Quick Build Guide

Synerduino Ardu 2560 Surface

Latest Version - 2024

For more Information:
www.synerflight.com

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ABOUT THE BOARD

Power

- Input Voltage from Arduino Board: 3.3-5V
- PWM Power Rail Regulated – 5V at 1.5A for V1 / 3A for V2
- Drone Power Input Voltage – 12.6V (3S) or 25.2V (6S)
- Power Distribution Lines – 80A

Properties

- Dimensions: 128 x 62 x 28 mm LWH / (V1.1)135mm x 62mm x 28mm
- Weight: 46.1g
- 4 Solder Pads for 4 ESCs and Motors
- 15 3-Pin Digital Headers
- 8 3-Pin Analog Headers
- 5 4-Pin Serial Headers

Sensors

- Gyroscope + Accelerometer: MPU6050 / MPU9250
- Magnetometer: QMC5883 / HMC5883
- Barometer: BMP280

BOARD VERSIONS

Synerduino Arduino Shield V2 -2024

- **MPU9250**
- **QMC5883**
- **BMP 280**

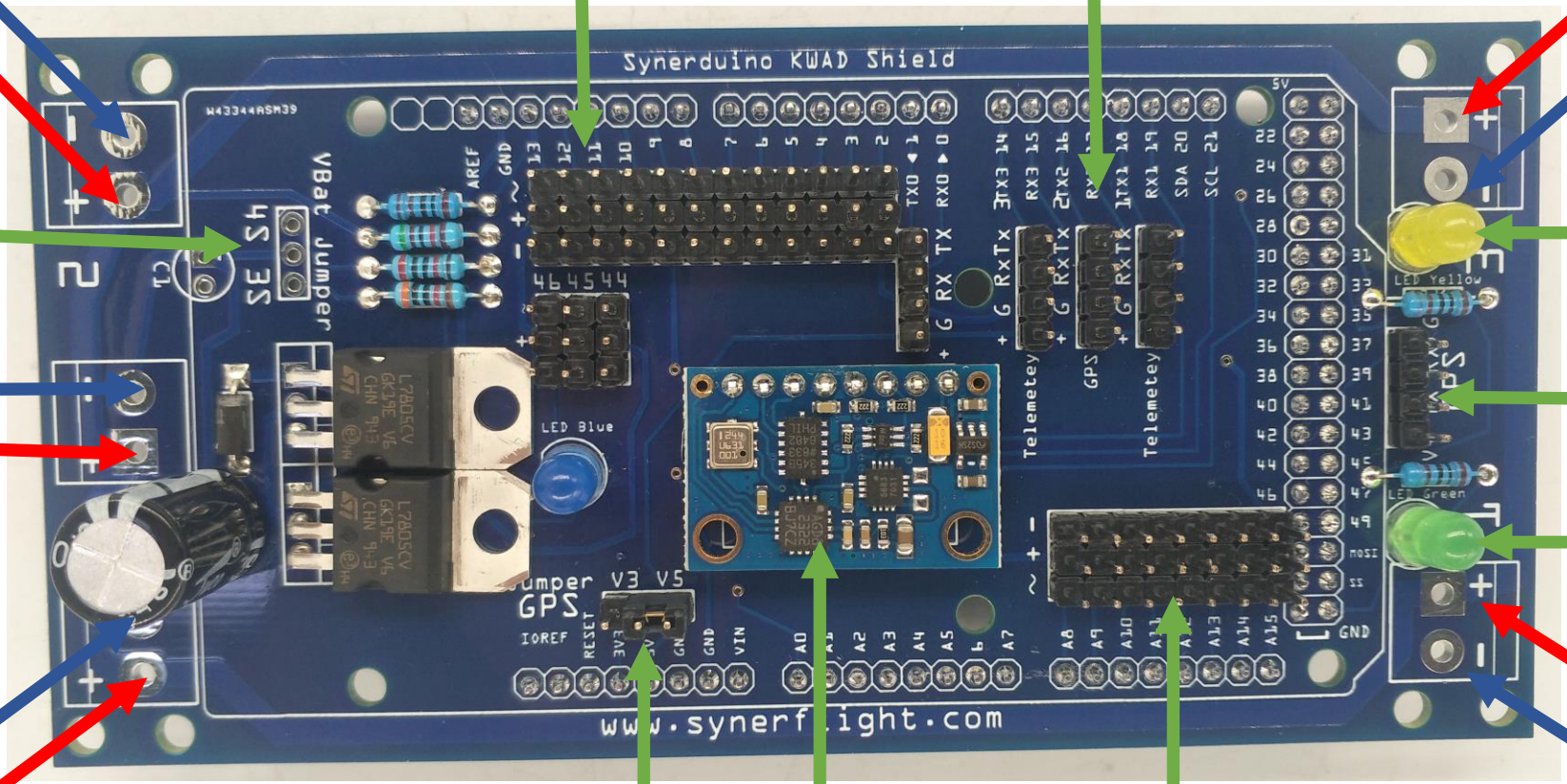
Synerduino Kwad Shield V1 -2021

- **MPU9250**
- **MAG 9250**
- **BMP 180**

Synerduino Kwad Shield Beta -2020

- **L3G4200D**
- **ADXL345**
- **BMP 180**
- **MMC5883**

PIN LAYOUT BETA



ESC is Solder on Top side only

ESC / Servo PWM Out

Serial Pins

ESC is Solder on Top side only

Set jumper to the Battery Cell count (Solded)

GPS LED

Power input 3s 11.1V

GPS Serial Pins

Status LED

ESC is Solder on Top side only

GPS Voltage Jumper

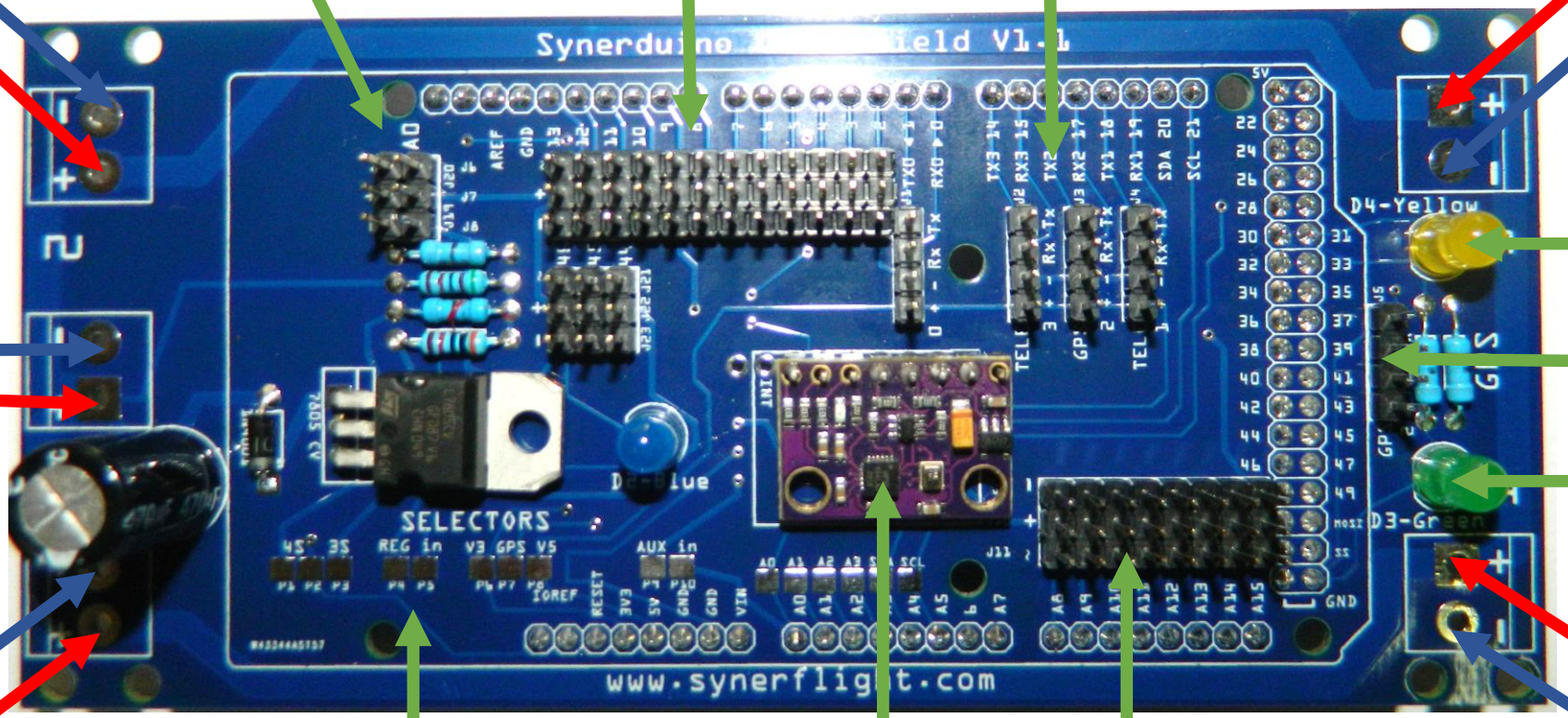
RC PWM in

ESC is Solder on Top side only

For improve performance IMU must be protected from the Environment

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

PIN LAYOUT V1.1



ESC is Solder on Top side only

Aux ADC in

ESC / Servo PWM Out

Serial Pins

ESC is Solder on Top side only

GPS LED

Power input 3s 11.1V

GPS Serial Pins

Status LED

ESC is Solder on Top side only

Jumper Pads Selector Zone

RC PWM in

ESC is Solder on Top side only

For improve performance IMU must be protected from the Environment

IMU : MPU-9250 & BMP280

PIN LAYOUT

Aux ADC in

Description: Auxiliary input for connecting additional sensors or components that output analog signals, allowing the board to read and process external analog data.

Note: *Input Voltage: 3.3-5V*

ESC / Servo PWM Out

Description: These are 36 PWM (Pulse Width Modulation) output pins used to control the motors through ESCs (Electronic Speed Controllers) or servos.

Serial Pins

Description: These are 12 serial pins for communication with external devices or modules like GPS or telemetry systems using a UART interface.

GPS Serial Pins

Description: These are 6 dedicated pins for connecting a GPS module's TX and RX (Transmit and Receive) lines for serial communication.

GPS LED

Description: This LED blinks or stays lit depending on whether the GPS is locked (has found satellites) or is searching for a signal.

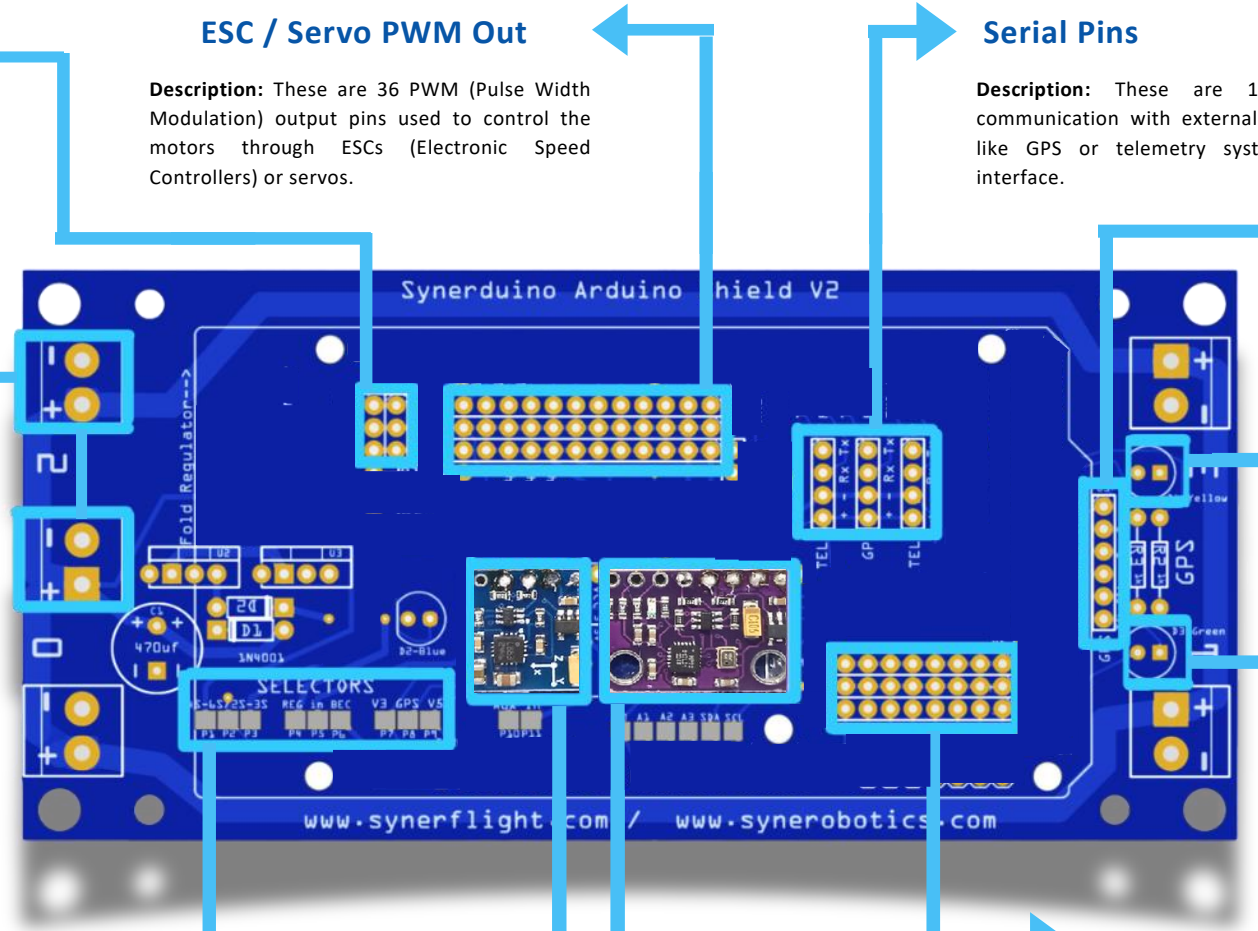
Status LED

Description: A general-purpose status indicator for the board. It could be used to indicate power, initialization, or operational status.

Power Input

Description: This is the main power input for the board, designed for a 3-cell (3S) - 4-cell (4S) LiPo battery - 11.1V and 14.8V respectively. It powers the ESCs, servos, and other components on the board.

Soldering Note: ESCs should only be soldered on the top side of the board, ensuring the solder joints do not penetrate through to the bottom.



Jumper Pads Selector Zone

Description: These are PWM (Pulse Width Modulation) output pins used to control the motors through ESCs (Electronic Speed Controllers) or servos.

BMP180–85 Baro

IMU MPU-9250

Note: *These modules may vary depending on the manufacturer or version. Some versions might use different sensor combinations that could exclude certain components, like the magnetometer.*

RC PWM In

Description: These are 24 pins which accept PWM signals from an RC (radio control) receiver, allowing manual control via an RC transmitter.

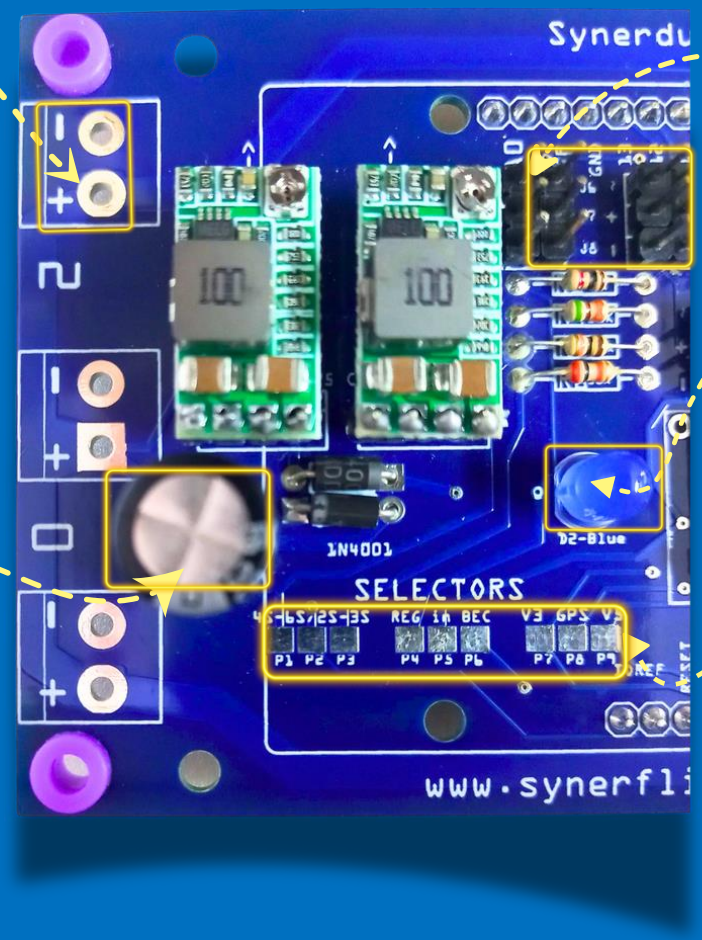
KEY FEATURES OF THE BOARD

Power Terminals (+ and -)

These terminals supply the voltage needed for the entire drone system, ensuring that the right amount of power is distributed across the board and connected components.

Capacitor

Ensures that power distributed to pins and components remains stable, reducing the risk of erratic behavior during flight due to power fluctuations.



GPIO and I/O Headers

Each pin corresponds to a specific function, such as reading throttle, aileron, elevator, and rudder signals from the receiver, processing sensor data, or controlling motors, making them critical for the drone's operation.

LED Indicator

Provides a quick visual confirmation that the board and connected pins are functioning correctly, which is particularly useful during pre-flight checks.

Selector Pins

Selector pins customize the board's power management, allowing you to configure ESCs, GPS modules, and sensors according to flight needs.

SYNERDUINO KIT COMPONENTS

Features:

- Compatible with MultiWii (open source RC multi rotor flying platform)
- Compatible with Arduino Mega 2560 and Uno
- Ground Station with Flywii GUI or Synerflight App
- IMU 10DOF
- Supports 3S/6S Batteries
- 4 Output ESC Pads
- Mode Selection Pads (V1.1)
- ADC sensor input (V1.1)
- Highly customizable
- PWM Power Rails support Upto 5V 3A – V2 boards

Technical Specifications:

- Physical Dimensions: 128 x 62 x 28 mm LWH
- Weight: 46.1g
- 4 Solder Pads for 4 ESCs and Motors
- 15 3-Pin Digital Headers
- 8 3-Pin Analog Headers
- 5 4-Pin Serial Headers

Firmware Specifications can be setup on Ino file:

- Support for M9 and M10 NEO GPS
- Angle home reset – manual home reset on drone position oppose to Traditional Arm home reset
- RX Fusion – allow MSP and RC RX to fusion control commands for multi-input useful for companion board operation
- Surface now include bow thrusters or mix lateral drive

ASSEMBLY

TOOLS AND MATERIALS

PLIERS

Used for gripping, bending, and cutting wires or components during the assembly process.

TAPES

Electrical and double-sided tapes used for securing wires and insulating electrical connections.

SOLDERING SET

Essential for soldering components and making secure connections between wires and circuit boards.

HEX DRIVER SET

Utilized for tightening or loosening hex screws commonly found in drone frames and components.

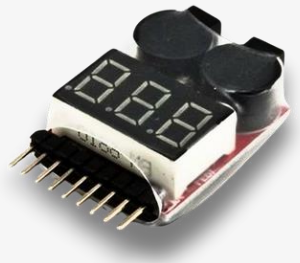
CUTTER

Handy for cutting zip ties, wires, or other materials to the desired length during assembly.

ZIP TIES

Used for bundling and securing wires, ensuring neat and organized cabling inside the drone.

TOOLS AND MATERIALS



BATTERY ALARM CHECKER

Monitors battery voltage, providing warnings when the battery is low to prevent damage or crashes.

LI-PO BATTERY CHARGER

Safely recharges Li-Po batteries, ensuring optimal battery health and longevity.

PVC GLUE

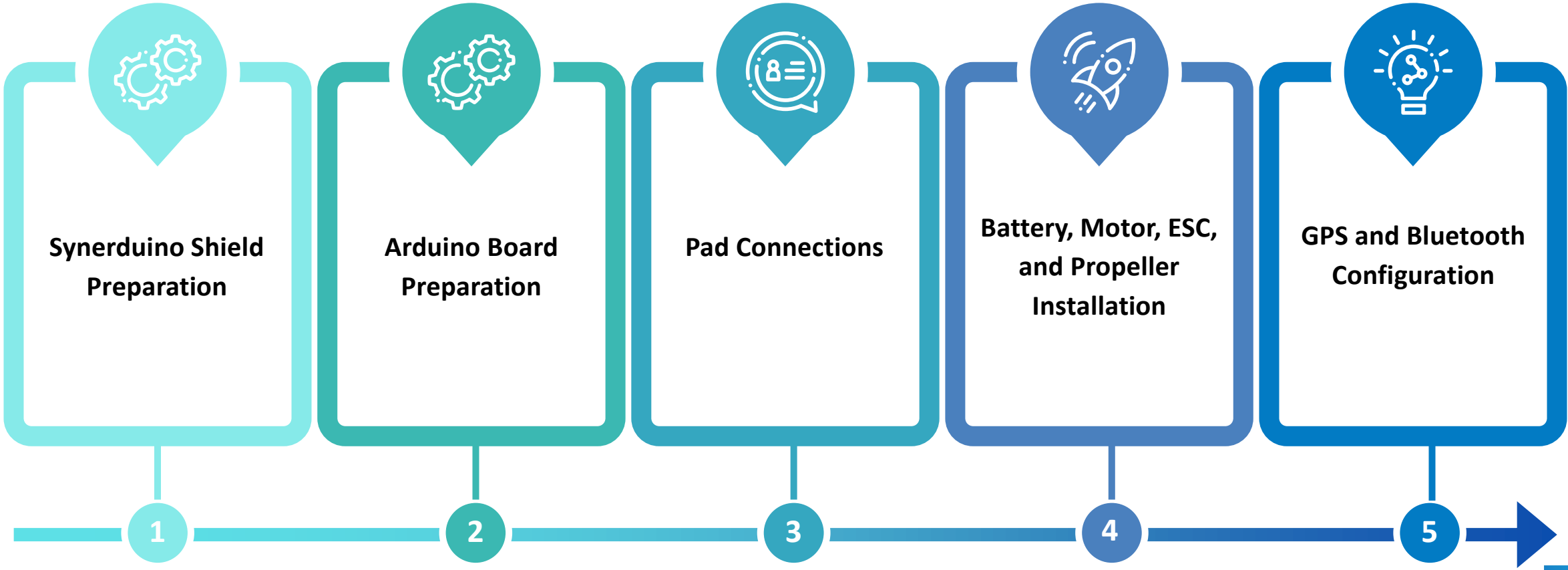
Used for assembling or reinforcing non-electrical parts of the drone frame and components.

THREAD LOCKER PURPLE

Secures screws and fasteners in place, preventing them from loosening due to vibration during flight.

ASSEMBLING PROCESS

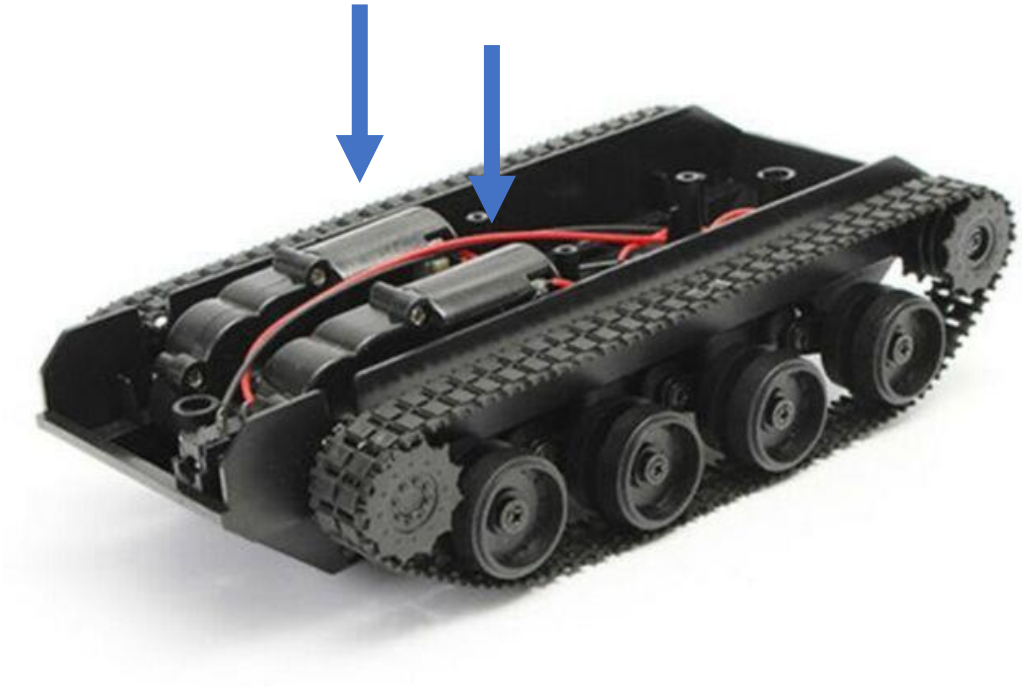
This section outlines the essential steps for assembling your Synerduino Drone Kit. Begin by gathering the necessary tools and materials, then prepare the Synerduino shield and the Arduino board. Finally, install the motor, Electronic Speed Controller (ESC), and propeller. Follow these steps carefully to ensure a successful assembly and get your drone ready for flight!



