

# Ardupilot / Qground Guide

## Synerduino STM

**VERSIONS: F405**

For more Information:  
[www.synerflight.com](http://www.synerflight.com)



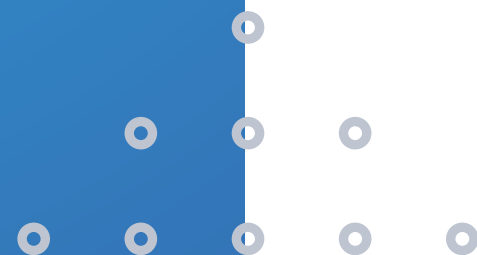
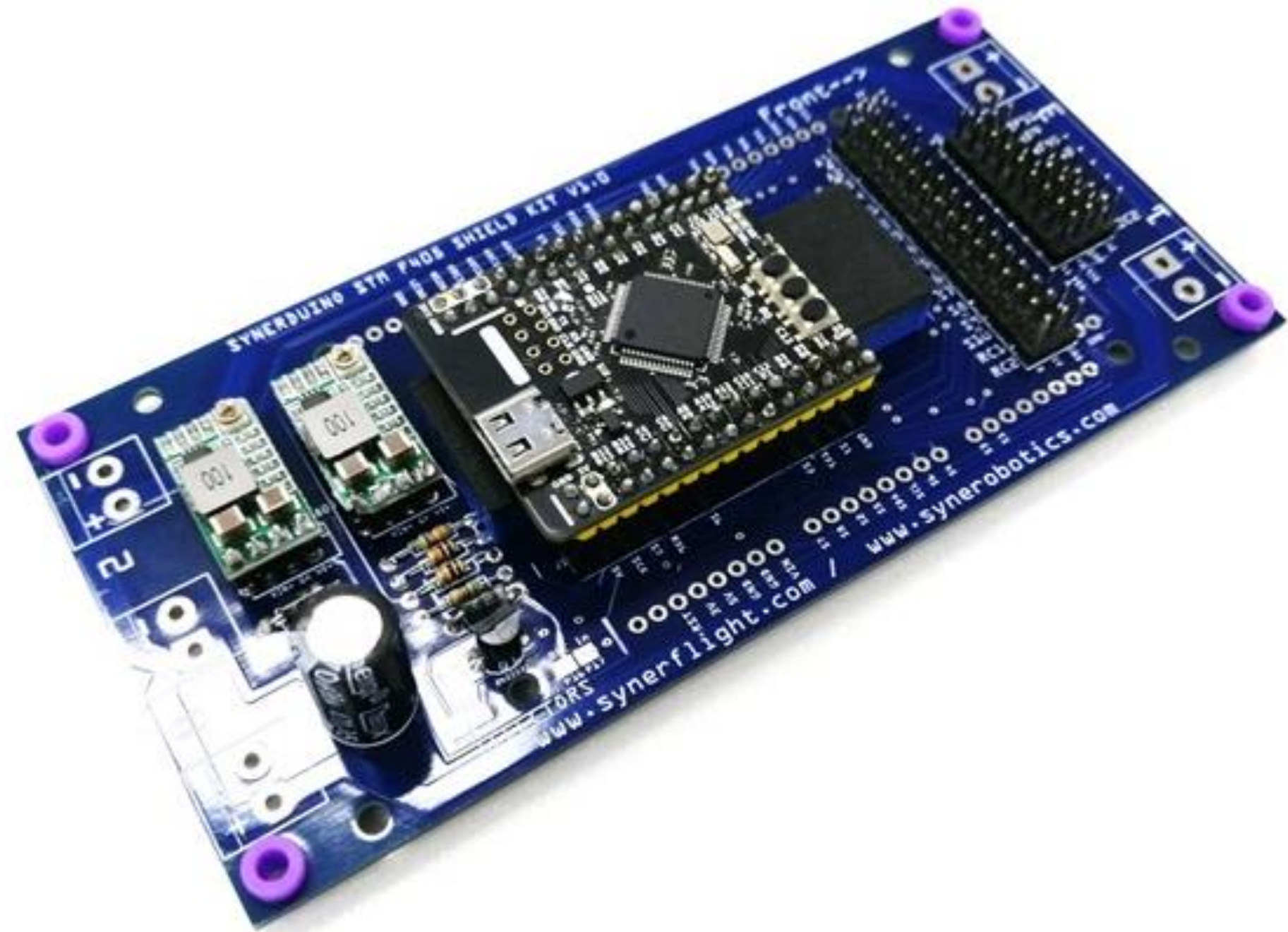


# INTRODUCTION

## Installation

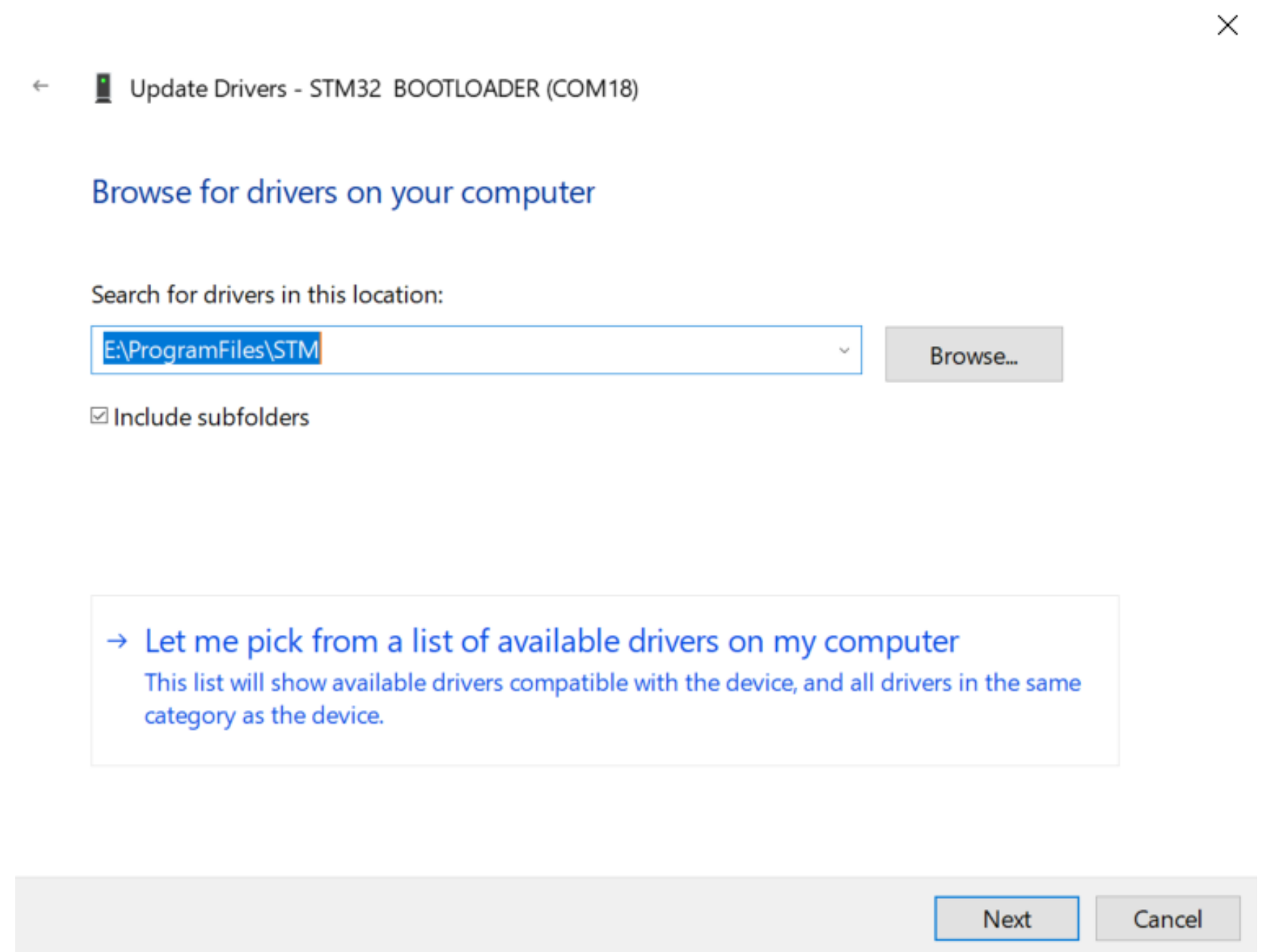
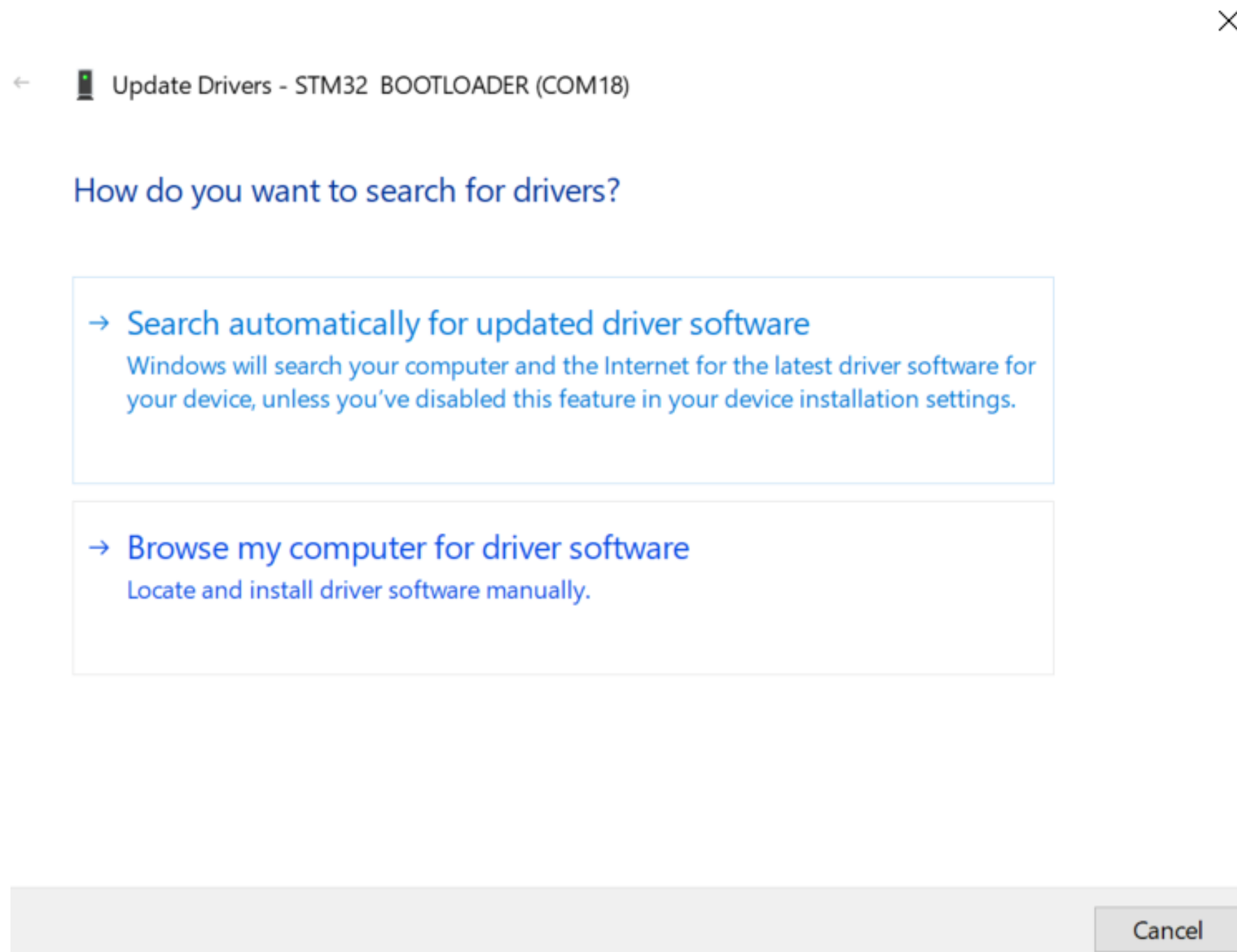
- Firmware
- Setup
- Configuration

This guide shows the software installation process



# FIRMWARE INSTALLATION

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




# FIRMWARE INSTALLATION

← Update Drivers - STM32 BOOTLOADER (COM18)


×


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


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


☒ Show compatible hardware


Model

 STM Device in DFU Mode

 STM32 BOOTLOADER Version: 1.0.0.0 [17/01/2019]

 STM32 BOOTLOADER Version: 6.1.7600.16385 [02/06/2012]

 STM32 Bootloader

 This driver is digitally signed.

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

Have Disk...

