General Guide

Synerduino Ardu 2560 Multirotor

Latest Version - 2024

For more Information:
www.synerflight.com

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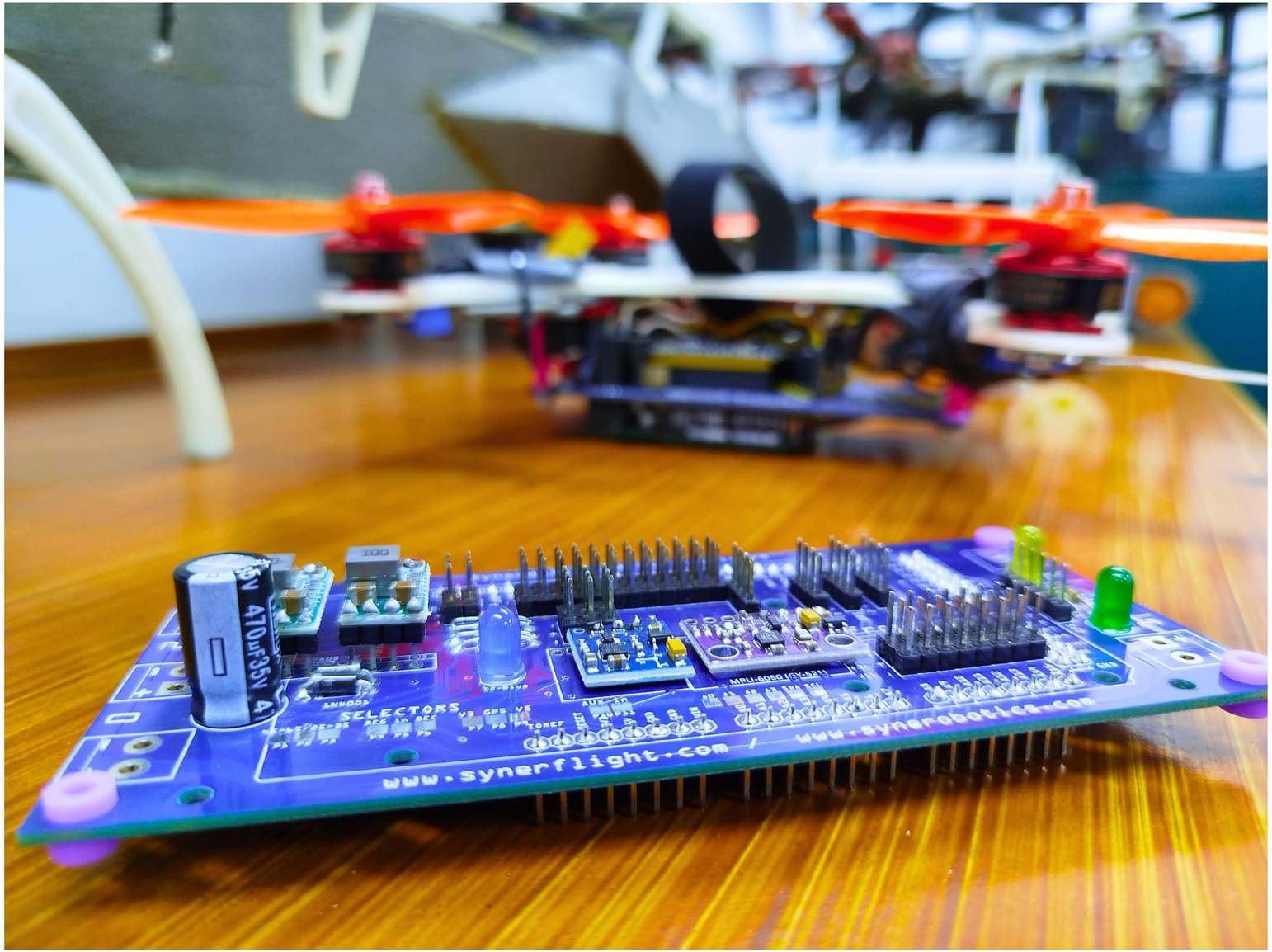
INTRODUCTION

Synerduino Ardu 2560 brings back the classic feel of Arduino, reminiscent of the 2012-2014 era. With its compatibility with the iconic 2560 board and the Arduino IDE, configuring your projects through Sketch .ino files has never been more straightforward. Built on top of the widely used Arduino boards, Synerduino Ardu 2560 is designed with the academic environment in mind, making it a perfect choice for educational and hobbyist projects alike.



SYNERDUINO ARDU 2560

ABOUT THE BOARD

Power

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

Properties

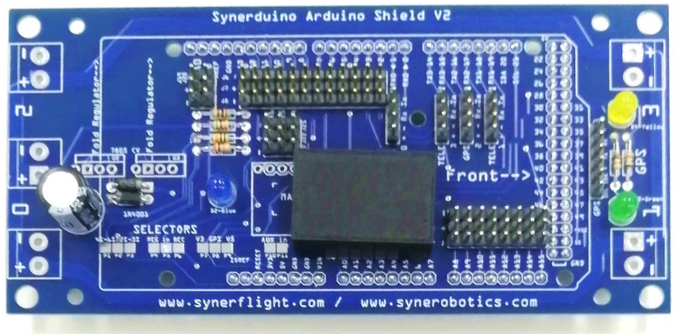
- Dimensions: 128 x 62 x 28 mm LWH / (V1.1)135mm x 62mm x 28mm
- Weight: 46.1g
- 4 Solder Pads for 4 ESCs and Motors
- 15 3-Pin Digital Headers
- 8 3-Pin Analog Headers
- 5 4-Pin Serial Headers

Sensors

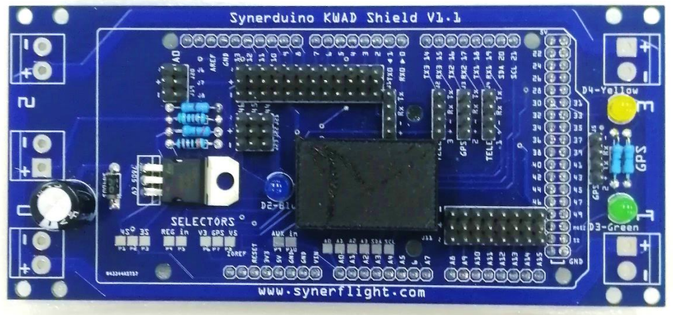
- Gyroscope + Accelerometer: MPU6050
- Magnetometer: QMC5883 / HMC5883
- Barometer: BMP280

BOARD VERSIONS

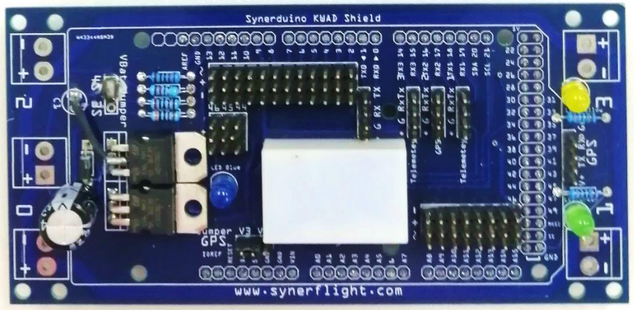
Synerduino Arduino Shield V2 -2024
- MPU9250
- QMC5883
- BMP 280



Synerduino Kwad Shield V1 -2021
- MPU9250
- MAG 9250
- BMP 180



Synerduino Kwad Shield Beta -2020
- L3G4200D
- ADXL345
- BMP 180
- MMC5883



PIN LAYOUT

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.

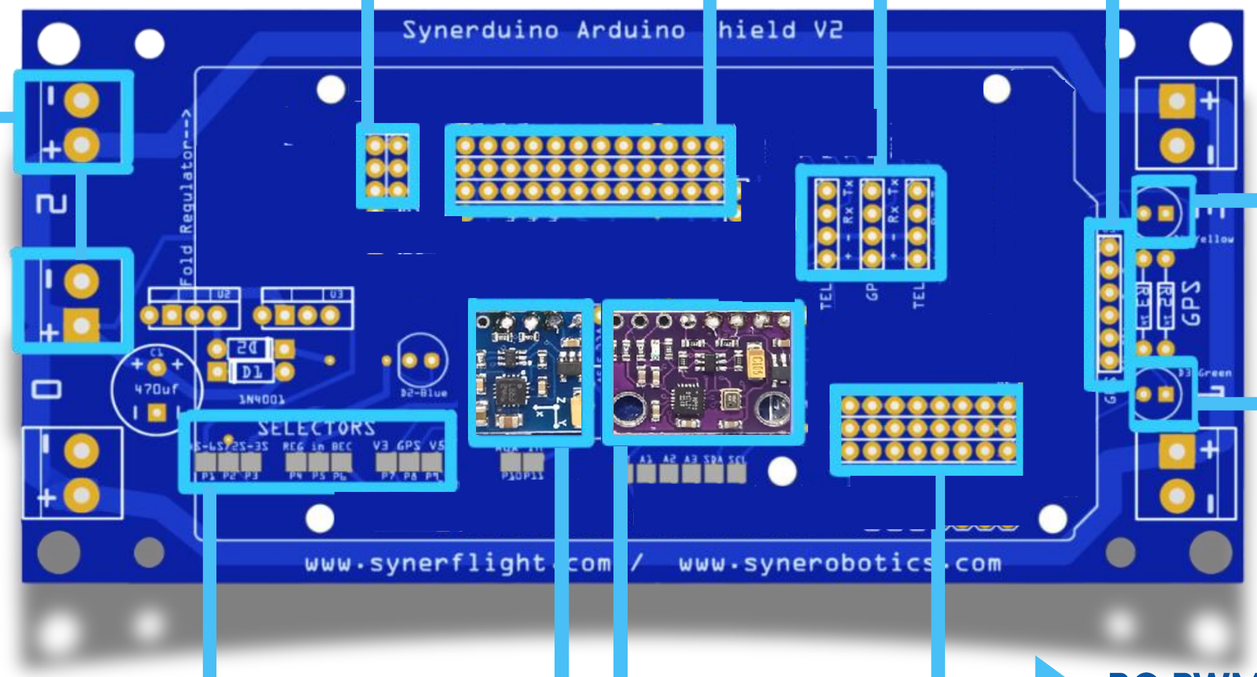
Status LED

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.

5883 Mag

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. See package version*

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.

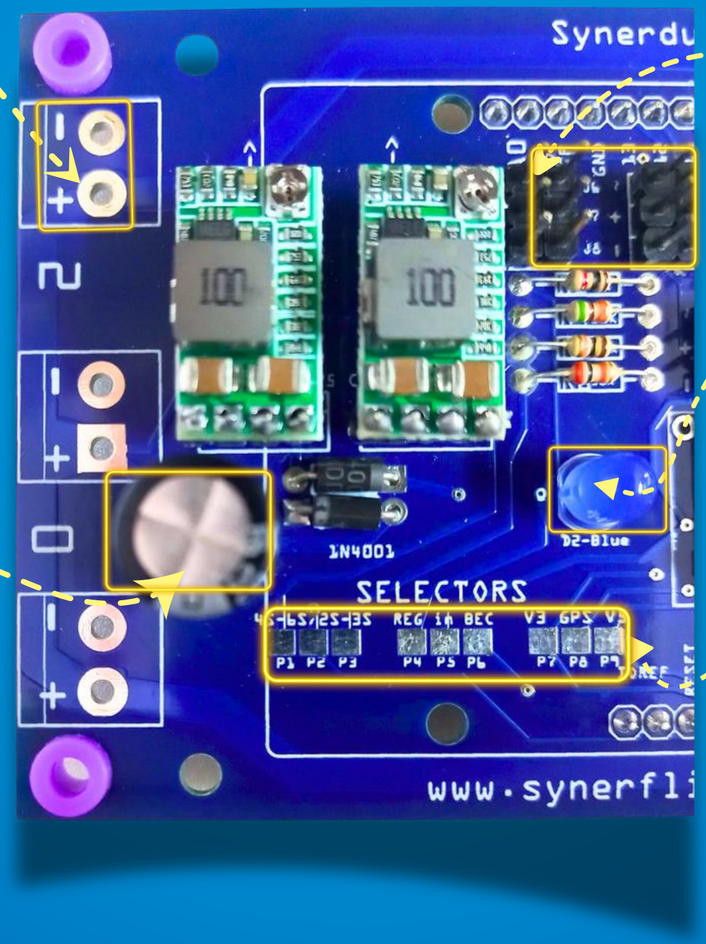
KEY FEATURES OF THE BOARD

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

Synerduino Kit + 250mm Frame

Description: A ready-made frame and controller kit for building a small quadcopter. The frame size (250mm) is suitable for small to mid-size drones.

Main Controller Board

Description: This is the central flight controller, responsible for processing inputs from sensors.

Plastic Casing

Description: High-current connector for connecting the battery.

Bluetooth and GPS Module

Description: Bluetooth module for wireless communication and GPS for positional tracking and navigation.

XT60 Plug

Description: High-current connector for connecting the battery.

Washers and Dampeners

Description: Washers spread out the load to keep screws tight, while dampeners absorb shocks and reduce vibrations.

Propellers (5x4.5 or 5x4)

Description: These are 5-inch blades in both clockwise and counterclockwise rotations, essential for balancing and stabilizing the quadcopter.

Spacers

Description: These are 5-inch blades in both clockwise and counterclockwise rotations, essential for balancing and stabilizing the quadcopter.

2300kV Motors

Description: High-speed motors delivering up to 1000g thrust each.

ESCs

Description: Motor controllers, some with BEC for powering extra components, running on 3S-4S batteries.

Servo Wires

Description: Cables for connecting servos or components to the flight controller.

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/4S Batteries
- 4 Output ESC Pads
- Mode Selection Pads (V1.1)
- ADC sensor input (V1.1)
- Highly customizable

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

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.

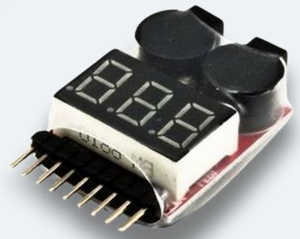
CUTTER

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

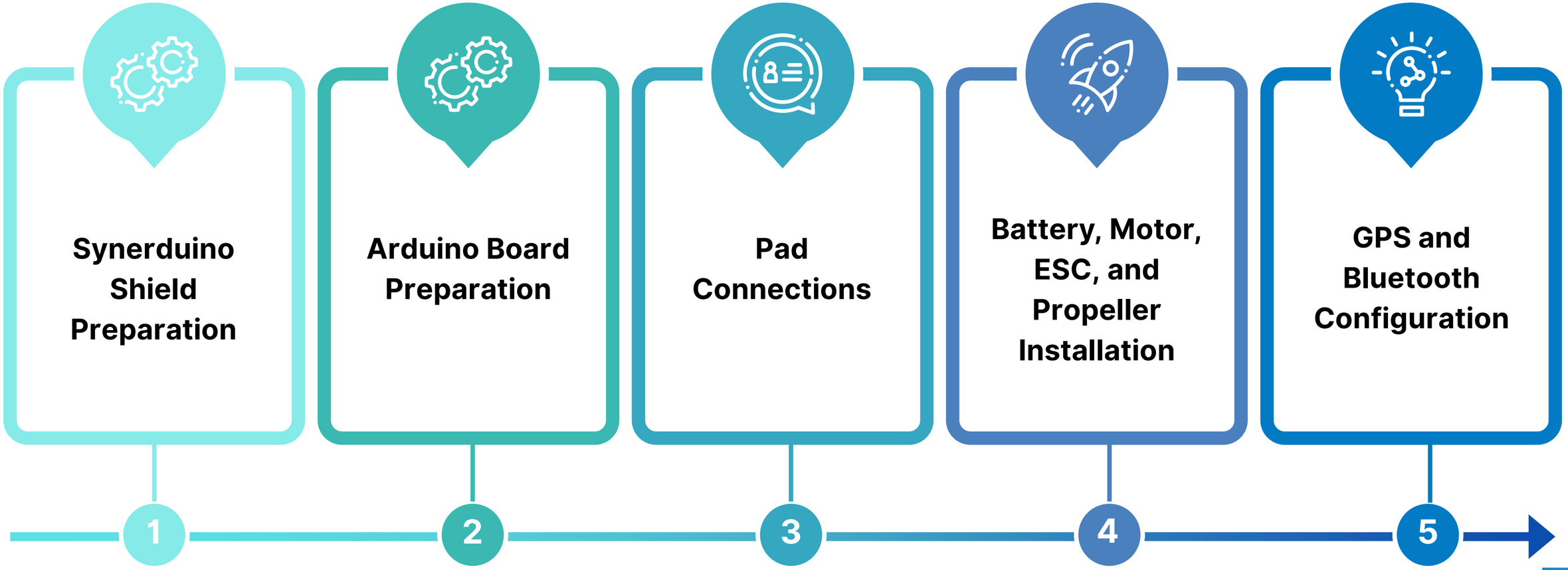
Used for assembling or reinforcing non-electrical parts of the drone frame and components.

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

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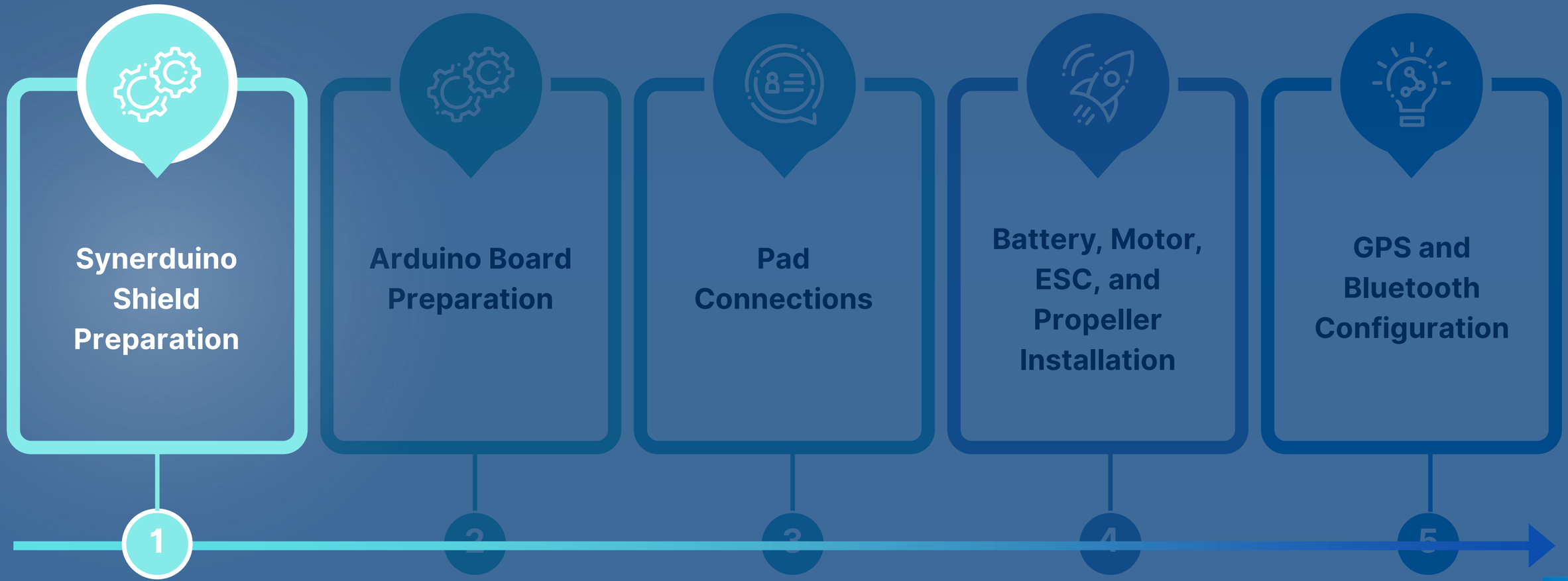


SYNERDUINO BOARD PREPARATION

Aux ADC in

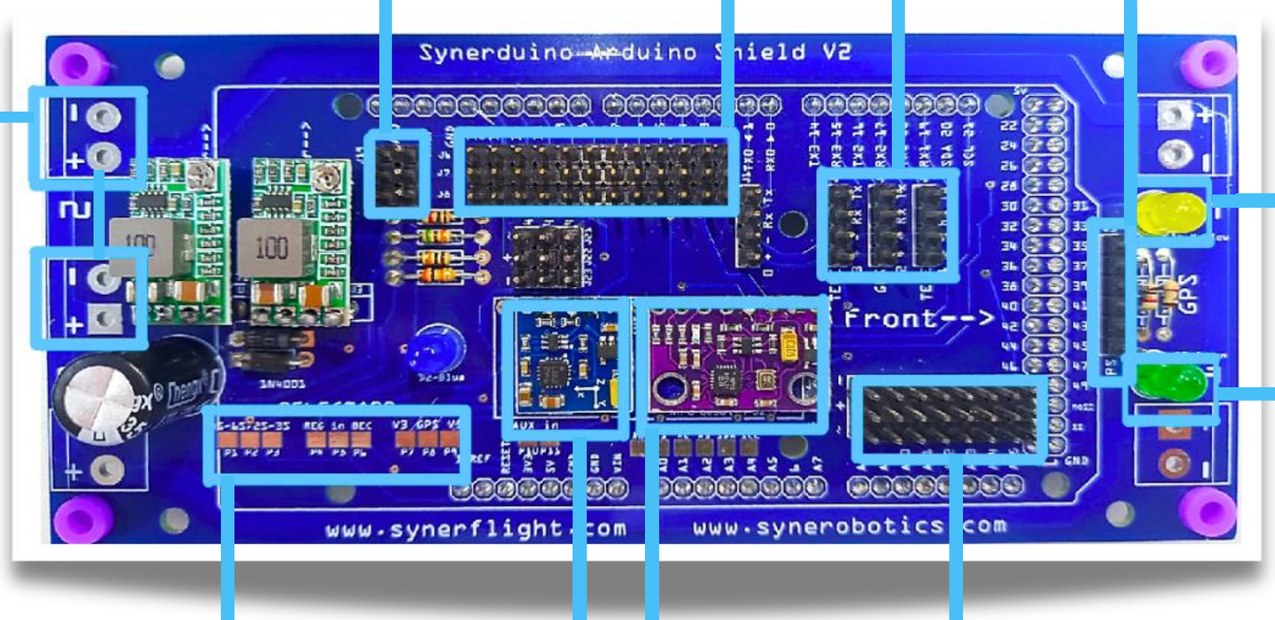
Usage: These pins are used to connect external sensors or devices that output analog signals, such as temperature, pressure, or current sensors.

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.

5883 Mag

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. See package version*

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!

1. **Synerduino Shield Preparation**
2. **Arduino Board Preparation**
3. **Pad Connections**
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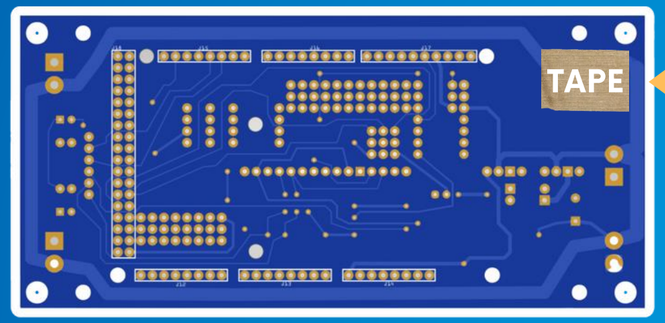
BOARD PREPARATION

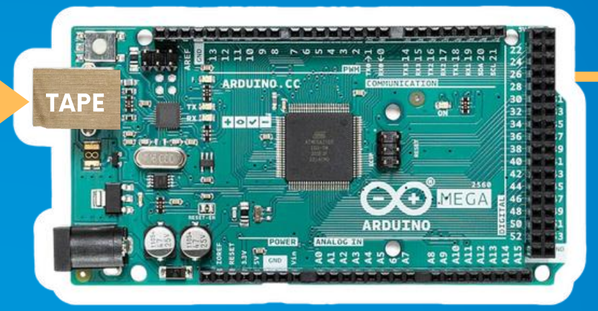
Step 1:

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

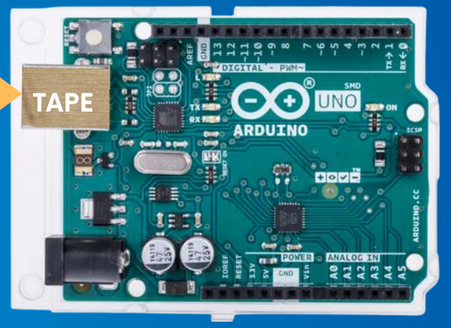


Add tape to the top right side corner at the back of the Synerduino board.

2560 MEGA



UNO 328

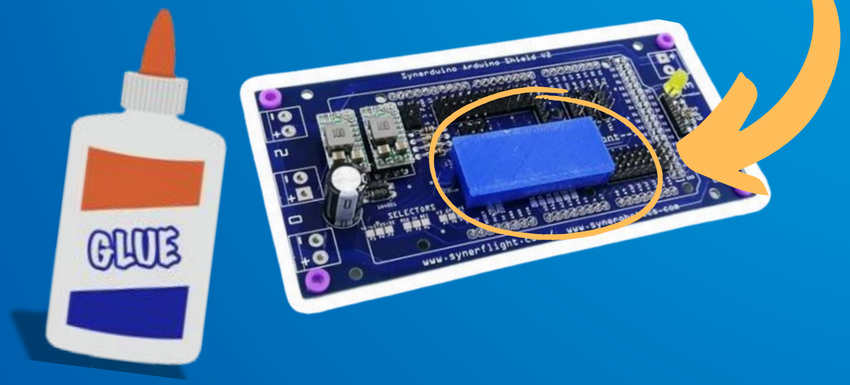


Add tape to the top-left side of the Arduino 2560 MEGA/UNO 328 board to cover the metal part.

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

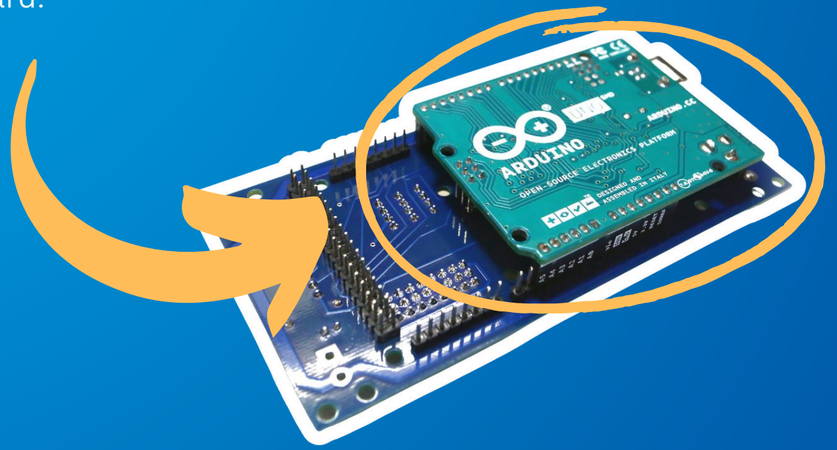
Step 2:

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.



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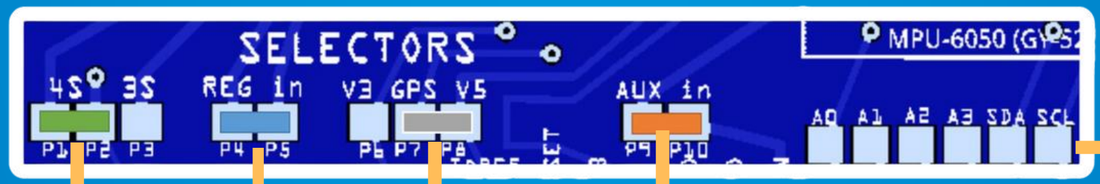
PAD CONNECTIONS SYNERDUINO KWAD SHIELD V1 BOARD

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 or 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.

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

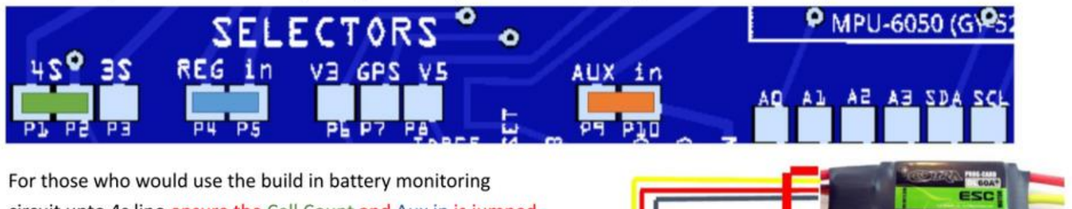
For Aux In:

- 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.

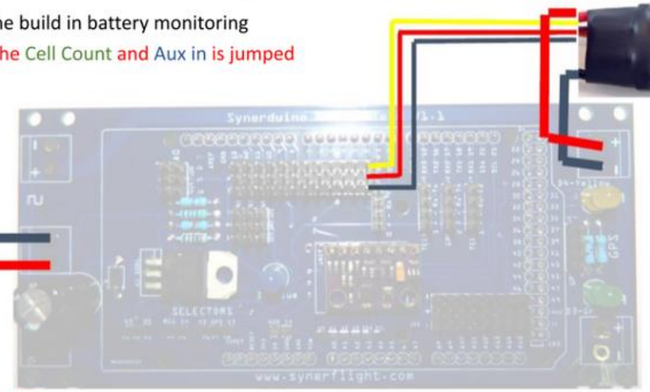
PAD CONNECTIONS

SYNERDUINO 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
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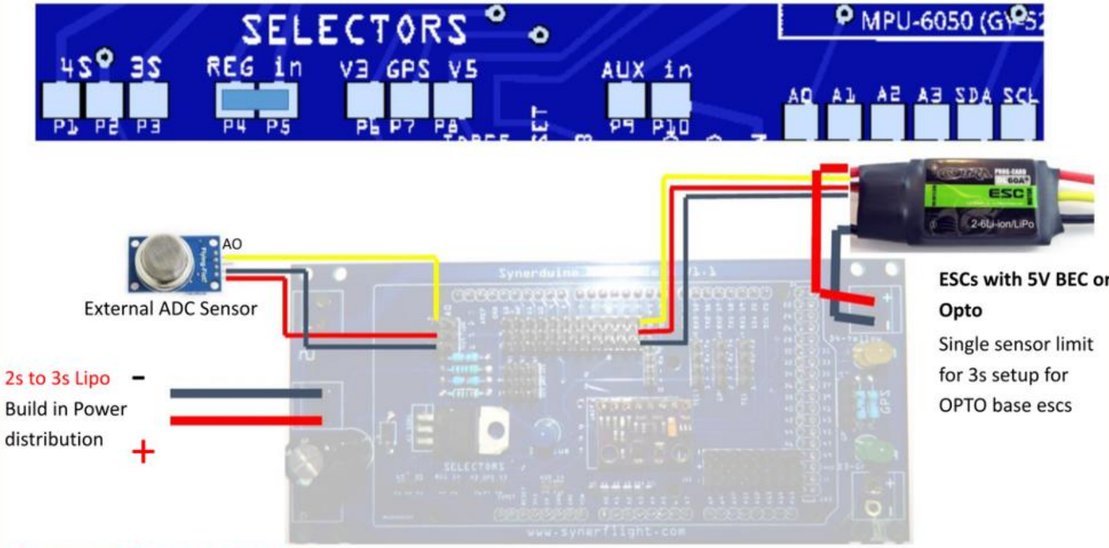
\+

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

PAD CONNECTIONS

SYNERDUINO ARDUINO V2 BOARD

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 or 3s

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- 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 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:

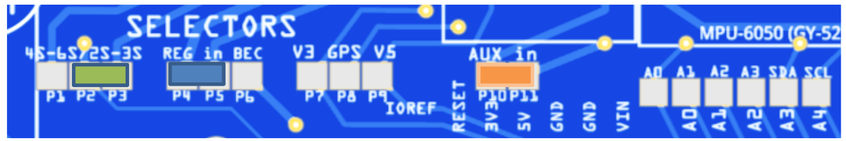
- Set to 5V for a regular GPS.
- Set to 3V for an external I2C sensor, such as a magnetometer.