ASSEMBLING PROCESS

Differential Drive

2pcs Motor Differential drive



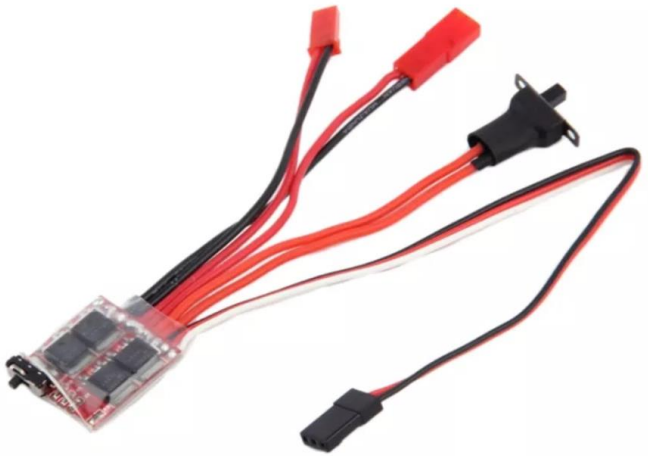
2pcs Motor Differential drive

HARDWARE SELECTION

Wheel and Geared motor

Rover 2pcs for Differential drive

ESCs with Bi-Directional function



2 Pcs for differential drive

Boat Propeller with Waterproof motor Pods

Boat 2pcs Differential Drive

Brushed or Brushless the BLDC motor should match your Electronic Speed controller

ASSEMBLING PROCESS

Steering Drive

Motor & Steering Servo

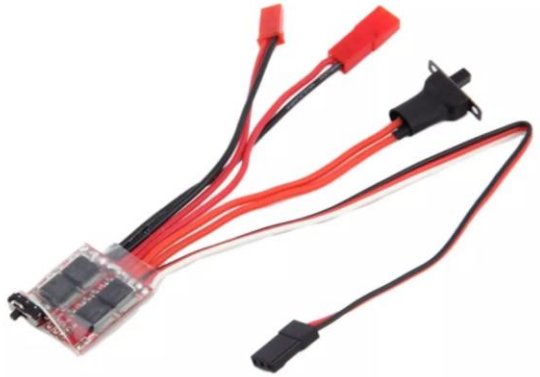
Motor & Rudder Servo

HARDWARE SELECTION

Wheel and Geared motor

Rover 1pcs for Steering drive

ESCs with Bi-Directional function



1pcs for Steering Drive

Servo

Boat Propeller with Waterproof motor Pods

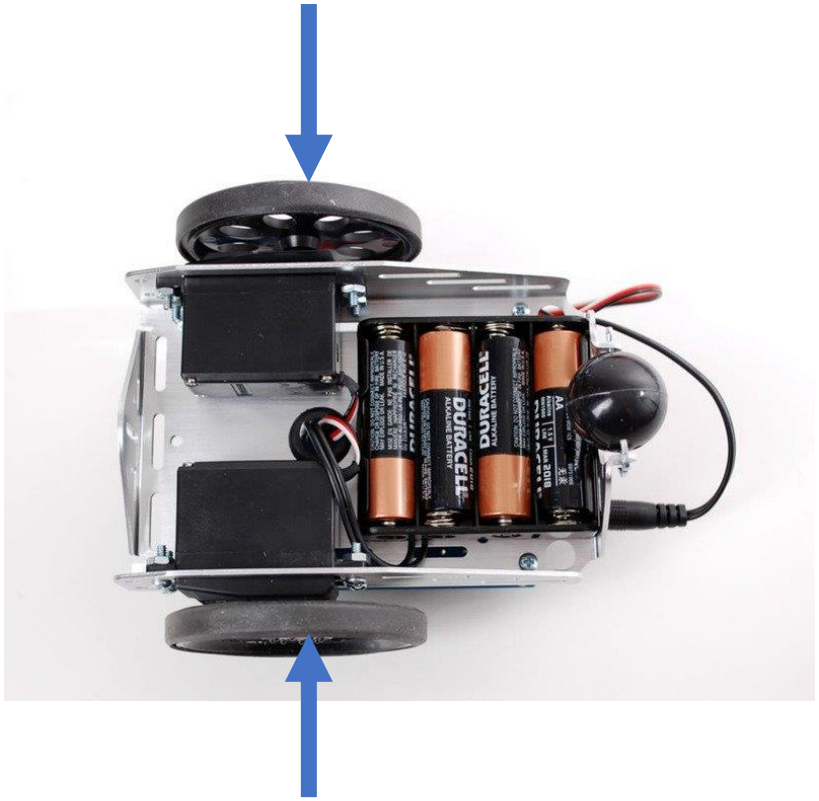
Boat 1pcs Steering Drive

Brushed or Brushless the BLDC motor should match your Electronic Speed controller

HARDWARE SELECTION

Differential Drive with CR Servos

Continues Rotational Servo



Continues Rotational Servo

Servos Design to rotate 360Degrees with proportional speed and directional control

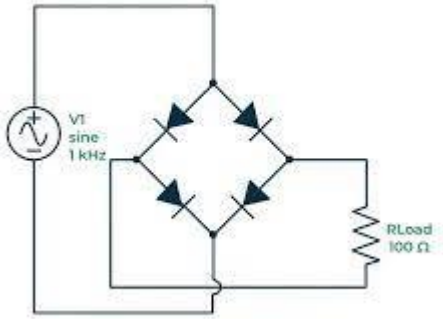
1000ms Reverse – 1500ms Neutral – 2000ms Forward

For 4wD configuration pair up two servos with a Servo Y splitter

HIGH POWER HARDWARE SELECTION

For those running additional sensors , servos and other 5V or 6V components Please use an standalone BEC to power extra hardware

Rectifiers are useful as reverse polarity protection at source. Can be place before the ESC,Servo,Synerduino board rating must be higher than the combine current off all the electronics and motor current draw

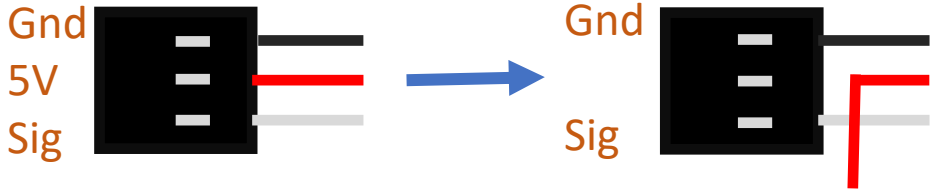


For ESCs that have 6V – 8V BEC , to prevent damage to Synerduino PWM Power Rail its recommended that the PWM Power wire is disconnected

High power servos that required 6V-12V

Its required you use an External BEC or Power supply to power Large servos

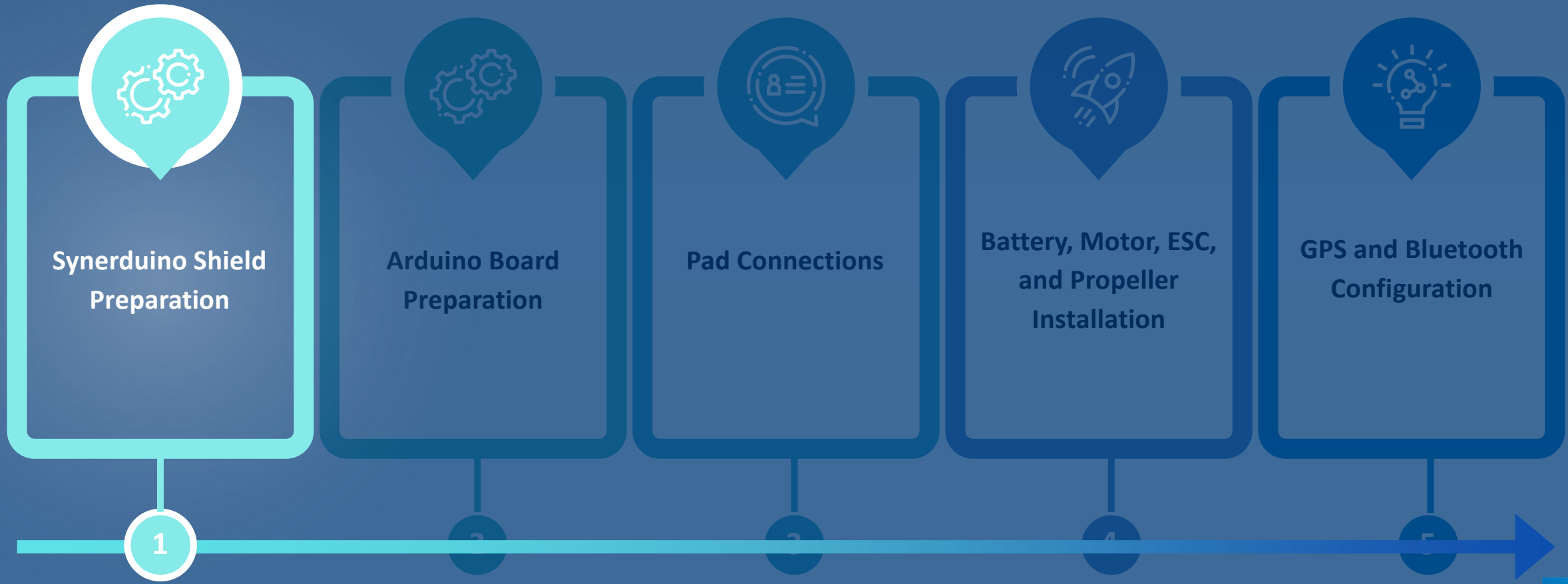
Disconnect the Red PWM servo wire to



this can be redirected to the power input rail or high power servo input

ASSEMBLING PROCESS

This section outlines the essential steps for assembling your Synerduino Drone Kit. Follow these steps carefully to ensure a successful assembly and get your drone ready for flight!



SYNERDUINO BOARD PREPARATION

Aux ADC in

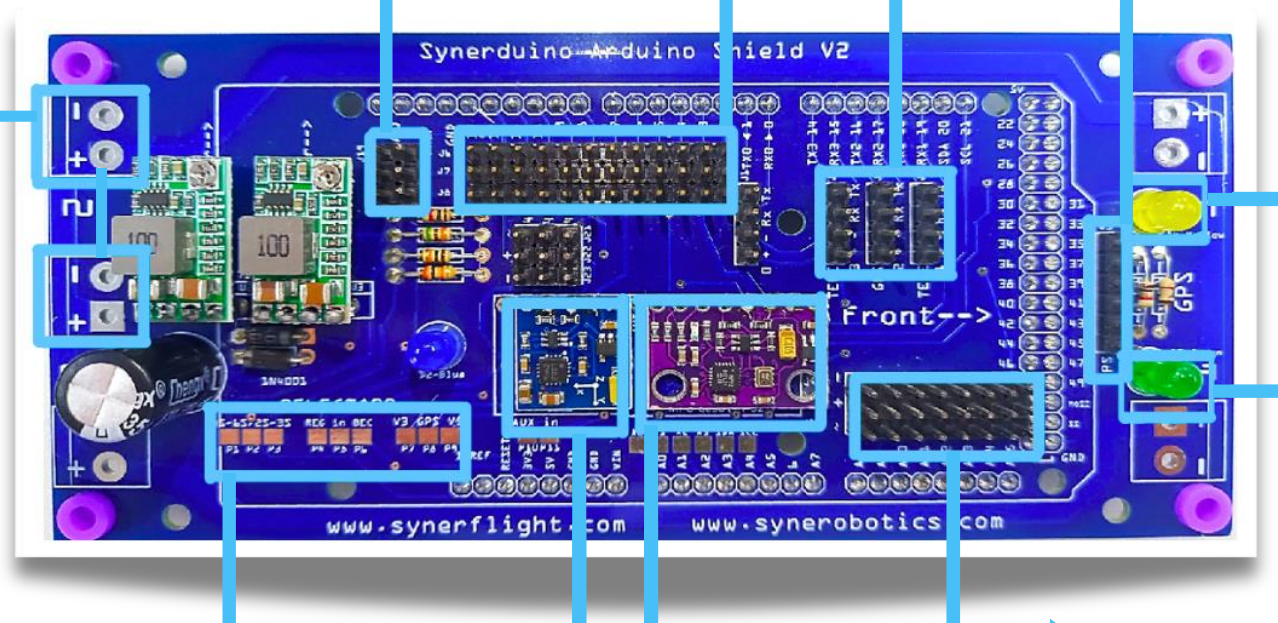
Usage: These pins are used to connect external sensors or devices that output analog signals, such as temperature, pressure, or current sensors.

ESC / Servo PWM Out

Usage: ESCs should be connected to these pins for motor control in a drone or robot.

Serial Pins

Usage: You can use these for connecting devices that need to send/receive serial data.



GPS Serial Pins

Usage: You will connect the GPS module's TX to the RX pin on the board and vice versa, ensuring the correct serial data exchange between the GPS and the microcontroller.

GPS LED

Usage: When the GPS module is properly connected, this LED will inform you of its status. A blinking or steady light usually indicates good GPS reception.

Status LED

Usage: The microcontroller on the board controls this LED, which will light up to signal that the board is functioning correctly.

Power Input

Usage: Connect a 3S LiPo battery to this input. Make sure to match the polarity of the battery with the input terminals to avoid damaging the board.

Soldering Note: ESCs should only be soldered on the top side of the board, ensuring the solder joints do not penetrate through to the bottom.

Jumper Pads Selector Zone

Usage: By soldering the appropriate jumper pads, you can select between different power sources or set the board for the correct number of battery cells.

BMP180 – 85 Baro

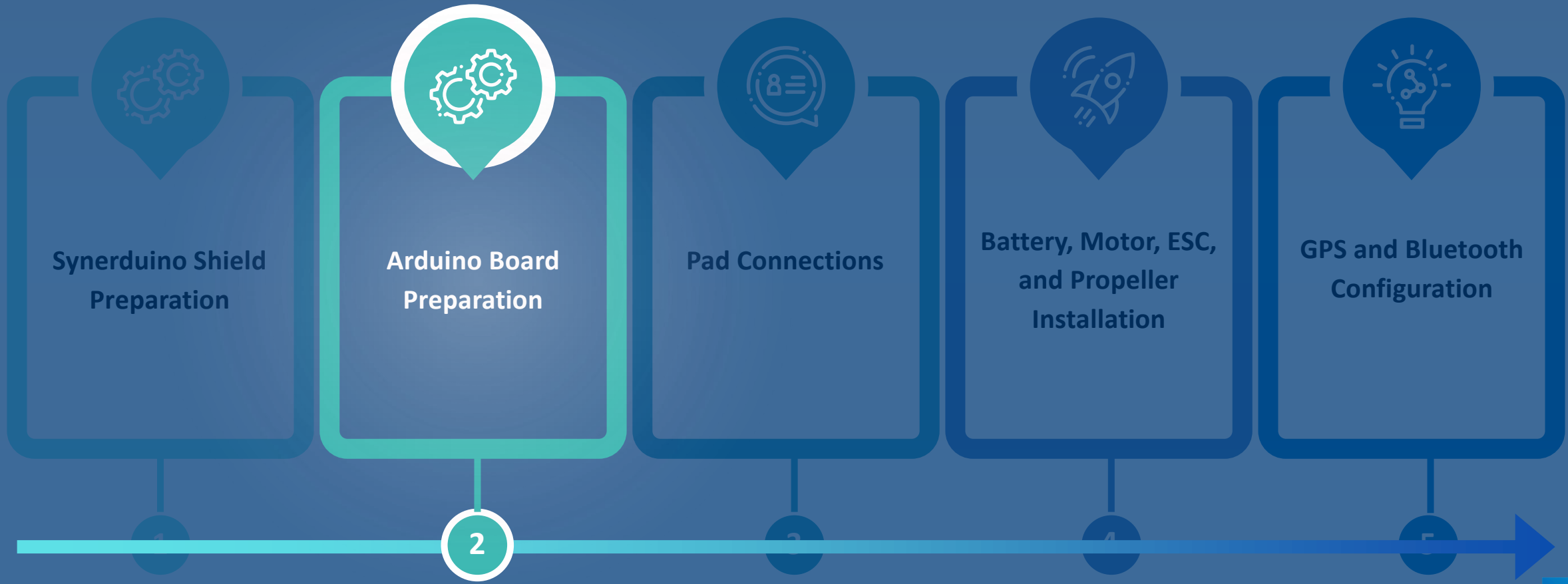
IMU : MPU-9250

RC PWM In

Usage: Connect the output pins from your RC receiver to these PWM input pins. The signals will then be processed by the microcontroller, which can send commands to the motors through the ESC.

ASSEMBLING PROCESS

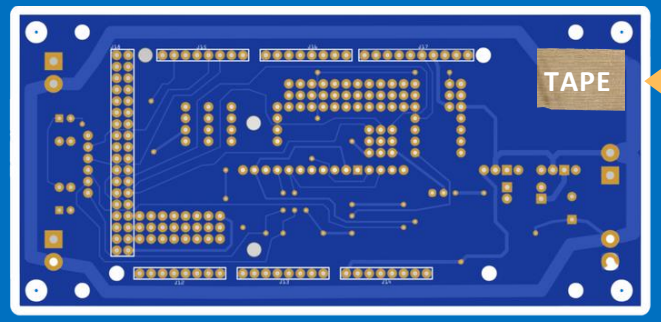
This section outlines the essential steps for assembling your Synerduino Drone Kit. Follow these steps carefully to ensure a successful assembly and get your drone ready for flight!



BOARD PREPARATION

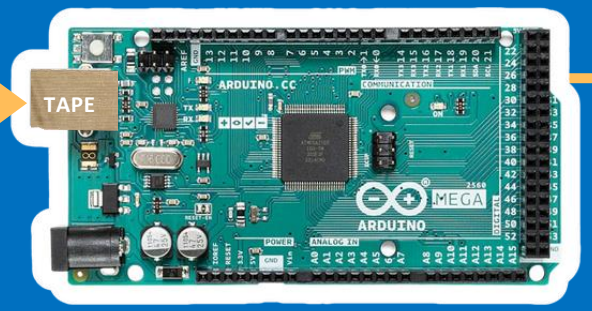
Step 1:

Add tape to these areas to ensure insulation from the Arduino board.

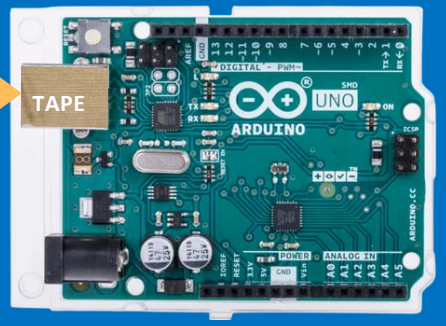


Add tape to the top right side corner at the back of the Synerduino board.

2560 MEGA



UNO 328



Add tape to the top-left side of the Arduino 2560 MEGA/UNO 328 board to cover the metal part.

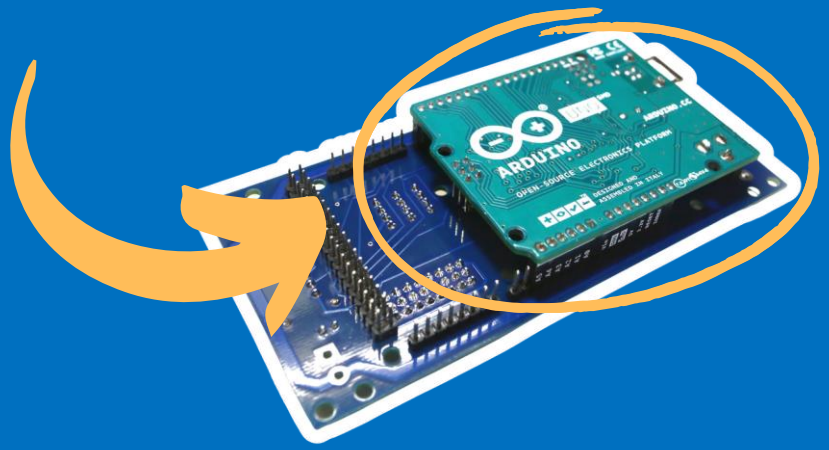
Note: The exposed metal areas may come into contact with the Synerduino kit components, potentially causing a short circuit.

Step 2:

Make sure to seal the cover onto the sensor using PVA glue, and allow it to fully dry before proceeding.

Step 3:

Now, connect the Arduino Uno Shield to the back of the Synerduino board.



ASSEMBLING PROCESS

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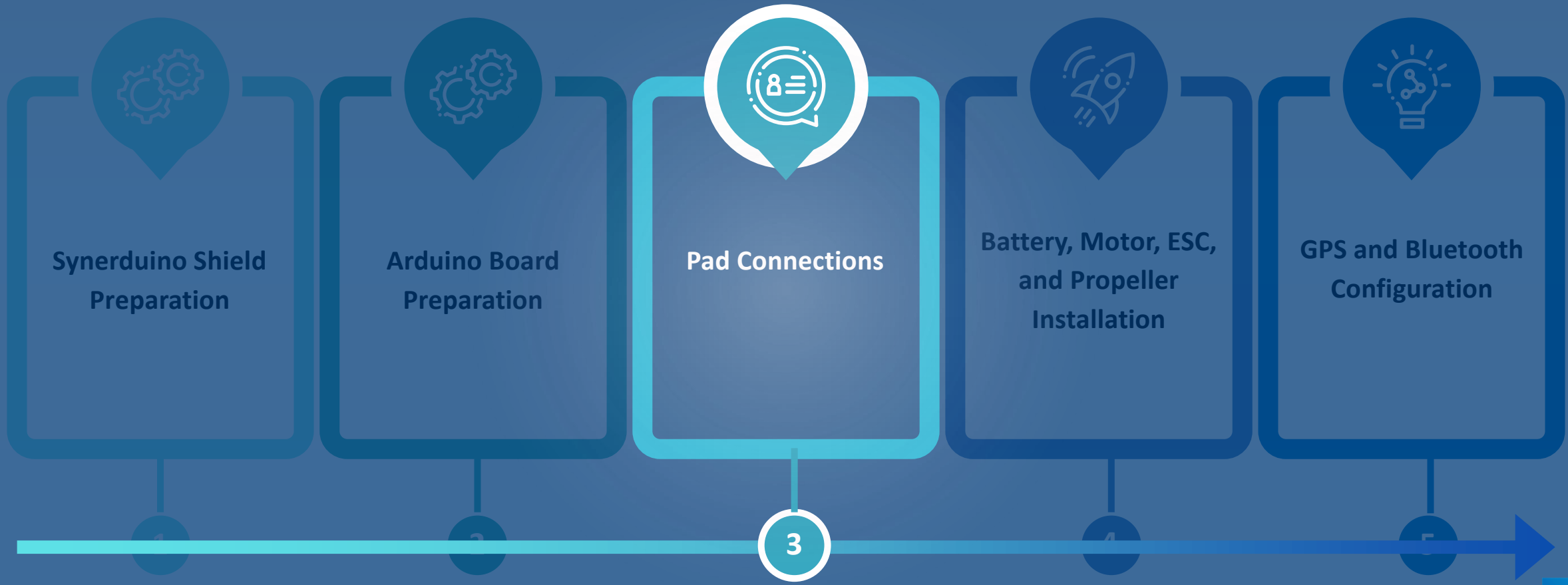
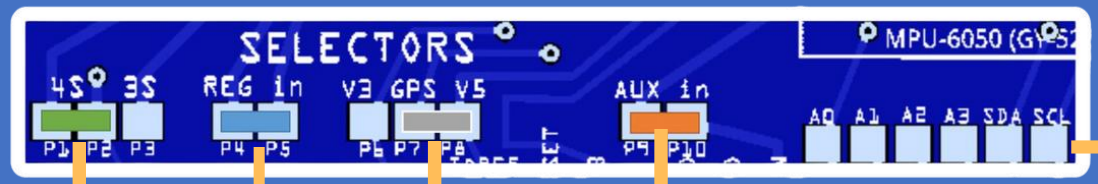


Step 4:

Power Selector Jumper Pads are directly added to the main board, enabling users to choose the desired power source through a simple soldering step:

Apply a **small blob of solder** to bridge the specific pads corresponding to your preferred power option.

This approach provides a secure connection, giving you the flexibility to configure power supply without additional components, all in a compact and reliable manner.



Battery cell monitoring 2s - 4S

To use the onboard battery monitoring with Aux In:

- Set to 3S if you're using a 1S-3S battery.
- Set to 4S if you're using a 4S battery.
- Leave it open when using Aux In as external sensors or when using 5S-6S batteries.

5V Regulator from battery

- For Reg In, short the pads to use the regulator to power both the Synerduino and Arduino board, along with the built-in power distributor.

GPS Pins V+ voltage in front of the board

The 2nd GPS pin comes with a voltage selector:

- Set to 5V for a regular GPS.
- Set to 3V for an external I2C sensor, such as a magnetometer.

Analog 0 pin Auxin / Battery monitor

For Aux In:

- Leave it open to utilize the A0 pins for external ADC sensors.
- Short the pads to use the built-in battery monitoring. Ensure the Cell Selector is set to 3S or 4S, depending on the battery configuration.

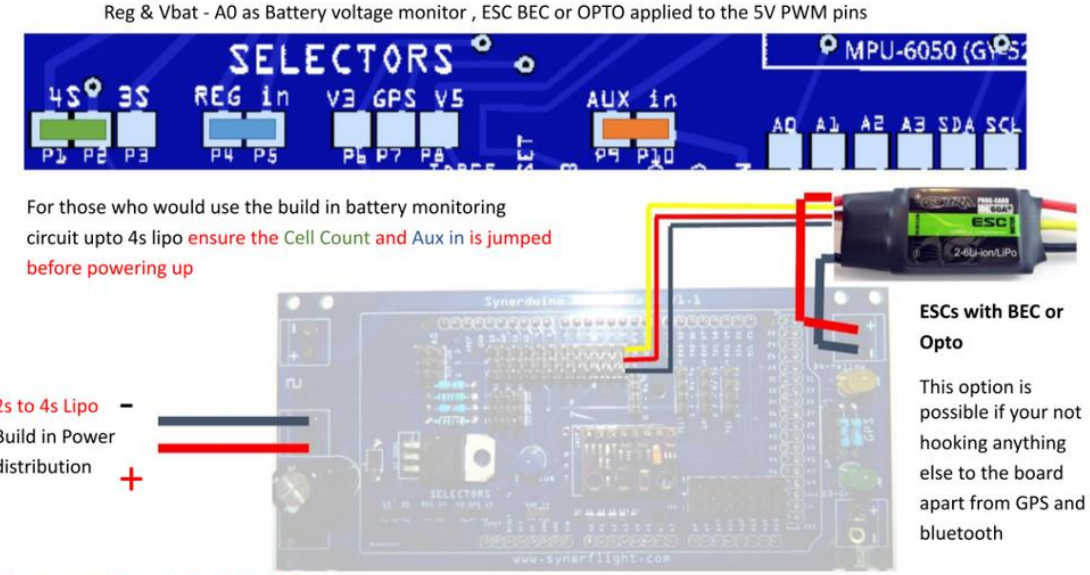
External i2C A4 and A4

For External Sensors not supported by the Board

PAD CONNECTIONS

SYNERDUINO KWAD SHIELD V1 BOARD

Reg & Vbat - A0 as Battery voltage monitor , ESC BEC or OPTO applied to the 5V PWM pins



For those who would use the build in battery monitoring circuit upto 4s lipo ensure the Cell Count and Aux in is jumped before powering up

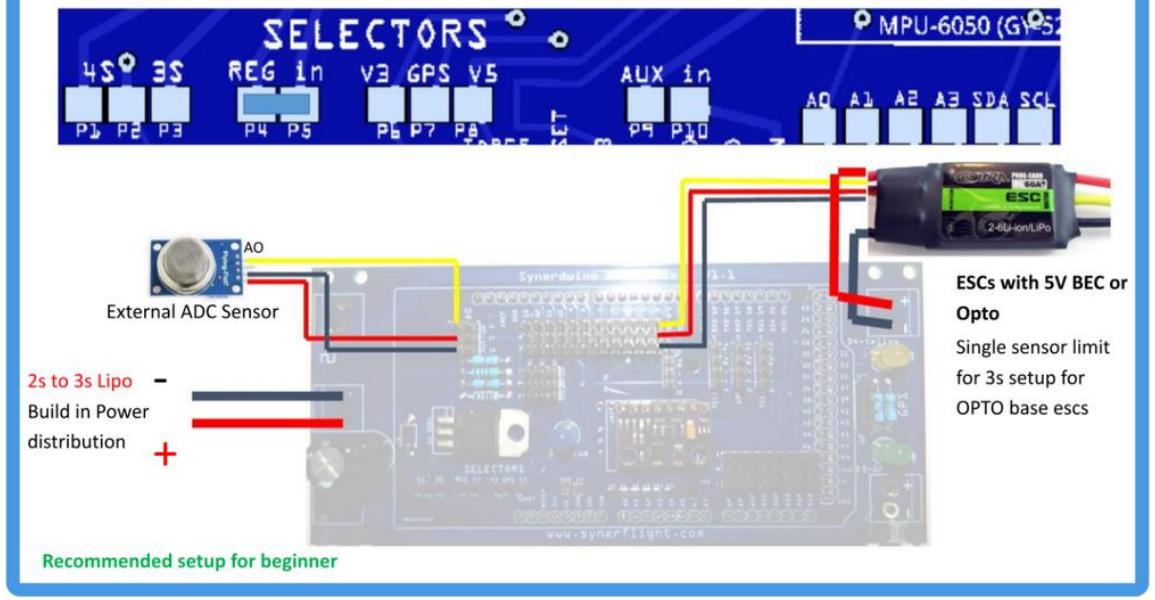
2s to 4s Lipo
Build in Power distribution
\+
–

ESCs with BEC or Opto

This option is possible if your not hooking anything else to the board apart from GPS and bluetooth

Recommended setup for beginner

Reg in only - A0 External ADC sensor , ESC BEC or OPTO applied to the 5V PWM pins



2s to 3s Lipo
Build in Power distribution
\+
–

ESCs with 5V BEC or Opto

Single sensor limit for 3s setup for OPTO base escs

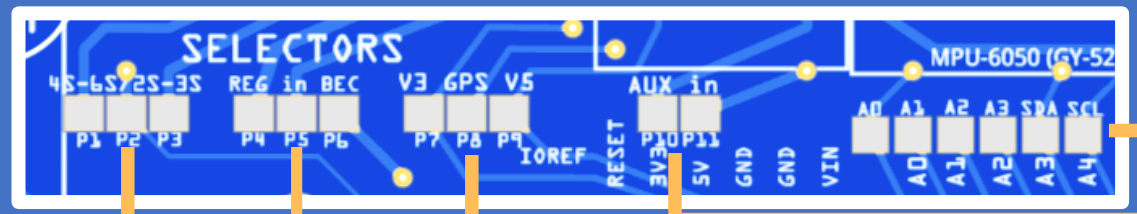
Recommended setup for beginner

Step 4:

Power Selector Jumper Pads are directly added to the main board, enabling users to choose the desired power source through a simple soldering step:

Apply a **small blob of solder** to bridge the specific pads corresponding to your preferred power option.

This approach provides a secure connection, giving you the flexibility to configure power supply without additional components, all in a compact and reliable manner.



External i2C A4 and A4

For External Sensors not supported by the Board

Battery cell monitoring 4s-6s or 2s-3s

To use the onboard battery monitoring with Aux In:

- Set to 3S if you're using a 1S-3S battery.
- Set to 4S if you're using a 4S battery.
- Leave it open when using Aux In as external sensors or when using 5S-6S batteries.