Next


Cancel

← Update Drivers - STM32 BOOTLOADER

×

Windows has successfully updated your drivers

Windows has finished installing the drivers for this device:

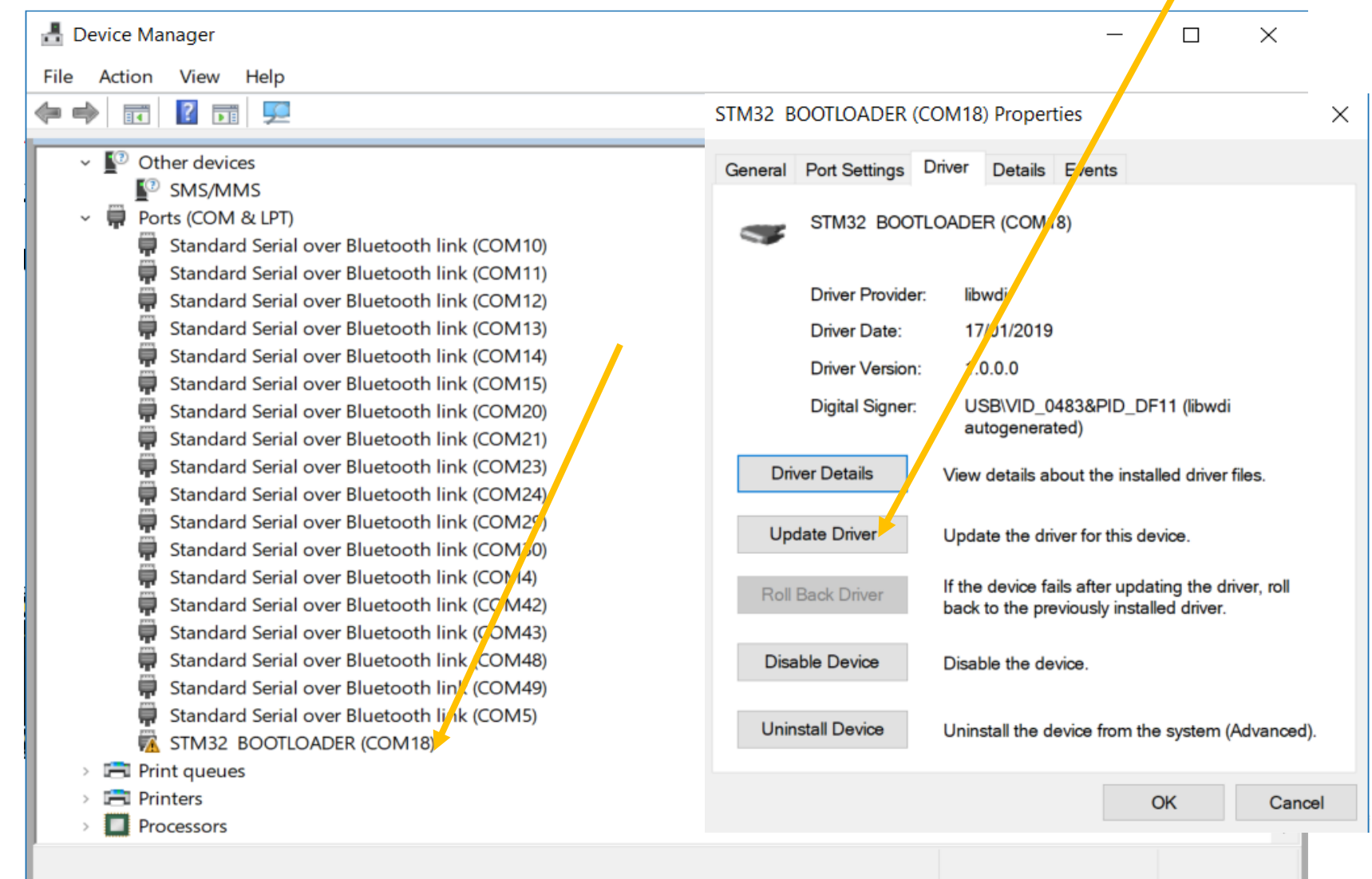
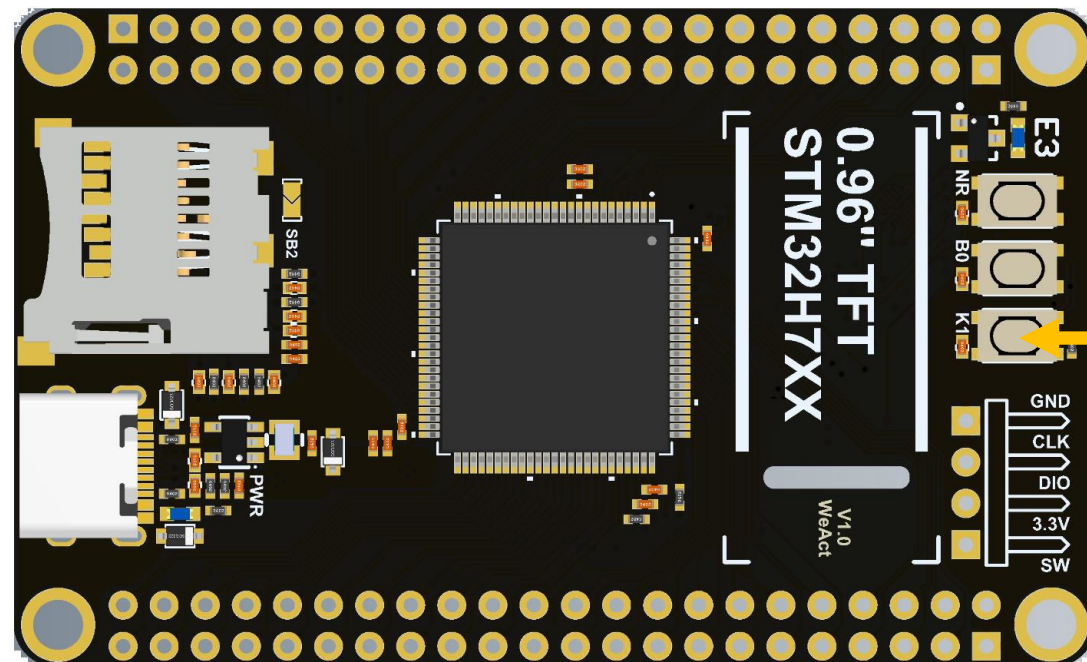
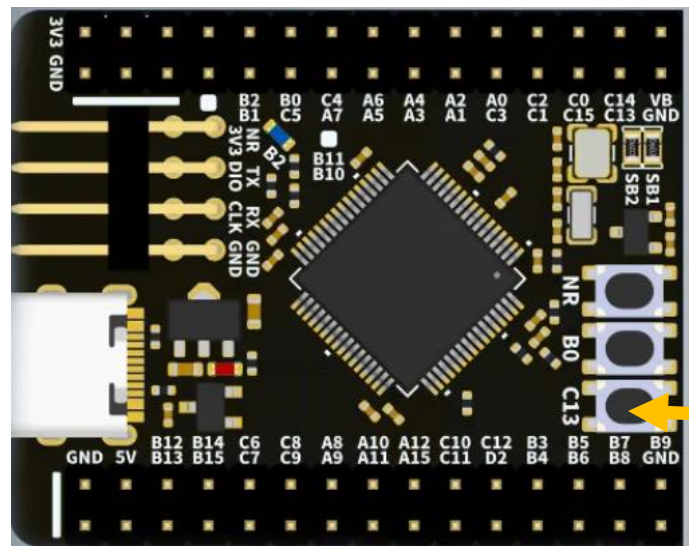
 STM32 Bootloader

Close

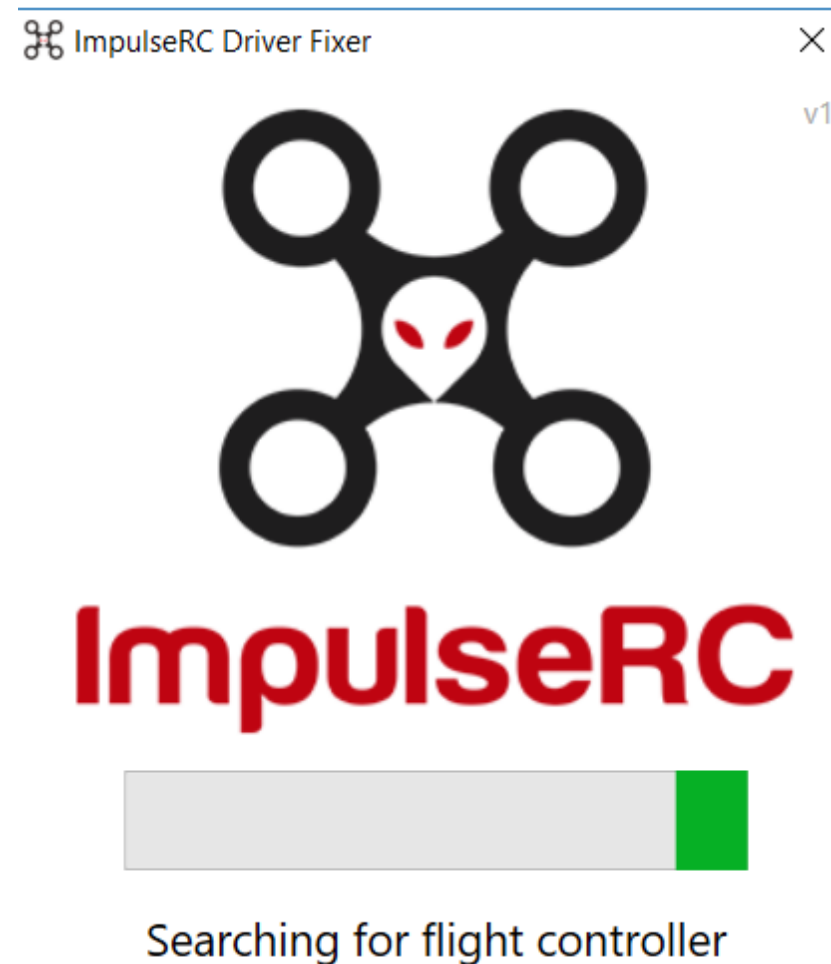


# FIRMWARE INSTALLATION

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



# FIRMWARE INSTALLATION

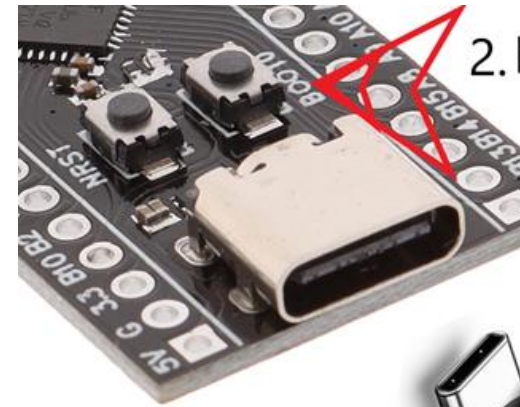
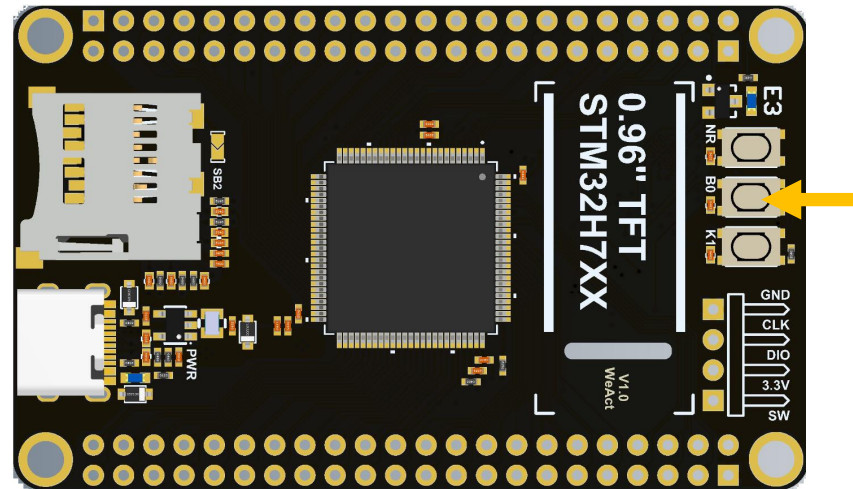
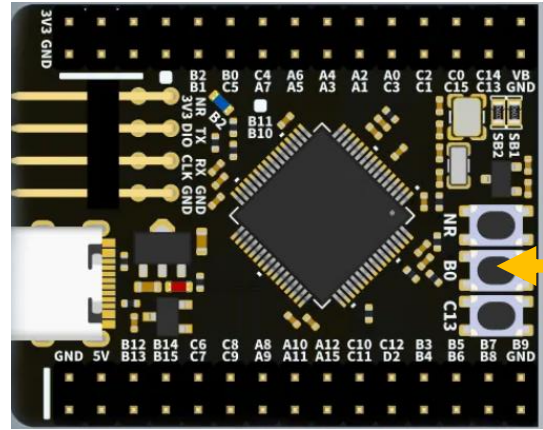


## ImpulseRC Driver Fixer

[https://impulserc.blob.core.windows.net/utilities/ImpulseRC\\_Driver\\_Fixer.exe](https://impulserc.blob.core.windows.net/utilities/ImpulseRC_Driver_Fixer.exe)

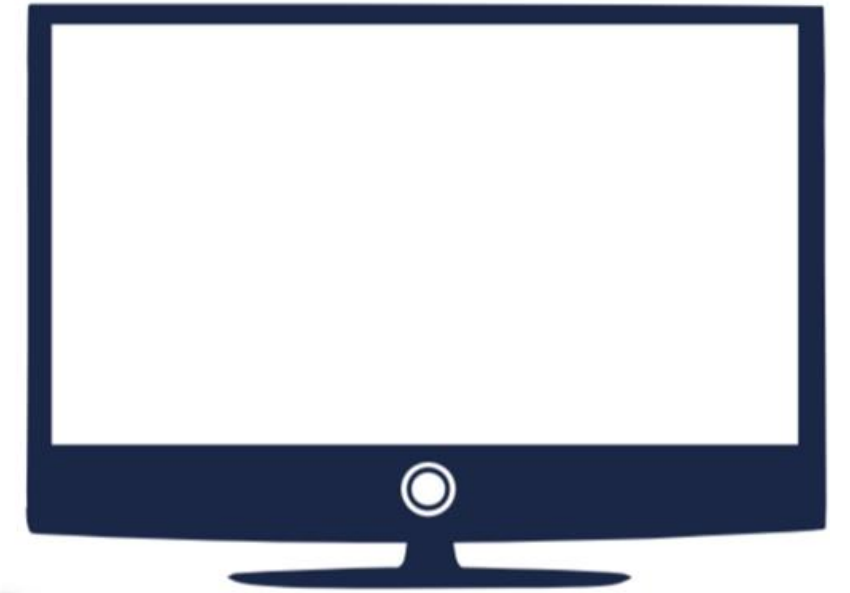
- Start ImpulseRC Driver Fixer
- Connect the FC USB to the PC While On DFU mode . (DO NOT power on FC via external 5V or Vbat)
- The ImpulseRC Driver Fixer should then see and load the proper driver