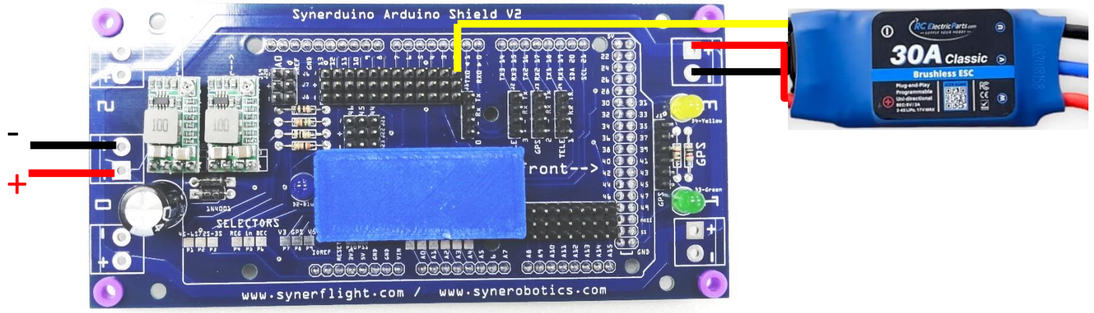
Analog 0 pin Auxin / Battery monitor

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.

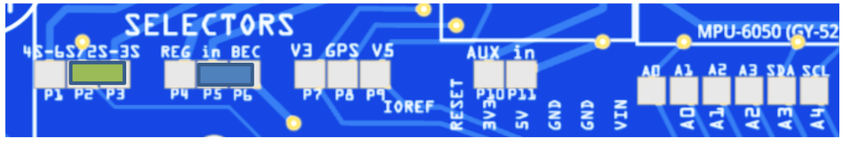
PAD CONNECTIONS SYNERDUINO ARDUINO SHIELD V2 BOARD

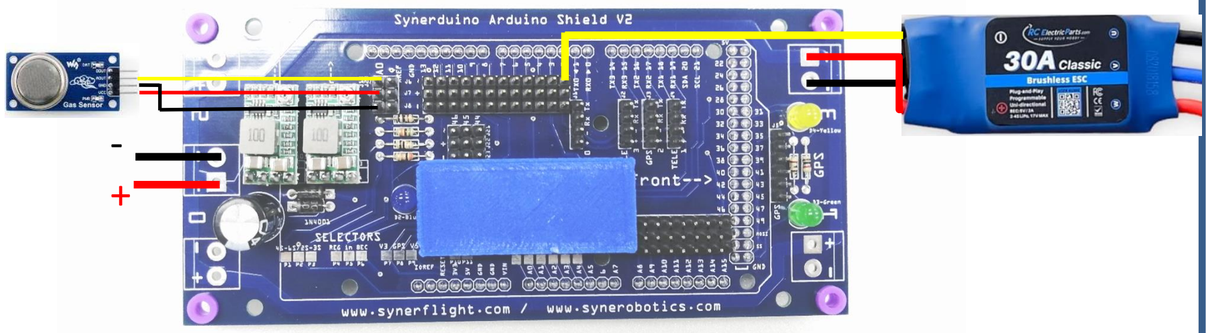




Reg in – to use the onboard power supply to run the board up to 3A

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

ASSEMBLING PROCESS

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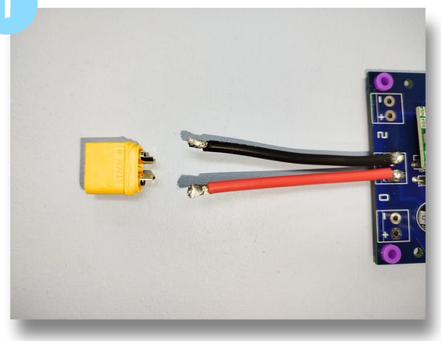
BATTERY INSTALLATION

1



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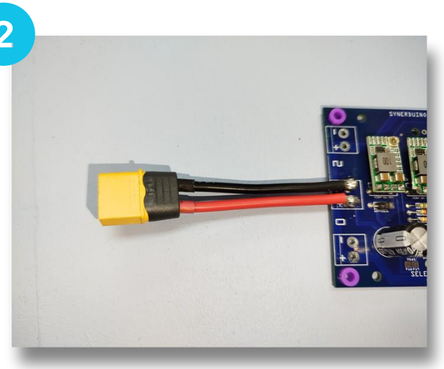

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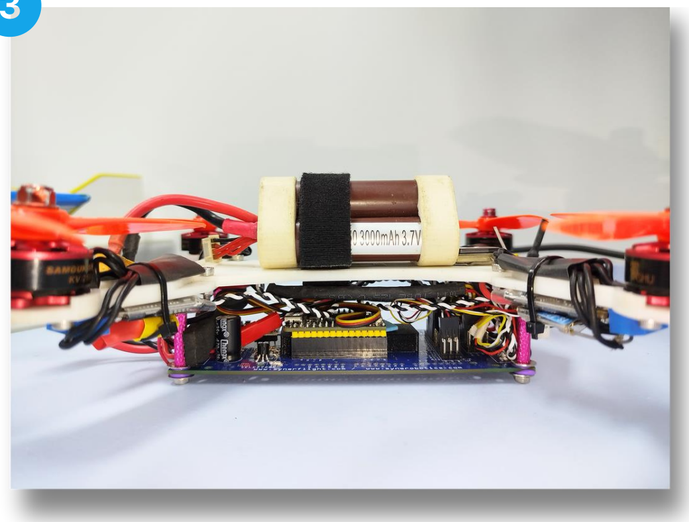


STEPS

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.

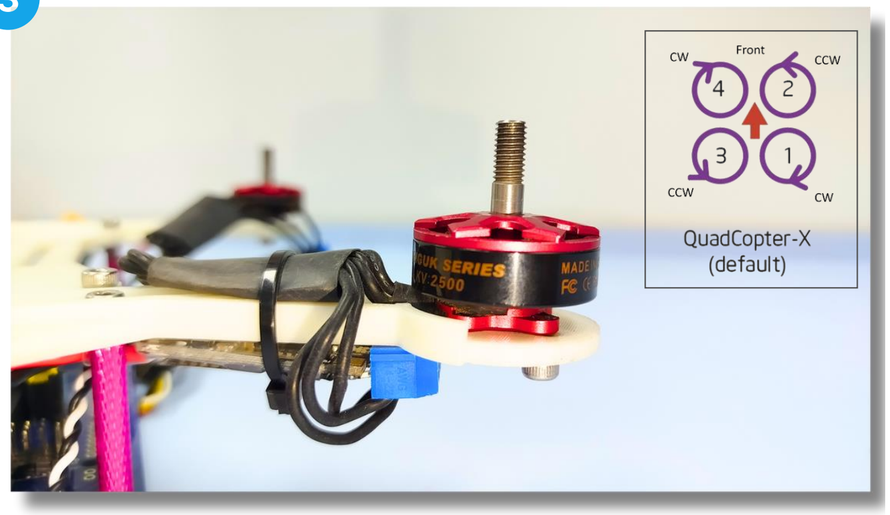
NOTE: Always check battery voltage before installation to ensure it's fully charged.

MOTOR INSTALLATION

1

2

3



STEPS

1. Prepare the motor along with the two screws and nuts. Threadlock with PVA glue or purple thread locker

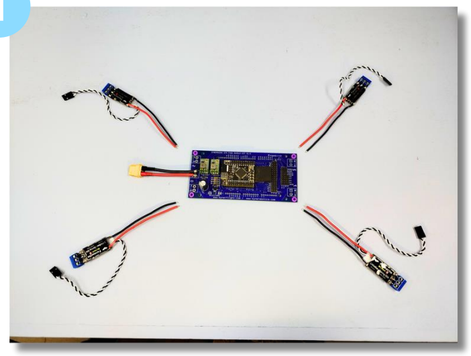
2. Secure the motor onto the designated motor mount, ensuring it aligns with the screw holes.

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

1



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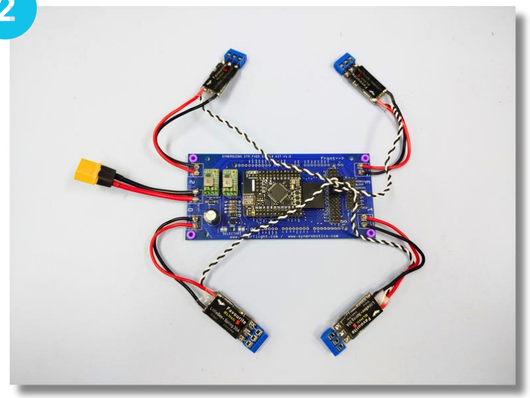
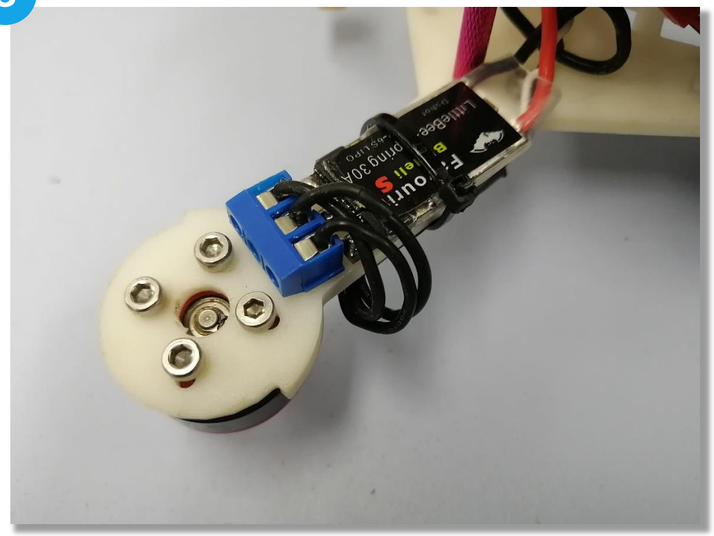


3



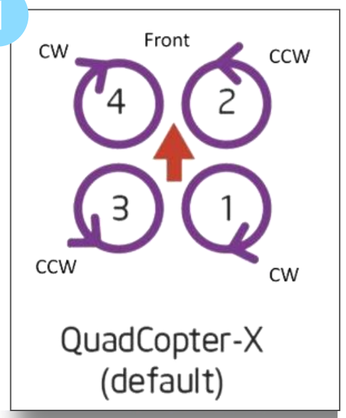
STEPS

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.

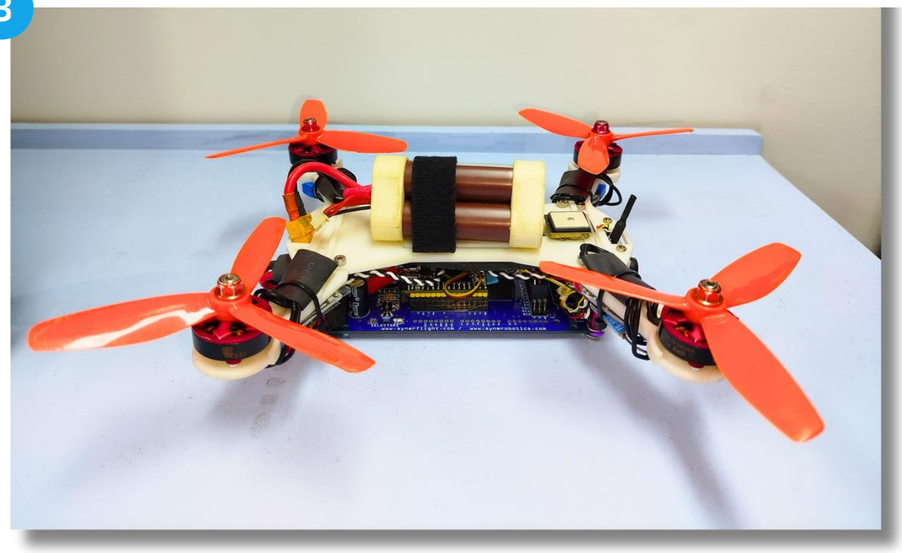
PROPELLER INSTALLATION

1



2

3

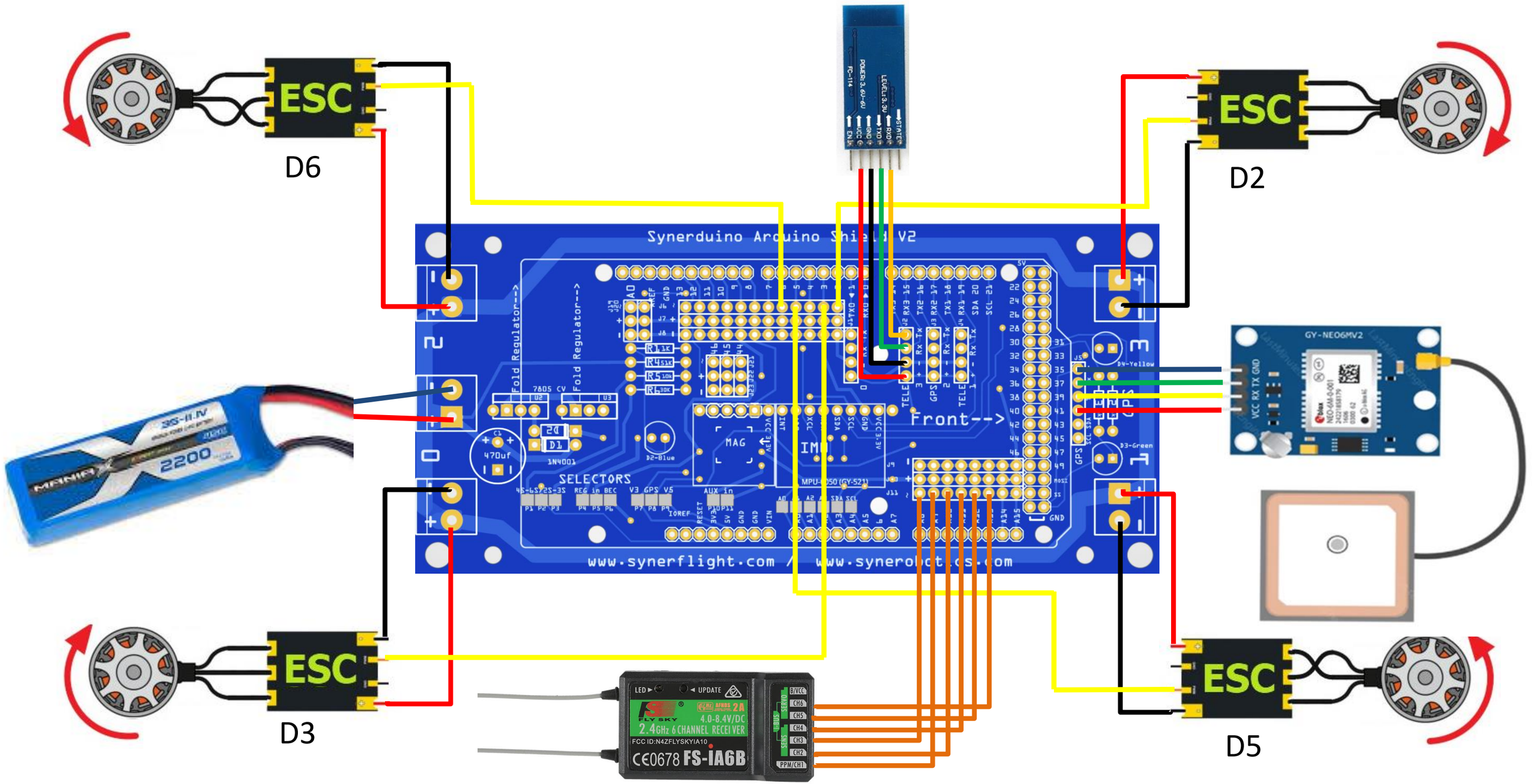


STEPS

1. Match the correct propeller to the motor, ensuring you have clockwise (CW) and counterclockwise (CCW) propellers in the right positions.
2. Push the propeller onto the motor shaft and tighten it with the provided nut or locking mechanism.
3. Repeat the steps on the other sides, and ensure that the propellers are firmly secured.

NOTE: Ensure no obstruction in the propeller's path for smooth rotation.

BATTERY, MOTOR, ESC, & PROPELLER INSTALLATION



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 Shield Preparation

1

Arduino Board Preparation

2

Pad Connections

3

Battery, Motor, ESC, and Propeller Installation

4

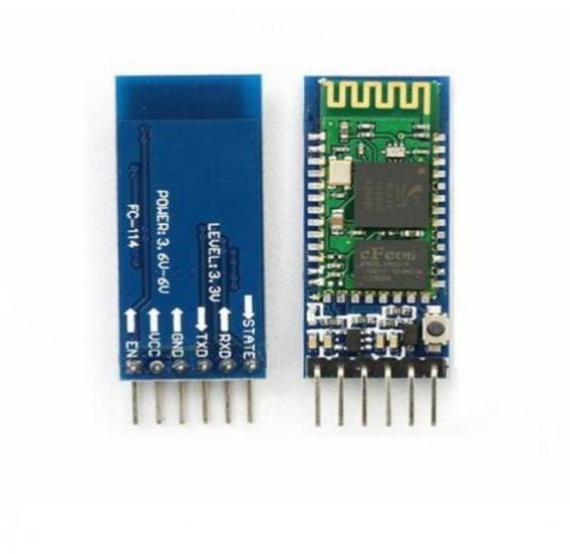
GPS and Bluetooth Configuration

5

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

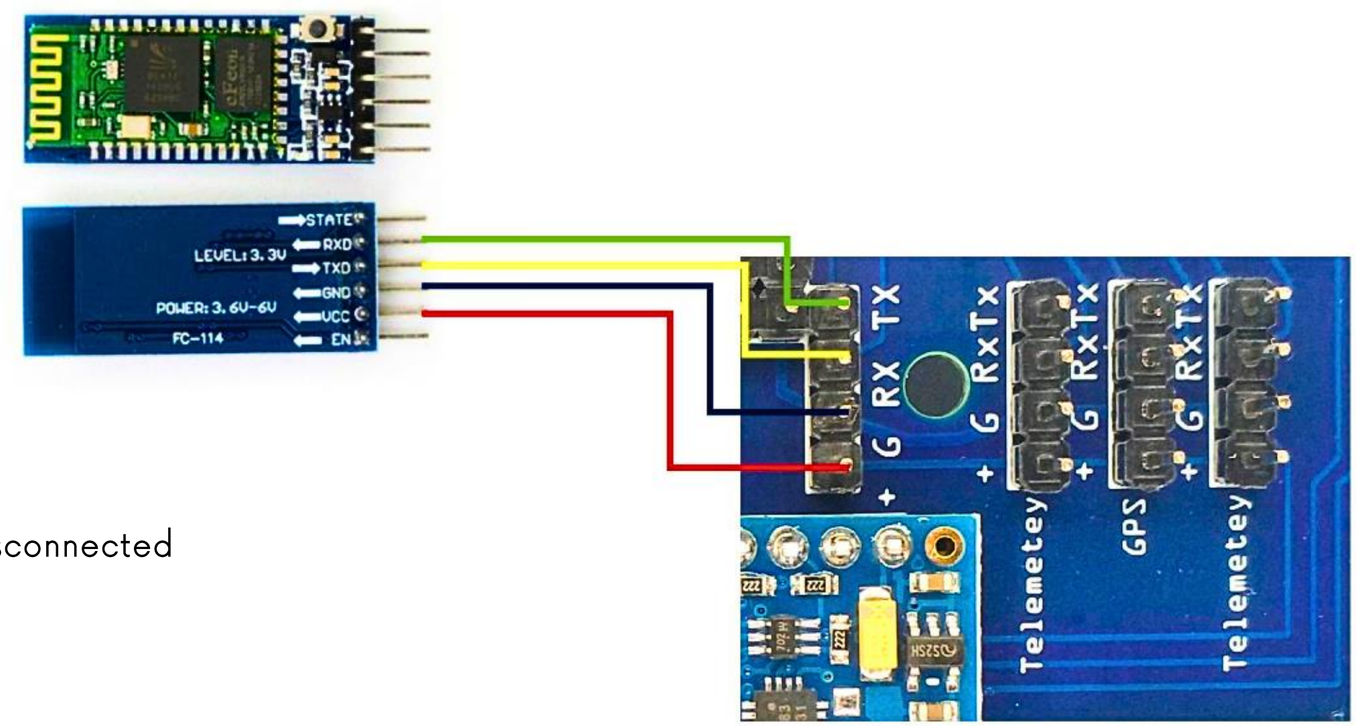
TO CONNECT THE **BLUETOOTH HC-05 MODULE** TO THE BOARD, ENSURE THE HEADERS ARE ARRANGED CORRECTLY. FOLLOW THIS WIRING CONFIGURATION:

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

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

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

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



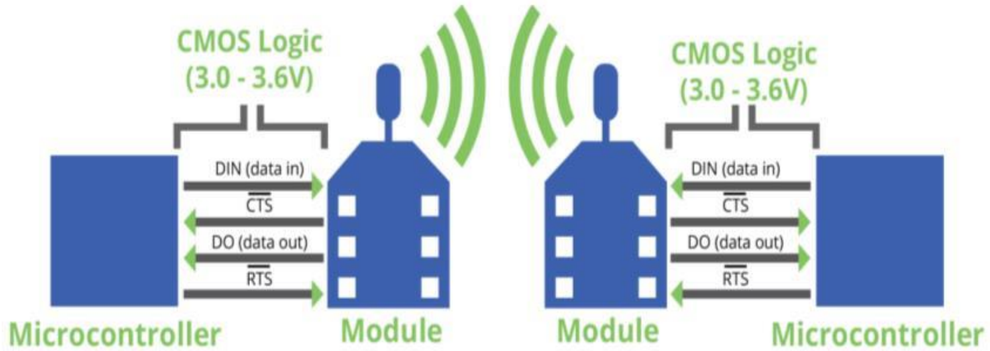
Any Serial Radio can be configured to run on Serial 0, 1, or Serial 3. with the matching Baud

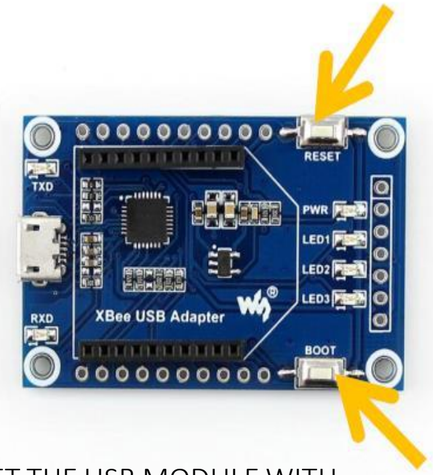
Serial 0 can be used for telemetry only if the USB is disconnected

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.

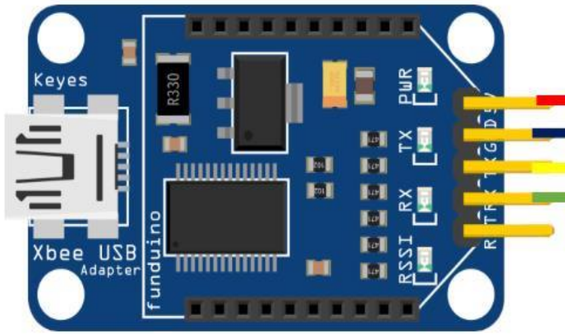
SERIAL RADIO CONFIGURATION

38400 FOR XBEE RADIO





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

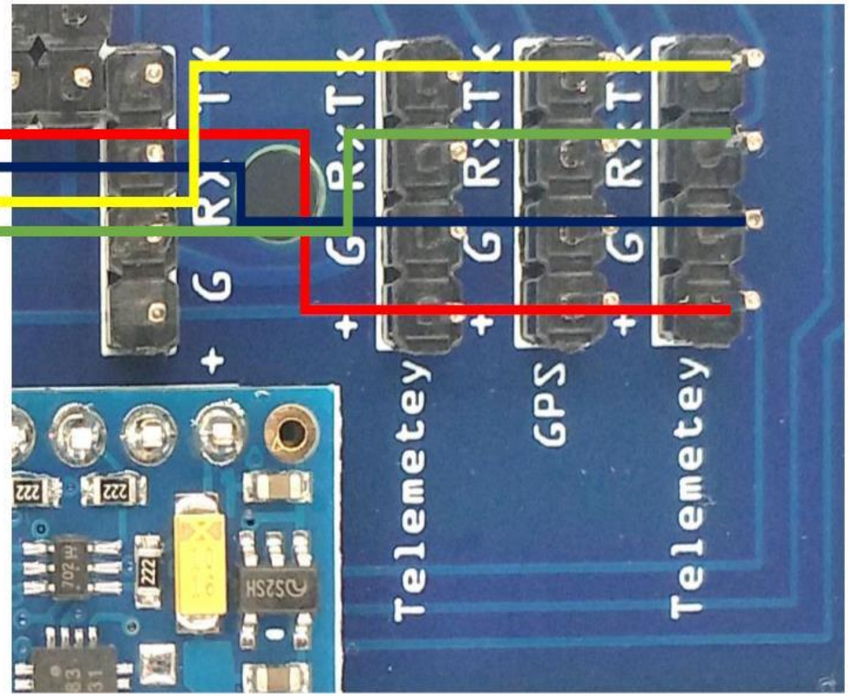


VCC >> +

GND >> G

TX >> TX

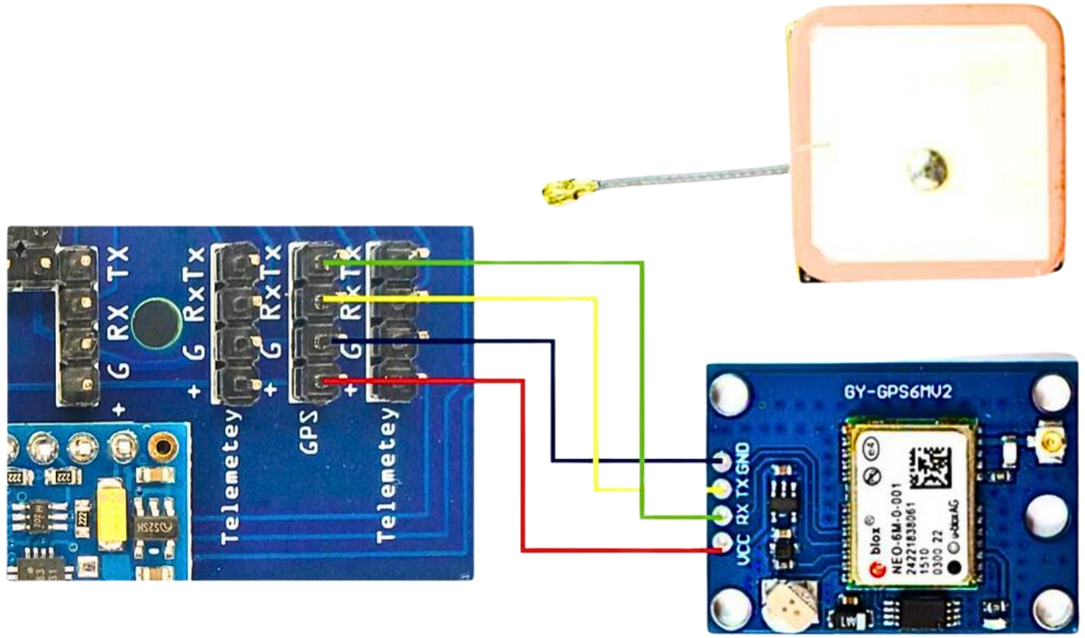
RX >>RX



GPS CONFIGURATION

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

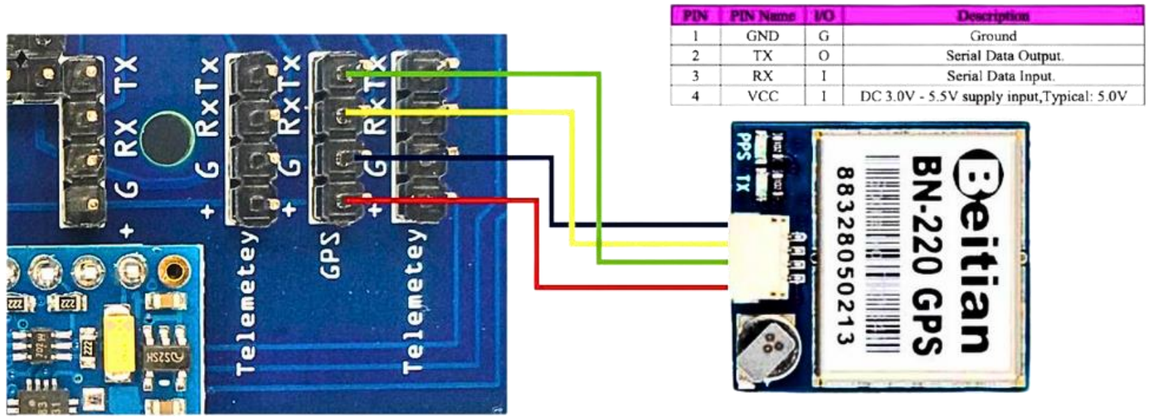
TO CONNECT THESE COMPONENTS, COLOR-CODED WIRES CLARIFY THESE CONNECTIONS, WITH **YELLOW** INDICATING **RX TO TX**, **GREEN** FOR **TX TO RX**, **BLACK** FOR **GROUND (GND)**, AND **RED** FOR **POWER (VCC).**



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	I	DC 3.0V - 5.5V supply input,Typical: 5.0V



RECEIVER TYPES PROTOCOL

PPM RECEIVER

SERIALRECEIVER

PWM RECEIVER

RECEIVER TYPE CONFIGURATIONS

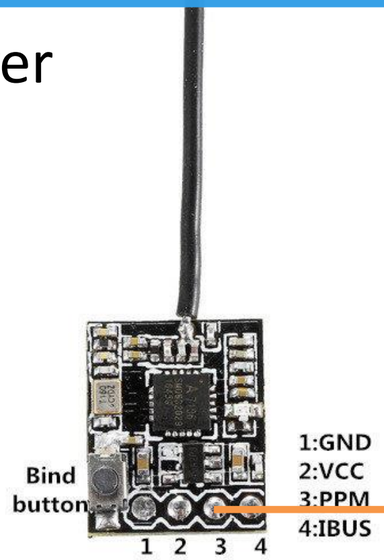
RX > SBUS INPUT	FUTABA FORMAT	JR FORMAT	WALKERA FORMAT	GRAUPNER FORMAT	MEGA 2560
	AETR	TAER	EATR	ERTA	INPUT
					