5V Regulator from battery

- For Reg In, short the pads to use the regulator to power both the Synerduino and Arduino board, along with the built-in power distributor.
- Bec to Used ESC's 5V BEC to power the Synerduino shield and Arduino Board

GPS Pins V+ voltage in front of the board

The 2nd GPS pin comes with a voltage selector:

- Set to 5V for a regular GPS.
- Set to 3V for an external I2C sensor, such as a magnetometer.

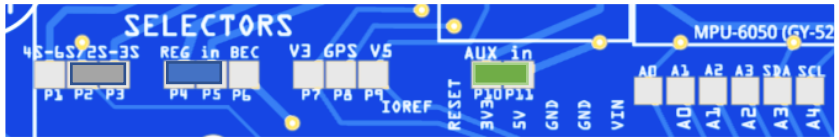
Analog 0 pin Auxin / Battery monitor

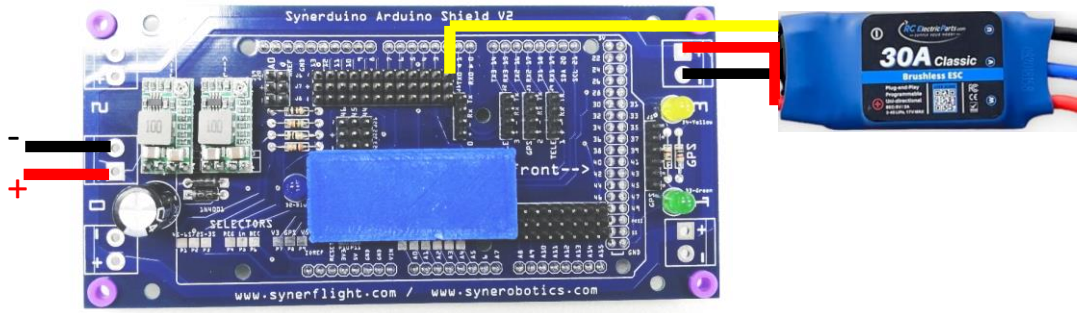
For Aux In:

- Leave it open to utilize the A0 pins for external ADC sensors.
- Short the pads to use the built-in battery monitoring. Ensure the Cell Selector is set to 3S or 4S, depending on the battery configuration.

PAD CONNECTIONS

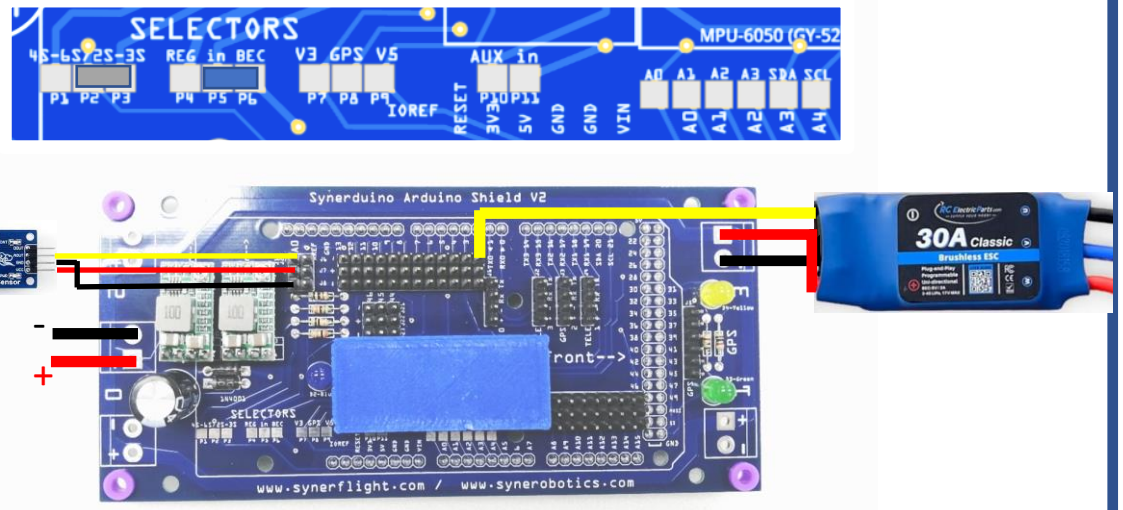
SYNERDUINO ARDUINO SHIELD V2 BOARD





Reg in – to use the onboard power supply to run the board up to 3A

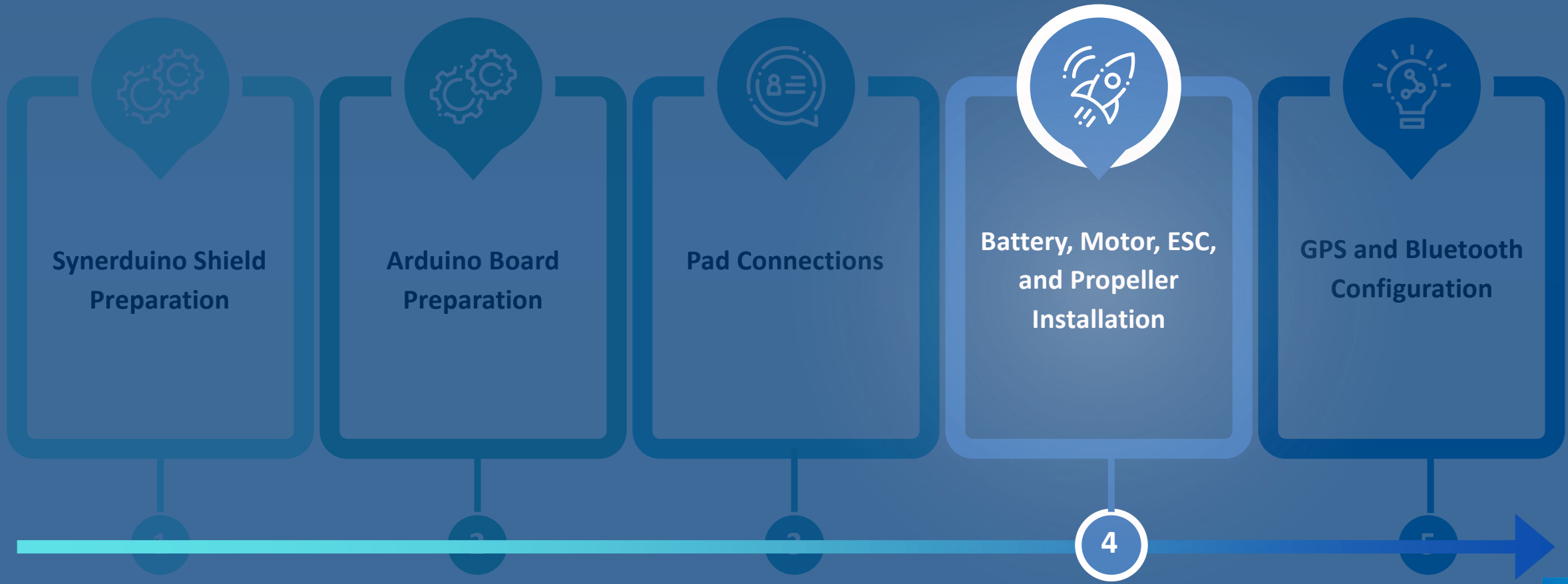
Aux in – to Read the Battert Voltage assign by the 4s-6s or 2s-3s pads



BEC in – if your using External BEC or ESC Bec to provide much needed Power to run Servos and External sensors and Companion Hardware NOTE: Synerduino only support 5V input from BEC

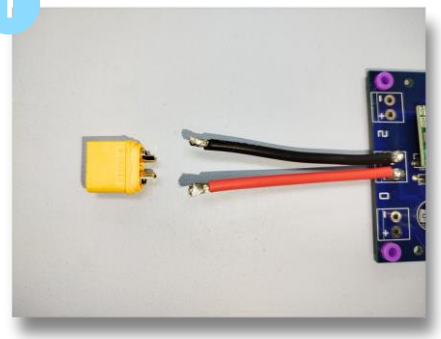
ASSEMBLING PROCESS

This section outlines the essential steps for assembling your Synerduino Drone Kit. Follow these steps carefully to ensure a successful assembly and get your drone ready for flight!

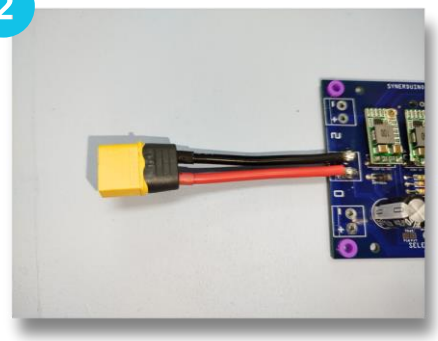


BATTERY INSTALLATION

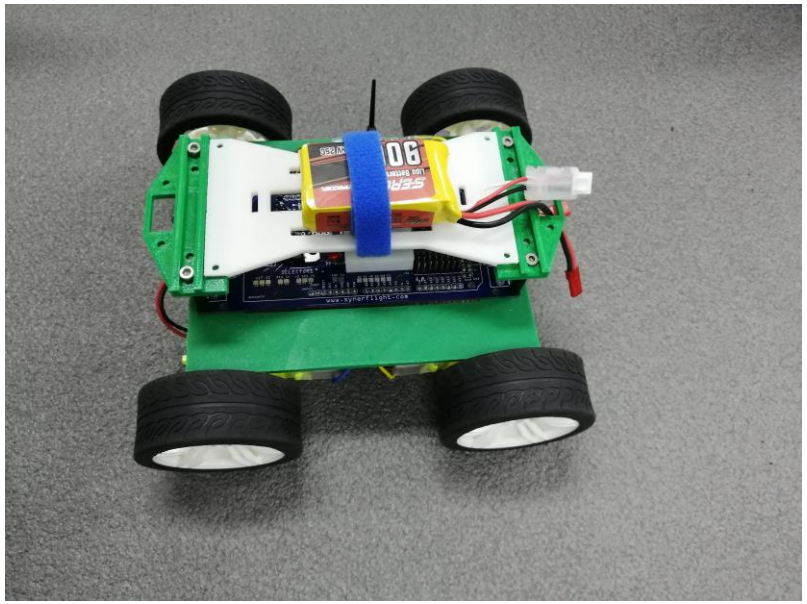
1



2



3



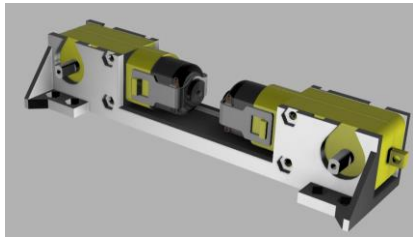
STEPS

1. Connect the battery cable to the power connector.
2. Secure the connection to prevent detachment.
3. Secure the battery using straps or clips to prevent movement during operation.

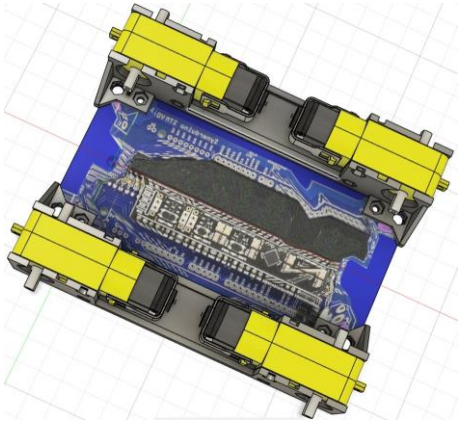
NOTE: Always check battery voltage before installation to ensure it's fully charged.

MOTOR INSTALLATION

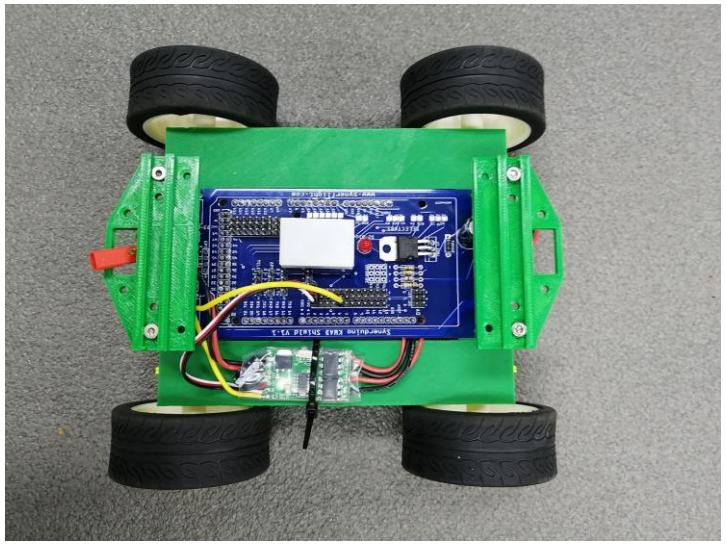
1



2



3

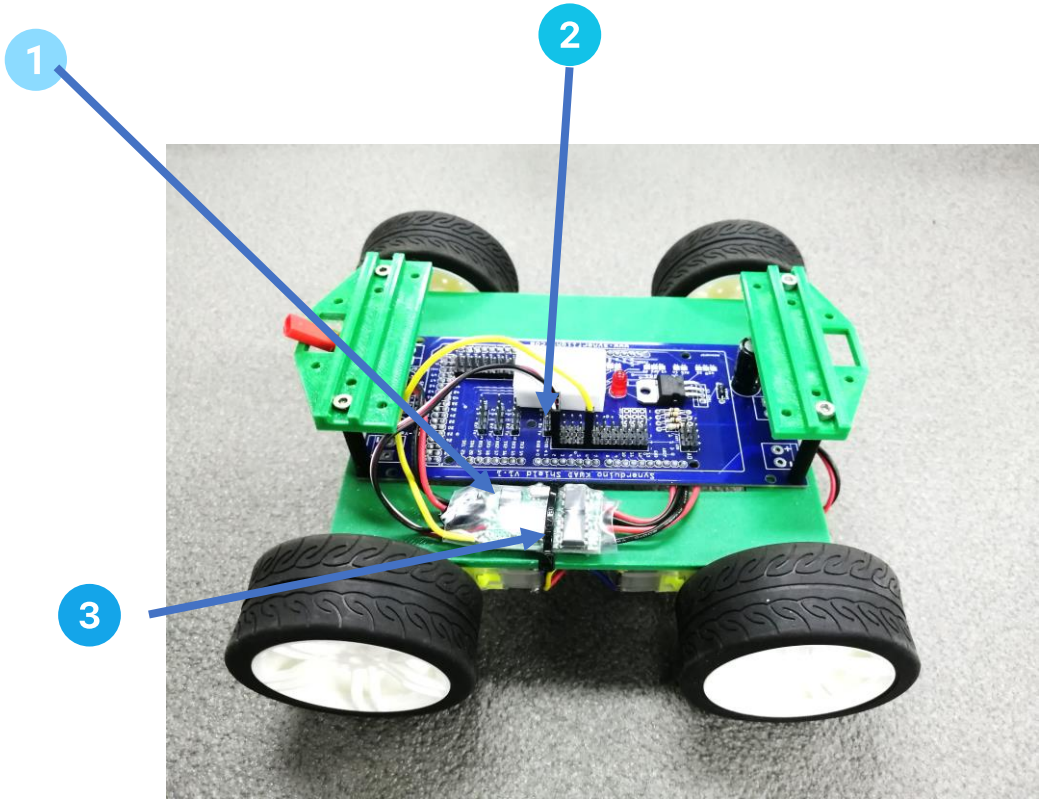


STEPS

1. Prepare the motor along with the two screws and nuts.
2. Secure the motor onto the designated motor mount, ensuring it aligns with the screw holes.
3. Connect the motor wires (usually three) to the ESC (Electronic Speed Controller), ensuring proper pairing (color-coded or numbered).

NOTE: If your motor has directional markings, ensure proper orientation for correct propeller spin.

ESC INSTALLATION

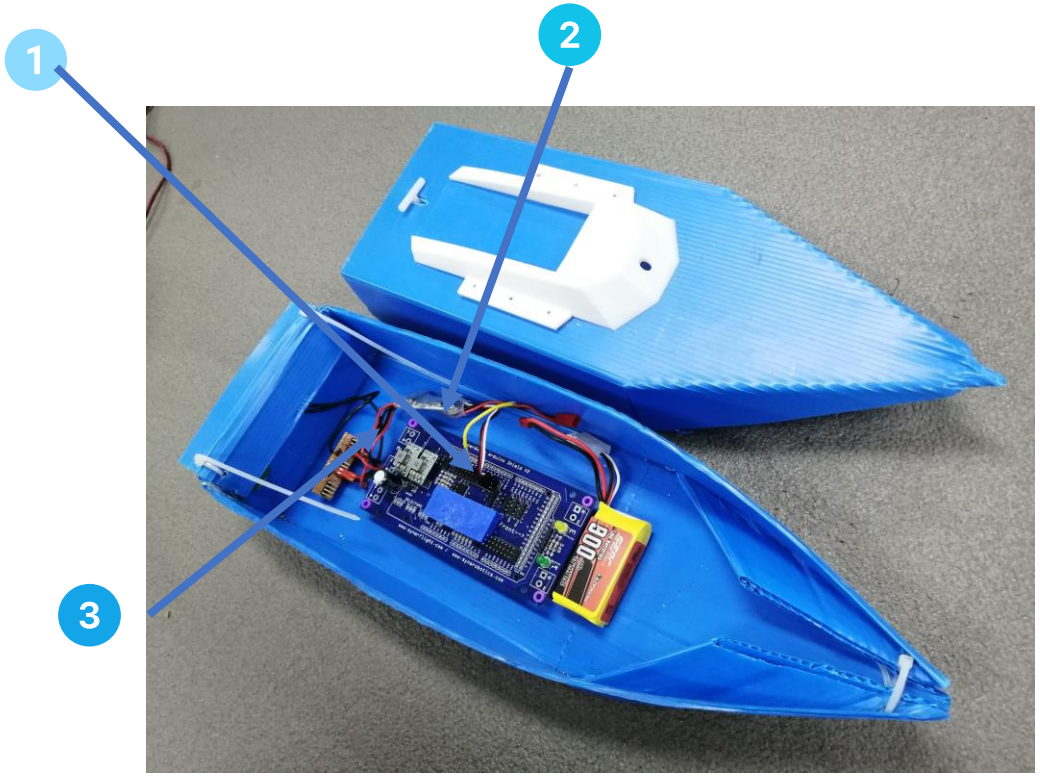


STEPS

1. Properly arrange the ESC modules and wiring layout.
2. Connect the ESCs to the Synerduino board, ensuring wires are correctly positioned and soldered.
3. Ensure that the ESC modules are securely zip-tied to the drone chassis and placed near the motor.

NOTE: Program the ESC to suit your motor's specifications if required.

ESC INSTALLATION



STEPS

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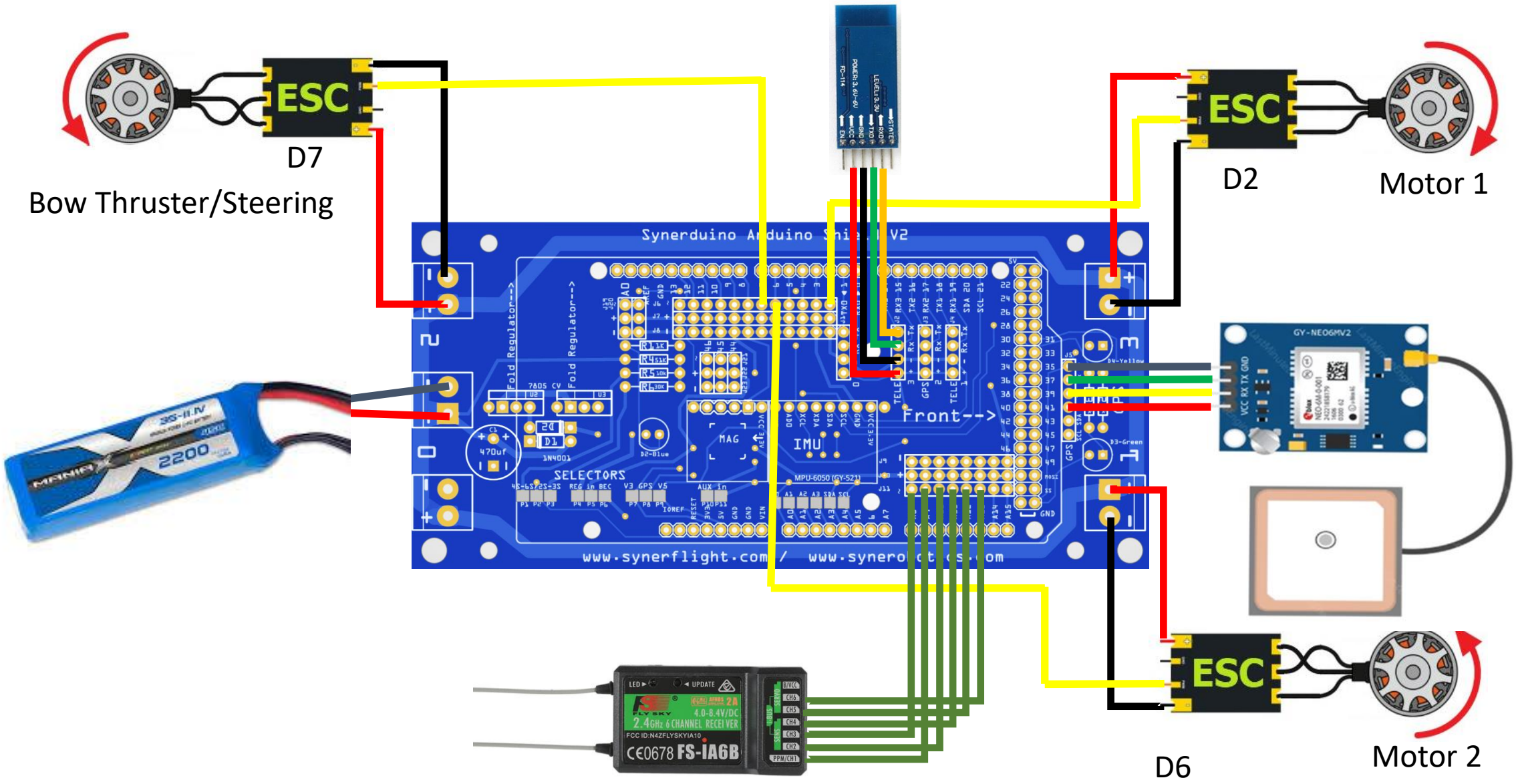
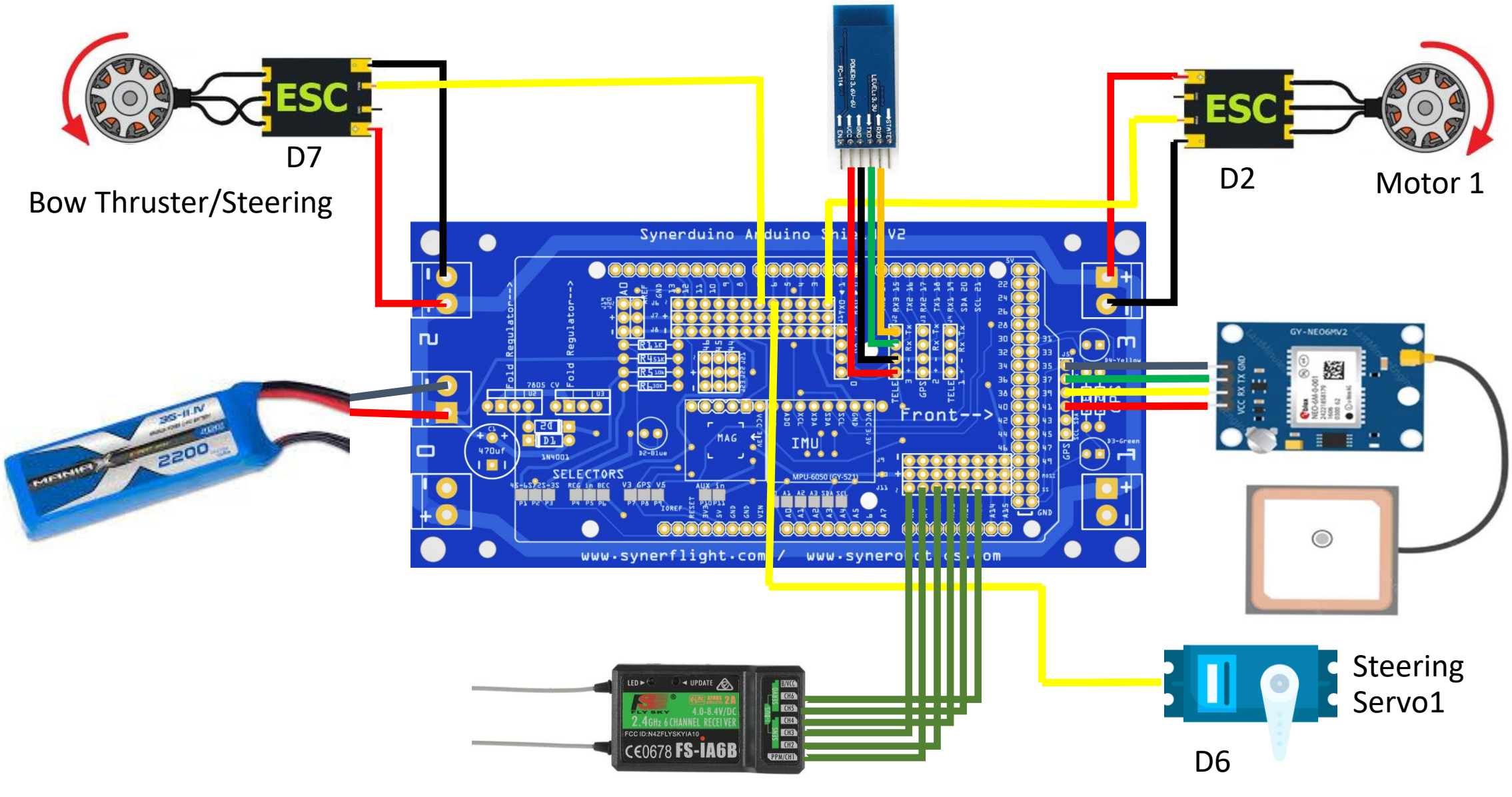
2. Connect the ESCs to the Synerduino board, ensuring wires are correctly positioned and soldered.
3. Ensure that the ESC modules are securely zip-tied to the drone chassis and placed near the motor.

NOTE: Program the ESC to suit your motor's specifications if required.

