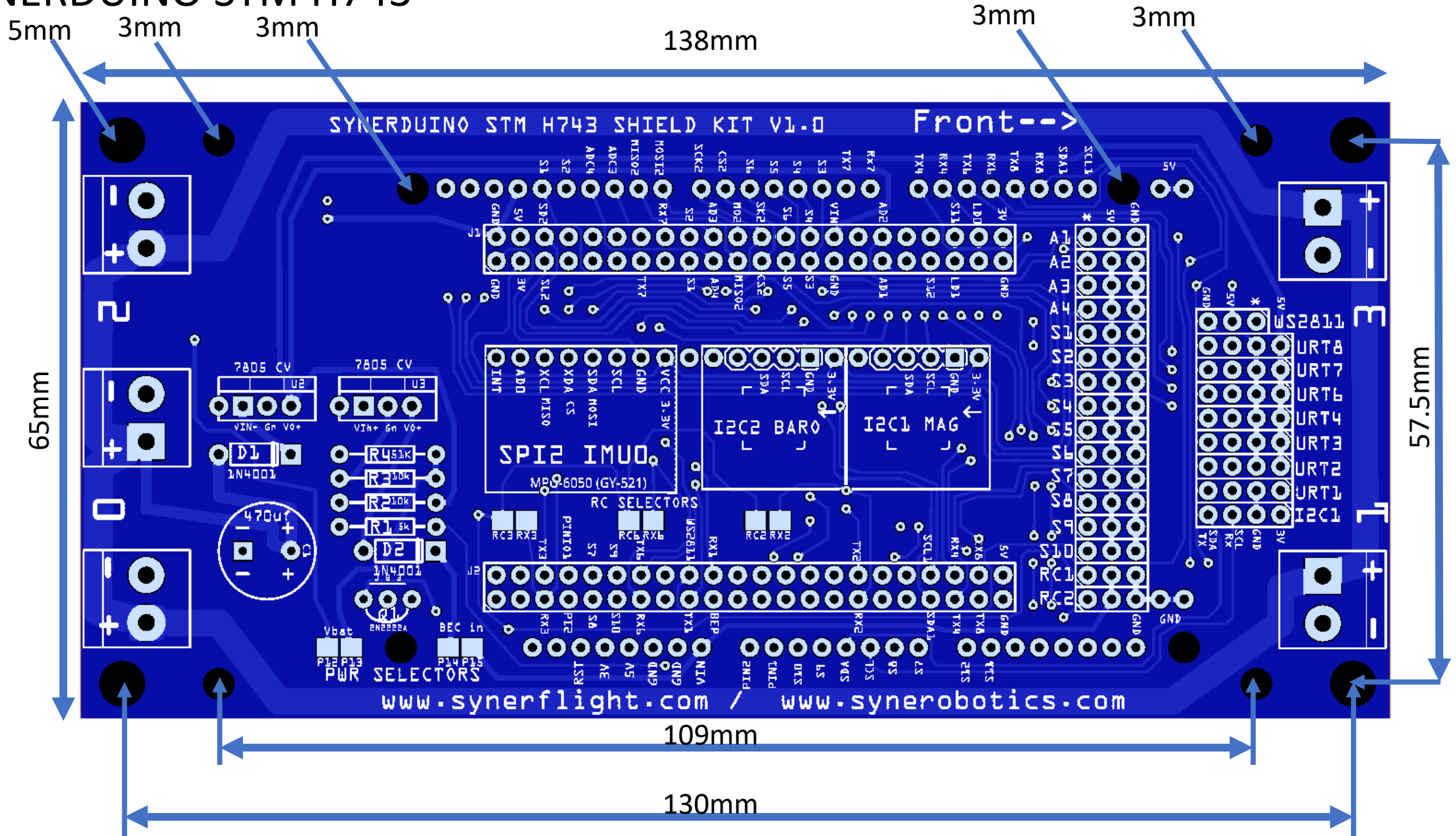
SYNERDUINO STM F411



SYNERDUINO STM F405



SYNERDUINO STM H743



Power Component STM32F411

ESC3

LIPO
3s-4s

ESC1

ADC or Vbat monitor control Pads

BEC or Regulator control Pads

5V regulated

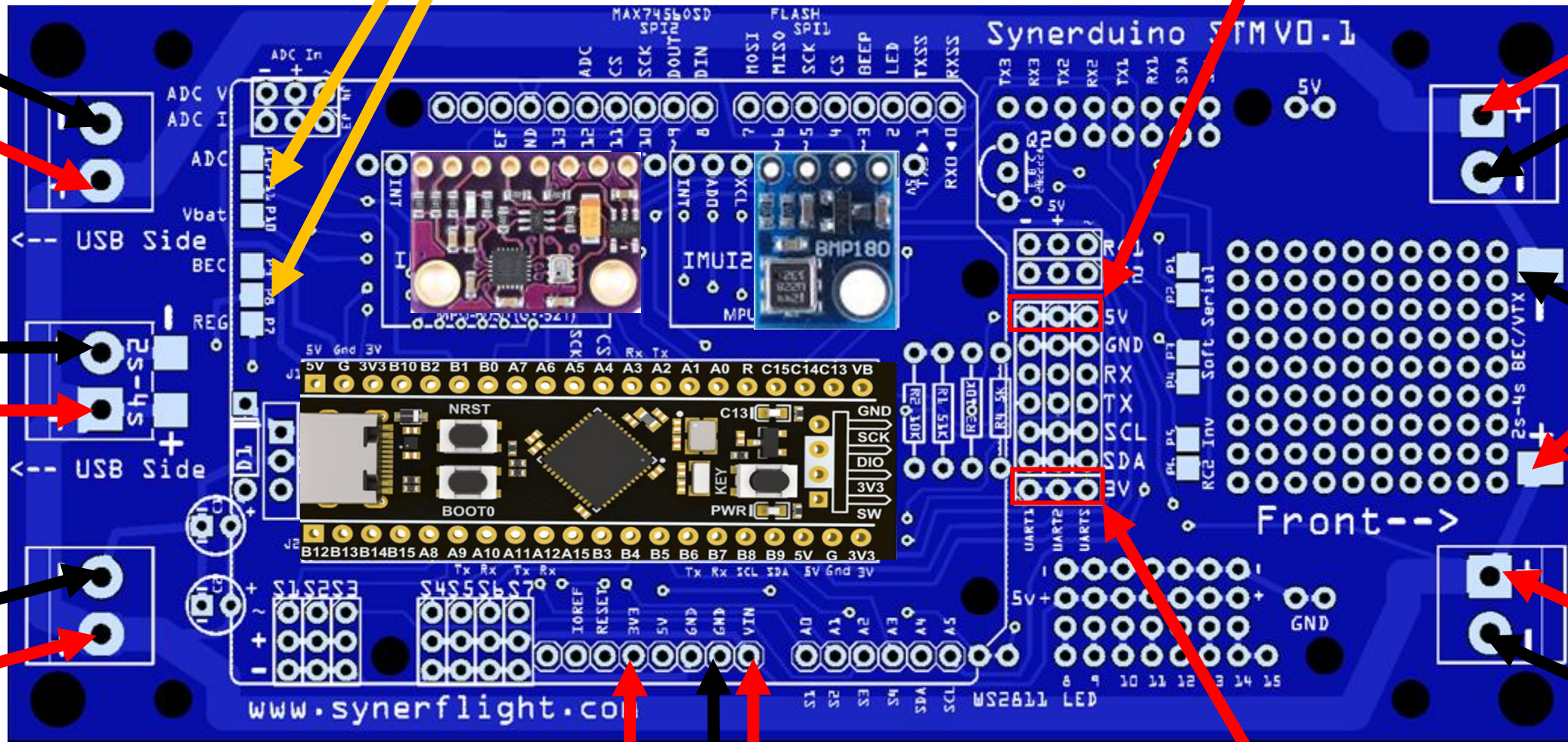
ESC4

3s-4s

ESC2

3V 5Vin

3V regulated



Power Component STM32F405

ESC3

5V regulated

ESC4

LIPO
3s-4s

ESC1

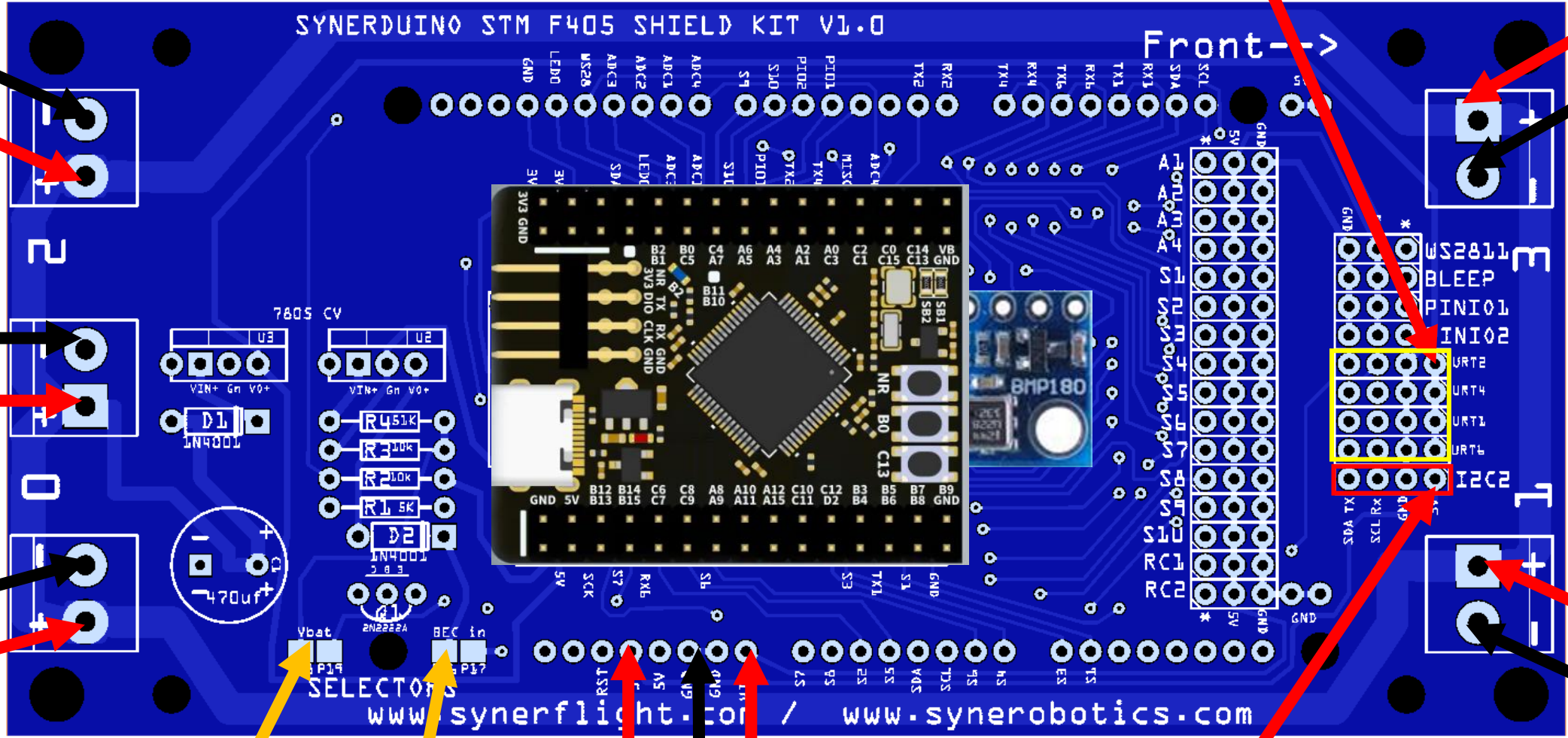
ESC2

ADC or Vbat monitor control Pads

BEC or Regulator control Pads

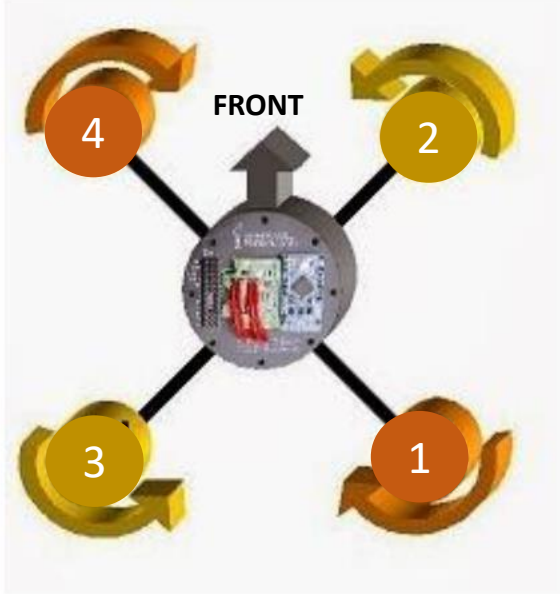
3V 5Vin

3V regulated



Electronic Speed Controller

Motor [4]



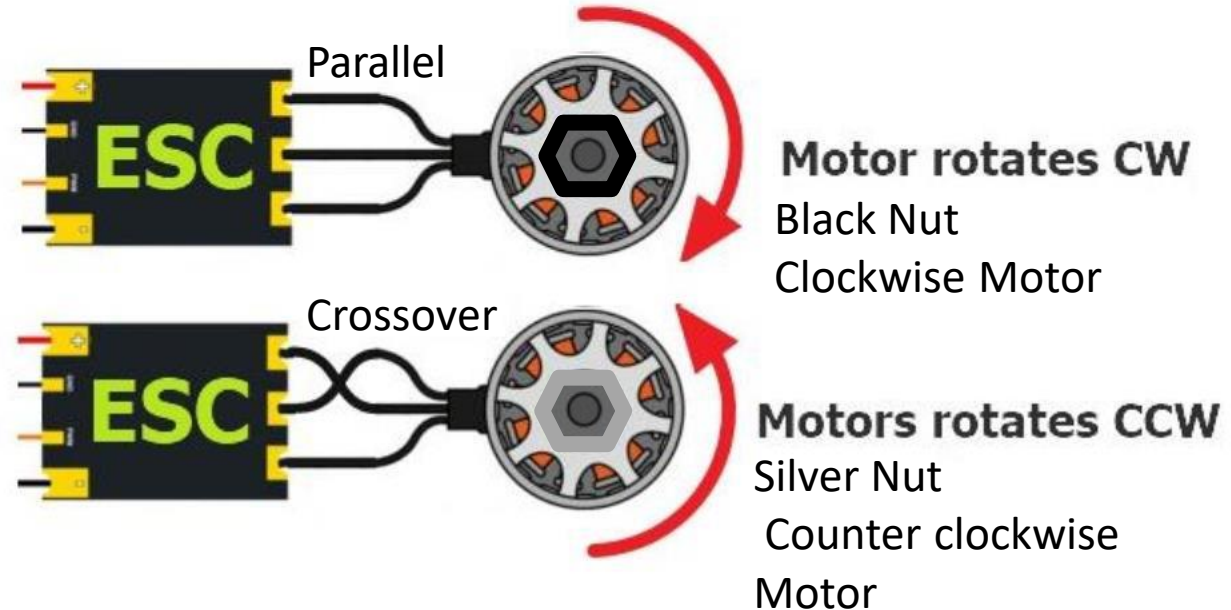
Motor [2]

Motor [1]

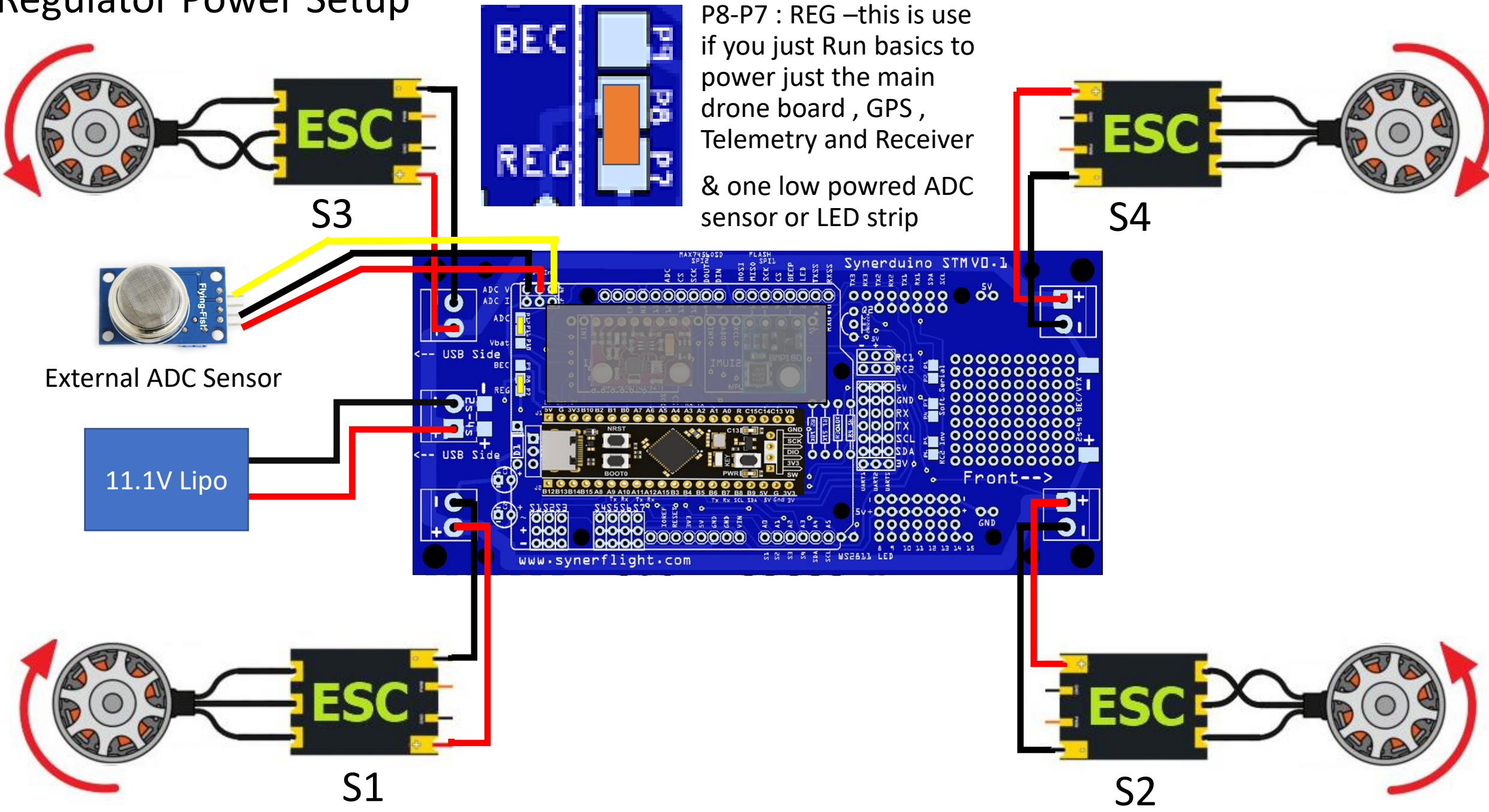
Motor [3]

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

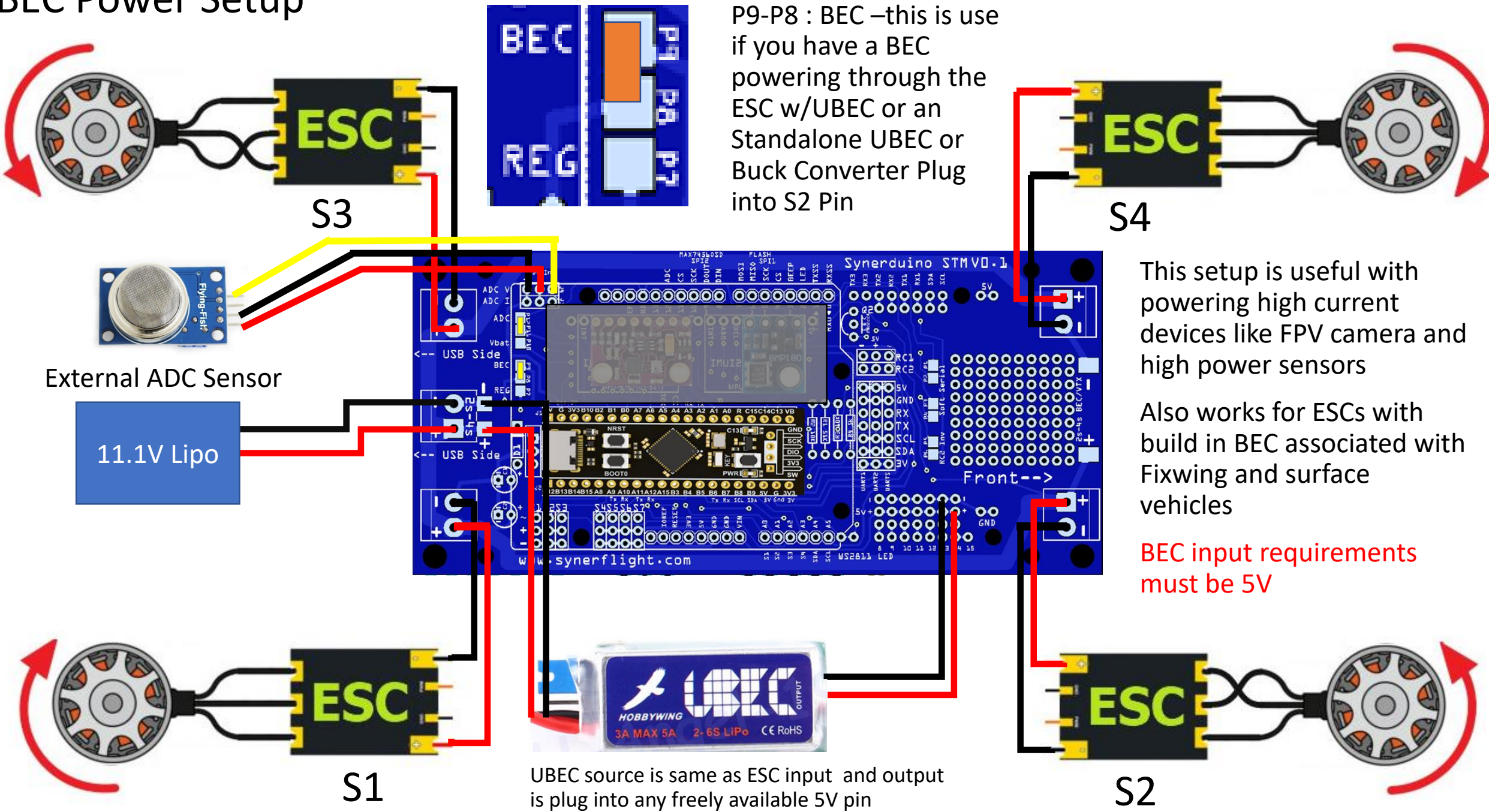
S3

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

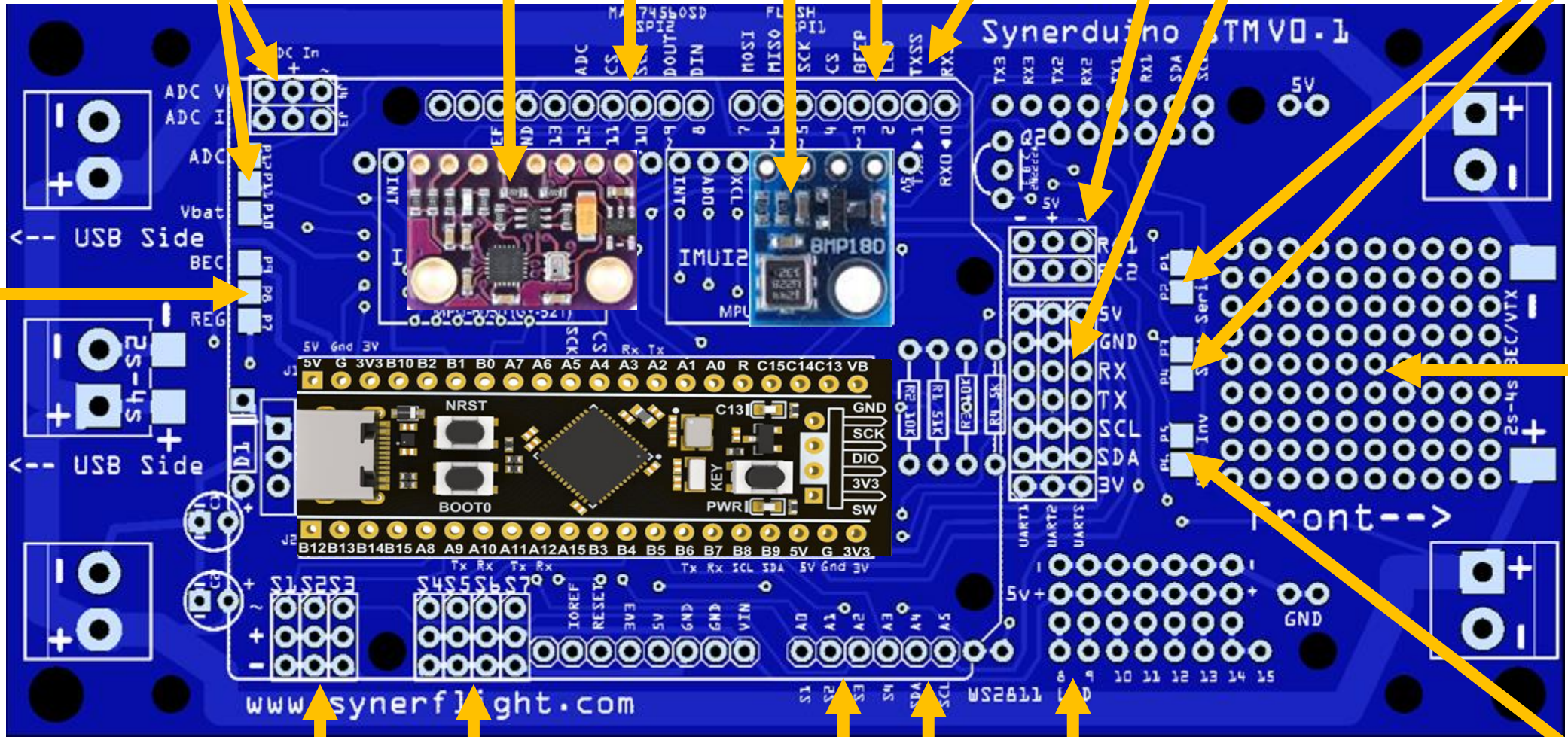
RC2 inverted Sbus signal

S1-S7 Motor/Servo

I2C Aux

8-9 WS2811 LED out

S1-S4 Motor/Servo Aux



Note: the power rails would support upto 4s safely

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

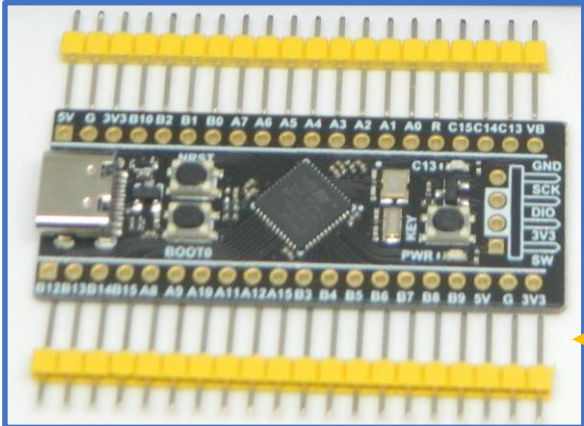
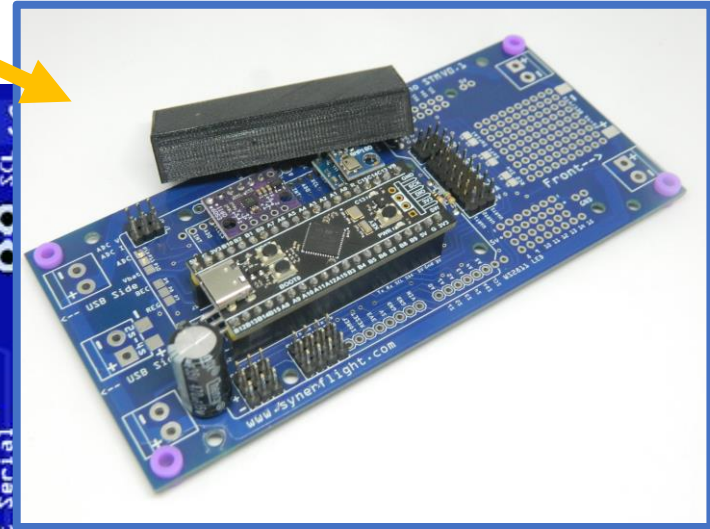
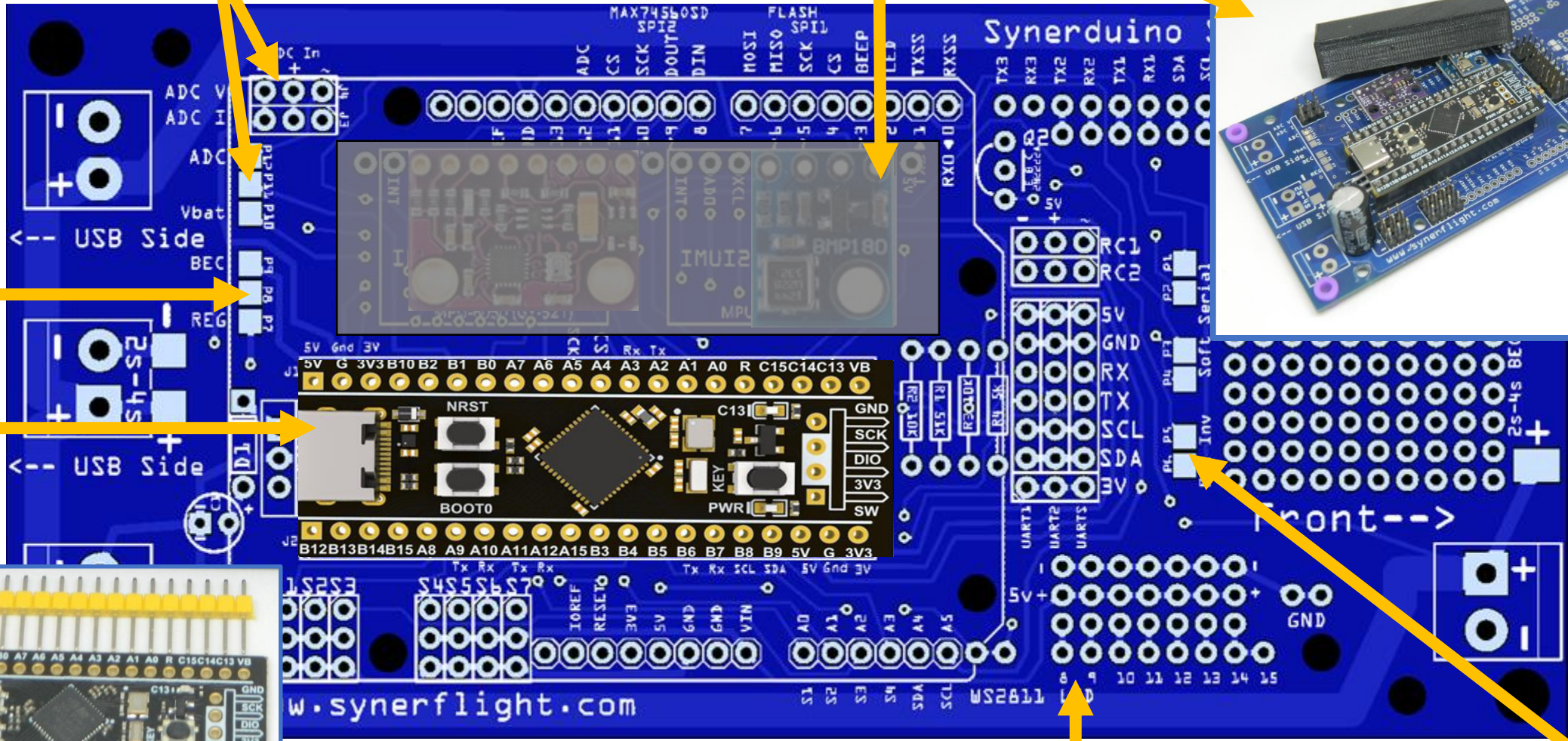
Board Preparations