THROTTLE	CH3	CH1	CH3	CH3	A8
AILERON	CH1	CH2	CH2	CH4	A9
ELEVATOR	CH2	CH3	CH1	CH1	A10
RUDDER	CH4	CH4	CH4	CH2	A11
AUX 1	CH5	CH5	CH5	CH5	A12
AUX 2	CH6	CH6	CH6	CH6	A13
AUX 3	CH7	CH7	CH7	CH7	A14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

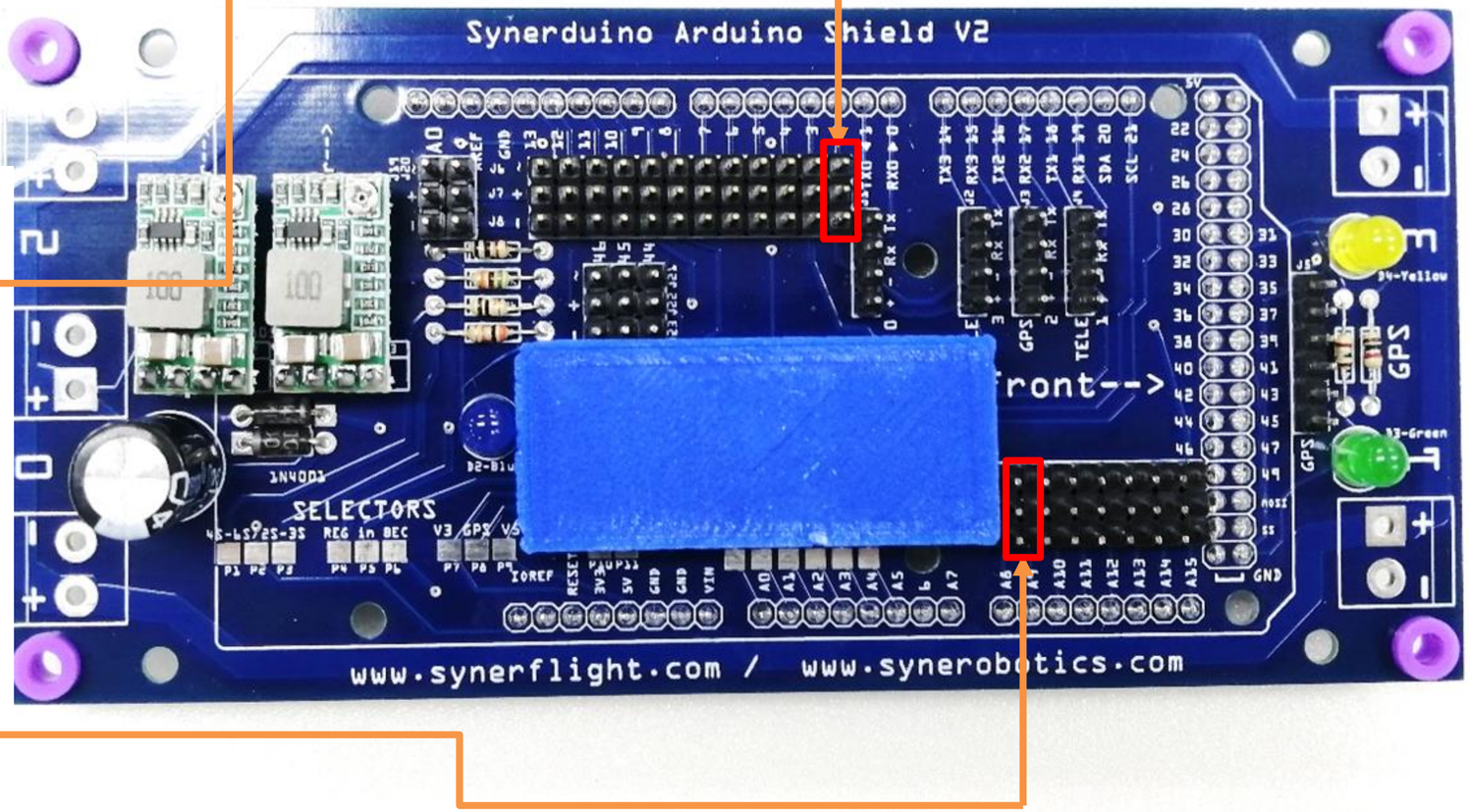
OTHER RECEIVER TYPE

PPM Receiver



Pin D2 for Uno

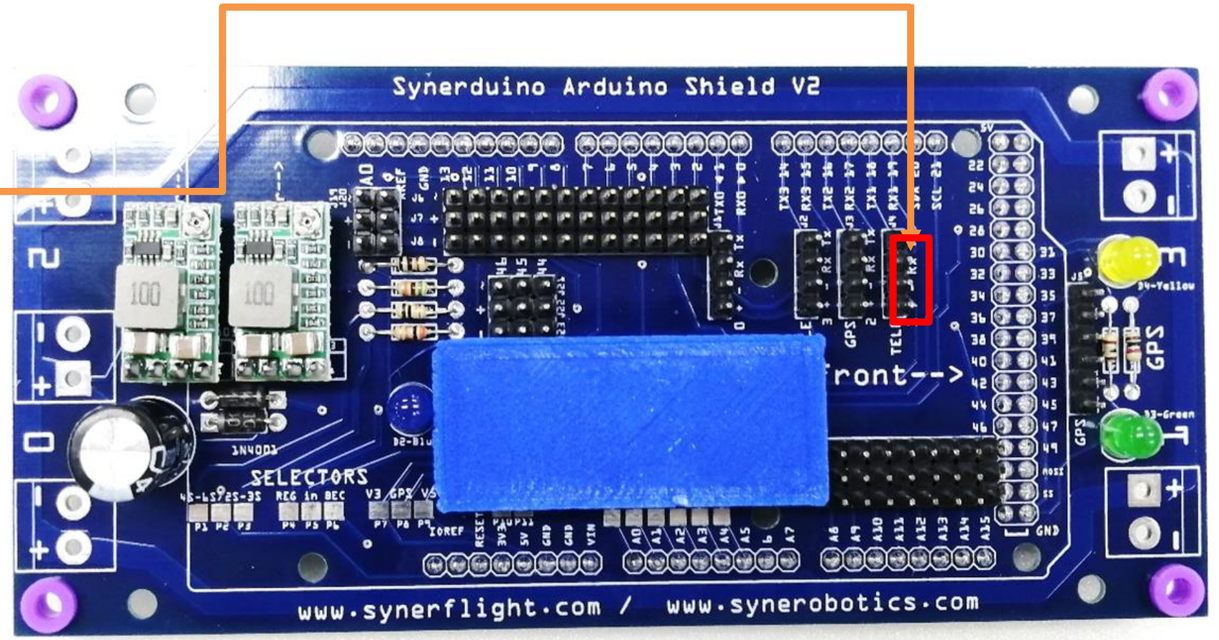
Pin A8 for Mega



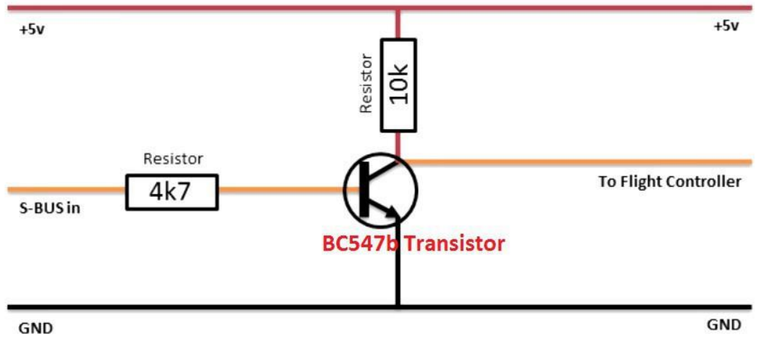
OTHER RECEIVER TYPE

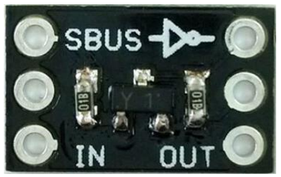
SBUS Receiver

RX 1 Telemetry



The SBUS system uses Futaba protocol and should be compatible with Most SBUS Receivers

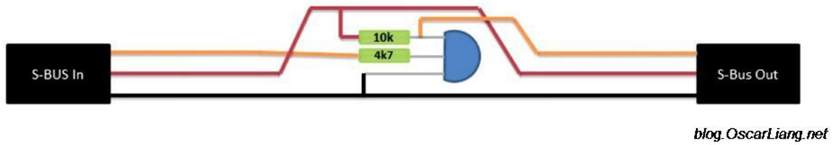




SBUS Inverter

Should there be issues in Signal Inversion an SBUS inverter may be use

You can tell if the RC control is not being read



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

SOFTWARE SETUP

Synerduino KWAD .ino

From here you require to download the Arduino IDE sketch

Multirotor Ino (2024) (Support M9-M10 NMEA , M7-M8 UBX , Home Reset)

Synerduino Kwad 02 09 2024

Multirotor Legacy Ino (2020) (Support M5-M6 NMEA , M7-M8 UBX)

(Arduino 1.8.5) SynerduinoKwad4-GY801-GY91
(Arduino 1.8.16) SynerduinoKwad4-GY801-GY91-1.8.16
(Arduino 1.8.16 – 2.0.0) SynerduinoGY91-1.8.6-2.0.0
(For UNO boards)Synerduino-Uno-GY91-801

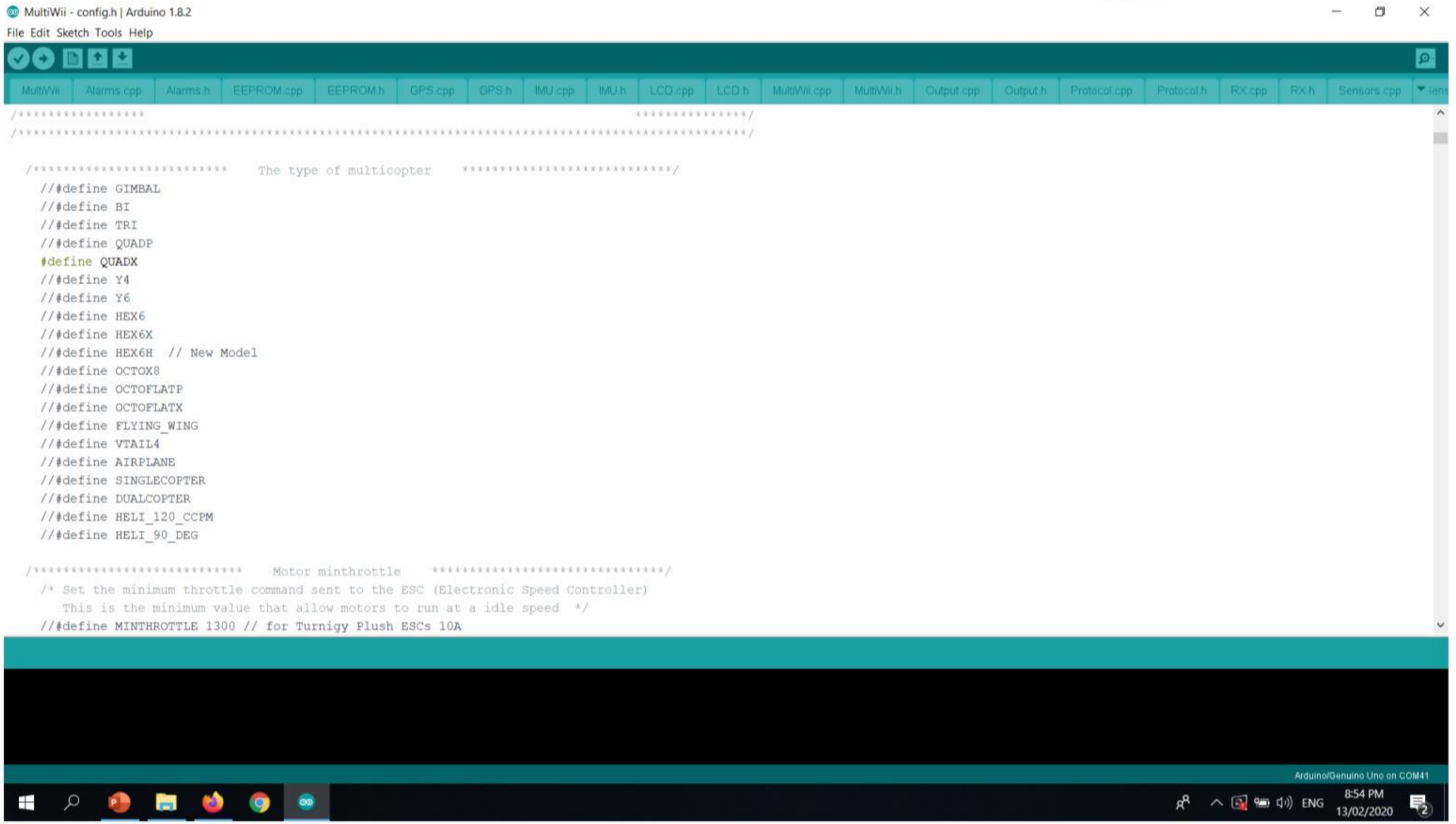
https://synerflight.com/drone-shield/

See the Synerflight.com website for new updates of the software and click on the download tab

This houses the bulk of that the Arduino Drones codes

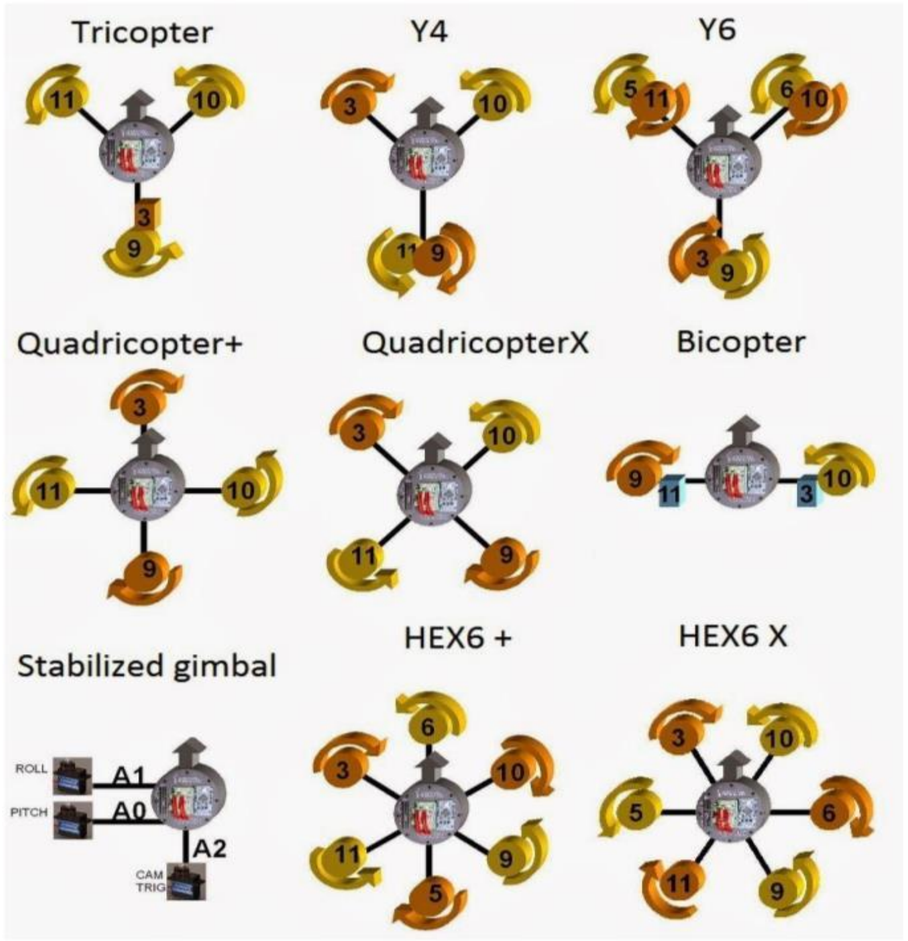
TYPE OF MULTICOPTER

CONFIG.H

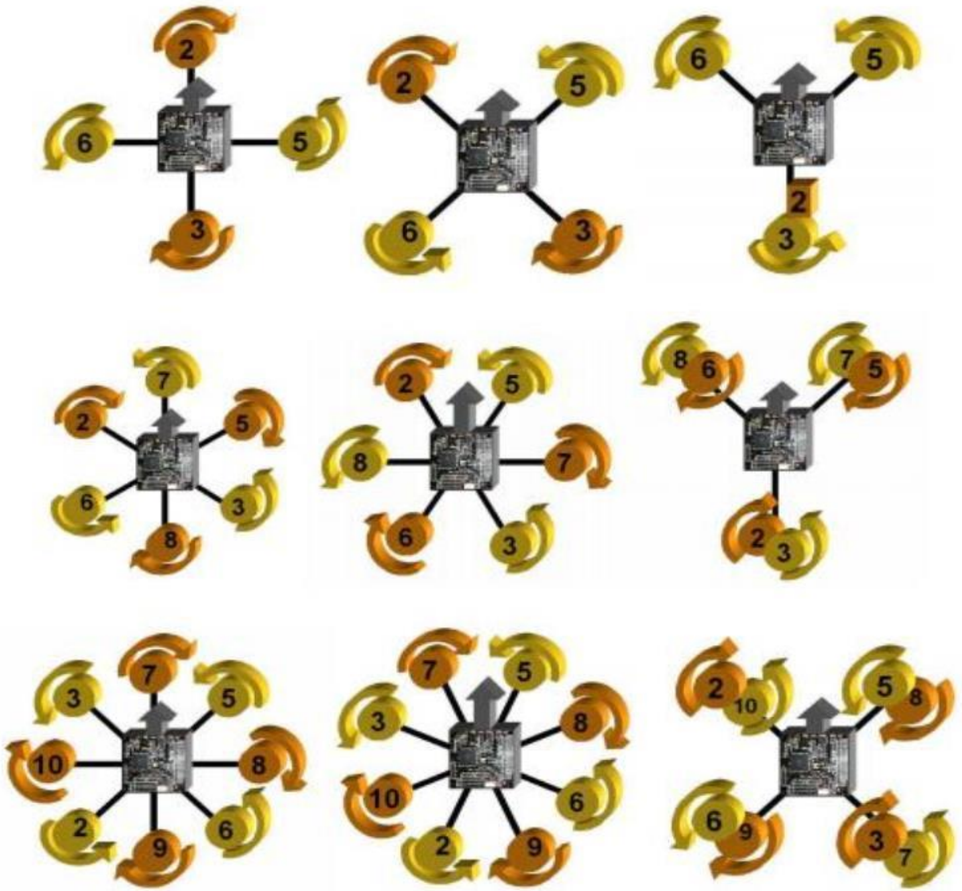


PIN ARRANGMENT FRAME TYPES

CONFIG.H



UNO 328

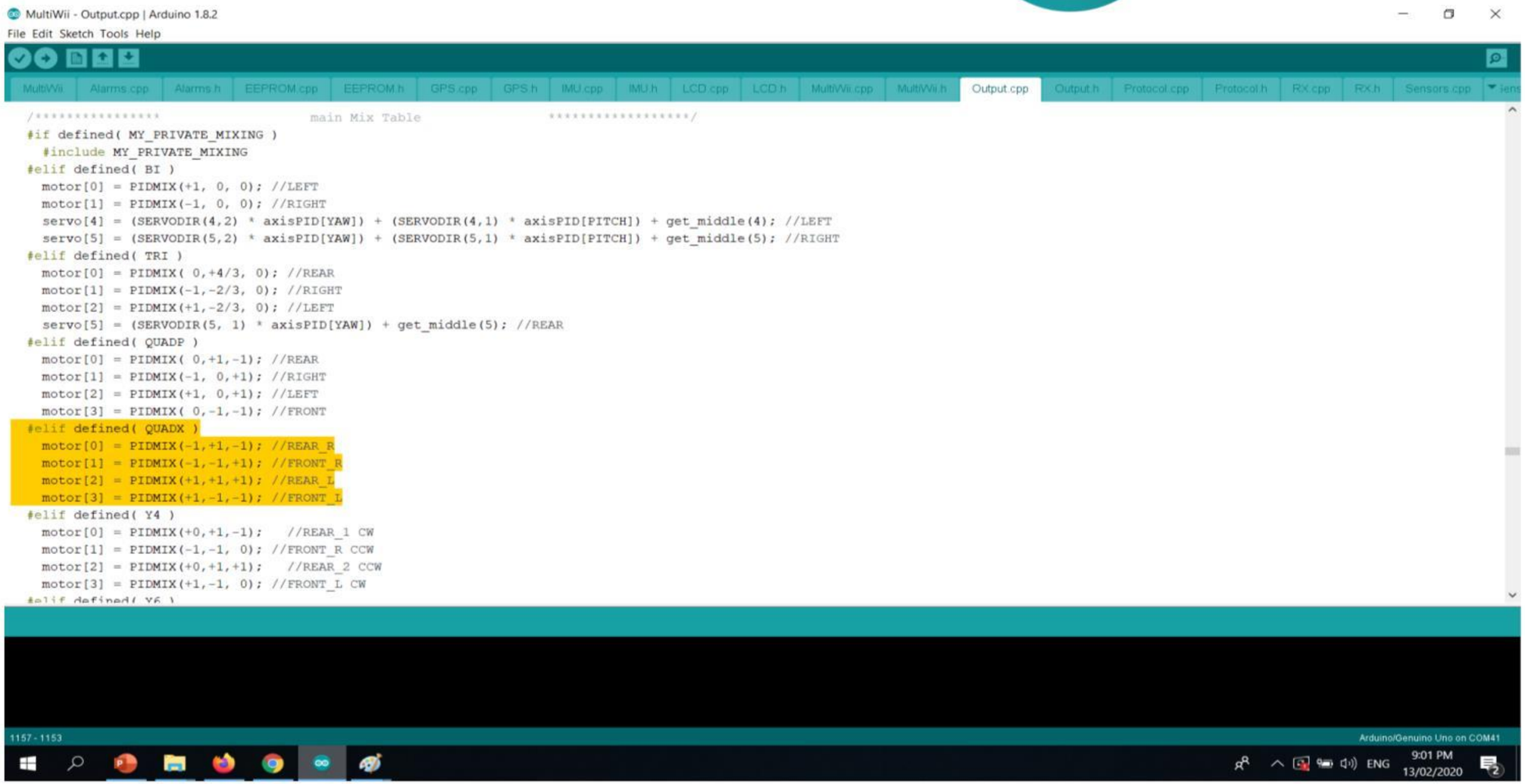


MEGA 2560

PWM Pins arrangement D2-D10 / PWM Output

MIX TABLE

OUTPUT.CPP

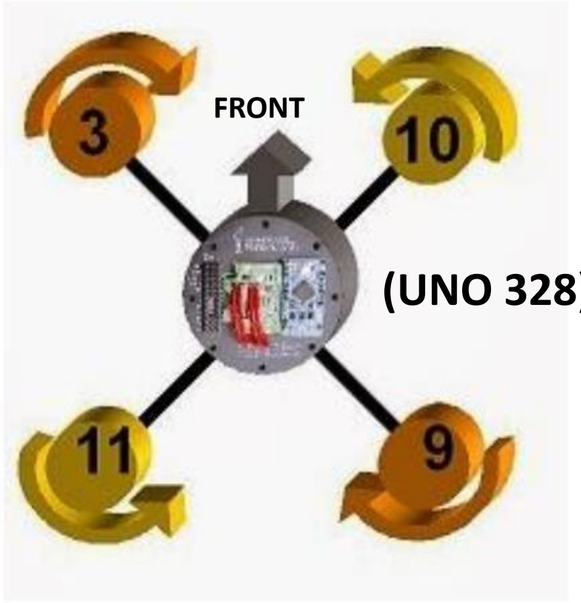


Mix Table shows the motors setup on input this is also helpful for those custom airframe designs require special mixing

OUTPUT.CPP

Roll Right Pitch Forward Yaw Right

Motor [3]

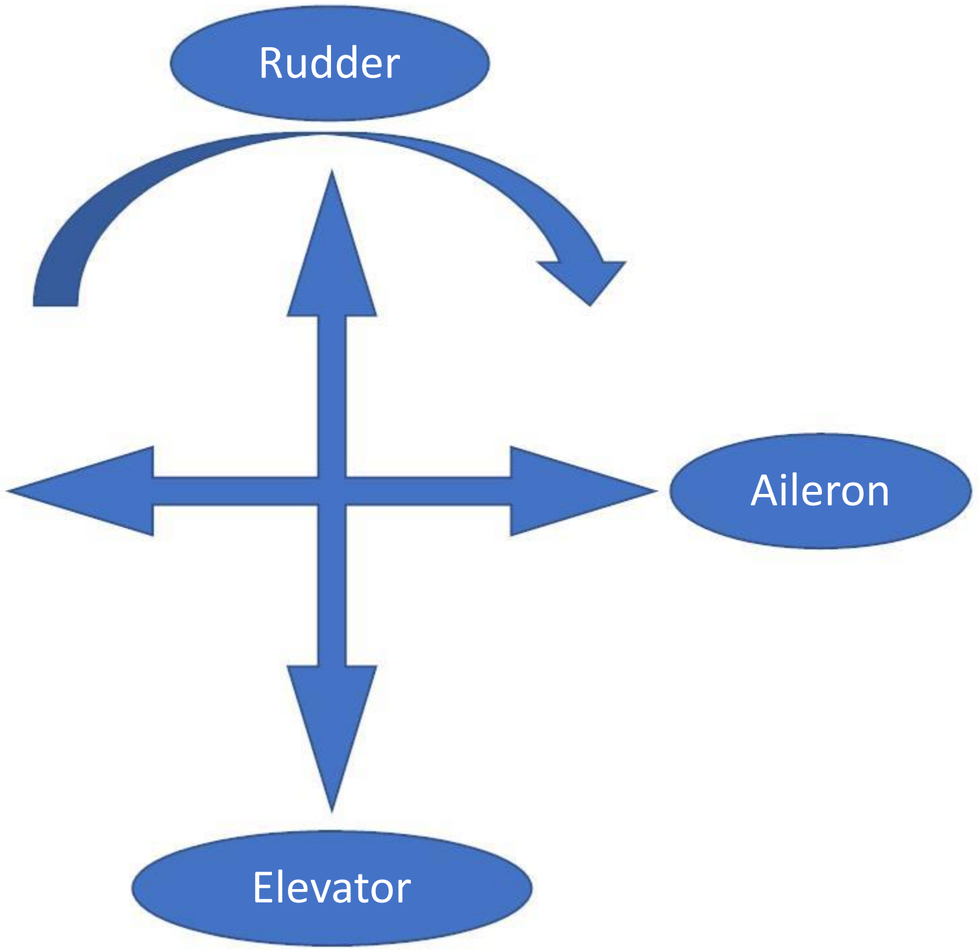


(UNO 328)

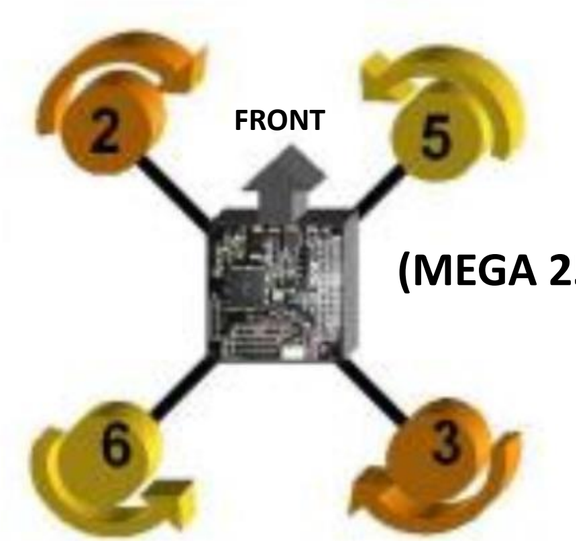
Motor [1]

Motor [2]

Motor [0]



Motor [3]



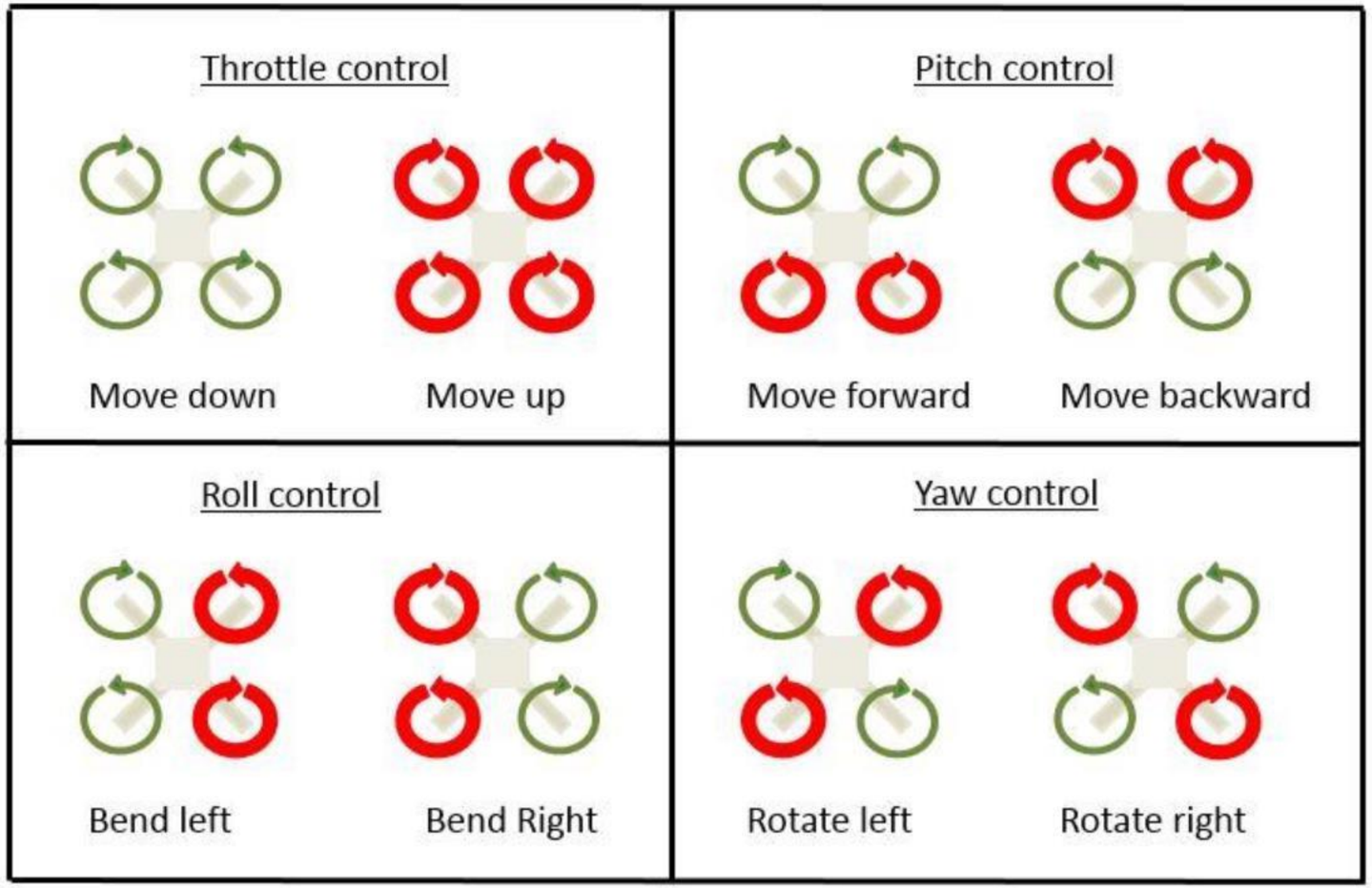
(MEGA 2560)