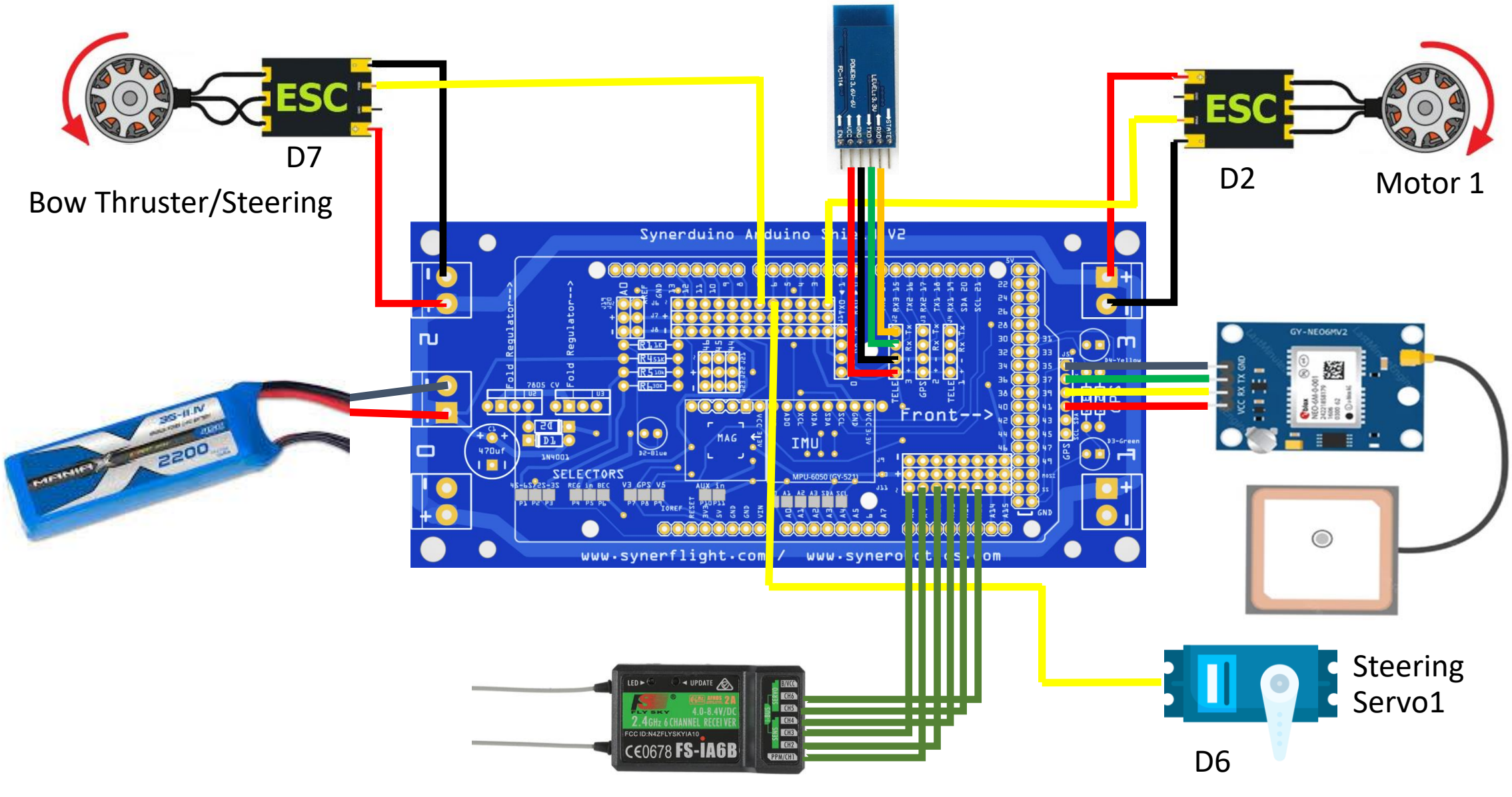
DIFFERENTIAL INSTALLATION



STEERING INSTALLATION

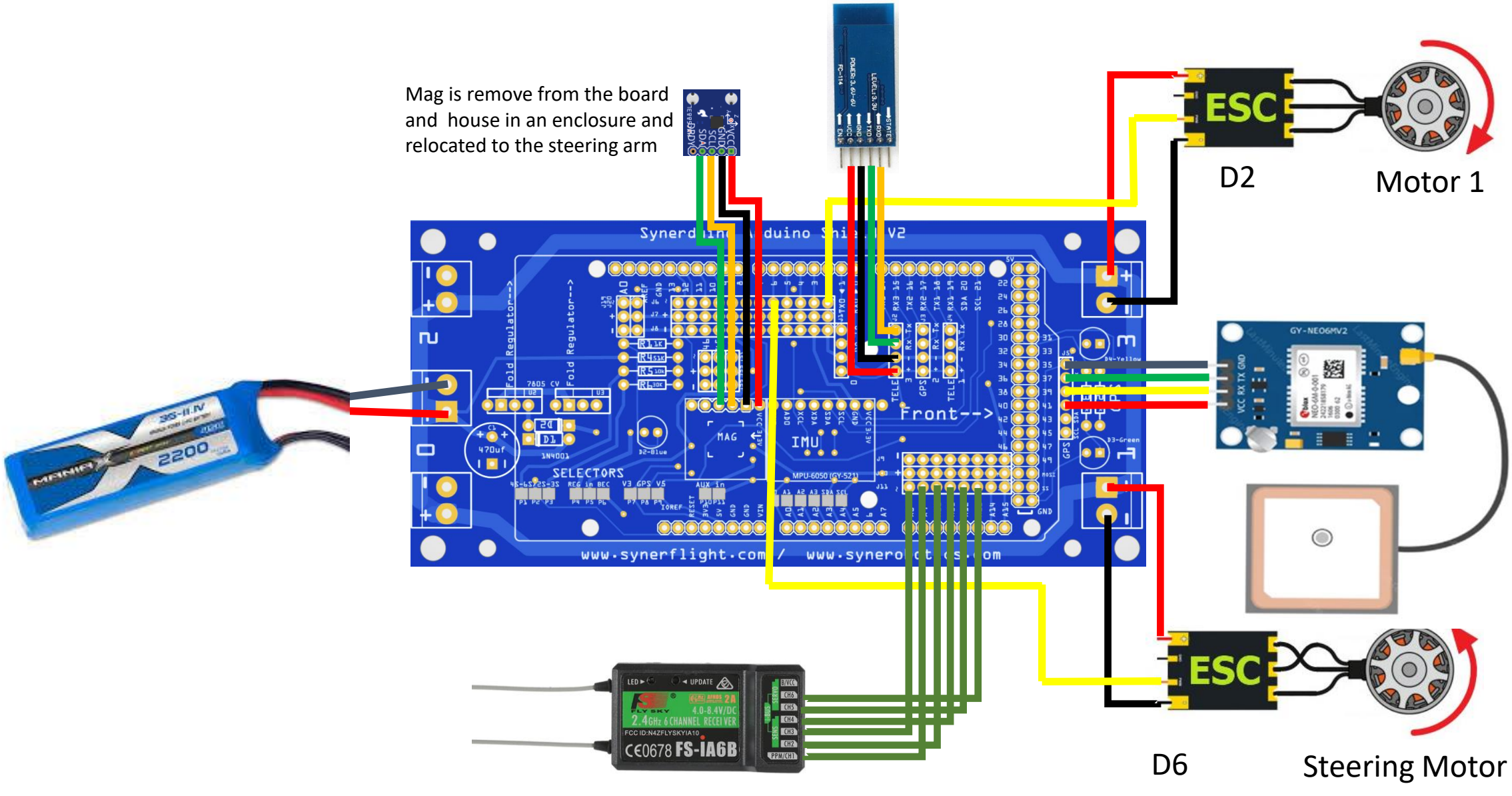


STEERING INSTALLATION

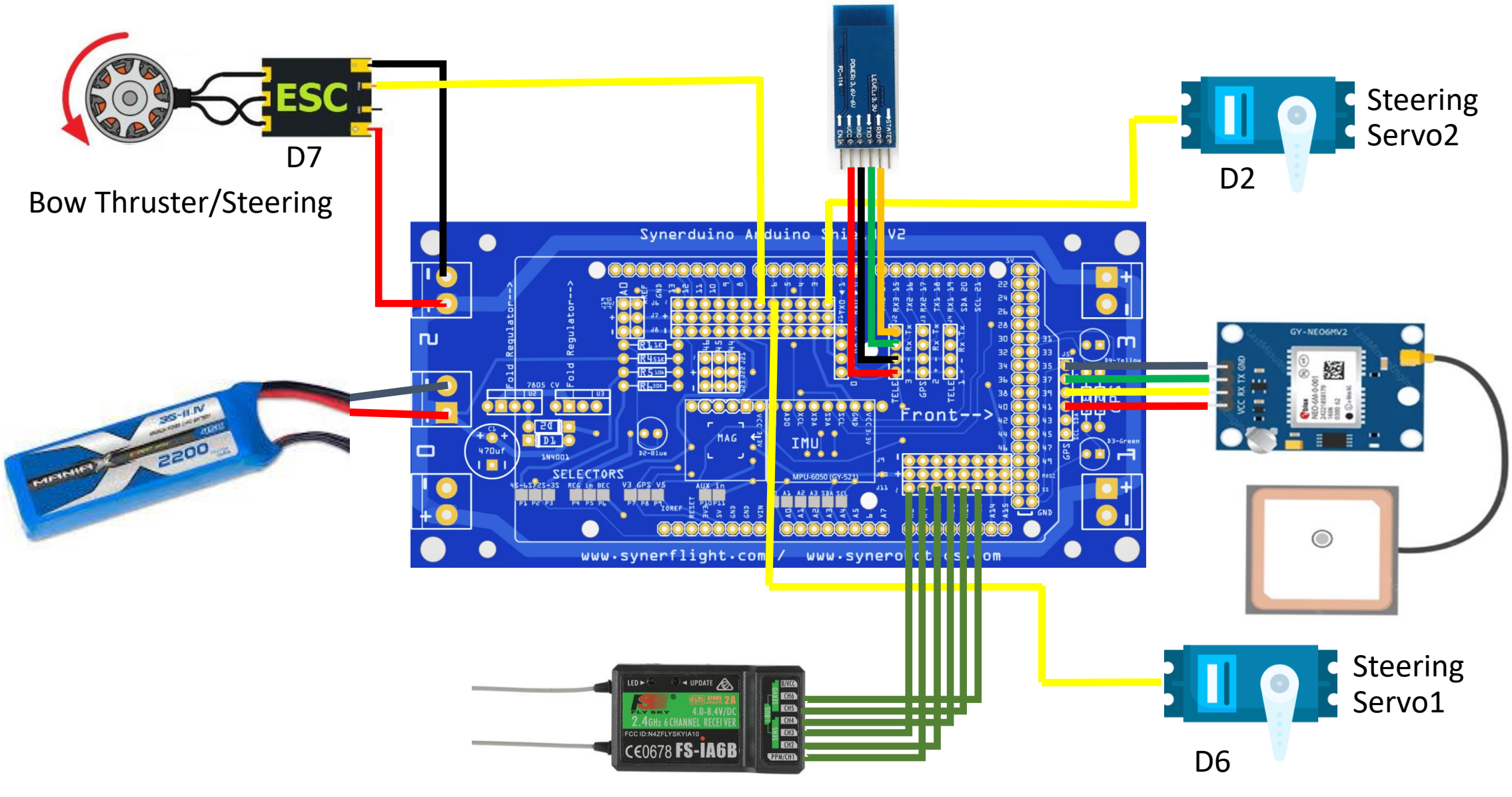


SPECIAL STEERING INSTALLATION

Mag is remove from the board and house in an enclosure and relocated to the steering arm



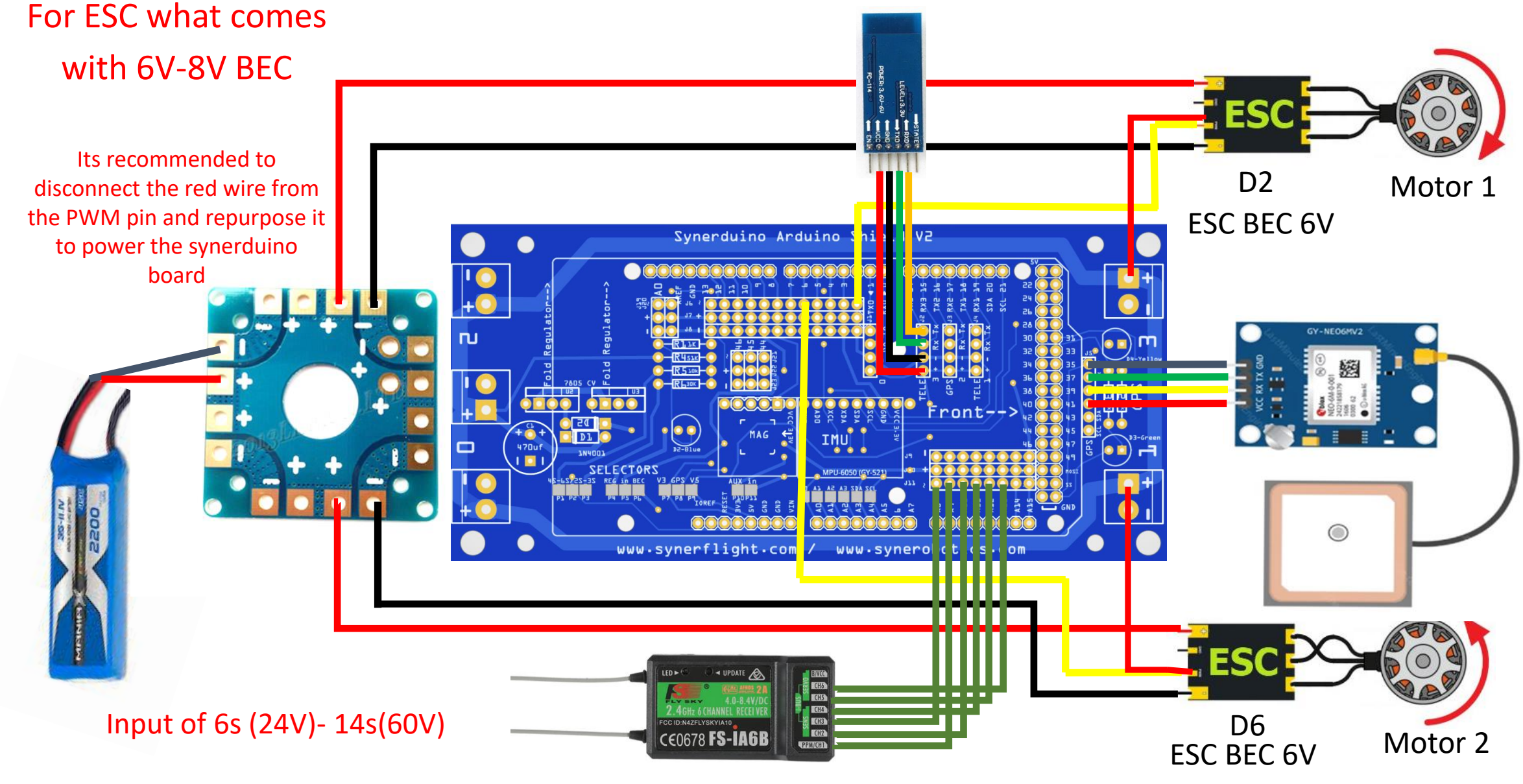
CR SERVO INSTALLATION



High Voltage BEC (5V- 12V) and High Current (40A-300A) DIFFERENTIAL INSTALLATION

For ESC what comes with 6V-8V BEC

Its recommended to disconnect the red wire from the PWM pin and repurpose it to power the synerduino board



HARDWARE INSTALLATION

Airframe/Chassis

Differential Drive

Select (**#Define Bi**) Frame on the CONFIG.H

D11 & D3 UNO 328
Motor A & Motor B

D6 & D2 MEGA 2560
Motor A & Motor B

Steering Drive

D2 Motor Drive

D6 Steering Servo

DIFFERENTIAL

DIFFERENTIAL

STEERING

STEERING

Arduino Uno Rover

MOTORA	MOTOR B	SERVO ROLL	AUX
D11	D3		D10 & D9

Arduino Mega Rover

MOTORA	MOTOR B	SERVO ROLL	AUX
D6	D2	D7	D3 & D4

Arduino Uno Rover

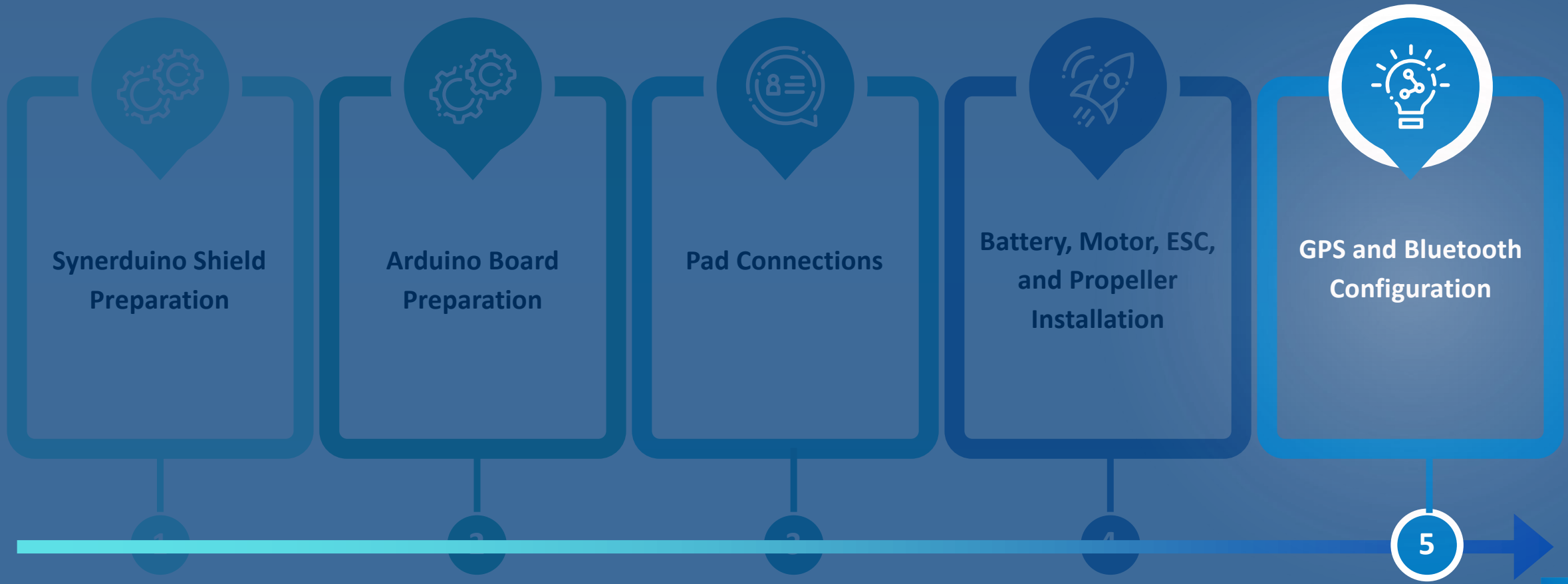
MOTOR	SERVO YAW	SERVO ROLL	AUX
D11	D3		D10 & D9

Arduino Mega Rover

MOTOR	SERVO YAW	SERVO ROLL	AUX
D2	D6	D7	D3 & D4

ASSEMBLING PROCESS

This section outlines the essential steps for assembling your Synerduino Drone Kit. Follow these steps carefully to ensure a successful assembly and get your drone ready for flight!



TELEMETRY

38400 OR 57600 FOR SIK RADIO DEPENDING IF USES 433MHZ OR 900MHZ (63kbps)

38400 FOR XBEE RADIO

115200 FOR BLUETOOTH HC-05

STANDARD FOR ALL DRONES TO USE SERIAL LINK AS TELEMETRY MAINLY ON YOUR TX RX SERIAL PORTS , NOTE: THE LOWER THE FREQUENCY OF THE RADIO THE LOWER THE BAUD IS NEEDED ,

MOST DRONES REQUIRE MINIMUM 63kbps AIRSPEED TO COMMUNICATE PROPERLY

PROTOCOL IS MSP RAW OR MAVLINK

BLUETOOTH CONFIGURATION

TO CONNECT THE **BLUETOOTH HC-05 MODULE** TO THE BOARD, ENSURE THE HEADERS ARE ARRANGED CORRECTLY. FOLLOW THIS WIRING CONFIGURATION:

VCC (Bluetooth) connects to **+** (Board)

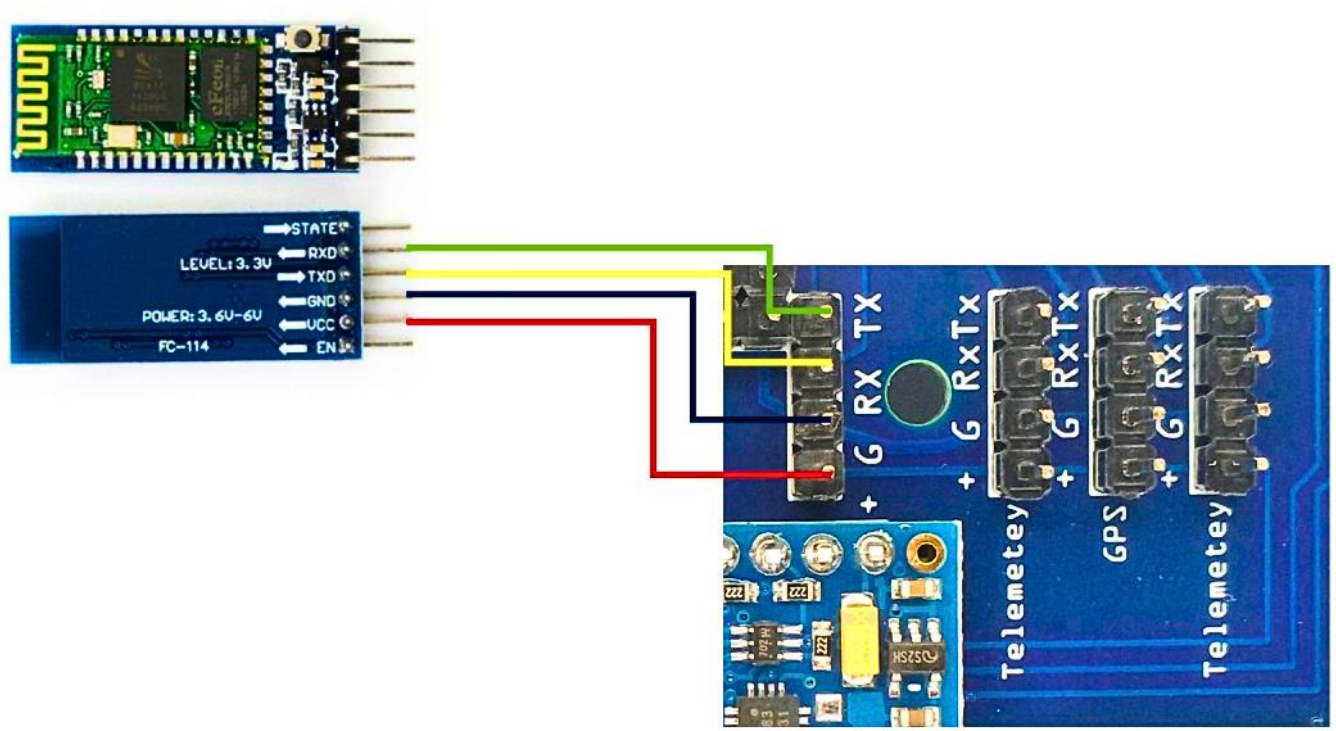
GND (Bluetooth) connects to **G** (Board)

TX (Bluetooth) connects to **RX** (Board)

RX (Bluetooth) connects to **TX** (Board)

Any Serial Radio can be configured to run on
Serial 0, 1, or Serial 3. with the matching Baud

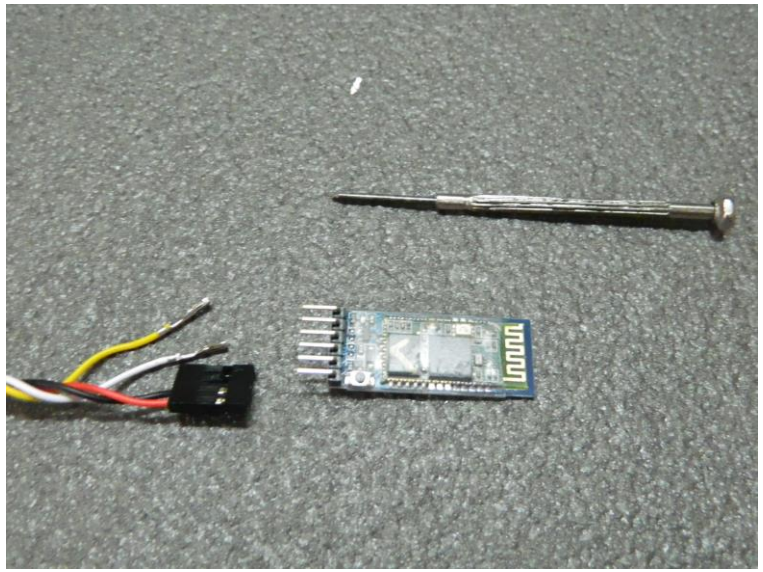
Serial 0 can be used for telemetry only if the USB is disconnected

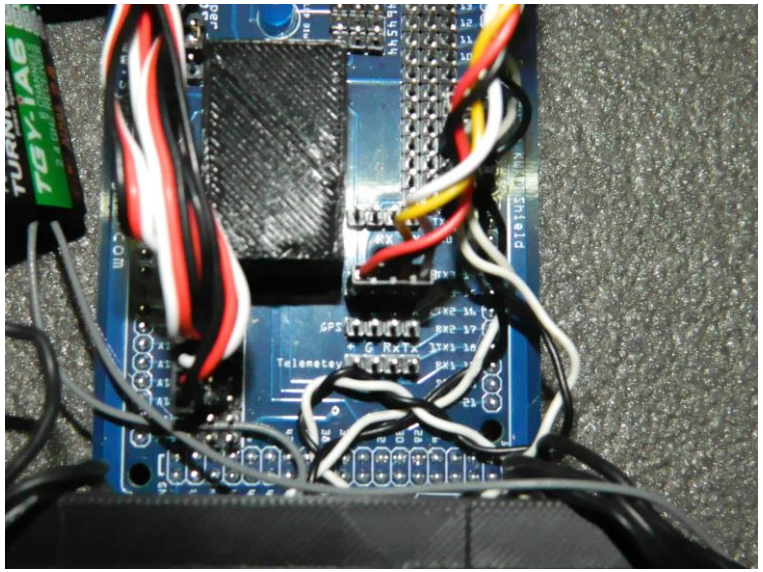


NOTE: DOUBLE-CHECK THAT THE WIRE COLORS MATCH THESE MARKINGS. INCORRECT INSTALLATION OR POLARITY MAY DAMAGE THE ARDUINO BOARD. THE BLUETOOTH MODULE IS PRESET TO A BAUD RATE OF 115200 FOR YOUR CONVENIENCE, BUT YOU MAY CHANGE THE SETTINGS IF NEEDED.