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

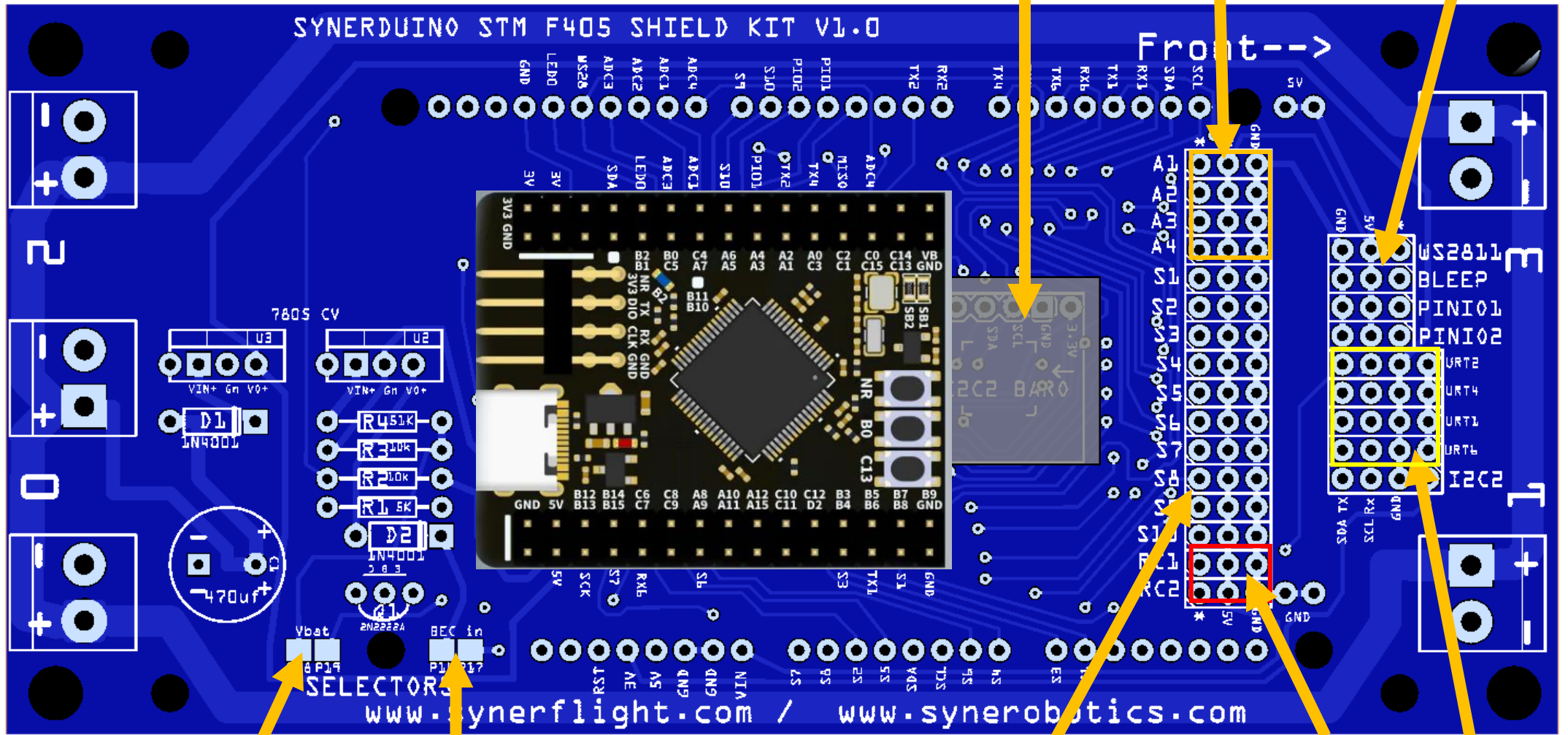
RC2 inverted Sbus signal
For those using PWM to SBUS converter

STM32F405

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

WS2811 & I/O

ADC input headers



ADC and Battery Monitoring

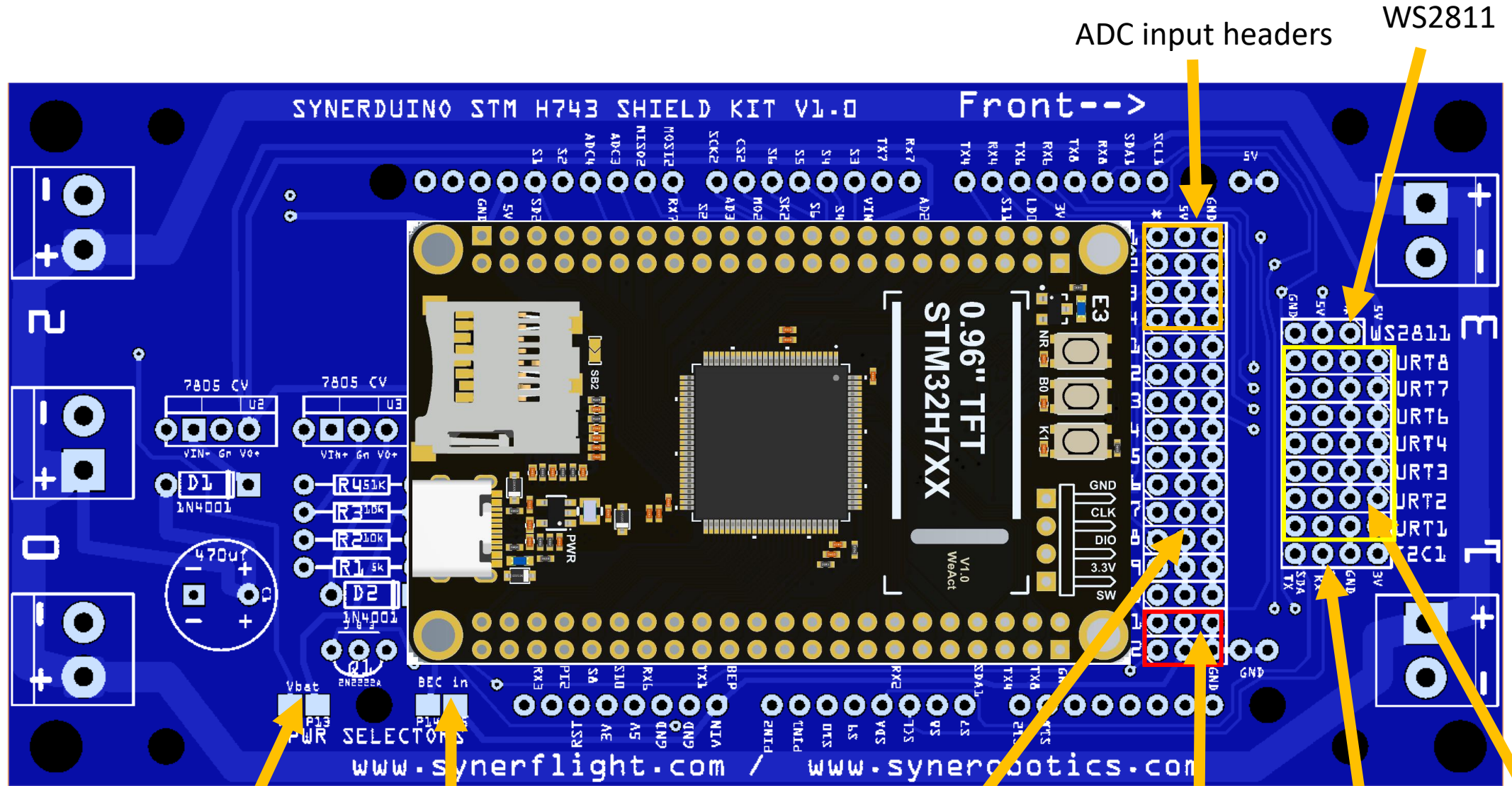
UBEC /Regulator Selection Pads

PWM output headers

RC1 & RC2

UART headers

STM32H743



ADC and Battery Monitoring

UBEC /Regulator Selection Pads

PWM output headers

RC1 & RC2

i2C Headers

UART headers

ADC input headers

WS2811

Selector Pads F411

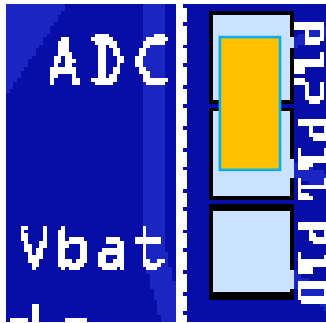
To Select two adjacent pads must be shorted with a solder blob



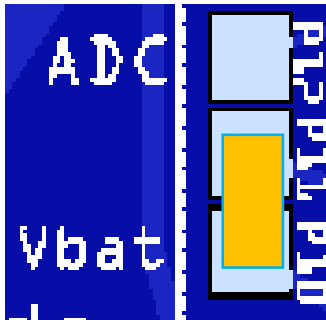
P9-P8 : BEC –this is use if you have a BEC powering through the ESC w/UBEC or an Standalone UBEC or Buck Converter Plug into S2 Pin **BEC input is 5V**



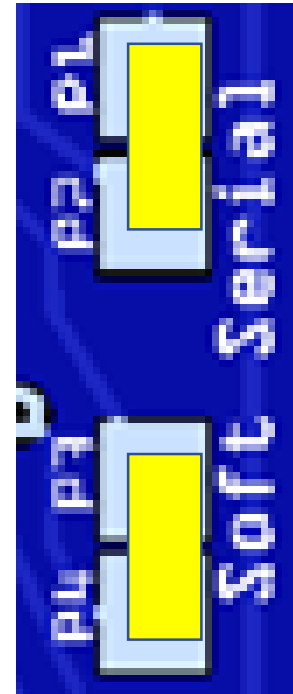
P8-P7 : REG –this is use if you just Run basics to power just the main drone board , GPS , Telemetry and Receiver



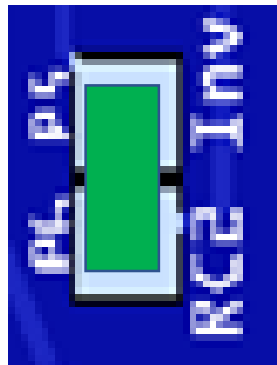
P12-P11 ADC Sensor Input



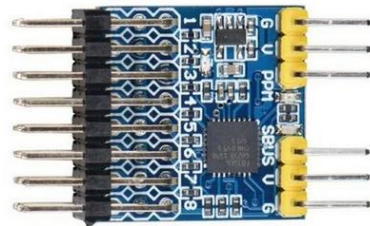
P11-P10 ADC Voltage Monitoring input



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

Selector Pads F405 & H743

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



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 Onboard Regulator



Default ADC1 input

P18-P19 ADC activate Battery monitoring

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



Selectable UART for RC RX

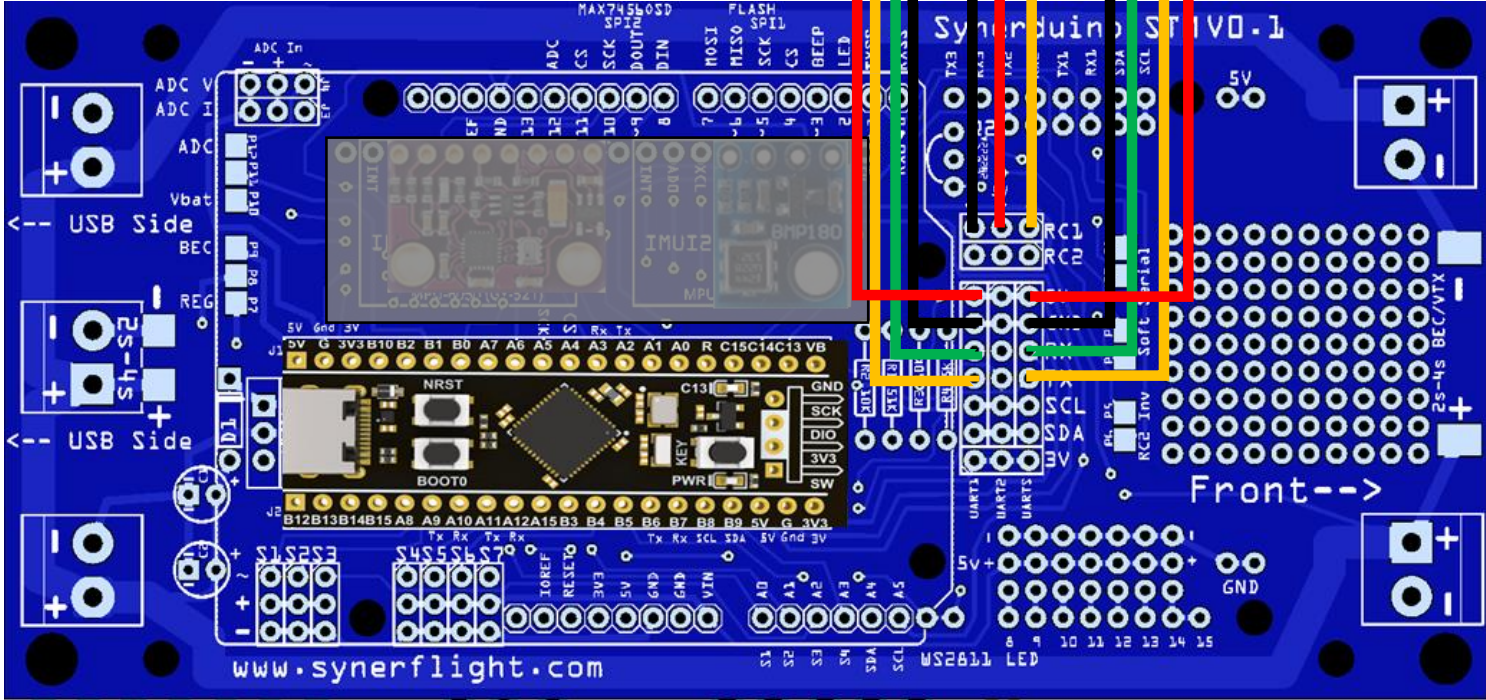
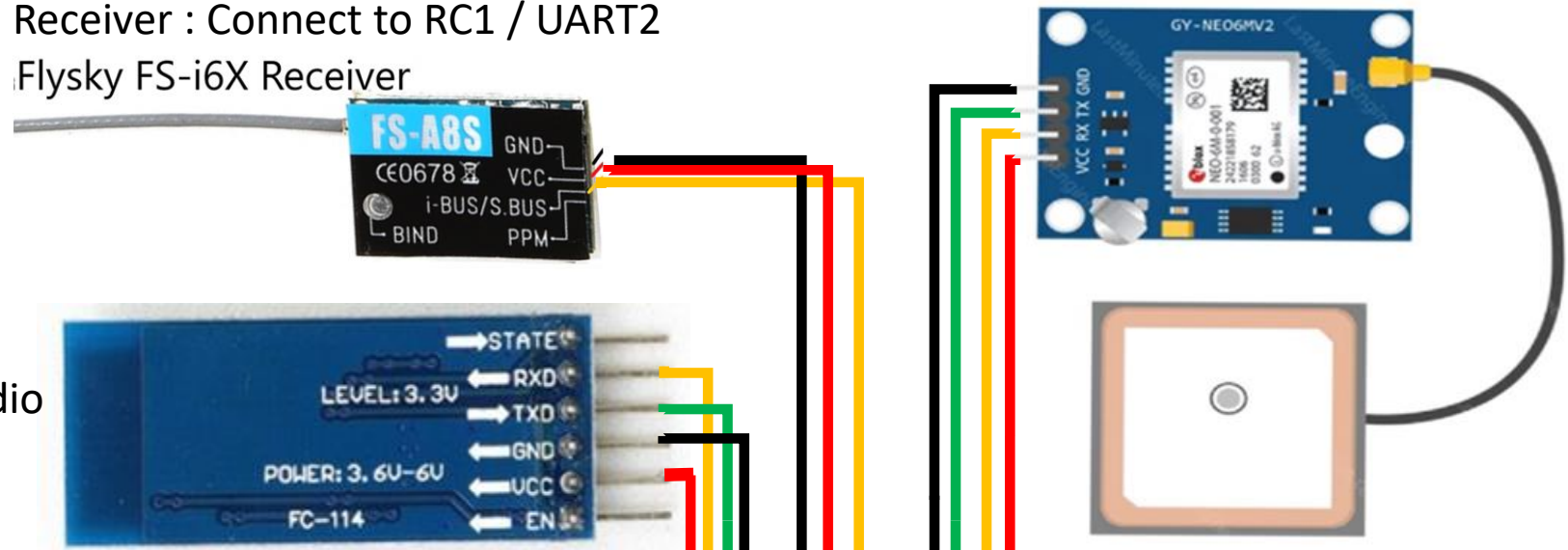
UART Serial Devices

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



STM32F411

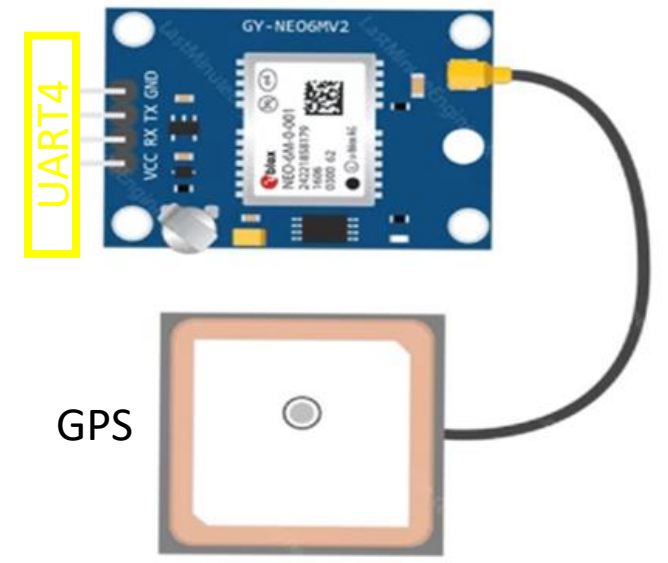
UART Serial Devices

AS if INAV5 and INAV6 its Required Receiver supports SBUS Serial

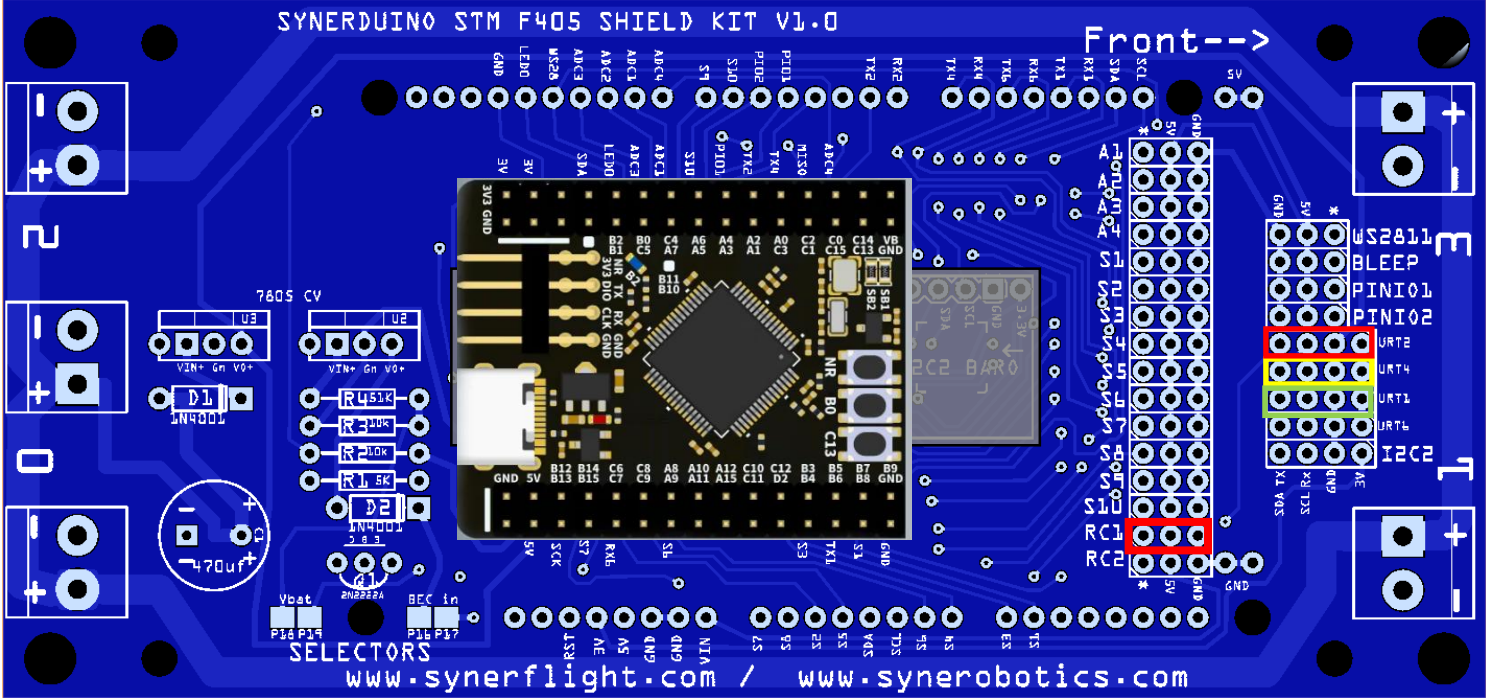
Receiver : Connect to RC1 / UART2
Flysky FS-i6X Receiver



Bluetooth/Serial Radio

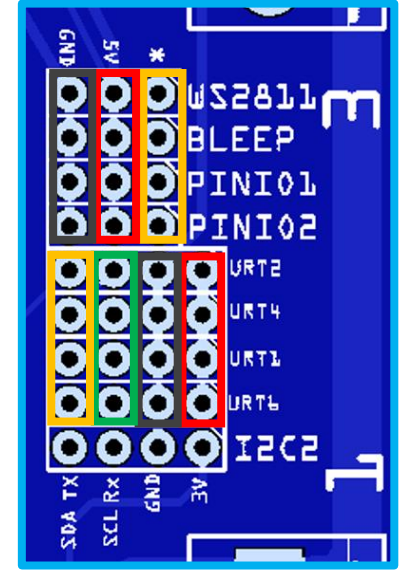


GPS



STMF405

V+ Gn Dat



TX RX Gn V+

Check connection Polarity

UART Serial Devices

AS if INAV5 and INAV8 its Required
Receiver supports SBUS Serial

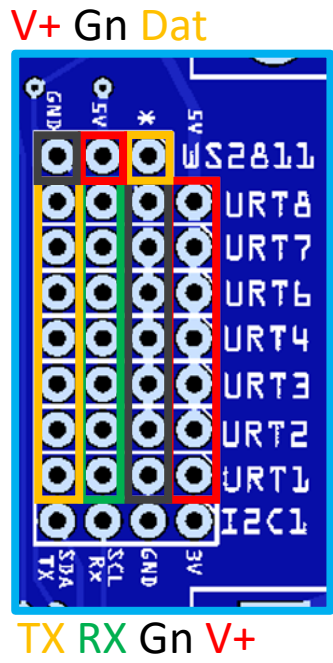
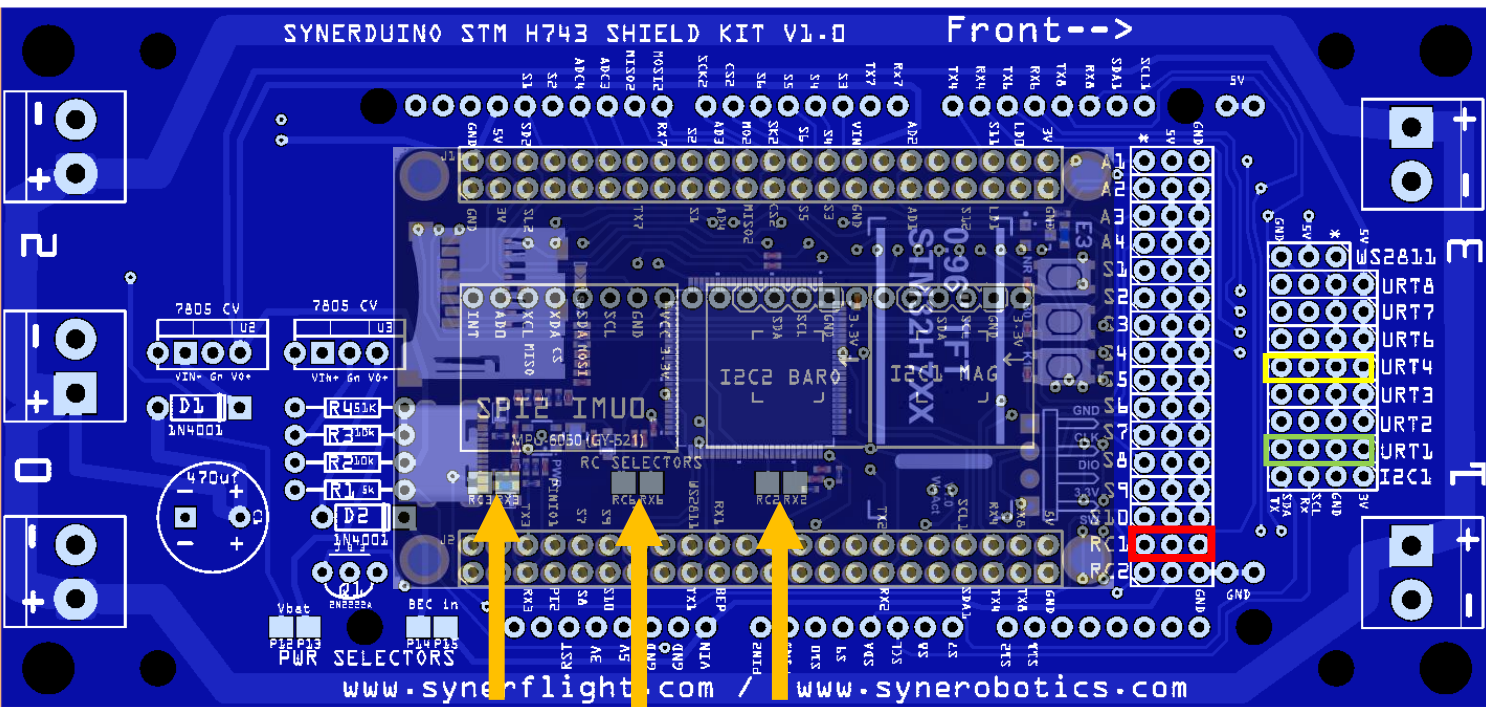
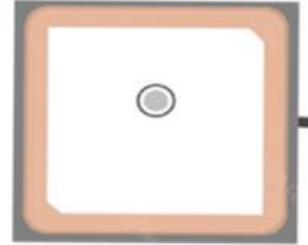
Receiver : Connect to RC1 / UART2
Flysky FS-i6X Receiver



Bluetooth/Serial Radio



GPS



Check connection Polarity

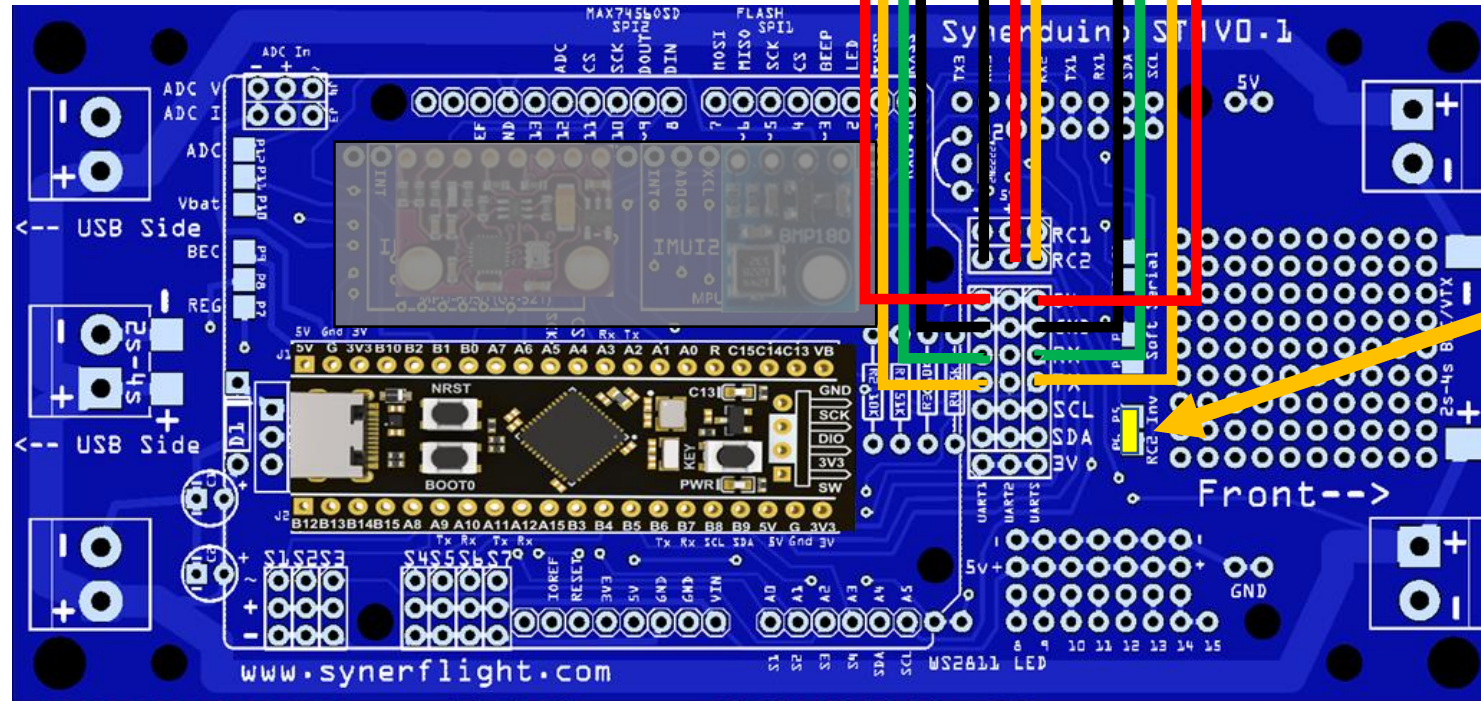
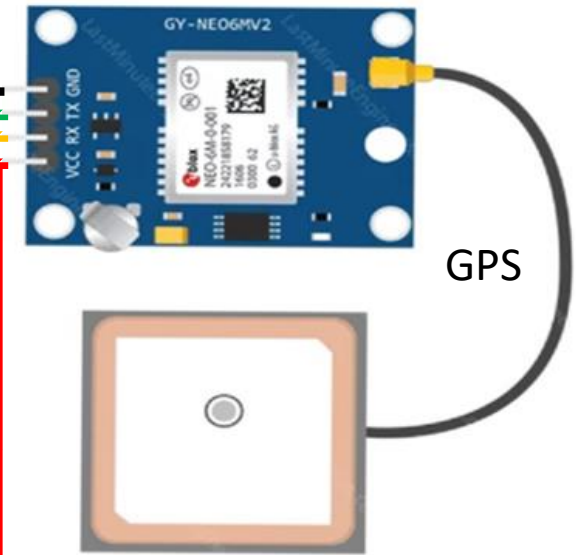
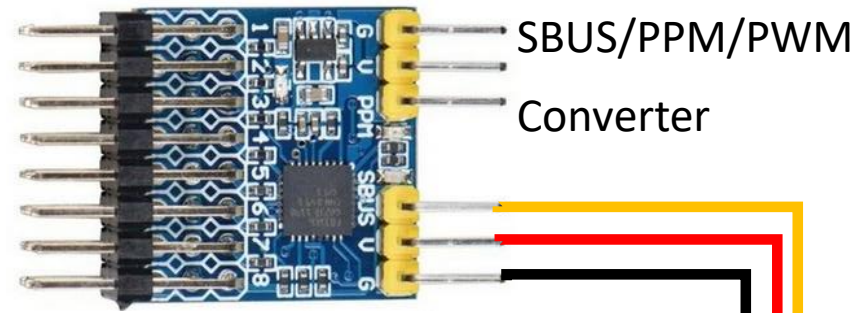
STMH743