Motor [1]

Motor [2]

Motor [0]

MOTOR MIXING



IDLE THROTTLE

CONFIG.H

SynerduinoKwad3-GY801-InvertedMag-1.8.16-M9-10 - config.h | Arduino 1.8.18

File Edit Sketch Tools Help

SynerduinoKwad3-GY801-InvertedMag-1.8.16-M9-10 | Alarms.cpp | Alarms.h | EEPROM.cpp | EEPROM.h | GPS.cpp | GPS.h | IMU.cpp | IMU.h | LCD.cpp | LCD.h | MultiWii.cpp | MultiWii.h | Output.cpp | Output.h | Protocol.cpp | Protoco...

```
50    //#define AIRPLANE
51    //#define SINGLECOPTER
52    //#define DUALCOPTER
53    //#define HELI_120_CCPM
54    //#define HELI_90_DEG
55
56  /*****************************    Motor minthrottle    ******************************/
57    /* Set the minimum throttle command sent to the ESC (Electronic Speed Controller)
58       This is the minimum value that allow motors to run at a idle speed  */
59    //#define MINTHROTTLE 1300 // for Turnigy Plush ESCs 10A
60    //#define MINTHROTTLE 1120 // for Super Simple ESCs 10A
61    //#define MINTHROTTLE 1064 // special ESC (simonk)
62    //#define MINTHROTTLE 1050 // for brushed ESCs like ladybird
63    #define MINTHROTTLE 1150 // (*) (**)
64
65  /*****************************    Motor maxthrottle    ******************************/
66    /* this is the maximum value for the ESCs at full power, this value can be increased up to 2000 */
67    #define MAXTHROTTLE 1850
68
69  /*****************************    Mincommand          ******************************/
70    /* this is the value for the ESCs when they are not armed
71       in some cases, this value must be lowered down to 900 for some specific ESCs, otherwise they failed to initiate */
72    #define MINCOMMAND  1000
73
74  /*********************************  I2C speed for old WMP config (useless config for other sensors)  *************/
75    #define I2C_SPEED 100000L     //100kHz normal mode, this value must be used for a genuine WMP
76    //#define I2C_SPEED 400000L   //400kHz fast mode, it works only with some WMP clones
77
78  /*****************************    Internal i2c Pullups   ******************************/
79    /* enable internal I2C pull ups (in most cases it is better to use external pullups) */
80    //#define INTERNAL_I2C_PULLUPS
81
```

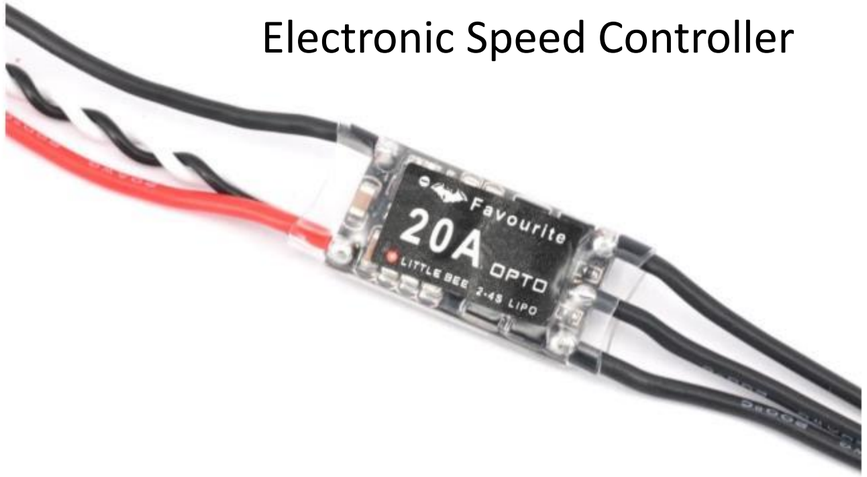
64 - 63

Arduino/Genuino Mega or Mega 2560, ATmega2560 (Mega 2560) on COM83

IDLE THROTTLE

CONFIG.H

Electronic Speed Controller



Brushless Motor

1500

Idle Speed

MINTHROTTLE 1150

PWM Frequency

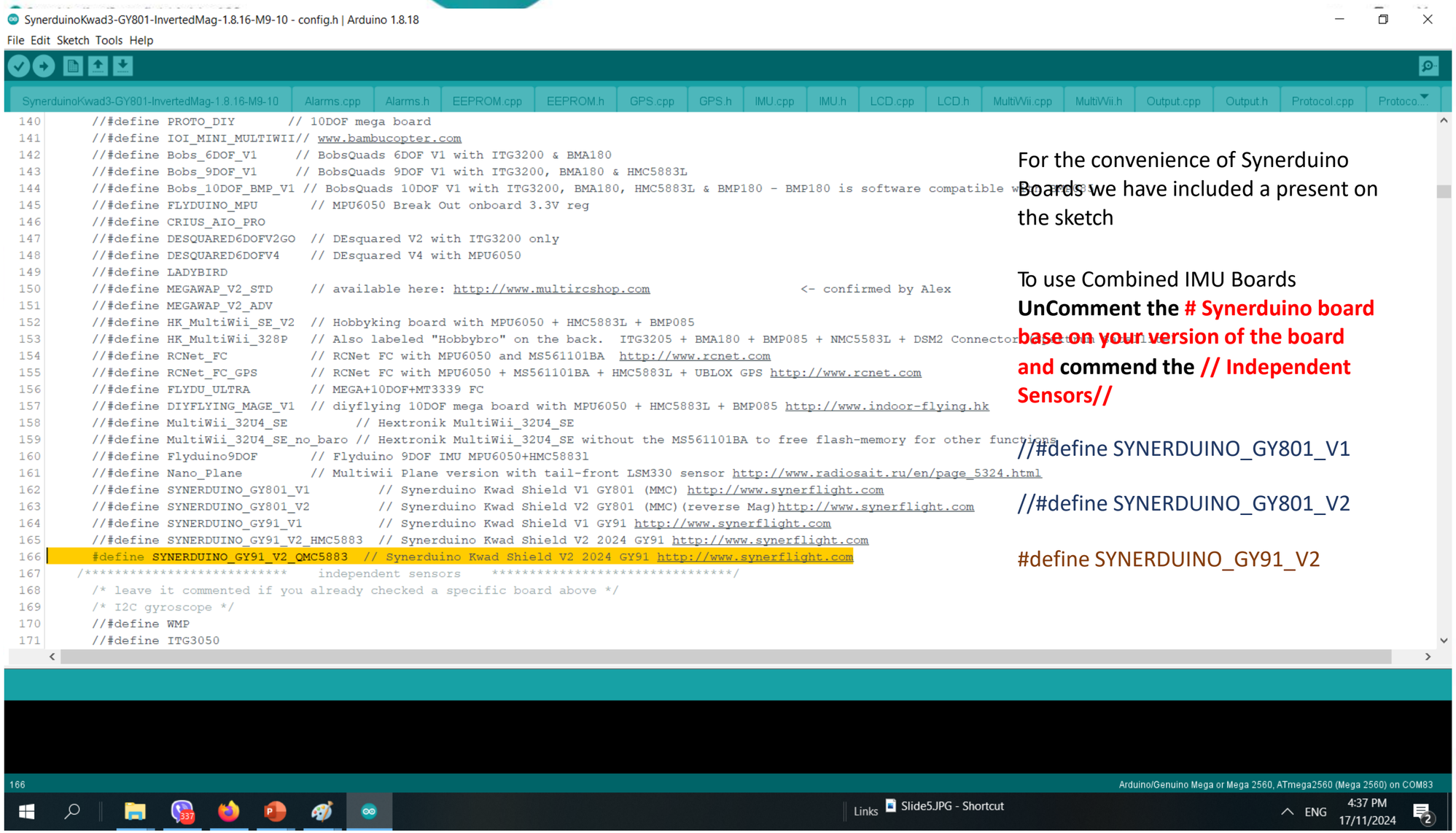
MAXTHROTTLE 1850

MINCOMMAND 800 - 1100

1900 – 2000

CONFIG.H

SELECTING THE SYNERDUINO BOARD



For the convenience of Synerduino Boards we have included a present on the sketch

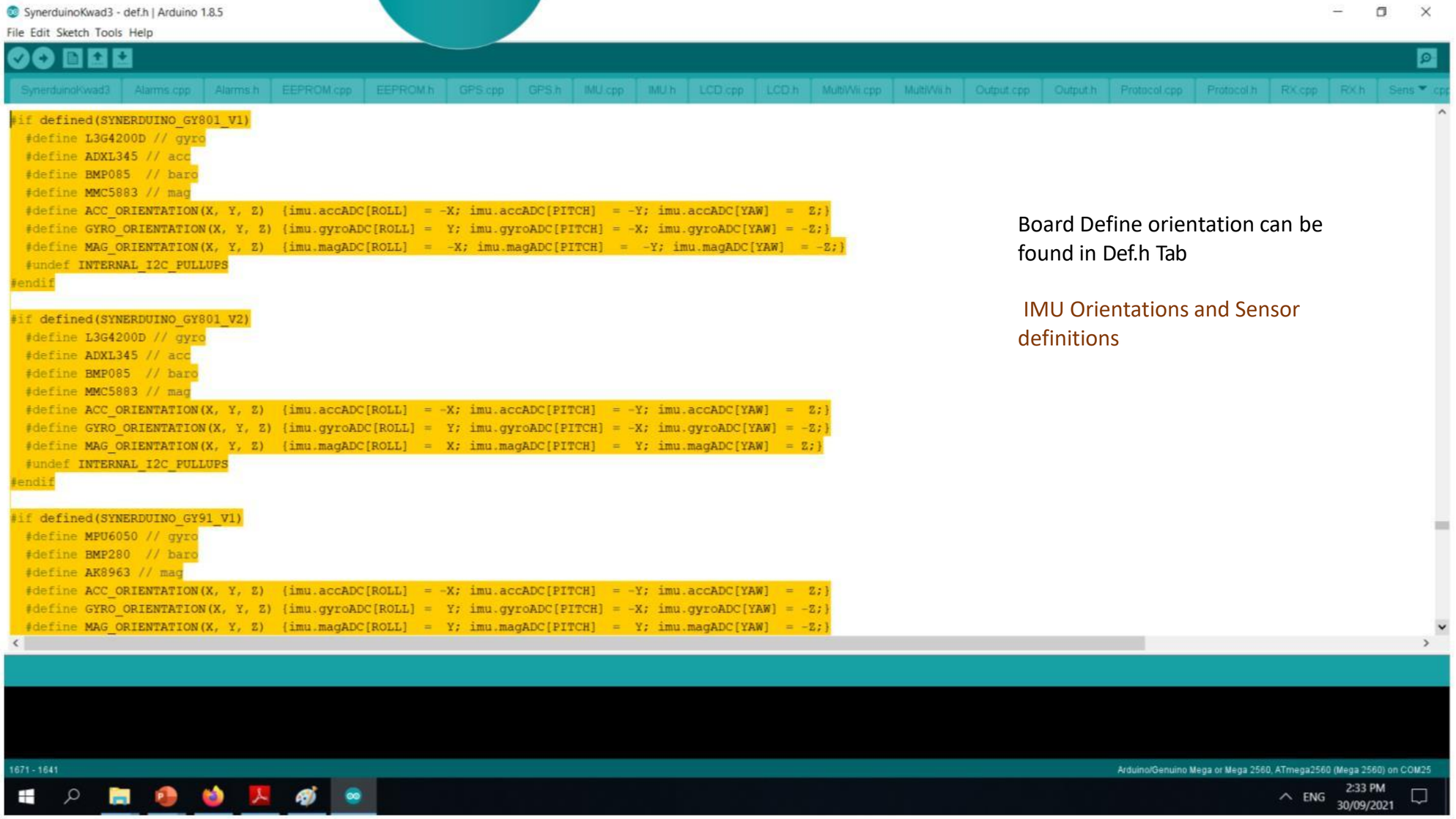
To use Combined IMU Boards **UnComment the # Synerduino board base on your version of the board and commend the // Independent Sensors//**

//#define SYNERDUINO_GY801_V1

//#define SYNERDUINO_GY801_V2

#define SYNERDUINO_GY91_V2

DEF.H



Board Define orientation can be found in Def.h Tab

IMU Orientations and Sensor definitions

SELECTING THE SENSORS

CONFIG.H

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

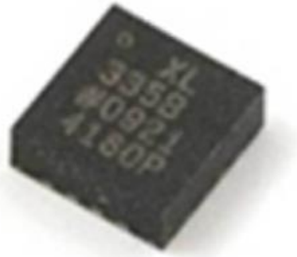
Magnetometer

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



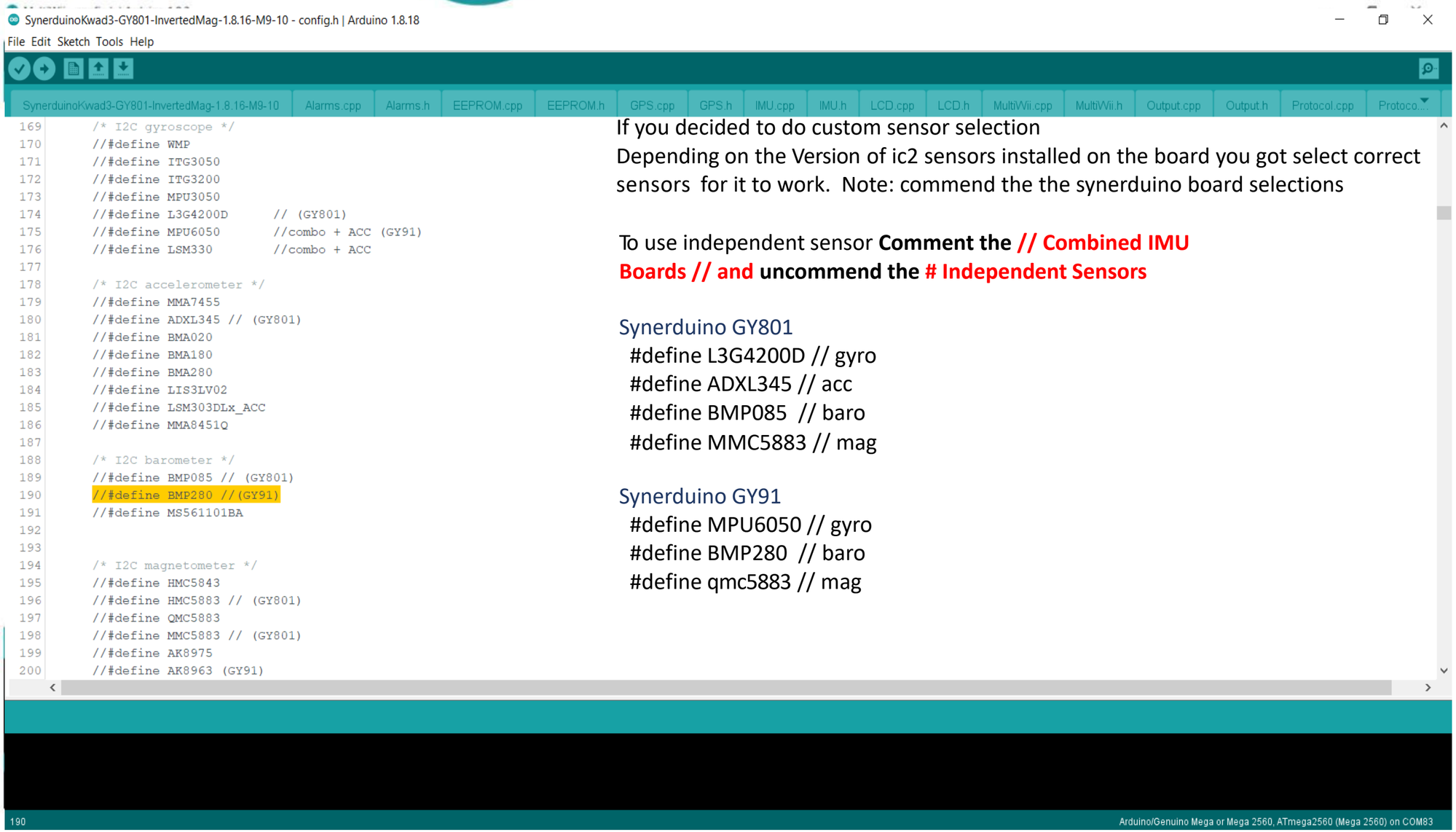
Gyroscope

Each sensor has a corresponding address registry set by manufacturer

You can find it on sensors.ccp tab

CONFIG.H

SELECTING THE SENSORS



If you decided to do custom sensor selection
Depending on the Version of ic2 sensors installed on the board you got select correct sensors for it to work. Note: commend the the synerduino board selections

To use independent sensor **Comment the // Combined IMU Boards // and uncommend the # Independent Sensors**

Synerduino GY801

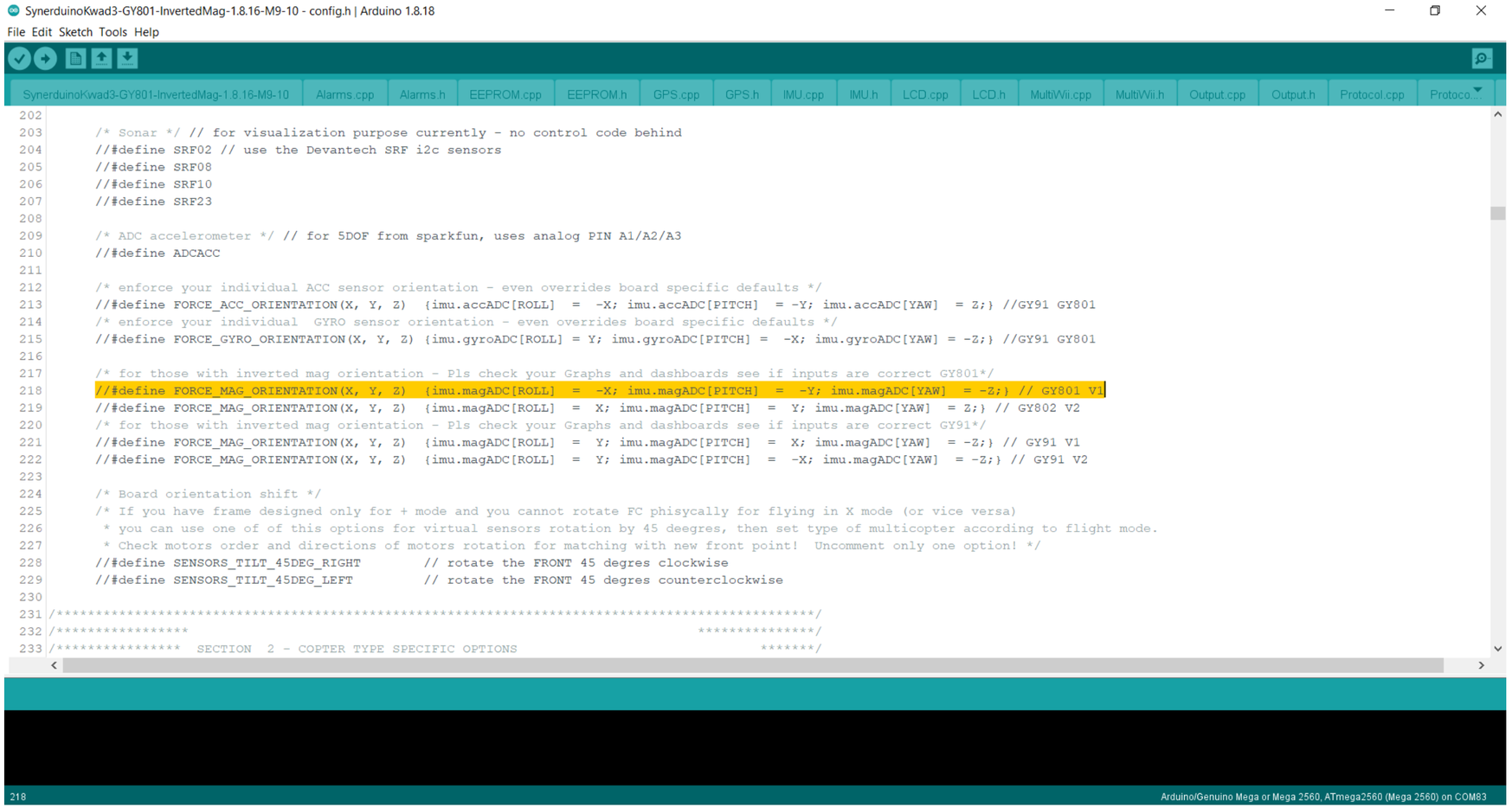
```
#define L3G4200D // gyro
#define ADXL345 // acc
#define BMP085  // baro
#define MMC5883 // mag
```

Synerduino GY91

```
#define MPU6050 // gyro
#define BMP280  // baro
#define qmc5883 // mag
```

SENSOR ORIENTATION

CONFIG.H



UNCOMMENTING THESE LINES FORCES THE ORIENTATION TO ENFORCE INDIVIDUAL SENSOR ORIENTATION MODE AND IGNORES THE DEFINE BOARDS ORIENTATION ON DEF.H

THIS IS USEFUL FOR SPECIFIC BOARD ALIGNMENT CHANGES OR A EXTERNAL SENSOR ADDON

SENSORS IMU ORIENTATION IS IMPORTANT SEE TO IT THE ACC GYRO AND MAG ALL COMPLIMENT EACH OTHER

RECEIVER TYPES PROTOCOL

CONFIG.H

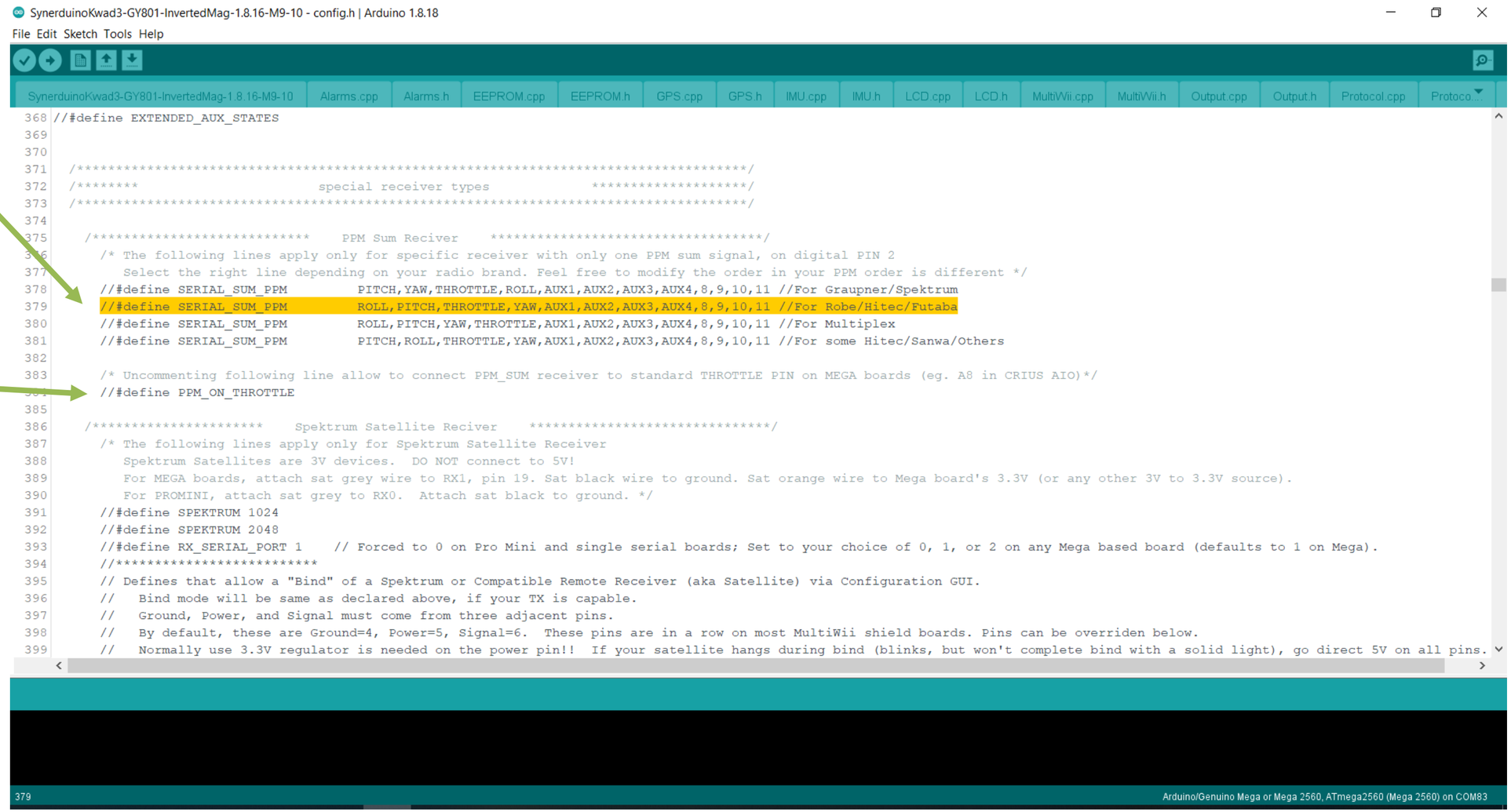
For PPM Receiver

Channel Mapping

Uncomment PPM on Throttle

Pin A8 for Mega
Pin D2 for Uno

You may need to uncomment and change the ordering of your channel depending on your Transmitter's model and specification



RECEIVER TYPES PROTOCOL

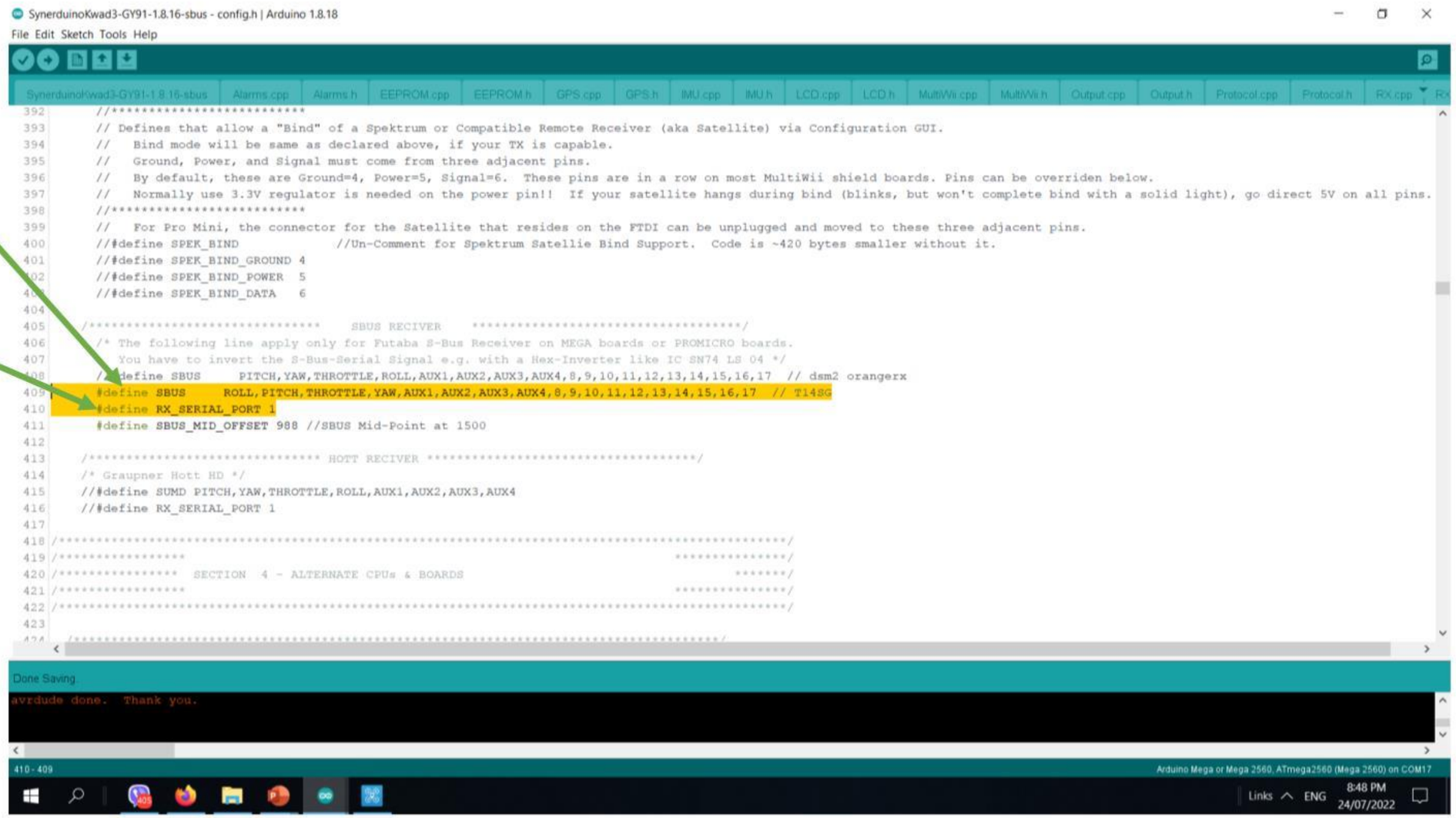
CONFIG.H

For SBUS Receiver

Channel Mapping

Uncomment SBUS on RX Serial Port 1 (Telemetry 1)

You may need to uncomment and change the ordering of your channel depending on your Transmitter's model and specification

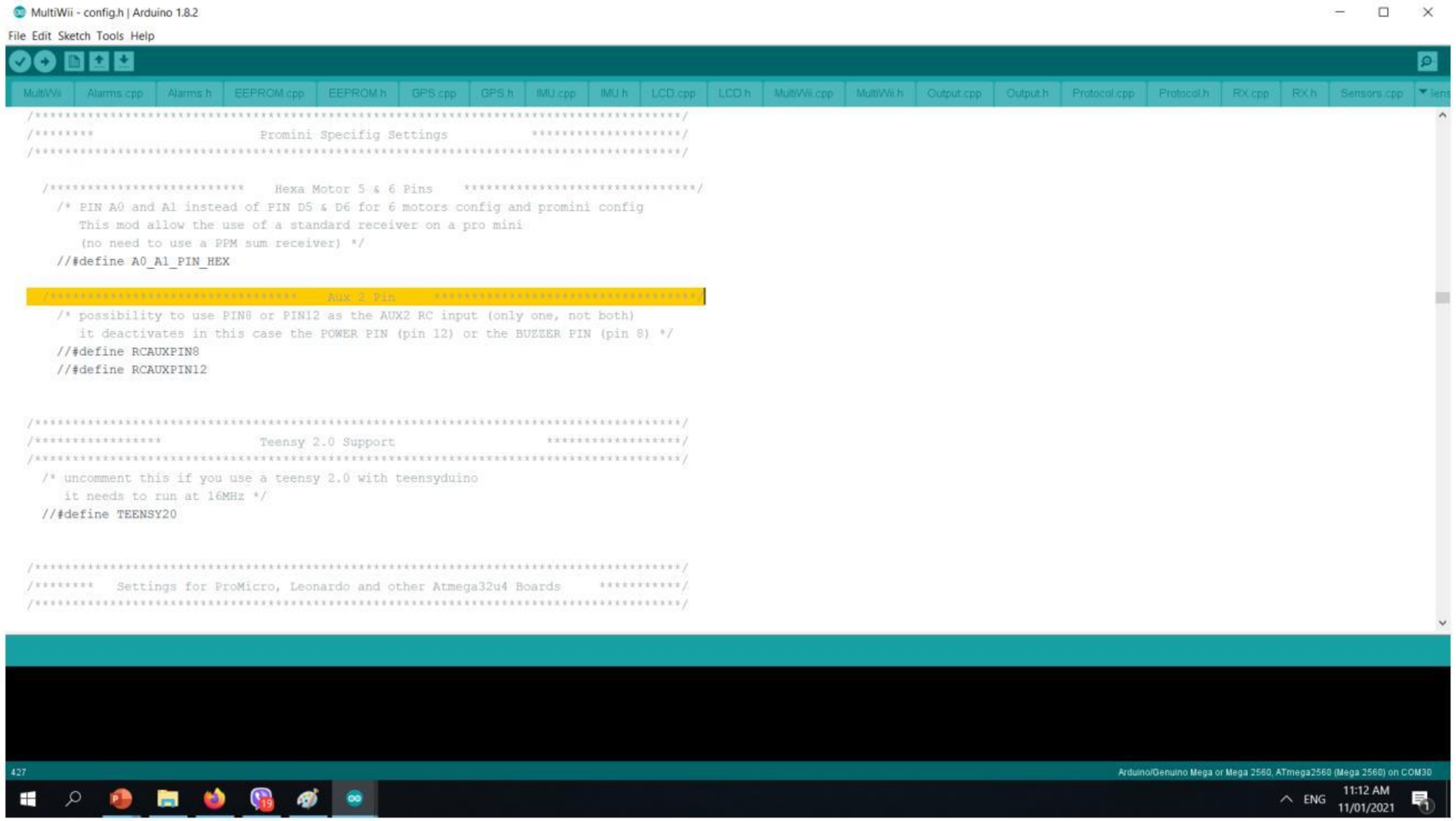


RECEIVER TYPES PROTOCOL

CONFIG.H

AUX PIN

For UNO you need to define your PPM Aux 2 Pin



TELEMETRY COM SPEED

CONFIG.H

SERIAL BAUD RATE

WILL DEPEND ON WHAT BAUD YOUR TELEMETRY MODULE ARE SET INTO YOU CAN CHANGE IT TO SUITE THE PORT YOUR DEVICE IS CONNECTED TO.