TELEMETRY

Bluetooth





BLUETOOTH PLUG INTO SERIAL 1 OR SERIAL 3

115200 FOR BLUETOOTH HC-05

ATTENTION:

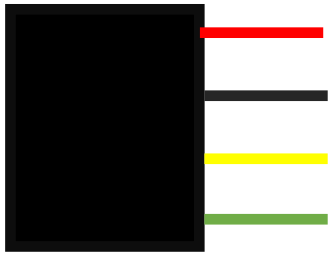
YOU MAY NEED TO REARRANGE THE HEADERS TO CONNECT THE BLUETOOTH MODULE TO THE SHIELD BOARD ACCORDINGLY

VCC >> +

GND >> G

TX >> RX

RX >>TX

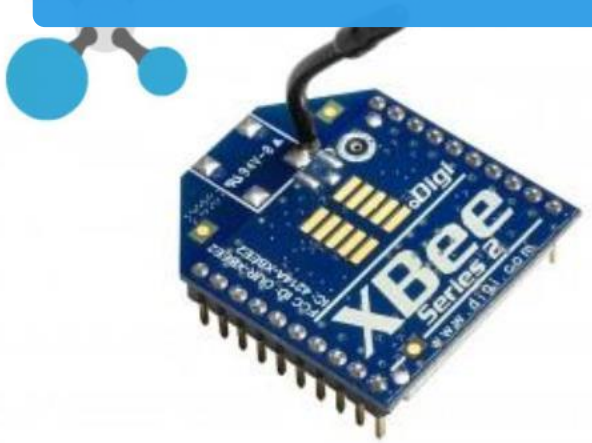


SEE TO IT THE WIRES COLOR CODE MATCHES THE MARKINGS

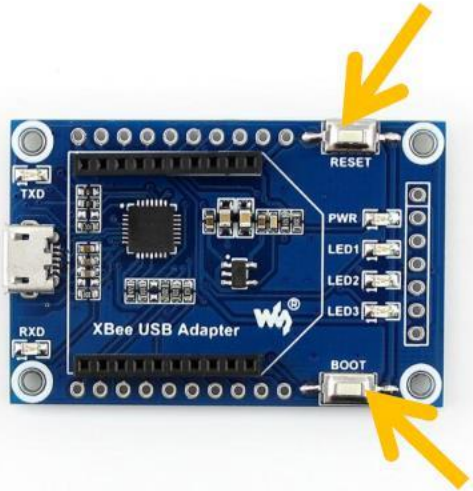
IMPROPER INSTALLATION MAY CAUSE DAMAGE TO THE ARDUINO BOARD AND SHIELD DUE TO REVERSE POLARITY

NOTE: WE PRESET THE BLUETOOTH FOR YOUR CONVENIENCE TO THE PROPER SETUP BUT SHOULD YOU WISH TO CHANGE THE SETTING ON YOUR DIGRESSION

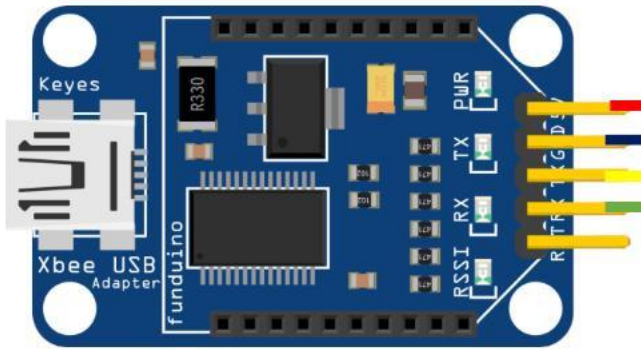
SERIAL RADIO CONFIGURATION



38400 FOR XBEE RADIO



GET THE USB MODULE WITH BOOT AND RESET BUTTON AS YOU MAY NEED TO RESET THE XBEE WHEN UPDATING FIRMWARE

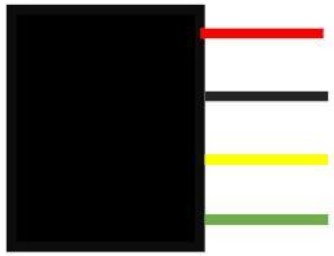


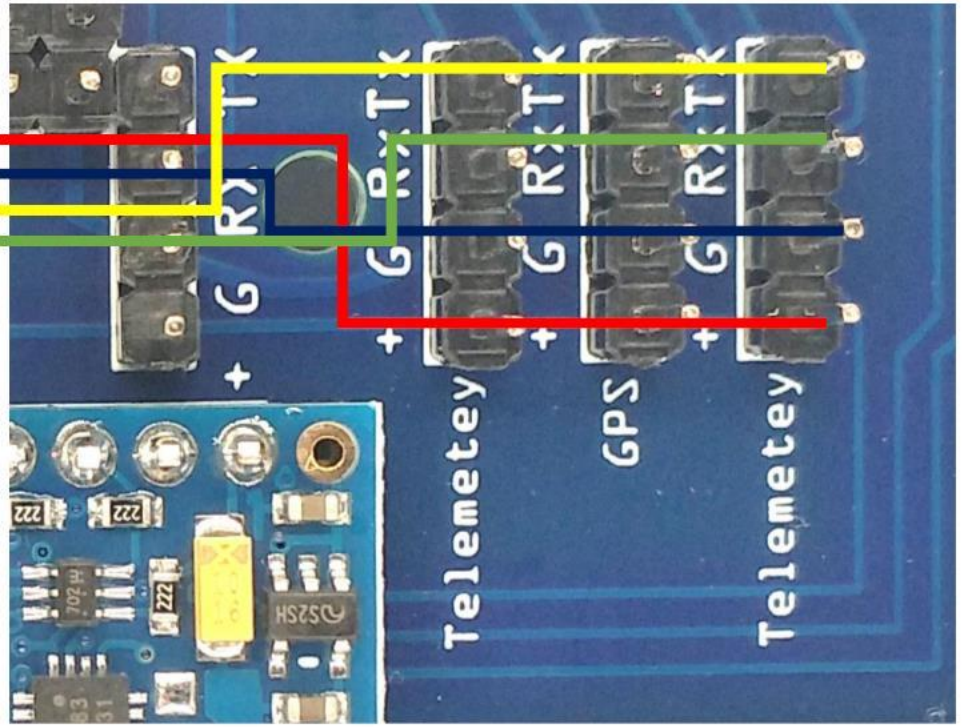
VCC >> +

GND >> G

TX >> TX

RX >>RX





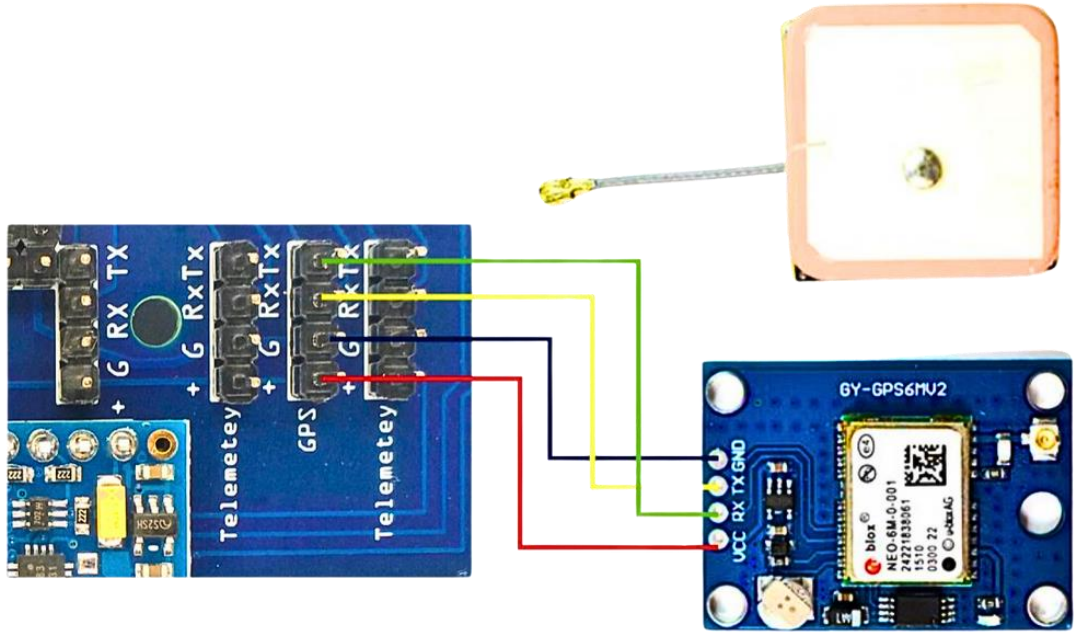
GPS CONFIGURATION

THE **TELEMETRY MODULE** INCLUDES PINS LABELED RX, TX, GND, AND VCC, WHICH CORRESPOND TO THE GPS MODULE'S MATCHING PINS.

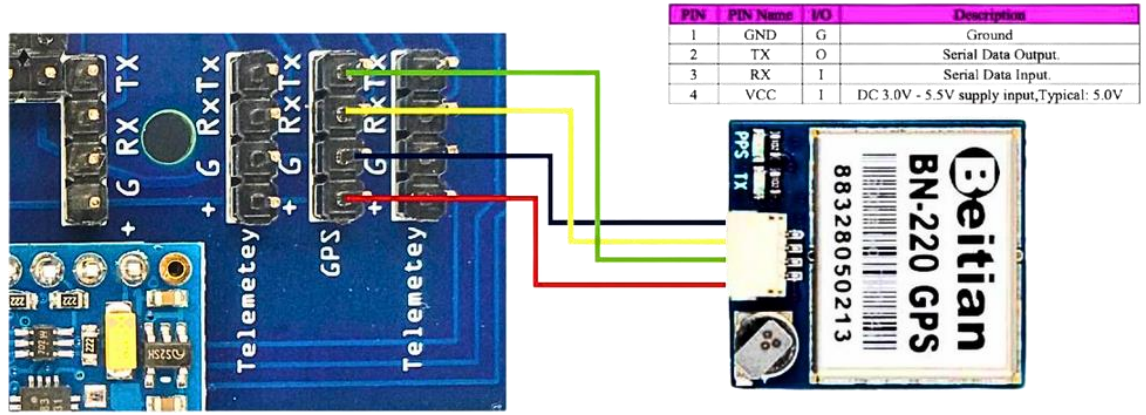
TO CONNECT THESE COMPONENTS, COLOR-CODED WIRES CLARIFY THESE CONNECTIONS, WITH **YELLOW** INDICATING **RX TO TX**, **GREEN** FOR **TX TO RX**, **BLACK** FOR **GROUND (GND)**, AND **RED** FOR **POWER (VCC).**

THE **BEITIAN BN-220 GPS MODULE** SHOWS A SPECIFIC PINOUT TABLE THAT DESCRIBES EACH PIN'S FUNCTION:

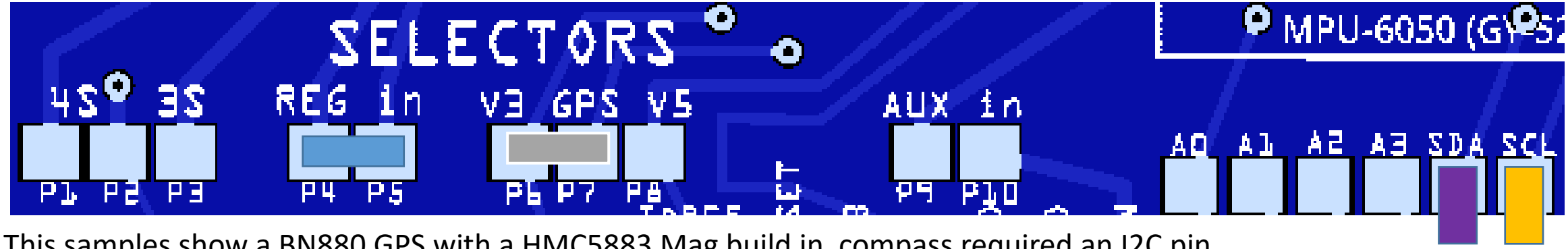
PIN 1 IS **GND (GROUND)**
PIN 2 IS **TX** (DATA OUTPUT)
PIN 3 IS **RX** (DATA INPUT)
PIN 4 IS **VCC** (POWER SUPPLY RANGES FROM 3.3V TO 5.0V)



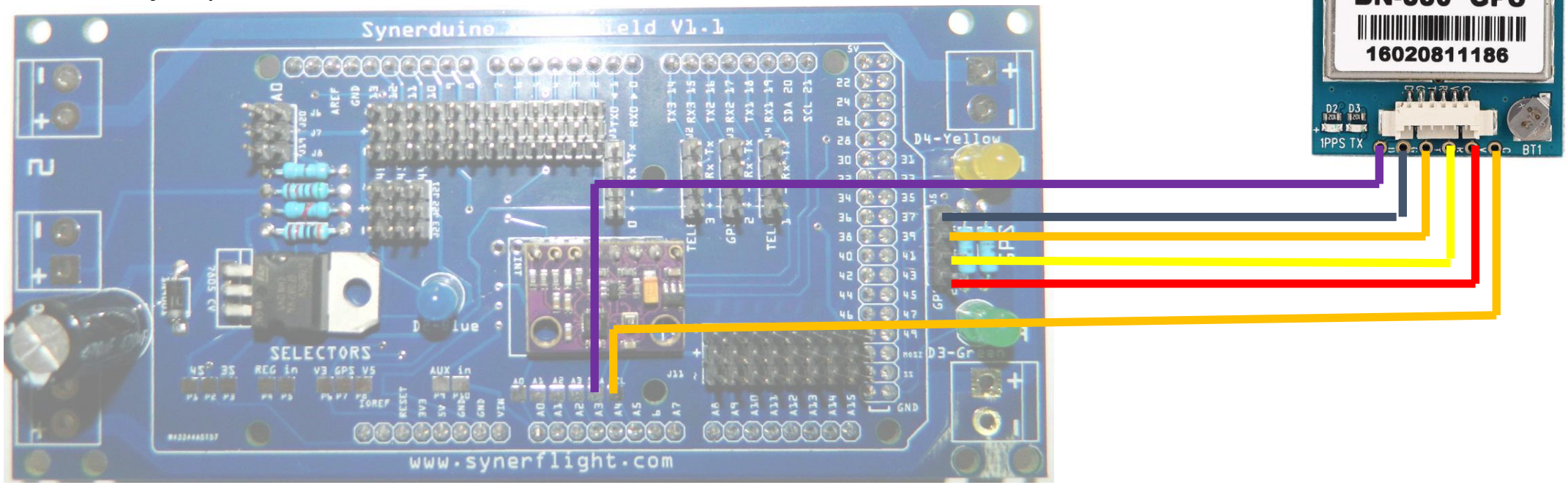
PIN	PIN Name	I/O	Description
1	GND	G	Ground
2	TX	O	Serial Data Output.
3	RX	I	Serial Data Input.
4	VCC	1	DC 3.0V - 5.5V supply input,Typical: 5.0V



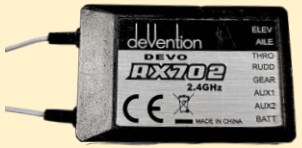
External Sensors



This samples show a BN880 GPS with a HMC5883 Mag build in compass required an I2C pin connection this works of all other I2C sensors (pls ensure the address doesn't conflict with the IMU as found in Sensors.cpp) Note: other than the GPS build in sensors might require 3V you may need to set jumper to 3V



RECEIVER TYPE CONFIGURATIONS

RX > SBUS INPUT	FUTABA FORMAT	JR FORMAT	WALKERA FORMAT	GRAUPNER FORMAT	MEGA 2560
	AETR	TAER	EATR	ERTA	INPUT
					
THROTTLE	CH3	CH1	CH3	CH3	A8
AILERON	CH1	CH2	CH2	CH4	A9
ELEVATOR	CH2	CH3	CH1	CH1	A10
RUDDER	CH4	CH4	CH4	CH2	A11
AUX 1	CH5	CH5	CH5	CH5	A12
AUX 2	CH6	CH6	CH6	CH6	A13
AUX 3	CH7	CH7	CH7	CH7	A14
AUX 4	CH8	CH8	CH8	CH8	A15

RECEIVER TYPE CONFIGURATIONS

RX > SBUS INPUT	FUTABA FORMAT	JR FORMAT	WALKERA FORMAT	GRAUPNER FORMAT	UNO
	AETR	TAER	EATR	ERTA	INPUT
					
THROTTLE	CH3	CH1	CH3	CH3	D2
AILERON	CH1	CH2	CH2	CH4	D4
ELEVATOR	CH2	CH3	CH1	CH1	D5
RUDDER	CH4	CH4	CH4	CH2	D6
AUX 1	CH5	CH5	CH5	CH5	D7
AUX 2	CH6	CH6	CH6	CH6	D8
AUX 3	CH7	CH7	CH7	CH7	N/A
AUX 4	CH8	CH8	CH8	CH8	N/A

OTHER RECEIVER TYPE

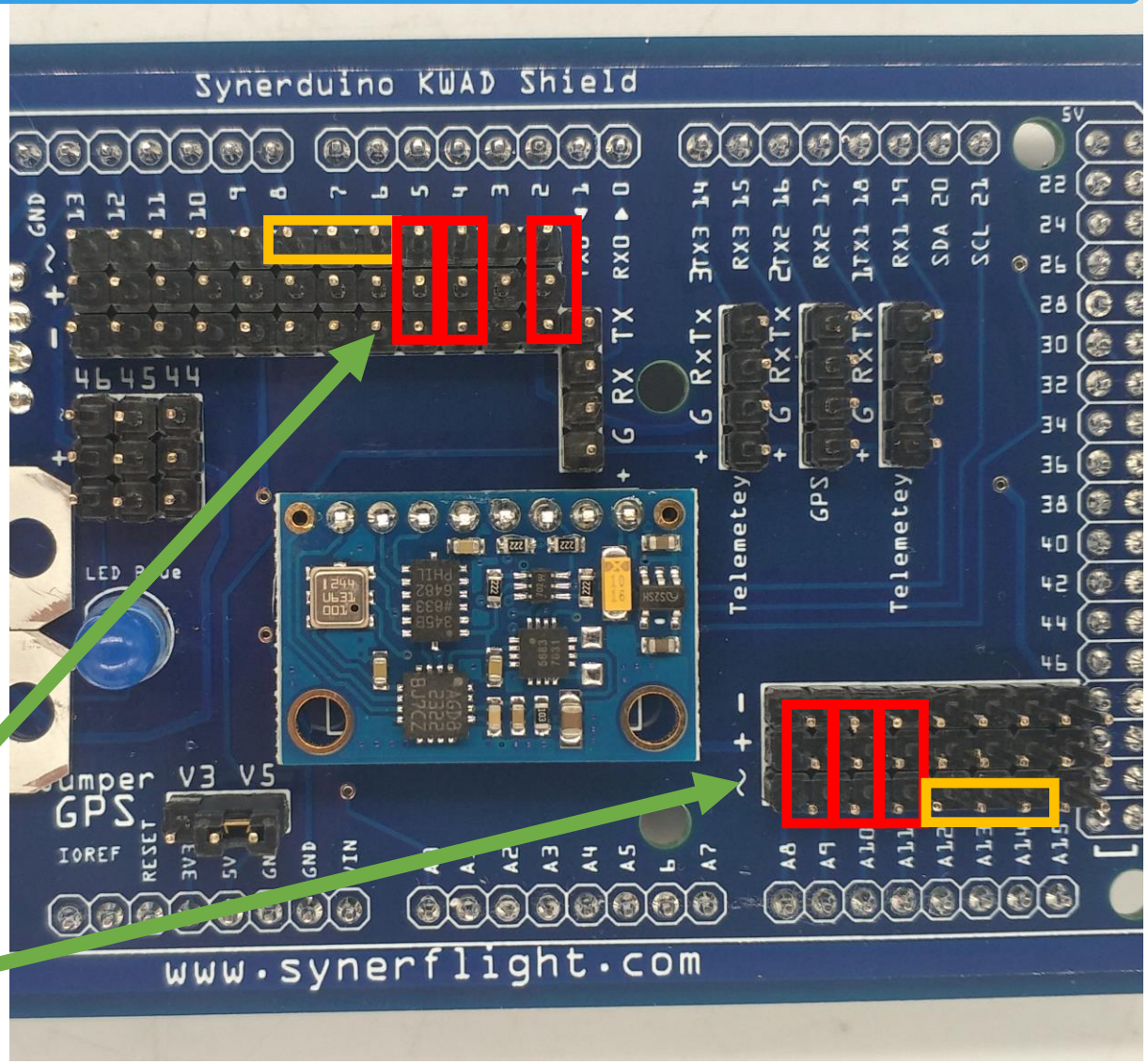
PWM RECEIVER

INCASE YOU'D ASK WHY THE SERVO CONNECTORS WERE DONE THIS WAY , ITS SIMPLY YOU DON'T NEED TO PLUG ALL THE PWM POWER RAILS ON ALL CHANNELS YOU JUST NEED THE PWM SIGNAL PIN ALONE

MOSTLY RUDDER AUX1 AND AUX2

UNO PWM IN

MEGA PWM IN



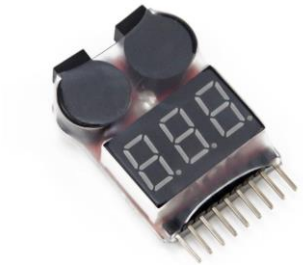
Battery

Lipo Charger 5A – to recharge select Battery type Lipo >> Balance
Voltage 11.1V 3s - 1.3Ah charge current

For Storage – select Battery type Lipo >> Storage at 1Ah , this would charge/Drain battery to 3.80V per cell

Plug the JST balance connector and the XT60 plug to the charger

Lipo Battery 3s 11.1V 1300mah To 1500mah
Fully Charge is 12.4V or 4.20V per cell
Storage is 11.1V or 3.80V per cell – battery when not in use for a long time
Do not drain the battery pass 3.3V Per cell



Voltage alarm Button on top sets the Alarm Voltage and it can be attach to the drone while in flight given its secure to the frame

Set voltage to 3.6V under load

SOFTWARE SETUP

X Loader

Download and unzip the Xloader and Synerduino Fiemware

XLoader for Hex files upload to Arduino board*

XLoader Download

Synerduino Firmware-Multirotor Download

Surface Firmware HEX

Surface Vehicle RX-Fusion-Hex 24-2-2025 Download

SurfaceVehicle-Hex 21-2-2025 Download

Unzip the Xloader and open Xloader.exe

Name	Date modified	Type	Size
avrdude.conf	18/03/2012 4:49 PM	CONF File	408 KB
avrdude.exe	18/03/2012 4:49 PM	Application	1,878 KB
devices.txt	18/03/2012 4:50 PM	Text Document	1 KB
libusb0.dll	18/03/2012 4:49 PM	Application extens...	43 KB
license.txt	18/03/2012 5:03 PM	Text Document	1 KB
XLoader.exe	18/03/2012 4:44 PM	Application	271 KB

Unzip the Synerduino Firmware files Differential drive and steering drive

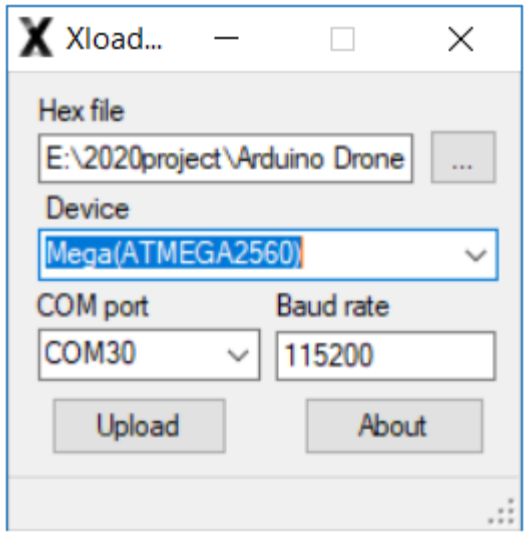
- Differential drive
- Steering drive
- Firmware Read.txt

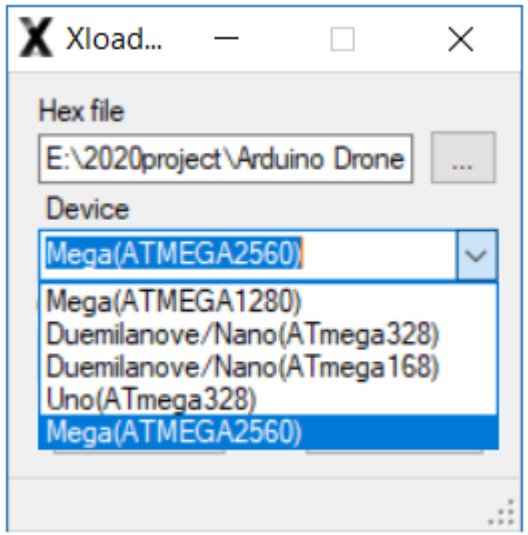
Each folder corresponding to your Board model and your GPS used inside which contrain vehicle types

- Synerduino-Differential-NMEA-GPS-GY91.ino.hex
- Synerduino-Differential-NMEA-GPS-GY801.ino.hex
- Synerduino-Differential-NMEA-GPS-GY801-InvertedMag.ino.hex
- Synerduino-Differential-UBLOX-GPS-GY91.ino.hex
- Synerduino-Differential-UBLOX-GPS-GY801.ino.hex
- Synerduino-Differential-UBLOX-GPS-GY801-InvertedMag.ino.hex

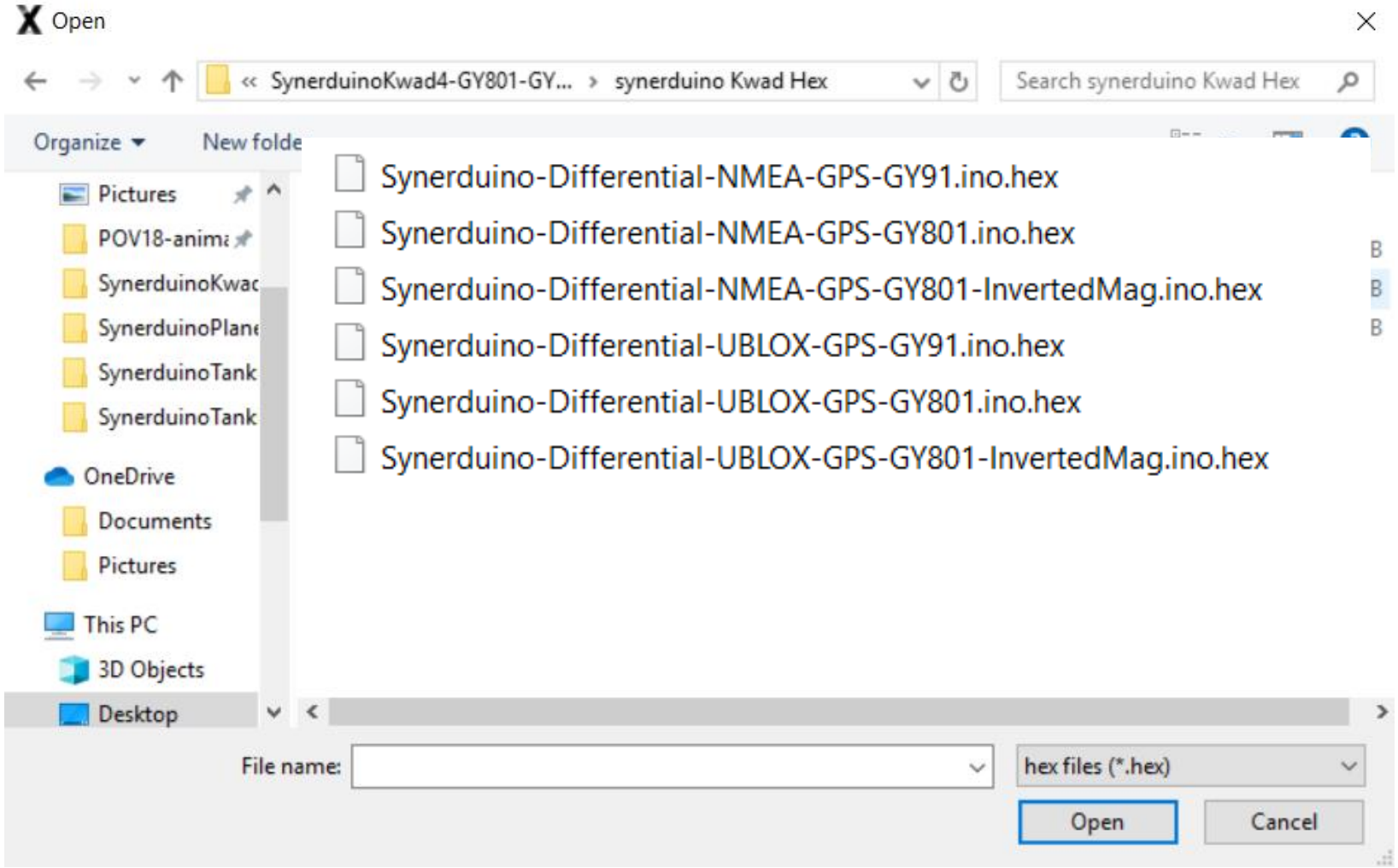
Firmware/sketch must be uploaded at this point before connecting the Arduino to the shield

X Loader





Select the matching Model Hexfile and the Arduino device to load the firmware to.



To tell that you loaded the correct Hex file when the FlywiiGUI Graphs and Dashboard shows correct orientation on all instruments and sensors after calibration

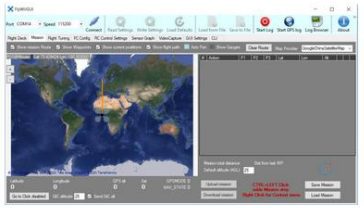
GROUND STATION

Download the FlyWiiGUI groundstation and open FlywiiGUI.exe

Name	Date modified	Type	Size
210130-0301	30/04/2021 3:01 PM	File	3 KB
210814-0408	14/09/2021 4:08 PM	File	3 KB
212812-0428	12/06/2021 4:28 PM	File	3 KB
214012-0340	12/06/2021 3:40 PM	File	3 KB
AForge.Controls.dll	25/01/2015 1:15 PM	Application extens...	44 KB
AForge.dll	25/01/2015 1:15 PM	Application extens...	17 KB
AForge.Imaging.dll	25/01/2015 1:15 PM	Application extens...	248 KB
AForge.Math.dll	25/01/2015 1:15 PM	Application extens...	67 KB
AForge.Video.DirectShow.dll	25/01/2015 1:15 PM	Application extens...	52 KB
AForge.Video.dll	25/01/2015 1:15 PM	Application extens...	19 KB
AForge.Video.FFMPEG.dll	25/01/2015 1:15 PM	Application extens...	60 KB
avcodec-53.dll	25/01/2015 1:15 PM	Application extens...	13,181 KB
avdevice-53.dll	25/01/2015 1:15 PM	Application extens...	342 KB
avfilter-2.dll	25/01/2015 1:15 PM	Application extens...	870 KB
avformat-53.dll	25/01/2015 1:15 PM	Application extens...	2,405 KB
avutil-51.dll	25/01/2015 1:15 PM	Application extens...	135 KB
FlyWiiGUI.exe	30/10/2021 11:41 ...	Application	6,945 KB
FlyWiiGUI.exe.config	28/02/2017 5:31 PM	CONFIG File	1 KB
FlyWiiGUI.exe.manifest	30/10/2021 11:41 ...	MANIFEST File	30 KB

The FlyWii GUI is a free updated version of the MultiWii WinGUI. It serves as the ground control station for the MultiWii 2.4 controller software.