# FIRMWARE INSTALLATION



2. Hold down the boot0 button.

1. Connect TYPE-C  
usb to Board



3. Connect to USB to PC

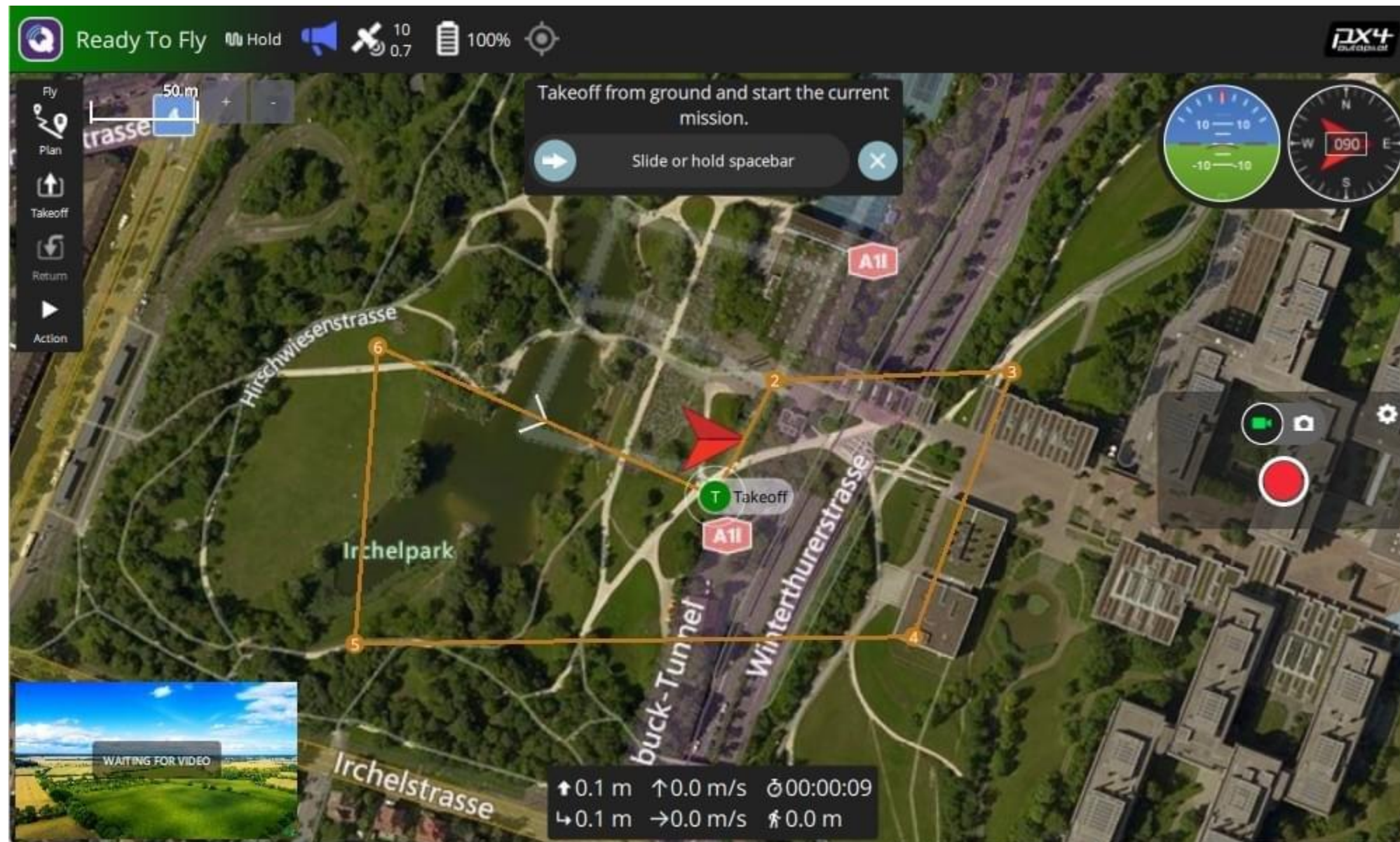


## After Flashed Processor setup

This can also be done by holding down the boot button while pressing the NRST button to reset the board . This is just like unplugging and plugging the USB



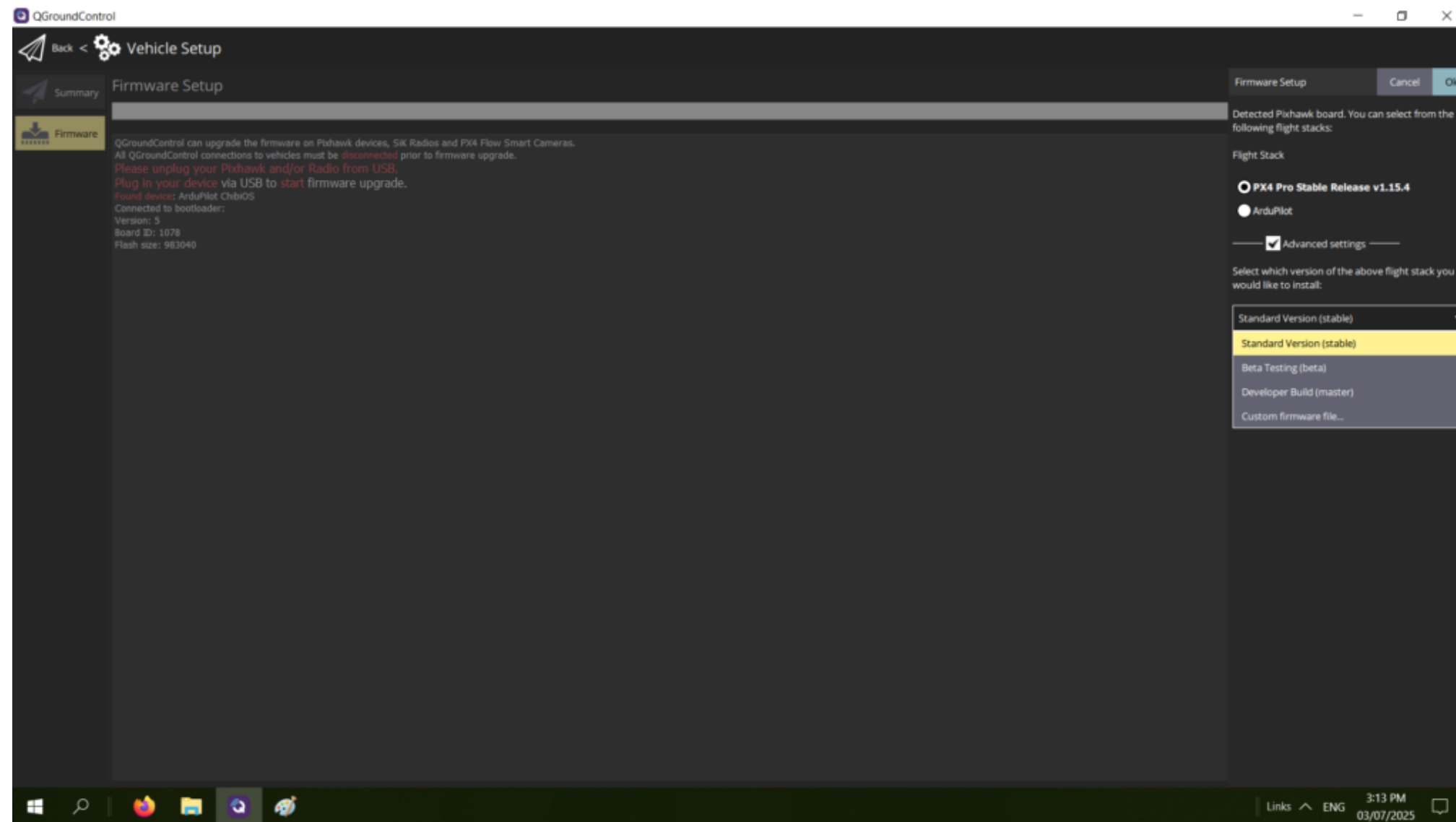
# FIRMWARE INSTALLATION



Q ground Control one of several Ground station options compatible with Ardupilot it has a clean refine design across its OS platforms making it easy to use and setup of your drone.



# FIRMWARE INSTALLATION



While the board is on **DFU** mode

**Start Qground**

**Open the Firmware tab**

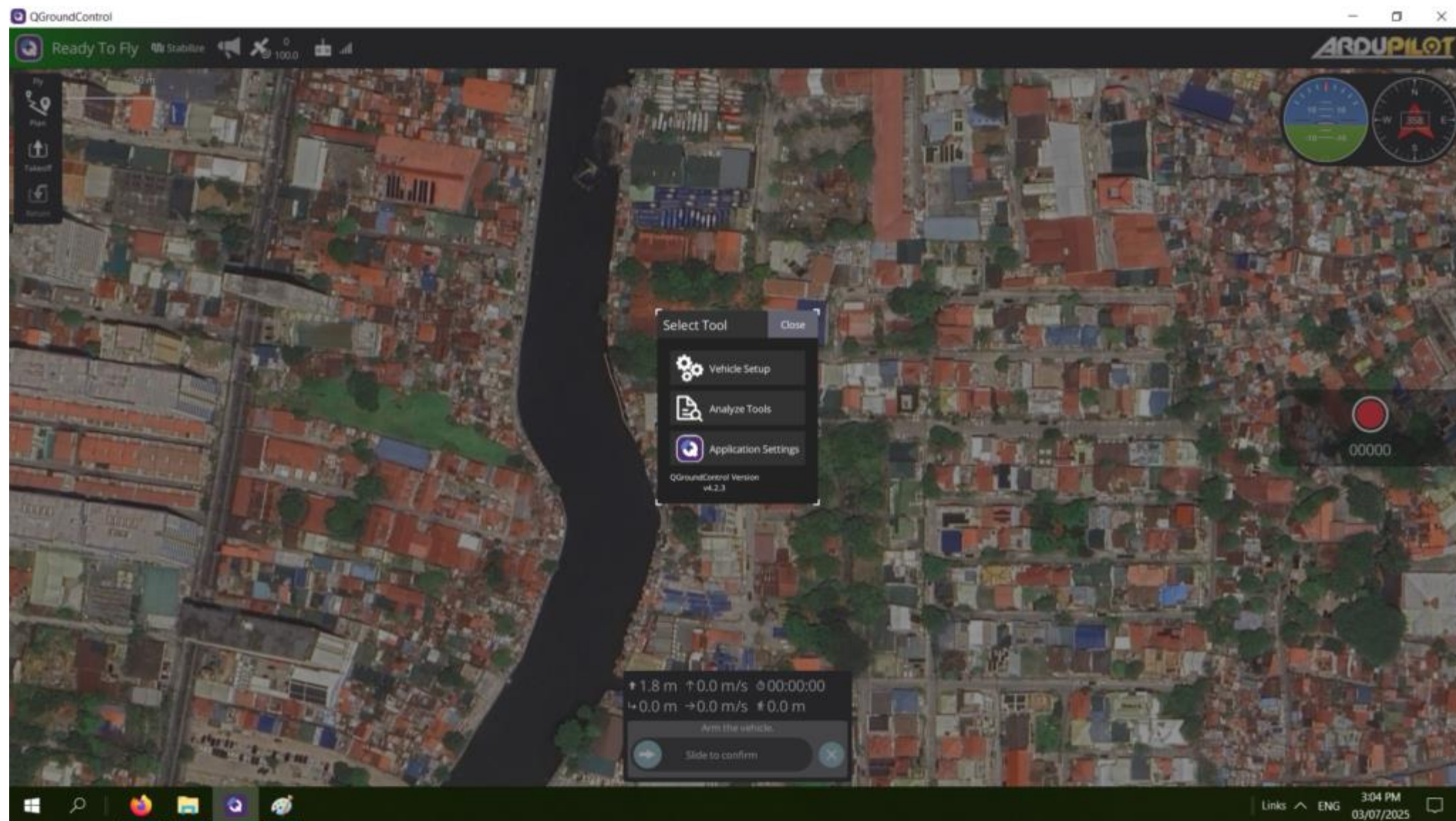
select **Ardupilot** and **Custom firmware**. Select the **.bin** or **.apj** file of **Synerduino F405**

Respectively Select the vehicle type you wish to use

- Arducopter
- Arduplane
- Ardurover
- Ardusub
- Blimp
- Antenna tracker

**Note: Synerduino Ardupilot firmware can also be flash using INAV configurator .HEX see: INAV Documentation firmware flash.**

# QGROUND

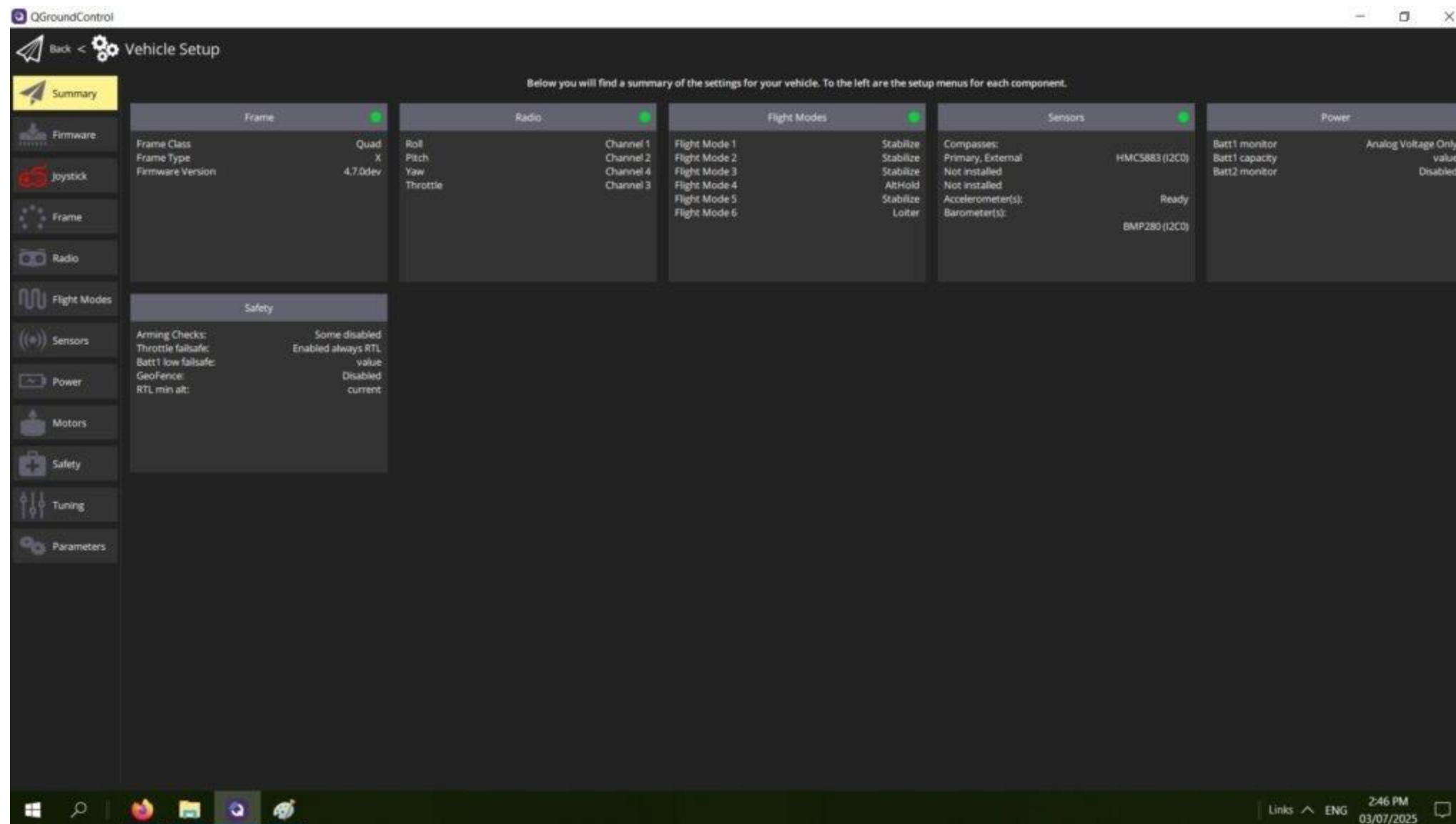


Once Firmware Is loaded Qground would automatically search for the USB where Synerduino is plugged in