SERIAL 0 CAN BE USE FOR TELEMETRY GIVEN NOTHING IS CONNECTED TO THE USB AT THIS POINT. AND FIRMWARE MUST BE FLISH PRIOR TO HOOKING UP ANYTHING TO THIS PINS

SERIAL 1 , 3 IS RESERVE FOR TELEMETRY

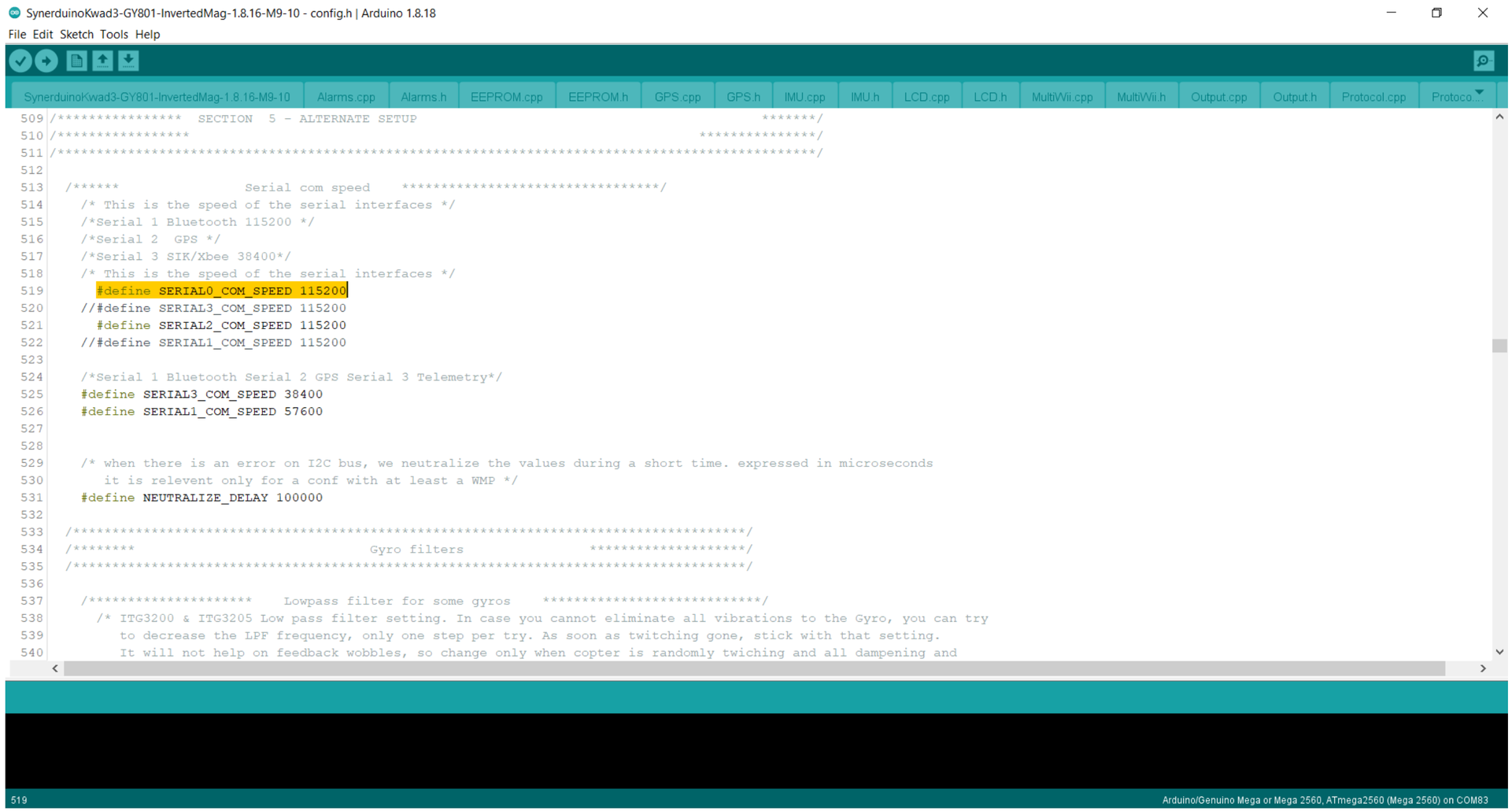
115200 FOR BLUETOOTH HC-05

38400 FOR XBEE RADIO

57600 for SIK RADIO

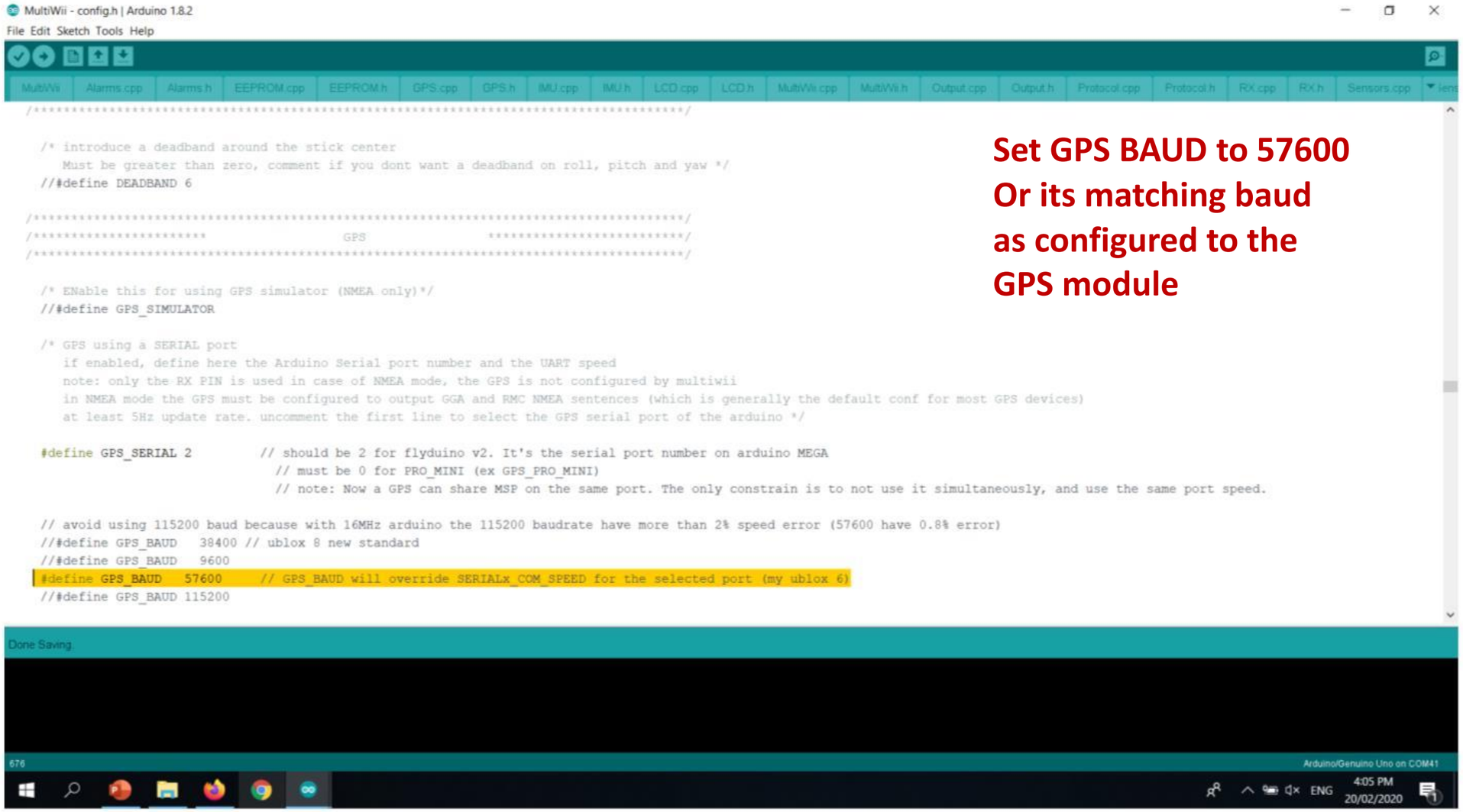
SERIAL 2 IS RESERVE FOR GPS

NMEA Baud 57600



GPS

CONFIG.H



Set GPS BAUD to 57600
Or its matching baud as configured to the GPS module

GPS

CONFIG.H

Depending on the GPS Version

Older formats uses NMEA protocol

Newer GPS uses UBLOX UBX Protocol

Support :

M6-M8 UBLOX

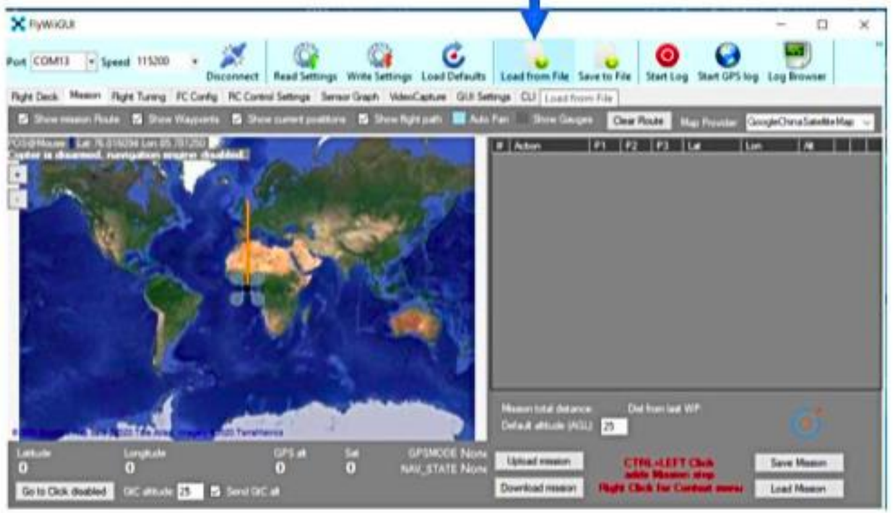
M8-M10 NMEA (Flash Required)

FLIGHT TUNING

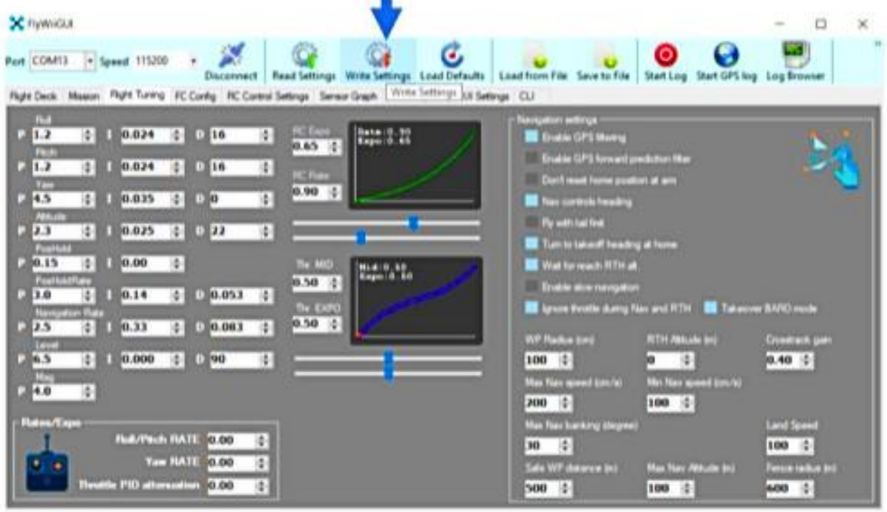
PID PARAMETERS

Download PID Parameters Preset Unzip and Load the PID file and Write settings after changes made in any of the parameters

Load the PID file



Write PID Parameter to drone



PID Parameters Preset*

PID 250mm v1.1 Slow Rate* Download

250mm v1.1 Kwad - slow rate PID.mws

FLIGHT TUNING AND PARAMETER ADJUSTMENTS

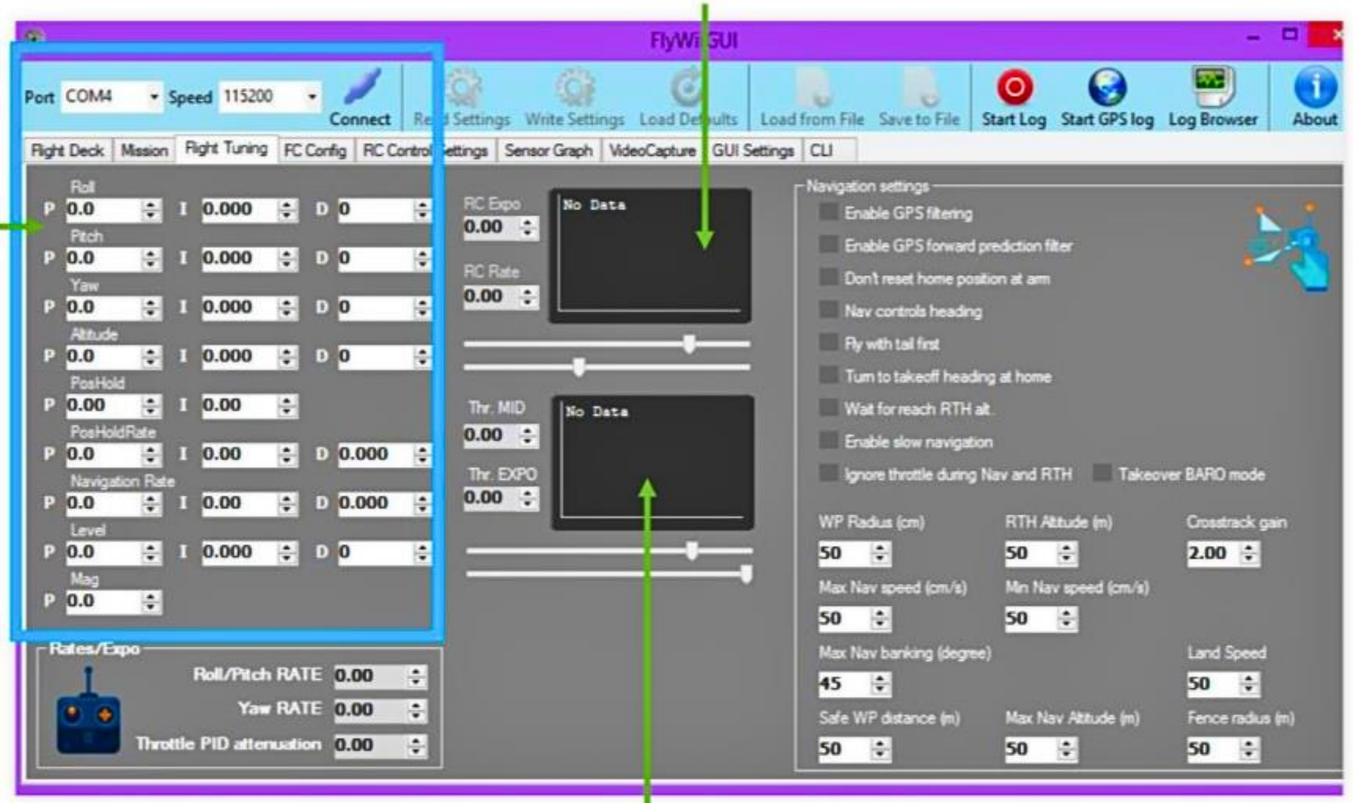
RC RADIO EXPO RATE CONTROL , THIS CONTROL HOW RESPONSIVE YOUR DRONE RESPOND TO YOUR STICK INPUT

FLIGHT TUNING FOR STABILITY AND CONTROL (PID)

PROPORTION

INTEGRAL

DERIVATIVE



THROTTLE CURVE EXPO THIS ALSO CONTROLS THE THROTTLE RESPONSIVENESS AND THE DEAD ZONE FOR ALTITUDE HOLD

Understanding PID and its relation to stability and Controls

Stability	Roll,Pitch,Yaw Gyro	PID : Level of your Gyro
Horizon / Level Mode	X,Y Accelerometer	PID : X ,Y Axis Level of your Accelerometer
Heading Lock	Compass/Mag	PID : heading of your magnetometer Calibration
Altitude Hold	Barometer / Z	PID : Barometer and Z accelerometer
Position Hold	GPS Pos	PID : sensitivity of GPS position reaction
Navigation Rate	GPS Nav	

Understanding impact of P, I and D

P : this is the amount of corrective force applied to return the MultiRotor back to its initial position

The amount of force is proportional to a combination of the the deviation from initial position minus any command to change direction from the controller input. A higher P value will create a stronger force to resist any attempts to change it's position. If the P value is too high, on the return to initial position, it will overshoot and then opposite force is needed to compensate. This creates an oscillating effect until stability is eventually reached or in severe cases becomes completely destabilised.

I : this is the time period for which the angular change is sampled and averaged

The amount of force applied to return to initial position is increased by the I factor the longer the deviation exists until a maximum force value is reached. A higher I will increase the angular hold capability.

D : this is the speed at which the MultiRotor is returned to its original position

Increasing value for D: Improves the speed at which deviations are recovered

With fast recovery speed comes a higher probability of overshooting and oscillations
Will also increase the effect of P

P – proportional

P provides a proportional amount of corrective force based upon the angle of error from desired position. The larger the deviation, the larger the corrective force.

A higher P value will create a stronger force to return to desired position. If the P value is too high, on the return to initial position, it will overshoot and then opposite force is needed to compensate. This creates an oscillating effect until stability is eventually reached or in severe cases, the overshoot becomes amplified and the multi-rotor becomes completely destabilised.

Increasing value for P :It will become more solid/stable until P is too high where it starts to oscillate and lose control. You will notice a very strong resistive force to any attempts to move the Multi-Rotor

Decreasing value for P: It will start to drift in control until P is too low when it becomes very unstable. Will be less resistive to any attempts to change orientation

Aerobatic flight: Requires a slightly higher P

Gentle smooth flight: Requires a slightly lower P

I – Integral

“I” gain provides a variable amount of corrective force based upon the angle of error from desired position.

The larger the deviation and / or the longer the deviation exists, the larger the corrective force. It is limited to prevent becoming excessively high.

A higher I will increase the heading hold capability

Increasing value for I: Increase the ability to hold overall position, reduce drift due to unbalanced frames etc

Decreasing value for I:Will improve reaction to changes, but increase drift and reduce ability to hold position

D- Divide / Derivative

This moderates the speed at which the Multi-Rotor is returned to its original position.

A lower D will mean the Multi-Rotor will snap back to its initial position very quickly

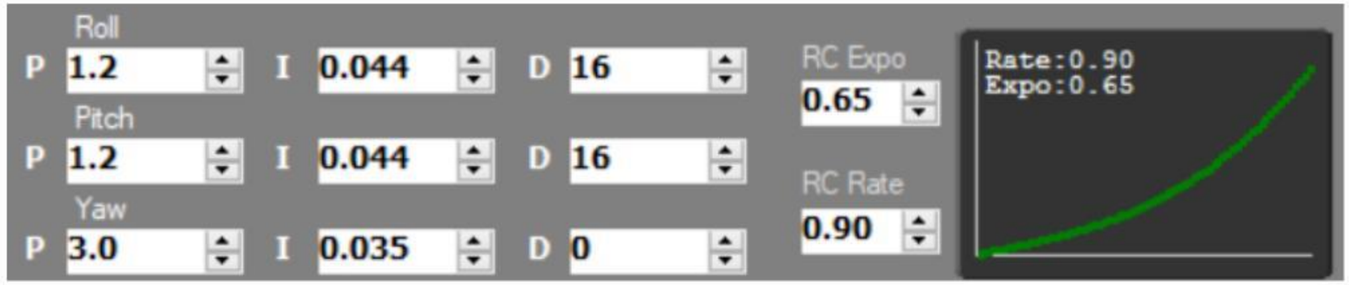
Increasing value for D: Dampens changes. Slower to react to fast changes

Decreasing value for D: Less dampening to changes. Reacts faster to changes

Aerobatic flight: Lower D

Gentle smooth flight: Increase D

Basic PID Tuning – on the ground



1 - Set PID to the designers default recommended settings.

2 - Hold the Multi-Rotor securely and safely in the air.

3 - Increase throttle to the hover point where it starts to feel light.

4 - Try to lean the Multi-Rotor down onto each motor axis. You should feel a reaction against your pressure for each axis.

5 - Change P until it is difficult to move against the reaction. Without stabilisation you will feel it allow you to move over a period of time. That is OK

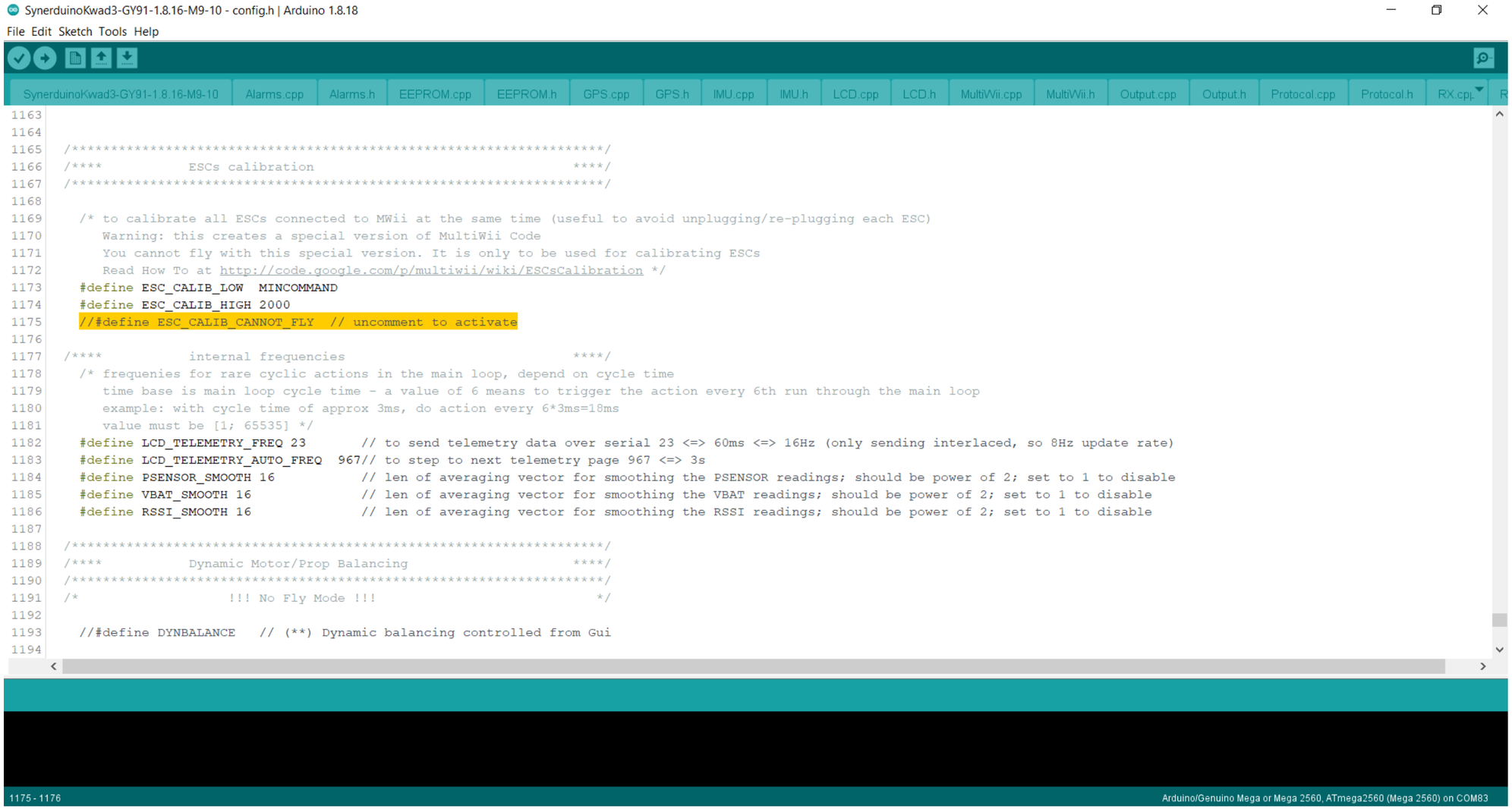
6 - Now try rocking the Multi-Rotor. Increase P until it starts to oscillate and then reduce a touch.

7 - Repeat for Yaw Axis. Your settings should now be suitable for flight tuning.

ESC CALIBRATION

To ensure a proper tune stable flight

All ESCs must be Calibrated

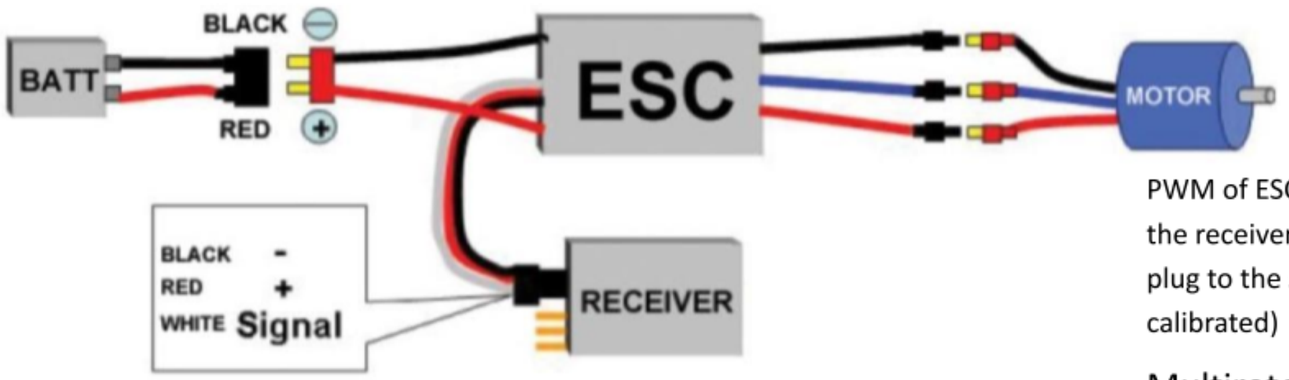


ESC CALIBRATION

STEP 1

XLoader Download

Electronic Speed Controller CALIBRATION



Propellers are removed during this process

PWM of ESC is directly hook up to the receiver Throttle pin . Ensure the receiver is getting power thru the Aux PWM pin which remains plug to the synerduino board (process is repeated till all ESCs are calibrated)

Multirotors must have all ESCs calibrated similarly to ensure reliable operations

Motor must be plug in at this point w/o the propeller. As it will serve several purpose

- An Speaker to listen to calibration tone of the ESC
- Identify motor rotation should it needs to be corrected
- Test full speed range

ESC calibration will vary based on what brand of ESC you are using, so always refer to the documentation for the brand of ESC you are using for specific information (such as tones). “All at once” calibration works well for most ESCs, so it is good idea to attempt it first and if that fails try the “Manual ESC-by-ESC” method.