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

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

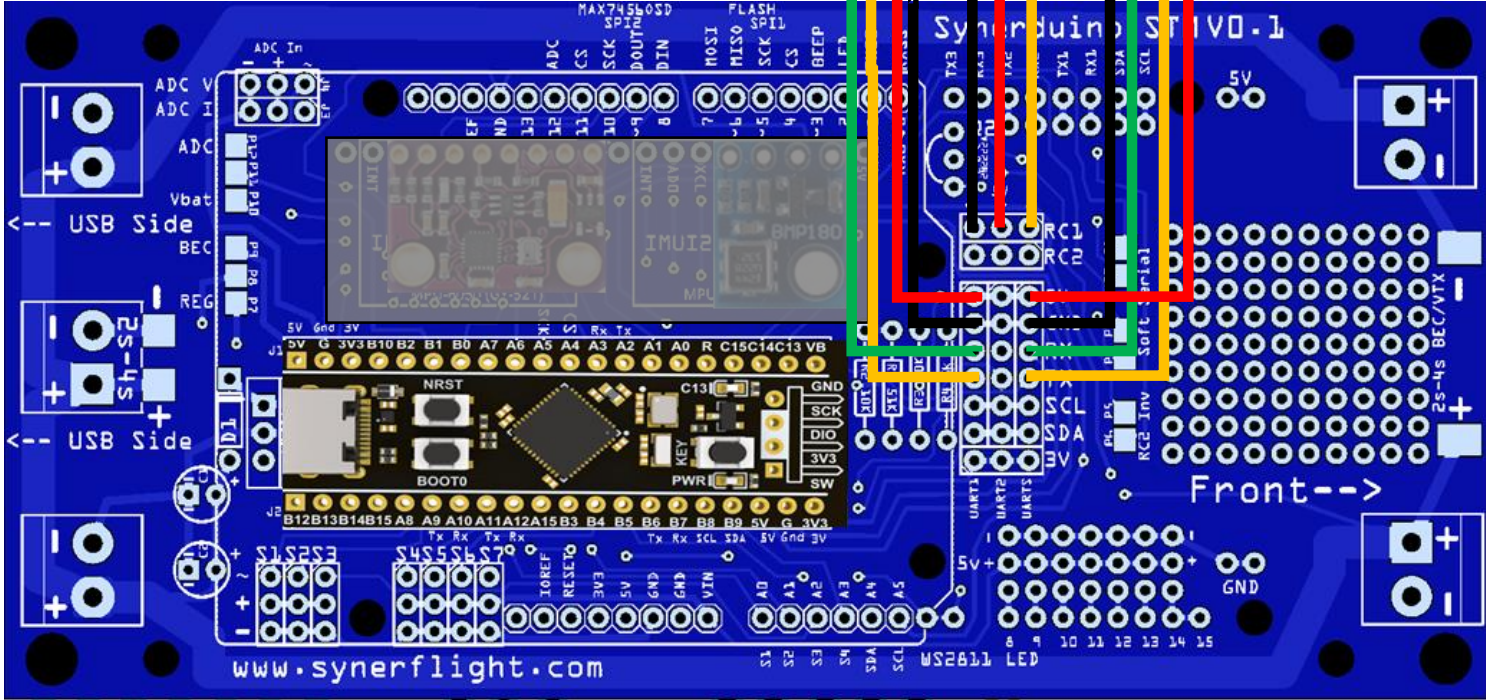
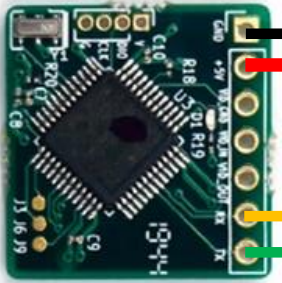


Mavlink OSD module

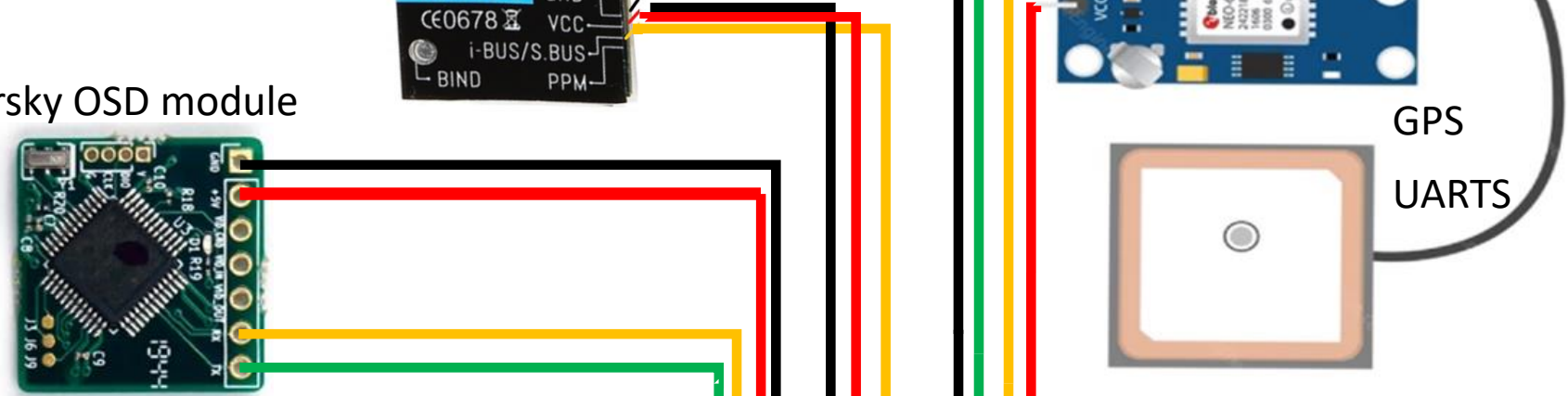
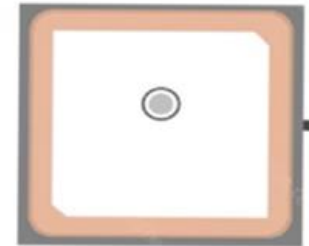
Flysky FS-i6X Receiver



Frsky OSD module



GPS
UARTS



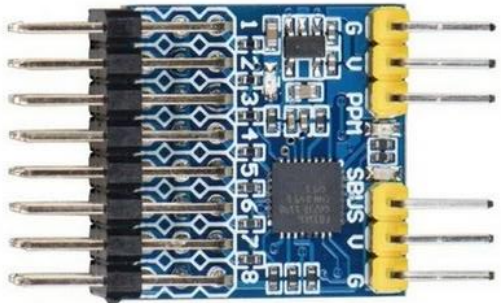
UART Serial Devices

AS if INAV5 and INAV8 its Required
Receiver supports SBUS Serial



Frsky OSD module

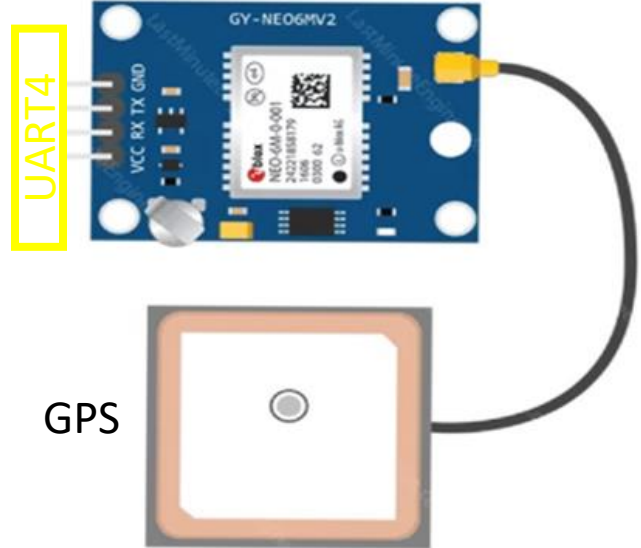
Mavlink OSD module



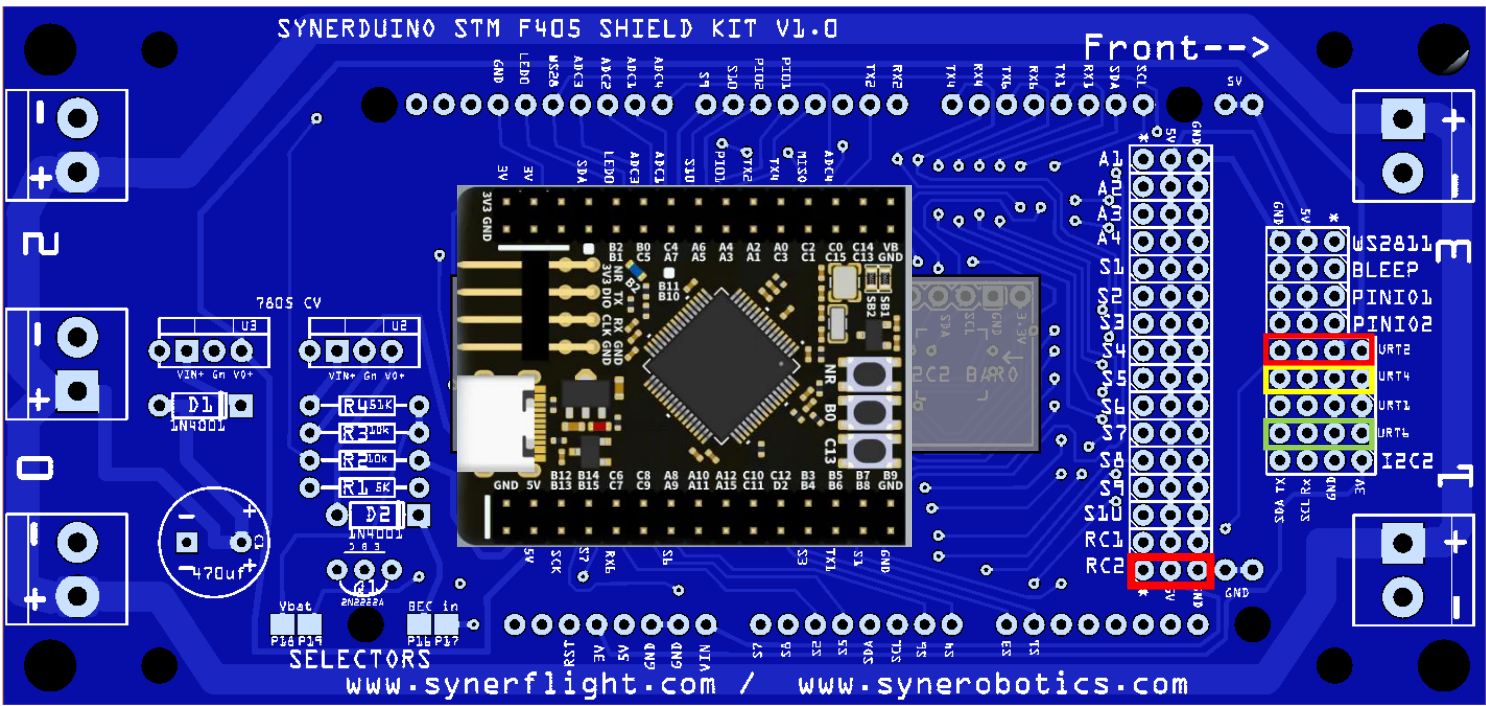
RC2



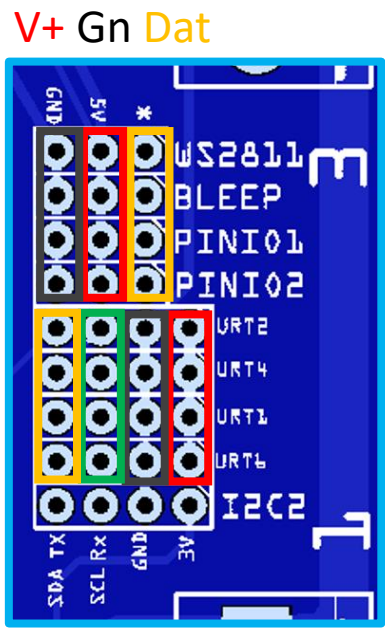
UART6



GPS



STMF405

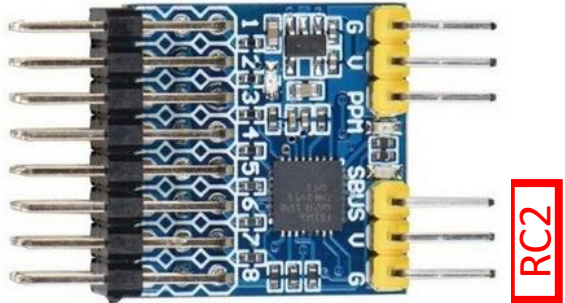


TX RX Gn V+

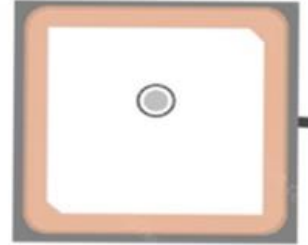
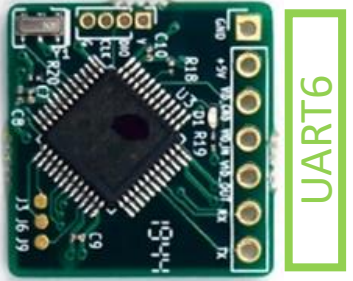
Check connection Polarity

UART Serial Devices

AS if INAV5 and INAV6 its Required Receiver supports SBUS Serial

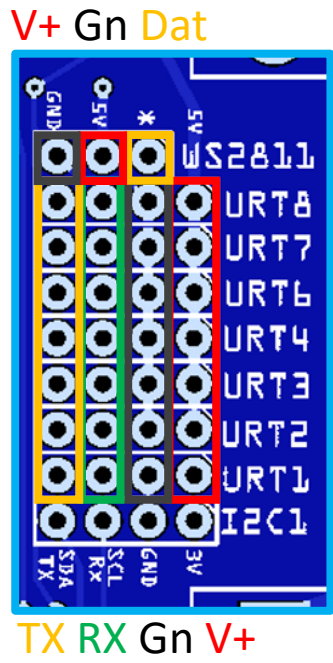
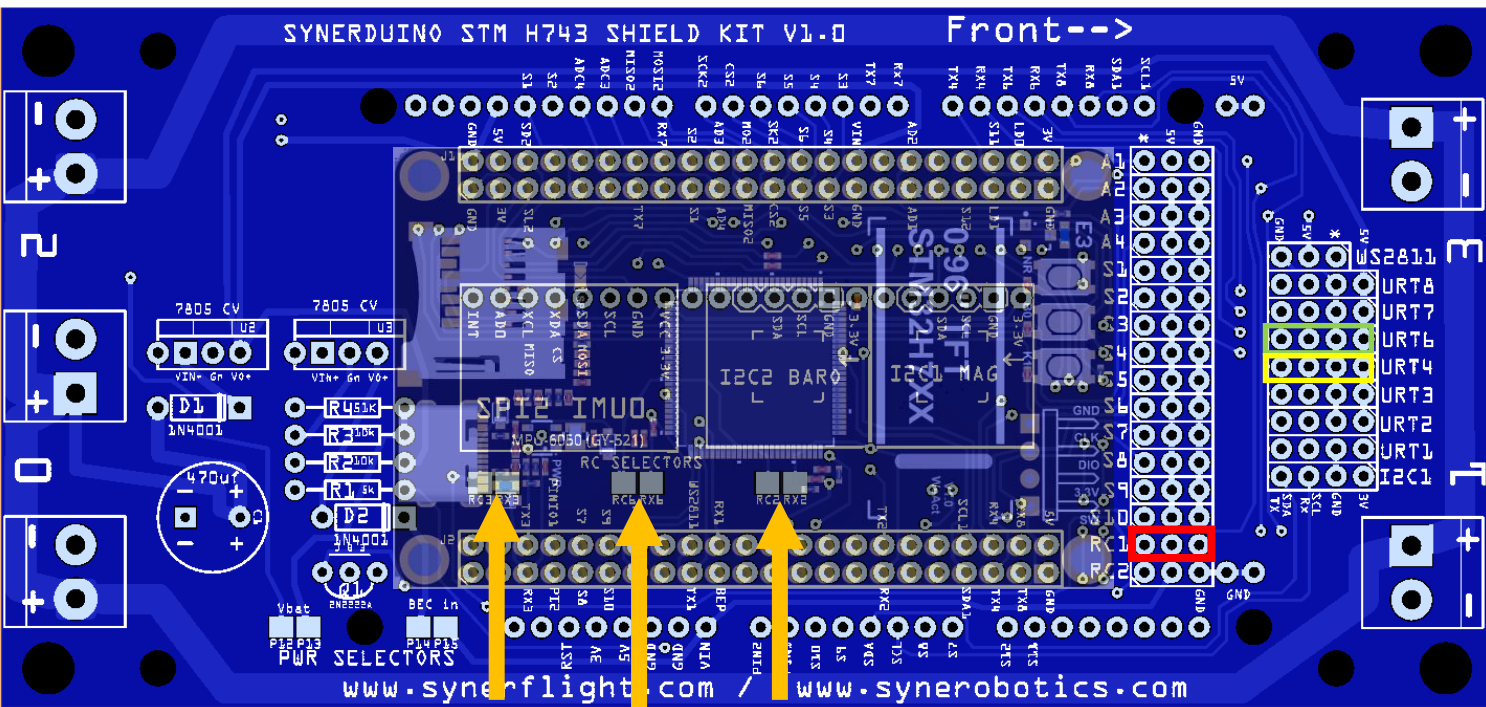


Frsky OSD module



Mavlink OSD module

GPS



Check connection Polarity

STMH743

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

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

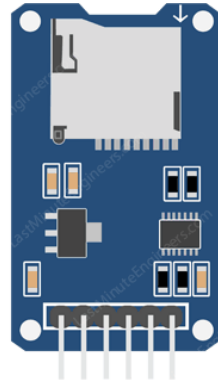
4GB , FAT32 Format

Some SD cards have compatibility issue.

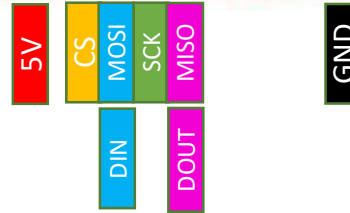
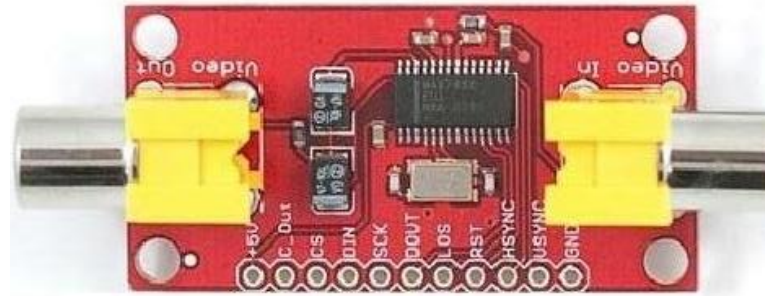
Check if other brands do work