For those using the telemetry later on this can be setup on the Comms later on



# VEHICLE STATUS

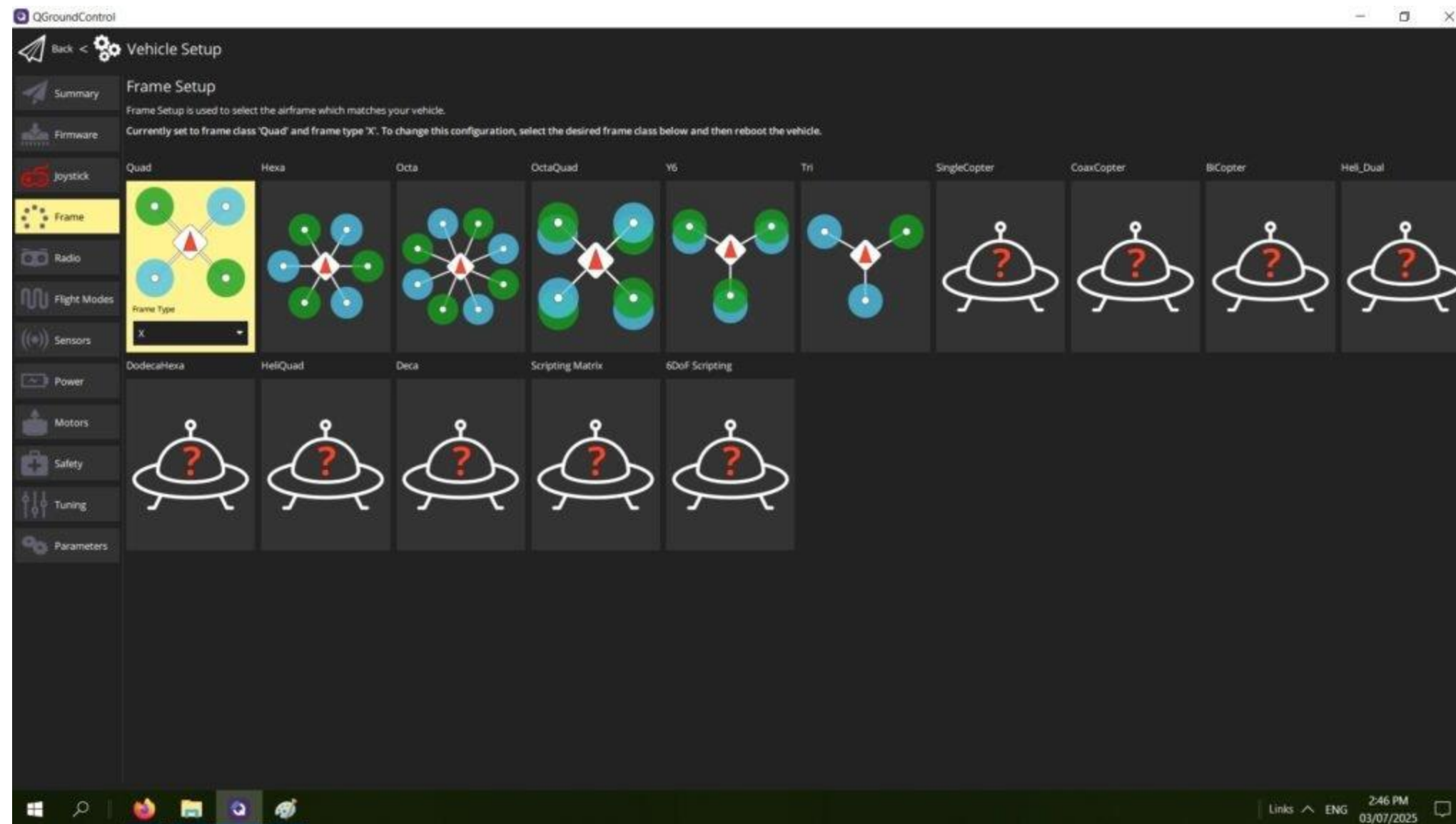


## Summary Tab

This is the basic status reported by the Flight controller

This relays information about the health conditions and modes that the drone is set to

# VEHICLE FRAME



## Frame

Synerduino uses Quad X. Be aware of the motor Orientation Pin assignment

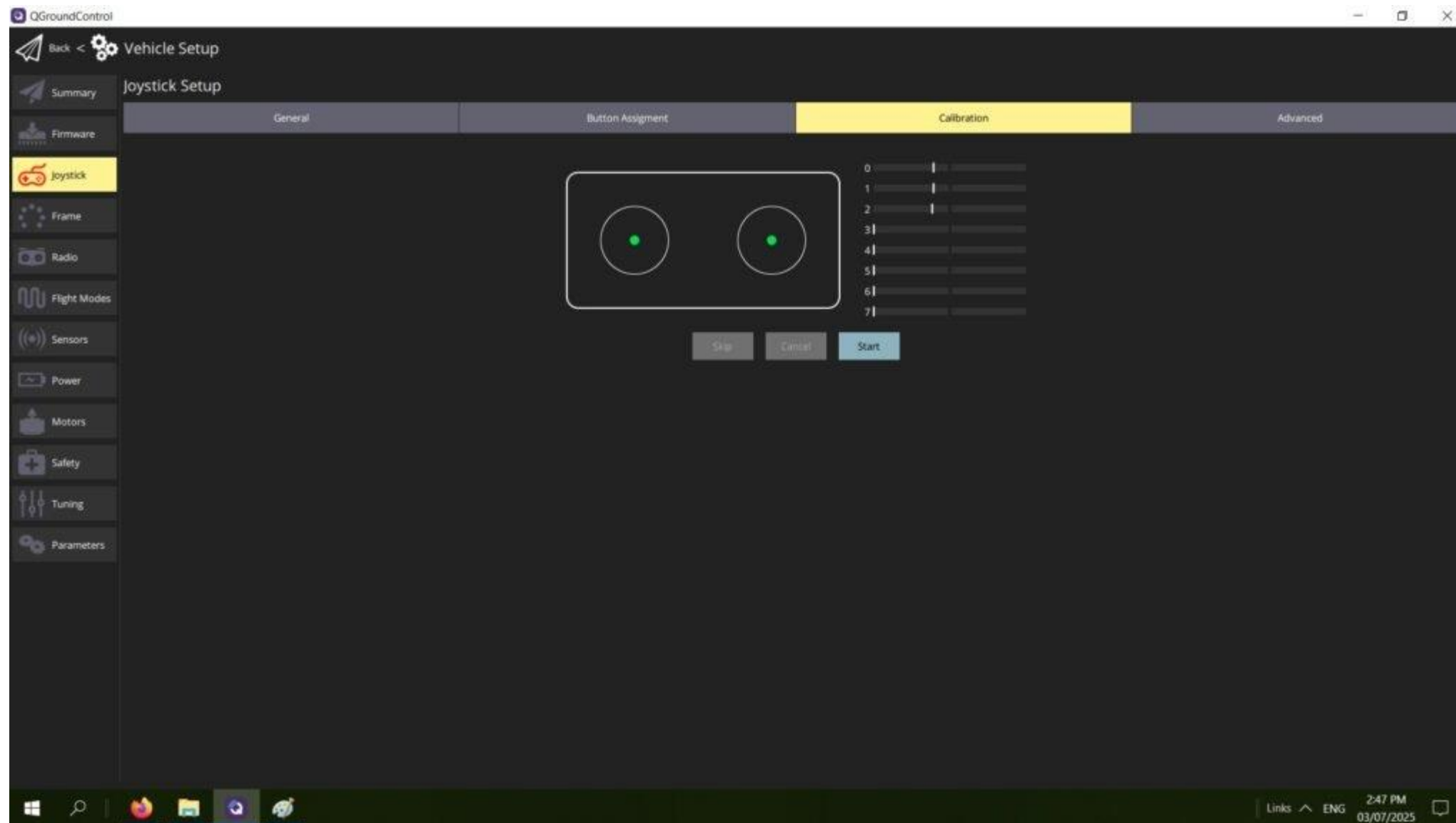
See: documentation

[ArduCopter  
Documentation](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/airframe_ardupilot.html)

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/airframe\\_ardupilot.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/airframe_ardupilot.html)



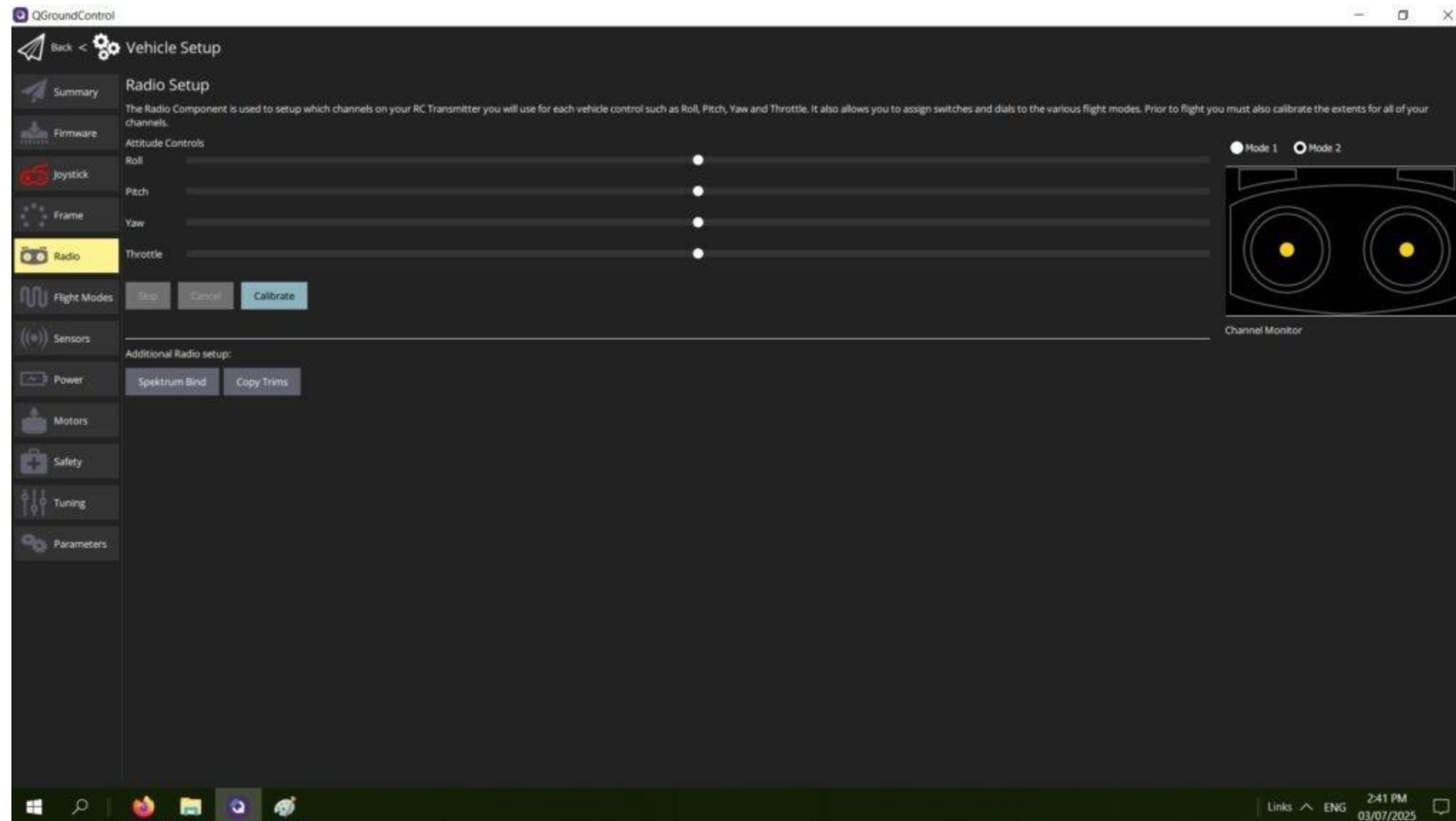
# JOYSTICK



## Joystick

This allows USB joystick to operate in conjunction with the GCS and whatever your means to communicate to the drone

# RADIO TRANSMITTER



## Radio

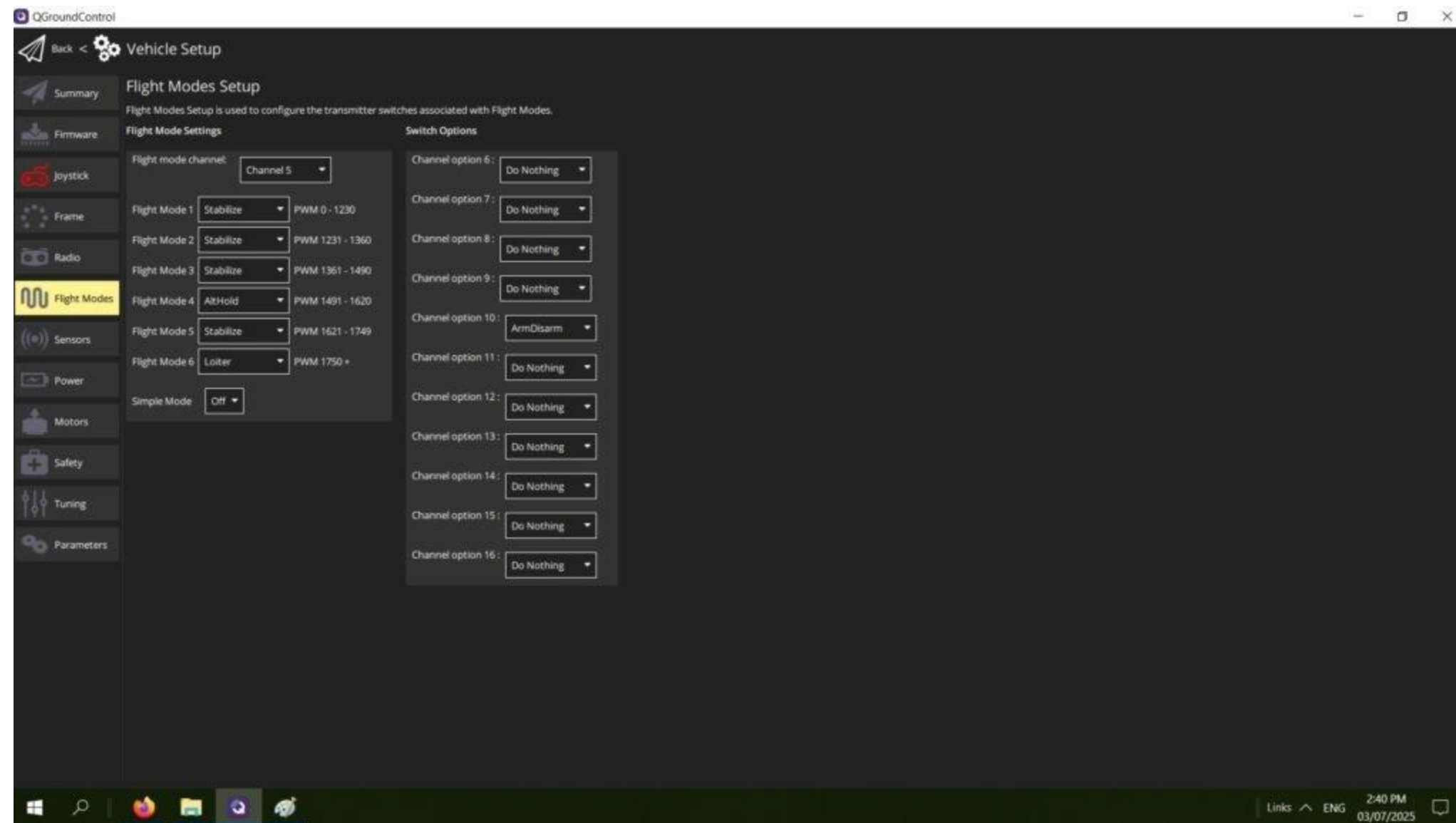
RC mapping and calibration  
of your main and Aux  
channels