If your ESC happens to be an OPTO. The Synerduino board can provide as power supply for both RC Receiver and ESCs when soldered in . Get the PWM Pin of the ESC you want to calibrate and plug it into the Throttle Channel of your Receiver

STEP 2

Synerduino Multiwii ESC calibration method , for All ESC at Once

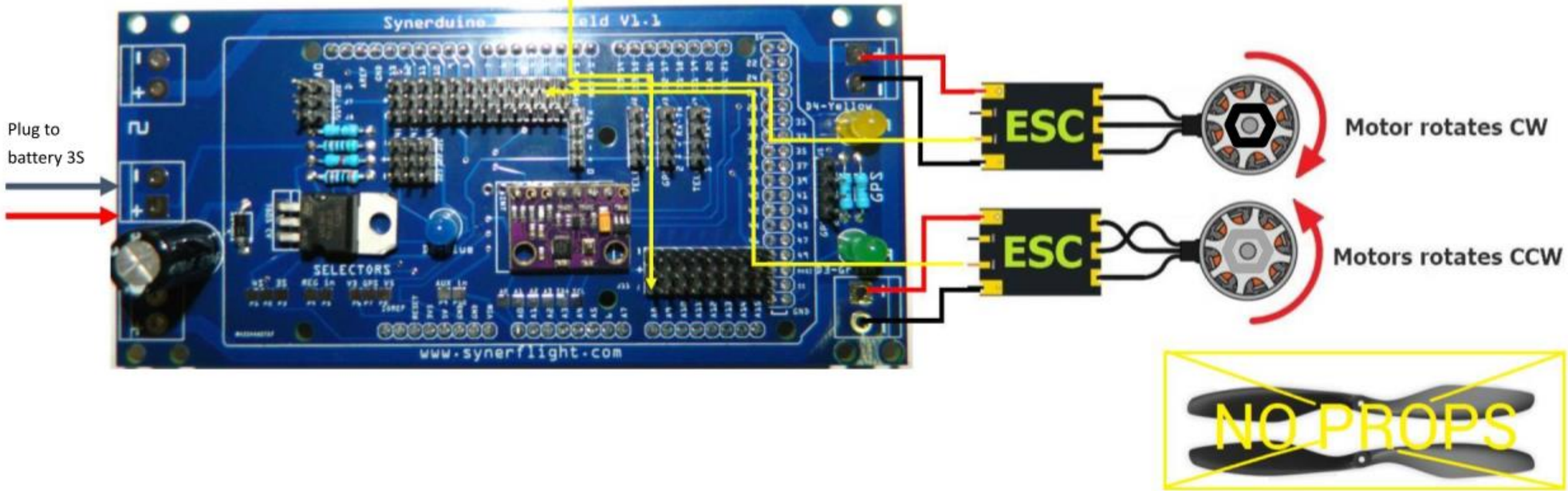
Throttle Pin is Connected to the Throttle Channel of the Receiver

All other Channels as is

to calibrate all ESCs connected to MWii at the same time (useful to avoid unplugging/re-plugging each ESC)

Warning: this creates a special version of MultiWii Code
You cannot fly with this special version. It is only to be used for calibrating ESCs

This is applicable to those who have PPM and SBUS Receivers

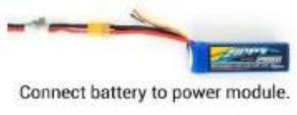


ESC CALIBRATION

CONFIG.H

STEP 3

- Remove props or tie the copter down.
- Plug in USB.
- Uncomment #define ESC_CALIB_CANNOT_FLY // uncomment to activate
- Flash firmware to Synerduino
- Disconnect the USB.
- Plug in the battery. The copter will not fly and will use ESC Tone/LEDs to indicate finished calibration (after approx. 5-10 seconds).
- Disconnect the battery.
- Plug in USB and Comment #define ESC_CALIB_CANNOT_FLY // uncomment to activate
- Or flash the appropriate drone firmware
- You can test carefully with your ESCs calibrated.



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

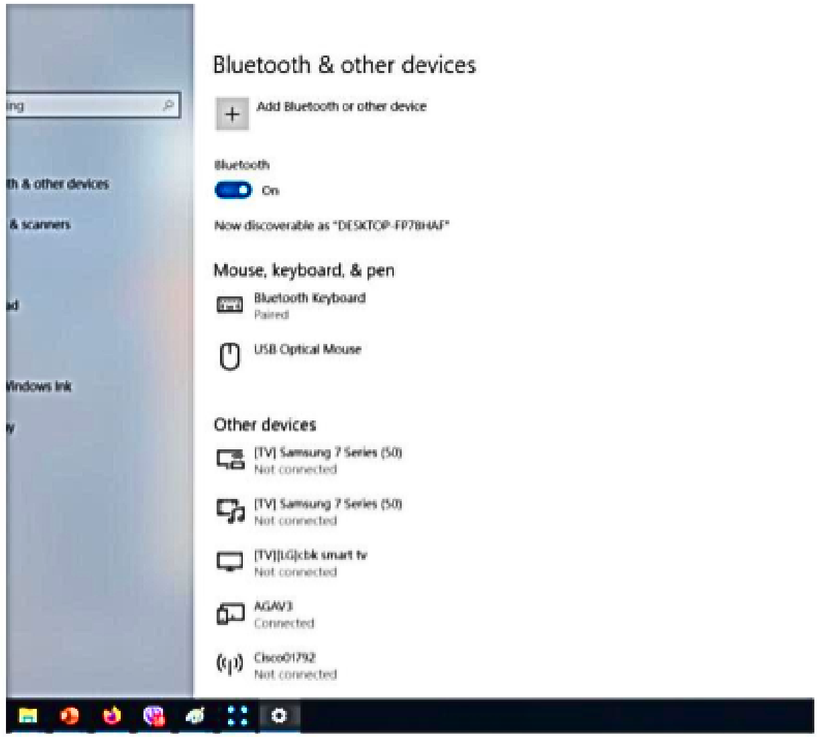
FlwiiGUI Ground Station Software .EXE*

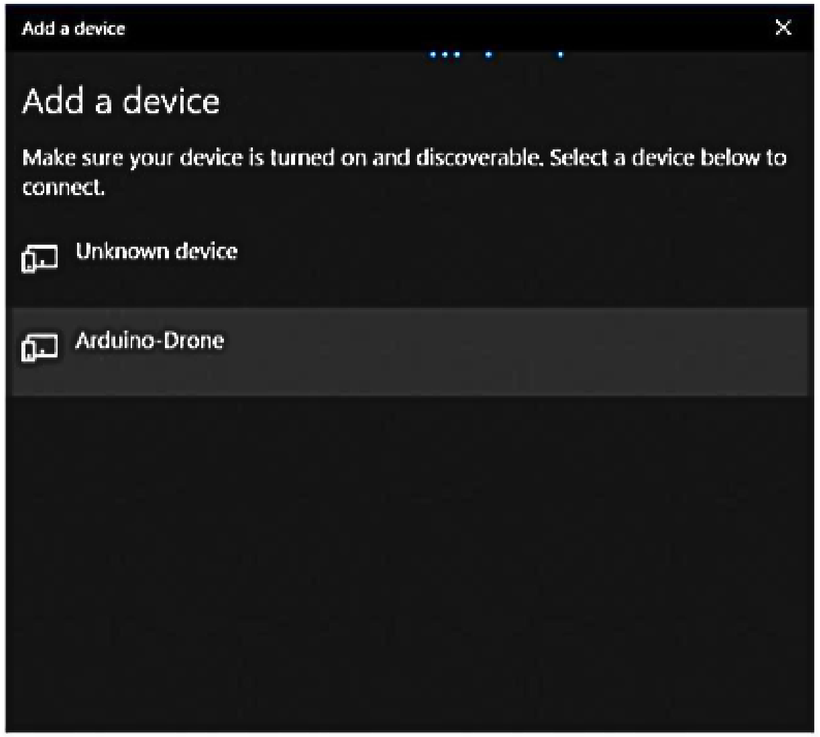
FlyWiiGUI20 Download

FLYWIIGUI INSTALLATION

STEP

2



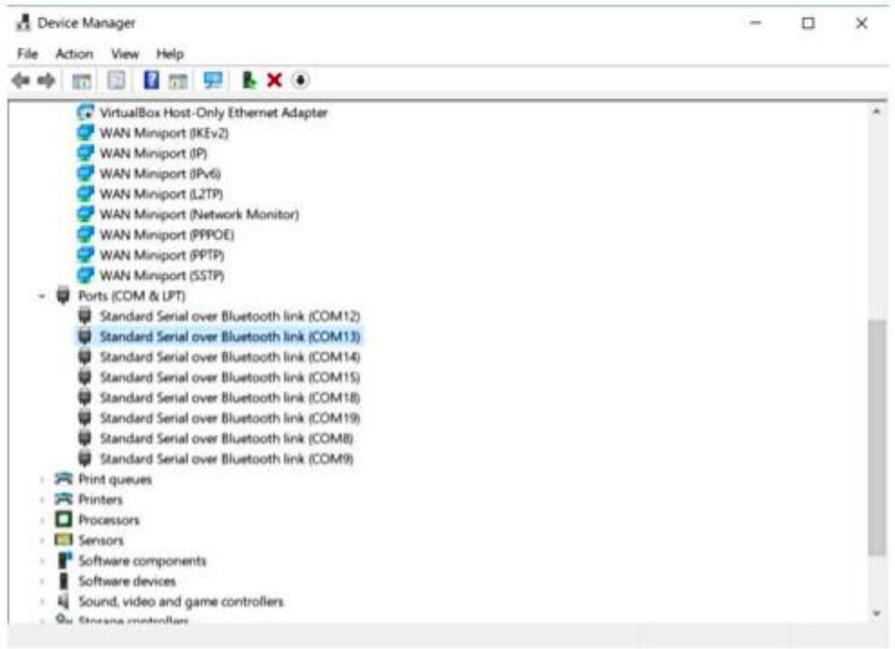


Adding Bluetooth on Windows Device Manager look for Arduino-Drone BT device

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

FLYWIIGUI INSTALLATION

3



In Device Manager Located in COM & LPT

FLYWIIGUI INSTALLATION

STEP

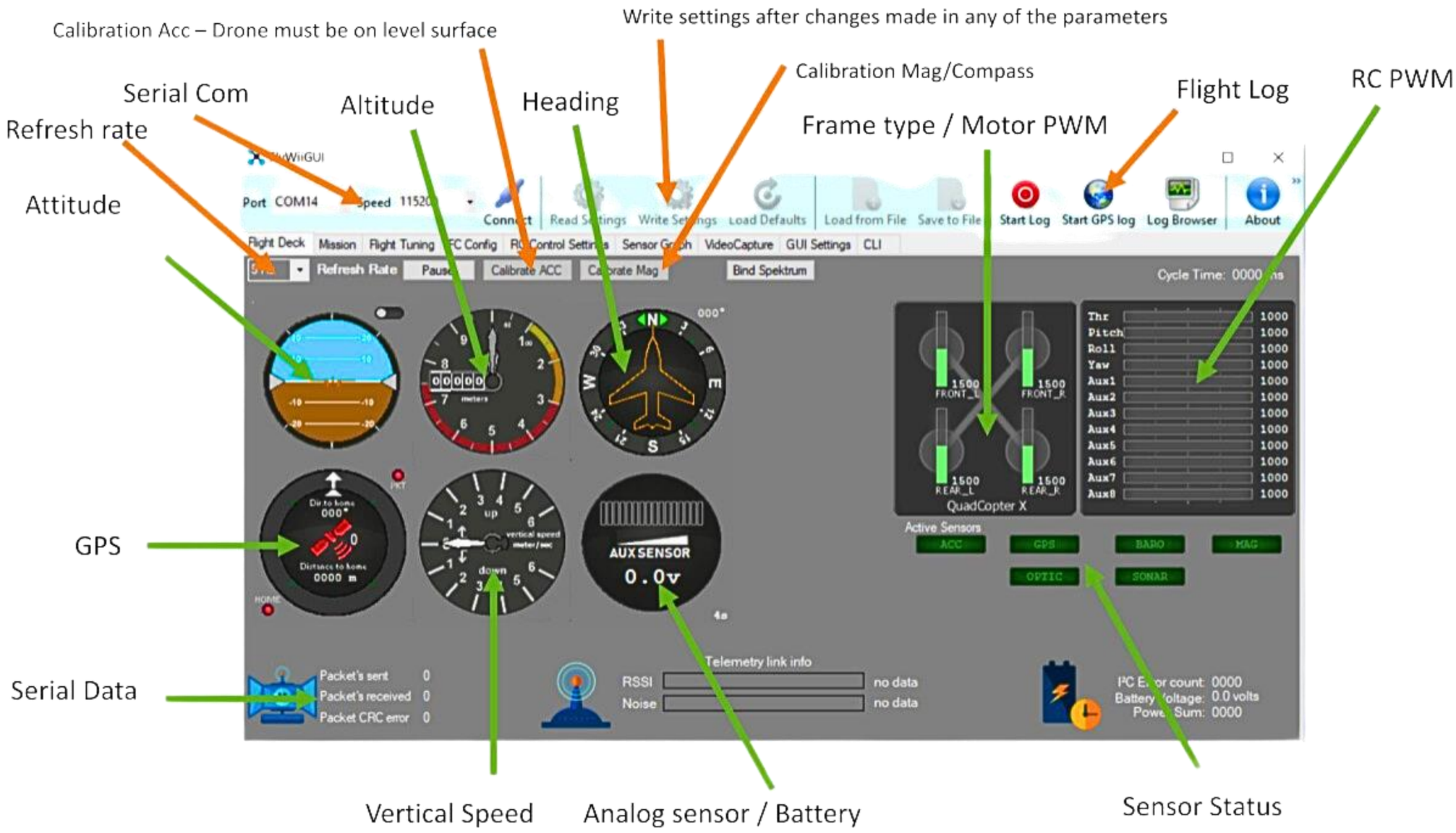
4

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

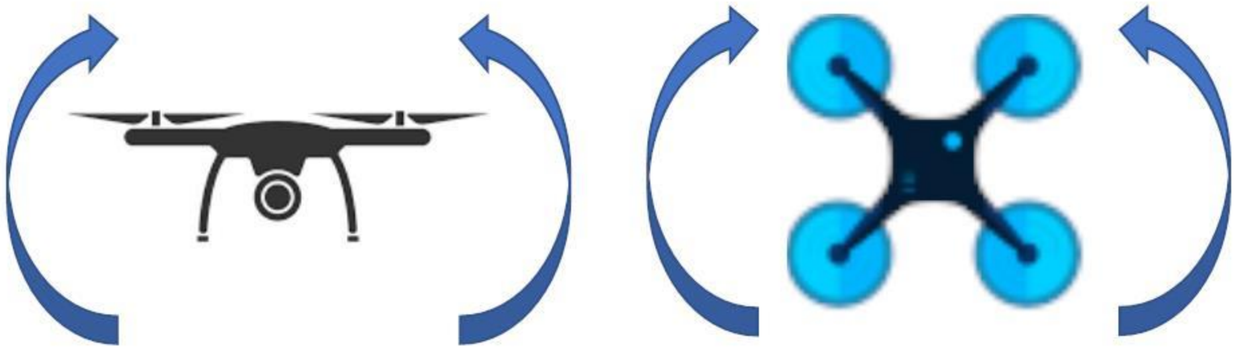


You will have to accept a compromise of optimal settings for stable hover and your typical mode of flying.

Obviously factor it towards your most common style.

Other factors affecting PID Taking known good PID values from an identical configuration will get you close, but bear in mind no two Multi-Rotors will have the same flying characteristics and the following items will have an impact on actual PID values:

1 - Frame weight /size / material / stiffness
2 - Motors - power / torque /momentum
3 - Position - Motor-->motor distance (I.E. frame size)
4 -ESC / TX - power curves
5 - Prop - diameter / pitch / material
6 - BALANCING
7 - Pilot skills



Advanced Tuning - practical implementation

For Aerobatic flying: Increase value for P until oscillations start, then back of slightly

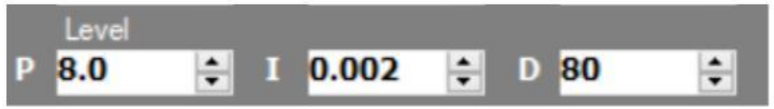
Change value for I until wobble is unacceptable, then decrease slightly

Decrease value for D until recovery from dramatic control changes results in unacceptable recovery oscillations, then increase D slightly Repeat above steps

For stable flying (RC): Increase value for P until oscillations start, then back of quite a bit

Decrease value for I until it feels too loose /unstable then increase slightly
Increase value for D

PID : Level

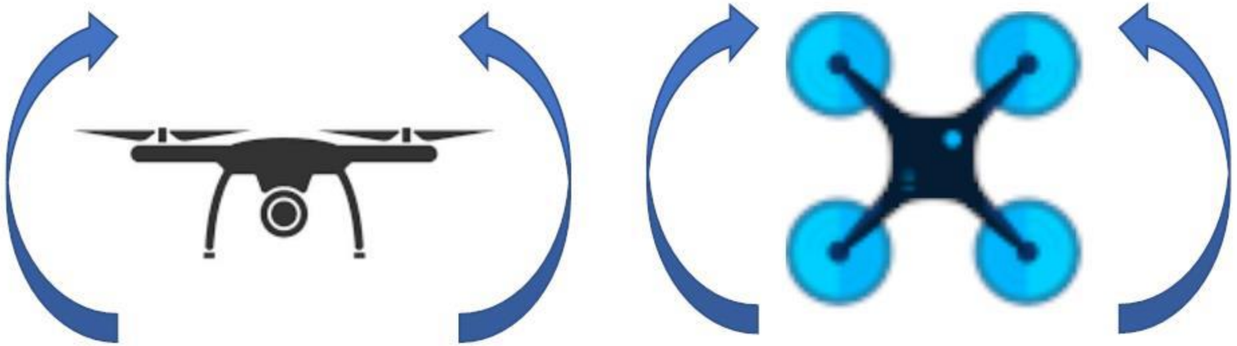


This will influence the flight characteristic with an accelerometer : this is Level Mode

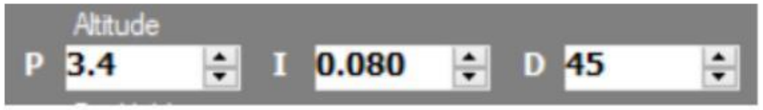
P is the dominant part of autolevel mode.
I will tell how much force must be applied when the mesured angle error persit
D is used to clamp the maximum correction for autolevel mode

Increase value for P will make the autolevel mode stronger

For smooth operation the sum of P axis + P level should stay near the default value : if you decrease P for Roll and Pitch axis you can increase P Level



ALT Hold



The Barometer sensor is used to detect the altitude of your multirotor aircraft and is used for altitude hold mode. As the barometer sensor is not very precise and is quite noisy, detection of small up and down movements is impossible.

So small up and down movements are detected by the accelerometer Z axis.
Combination of these two sensors gives good altitude hold.
PID settings for ALT works like this:

P - Is how much the multirotor should rely on the barometer sensor. The higher the value is the stronger the multirotor relies on the Barometer reading.

I - Is used to compensate for drift caused by battery voltage drop during the flight. The higher the value is more the multirotor will react to voltage drops (or other varying factors over time).

D - Is how strong the multirotor should react to data from the accelerometer Z axis. It is used to react to small up and down movements that the barometer cannot accurately sense. The higher the value is the stronger the multirotor will react to small altitude changes.

1. So set the P and I to 0

2. Start to play with D value only. To high D may cause yoyo effect (up and down oscillations). With to low D copter will be not able to react strong/fast enough to hold altitude. Your goal here is to set D to the value when copter don';t oscillate up and down and also holds altitude quite well for a not very long period of time. Copter will not hold altitude perfectly at this point during long periods. It will slowly drift up or down, but altitude should be quite stable in short periods.

3. Start to increase P to the point where copter holds altitude over long time period. If the value is to small the copter will drift slowly up and down. If the value is to high yoyo effect may appear. Goal here is to set it to the point where copter holds altitude for quite some time. Copter will still go slowly down due to battery voltage drop over time.

4. "I" is used to compensate the voltage drop. So start to increase the "I" value slowly until you get a perfect position hold during a very long time.
Now your altitude hold should be good enough.

For Mega 2560 + GPS Pos Rate PID controller & Pos Rate PID Tuning

Pos Rate PID controller
Pos Rate PID Tuning

The Pos Rate PID controller takes the commanded speed output from the Pos PI controller and commands an attitude in order to maintain the position hold location. This PID controller should be tuned before adjusting the Pos PI controller.

The Pos Rate PID settings control how the attitude of the multirotor is changed in order to move towards the desired hold location.

The speed of movement is controlled by the Pos PI controller, while the attitude of the multirotor is controlled by Pos Rate.

When the multirotor is within the defined distance of the hold location or waypoint (set by GPS_WP_RADIUS in config.h) the Pos Rate PID is used, when further away from the location the Nav Rate PID is used to return to within the defined waypoint radius.

For Mega 2560 + GPS Pos Rate PID controller & Pos Rate PID Tuning

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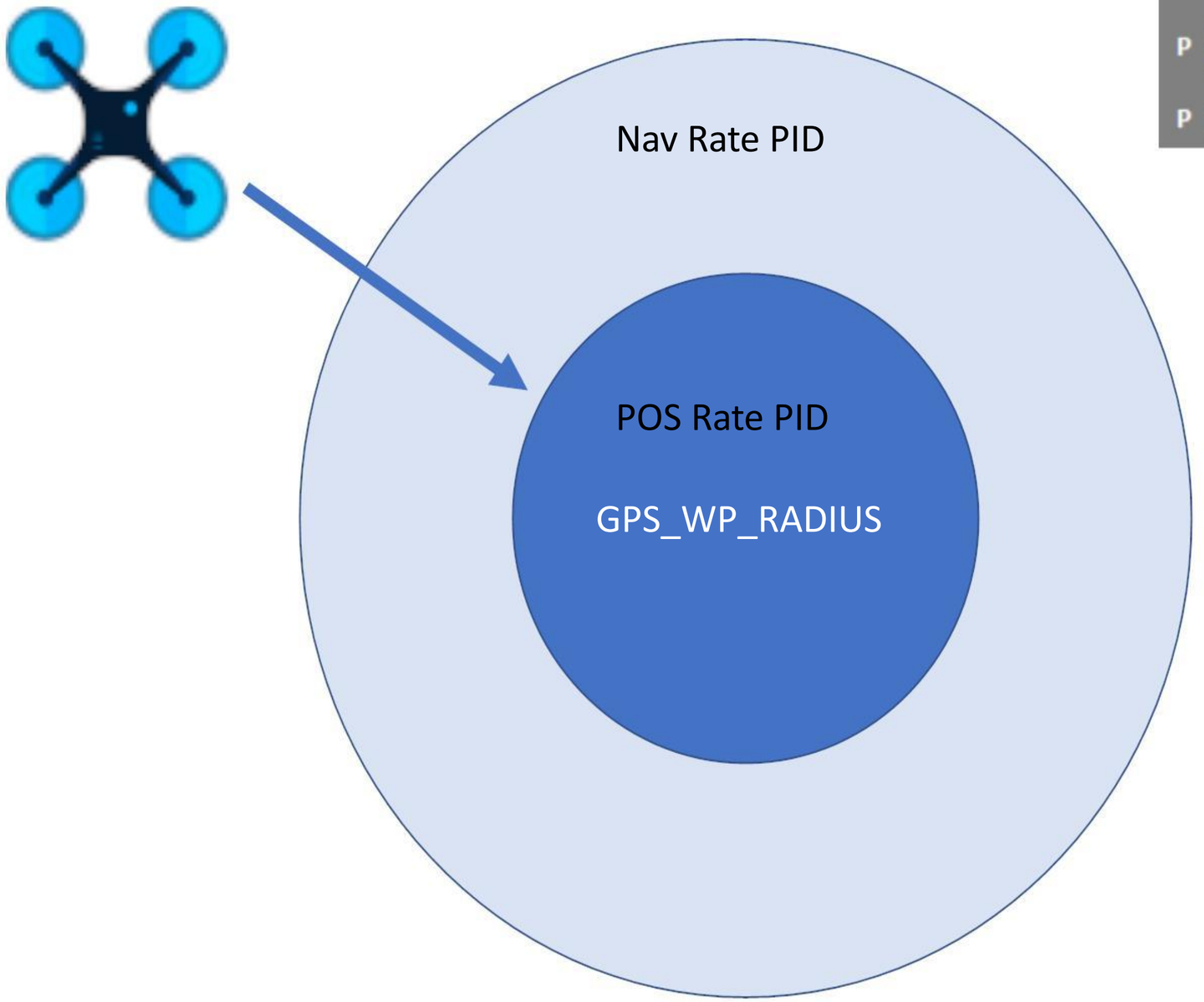
The speed of movement is controlled by the Pos PI controller, while the attitude of the multirotor is controlled by Pos Rate.

When the multirotor is within the defined distance of the hold location or waypoint (set by GPS_WP_RADIUS in config.h) the Pos Rate PID is used, when further away from the location the Nav Rate PID is used to return to within the defined waypoint radius.

To tune the Pos Rate PID, initially set P, I and D values to 0.
Gradually increase P until the multirotor begins to position hold with some drift.
Gradually increase D until the multirotor responds more quickly to undesired changes in attitude caused by the wind. If this value is set too high you will see oscillations or sudden jerking in pitch and roll motion.
If needed, gradually increase I value to allow the PID controller to compensate for long lasting error, ie if it is being blown by the wind.



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

To tune the Pos Rate PID, initially set P, I and D values to 0.

Gradually increase P until the multirotor begins to position hold with some drift.

Gradually increase D until the multirotor responds more quickly to undesired changes in attitude caused by the wind. If this value is set too high you will see oscillations or sudden jerking in pitch and roll motion.

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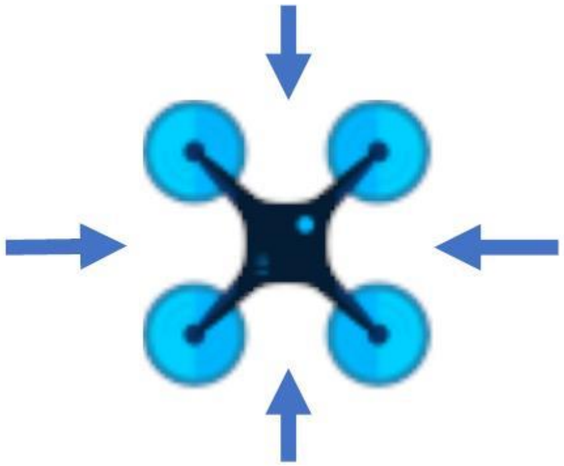


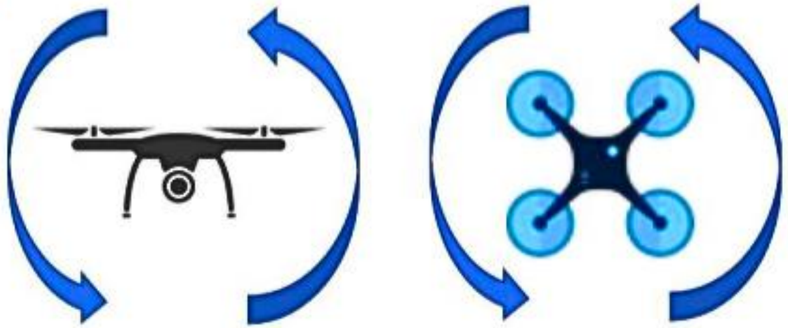
FLIGHT TUNING AND PARAMETER ADJUSTMENTS

On Flight Deck Tab calibrate your drone

Refresh Rate . Telemetry update speed

Acc Calibration . Set the drone down on a level surface . Away from any metal objects for 30 secs.