SAMSUNG microSD EVO plus(Red) is recommended

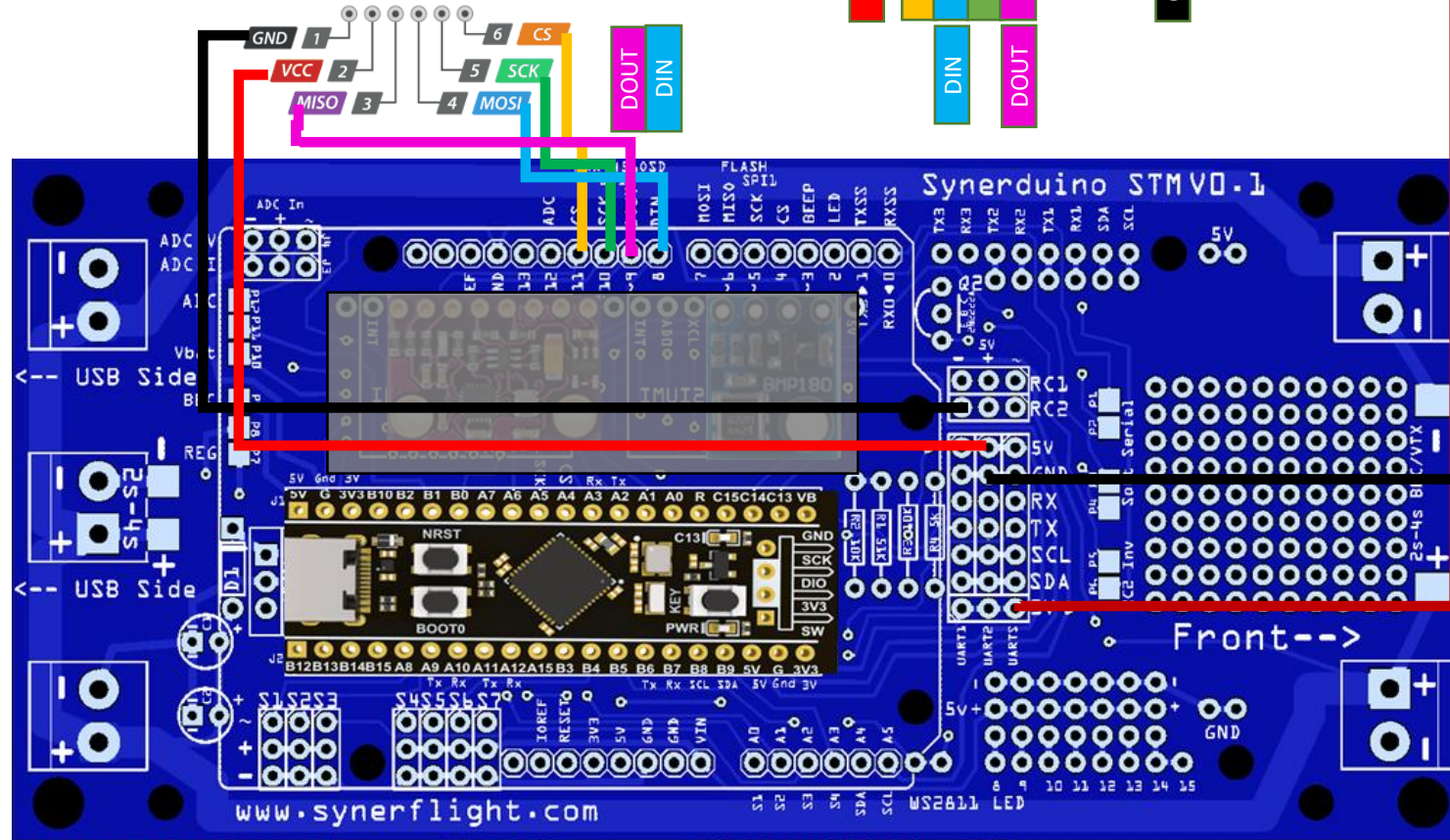
SD Card Reader



MAX7456 OSD



W25QXX Flash



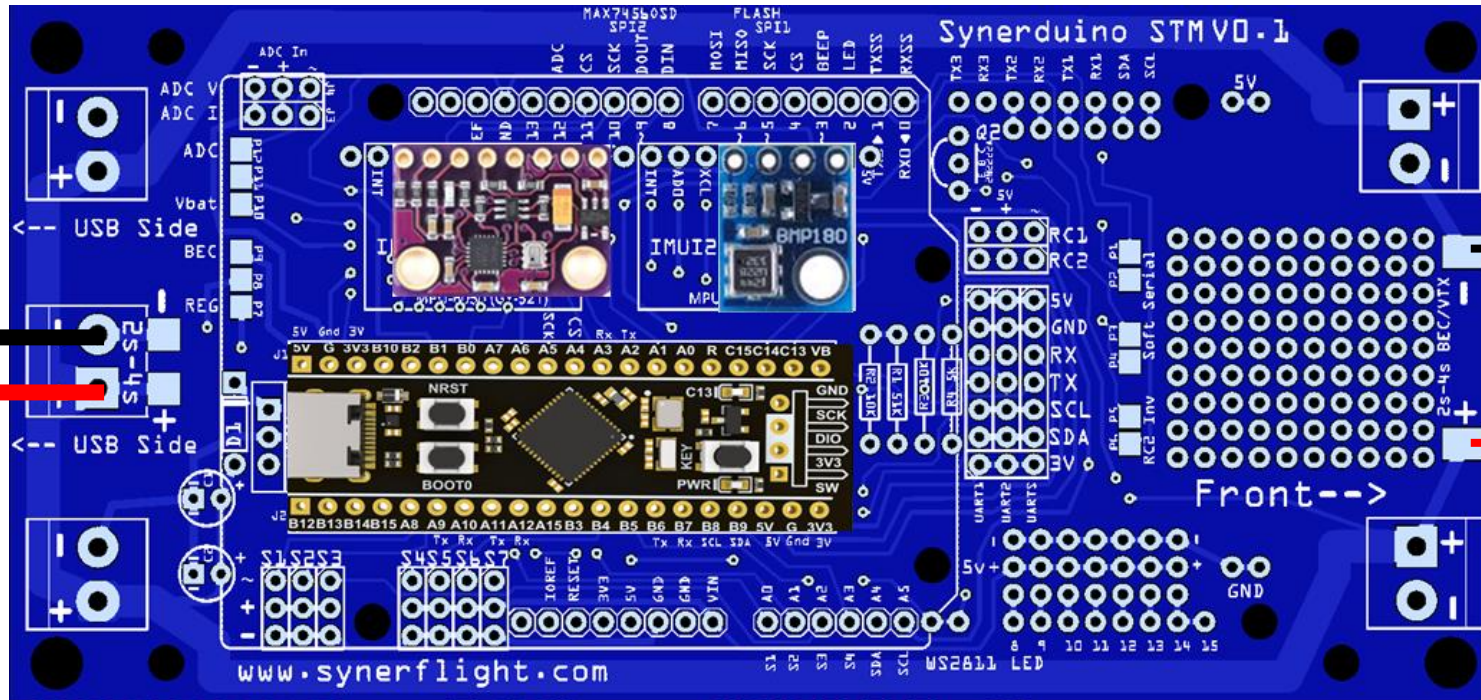
FPV Standalone

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

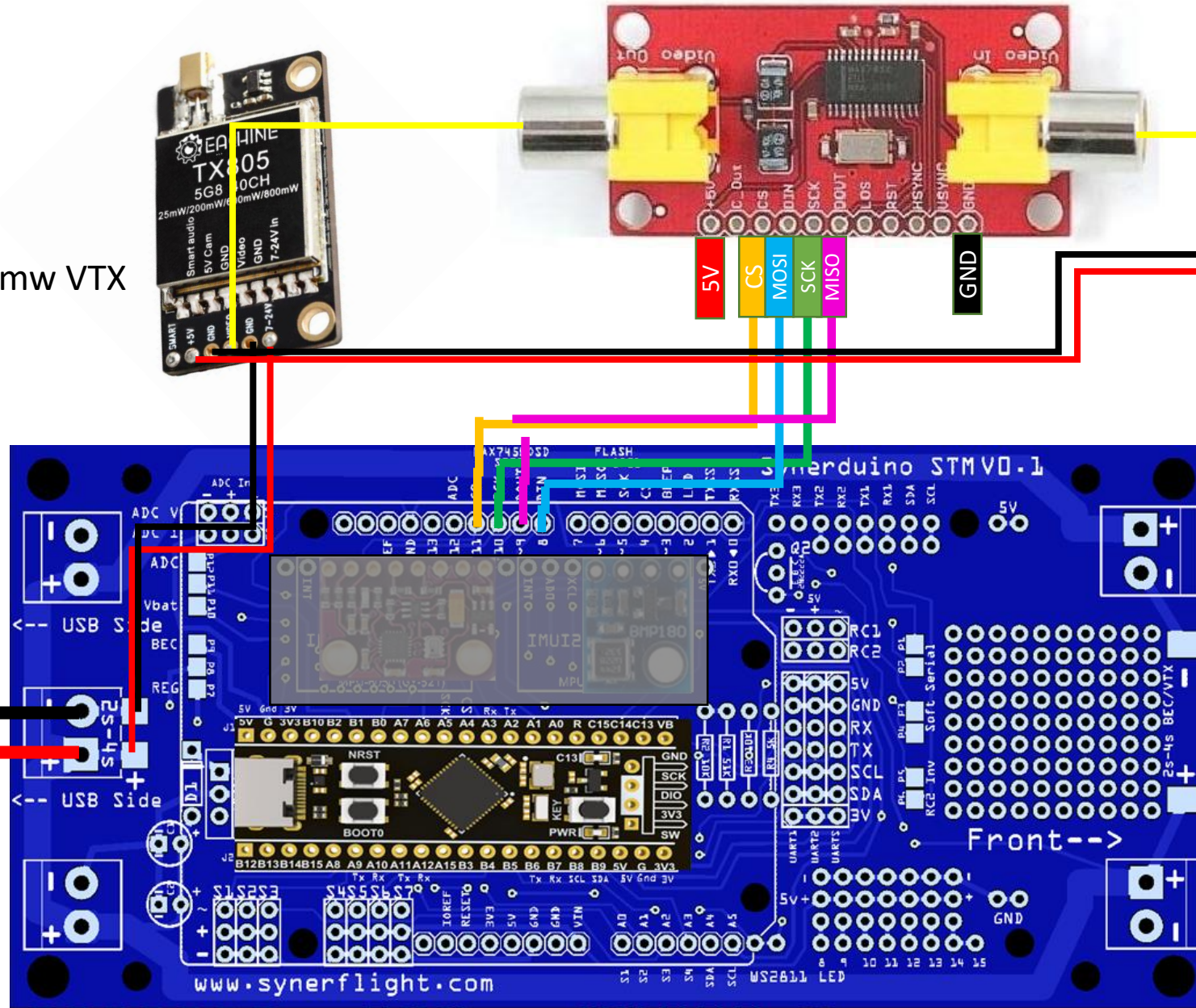
MAX7456 OSD

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

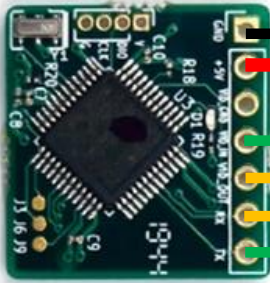


Power Pads is selected to BEC to use external BEC

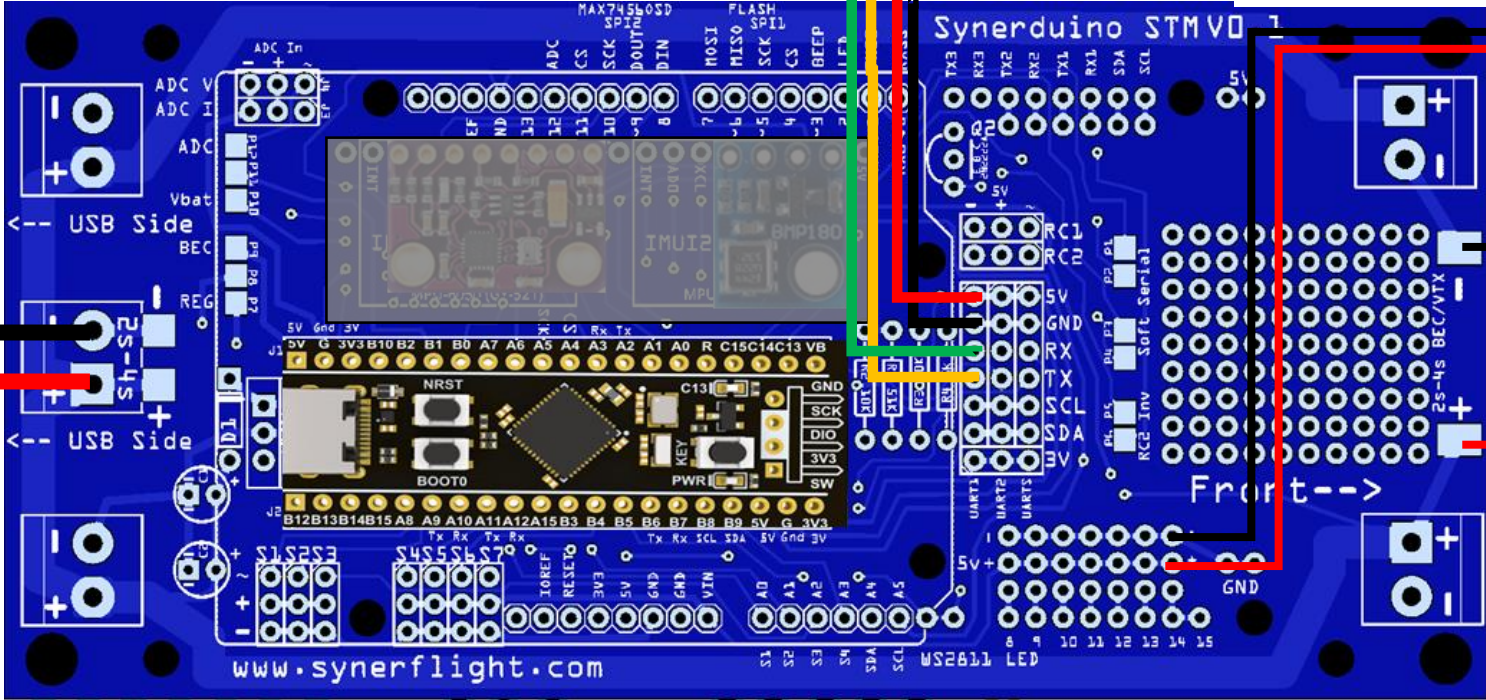
Battery 3s or 4s

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

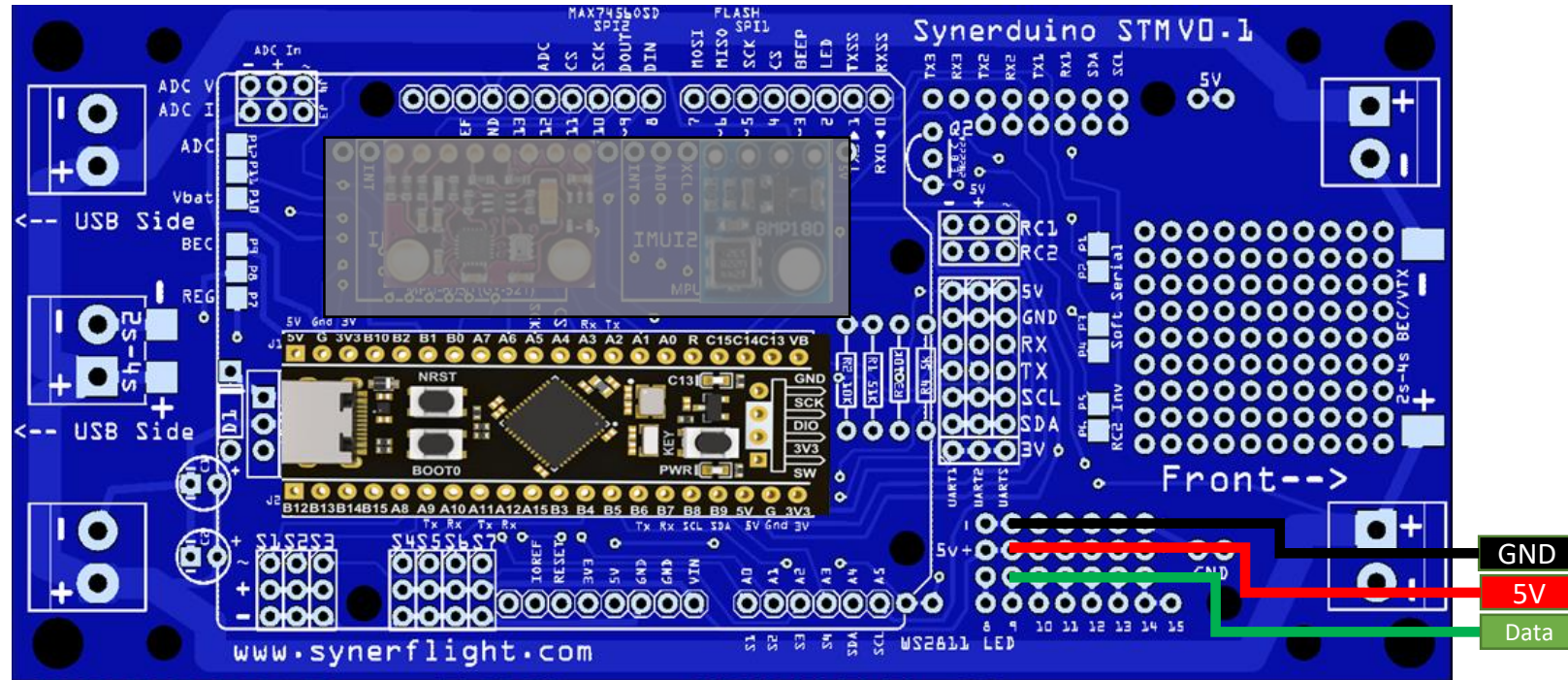
GND

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

Accessible on Pin 8 & 9

This also requires 3 Timers

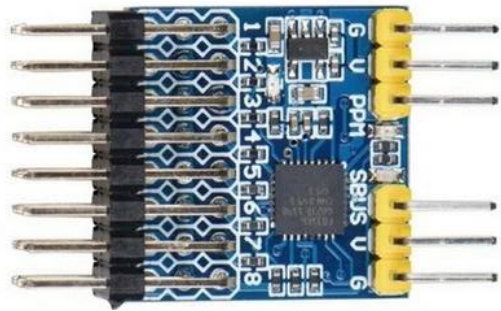
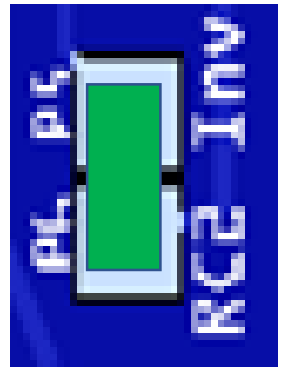
When activated only 5 PWM pins can be use for Motor/Servo



RECEIVER TYPES



PPM AND PWM RECEIVER



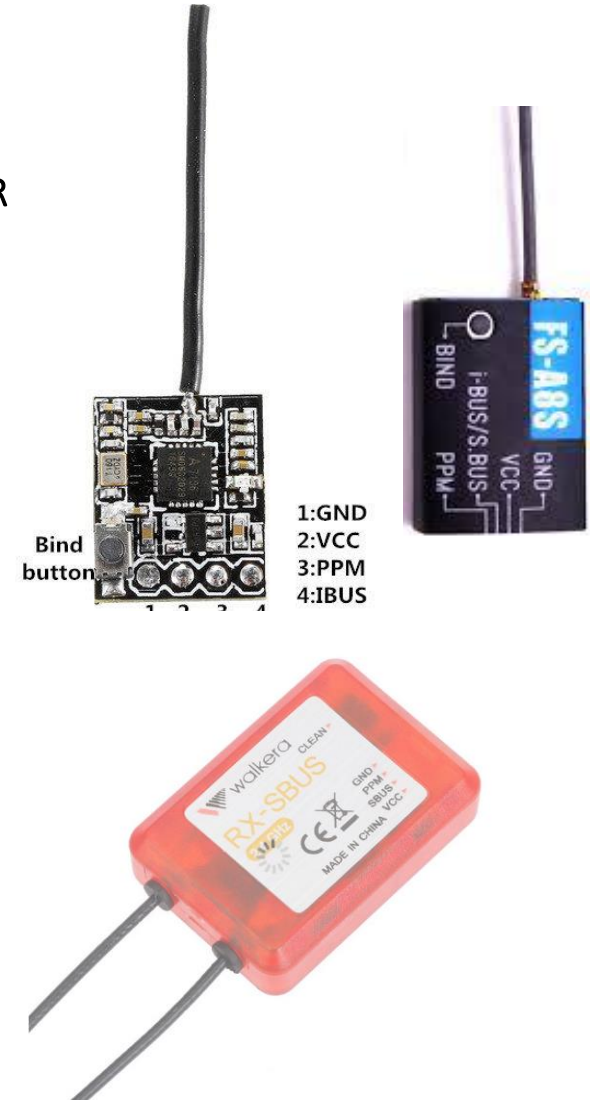
PWM/PPM/SBUS CONVERTER

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

COMPATIBLE RECEIVER

- CRSF
- FBUS
- FPORT
- FPORT2
- GHST
- IBUS
- JETIEXBUS
- MAVLINK
- SBUS
- SBUS_FAST
- SPEK1024
- SPEK2048
- SRXL2
- SUMD

SERIAL RECEIVER



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

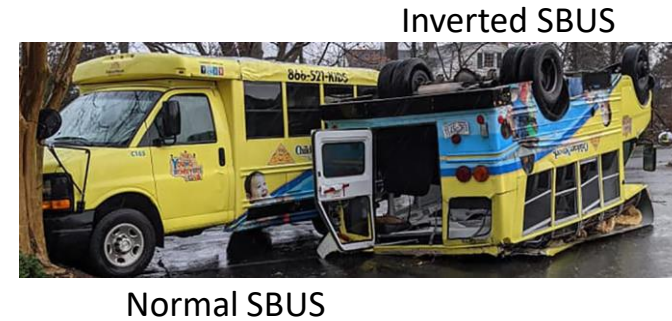
INAV like most modern Flight controllers now Supports Sbus to reduce the number of wires in build its advice to use Sbus Receiver for Synerduino STM as well

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

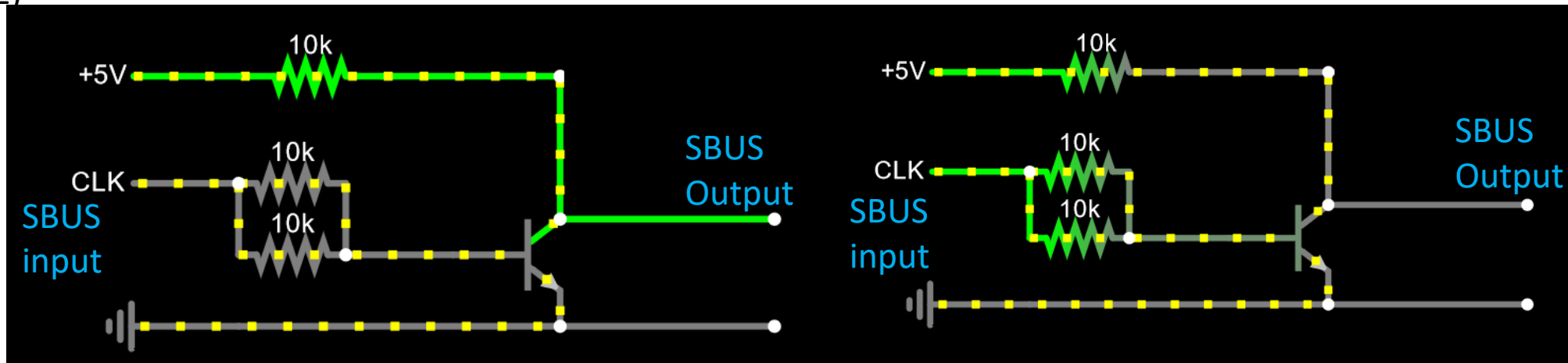
SBUS inversion depending on the Brand of Receiver or the PPM/PWM/SBUS Converter you have the SBUS signal can come as Forward Signal or Reverse Signal . This is crucial in getting a Good Receiver connection to the Synerduino STM

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

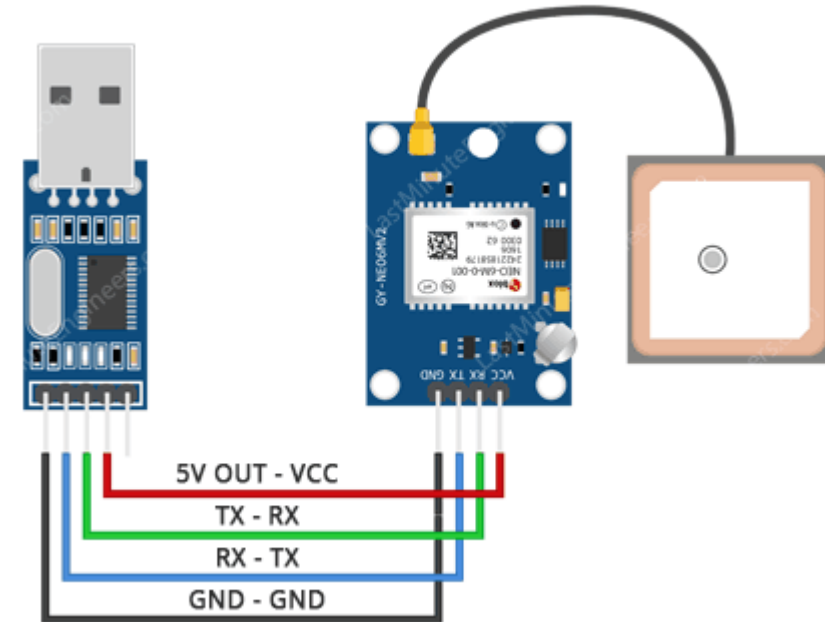
ublox



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

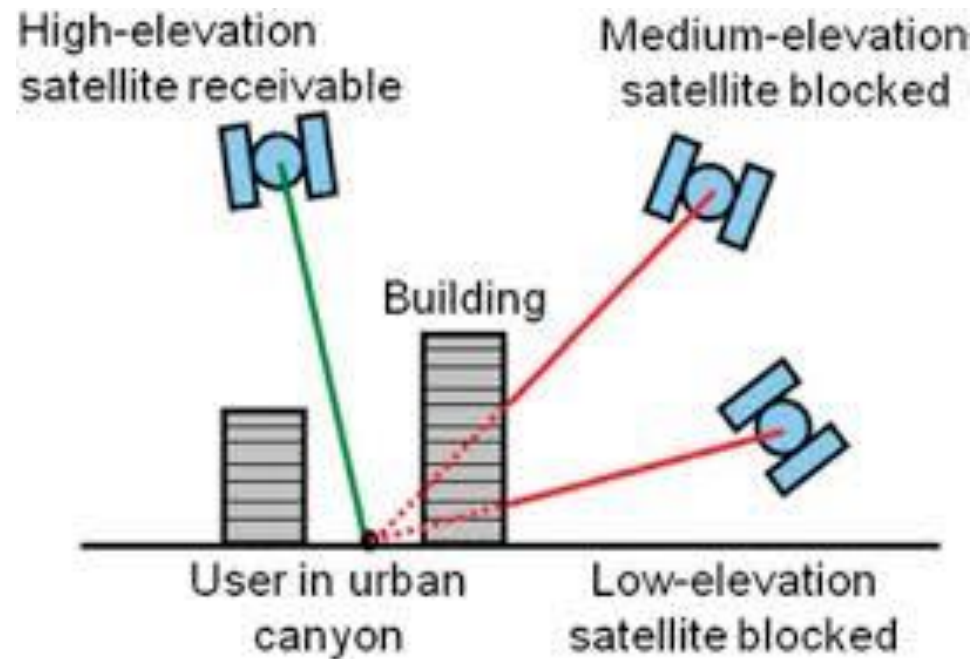


Pin Description:

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)

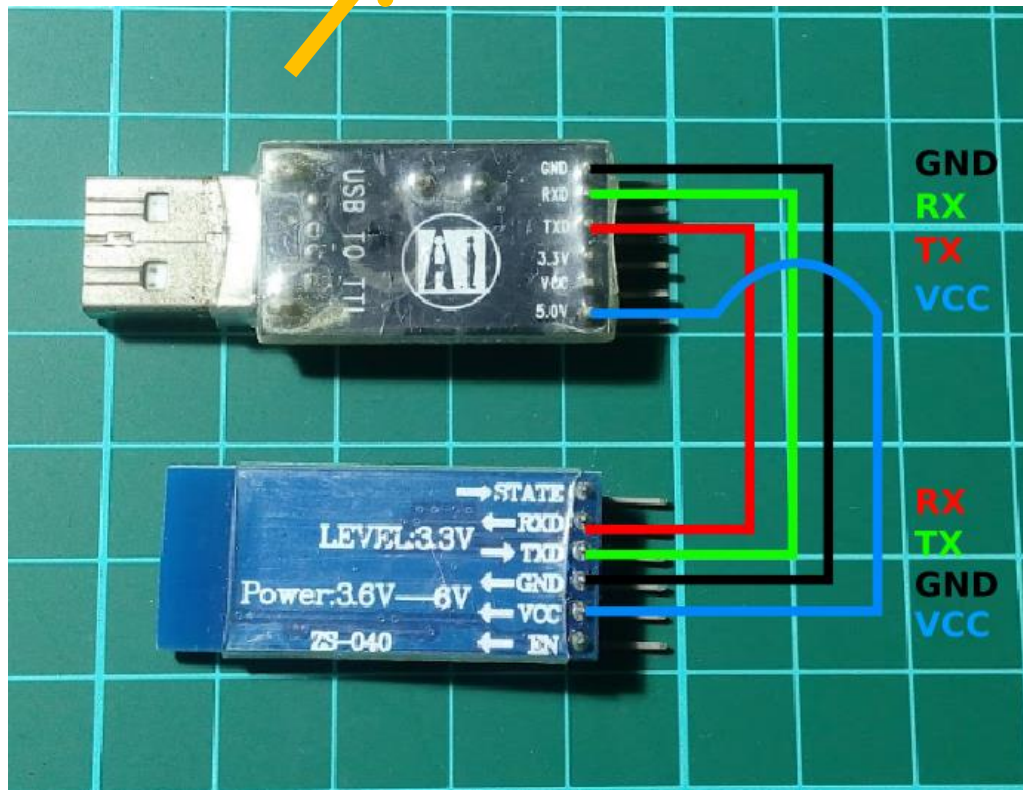
AT+NAME=Change name (Synerduino)

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.

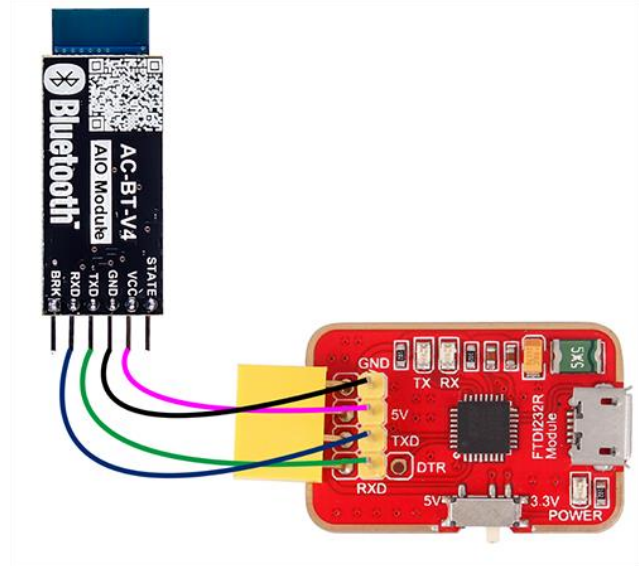
Example

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**

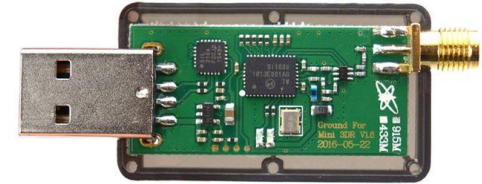
AT+ROLE**0**

SIK SERIAL RADIO

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

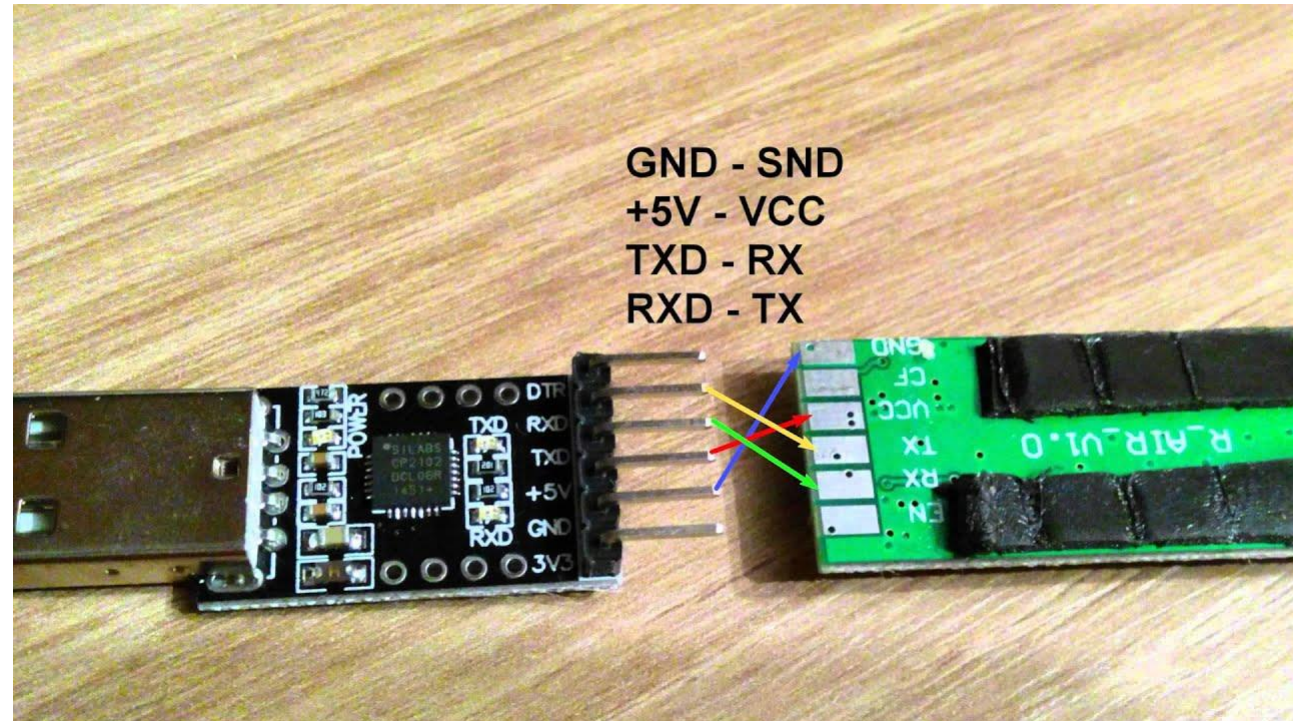


RadioTelemetry Air Module



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



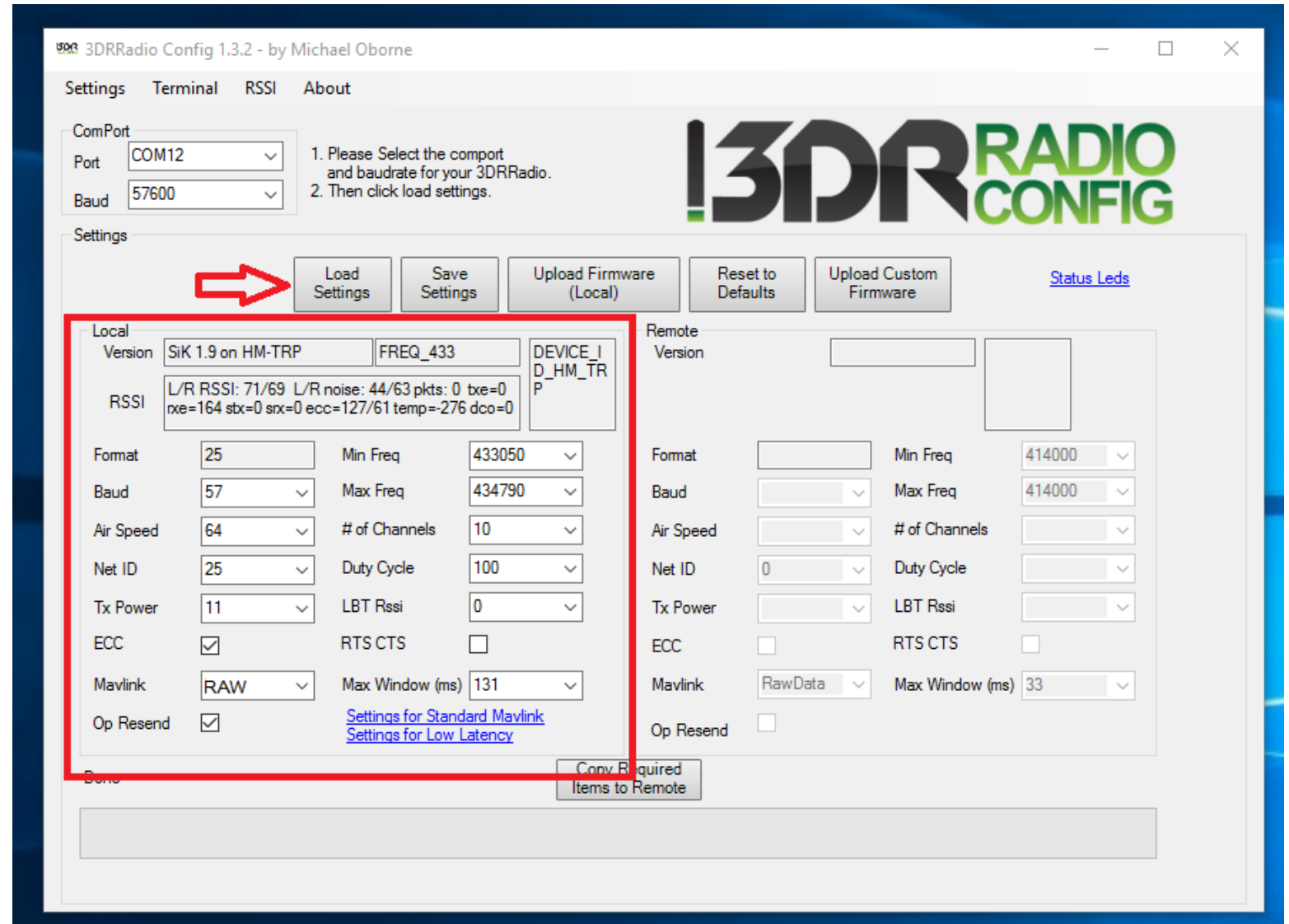
Manually configuring the telemetry kit for Synerduino uses the 3DR radio Config

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

Also available in the synerduino page

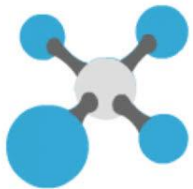
Both Vehicle and Ground station unit must have similar in the following

- 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)

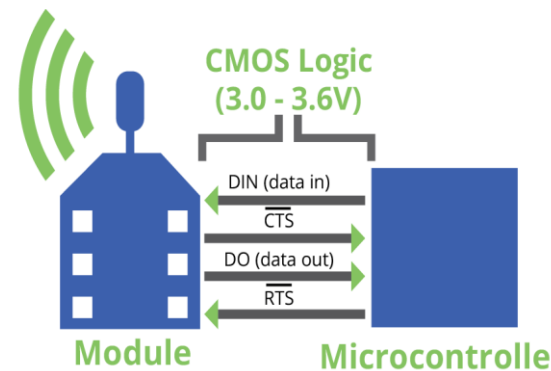
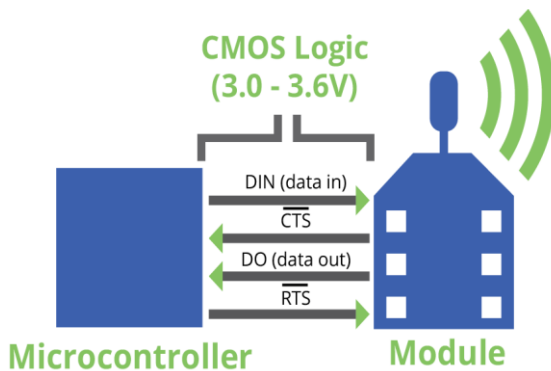




XBEE RADIO



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

[View Release Notes](#)

Force the module to maintain its current configuration. [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:

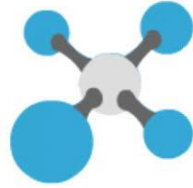
Product family	Function set	Firmware version
XB24-B	End Device - LTH	20A7 (Newest)
XB24-SE	ZigBee Coordinator API	20A0
XB24-ZB	ZigBee Coordinator AT	208C
	ZigBee End Device API	2070
	ZigBee End Device AT	2064
	ZigBee End Device Analog IO	2041
	ZigBee End Device Digital IO	2021

[View Release Notes](#)

Force the module to maintain its current configuration. [Select current](#)

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

GROUND STATION



XCTU



Radio Modules

Name:
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		

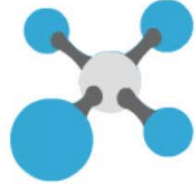
Addressing

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:
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)	✓	✗

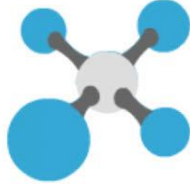
Sleep Modes

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:
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	