Click on the calibrate button  
and follow as instructed

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/radio.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/radio.html)



# FLIGHT MODES



## Flight Modes

Here you setup your modes assign to your Aux channels Switches

Note Ardupilot always have Ch5 as a multi selection

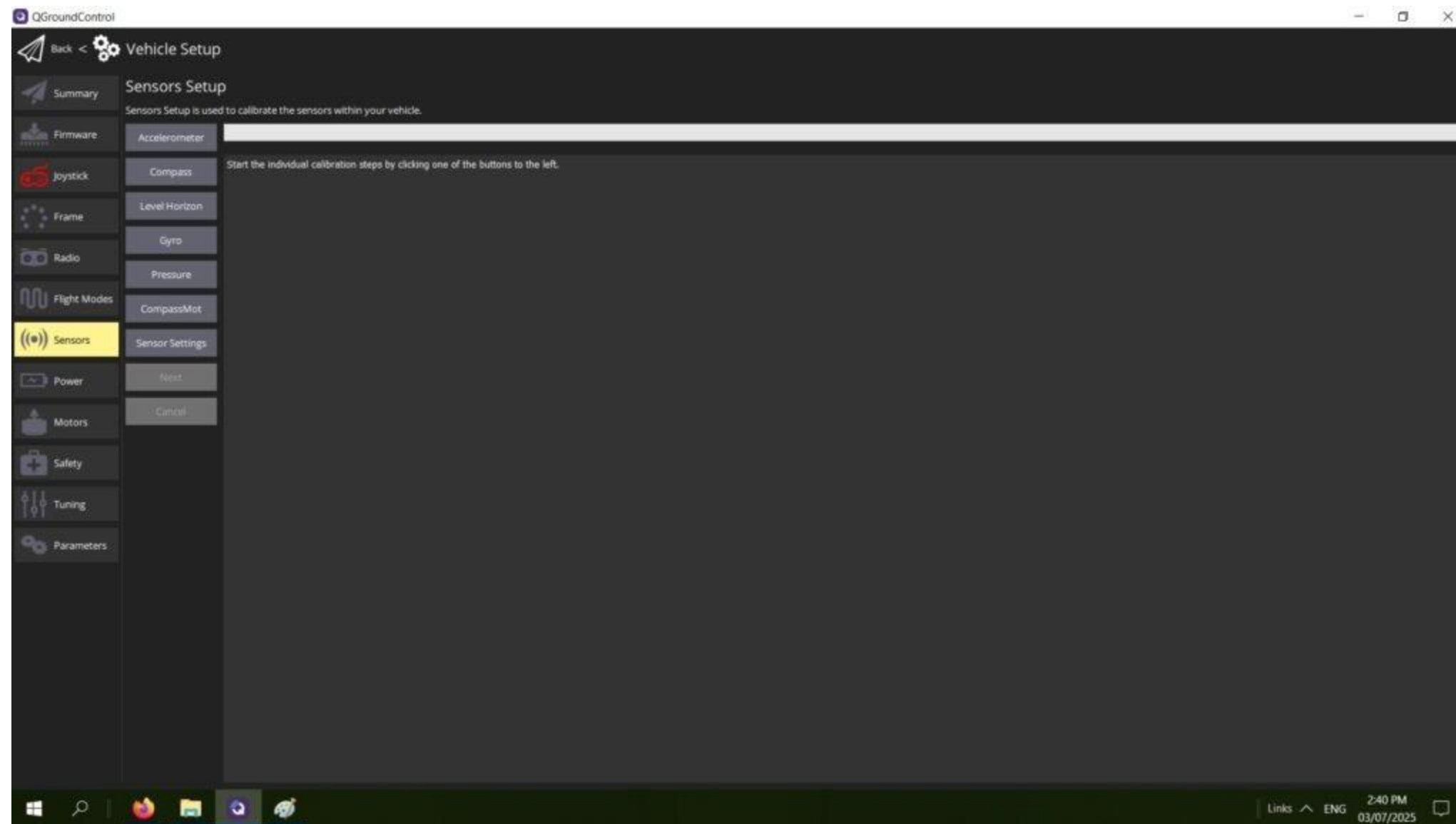
Eg.

Ch5 – Althold/Loiter/Mission

Ch6 – Arm/Disarm

Ch7 - Payload

# SENSORS



## Sensors

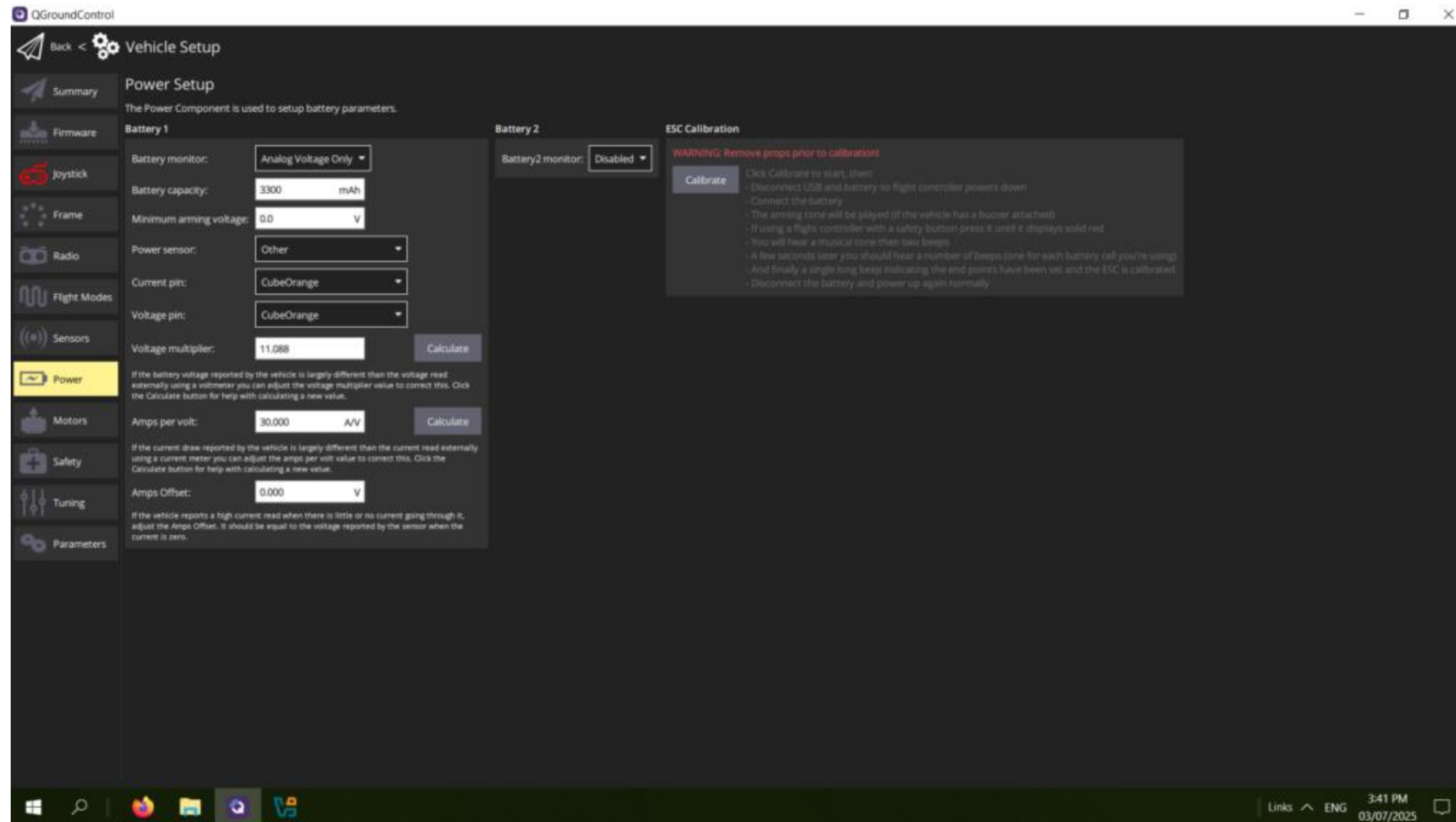
IMU setup and Calibrations ,  
you need to follow the  
instruction on how to orientate  
your drones to calibrate it and  
require Reboot .

This calibrates the  
Magnetometer  
Gyro Accelerometer  
Horizon

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/sensors\\_ardupilot.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/sensors_ardupilot.html)



# POWER



## Power

setup your power management parameters

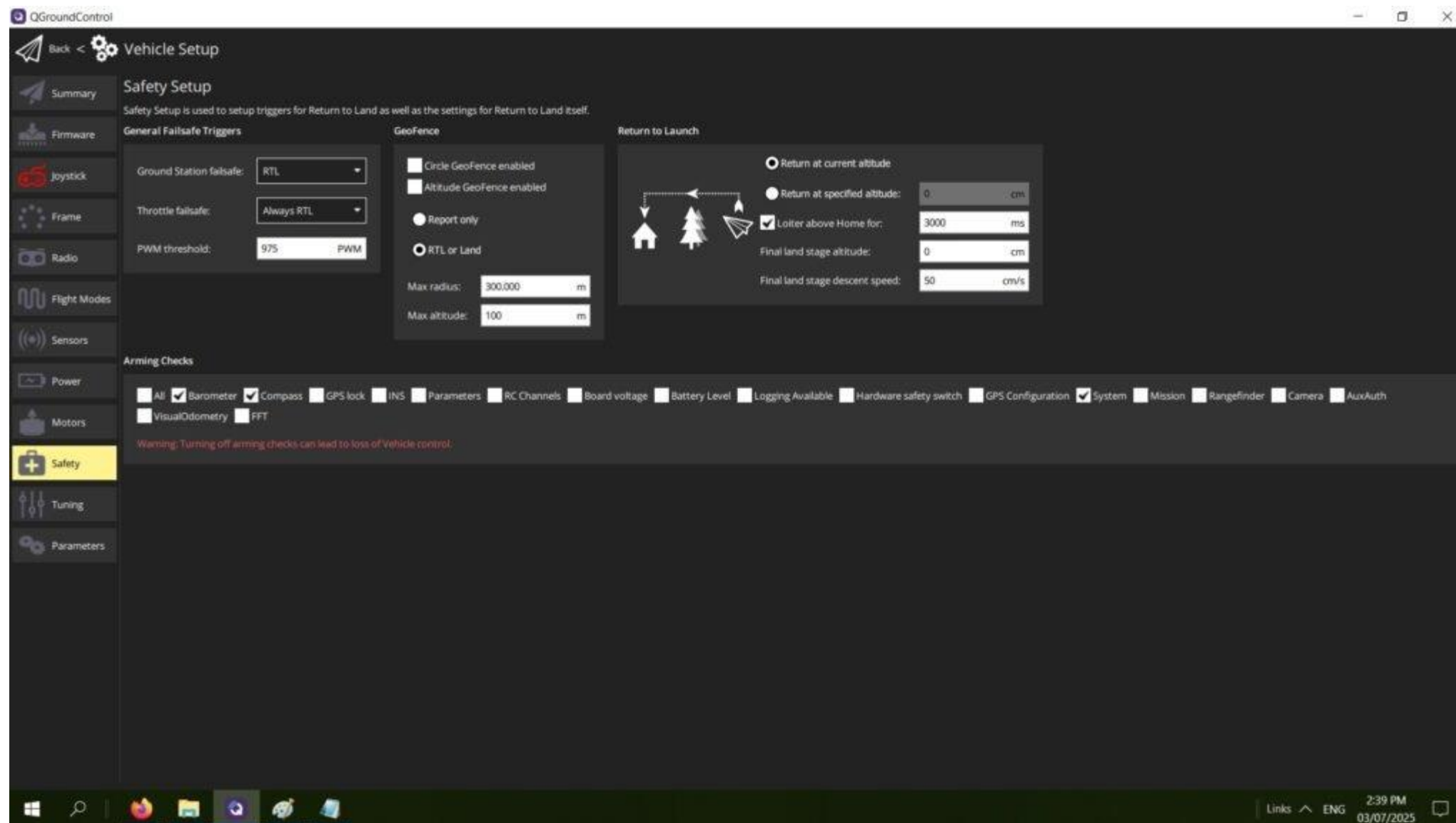
Voltage test your batteries before plugging them in the drone

Use the test information as baseline to calibrate your voltage

Adjust multiplier when needed

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/power.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/power.html)

# SAFETY



## Safety

This setup the failsafe mode what the drone would do if it gets disconnected from RC or Telemetry

This specify the various trigger and action the would do

### General Trigger

- Ground station – loss telemetry
- Throttle – thrust loss error
- PWM – PWM as set by your receiver which is zero throttle when disconnected