Mag Calibration . Move the drone 360 degrees in all axis within 1 min. while the blue Led flashes



These Calibration must be perform after Parameter updates after Flashing the firmware

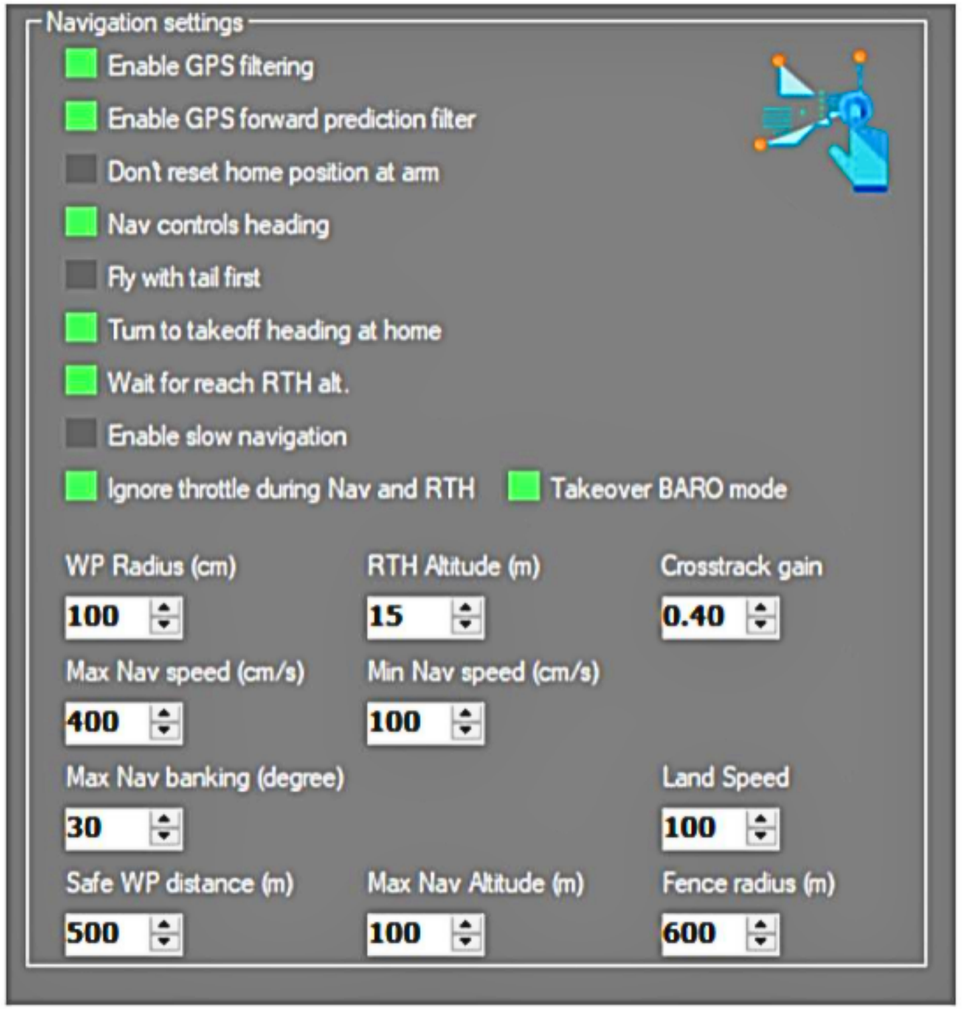
FLIGHT TUNING AND PARAMETER ADJUSTMENTS

Graphs and Data Logging

Check the Graphs to ensure each sensors are correctly oriented properly

FLIGHT TUNING AND PARAMETER ADJUSTMENTS

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 drone 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 – Altitude the drone will climb to when its below the altitude in relation to its home point when the RTH is trigger set this to 0 to RTH at current altitude

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)

Max Nav Altitude – Max altitude the drone is cap to fly at

Land Speed – speed of descending for Landing cm/s

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

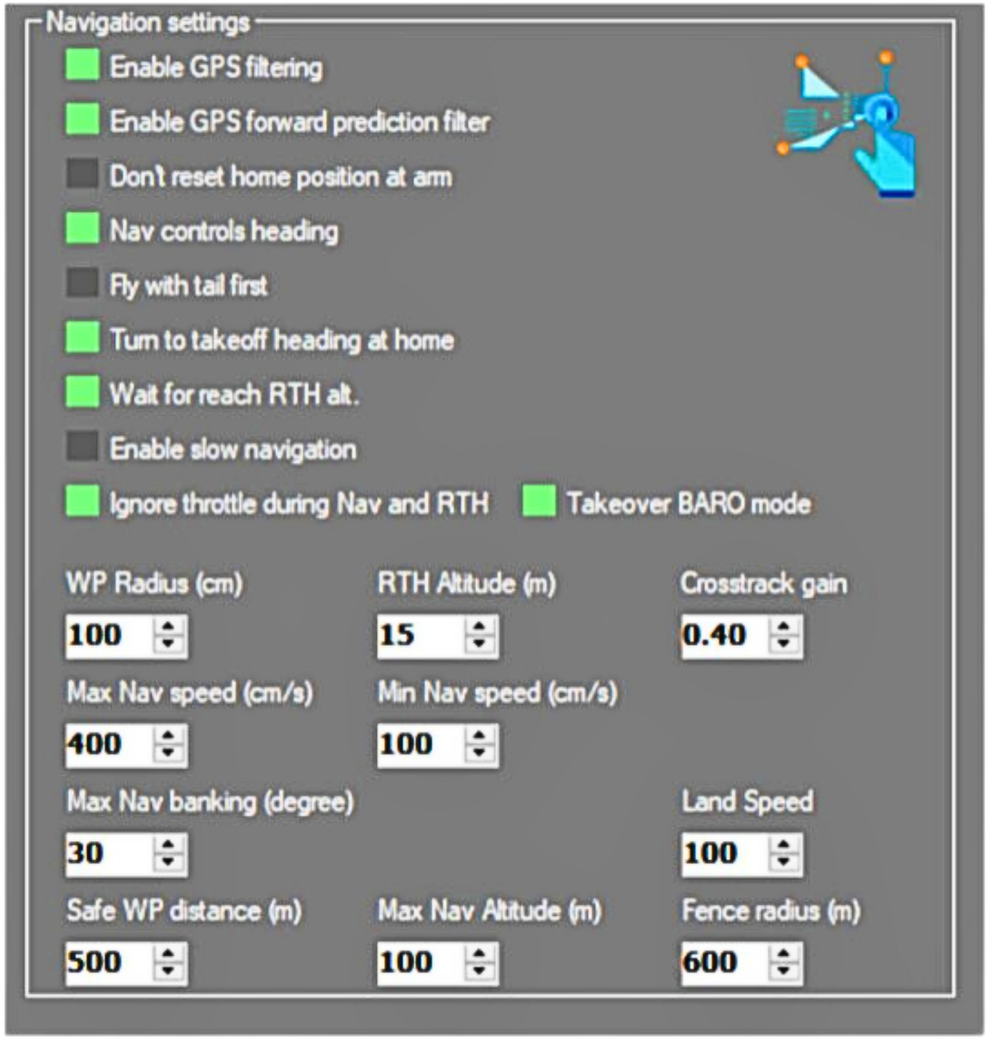
Fence Radius – Geo Fence to keep the drone with in the perimeter in relation to home position

CrossTrack gain - this tune the GPS and Nav sensitivity

GPS Filtering – use to enhance GPS accuracy

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

FLIGHT TUNING AND PARAMETER ADJUSTMENTS



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

Nav Controls Heading – this points the drone to its next waypoint

Fly tail first – makes the drone fly reverse (don't use unless it 's a camera pull out shot)

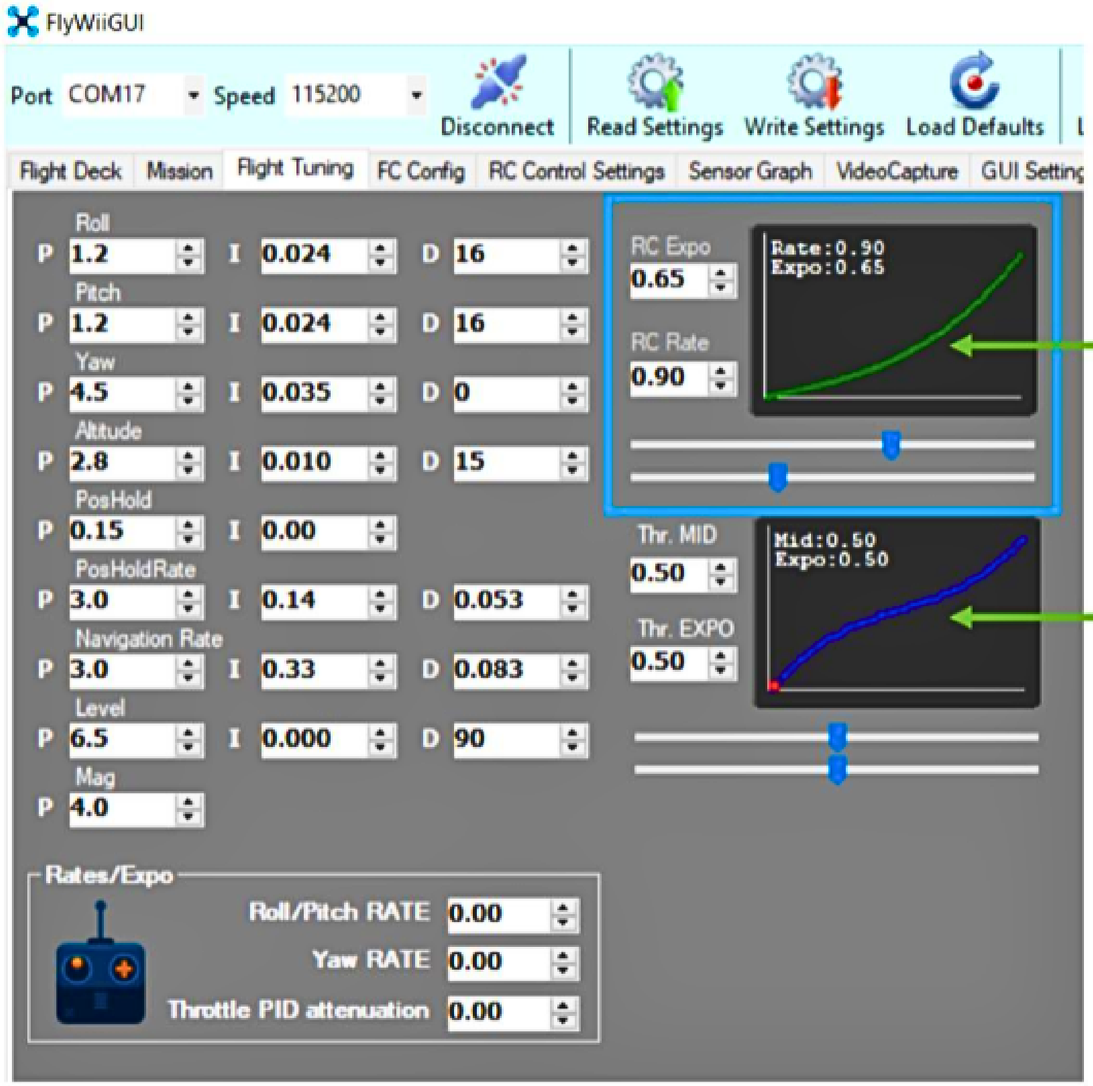
Turn take off heading at Home – when drone arrives at home position it orientates to its heading right after arming

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

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

Ignore throttle and Take over Baro – as the name suggest disable throttle stick command from the controller when the drone is on mission mode

FLIGHT TUNING AND PARAMETER ADJUSTMENTS



RC RADIO EXPO RATE CONTROL , THIS CONTROL HOW RESPONSIVE YOUR DRONE RESPOND TO YOUR STICK INPUT

HIGHER NUMBER MEANS MORE RESPONSIVENESS THE DRONE TO STICK INPUTS

FOR BEGINNERS WE RECOMMEND RC RATE AT .50-.60 THIS OFFER A MORE SLUGGISH RESPONDS OF THE DRONE AND NOT ADVICE ABLE FOR STRONG WINDS CONDITION

THROTTLE CURVE EXPO THIS ALSO CONTROLS THE THROTTLE RESPONSIVENESS AND THE DEAD ZONE FOR ALTITUDE HOLD

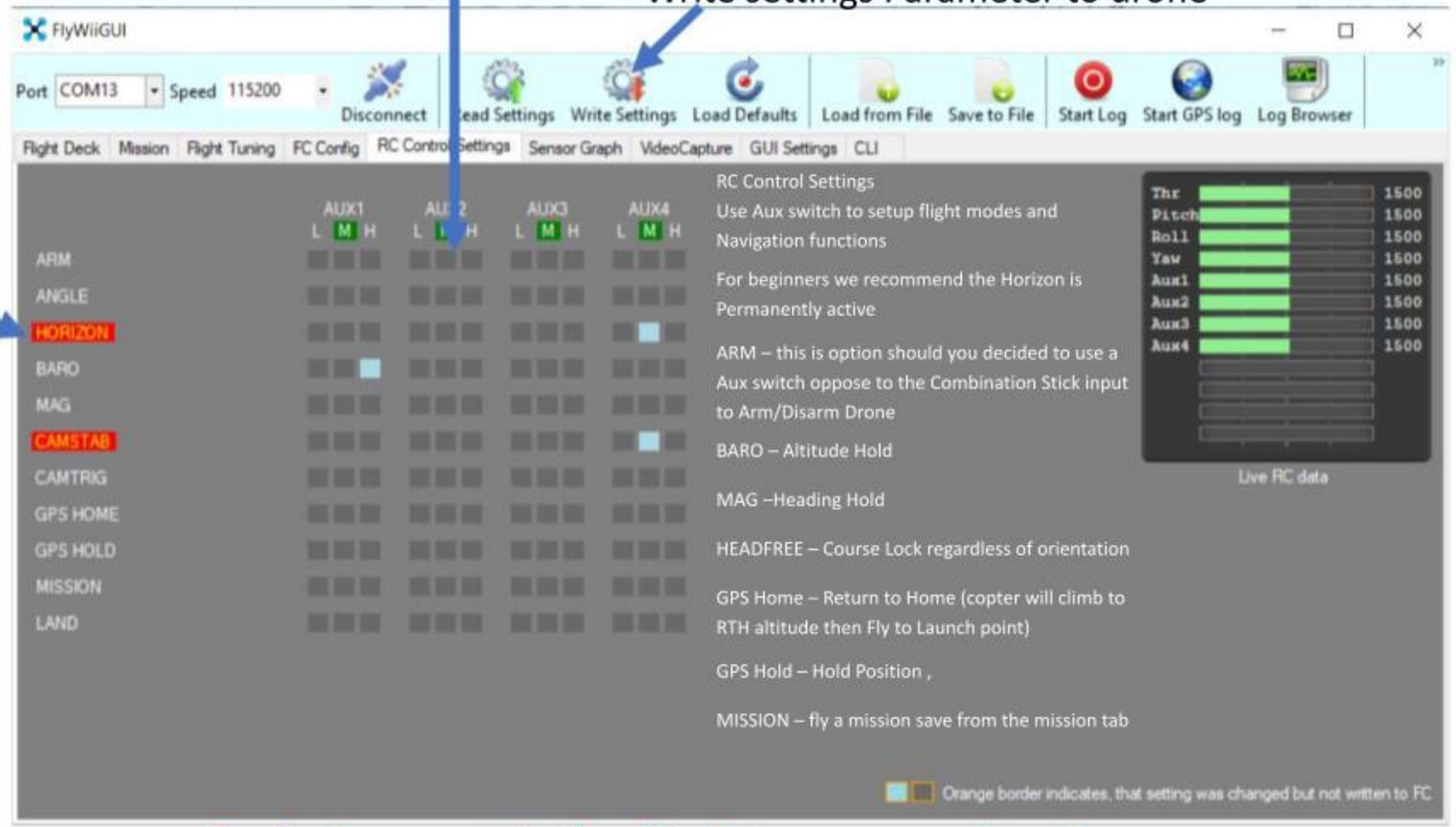
ADJUST THIS FOR YOUR THROTTLE RESPOND RATE AND WHERE YOUR CENTER STICK DEADBAND FOR ALTITUDE HOLD IS

FLIGHT TUNING AND PARAMETER ADJUSTMENTS

Set Flight Modes and Failsafe Modes using the Aux switch on your remote then hit the write setting icon

Write settings Parameter to drone

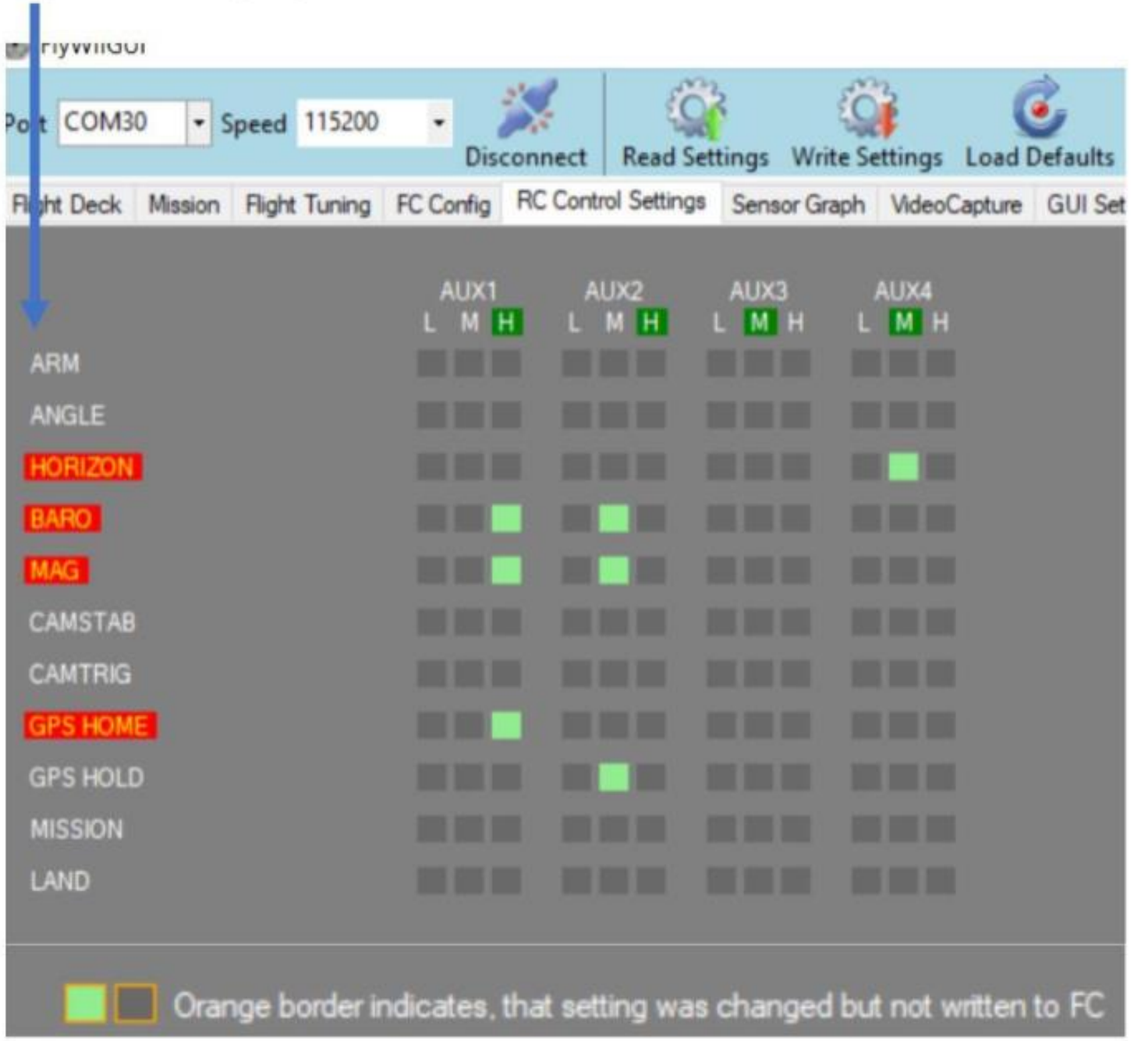
Flight mode Highlighted when Mode is on



For Beginners set Horizon Mode to permanently active

FLIGHT TUNING AND PARAMETER ADJUSTMENTS

Flight mode Highlighted when Mode is on



Click on the Box to Highlight on position

Mode on

Mode off

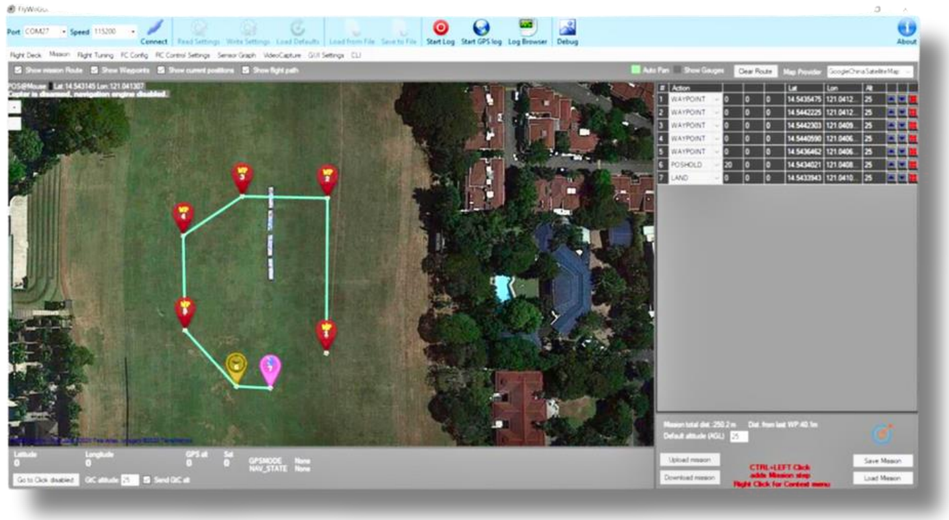
For Beginners

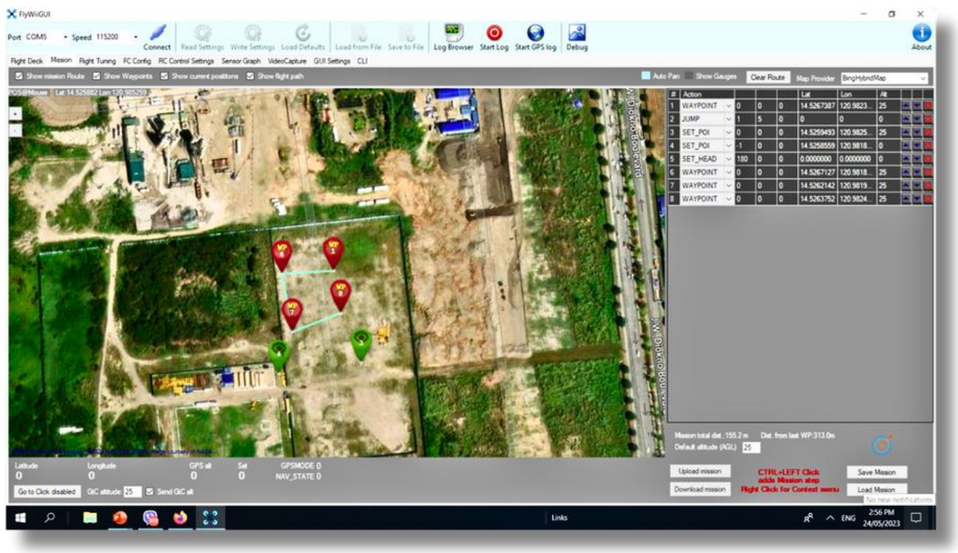
- Horizon mode is permanently active
- Other flight modes Place on switch & must be off when Arming or not in use

MISSIONS

Missions

1. Power on the UAV and ground control station.
2. Ensure that the UAV and ground control station are connected.
3. Calibrate the UAV's compass and accelerometer before flight.
4. Check the GPS signal to ensure it is stable and that the UAV has locked onto multiple satellites.
5. Plan the mission using the mission planning software:
    - Set waypoints and define actions at each waypoint.
    - Set altitude, speed, and other flight parameters.
6. Upload the mission to the UAV.
7. Arm the UAV by performing the arming procedure as defined by the flight controller.
8. Take off manually or let the UAV take off automatically if the mission includes an automatic takeoff procedure.
9. Monitor the UAV's flight from the ground control station, checking telemetry data such as altitude, speed, and battery levels.
10. If necessary, adjust the mission parameters mid-flight using the ground control station.
11. Once the mission is complete, the UAV will return to the designated home point and land automatically, or you can take manual control for landing.





MISSION PLANNING

Note: Only functional for Mega 2560 Boards with GPS

Waypoint – the drone with travel between those points

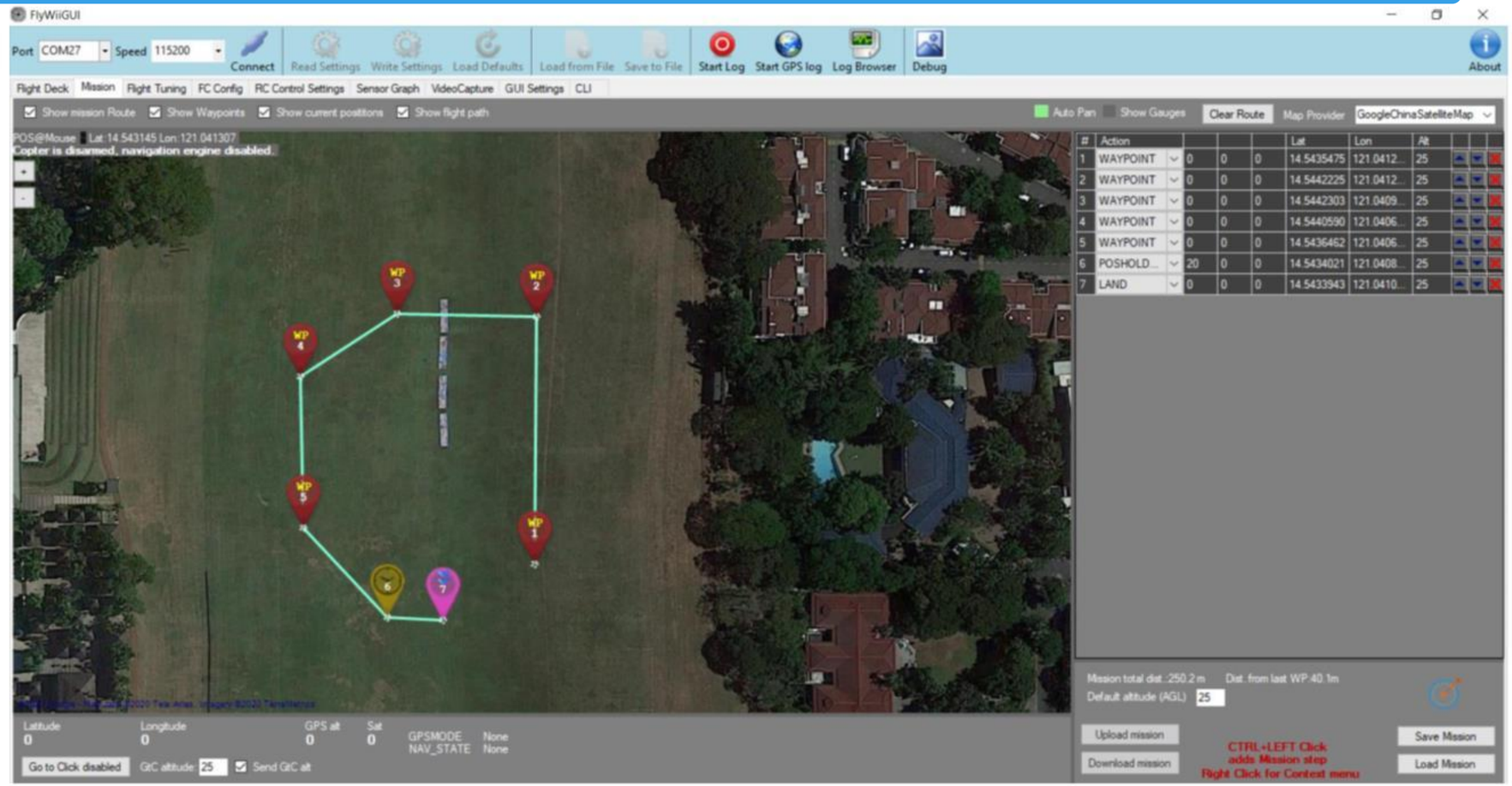
Time PosHold – Drone will wait X number of **00 seconds** then move to the next waypoint

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

Land – the drone will land once it has reach this point (Must be place at the end of the mission)

RTH – the Drone will fly back to home position (Must be place at the end of the mission)
0: RTH and hover at Last Waypoint Altitude
1: Land at RTH

Default Alt – Altitude in meters (for first Mission test waypoint with altitude 2m-3m Above Ground Level) And set missions with 2m-3m altitude with Nav speed of 100cm/s .



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

MISSION PLANNING

Note: Only functional for Mega 2560 Boards with GPS

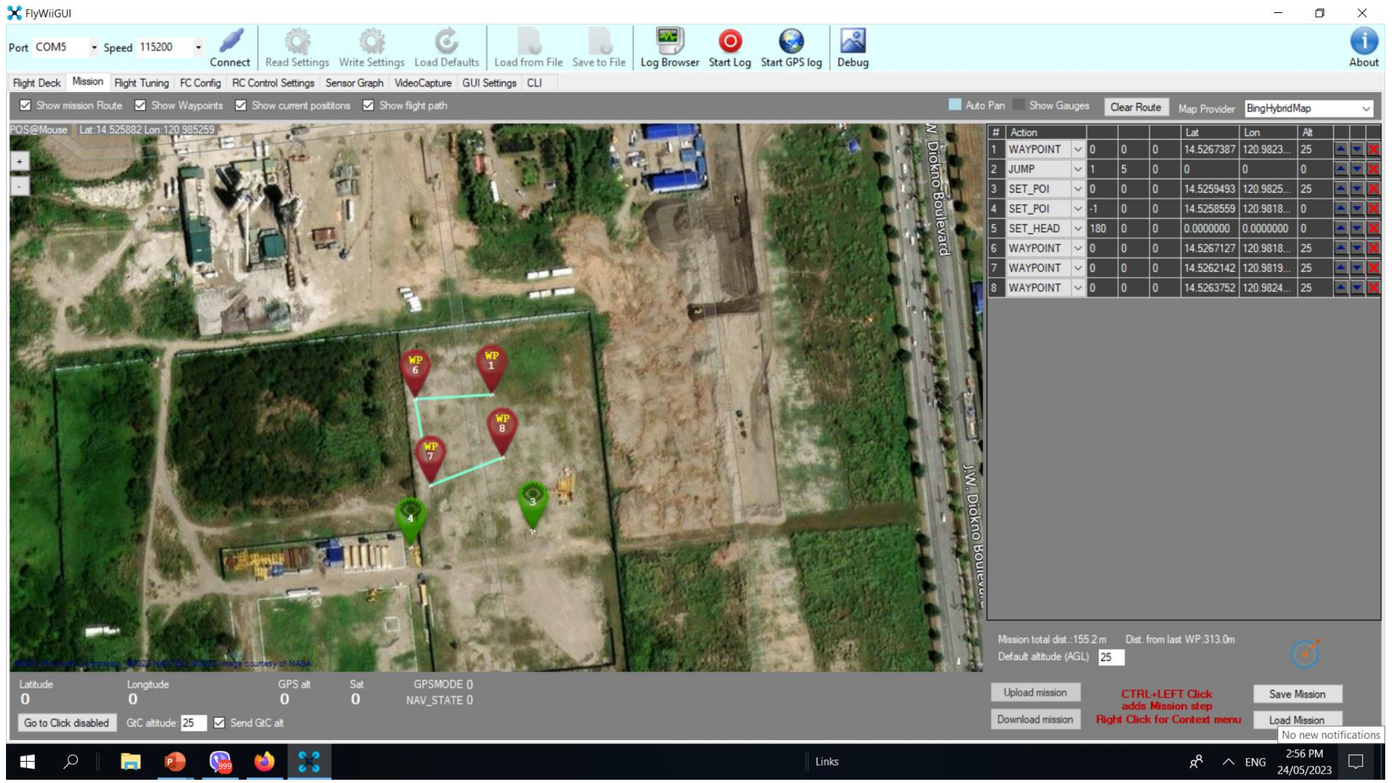
Jump – the drone with travel to the selected waypoint and continue the mission from there

WP# - the Waypoint to jump to
REP - how many times to repeat this operations

SET_POI – Drone heading would face the Point of interest while flying between waypoint

0 or 1 – Turn POI on
-1 - Turn POI off and resume Nav Heading

SET_HEAD – Drone heading would base the orientation as inputted **1-360**
-1 - Turn Turn Set_head off and resume Nav Heading



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

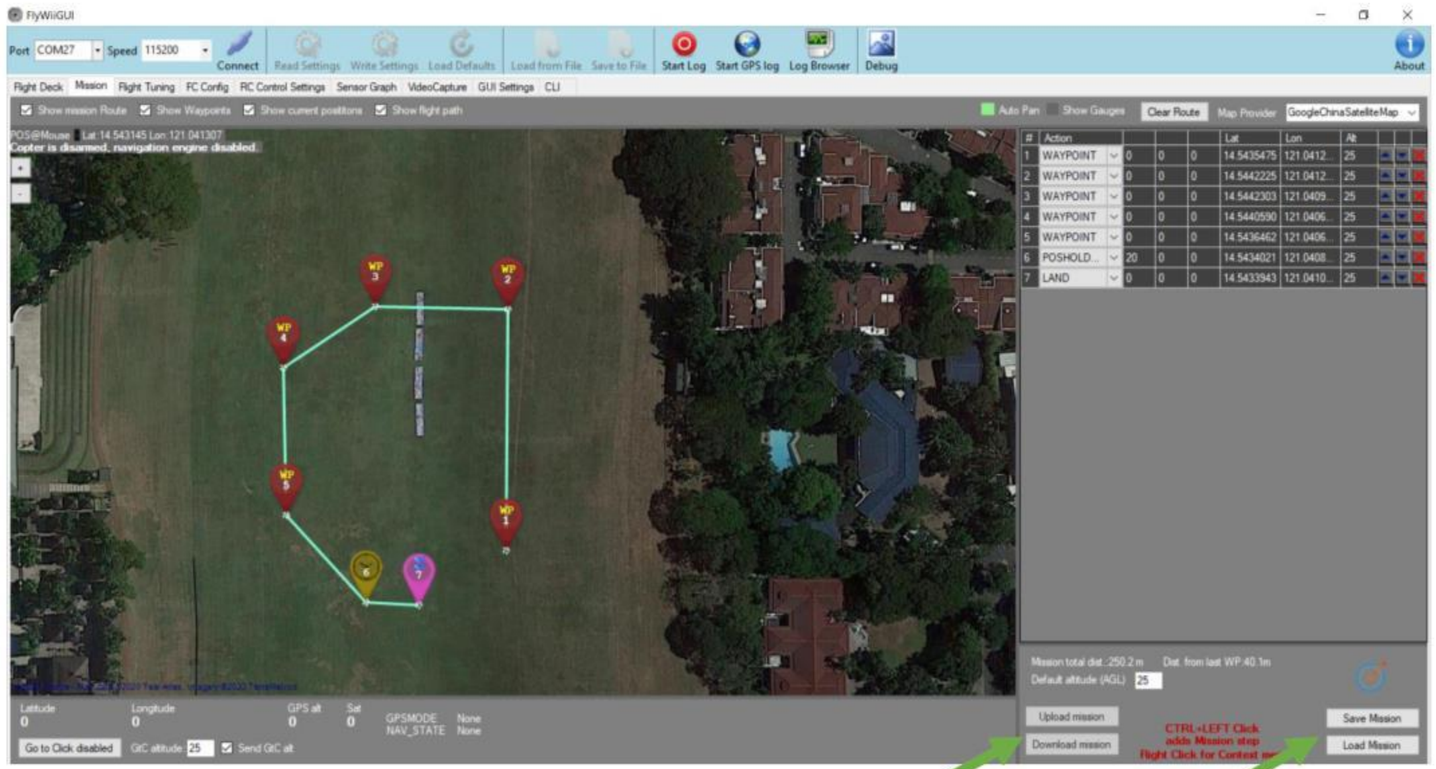
MISSION PLANNING

Prerequisite and process for a good mission , Points to test before performing a mission

1. Drone is flying stable in horizon and Alt hold mode , holding altitude consistently less than 1m variation over 1 minute period . Tune PID and altitude PID when necessary.