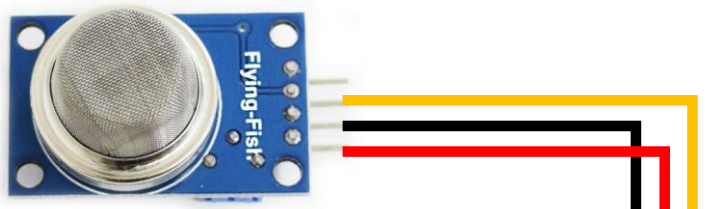
Addressing
Change addressing settings

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 Bvtes	54	



Battery Monitoring or ADC Sensor Devices F411

ADC External Sensor

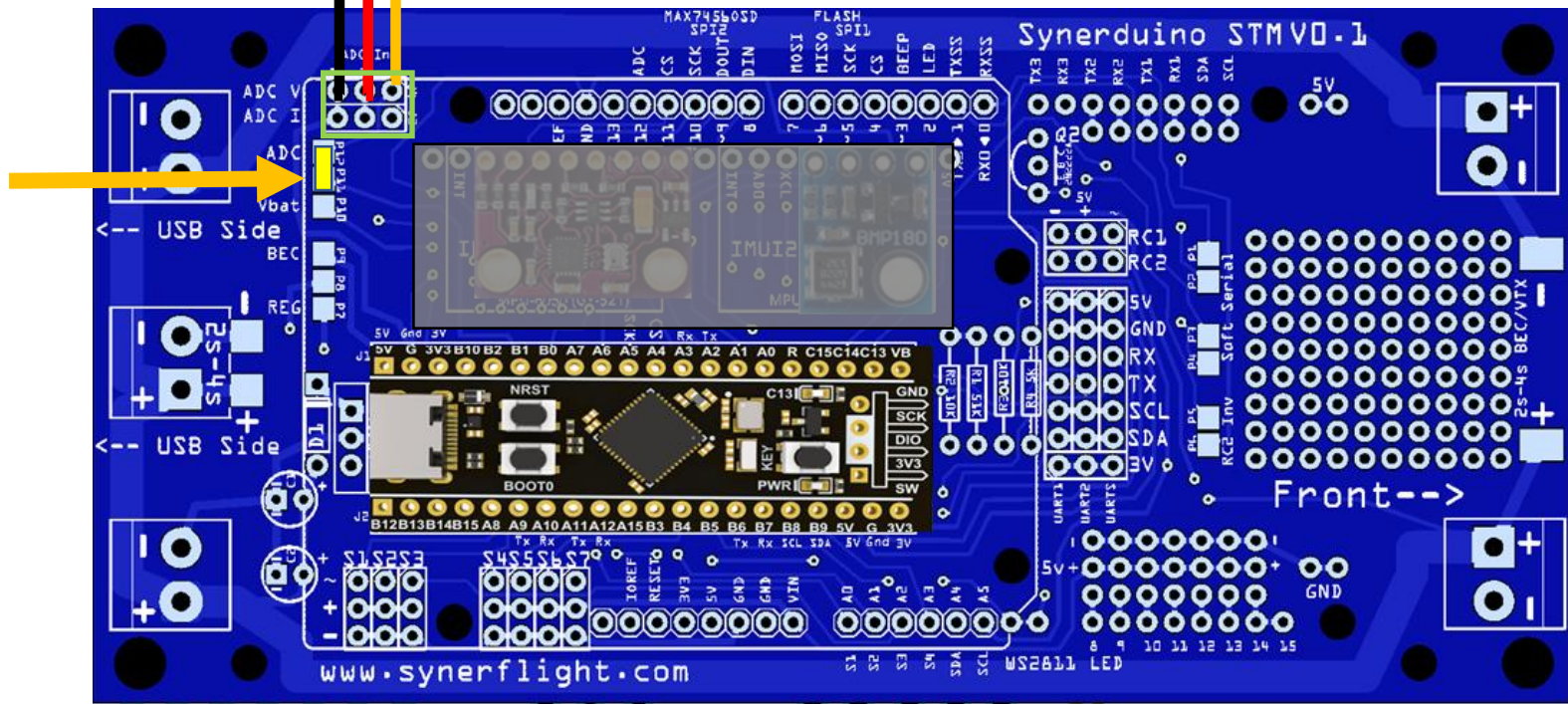


ADC 1 – Voltage 0V-5V
ADC 2 – Current 0V-5V

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

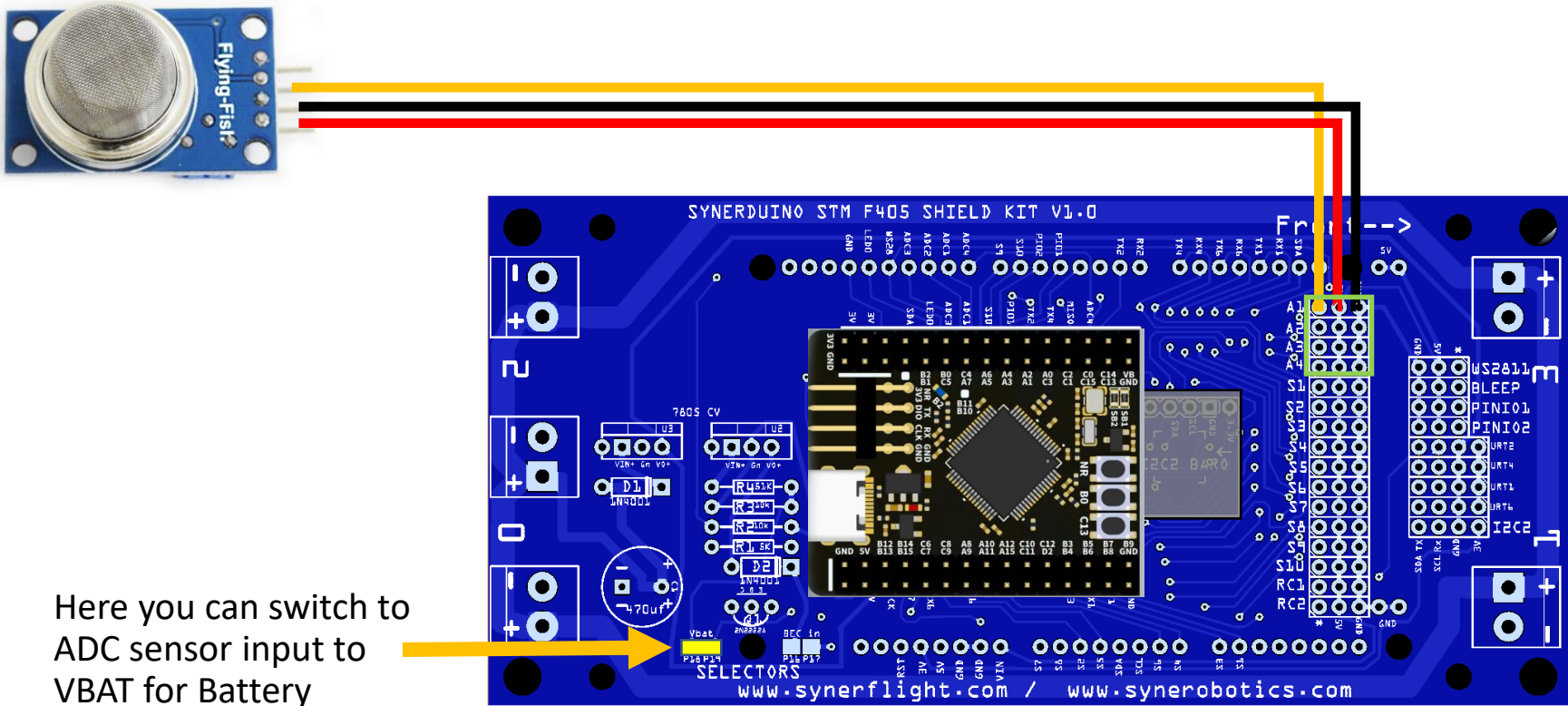
ADC V – Voltage 0-5V

ADC I – Current 0-5V



Battery Monitoring or ADC Sensor Devices F405

ADC External Sensor



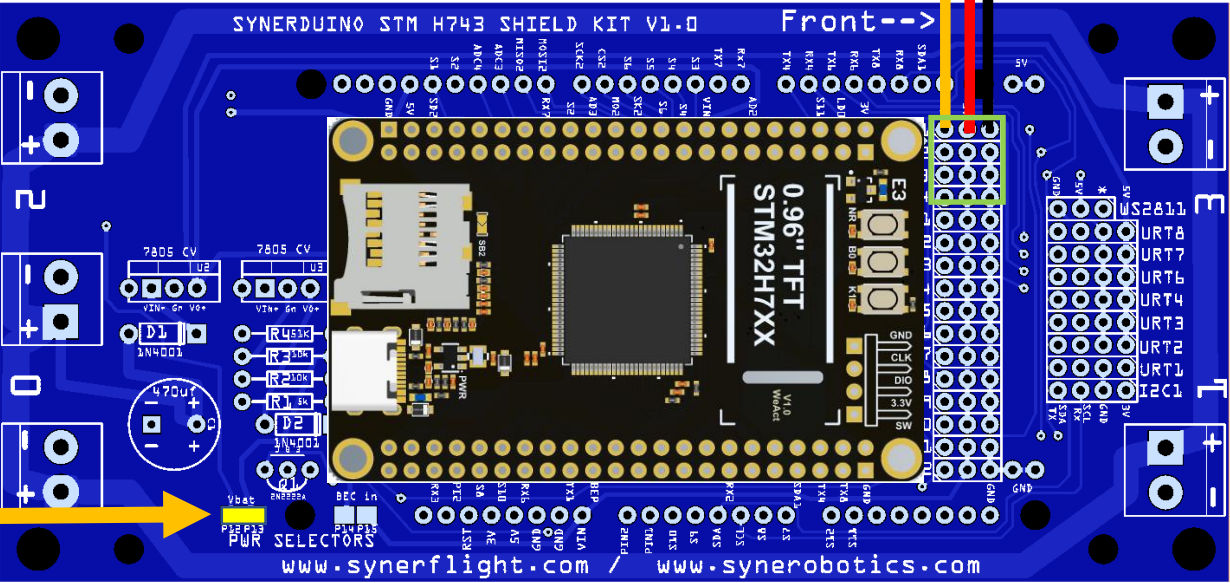
- ADC 1 – Voltage 0V-5V
- ADC 2 – Current 0V-5V
- ADC3 – RSSI
- ADC – 4 Airspeed

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

ADC V – Voltage 0-5V

Battery Monitoring or ADC Sensor Devices H743

ADC External Sensor



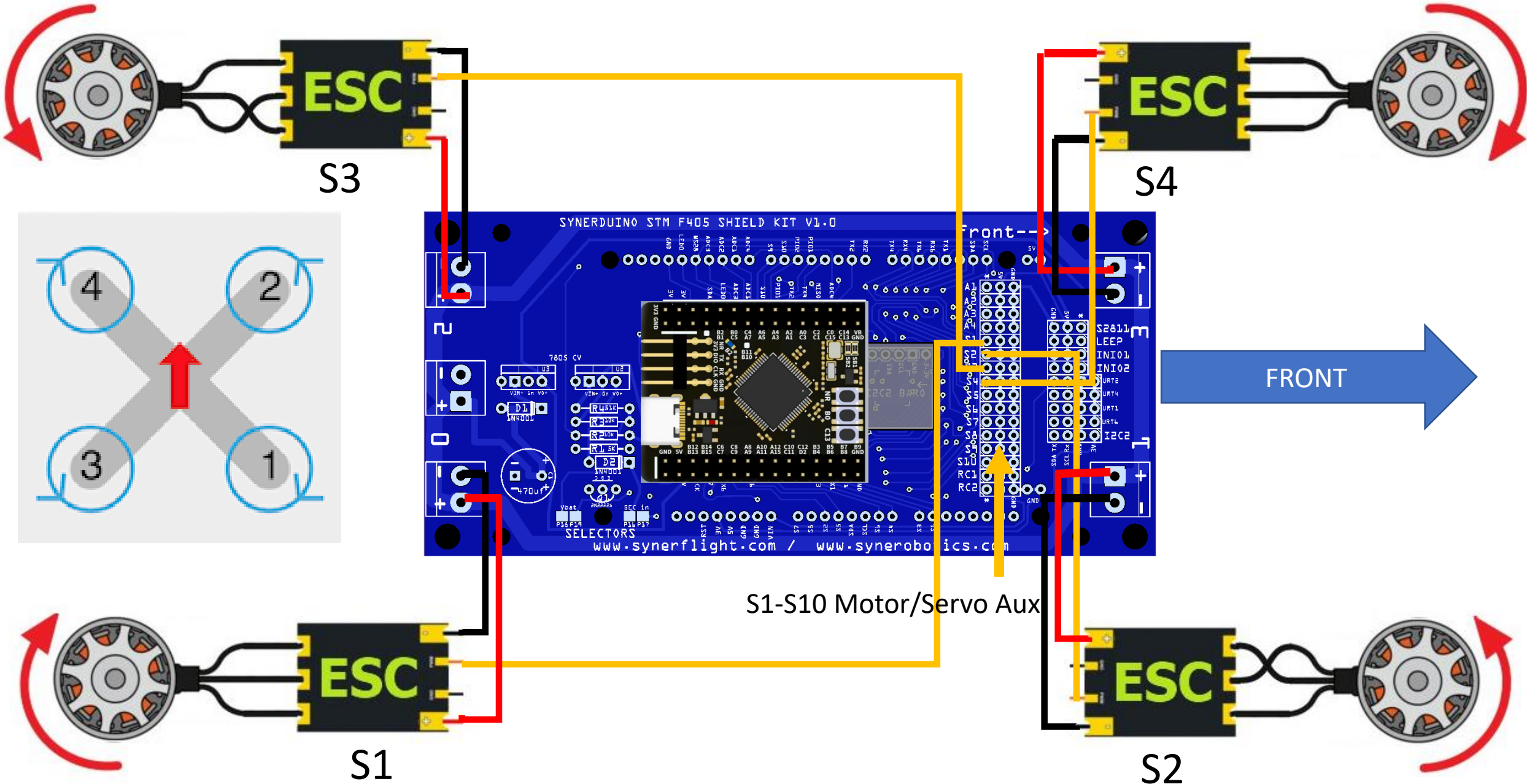
- ADC 1 – Voltage 0V-5V
- ADC 2 – Current 0V-5V
- ADC3 – RSSI
- ADC – 4 Airpseed

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

ADC V – Voltage 0-5V

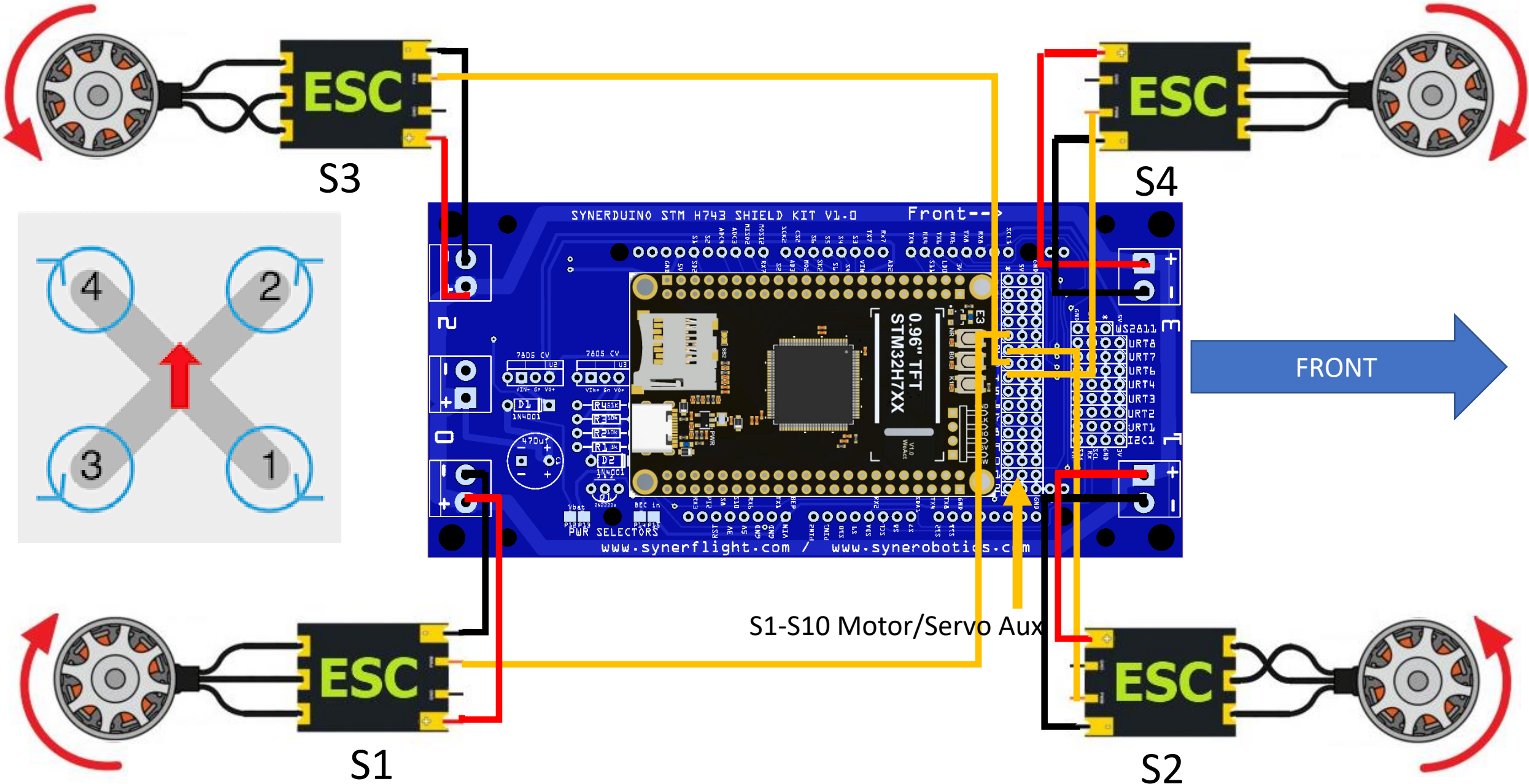
Multicopter Setup F405

See Mixing Tab - this may Vary depending on firmware and mixing



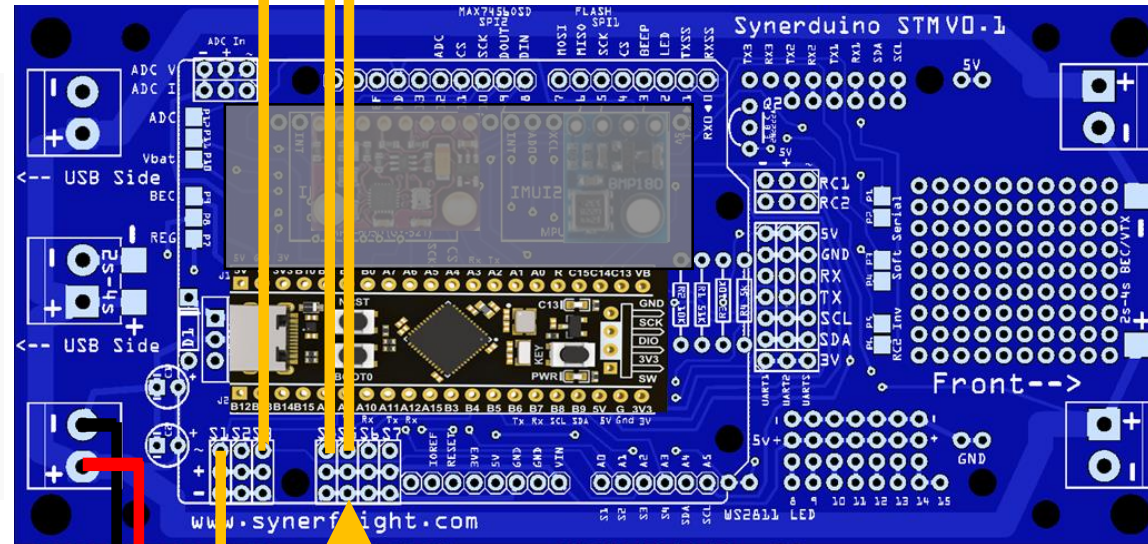
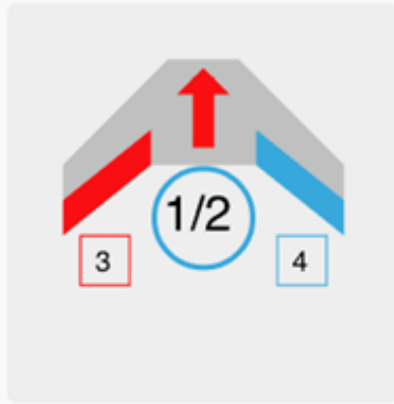
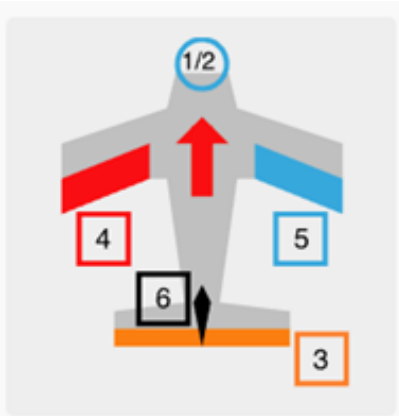
Multicopter Setup H743

See Mixing Tab - this may Vary depending on firmware and mixing



Fixwing Setup F411

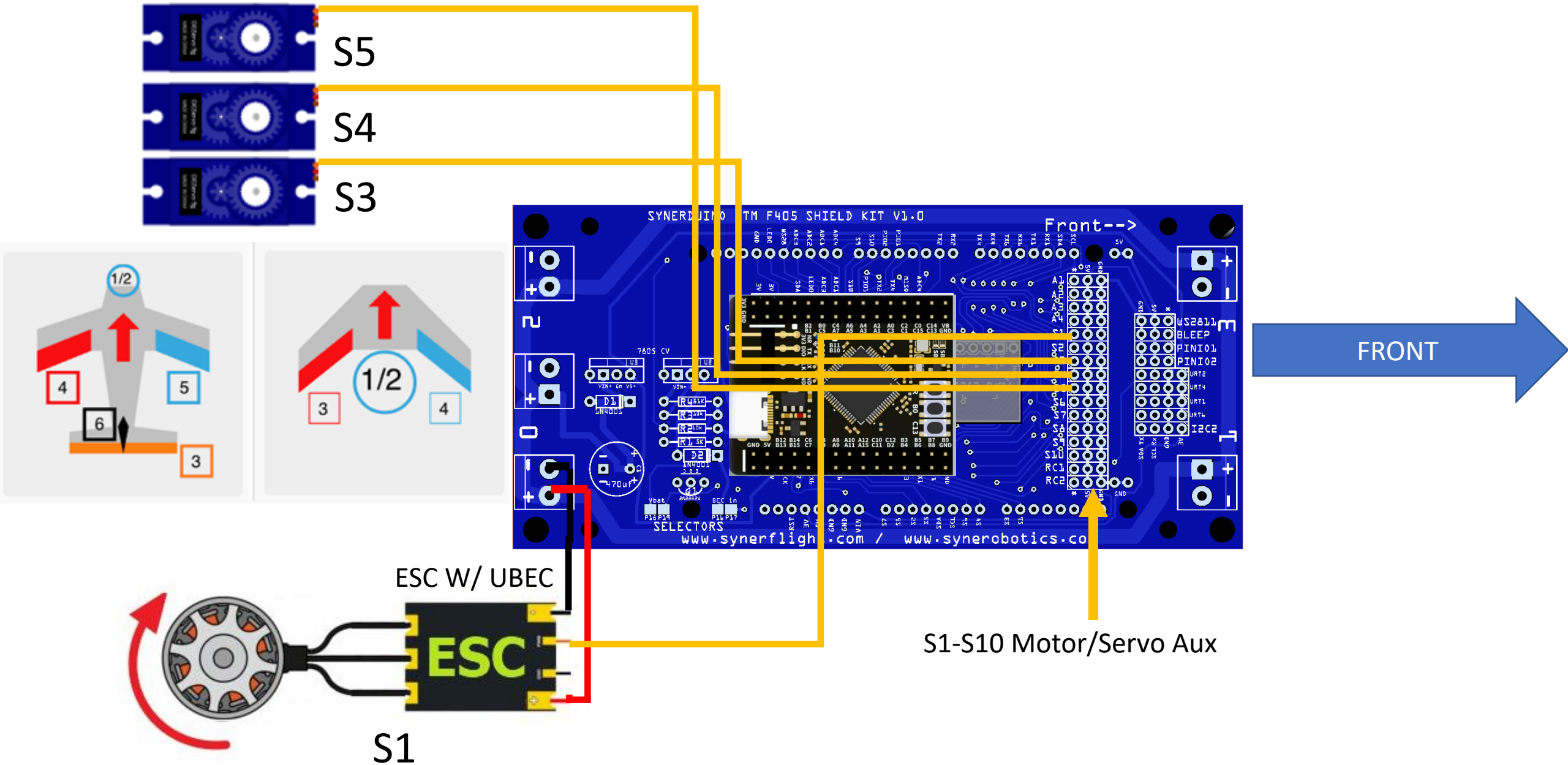
See Mixing Tab - this may Vary depending on firmware and mixing



S1-S7 Motor/Servo Aux

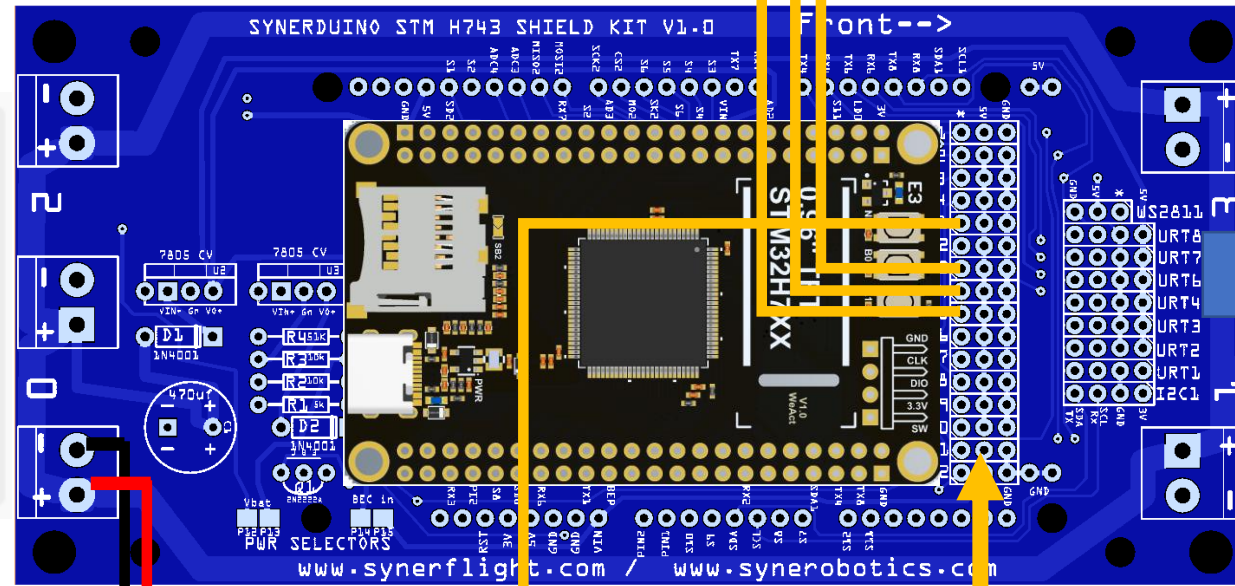
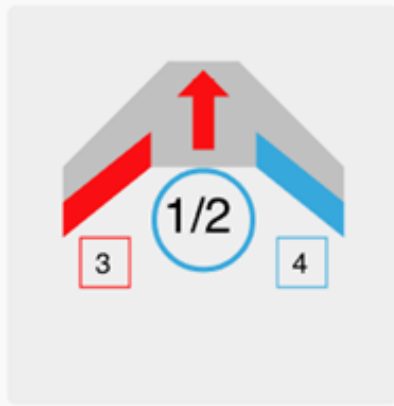
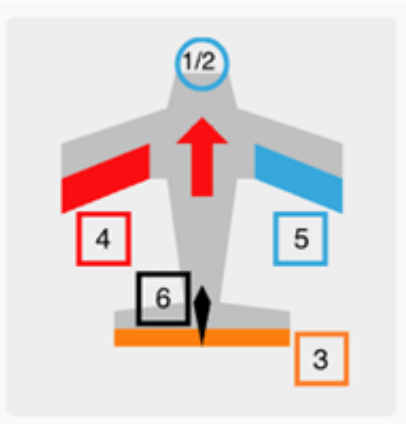
Fixwing Setup F405

See Mixing Tab - this may Vary depending on firmware and mixing

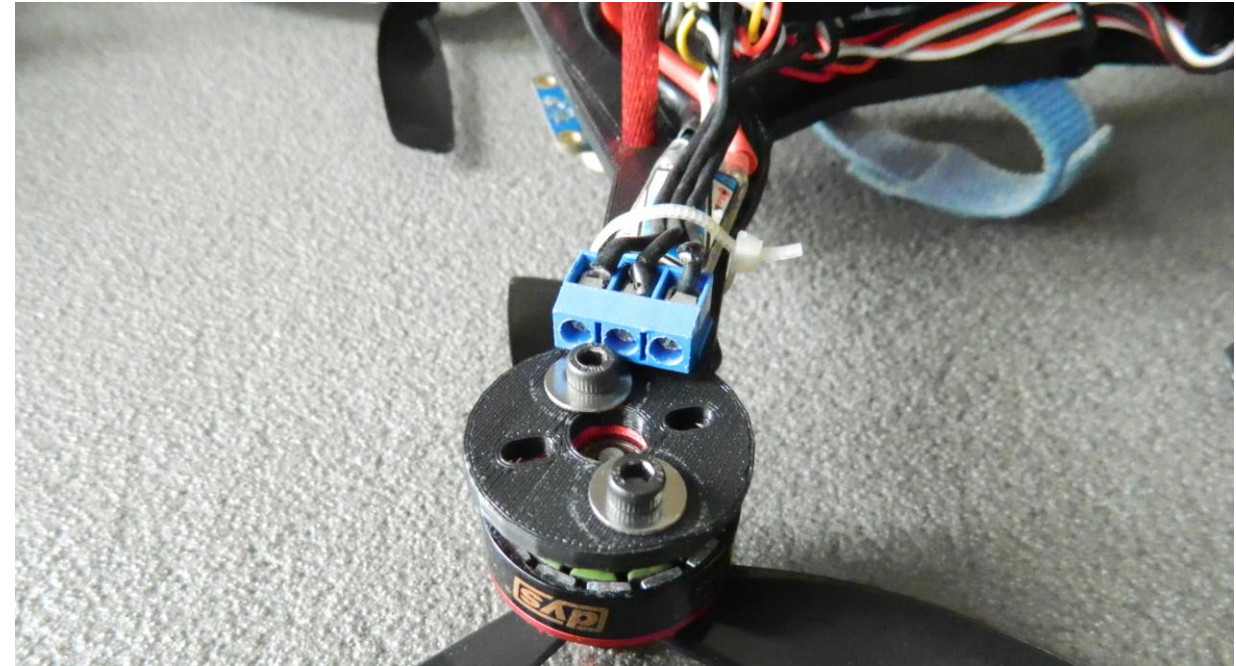
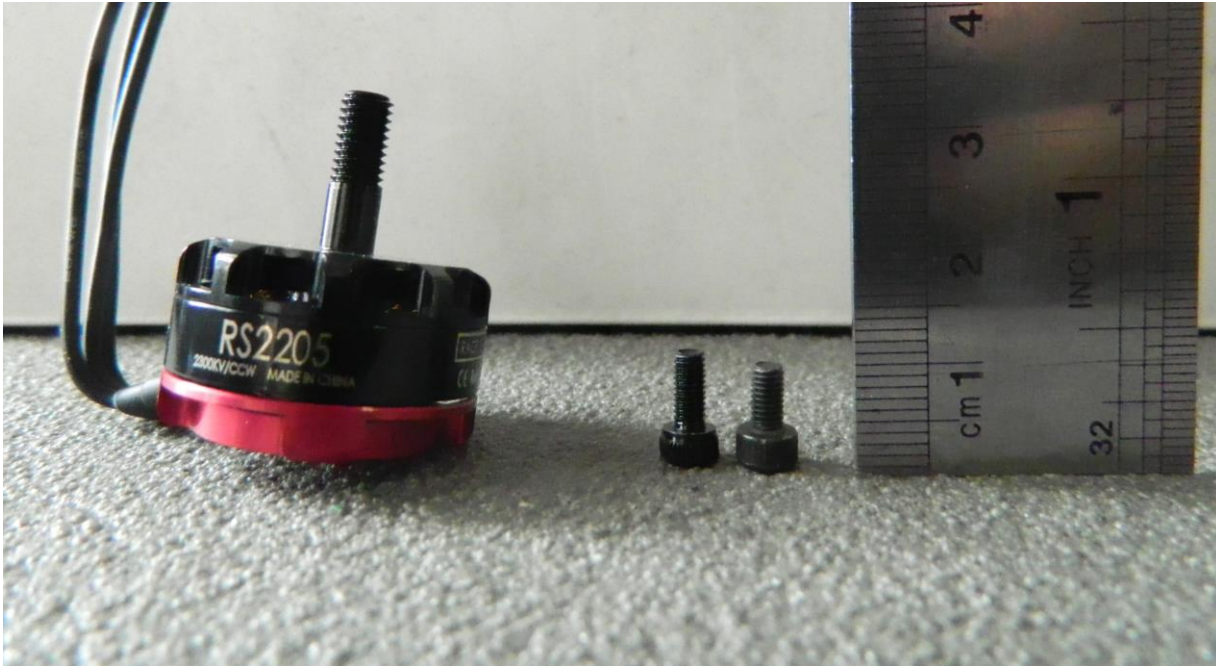