### Geofence

- When your drone exceed the perimeter

### Return to Launch

This is refer to the action the drone needs to perform

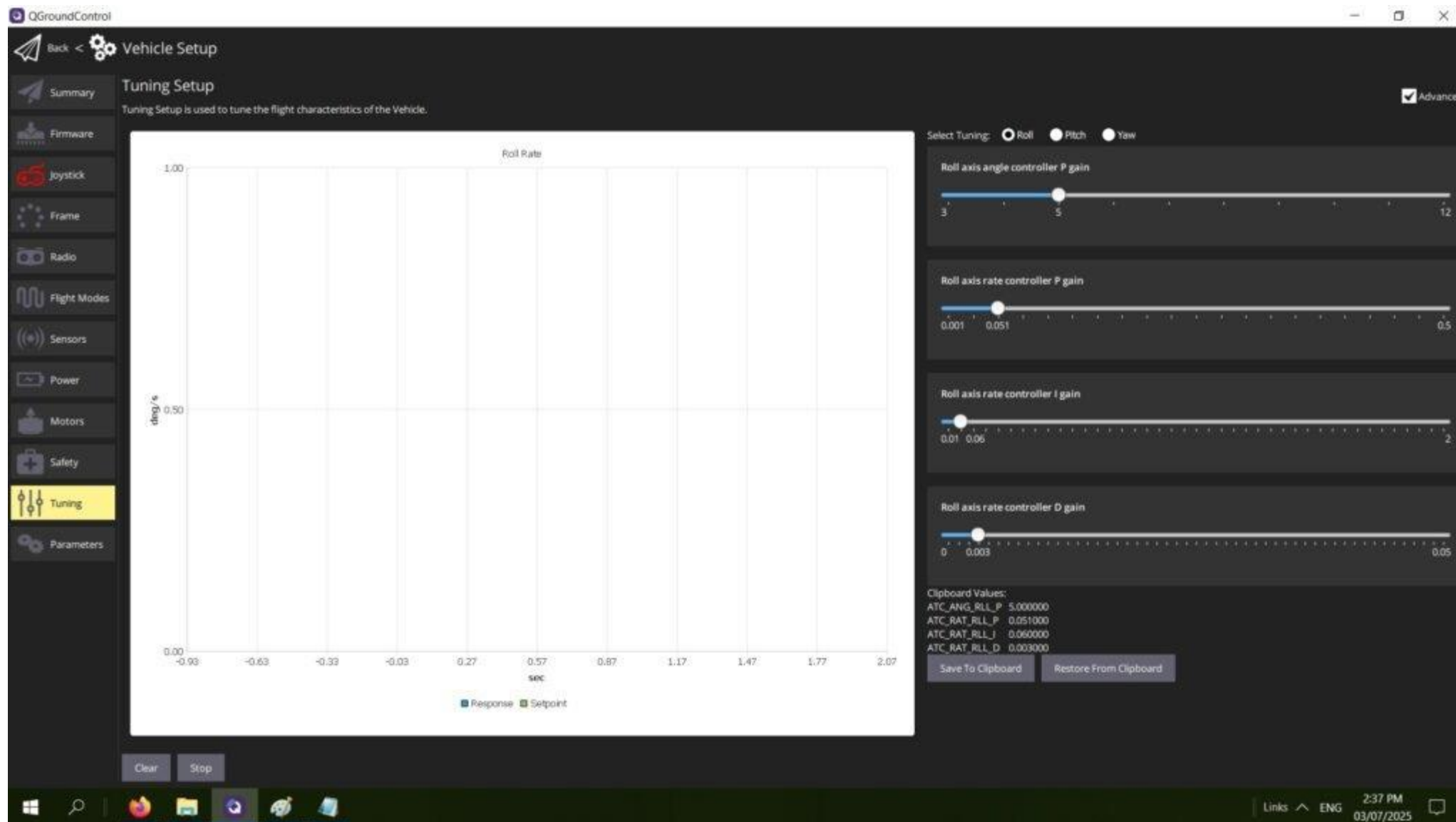
### Arming checks

This checks the condition of your drone status

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/safety.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/safety.html)



# TUNING



## Tuning

this is where you Tune your PIDS and stability of the drone . **NOTE: Ardupilot default are design for 450mm - 650mm 10" -15" drones**

Select Advance and set the PIDS from here

## Synerduino 250mm Drone PID setting

### Roll

ATC\_ANG\_RLL\_P 5.000000

ATC\_RAT\_RLL\_P 0.051000

ATC\_RAT\_RLL\_I 0.060000

ATC\_RAT\_RLL\_D 0.003000

### Pitch

ATC\_ANG\_PIT\_P 5.000000

ATC\_RAT\_PIT\_P 0.051000

ATC\_RAT\_PIT\_I 0.060000

ATC\_RAT\_PIT\_D 0.003000

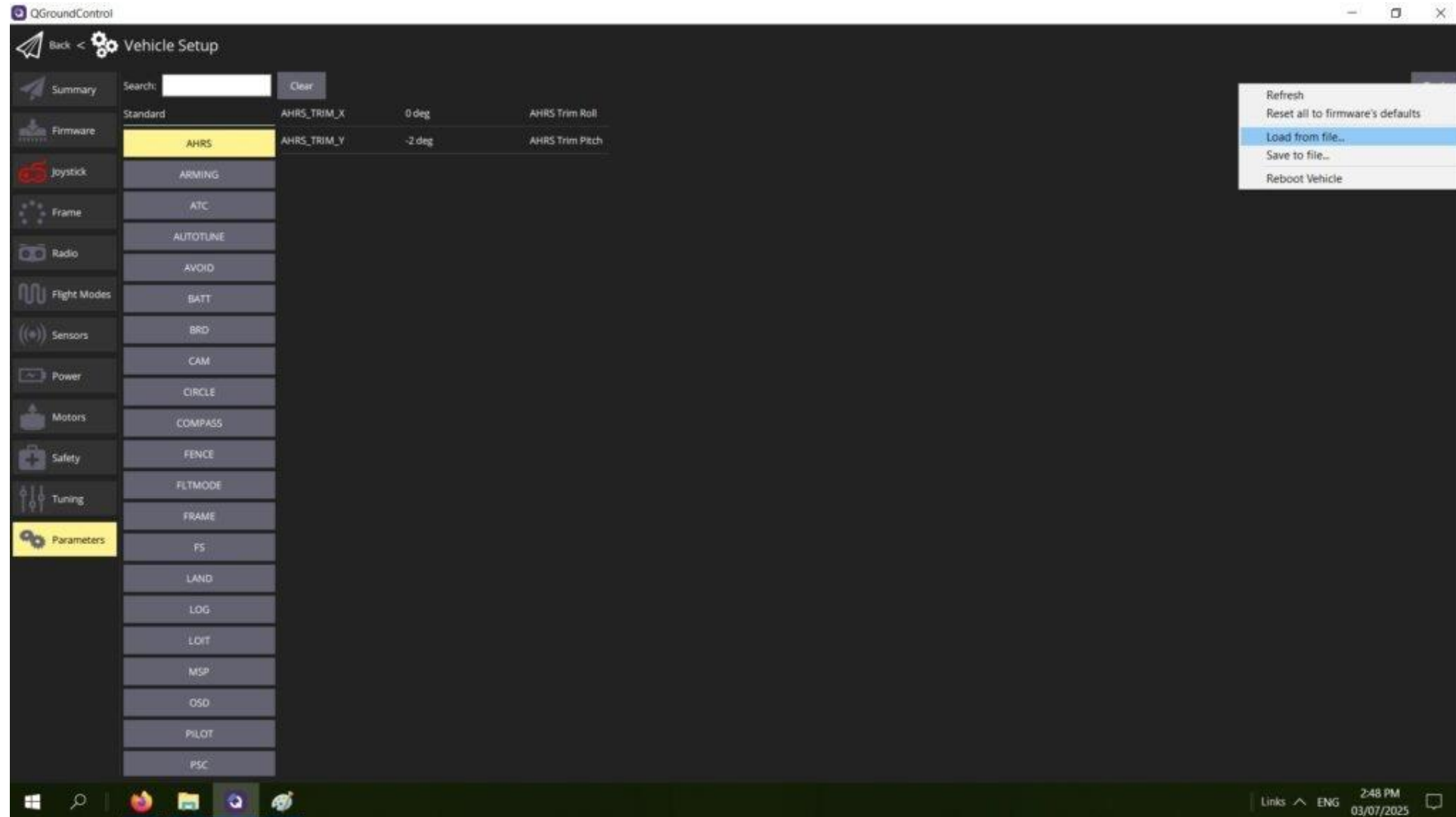
### Yaw

ATC\_ANG\_YAW\_P 4.500000

ATC\_RAT\_RLL\_P 0.180000

ATC\_RAT\_RLL\_I 0.018000

# PARAMETERS



## Parameters

### For other setting

Sometimes the drone is too large or too small from default , new sensors added , or Pin assignment of your ADC or PWM would require a parameter change

Synerduino 250mm F405 Drone has a downloadable preset of parameter files [Synerduino-250mm-Arducopter-4.7.0.zip](#)

<https://synerflight.com/synerduino-documentation/q-ground-synerduino-quick-setup/>

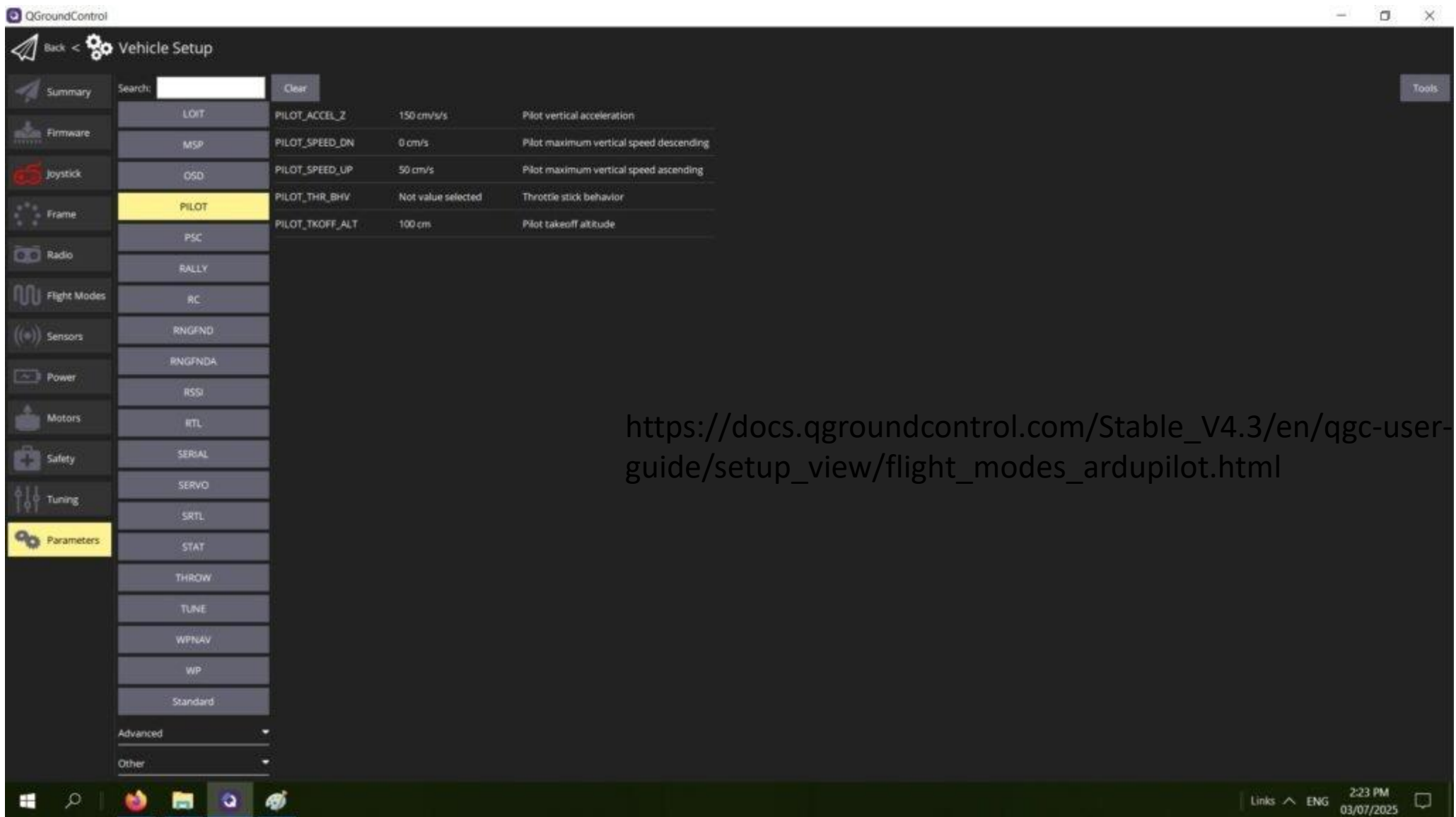
To know more details

<https://ardupilot.org/copter/docs/parameters.html#parameters>

[https://docs.qgroundcontrol.com/Stable\\_V4.3/en/qgc-user-guide/setup\\_view/tuning\\_arducopter.html](https://docs.qgroundcontrol.com/Stable_V4.3/en/qgc-user-guide/setup_view/tuning_arducopter.html)



# PARAMETERS



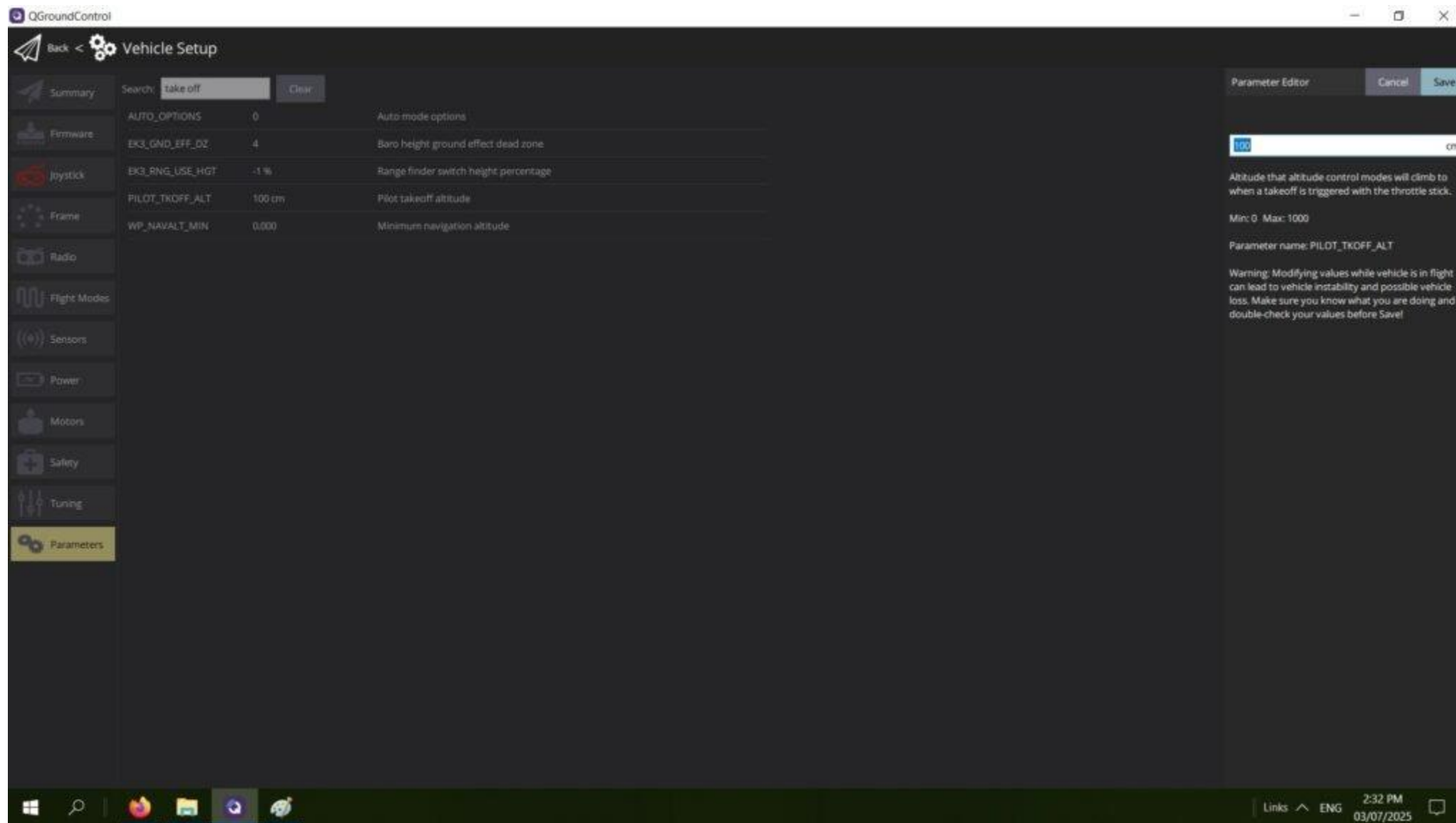
## Parameters

Synerduino 250mm drone because of its small size can have some unusual Behavior that is different from default we are going to run over a few of them

## PILOT

PILOT\_SPEED\_UP 50 CM/S – this controls the climb rate of the drone .

