

INAV Guide

Synerduino STM

VERSIONS: F405, F411, H743

For more Information:
www.synerflight.com

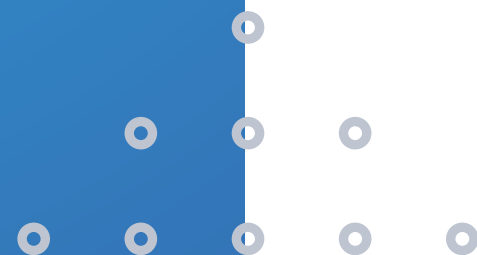


INTRODUCTION

Installation

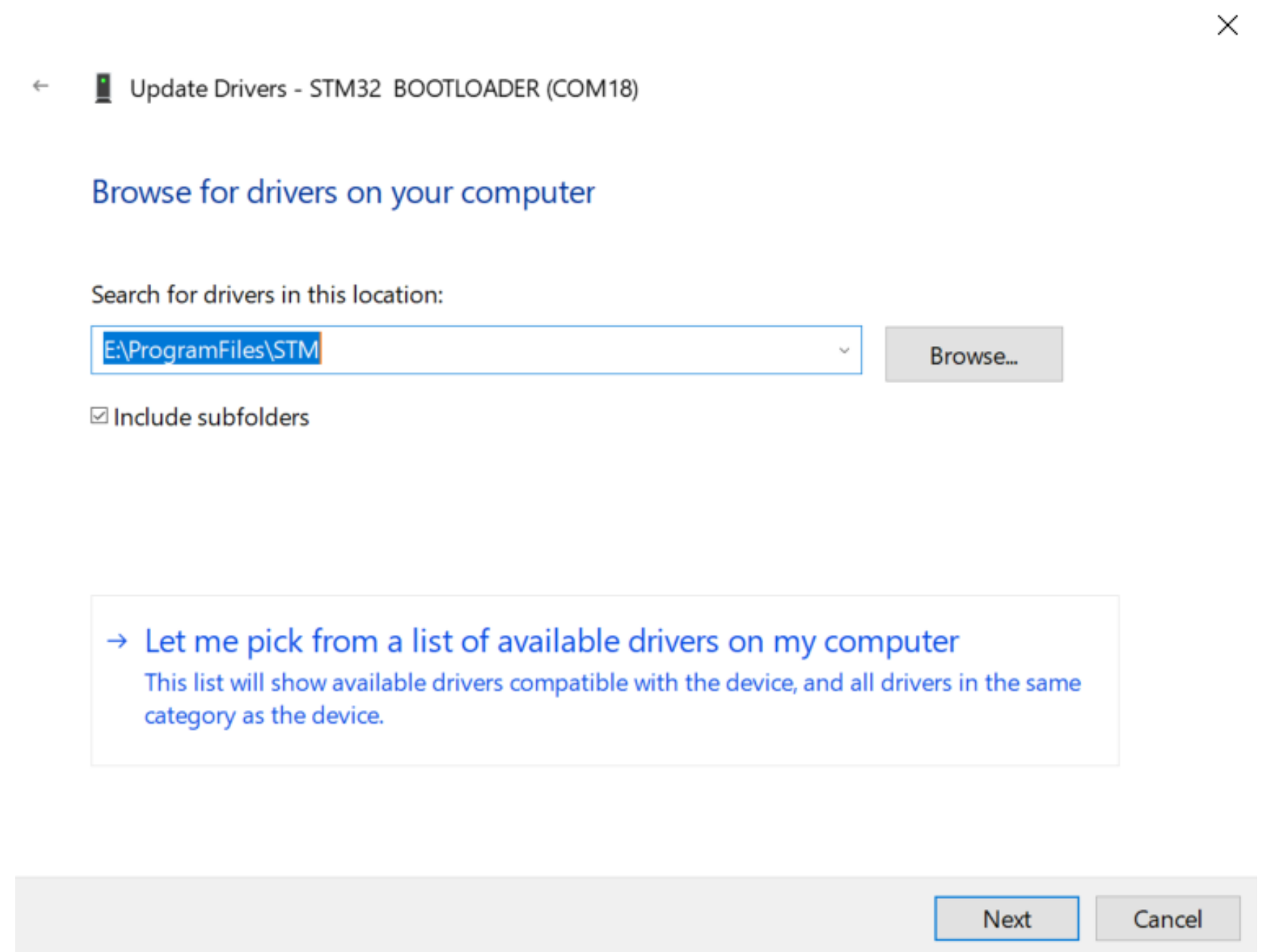
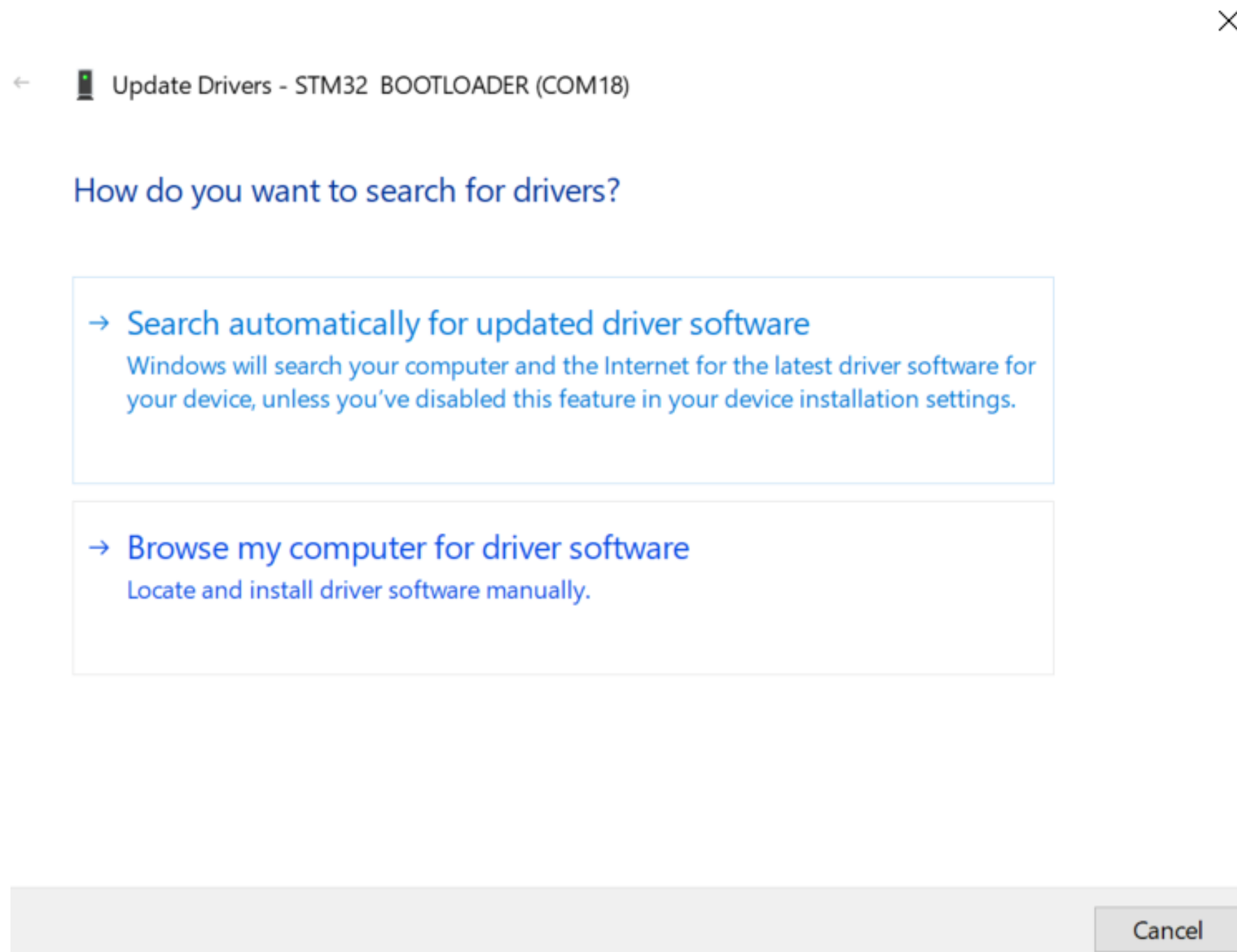
- Firmware
- Setup
- Configuration