Fixwing Setup H743

See Mixing Tab - this may Vary depending on firmware and mixing



S1-S10 Motor/Servo Aux



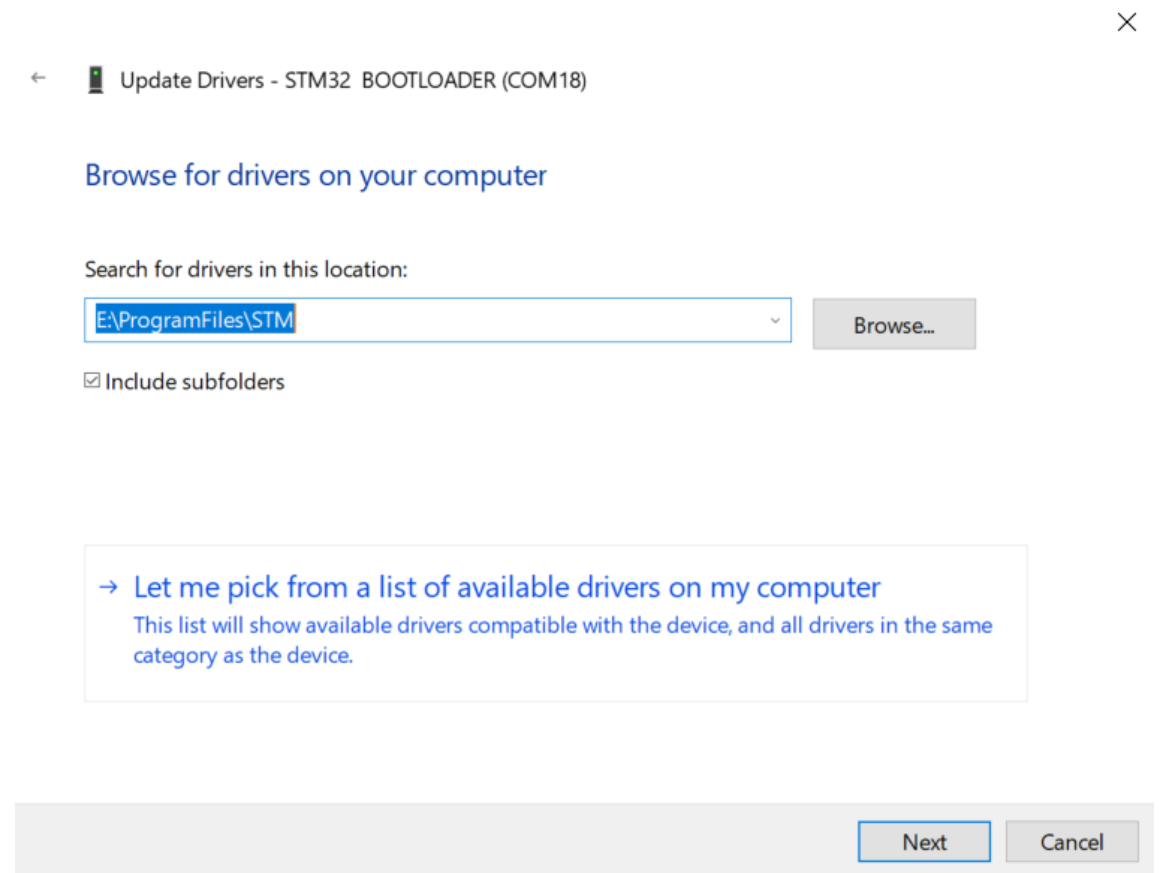
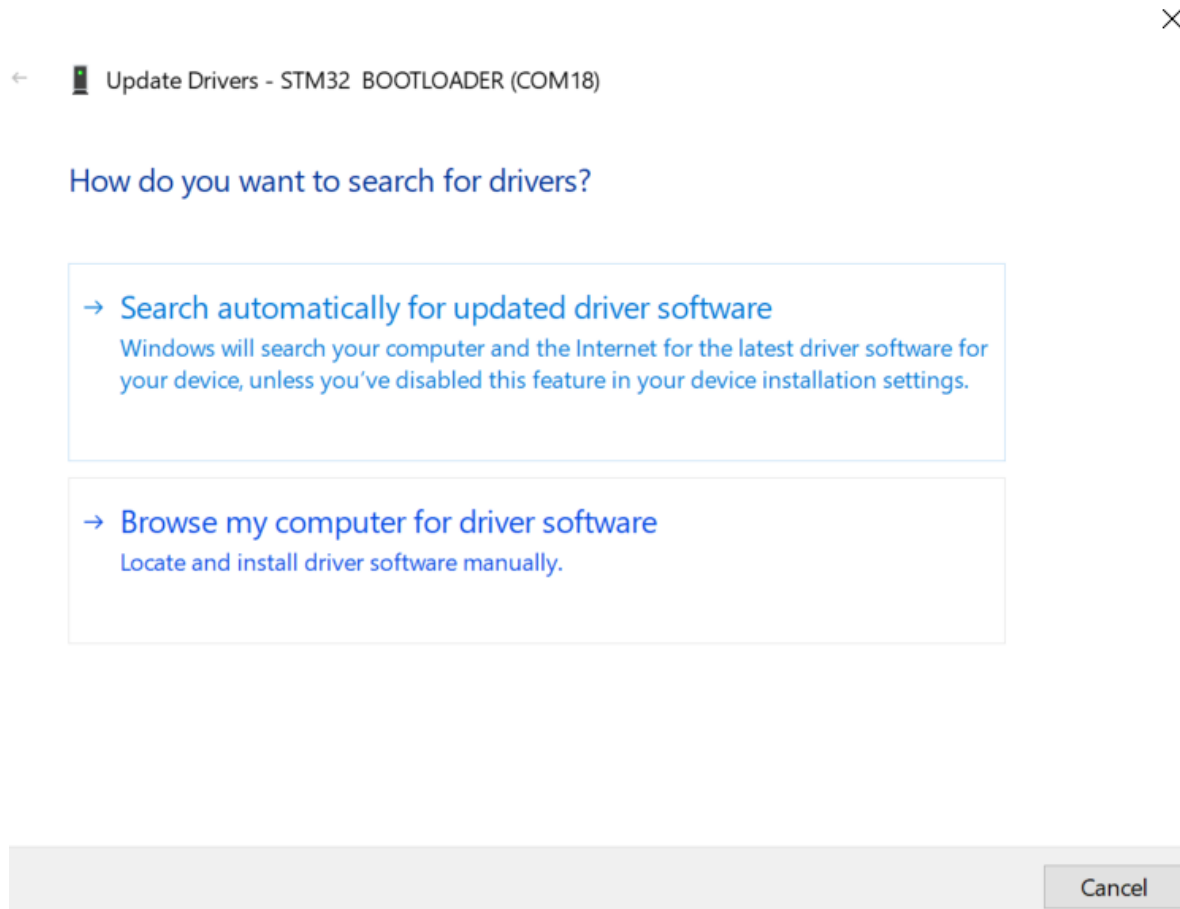
Frames are design to use the 6mm M3 Bolt for motor and must be thread lock with PVA glue in place to prevent it from going loose

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. Have Disk...


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

Next Cancel

← Update Drivers - STM32 BOOTLOADER ×

Windows has successfully updated your drivers

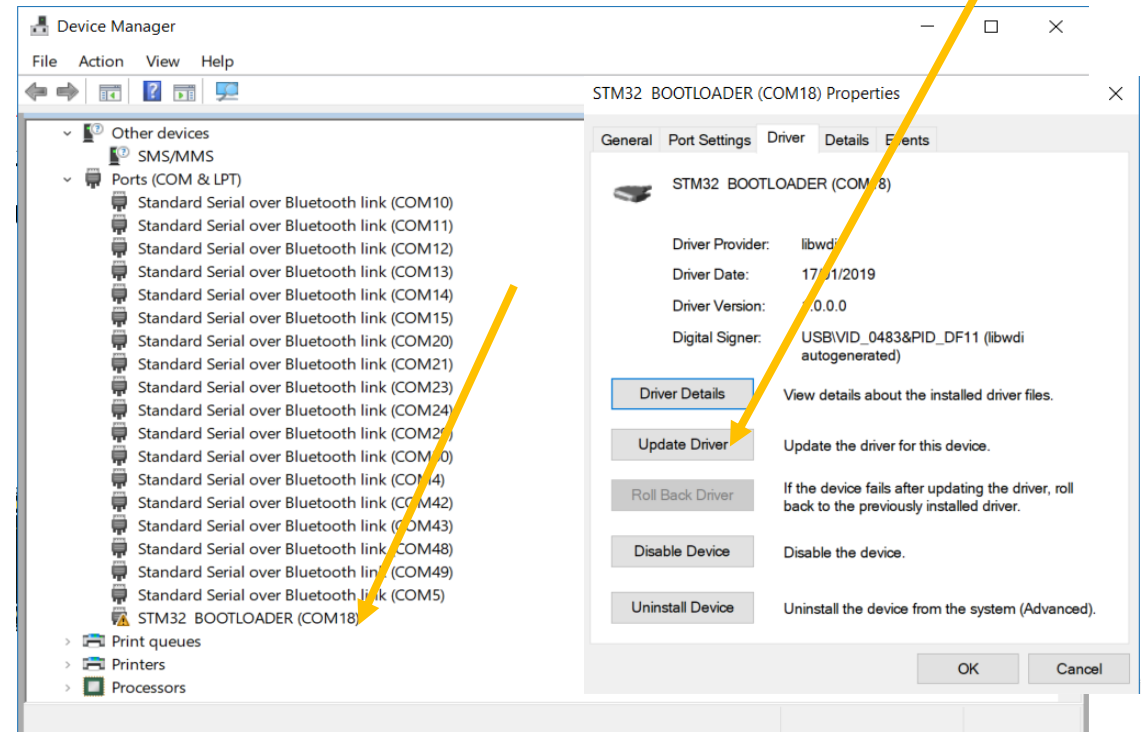
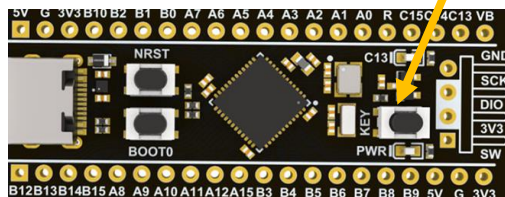
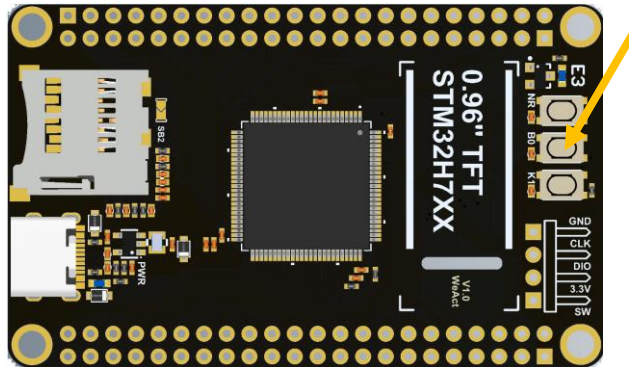
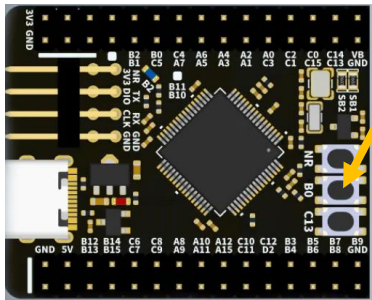
Windows has finished installing the drivers for this device:

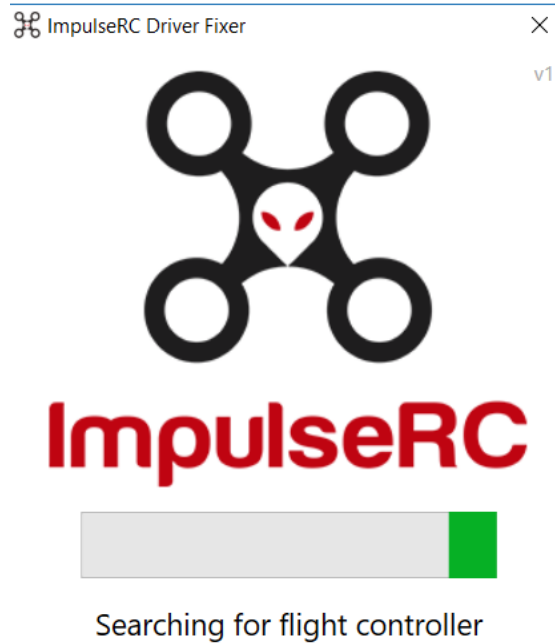
 STM32 Bootloader

Close

STM Board 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



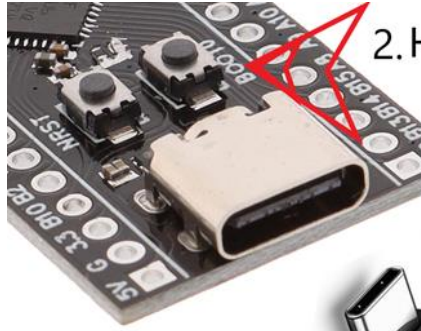


Impulse RC Driver Fixer

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 STM32 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

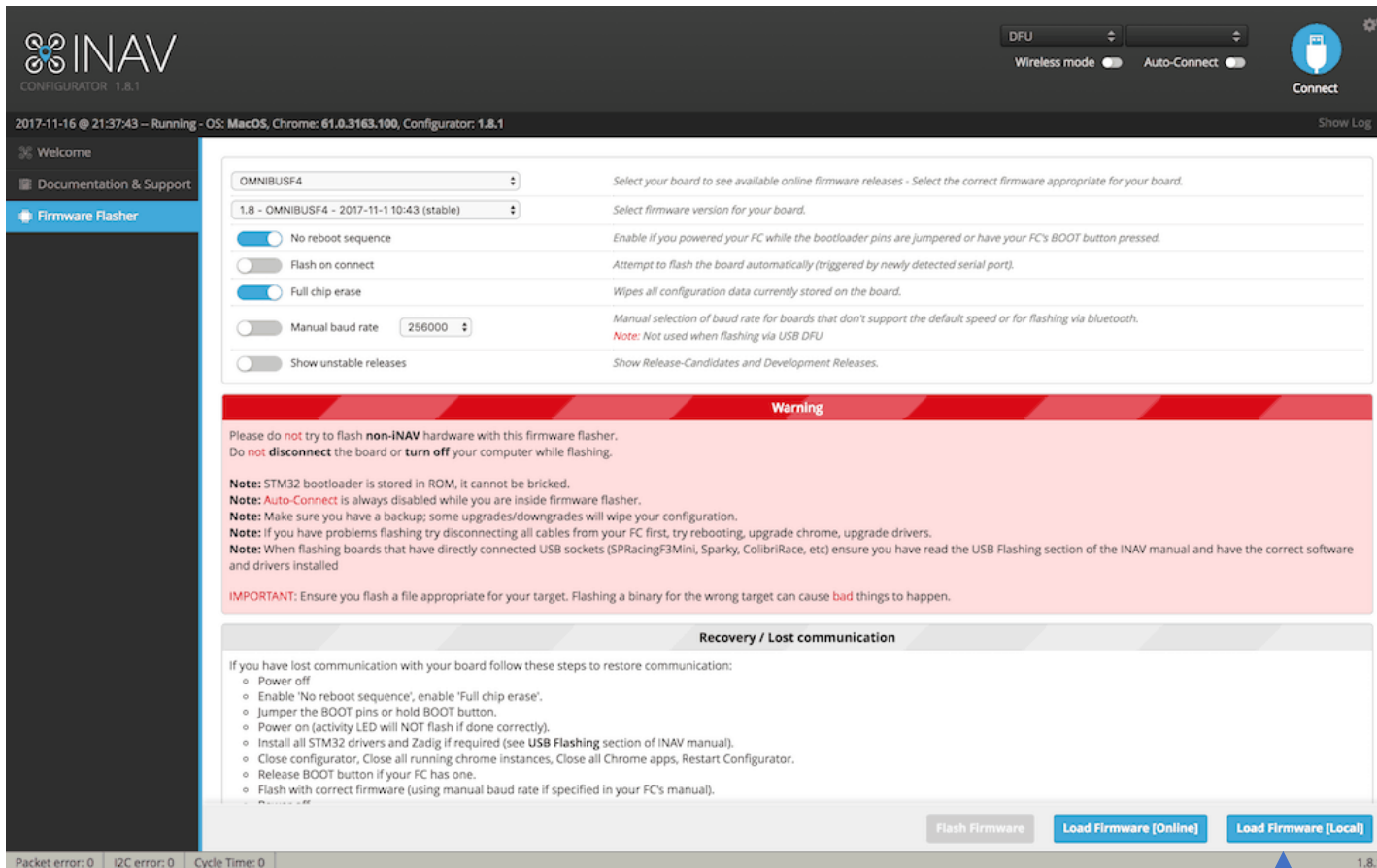
When you've successfully connected, the Configurator will recognize a device in DFU mode – which will be reflected in the port selection tab at the top. (Do Not Connect at this point)

Next, click on the Firmware Flasher tab

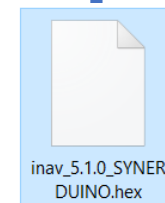
DFU (**Device Firmware Update**) mode is an incredibly useful feature on modern microcontrollers. It allows for quick and easy updates to a device's firmware without the need of extra piece of hardware.

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

The screenshot shows the INAV Configurator web interface. The top right corner features a 'DFU' dropdown menu, 'Wireless mode' and 'Auto-Connect' toggles, and a 'Connect' button. A red box highlights this area, with a red arrow pointing from the text above to it. The left sidebar has a 'Firmware Flasher' tab selected, indicated by a red arrow from the text 'Next, click on the Firmware Flasher tab'. The main content area displays the INAV logo and a welcome message. Below this, there are links for 'Slack Support Live Chat' and 'RC Groups Support'. The 'Hardware' section lists supported devices and provides links for downloading source code, binary firmware, and drivers. The 'Contributing' section lists ways to help improve the project. The 'Open Source / Donation Notice' section includes logos for PayPal, Patreon, and Яндекс ДЕНЬГИ. The footer shows sponsors like Airbot, CarbonBird.com, and ADPM Drones Srl, along with system status information like 'Packet error: 0', 'I2C error: 0', and '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 – INAV7.0.0
SynerduinoSTMF411.hex
SynerduinoSTMF405.hex
SynerduinoSTMH743.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: 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

8.88 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

No dataflash chip found

Mixer profile 1 PID profile 1 Battery profile 1

Disconnect

Hide Log

Scroll

DOCUMENTATION

Setup

Reset Settings Restore settings to default

Heading: 163 deg
Pitch: 13.3 deg
Roll: 2.2 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:	8.88 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: 516 CPU Load: 27% MSP version: 2 MSP load: 0.3 MSP round trip: 83 HW round trip: 39 Drop ratio: 0% Arming Flags: -

7.0.0-RC2

12:19 PM 28/03/2024

CALIBRATION

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

INAV Configurator

8.93 V

INAV CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

Mixer profile 1 PID profile 1 Battery profile 1

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

Step 1 Step 2 Step 3
Step 4 Step 5 Step 6

Accelerometer Values

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

Compass Calibration

Zero X	-24
Zero Y	33
Zero Z	-24
Gain X	1351
Gain Y	1317
Gain Z	1249

Optic Flow Calibration

Scale 10.5

Save and Reboot

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: - 7.0.0-RC2

12:20 PM 28/03/2024

MIXER (INAV5-6)

Airframe or
Vehicle time
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. At the top, there's a status bar with battery level (8.97 V) and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The main header shows the INAV logo and version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0). Below this, there are several log entries for the current session.

The left sidebar contains a navigation menu with options: Setup, Calibration, Mixer (selected), Outputs, Ports, Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD.

The main content area is titled "Mixer" and is divided into several sections:

- Platform configuration:** A dropdown menu is open, showing "Multirotor" selected. Other options include Airplane, Tricopter, Rover, Boat, and Other.
- Mixer preset:** A diagram shows a quadcopter layout with motors numbered 1, 2, 3, and 4. A red arrow points to motor 2. A dropdown menu is set to "Quad X". Buttons for "Mixer wizard", "Load and apply", and "Load mixer" are visible.
- Output Mapping:** A table with columns for Output (S1-S7) and Function (Motor 1-4, -, -).
- Motor Mixer:** A table with columns for Motor, Throttle [T], Roll [A], Pitch [E], and Yaw [R].

At the bottom of the interface, there's a status bar with system metrics: Packet error: 0, I2C error: 0, Cycle Time: 3246, CPU Load: 90%, MSP version: 2, MSP load: 0.1, MSP round trip: 48, HW round trip: 18, Drop ratio: 0%. The bottom right corner shows the time (6:07 PM) and date (23/07/2022).