# PARAMETERS



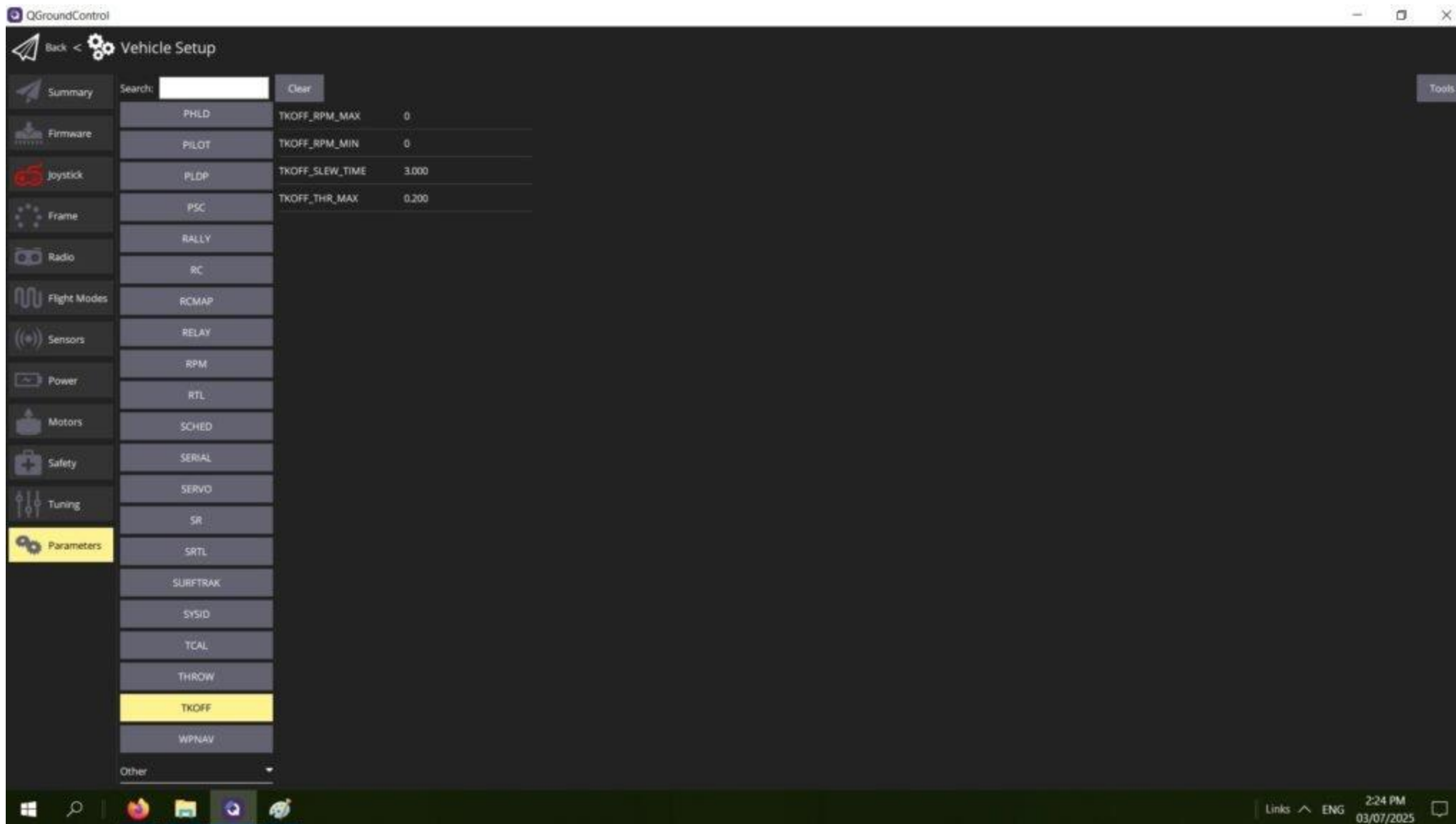
## Parameters

Default altitude the drone would climb when auto take off is initiated

## PILOT\_TKOFF\_ALT

PILOT\_TKOFF\_ALT set to 100cm – this is the Altitude the drone would climb to when auto take off is selected. or in the start of the mission by default

# PARAMETERS



## Parameters

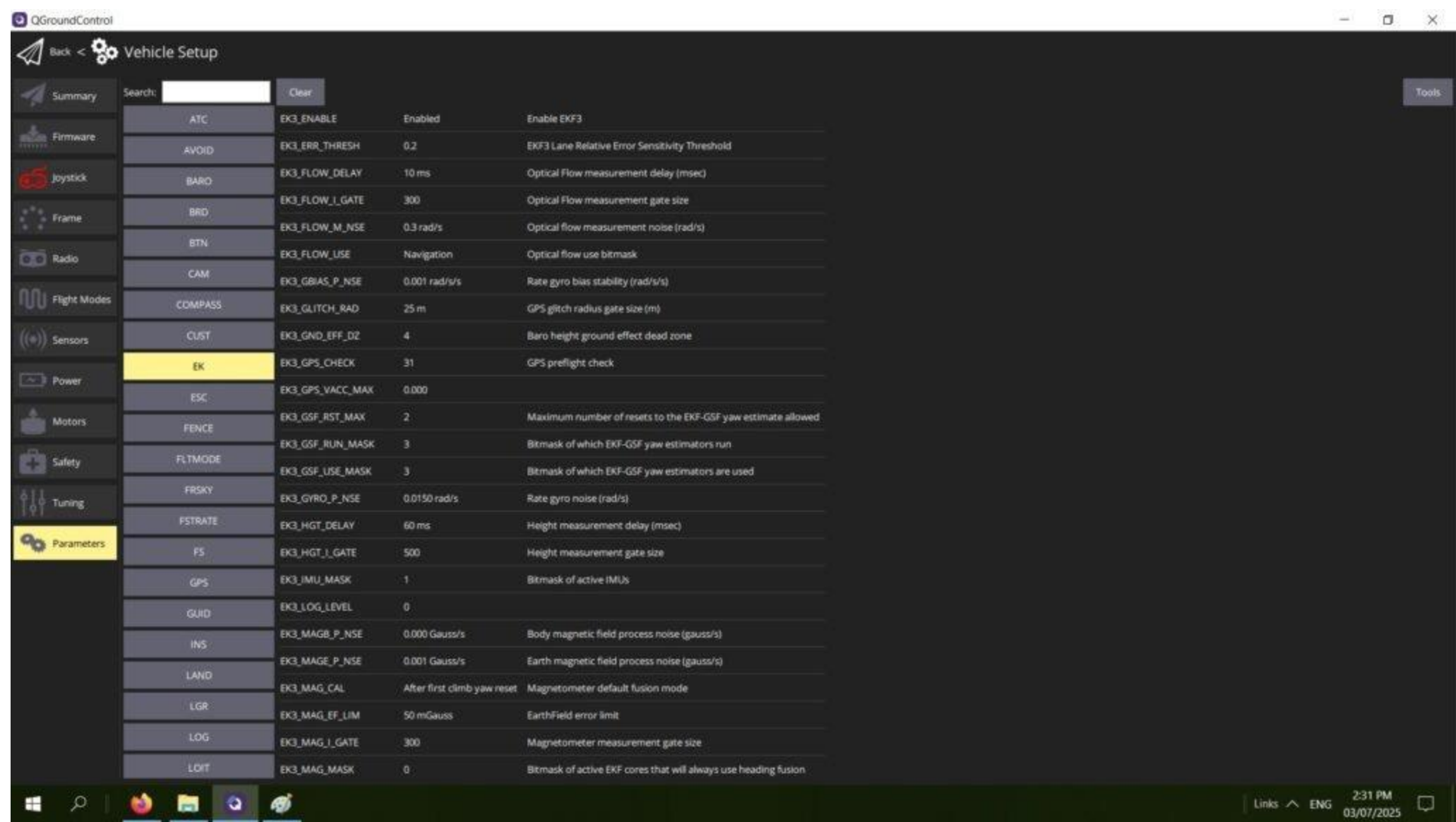
Take off settings

**TKOFF\_SLEW\_TIME 3.000** – 3 seconds allow the motor to spool up after arm then take off. this is set to 5 Seconds for Large drones as it takes longer to get the Motors at Idle speed

**TKOFF\_THR\_MAX – 0.200** Synerduino 250 is light so a little throttle is require to take off Maximum throttle engage . this jumps the drone to the determine take off altitude . larger drone may require 0.400



# PARAMETERS



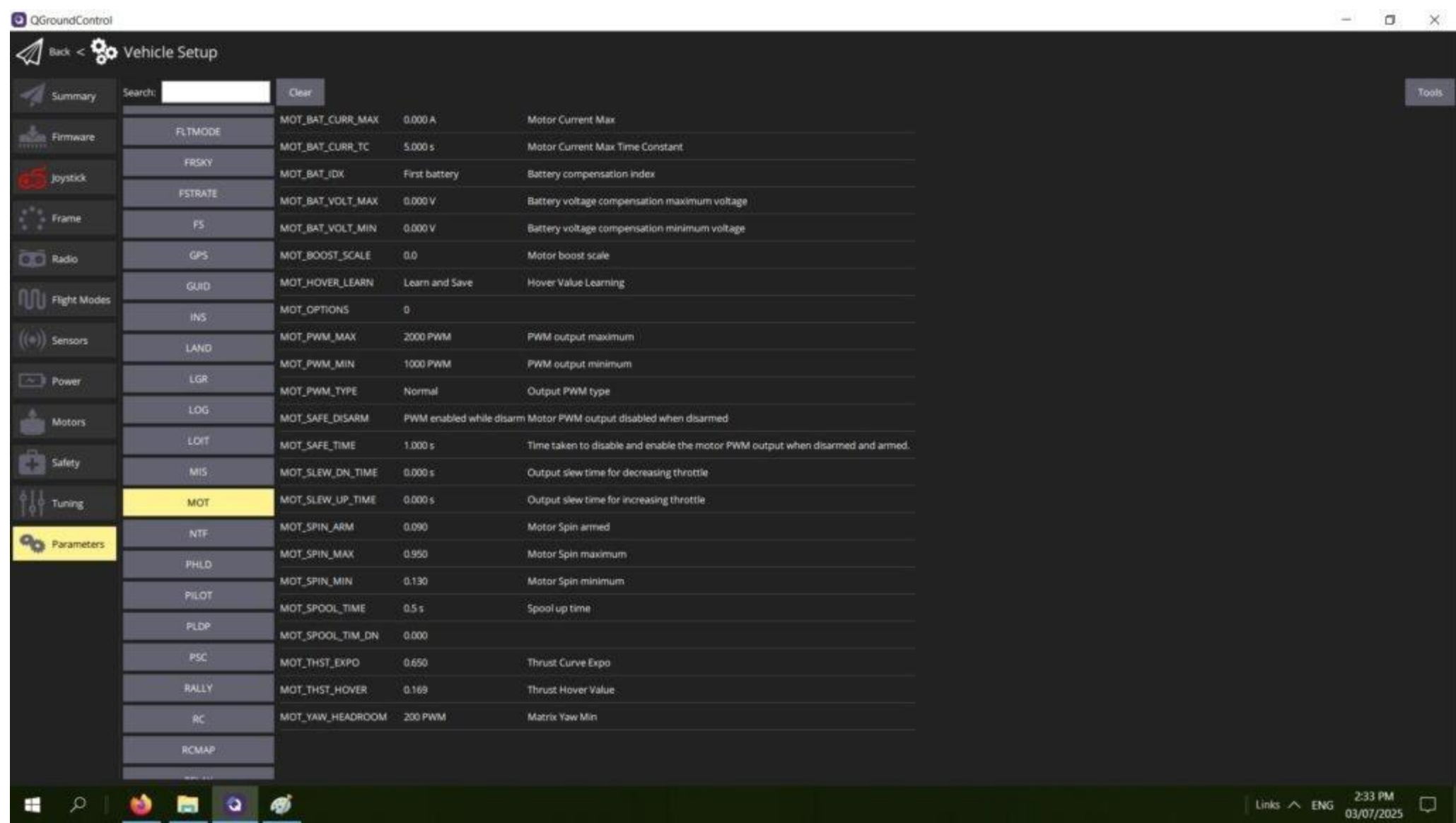
Summary	Search:	Clear		
Firmware	ATC	EKF_ENABLE	Enabled	Enable EKF3
Joystick	AVOID	EKF_ERR_THRESH	0.2	EKF3 Lane Relative Error Sensitivity Threshold
Frame	BARO	EKF_FLOW_DELAY	10 ms	Optical Flow measurement delay (msec)
Radio	BRO	EKF_FLOW_I_GATE	300	Optical Flow measurement gate size
Flight Modes	BTN	EKF_FLOW_M_NSE	0.3 rad/s	Optical flow measurement noise (rad/s)
Sensors	CAM	EKF_FLOW_USE	Navigation	Optical flow use bitmask
Power	COMPASS	EKF_GBIAS_P_NSE	0.001 rad/s/s	Rate gyro bias stability (rad/s/s)
Motors	CUST	EKF_GLITCH_RAD	25 m	GPS glitch radius gate size (m)
Safety	EK	EKF_GND_EFF_DZ	4	Baro height ground effect dead zone
Tuning	ESC	EKF_GPS_CHECK	31	GPS preflight check
Parameters	FENCE	EKF_GPS_VACC_MAX	0.000	
	FLTMODE	EKF_GSF_RST_MAX	2	Maximum number of resets to the EKF-GSF yaw estimate allowed
	FRSKY	EKF_GSF_RUN_MASK	3	Bitmask of which EKF-GSF yaw estimators run
	FSTRATE	EKF_GSF_USE_MASK	3	Bitmask of which EKF-GSF yaw estimators are used
	FS	EKF_GYRO_P_NSE	0.0150 rad/s	Rate gyro noise (rad/s)
	GPS	EKF_HGT_DELAY	60 ms	Height measurement delay (msec)
	GUID	EKF_HGT_I_GATE	500	Height measurement gate size
	INS	EKF_IMU_MASK	1	Bitmask of active IMUs
	LAND	EKF_LOG_LEVEL	0	
	LGR	EKF_MAGB_P_NSE	0.000 Gauss/s	Body magnetic field process noise (gauss/s)
	LOG	EKF_MAGE_P_NSE	0.001 Gauss/s	Earth magnetic field process noise (gauss/s)
	LOIT	EKF_MAG_CAL	After first climb yaw reset	Magnetometer default fusion mode
		EKF_MAG_EF_LIM	50 mGauss	EarthField error limit
		EKF_MAG_I_GATE	300	Magnetometer measurement gate size
		EKF_MAG_MASK	0	Bitmask of active EKF cores that will always use heading fusion

## Parameters

### Take off settings

**EK3\_GND\_EFF\_DZ 4** – small drones are affected by ground effect so allowance of a dead zone allow the barometer to adjust and compensate sometimes jumping the copter on takeoff to clear it.