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

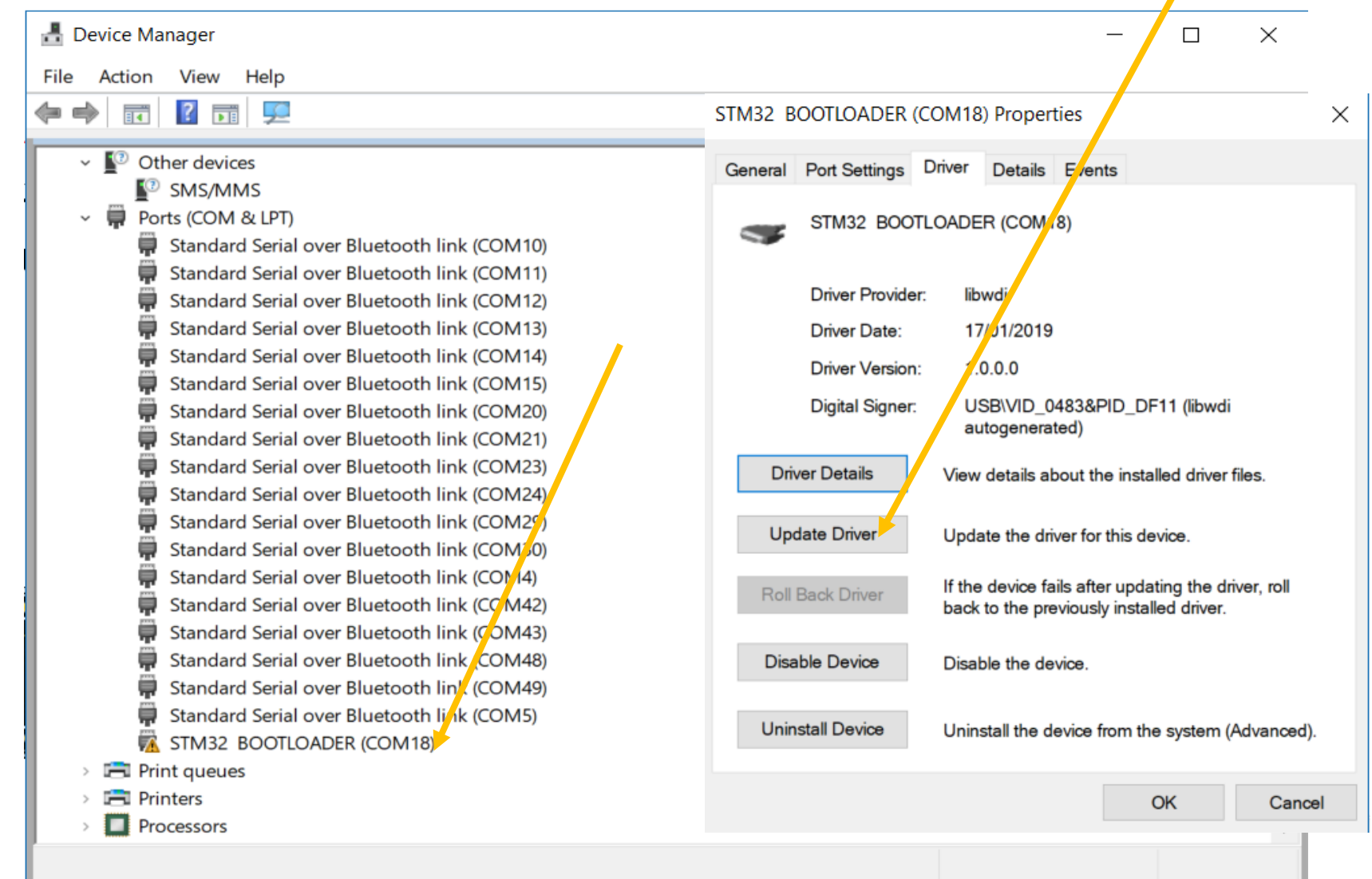
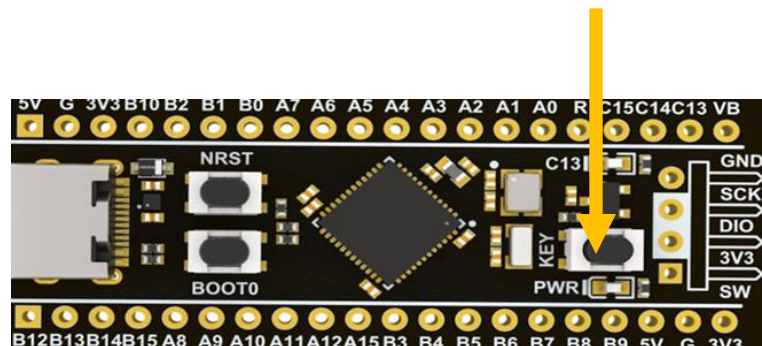