2. Drone is flying stable and holding position in GPSHold mode and Alt Mode not deviating with in a 1 x1 Meter Imaginary box , tune PosHold Rate PID when necessary

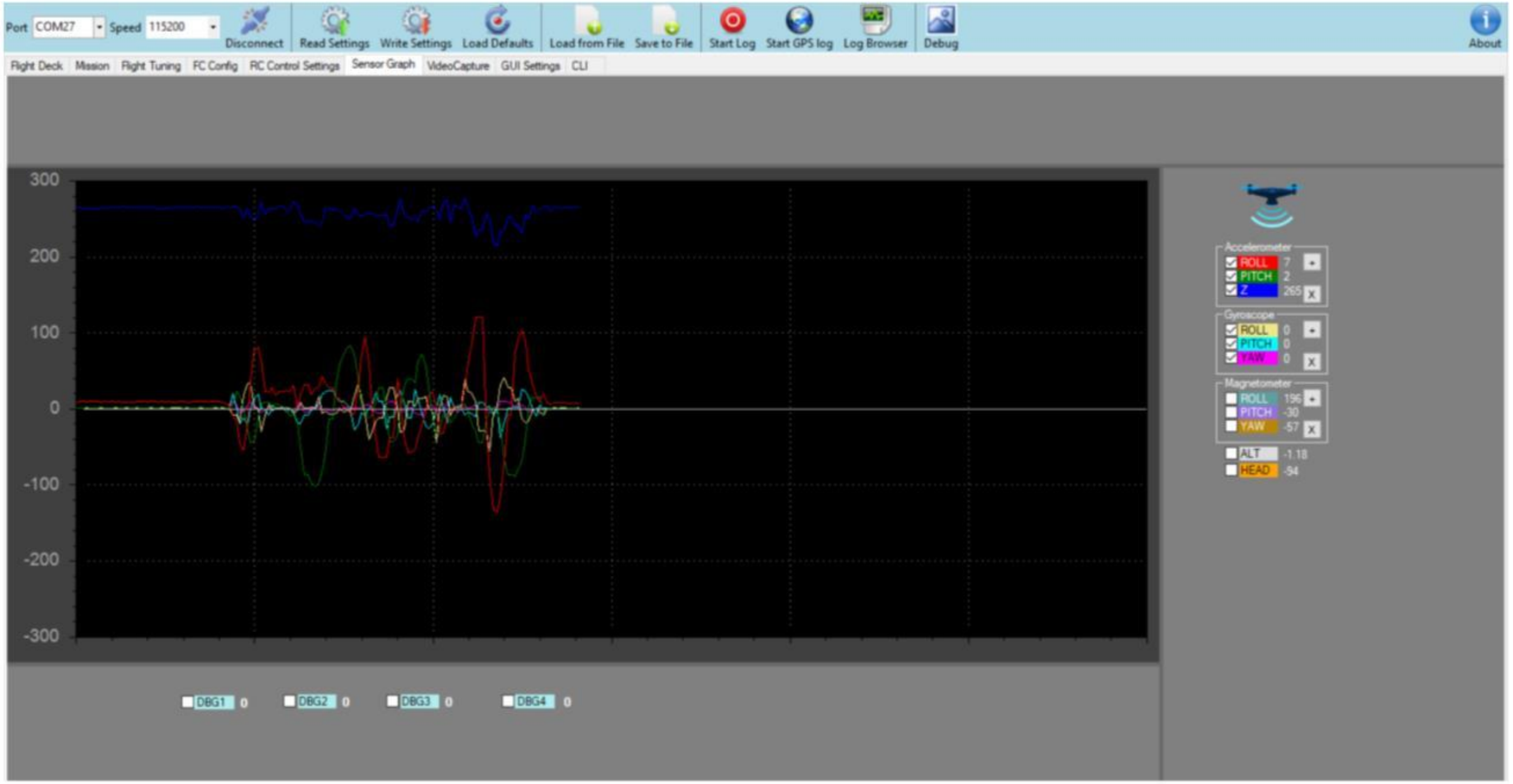
3. RTH – set RTH Altitude to 0 , Max Nav speed to 100cm/s , set aux switch to RTH ,Baro , Mag and write settings ,Fly the drone 5 Meters away from the Launch site and activate the RTH Aux switch ,see if the drone returns back to home position and holds position when arrive . Tune Navigation Rate PID when necessary



Mission upload to /download from Drone

Mission Save to /Open from File

SENSOR GRAPH



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 , and if you hold the drone upsidedown Z axis would show Negative numbers

the correct orientation

ACC

Roll Right + no#

Pitch nose down + No#

Z up + No#

GYRO

Roll Right + no#

Pitch nose down + No#

Yaw Right +No#

MAG

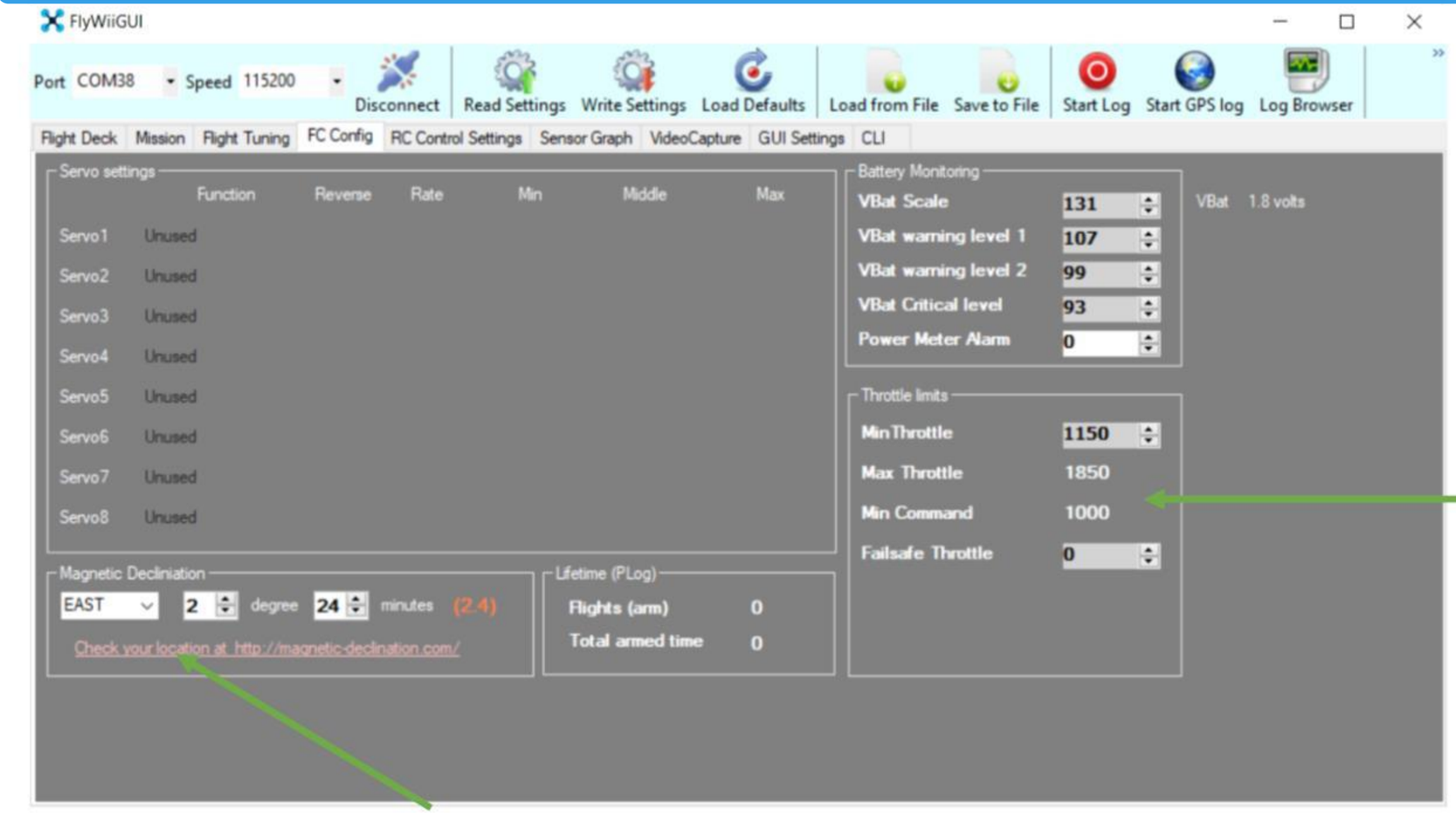
Mag & HEAD degrees corresponds to the compass

0 Degrees is North

BARO

Alt up +no#

FC CONFIG FUNCTION



MOTOR THROTTLE RANGE PWM TO THE MOTOR

THIS ALSO CONTROLS THE MOTOR IDLE SPEED ON ARM

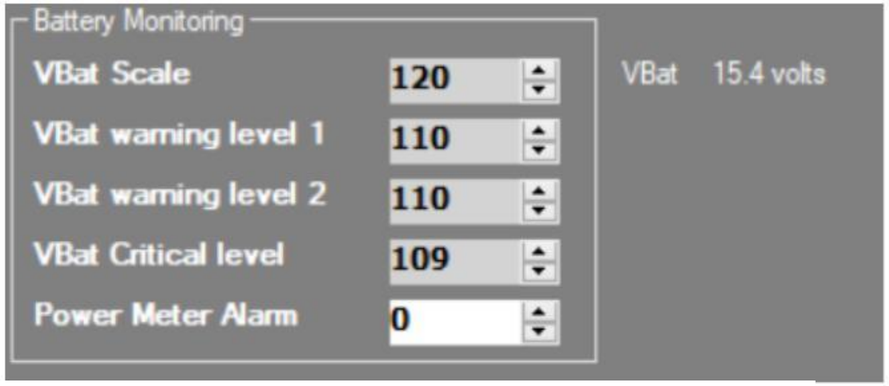
IMPORTANT TO KNOW THE MAGNETICDECLINATION OF YOUR REGION

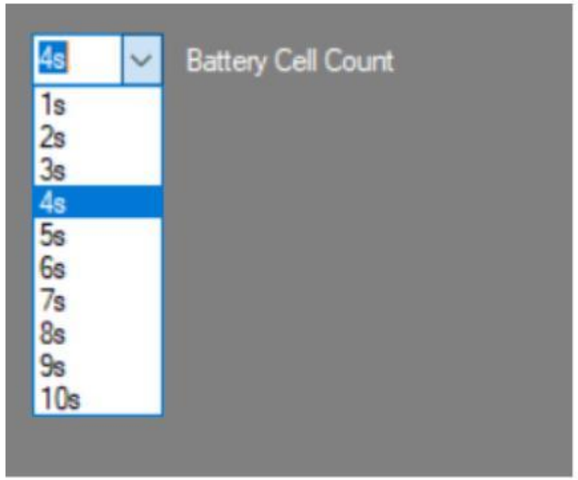
THIS AID ANY AUTONOMOUS FUNCTION THAT REQUIRES COMPASS

- HEADING HOLD
- GPS HOLD
- RTH
- MISSION

CALIBRATE COMPASS AT THE FLIGHT DECK TAB AFTER SETTING THIS UP

BATTERY VOLTAGE CALIBRATION





(FC CONFIG TAB)

BATTERY MONITORING

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

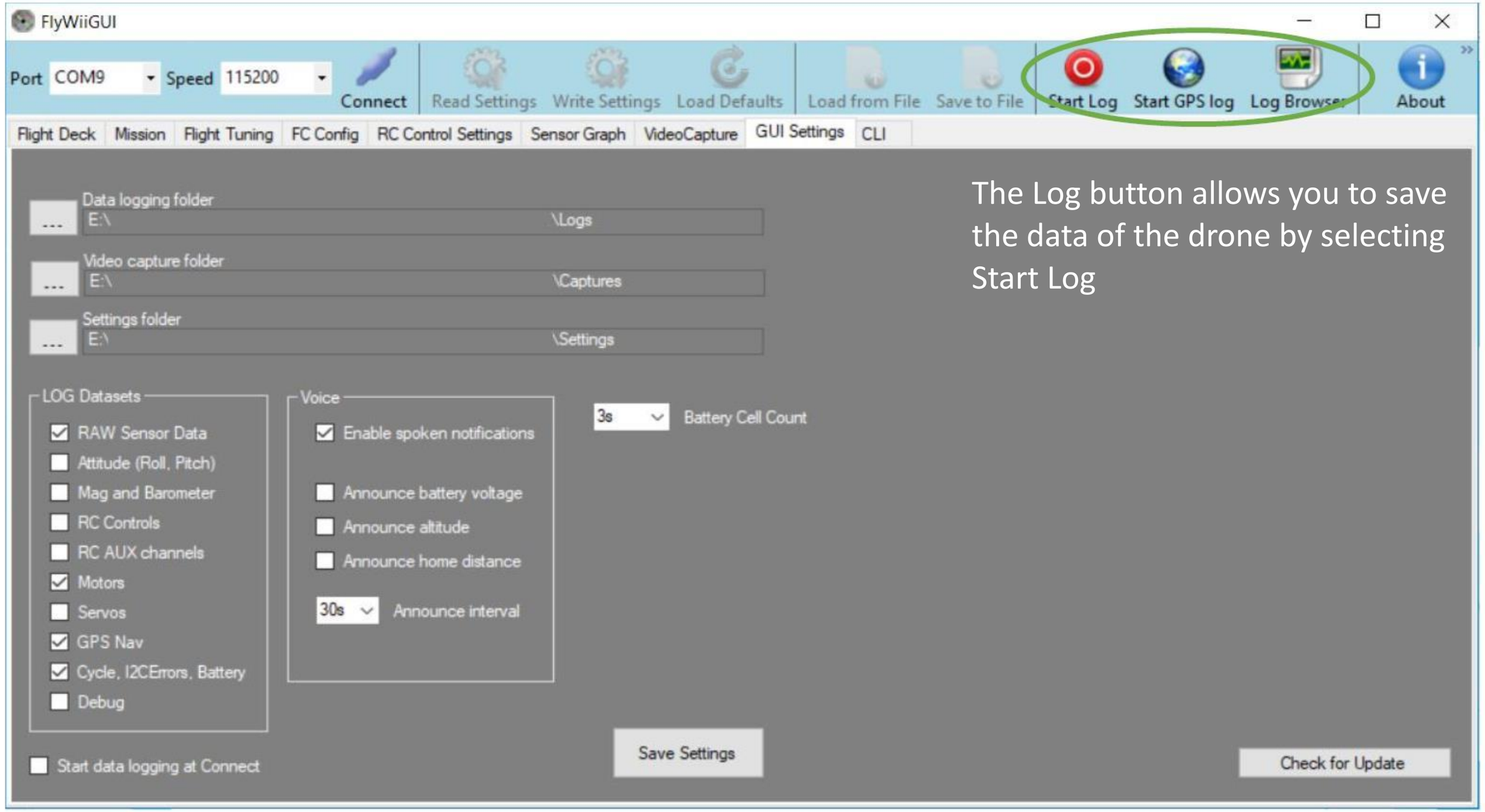
VBAT WARNING LEVEL – IDENTIFY THE NOTICE WHEN THE BATTERY DROPS TO THIS VOLTAGE

(GUI SETTINGS TAB)

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

THIS BOARD SUPPORTS 2S-4S BATTERY

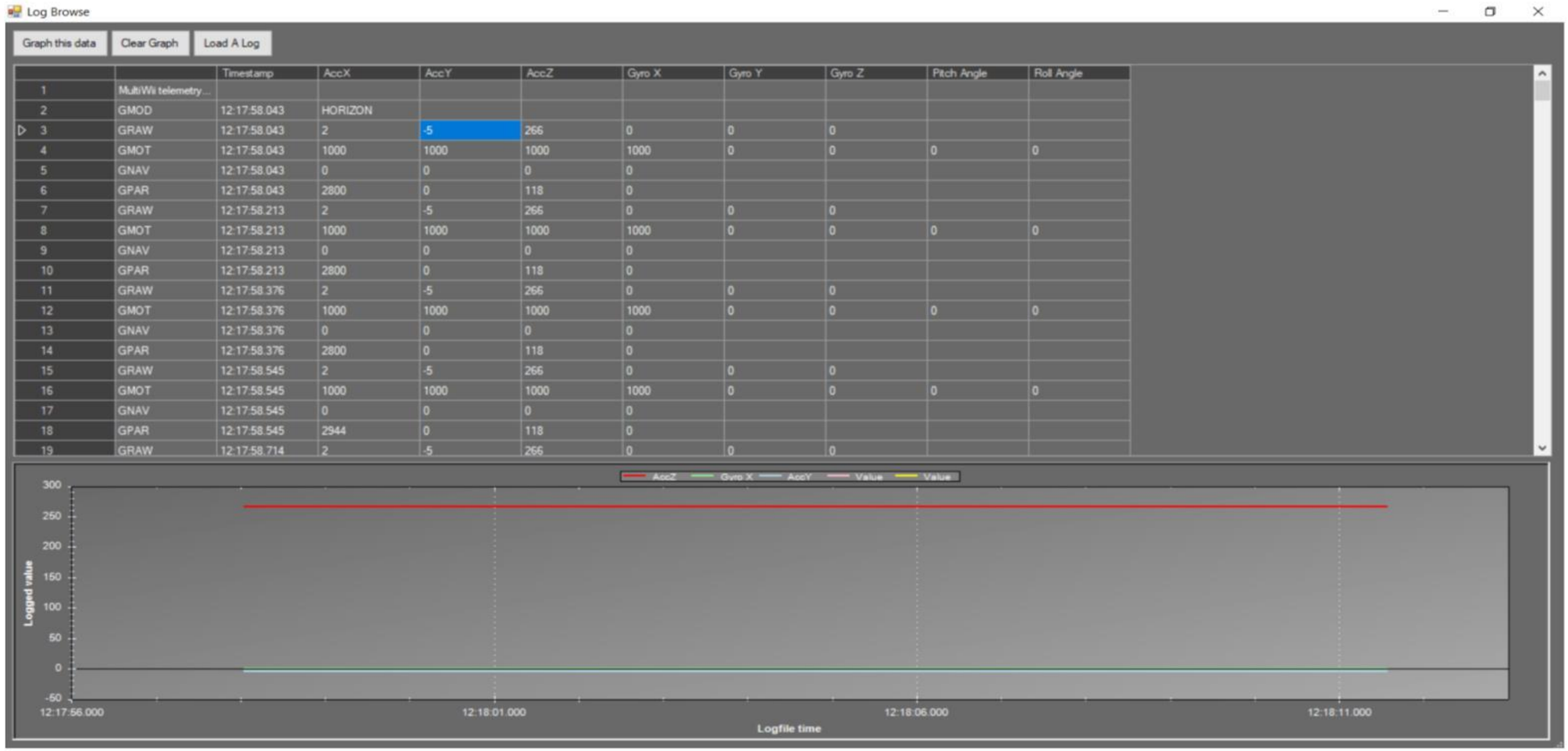
MISSION PLANNING



The Log button allows you to save the data of the drone by selecting Start Log

GUI Settings (where you save your PID ,Flight Logs and Video Logs)

LOG BROWSER



		Timestamp	AccX	AccY	AccZ	Gyro X	Gyro Y	Gyro Z	Pitch Angle	Roll Angle
1	MultiWii telemetry...									
2	GMOD	12:17:58.043	HORIZON							
3	GRAW	12:17:58.043	2	-5	266	0	0	0		
4	GMOT	12:17:58.043	1000	1000	1000	1000	0	0	0	0
5	GNAV	12:17:58.043	0	0	0	0				
6	GPAR	12:17:58.043	2800	0	118	0				
7	GRAW	12:17:58.213	2	-5	266	0	0	0		
8	GMOT	12:17:58.213	1000	1000	1000	1000	0	0	0	0
9	GNAV	12:17:58.213	0	0	0	0				
10	GPAR	12:17:58.213	2800	0	118	0				
11	GRAW	12:17:58.376	2	-5	266	0	0	0		
12	GMOT	12:17:58.376	1000	1000	1000	1000	0	0	0	0
13	GNAV	12:17:58.376	0	0	0	0				
14	GPAR	12:17:58.376	2800	0	118	0				
15	GRAW	12:17:58.545	2	-5	266	0	0	0		
16	GMOT	12:17:58.545	1000	1000	1000	1000	0	0	0	0
17	GNAV	12:17:58.545	0	0	0	0				
18	GPAR	12:17:58.545	2944	0	118	0				
19	GRAW	12:17:58.714	2	-5	266	0	0	0		

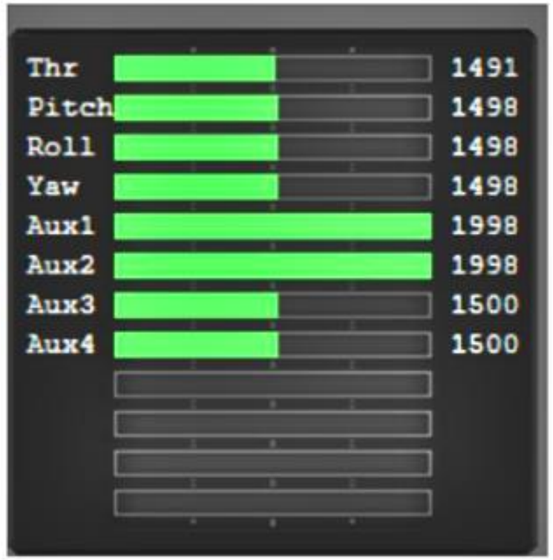
Log Browser this is selected in the Log button on top its use as a visual from data gather from the IMU , RC input and sensor inputs with GPS coordinates this also outputs as CSV for viewing on excel spread sheet

RADIO CONTROL

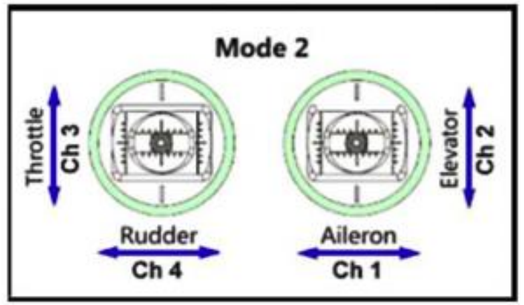
RC Mapping and Remote

To ensure the correct orientation of your control and PWM pin installation, follow the FlywiiGUI arrangement as follows:

- Throttle
- Aileron
- Elevator
- Rudder
- Aux1
- Aux2
- Aux3
- Aux4



PWM 1000 1500 2000



RADIO CONTROL

RC Display

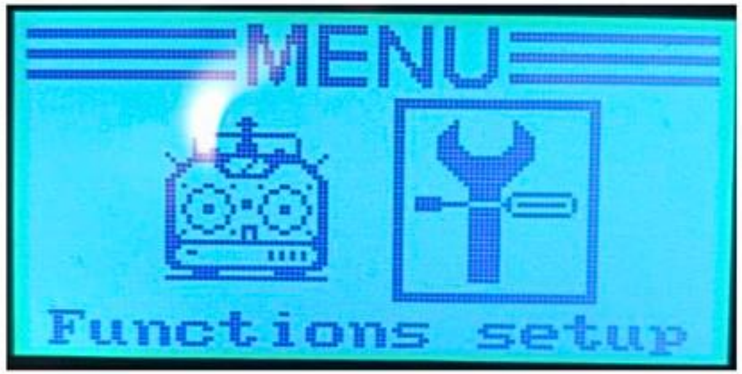
This is used to see if the RC output matches the required input of the Synerduino, as seen in the FlywiiGUI main dashboard's Flight Deck tab.

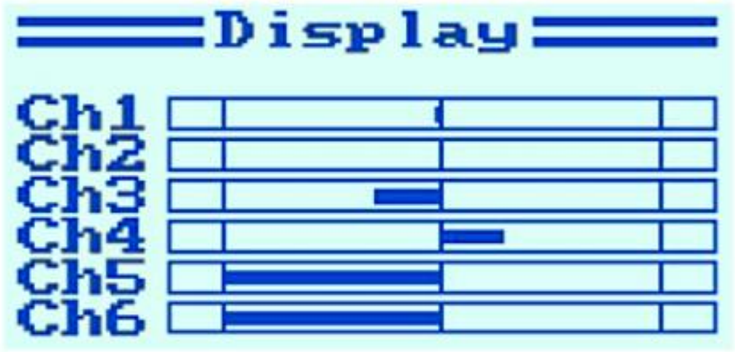
- **Press OK for 1 sec**
- **Enter Systems**
- **Choose RX Setup**
- **Choose Display**
- **Test the channels by moving the sticks and switches**
- **Hold the Cancel button for 3 seconds to set and save the profile when exiting**

Good news for the i6 Series Radio: this function is aligned with the Synerduino codes.

Note: If you notice that the PWM isn't correct or if the display output doesn't match what the Flywii is doing, you may need to reverse it.

See the manual for other radios, as the channel output may differ.





RADIO CONTROL

Aux Switches

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

It can be setup using the Aux switches:

ARM
Baro
Altitude
GPS Hold
Mag
GPS Home
Mission
Trigger
Land

PWM 1000 1500 2000

RADIO CONTROL

Fail Safe

Your Drone should enter this modes when it gets disconnected from the remote for whatever reason

it ’s a safety function as important as getting it connected in the first place.

Two Option can be configured

- GPS Home (RTH)– this sets the drone into return to home mode right to the Launch location only works when GPS is available
- Land - the simplest way is to quit all other flight modes and throttle down . Commonly use in none GPS Drones

This require setup both on Remote and FlyWiiGUI

RADIO CONTROL

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

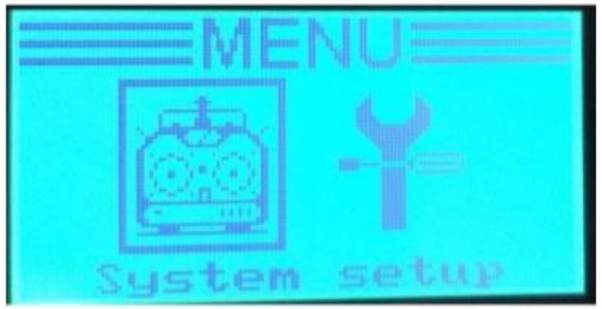
Hold Cancel Button for 3sec to set when exiting the failsafe menu

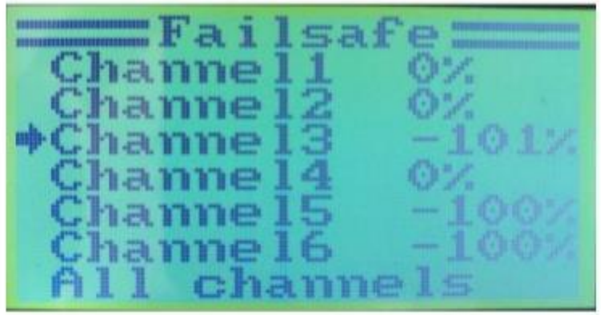
You may enter in again to see if its set properly

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

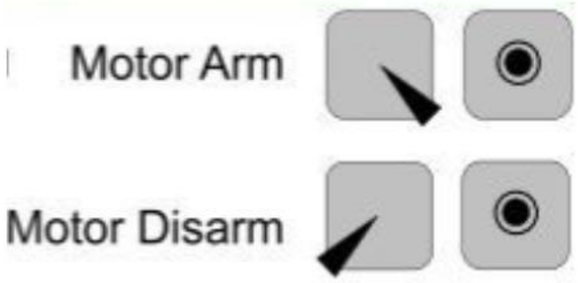




PRE-FLIGHT

And your much Done on your setup

For Mode 2 Hold 2 seconds



Cannot Arm Motors

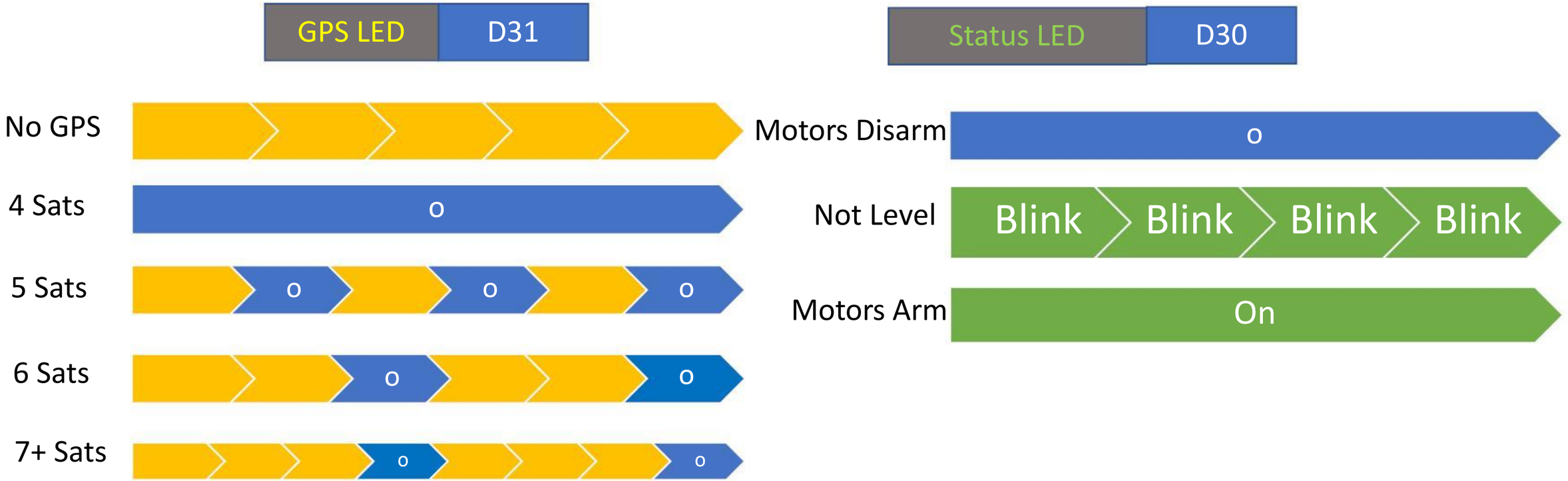
when on GPS Home , GPS Hold , Mission Flight modes & when USB is plugged in . (pls use Bluetooth telemetry)

Tests motors with Props off

Baro and Mag preferably switch off when Arming

Pls calibrate ACC and Mag in the Dashboard

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 +

SYNERFLIGHT

SYNERDUINO

ARDU 2560