# PARAMETERS



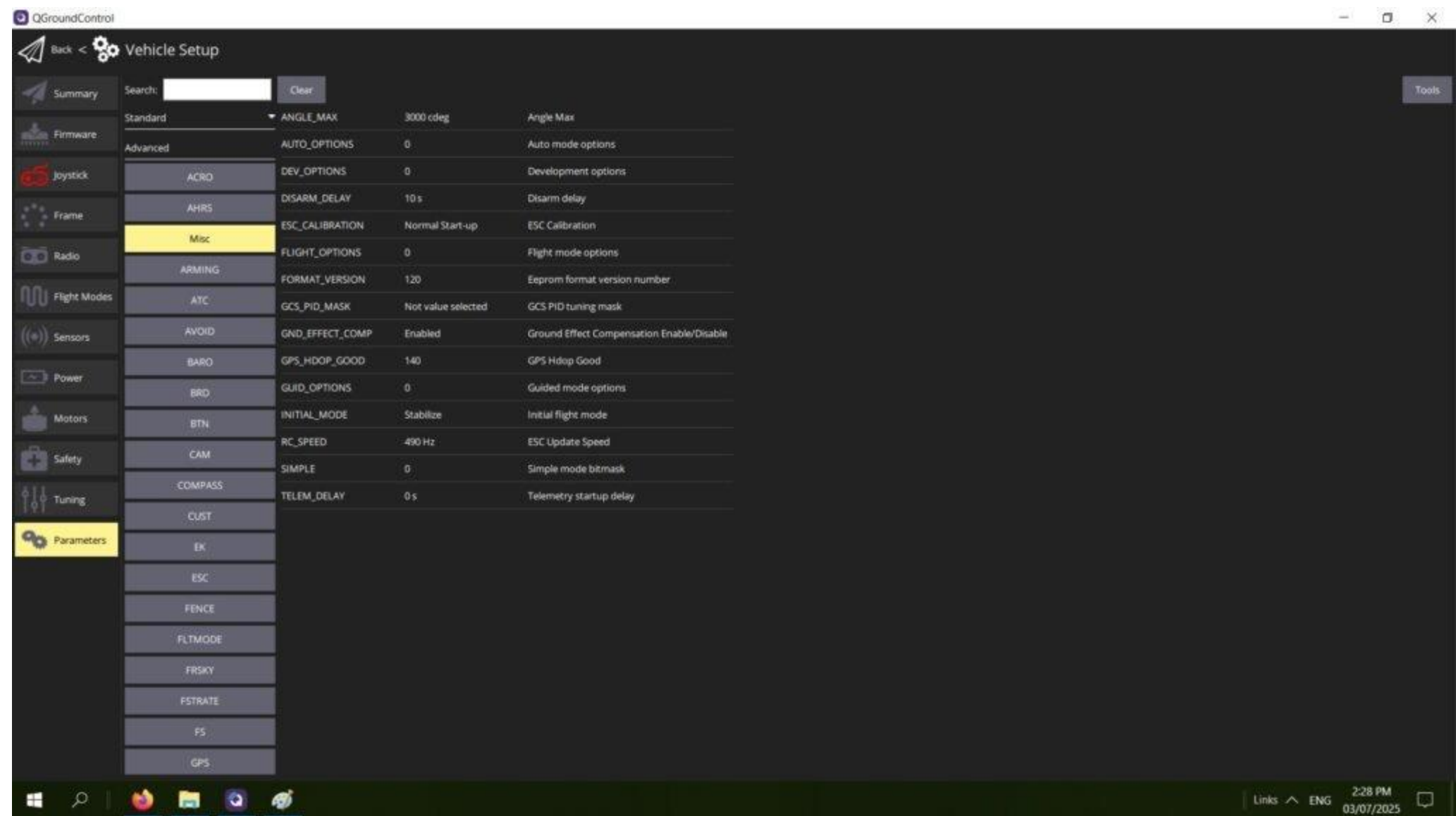
## Parameters

### Arm settings

MOT\_SPOOL\_TIME 0.5 – this is ok for small drones however Large drones can take upto 2.0 to spool the motor up to idle mode. the must be set less than TKOFF\_SLEW\_TIME

MOT\_SPIN\_ARM 0.090 – Idle Speed of the motor after arming

# PARAMETERS



## Parameters

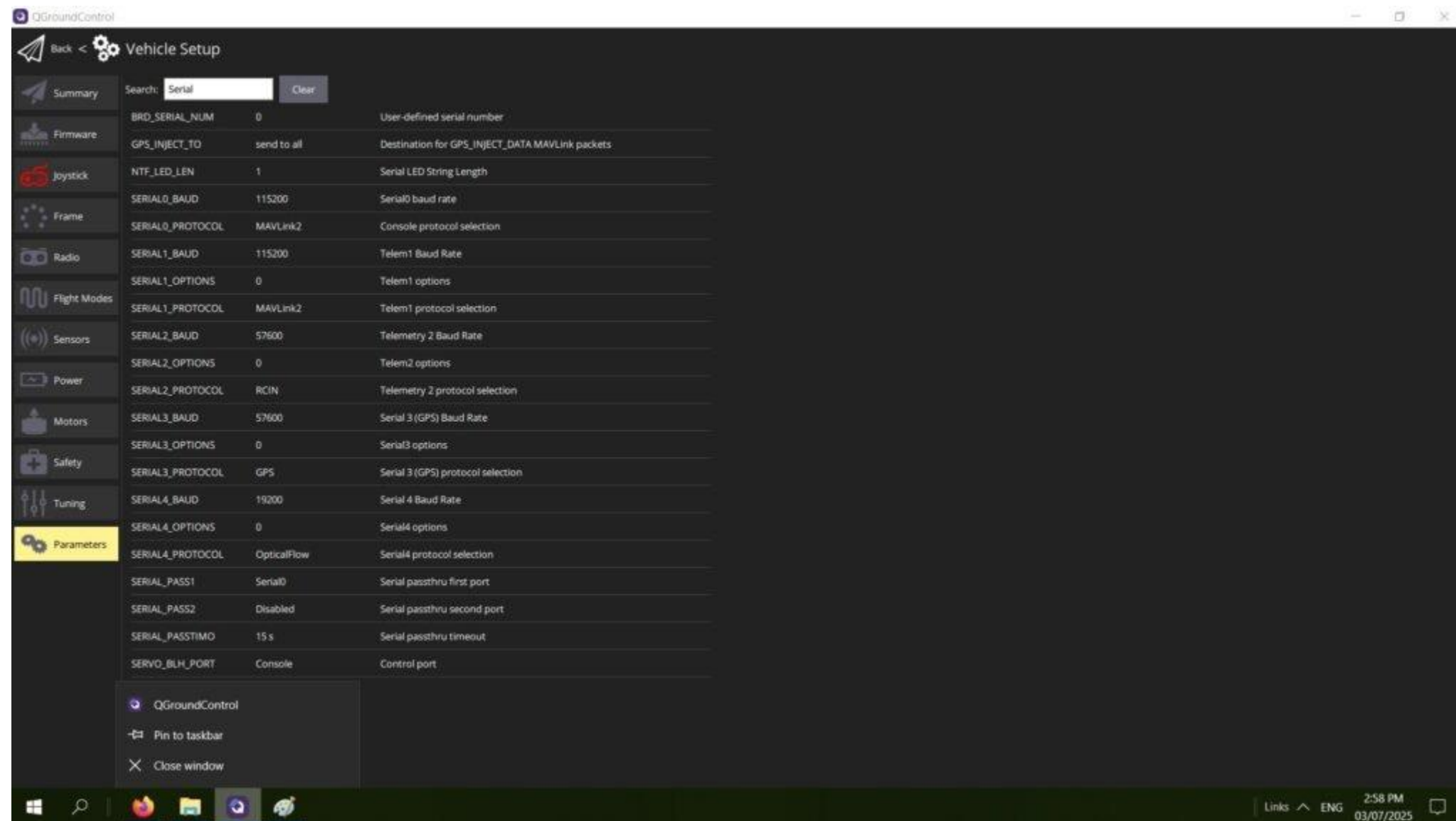
Ground effect this affect any drones sizes  
adjust accordingly

MSK

GND EFFECT\_COMP – the is active to  
compensate for ground effect



# PARAMETERS

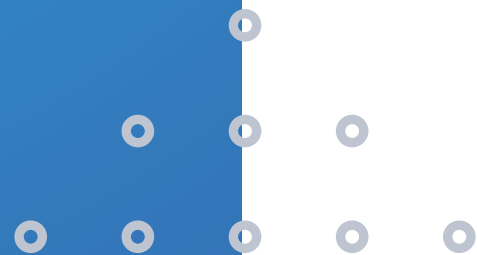


Here you can set the serial assignment which device is connected and its baud rate

## SERIAL

- Serial1 – UART1 – Mavlink2 – Tel
- Serial2 – UART2 – RCIN – SerialRC
- Serial3 – UART4 – GPS – Set Baud 57600
- Serial4 – UART6 – 0

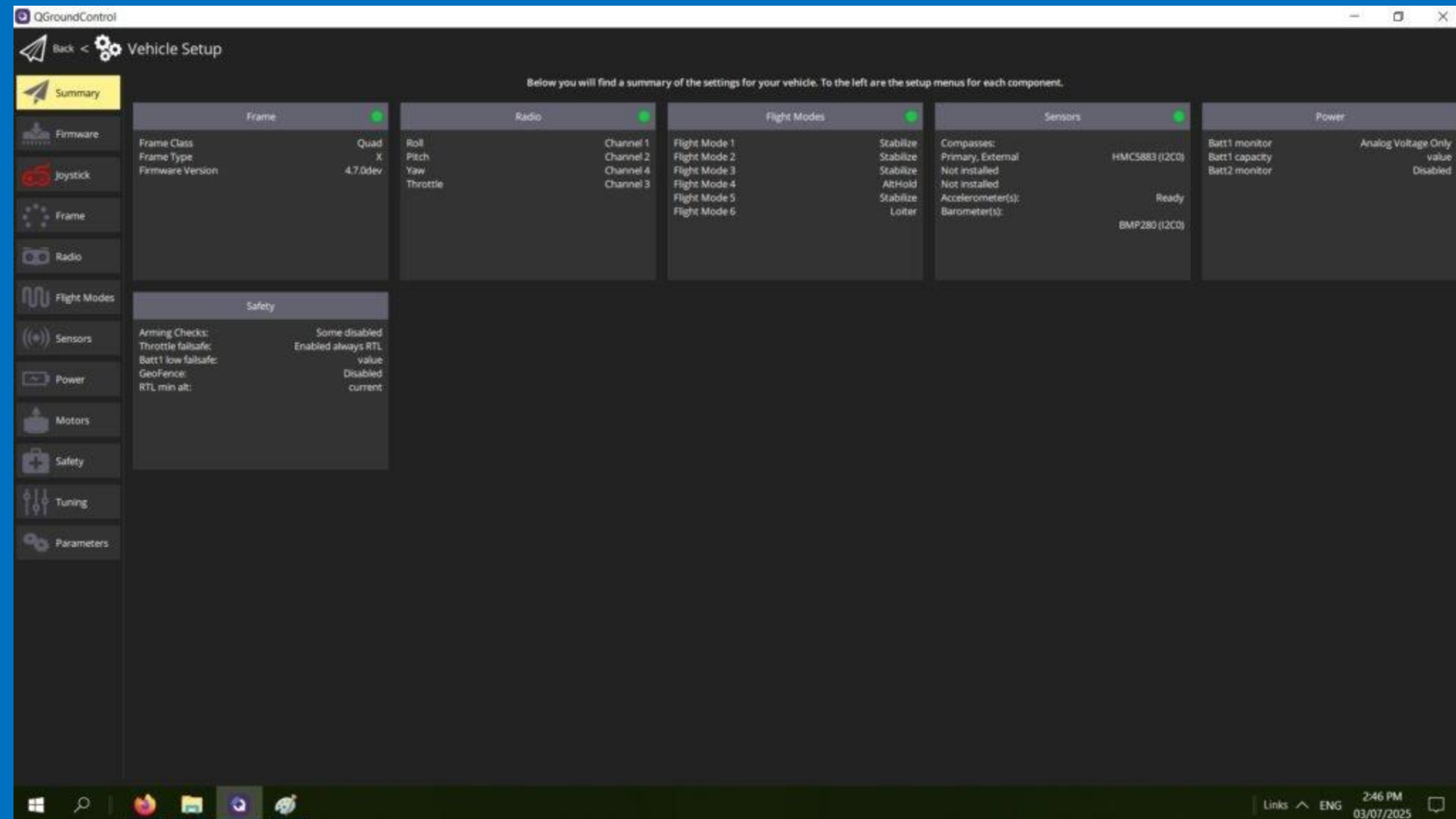
# TESTING



# SYSTEM CHECKS

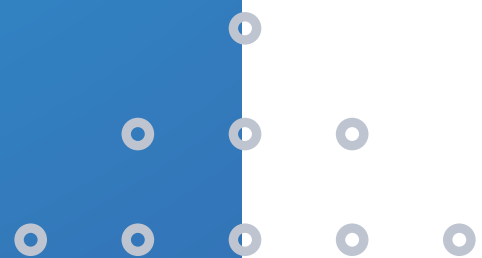
## NOTE:

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





# PRE-FLIGHT



# PREFLIGHT

## NOTE:

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