FlyWii GUI is currently only supported for Windows 7/8/10


Download

FlwiiGUI Ground Station Software .EXE

Ground Station FlyGUI19 Download

FLYWIIGUI INSTALLATION

STEP 1

Download the FlyWiiGUI groundstation and open FlywiiGUI.exe

Name	Date modified	Type	Size
210130-0301	30/04/2021 3:01 PM	File	3 KB
210814-0408	14/09/2021 4:08 PM	File	3 KB
212812-0428	12/06/2021 4:28 PM	File	3 KB
214012-0340	12/06/2021 3:40 PM	File	3 KB
AForge.Controls.dll	25/01/2015 1:15 PM	Application extens...	44 KB
AForge.dll	25/01/2015 1:15 PM	Application extens...	17 KB
AForge.Imaging.dll	25/01/2015 1:15 PM	Application extens...	248 KB
AForge.Math.dll	25/01/2015 1:15 PM	Application extens...	67 KB
AForge.Video.DirectShow.dll	25/01/2015 1:15 PM	Application extens...	52 KB
AForge.Video.dll	25/01/2015 1:15 PM	Application extens...	19 KB
AForge.Video.FFMPEG.dll	25/01/2015 1:15 PM	Application extens...	60 KB
avcodec-53.dll	25/01/2015 1:15 PM	Application extens...	13,181 KB
avdevice-53.dll	25/01/2015 1:15 PM	Application extens...	342 KB
avfilter-2.dll	25/01/2015 1:15 PM	Application extens...	870 KB
avformat-53.dll	25/01/2015 1:15 PM	Application extens...	2,405 KB
avutil-51.dll	25/01/2015 1:15 PM	Application extens...	135 KB
FlyWiiGUI.exe	30/10/2021 11:41 ...	Application	6,945 KB
FlyWiiGUI.exe.config	28/02/2017 5:31 PM	CONFIG File	1 KB
FlyWiiGUI.exe.manifest	30/10/2021 11:41 ...	MANIFEST File	30 KB

The FlyWii GUI is a free updated version of the MultiWii WinGUI. It serves as the ground control station for the MultiWii 2.4 controller software.

FlyWii GUI is currently only supported for Windows 7/8/10

Download

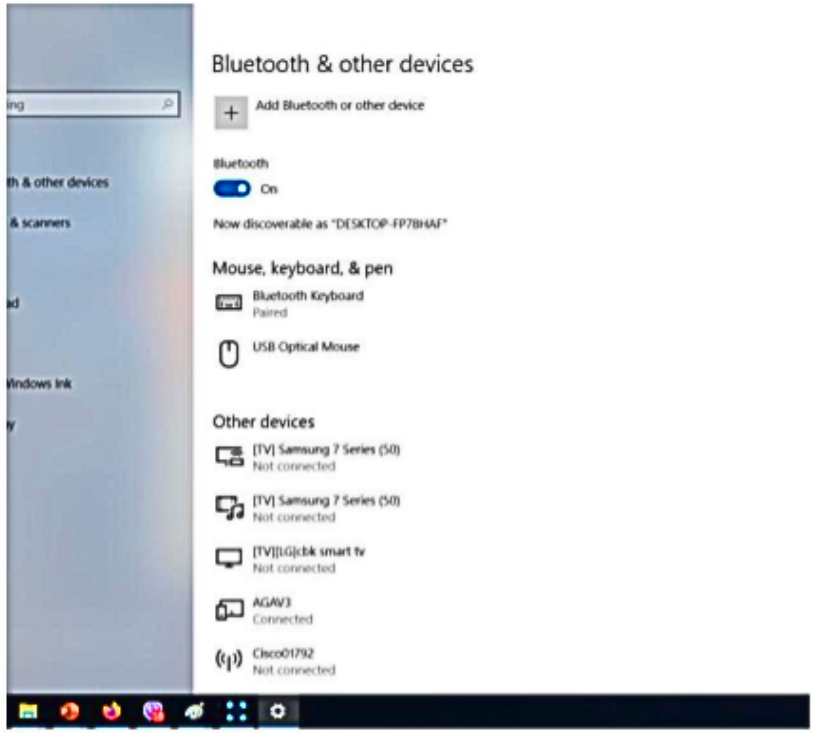
Latest Release

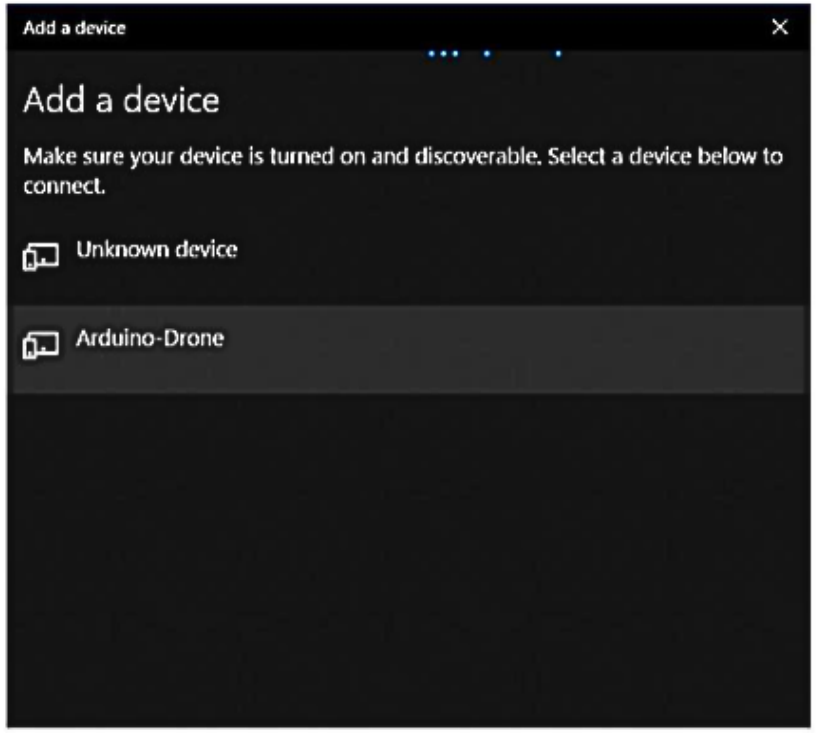
FlwiiGUI Ground Station Software .EXE*

FlyWiiGUI20 Download

STEP

2



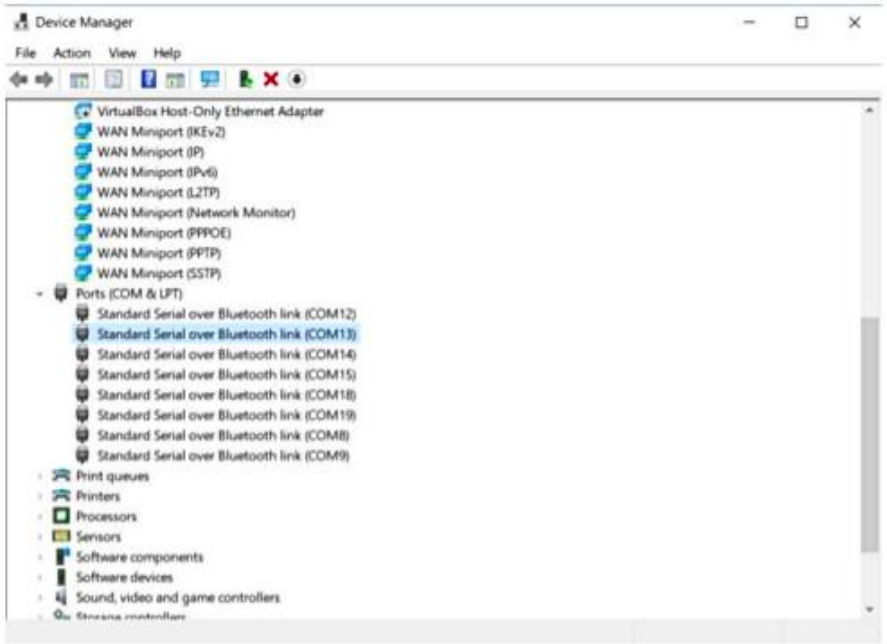


Adding Bluetooth on Windows Device Manager look for Arduino-Drone BT device

Take note on which Serial Com port its added to in Device Manager

STEP

3



In Device Manager Located in COM & LPT

FLYWIIGUI INSTALLATION

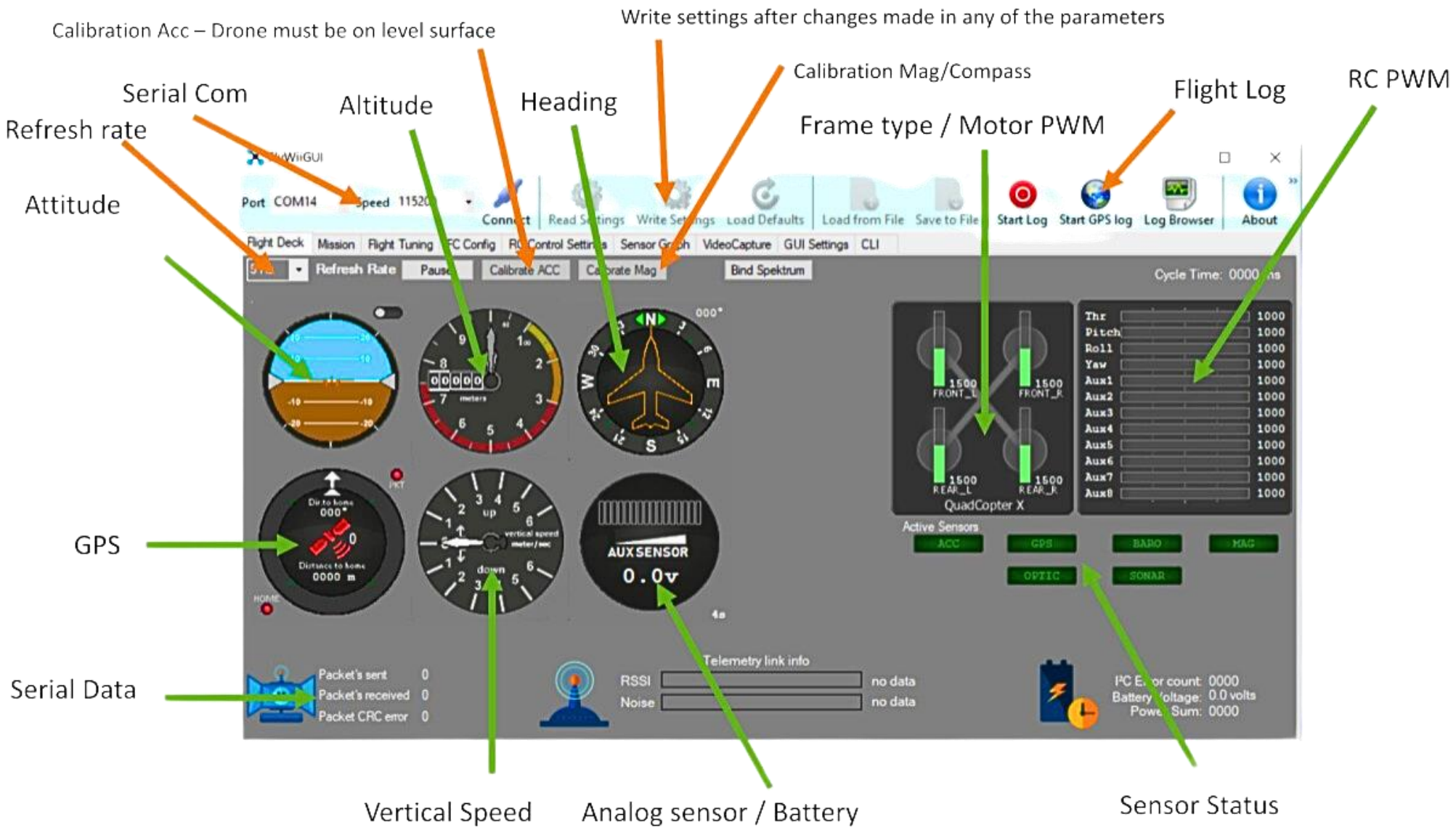
STEP 4

Select the com port your Bluetooth is connected to .

At this point Disconnect your Physical USB and your drone should be running on batteries using only the Bluetooth to communicate

Connect to the Drone with the associated COM port and Baud as found in your device manager

FLYWIIGUI INSTALLATION



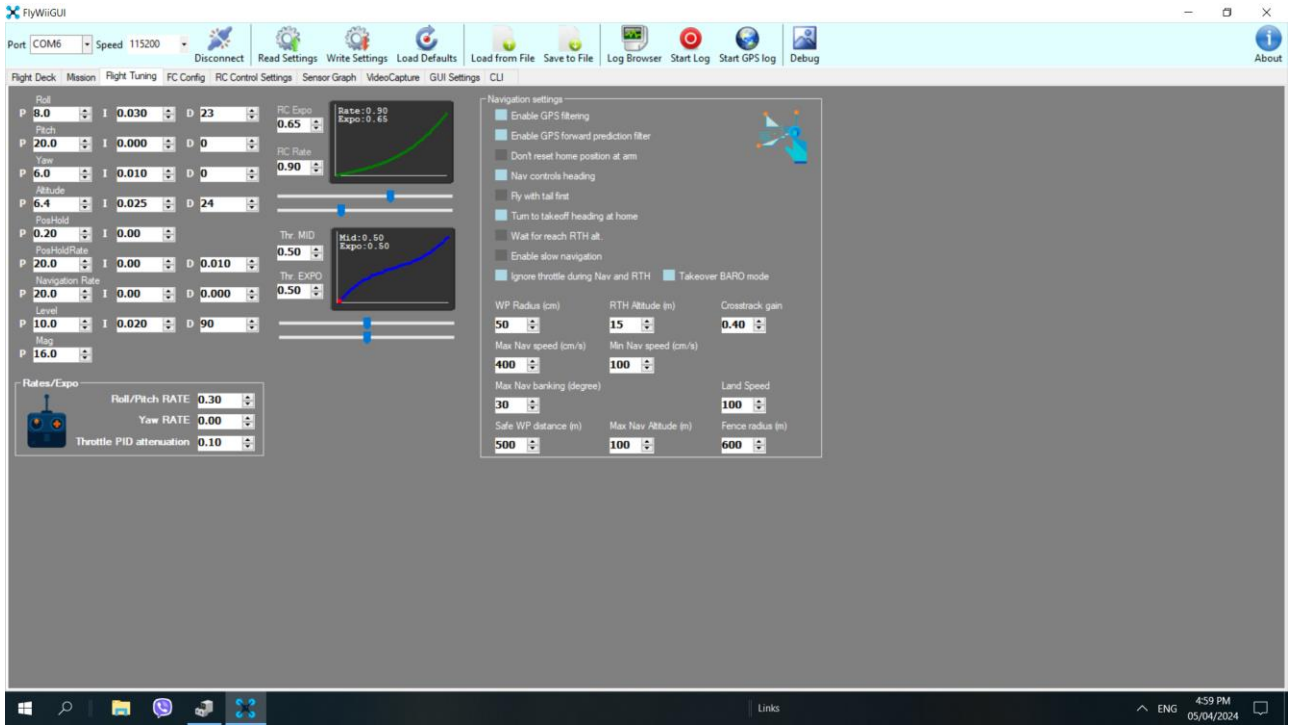
Load PID Presets

Download the Preset PIDs from Surface Documentation

PID Parameters* (Boat kits and Surface PIDs can be use interchangeable)

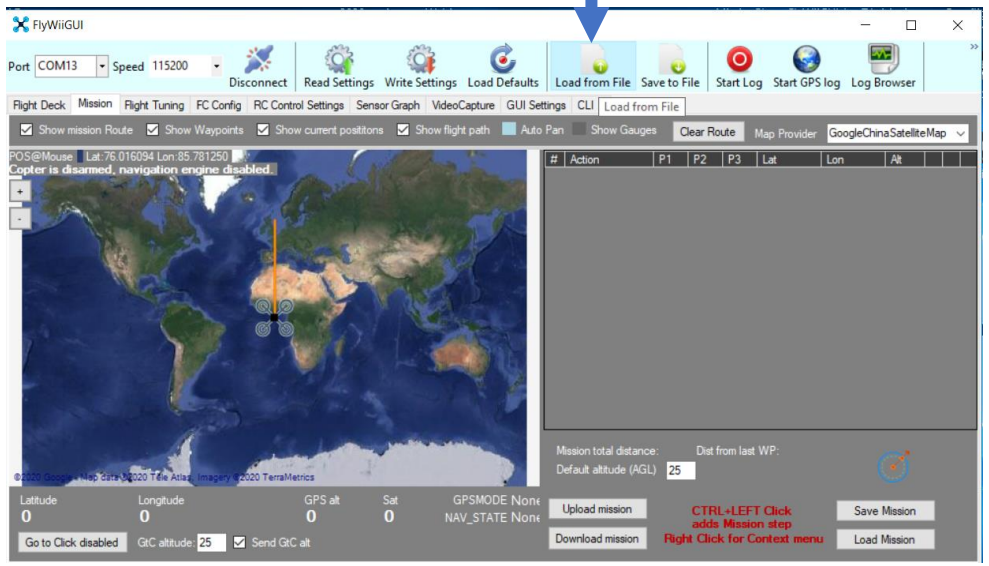
Surface PID settings 2024 Download

Jet Boat kits PIDs- Forward only Download

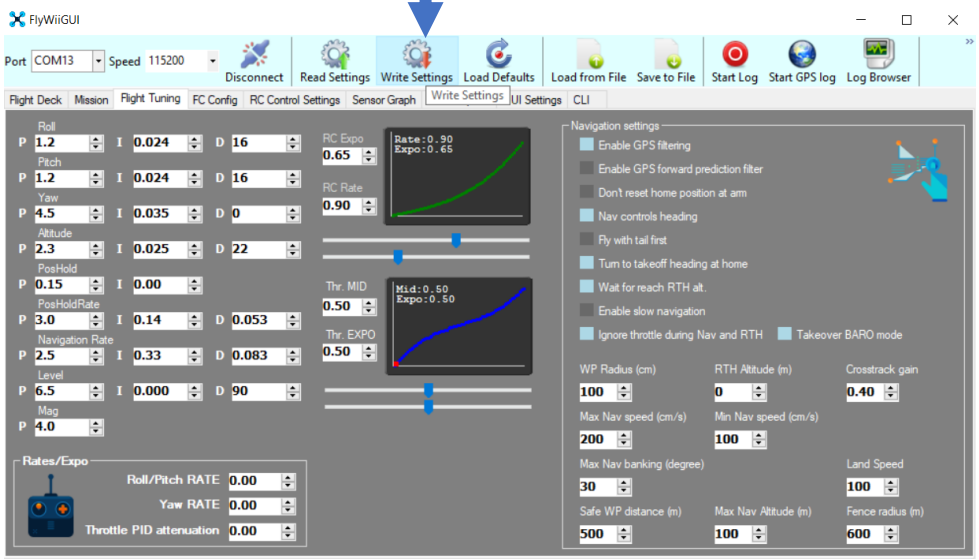


Load PID Presets

Load the PID file



Write PID Parameter to drone



Load the PID file and Write settings after changes made in any of the parameters

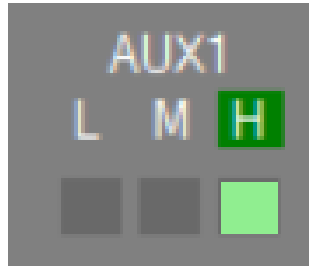
RADIO

Aux Switches

Flight modes allows for additional access functions to your drone's capabilities

And can be setup using the Aux switch

ARM
Baro
Altitude
GPS Hold
Mag
GPS Home
Mission
Trigger
Land



PWM 1000 1500 2000

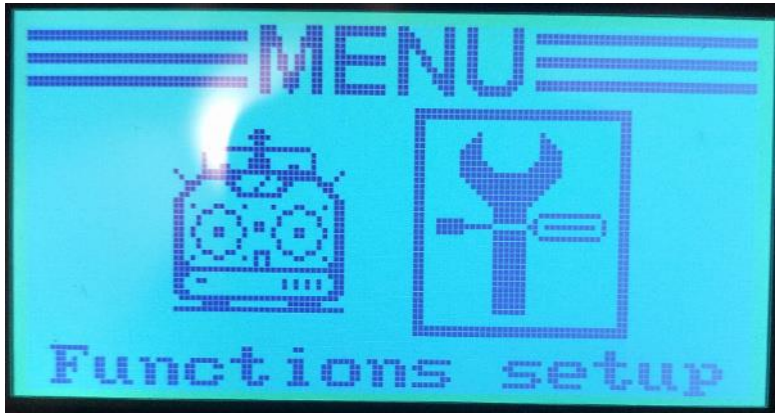
FS or TYG i6 remote example for Assigning Aux switch

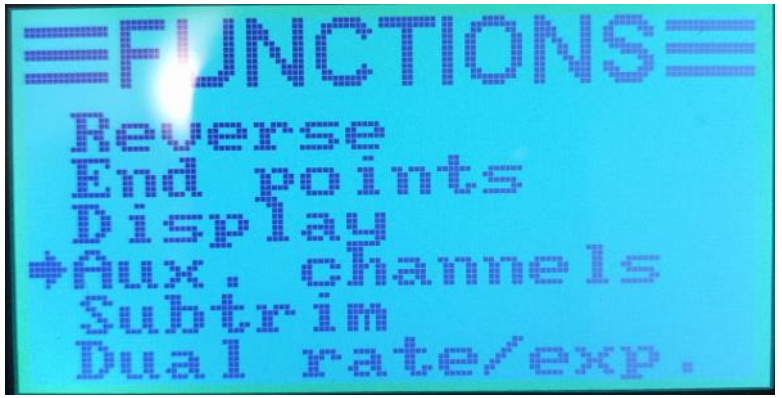
Press OK for 1 sec
Enter Function setup
Choose Aux Channels
Hit ok button
Choose Channel to switch assignment on the remote

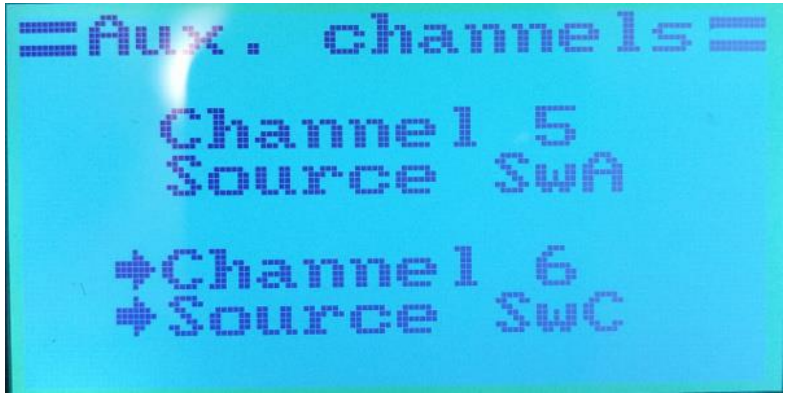
Up/down button to select assignment

Hold Cancel Button for 3sec to set when exiting the Aux Channel menu

You may enter in again to see if its set properly

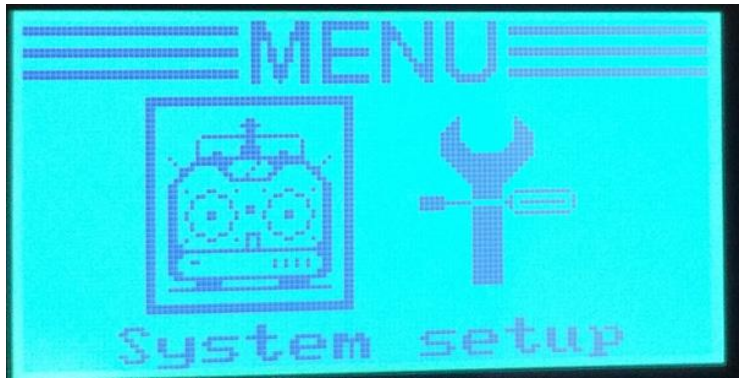






FS or TYG i6 remote example for Fail safe

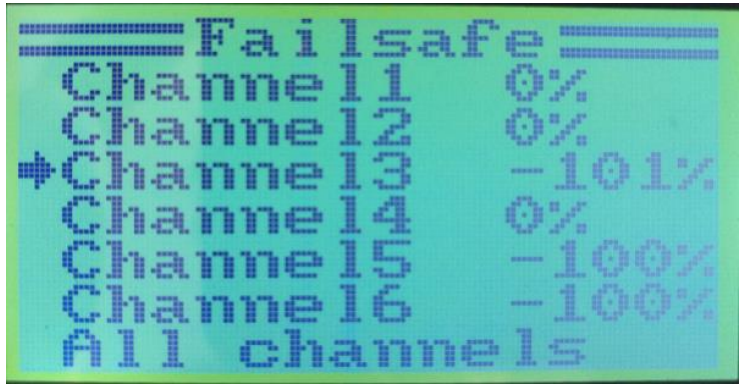
Press OK for 1 sec
Enter Systems
Choose RX Setup
Choose Failsafe
Choose Channel to set failsafe to
Move the stick or Aux switch to its fail safe position



Eg. GPS Home Mode (Ch5 or Ch6 where ever you set that mode in) or throttle down Stick on Ch3
Hit ok button

Hold Cancel Button for 3sec to set when exiting the failsafe menu

You may enter in again to see if its set properly

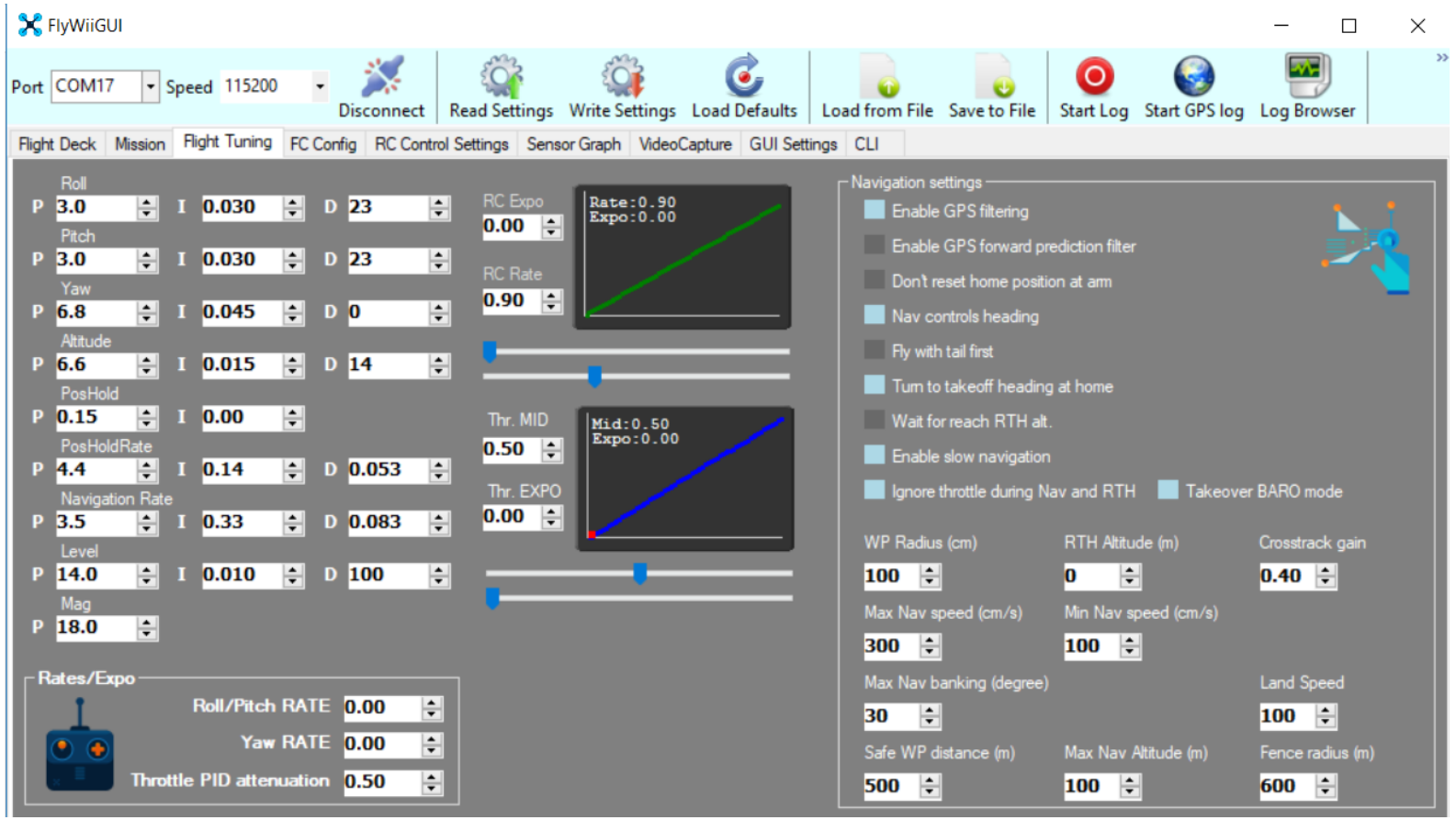


Attention:
The Receiver will enter this mode when radio link is lost from the Transmitter