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
```


MIXER (INAV7-8)

Airframe or Vehicle
time Preset and mix
selection

Load and apply
when selected then
Save Reboot

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

Mixing is now color
coded to timer
availability

The screenshot shows the INAV Configurator interface for a Multirotor platform. The 'Mixer' section is active, displaying the following configuration:

- Platform configuration:** Multirotor, Normal motor direction / Props In configuration (disabled), PID Profile will use same index as Mixer Profile index (disabled).
- Timer outputs:** 5 timers, all set to AUTO.
- Mixer preset:** Quad X, with a motor layout diagram showing a red arrow pointing to motor 1.
- 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	-	-	-	-

Buttons for 'Mixer wizard', 'Load and apply', 'Load mixer', and 'Save and Reboot' are visible.

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

MOTOR MIX FOR QUAD X (INAV 5-6)

THROTTLE – SPOOL UP

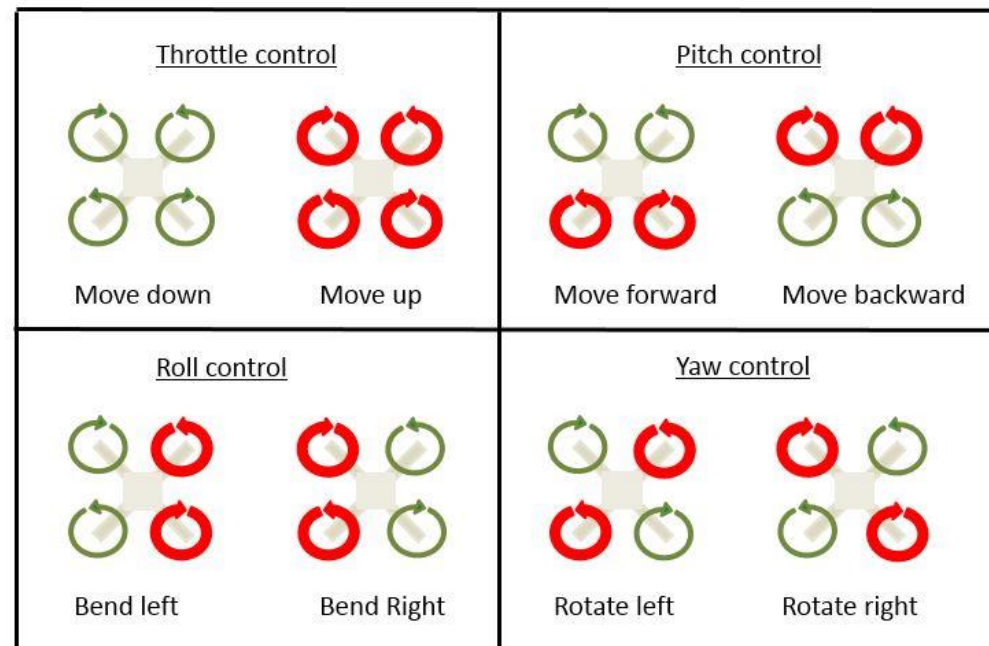
AILERON - ROLL RIGHT

ELEVATOR - PITCH FORWARD

RUDDER - YAW RIGHT

(-) REDUCE RPM

(+) INCREASE RPM



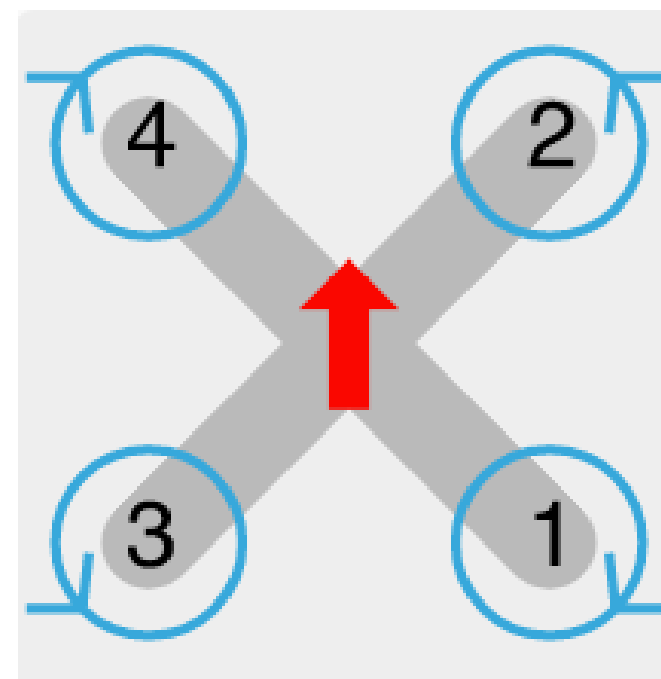
Output	S1	S2	S3	S4	S5	S6	S7
Function	Motor 1	Motor 2	Motor 3	Motor 4	Servo 1	-	-

Motor	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](#)

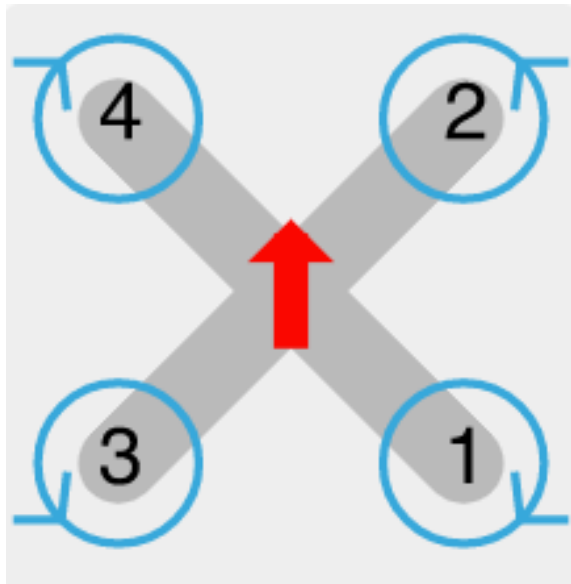
Servo	Input	Weight (%)	Speed (10µs/s)	Active	
<input type="text" value="1"/>	RC Channel 6	<input type="text" value="100"/>	<input type="text" value="0"/>	Always	Delete

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



MOTOR MIX FOR QUAD X (INAV 7-8)

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



INAV Configurator

8.93 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

Mixer profile 1 PID profile 1 Battery profile 1

Disconnect

Hide Log

Scroll

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

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	-	-	-	-

Motor Mixer

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

Add new mixer rule

Servo mixer

Servo	Input	Weight (%)	Speed (10µs/s)	Active
-------	-------	------------	----------------	--------

Logic conditions

Add new mixer rule

Save and Reboot

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

Windows taskbar: 12:20 PM 28/03/2024

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 with a 0% throttle indicator. A diagram of a quadcopter shows motor assignments 1, 2, 3, and 4. On the right, system statistics are displayed: Acc. noise RMS (0.0030), Current [A] (0.00), and Voltage [V] (8.94). At the bottom, there are 'Save and Reboot' and 'Save' buttons. The status bar at the very 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 version 5.0.0. The Windows taskbar is visible at the bottom of the screen.

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. The top 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 system information including MultiWii API version (2.4.0), flight controller info (INAV 6.0.0), board name (SYDU), and unique device ID.
- Motors:** Features a 'Number of motor poles' field set to 14 and a 'Reversible motors mode' toggle. Below this is a 'Motors' section with four sliders for motors 1, 2, 3, and 4, all set to 100%. A 'Master' slider is also present. To the right, a motor test diagram shows four propellers (1, 2, 3, 4) with a red arrow pointing to propeller 1. A 'Motor Test Mode Notice' box is visible, stating: "Moving the sliders will cause the motors to spin up. In order to prevent injury remove ALL propellers before using this feature." A checkbox below the notice is checked, indicating "I understand the risks, propellers are removed - Enable motor control."
- Servos:** A row of 16 servos is shown, with servo 1 selected.
- Acc. noise RMS:** A table showing current values: 0.0013 for Acc. noise RMS, 20.50 for Current [A], and 8.99 for Voltage [V].

At the bottom, there are 'Save and Reboot' and 'Save' buttons. The system status bar at the very bottom shows metrics like Packet error: 0, I2C error: 0, Cycle Time: 503, CPU Load: 16%, and the current time is 12:51 PM on 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

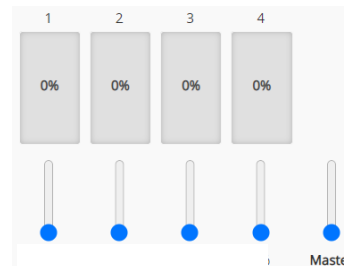
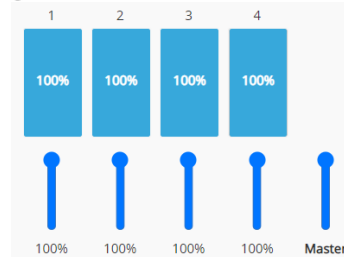


Motor Test Mode Notice:

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

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

5.48 V
Gyro Accel Mag Baro GPS Flow Sonar Speed IMU2
No dataflash chip found
Profile 1 Battery prof

How about NO

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

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)

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)

BN 880 GPS / Baud 57600 CXFO Optical Flow / Baud 19200 Bluetooth / Baud 115200 SIK Radio / Baud 75600

PORTS

Peripherals

This shows the Equipment choices that can be connected to the selected serial Port with the appropriate Baud

- Blackbox
- RunCam Device
- TBS SmartAudio
- IRC Tramp
- FuriousFPV Vtx
- ESC output/telemetry
- FrSky OSD
- DJI FPV VTX
- MSP DisplayPort
- SmartPort Master
- SBus Output

INAV Configurator

0.87 V

INAV CONFIGURATOR 7.1.0
FC FIRMWARE 7.1.1 [SYNERDUINOSTM_F405]

2024-09-22 @ 18:11:55 -- MultiWii API version received - 2.5.0
2024-09-22 @ 18:11:55 -- Flight controller info, identifier: INAV, version: 7.1.1
2024-09-22 @ 18:11:55 -- Running firmware released on: Sep 8 2024 14:51:23
2024-09-22 @ 18:11:55 -- Board: SYND, version: 0
2024-09-22 @ 18:11:55 -- Unique device ID received - 0x3500313033471931383336

Outputs

Ports

Configuration

Failsafe

Ez Tune

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Alignment tool

Mission Control

OSD

LED Strip

Sensors

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
UART4	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial RX	GPS 57600	Disabled 115200
UART6	<input type="checkbox"/> MSP 9600	Disabled AUTO	<input type="checkbox"/> Serial RX	Disabled 115200	Disabled 115200

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 505 CPU Load: 7% MSP version: 2 MSP load: 0.0 MSP round trip: 213 HW round trip: 16 Drop ratio: 0% Arming Flags: ARMING_DISABLED_NAVIGATION_UNSAFE, ARMING_DISABLED_RC_LINK 7.1.0

PORTS

Sensors

gives you the Options of your choice of navigation and stability devices

- GPS
- Optica Flow
- Range finder

INAV Configurator

0.87 V

No dataflash chip found

Disconnect

2024-09-22 @ 18:11:55 -- MultiWii API version received - 2.5.0
2024-09-22 @ 18:11:55 -- Flight controller info, identifier: INAV, version: 7.1.1
2024-09-22 @ 18:11:55 -- Running firmware released on: Sep 8 2024 14:51:23
2024-09-22 @ 18:11:55 -- Board: SYND, version: 0
2024-09-22 @ 18:11:55 -- Unique device ID received - 0x3500313033471931383336

Outputs

Ports

Configuration

Failsafe

Ez Tune

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Alignment tool

Mission Control

OSD

LED Strip

Sensors

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
UART4	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial RX	GPS 57600	Disabled 115200
UART6	<input type="checkbox"/> MSP 9600	Disabled AUTO	<input type="checkbox"/> Serial RX	Disabled GPS Rangefinder Optic flow	Disabled 115200

Save and Reboot

Packet error: 0 | I2C error: 0 | Cycle Time: 820 | CPU Load: 7% | MSP version: 2 | MSP load: 0.0 | MSP round trip: 2618 | HW round trip: 17 | Drop ratio: 0% | Arming Flags: ARMING_DISABLED_NAVIGATION_UNSAFE, ARMING_DISABLED_RC_LINK | 7.1.0

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)

Enable CPU based serial ports

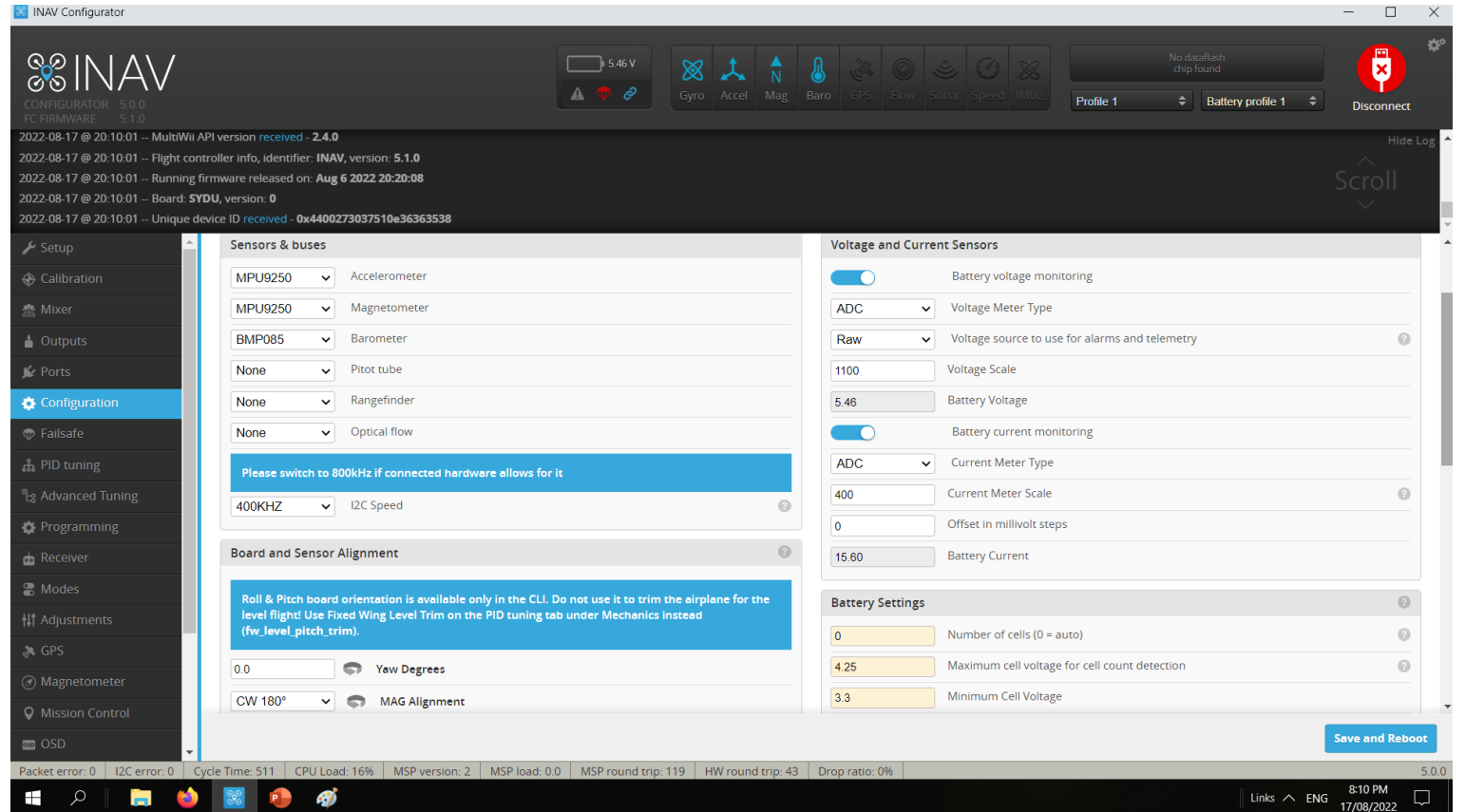
GPS for navigation and telemetry

Telemetry output

Multi-color RGB LED strip support

Enable motor and servo output

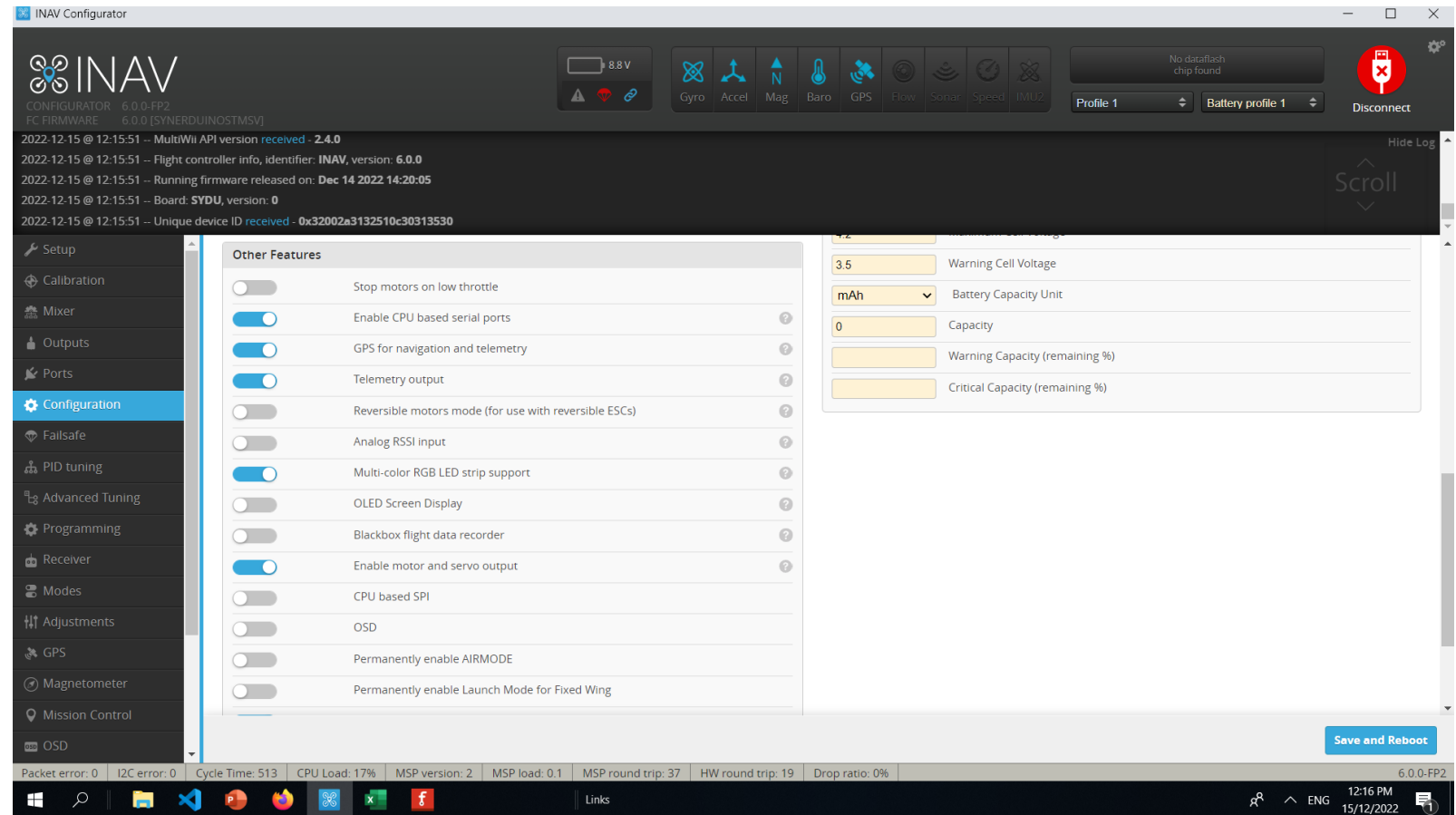
Profile selection with TX stick command



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



Magnetometer



Barometer

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



Accelerometer



Gyroscope

Each sensor has a corresponding address registry set by manufacturer

You can find it on sensors.ccp tab

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 indicator shows 5.46 V. The main area is divided into sections for Roll, Pitch, and Yaw, each with sliders for Proportional, Integral, Derivative, and FeedForward gains. The Roll section has values: Proportional 15, Integral 30, Derivative 15, FeedForward 87. The Pitch section has values: Proportional 15, Integral 30, Derivative 15, FeedForward 60. The Yaw section has values: Proportional 35, Integral 80, Derivative 0. Below these sections is a table of sensor feedback loop 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 settings:

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 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 is 30/07/2022 at 9:10 AM.

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 top bar includes the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), and various sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sobar, Speed, IMU2). The main content area is divided into tabs: PID gains, Rates & Expo (selected), Filters, and Mechanics. The Rates & Expo tab displays a list of parameters with their current values and units:

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 metrics: 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 Windows taskbar at the bottom indicates the time is 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)

EZ PID Tuning

Synerduino Mini KWAD PID

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

When Enable it automatically override 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 wildly varied inertias and weight.

Recommend to use conventional PID tuning meathod

The screenshot shows the INAV Configurator software interface. The top bar displays system status: 8.94 V battery, No dataflash chip found, and a Disconnect button. The main menu on the left includes Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune (selected), PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, and Mission Control. The Ez Tune page features a disclaimer, an 'Enabled' toggle switch, a 'Filter Hz' slider set to 90, and an 'Axis ratio' slider set to 110. A 'PID preview' table is shown on the right, and a 'Rate preview' table is below it. The bottom status bar shows system metrics like Cycle Time, CPU Load, MSP version, and Arming Flags.

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 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

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



CONFIGURATOR: 7.0.0-RC2
FC FIRMWARE: 7.0.0 [SYNERDUINOSTM_F411]

8.94 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

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

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

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

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

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

Aggressiveness

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: -


Yaw 500 dps 70%

Save and Reboot

7.0.0-RC2

Links

12:24 PM 28/03/2024



CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.94 V
Gyro
Accel
Mag
Baro
GPS
Flow
Sonar
Speed

No dataflash chip found
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 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

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

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

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.

Rate


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.

Expo

Save and Reboot

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: -
7.0.0-RC2





CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.91 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

PID gains
Rates & Expo
Filters
Mechanics
DOCUMENTATION

Reset PID Controller
Select New Defaults
Show all PIDs

Roll

Proportional	40	<input type="range" value="40"/>
Integral	75	<input type="range" value="75"/>
Derivative	26	<input type="range" value="26"/>
FeedForward	60	<input type="range" value="60"/>

Pitch

Proportional	44	<input type="range" value="44"/>
Integral	85	<input type="range" value="85"/>
Derivative	28	<input type="range" value="28"/>
FeedForward	60	<input type="range" value="60"/>

Yaw

Proportional	40	<input type="range" value="40"/>
--------------	----	----------------------------------

Refresh
Save and Reboot

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: -



Links

12:25 PM
28/03/2024

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

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.

RECEIVER

Serial Receiver as your compatible hardware in the list

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 the INAV logo, version 5.0.0, and system status including battery level (8.96 V) and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). A log window shows system messages: "MultiWii API version received - 2.4.0", "Flight controller info, identifier: INAV, version: 5.0.0", "Running firmware released on: Jun 4 2022 12:14:54", "Board: ST41, version: 0", and "Unique device ID received - 0x4400273037510e36363538".

The main interface is divided into several sections:

- Left sidebar:** A navigation menu with options: Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver (highlighted), Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD.
- Center:** A table showing signal strength for various channels. The "AETR" receiver is selected, and the "Receiver mode" is set to "Disabled". The table lists channels from Roll [A] to CH 18 with their respective signal strength values.
- Right sidebar:** Receiver configuration options. The "Receiver type" is set to "SERIAL". A green note states: "Note: Remember to configure a Serial Port (via Ports tab) for the serial receiver". Other settings include "Serial Receiver Provider" (SBUS), "Serial Port Inverted" (OFF), and "Serial receiver half-duplex" (AUTO). Below this are two graphs showing throttle and RC signal curves, and a table of control parameters.

Channel	Signal Strength
Roll [A]	1,98
Pitch [E]	1,98
Yaw [R]	1,50
Throttle [T]	1000
CH 5	1000
CH 6	1000
CH 7	1,50
CH 8	1,50
CH 9	1,50
CH 10	1,50
CH 11	1,50
CH 12	1,50
CH 13	1,50
CH 14	1,50
CH 15	1,50
CH 16	1,50
CH 17	988
CH 18	988

Parameter	Value
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

The bottom status bar shows system metrics: 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%. The Windows taskbar at the bottom shows the date and time: 9:28 AM, 29/07/2022.

Select the Appropriate compatible receiver to match your hardware

Receiver Mode

SERIAL Receiver type

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

IBUS Serial Receiver Provider

CRSF
FBUS
FPORT
FPORT2
GHST
IBUS
JETIEXBUS
MAVLINK
SBUS
SBUS_FAST
SPEK1024
SPEK2048
SRXL2
SUMD

Serial Port Inverted (comparing to protocol default)

Serial receiver half-duplex

Use automatic RC smoothing

Manual LPF Hz

Auto Smoothing Factor

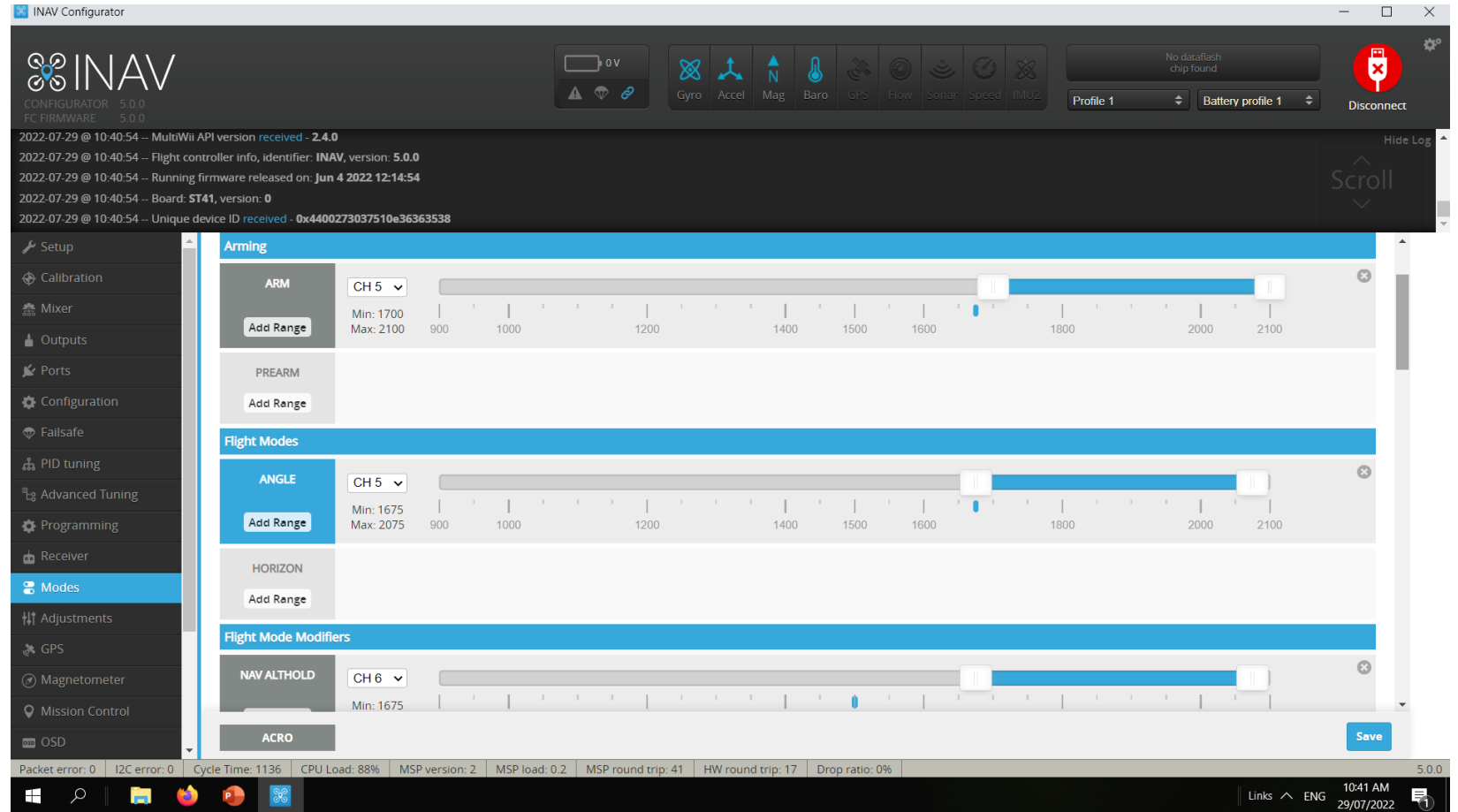
MODES

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](#)



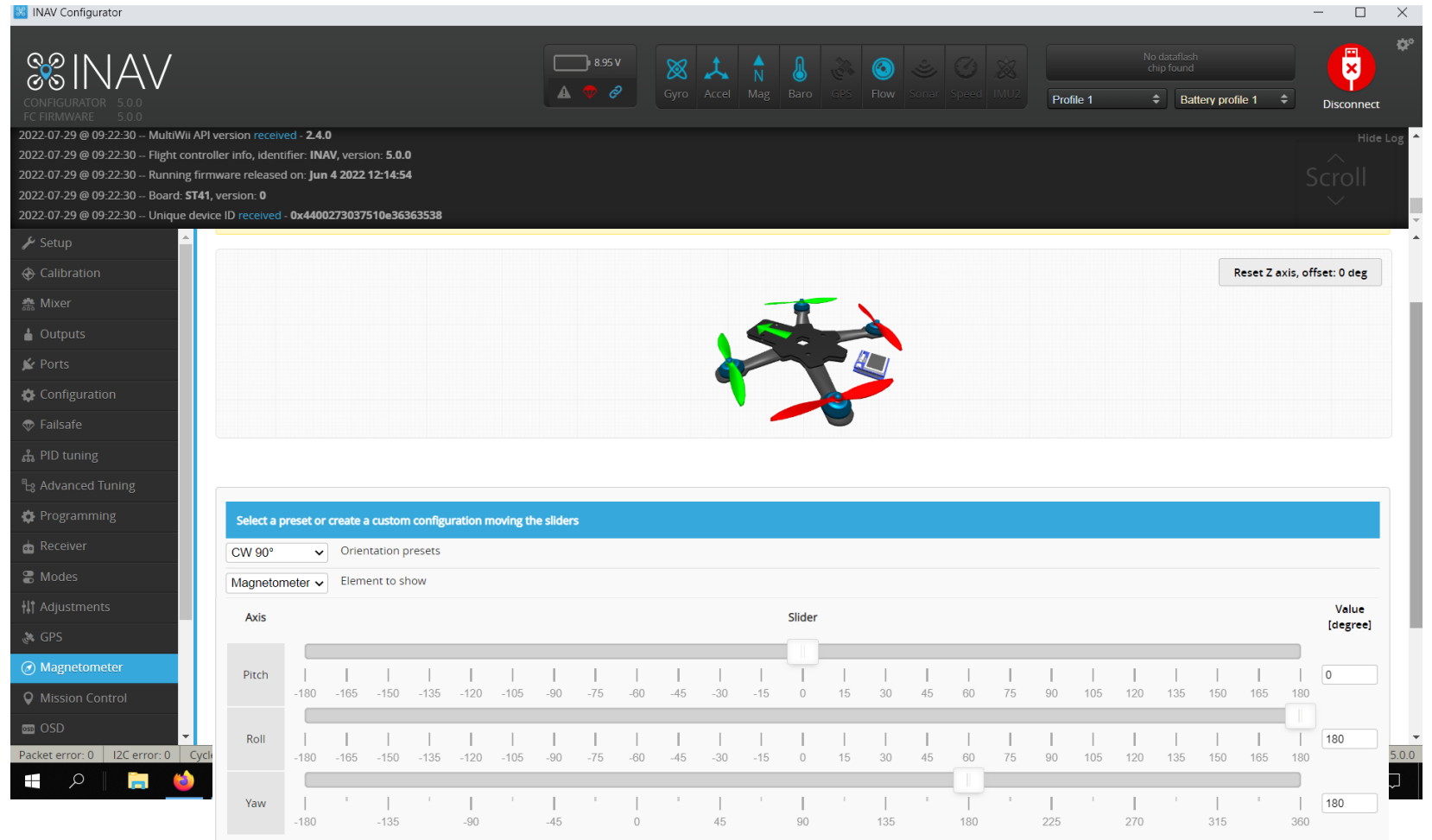
MAGNETOMETER (INAV5-6)

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 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

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

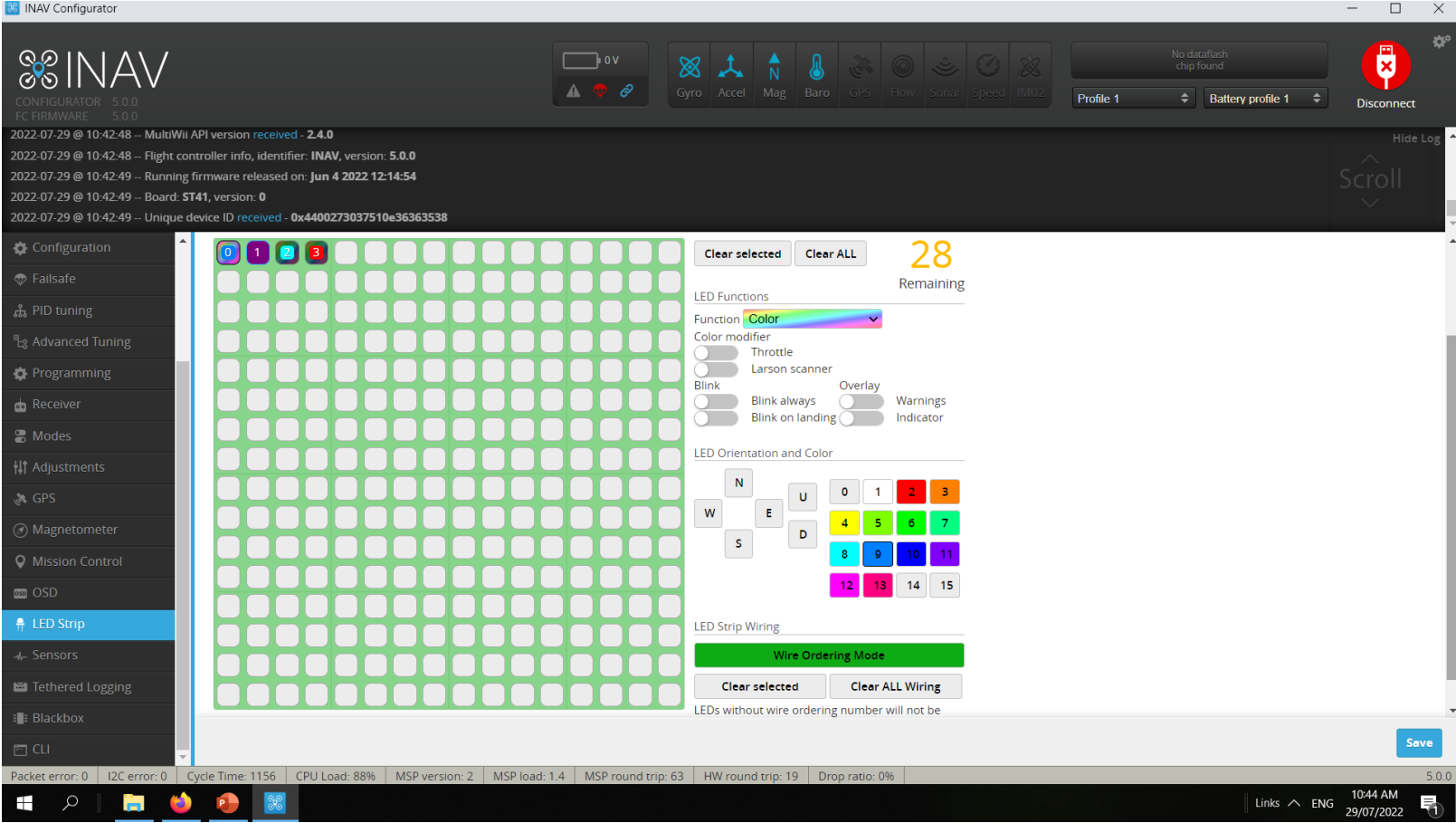
180 Degrees = South

270 Degrees = West

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.93V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed). The main area is divided into a left sidebar with navigation options (Setup, Calibration, Mixer, Outputs, Ports, Configuration, Fallsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, Mission Control) and a central 3D drone model. The drone model shows a green arrow pointing towards the heading. On the right, there are two sections for selecting flight controller alignment and magnetometer presets. The status bar at the bottom shows system metrics like Packet error: 0, I2C error: 0, Cycle Time: 521, CPU Load: 29%, MSP version: 2, MSP load: 0.8, MSP round trip: 99, HW round trip: 40, Drop ratio: 0%, Arming Flags: -, and the current version (7.0.0-RC2). The system tray shows the time (12:32 PM) and date (28/03/2024).

LED STRIP

WS2811/WS2812 – Led strip programming upto 32 LEDs



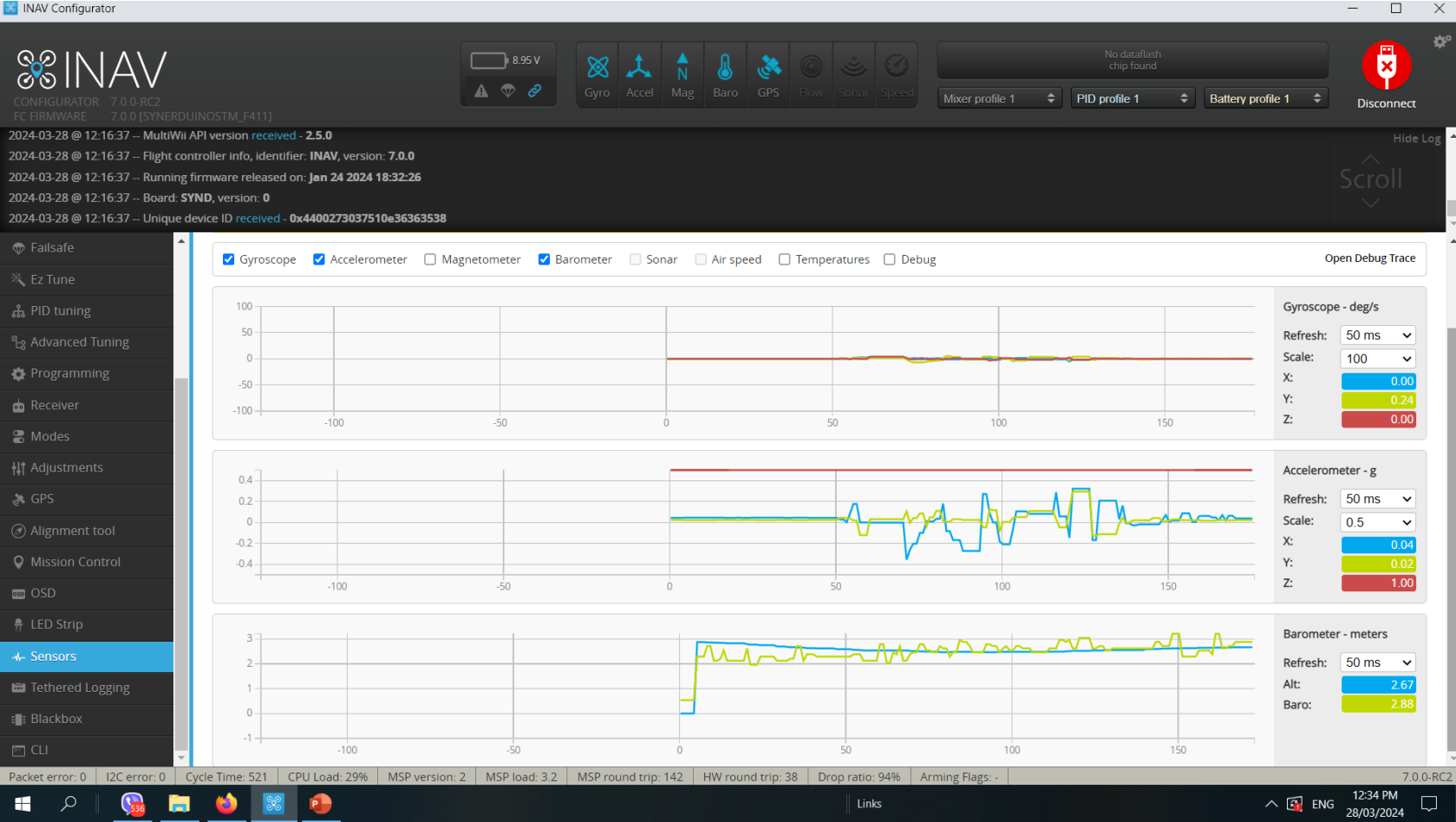
The screenshot shows the INAV Configurator interface. The top bar includes the INAV logo, version information (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0), and system status (0V, No dataflash chip found). The main area displays system logs and a configuration sidebar. The 'LED Strip' tab is active, showing a 5x5 grid of LEDs. The first three LEDs in the top row are highlighted with numbers 0, 1, and 2. The right panel shows 'LED Functions' (Color selected), 'LED Orientation and Color' (a 5x3 grid of colored squares), and 'LED Strip Wiring' (Wire Ordering Mode button). A 'Save' button is at the bottom right.

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)

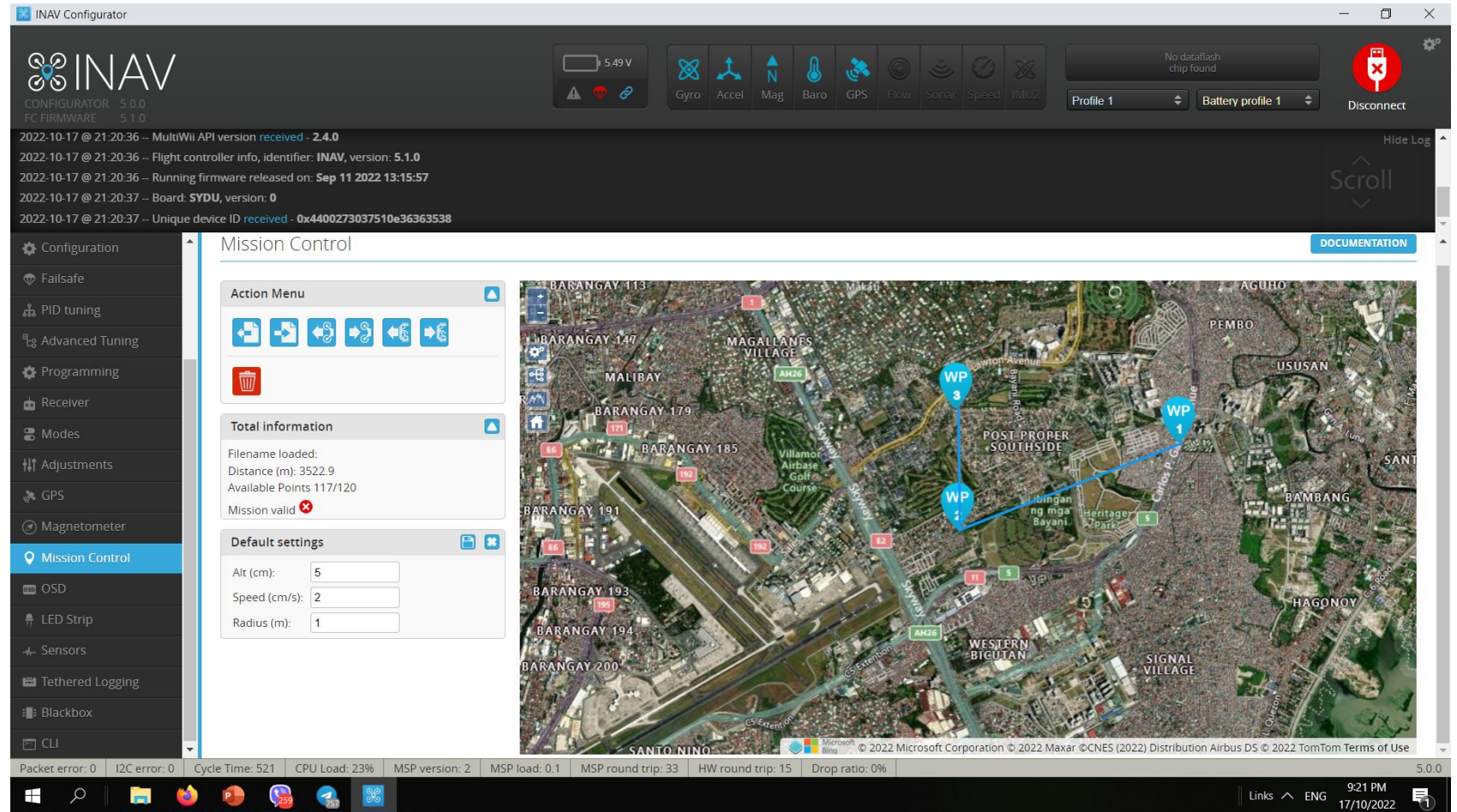
SENSORS

This is to visualize your Sensors input and aid for orientation



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.



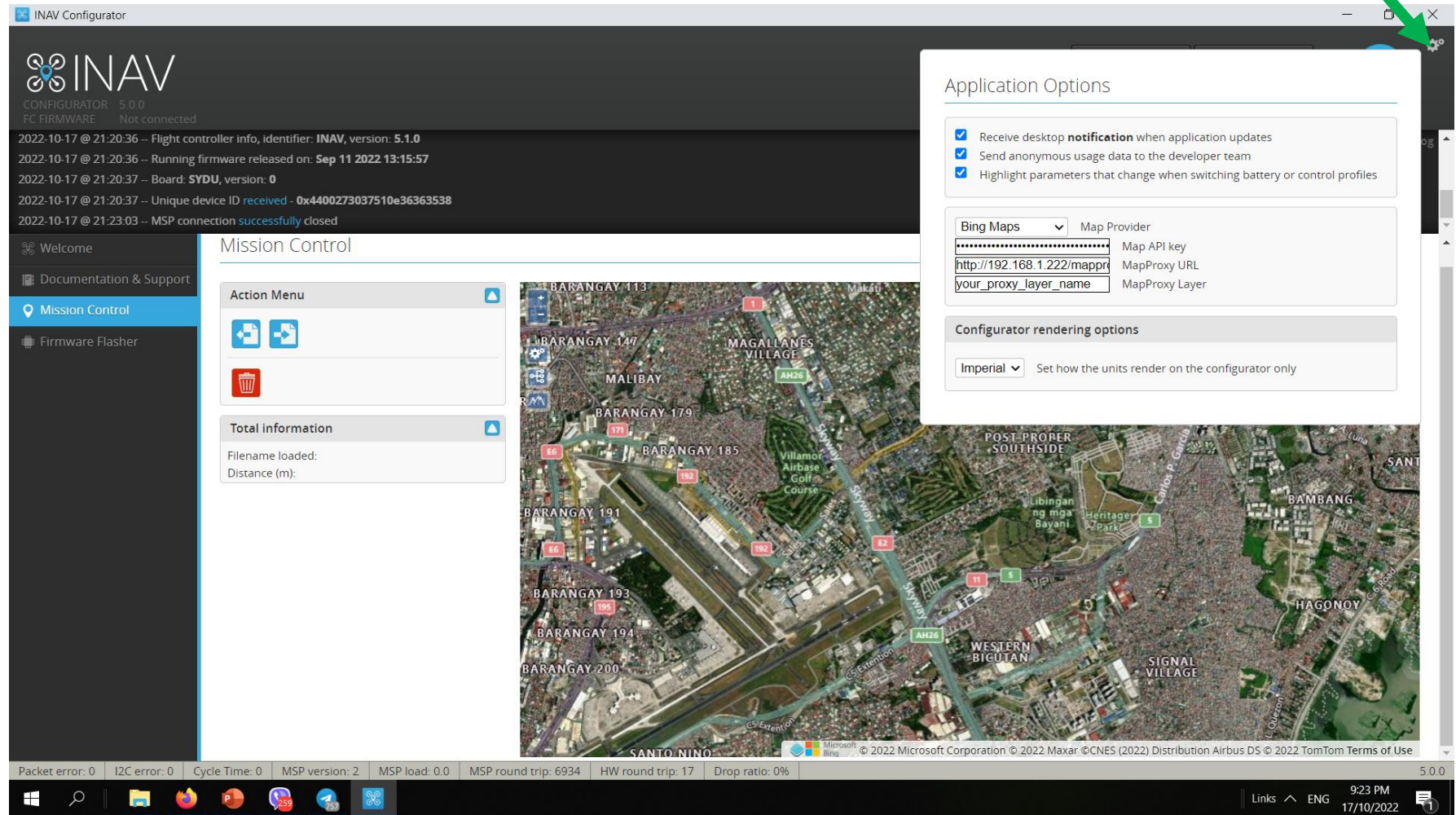
How to choose Map provider

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 displays the INAV Configurator application window. The title bar reads "INAV Configurator". The main interface is divided into several sections:

- Header:** INAV logo, CONFIGURATOR 5.0.0, FC FIRMWARE Not connected.
- Log:** A list of system messages including flight controller info, firmware release dates, board version (SYDU), and device ID.
- Left Sidebar:** Navigation menu with options: Welcome, Documentation & Support, Mission Control (selected), and Firmware Flasher.
- Mission Control Panel:** Contains an Action Menu with file and trash icons, and a Total information section for filename and distance.
- Map:** A satellite map of a city area, showing various barangays and landmarks like Villamor Airbase Golf Course.
- Application Options Dialog:** A white dialog box is open in the top-right corner, with a green arrow pointing to the settings icon in the title bar. It contains:
 - 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.
 - Map Provider: A dropdown menu set to "Bing Maps".
 - Map API key: A text field containing a long alphanumeric string.
 - MapProxy URL: A text field containing "http://192.168.1.222/mappro".
 - MapProxy Layer: A text field containing "your_proxy_layer_name".
 - Configurator rendering options: A dropdown menu set to "Imperial".
- Footer:** System status bar showing packet error, I2C error, cycle time, MSP version, MSP load, MSP round trip, HW round trip, and drop ratio. The taskbar at the bottom shows the Windows logo, search, and several application icons. The system tray shows "Links", "ENG", "9:23 PM", and "17/10/2022".

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			

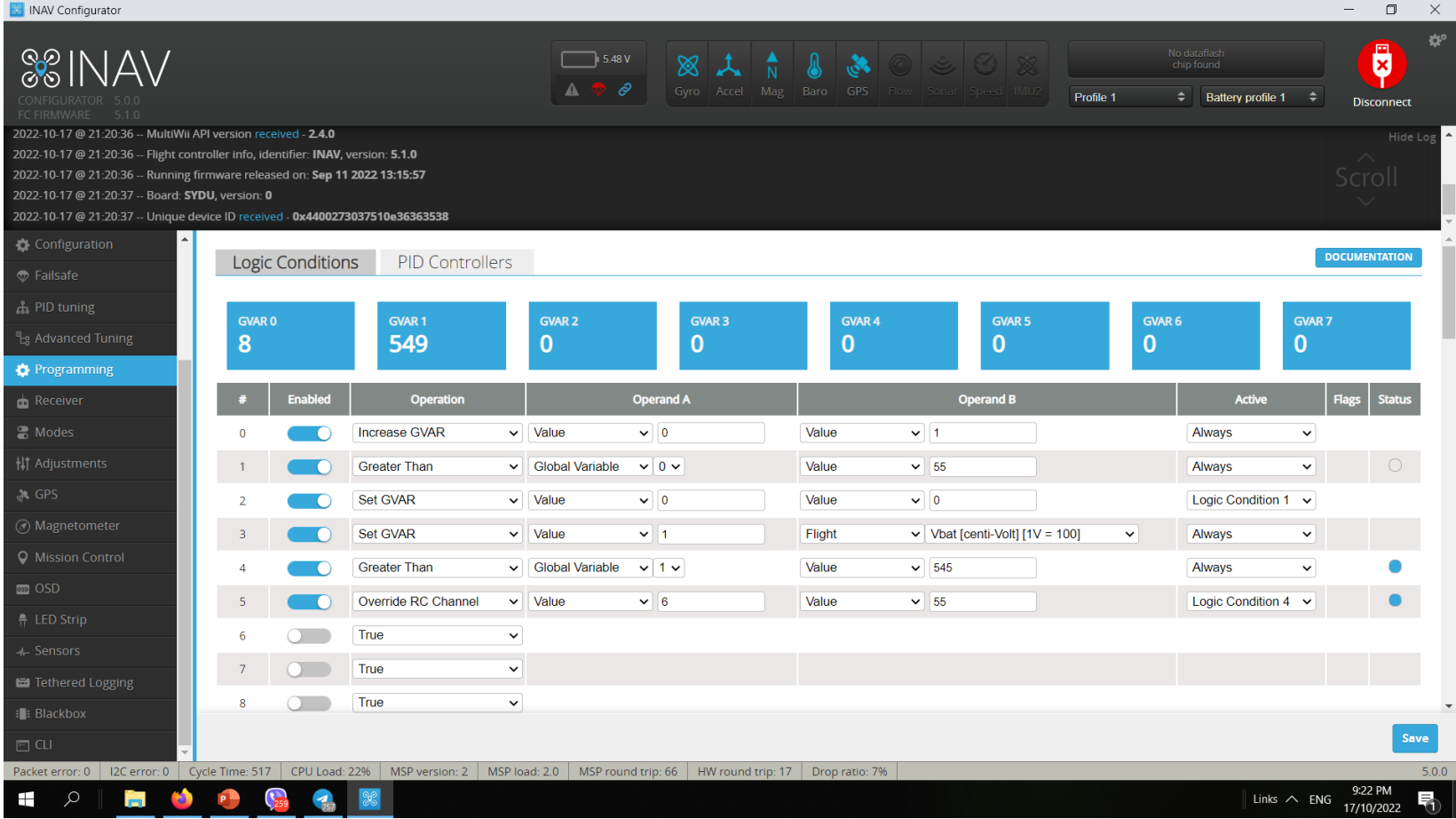
Configurator rendering options

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



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 interface. At the top, there's a status bar with battery level (8.97V) and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). Below that, a log shows system information: INAV version 5.0.0, board ST41, and unique device ID. A yellow warning box 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 main area displays the output of the '# tasks' command, showing a table of task statistics.

Task list	rate/hz	max/us	avg/us	maxload	avgload	total/ms
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 table, it shows '# set looptime = 3500' and 'looptime set to 3500'. At the bottom, there's a command input field and 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 like 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 the date/time 5:39 PM 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

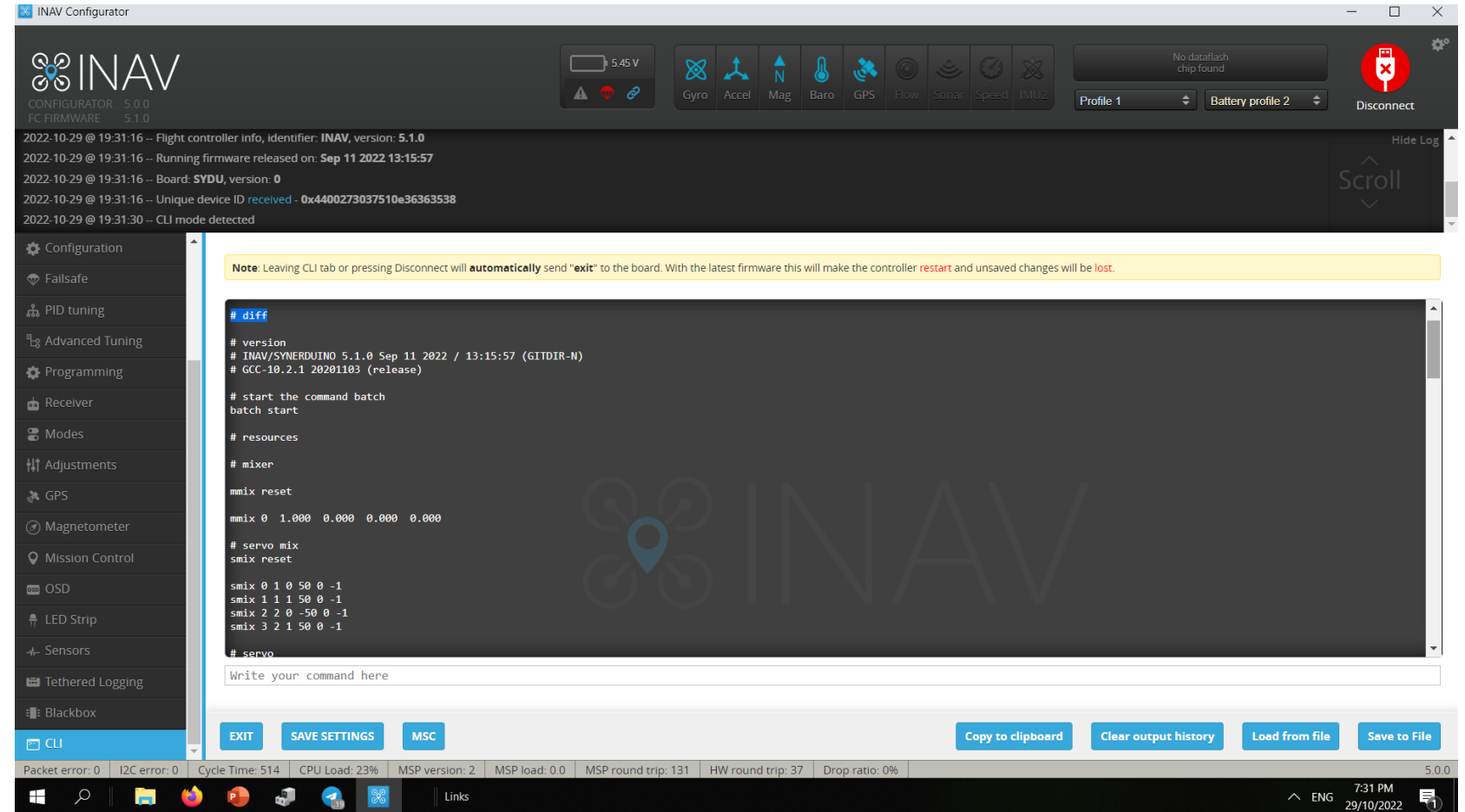
CLI Command Line Saving and Loading Parameters

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 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 8.97 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
```