Switch transmitter off to test this function
Make sure props are remove before doing so

TUNING

TUNING


FlyWiiGUI
Port COM17 Speed 115200
Disconnect
Read Settings
Write Settings
Load Defaults
Load from File
Save to File
Start Log
Start GPS log
Log Browser
Flight Deck
Mission
Flight Tuning
FC Config
RC Control Settings
Sensor Graph
VideoCapture
GUI Settings
CLI
Roll P 3.0 I 0.030 D 23
Pitch P 3.0 I 0.030 D 23
Yaw P 6.8 I 0.045 D 0
Altitude P 6.6 I 0.015 D 14
PosHold P 0.15 I 0.00
PosHoldRate P 4.4 I 0.14 D 0.053
Navigation Rate P 3.5 I 0.33 D 0.083
Level P 14.0 I 0.010 D 100
Mag P 18.0
RC Expo 0.00
RC Rate 0.90
Rate:0.90
Expo:0.00
Thr. MID 0.50
Thr. EXPO 0.00
Mid:0.50
Expo:0.00
Rates/Expo
Roll/Pitch RATE 0.00
Yaw RATE 0.00
Throttle PID attenuation 0.50
Navigation settings
Enable GPS filtering
Enable GPS forward prediction filter
Don't reset home position at arm
Nav controls heading
Fly with tail first
Turn to takeoff heading at home
Wait for reach RTH alt.
Enable slow navigation
Ignore throttle during Nav and RTH
Takeover BARO mode
WP Radius (cm) 100
RTH Altitude (m) 0
Crosstrack gain 0.40
Max Nav speed (cm/s) 300
Min Nav speed (cm/s) 100
Max Nav banking (degree) 30
Land Speed 100
Safe WP distance (m) 500
Max Nav Altitude (m) 100
Fence radius (m) 600

FLIGHT DECK – IF THIS DOESN'T LOOK RIGHT CHECK YOUR SENSORS ORIENTATION AGAIN USING THE SENSOR GRAPH

TELEMETRY CONNECTION SEE YOUR CHECK YOUR BLUETOOTH RADIO OR USB ON WHERE IS THE VIRTUAL COM PORT IS

COMPASS (MAG AND GYRO)

SAVE CONFIG

PWM OUTPUT INDICATOR

PWM INPUT INDICATOR

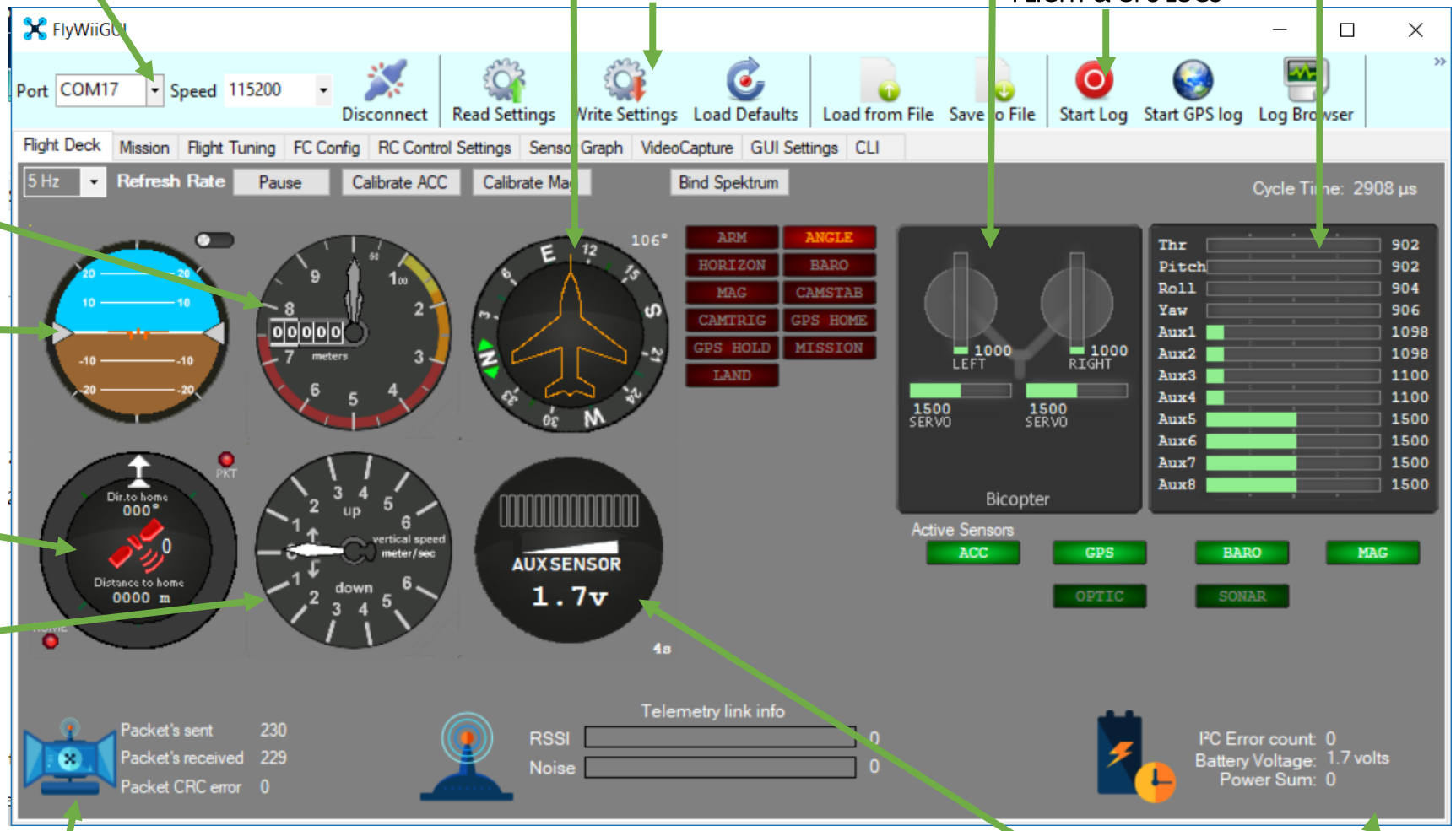
FLIGHT & GPS LOGS

ALTITUDE (BARO)

ATTITUDE (ARTIFICIAL HORIZON)
(GYRO XYZ AND ACC XYZ)

GPS SATELLITE COUNT
(4 SATS FOR 3D FIX – IDEAL 7 SATS)

VERTICAL SPEED INDICATOR
(ACC Z AXIS)



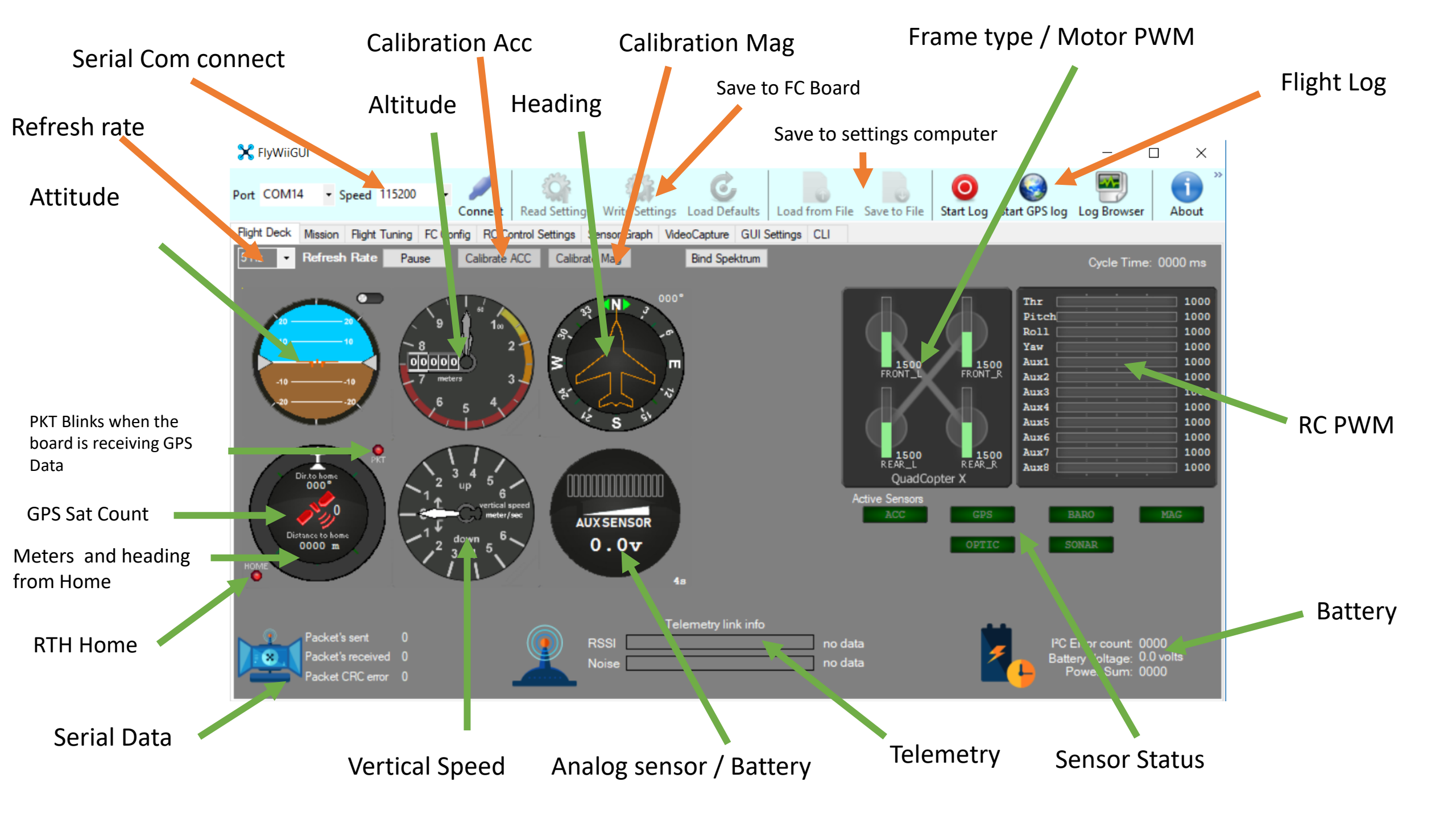
PACKETS STATUS

(IF THE ERROR NUMBERS ARE HIGH PLS CHECK YOUR TELEMETRY CONFIG)

POWER STATUS / AUX SENSOR

ALSO KNOWN AS FUEL GAUGE

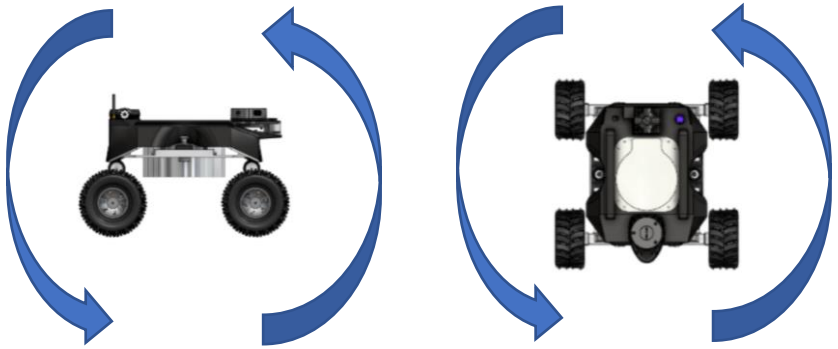
(VBAT)


Serial Com connect
Calibration Acc
Calibration Mag
Frame type / Motor PWM
Flight Log
Altitude
Heading
Save to FC Board
Refresh rate
Save to settings computer
Attitude
FlyWiiGUI
Port COM14
Speed 115200
Connect
Read Setting
Write Settings
Load Defaults
Load from File
Save to File
Start Log
Start GPS log
Log Browser
About
Flight Deck
Mission
Flight Tuning
FC Config
RC Control Settings
Sensor Graph
VideoCapture
GUI Settings
CLI
Refresh Rate
Pause
Calibrate ACC
Calibrate Mag
Bind Spektrum
Cycle Time: 0000 ms
PKT Blinks when the board is receiving GPS Data
PKT
Dir.to home
000°
Distance to home
0000 m
HOME
GPS Sat Count
Meters and heading from Home
RTH Home
Serial Data
Vertical Speed
Analog sensor / Battery
Telemetry
Sensor Status
RC PWM
Battery
AUX SENSOR
0.0v
4s
1500 FRONT_L
1500 FRONT_R
1500 REAR_L
1500 REAR_R
QuadCopter X
Thr 1000
Pitch 1000
Roll 1000
Yaw 1000
Aux1 1000
Aux2 1000
Aux3 1000
Aux4 1000
Aux5 1000
Aux6 1000
Aux7 1000
Aux8 1000
Active Sensors
ACC
GPS
BARO
MAG
OPTIC
SONAR
Packet's sent 0
Packet's received 0
Packet CRC error 0
Telemetry link info
RSSI
Noise
no data
no data
I²C Error count: 0000
Battery Voltage: 0.0 volts
Power Sum: 0000

Refresh Rate . Telemetry update speed

Acc Calibration . Set the vehicle down on a level surface . Away from any metal objects for 10 secs.

Mag Calibration . rotate the vehicle 360 degrees in all axis within 30sec - 1 min. while the blue Led flashes



Mag Calibration must be perform when running your vehicle in a new location for the first time. Pls verified the Compass if the drone heading matches your compass app in your phone.

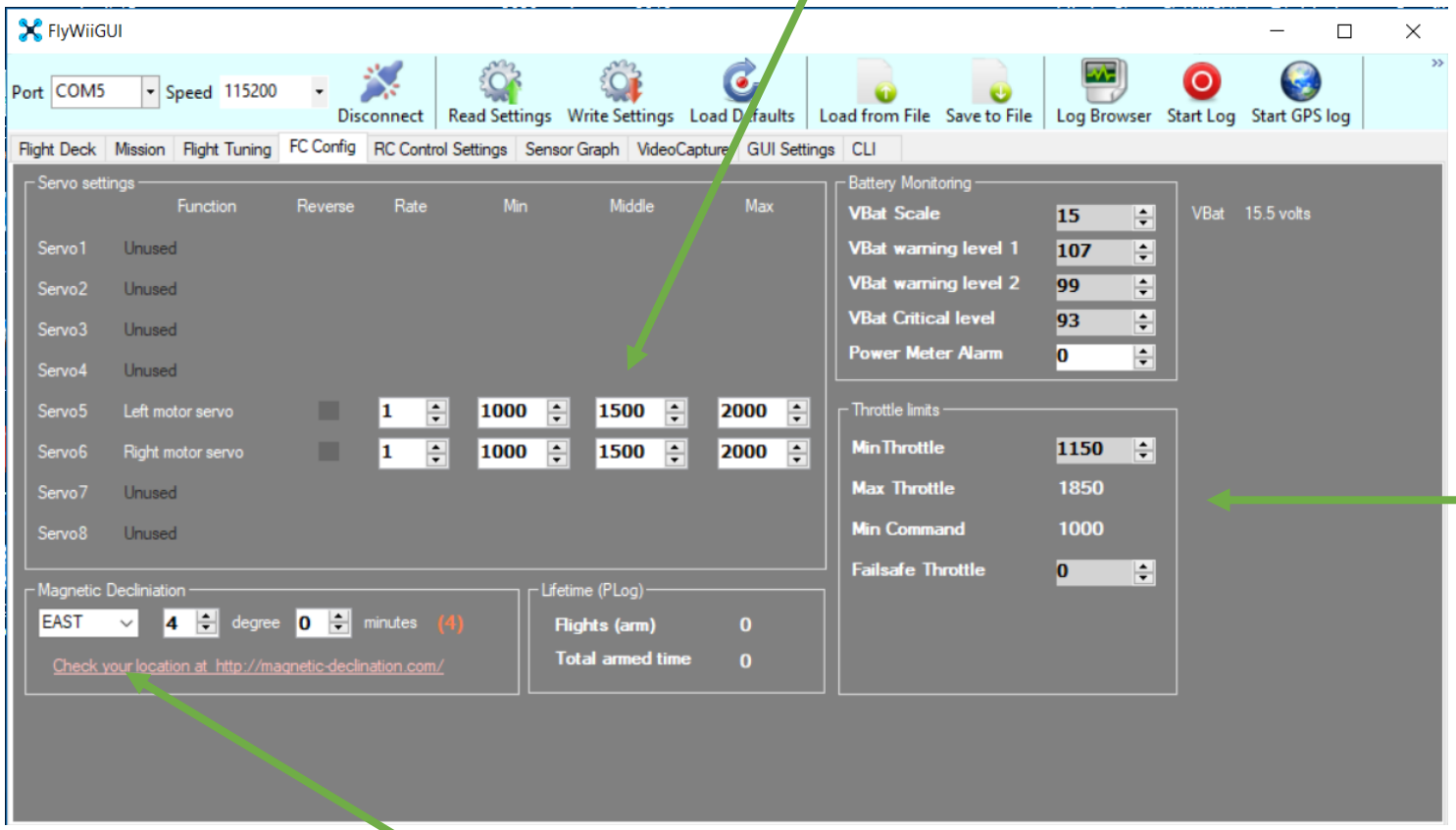
These Calibration must be perform after Parameter updates after Flashing the firmware
Blue LED would flash during these calibration processes

Other Navigation Functions

FC Config

SERVO REVERSE OPTION – IF THE SERVO / **REVERSABLE ESCS**

IS OPERATING IN THE WRONG DIRECTION FROM CONTROLS



MOTOR THROTTLE RANGE PWM TO THE MOTOR

THIS ALSO CONTROLS THE MOTOR IDLE SPEED ON ARM

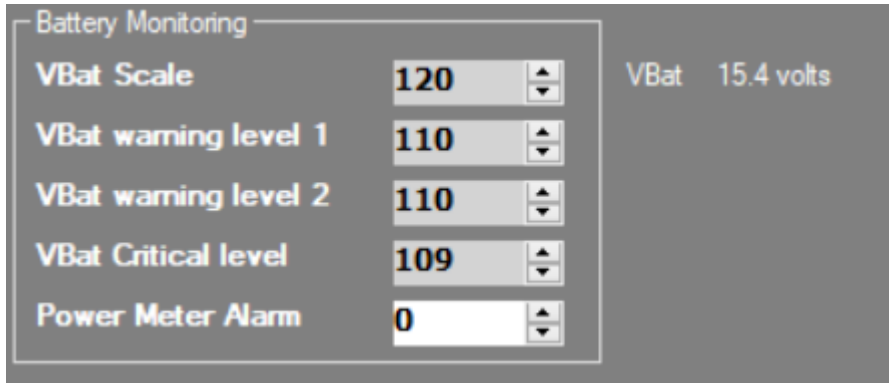
IMPORTANT TO KNOW THE MAGNETIC DECLINATION OF YOUR REGION

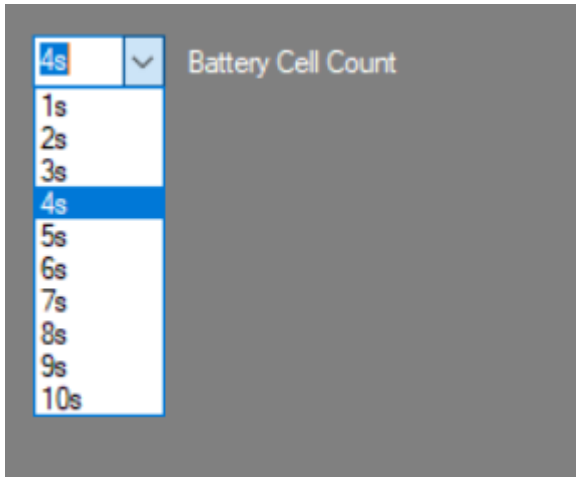
THIS AID ANY AUTONOMOUS FUNCTION THAT REQUIRES COMPASS

- HEADING HOLD
- GPS HOLD
- RTH
- MISSION

CALIBRATE COMPASS AT THE FLIGHT DECK TAB AFTER SETTING THIS UP

FLYWII GUI





BATTERY

(FC CONFIG TAB)

BATTERY MONITORING

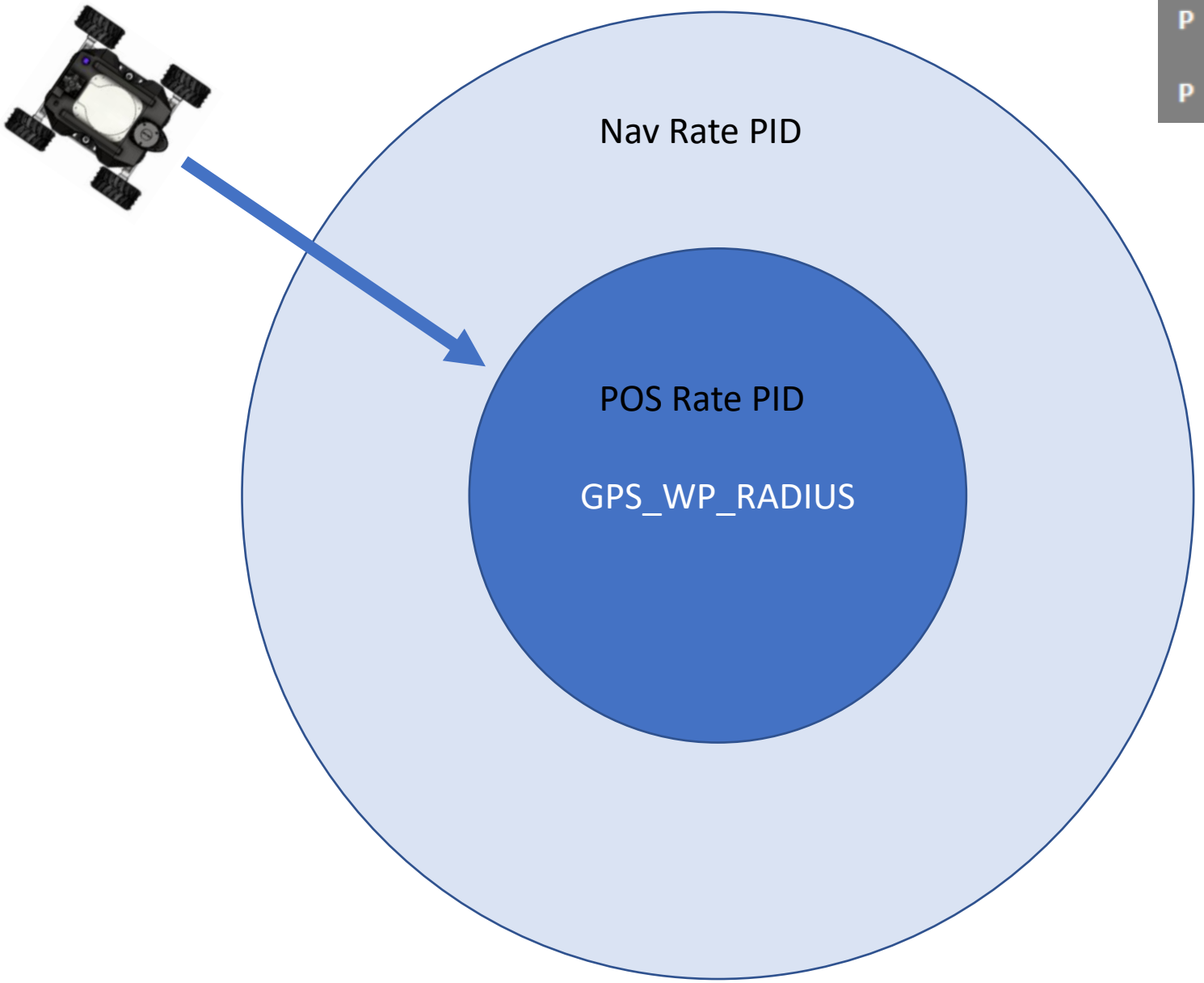
VBAT SCALE - ADJUST THIS TO MATCH THE BATTERY VOLTAGE OUTPUT USING THE VOLTAGE ALARM INDICATOR

VBAT WARNING LEVEL – IDENTIFY THE NOTICE WHEN THE BATTERY DROPS TO THIS VOLTAGE

(GUI SETTINGS TAB)

BATTERY CELL COUNT- ADJUST THIS DEPENDING ON THE NUMBER OF CELLS

THIS BOARD SUPPORTS 2S-4S BATTERY



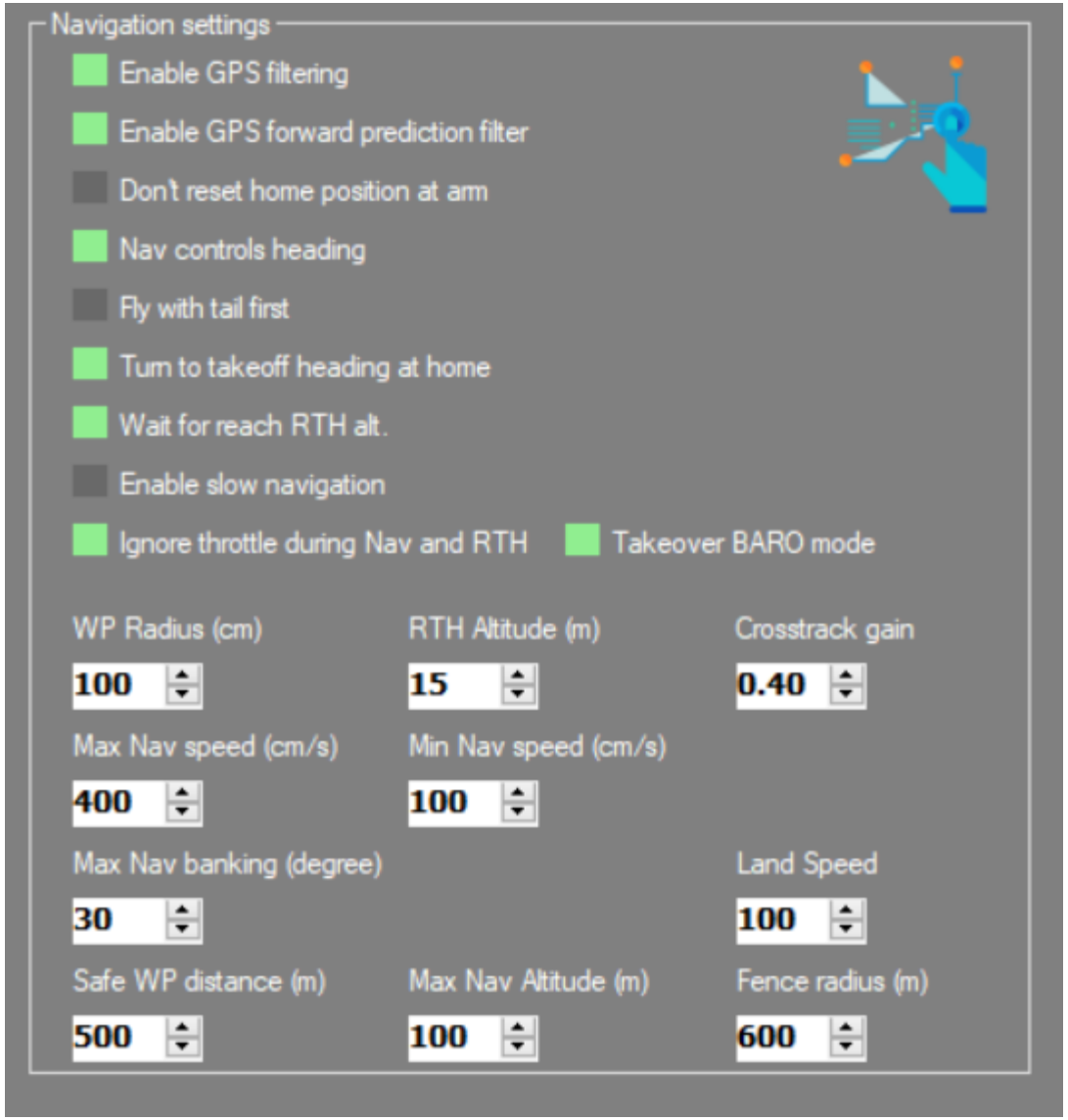
PosHold
P 0.15 I 0.00

PosHoldRate
P 3.4 I 0.14 D 0.053

Navigation Rate
P 2.5 I 0.33 D 0.083

The Navigation responds is the vehicle will orientate to the direction of the waypoint
It will proceed to drive straight until it reach the WP_Radius and stop
With multiple waypoint it will repeat the process till it completes the mission