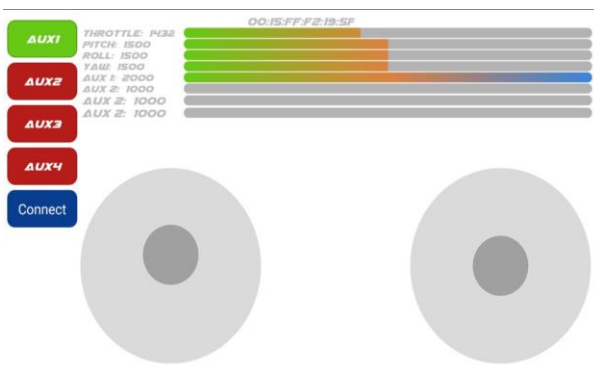
For users who wish to control this drone using the Synerduino APP

`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



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 area. The CLI area shows the following settings being entered:

```
# 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

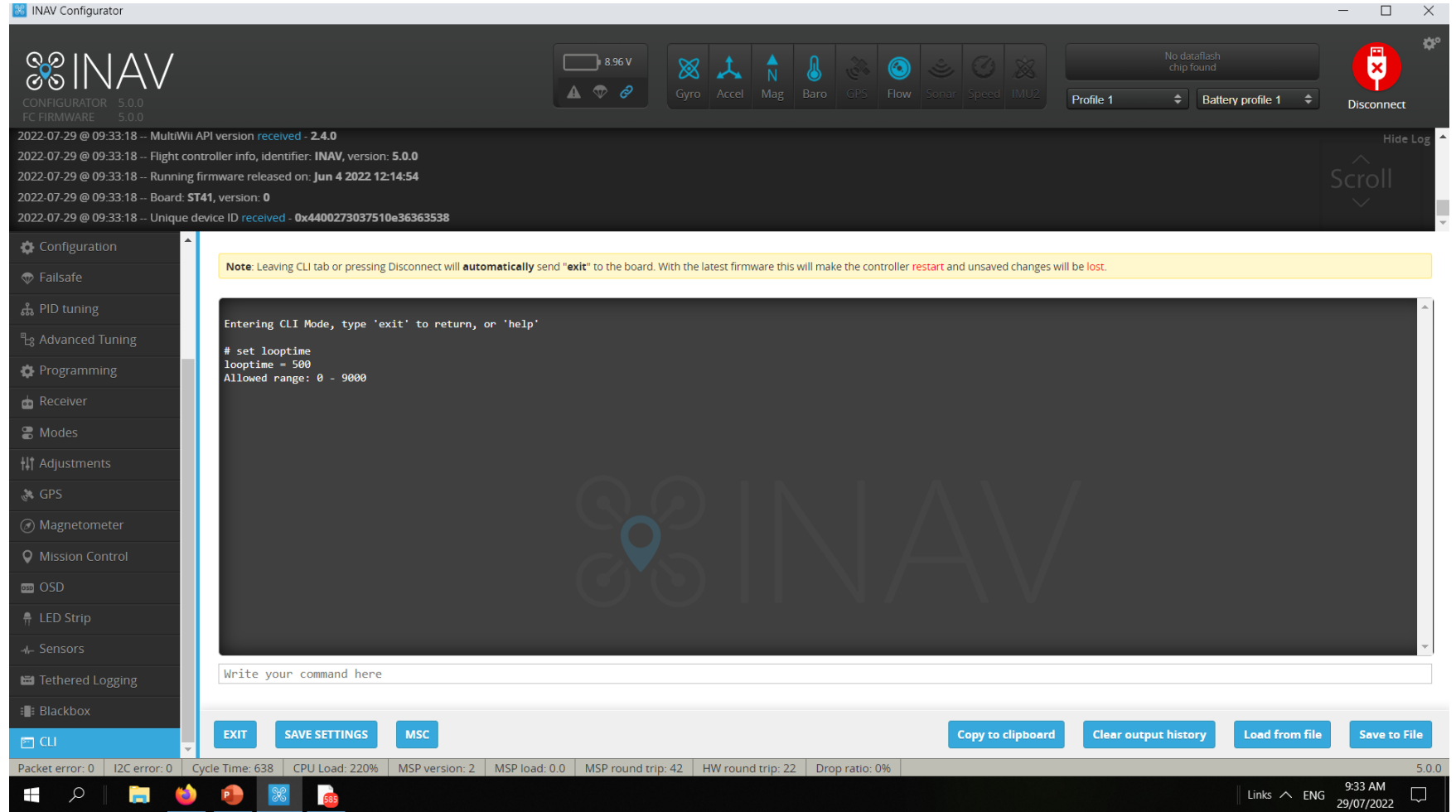
gps_min_sats = 6
Allowed range: 5 - 10
```

Below the CLI area, there are buttons for EXIT, SAVE SETTINGS, and MSC. At the bottom of the window, a 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, version 5.0.0, and various system status indicators like battery level (8.96 V) and sensor status. A sidebar on the left contains navigation options such as Configuration, Failsafe, PID tuning, and Programming. The main area is the CLI (Command Line Interface) tab, which shows a terminal window with the following text:

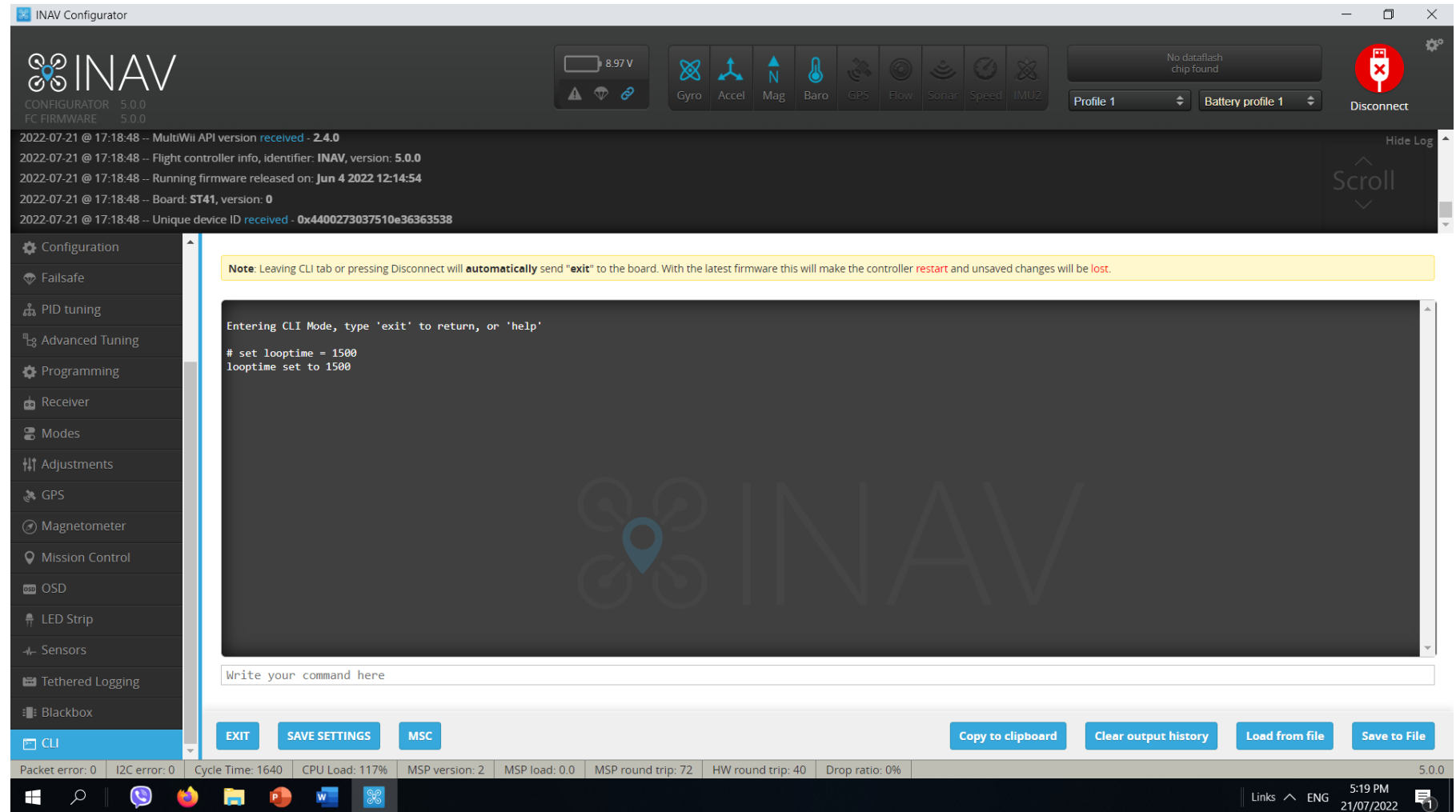
```
Entering CLI Mode, type 'exit' to return, or 'help'  
  
# set looptime  
looptime = 500  
Allowed range: 0 - 9000
```

Below the terminal 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 provides real-time 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 current time and date (9:33 AM, 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 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 8.97 V. 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 text:

```
Entering CLI Mode, type 'exit' to return, or 'help'  
# set looptime = 1500  
looptime set to 1500
```

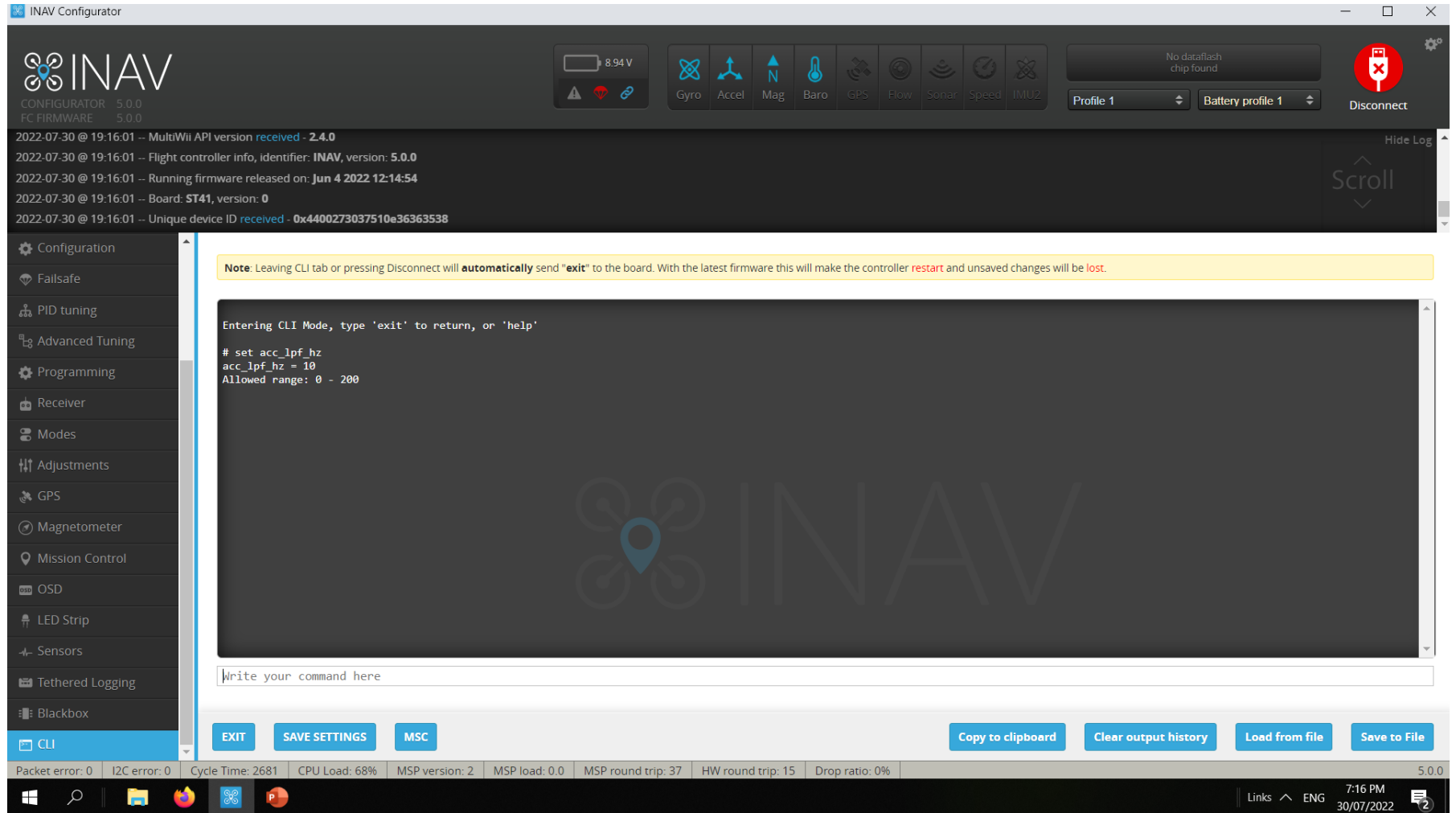
Below the CLI window is a text input field labeled "Write your command here". At the bottom of the interface, there are buttons for "EXIT", "SAVE SETTINGS", "MSC", "Copy to clipboard", "Clear output history", "Load from file", and "Save to File". The status bar at the very bottom shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 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 main area is divided into a left sidebar with navigation options (Configuration, Fallsafe, PID tuning, etc.) and a central CLI window. The CLI window shows the command `set acc_lpf_hz = 10` being entered and executed, resulting in the output `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 shows system metrics like 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 date and 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

www.Synerflight.com