Other Navigation Functions



WP Radius – the radius of the area the Pos PID with trigger it has reach the waypoint

Max Nav Speed – Maximum speed the Vehicle travel between waypoints (too fast and you likely over shoot your target**)** ***for first mission flight test Nav speed of 100cm/s with ("Enable Slow Navigation "Active)***

Min Nav Speed – the speed the drone travel when with in the WP Radius

RTH Altitude – (Zero Value for surface vehicle)

Max Nav Banking – the max allowable pitch and roll the drone will be set too while traveling between waypoints (tune this along with Max Nav Speed to take account with Environment conditions) (not applicable for surface vehicle)

Max Nav Altitude – Max altitude the drone is cap to fly at (Zero Value for surface vehicle)

Land Speed – speed of descending for Landing cm/s (not applicable for surface vehicle)

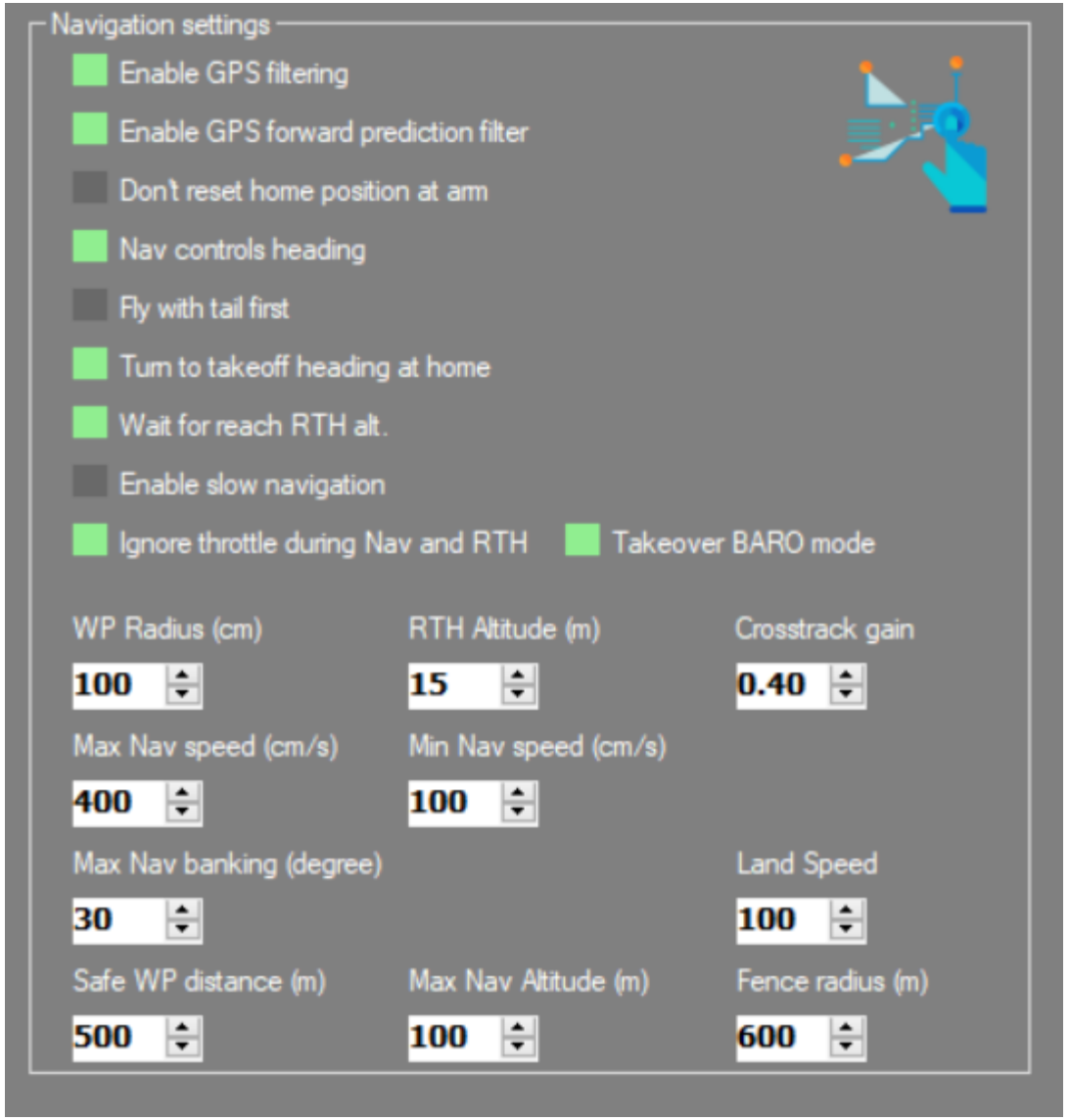
Safe WP Distance – max distance between waypoint before its null out

Fence Radius – Geo Fence to keep the drone with in the perimeter in relation to home position

CrossTrack gain - this tune the GPS and Nav sensitivity

GPS Filtering – use to enhance GPS accuracy

GPS Forward Prediction Filter – predicting the Vehicle's location and to compensate for lag . (optional) – not necessary for most application



Don't Reset Home position at Arm – this retains the home position where you first plug power on your Vehicle

Nav Controls Heading – this points the Vehicle to its next waypoints (Keep this on) exception for omnidirectional vehicles

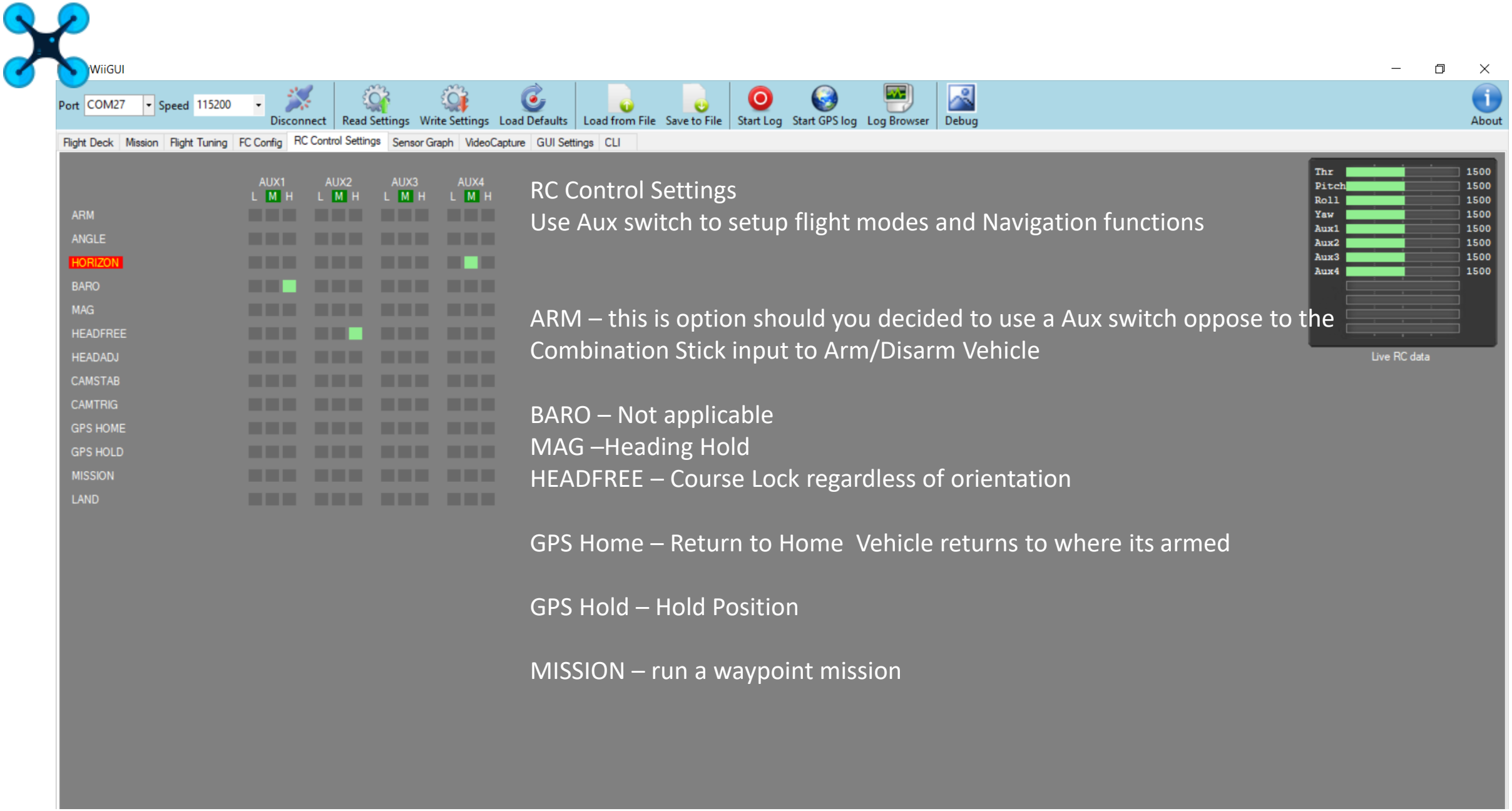
Fly tail first – makes the Vehicle drive reverse

Turn take off heading at Home – when drone arrives at home position it orientates to its heading right after arming

Wait to reach RTH - this works with RTH altitude command which the drone would climb to the said altitude before initiating the flight to home position (turn off for surface vehicle) (not applicable for surface vehicle)

Enable slow navigation – this works with keeping the drone to its **Min Nav speed**

Ignore throttle and Take over Baro – Not applicable



RC Control Settings

Use Aux switch to setup flight modes and Navigation functions

ARM – this is option should you decided to use a Aux switch oppose to the Combination Stick input to Arm/Disarm Vehicle

BARO – Not applicable

MAG –Heading Hold

HEADFREE – Course Lock regardless of orientation

GPS Home – Return to Home Vehicle returns to where its armed

GPS Hold – Hold Position

MISSION – run a waypoint mission

Missions

Note: Only functional for Mega 2560 Boards with GPS

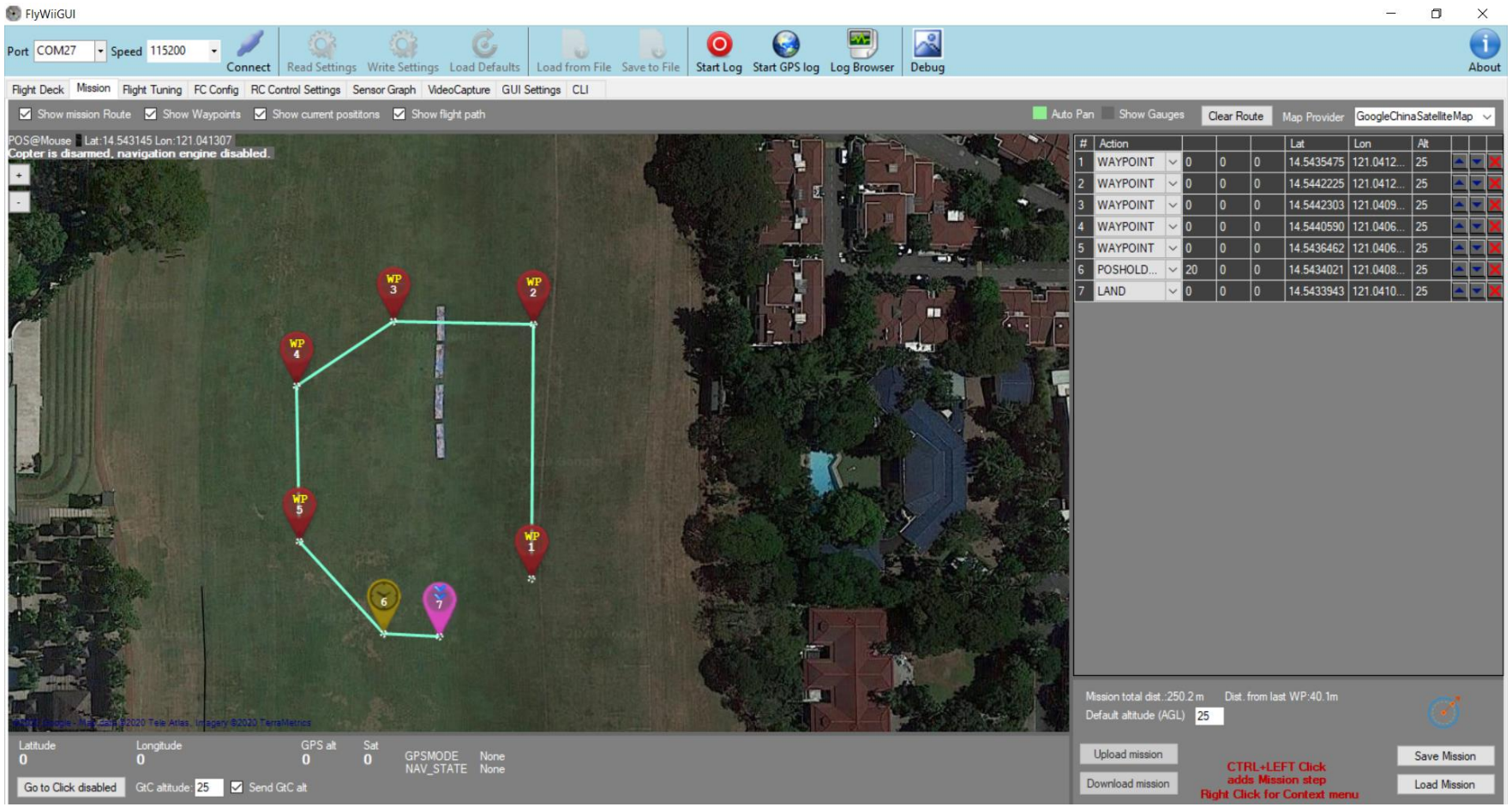
Waypoint – the Vehicle with travel between those points

Time PosHold – Vehicle will wait X number of 00:00:00 then move to the next waypoint

Unlimited PosHold – once the Vehicle reach this point it will hover and wait till you switch out of Mission mode

Land – the Vehicle Stop when has reach this point (Must be place at the end of the mission)

RTH – the Vehicle will go back to home position (Must be place at the end of the mission)



RC Control Setting Tab – activate Baro , Mag , Mission

To start mission takeoff aircraft in stabilize mode up to 1-2meter altitude then switch the aux switch to mission mode .

Any time you can switch out of it on hold or stabilize mode

Missions

Note: Only functional for Mega 2560 Boards with GPS

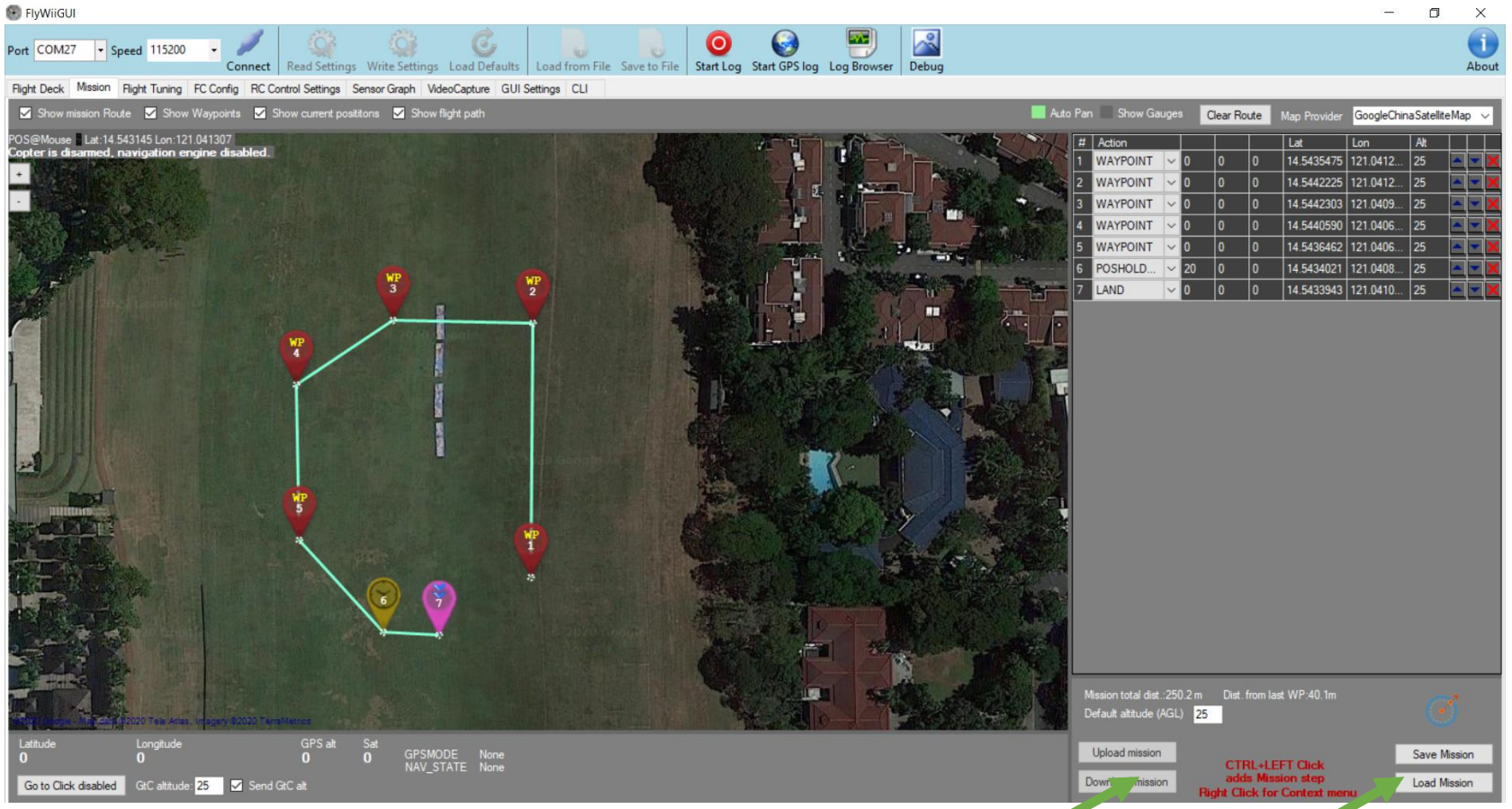
Waypoint – the Vehicle with travel between those points

Time PosHold – Vehicle will wait X number of 00:00:00 then move to the next waypoint

Unlimited PosHold – once the Vehicle reach this point it will hover and wait till you switch out of Mission mode

Land – the Vehicle Stop when has reach this point (Must be place at the end of the mission)

RTH – the Vehicle will go back to home position (Must be place at the end of the mission)



Mission upload to /download from Vehicle

Mission Save to /Open from File

Graphs and Sensors

Upload the sketch to the Arduino attach to the drone shield and open the FlywiiGUI sensor Graphs tab and hit connect to the appropriate COM your drone is connected to

the correct orientation

Roll Right + no#
Pitch nose down + No#
Z up + No#

Roll Right + no#
Pitch nose down + No#
Yaw Right +No#

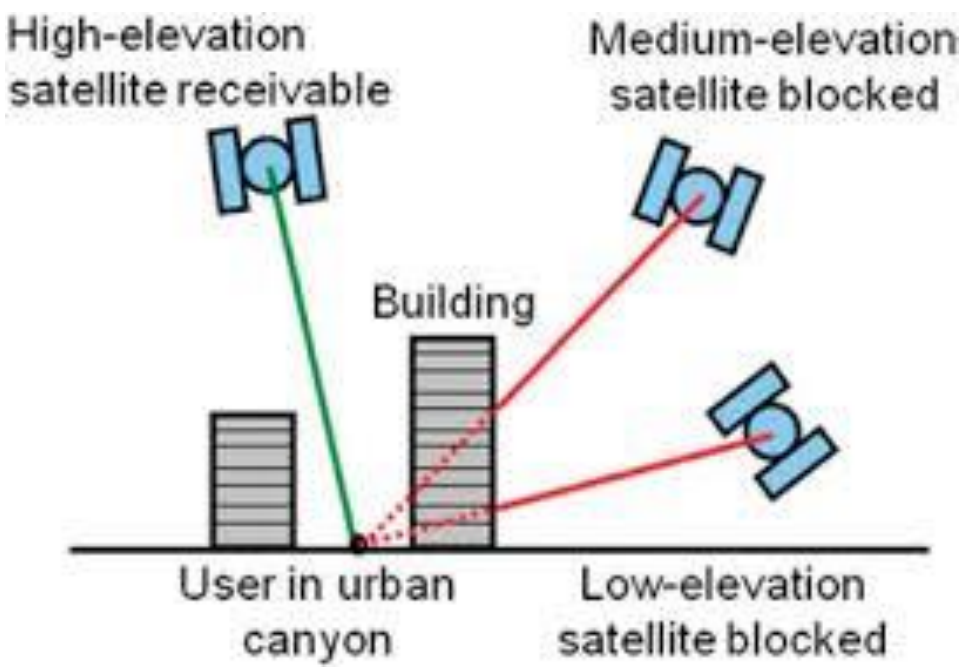
Mag & HEAD degrees corresponds to the compass

(0 degrees = North)

Alt up +no#

Example : if roll the drone to the right the Accelerometer and Gyroscope graphs would show positive numbers and to the Left Negative numbers

If Lift the drone up Vertically the accelerometer Z axis should shows positive numbers and altitude should show a climb in meters

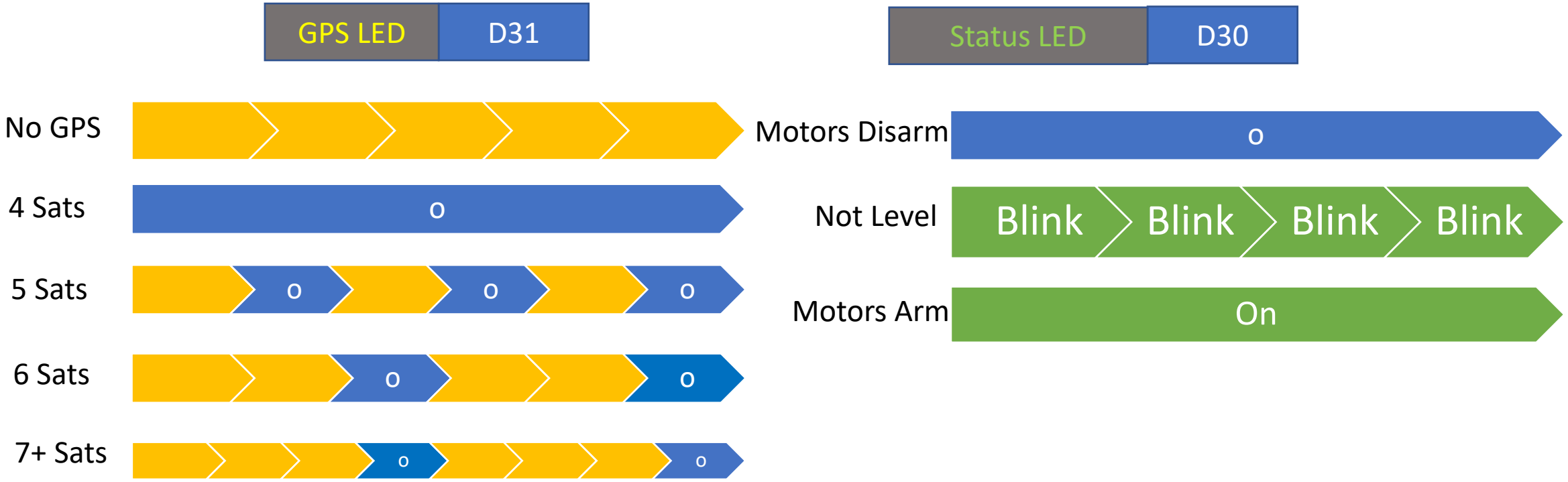


Note : GPS require a clear open area to get a proper fix and accuracy minimum 7 satellites but 10+ are Ideal

operating next to a building can distort satellite signal deteriorating accuracy

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

LED Indicator



indicate a valid GPS fix by flashing the LED
- led work as sat number indicator
- No GPS FIX -> LED blinks constant speed
- Fix and sat no. below 5 -> LED off
- Fix and sat no. >= 5 -> LED blinks, one blink for 5 sat, two blinks for 6 sat, three for 7 +

And your much Done on your setup

Cannot Arm Motors

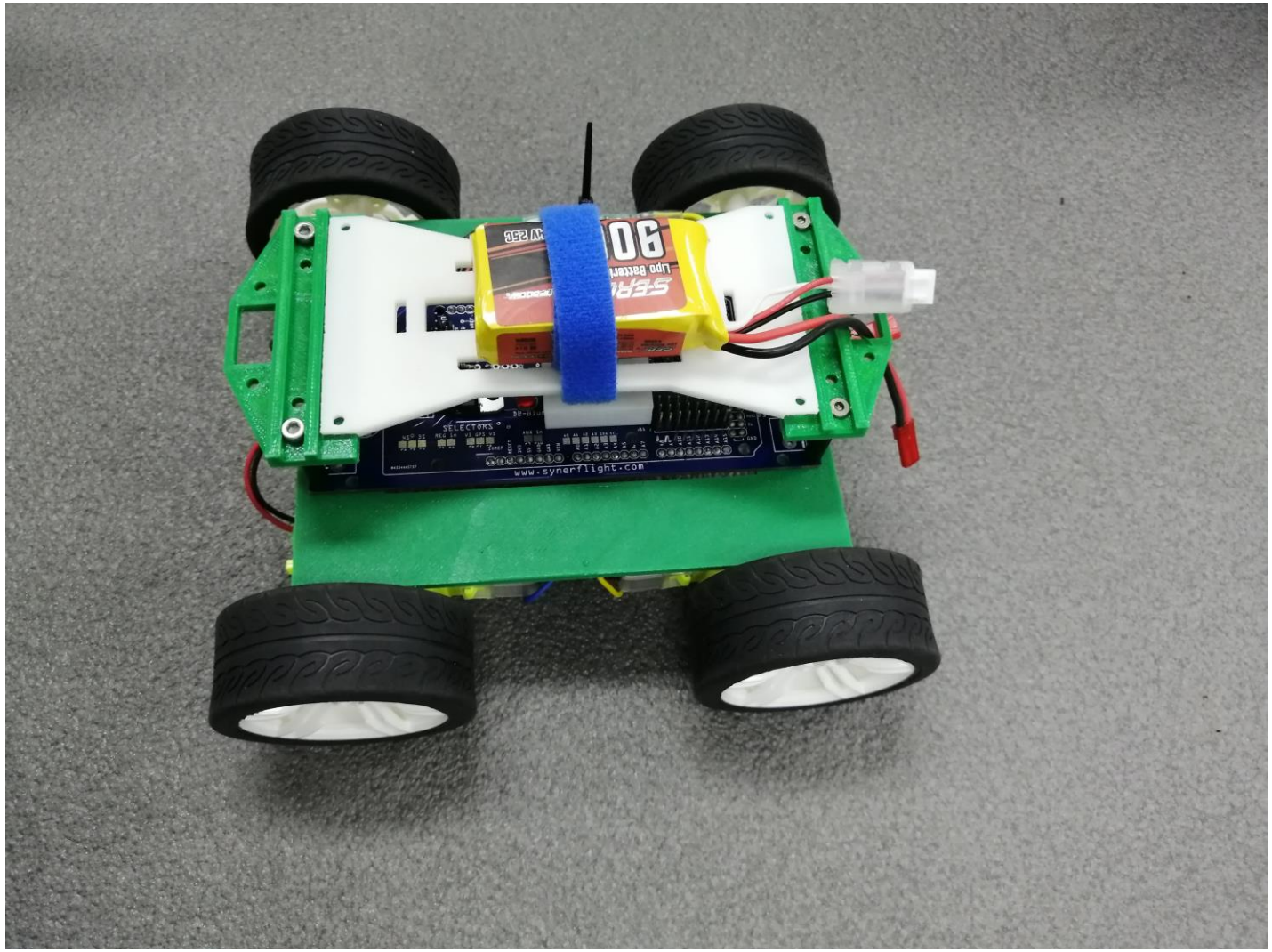
when on GPS Home , GPS Hold , Mission Flight modes & when USB is plugged in . (pls use Bluetooth telemetry)

You can Test with the Vehicle’s wheels off the ground first

Pls calibrate ACC and Mag in the FlyWii GUI Dashboard

Ensure the compass is facing the correct orientation

Set Aux1 as Arm Switch at RC control



For surface vehicles at RC control settings

Set Aux1 as Arm Switch at RC control

Boats must be plug in on level surface first before placing on water

SYNERFLIGHT

SYNERDUINO

ARDU 2560