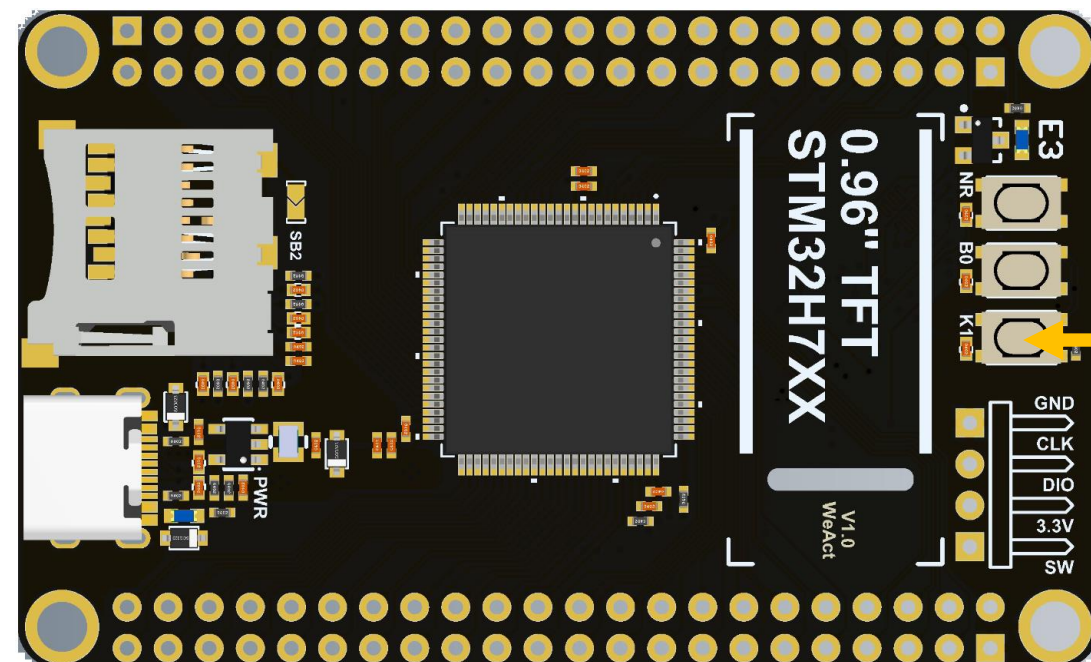
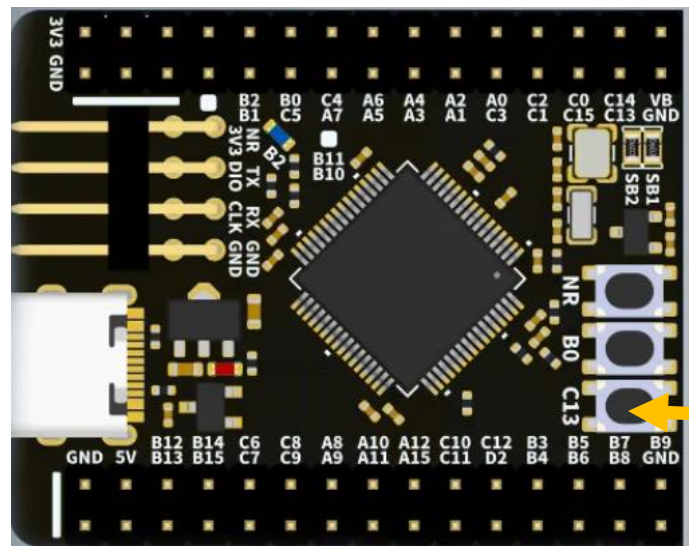
Windows has finished installing the drivers for this device:

 STM32 Bootloader

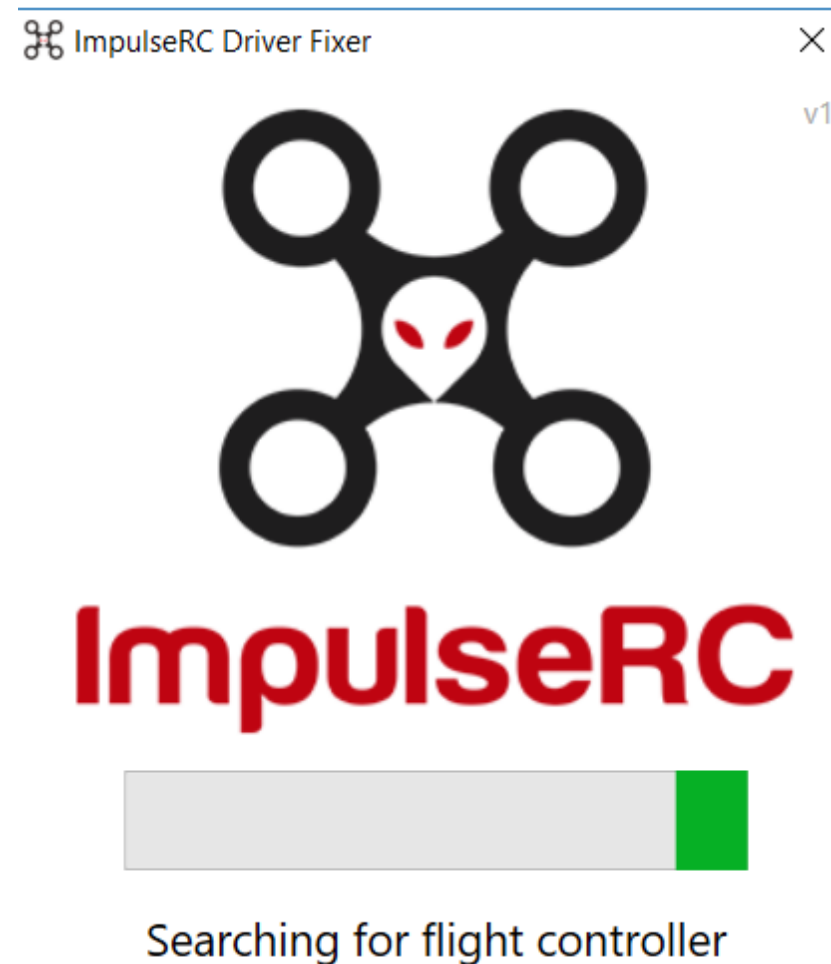
Close

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

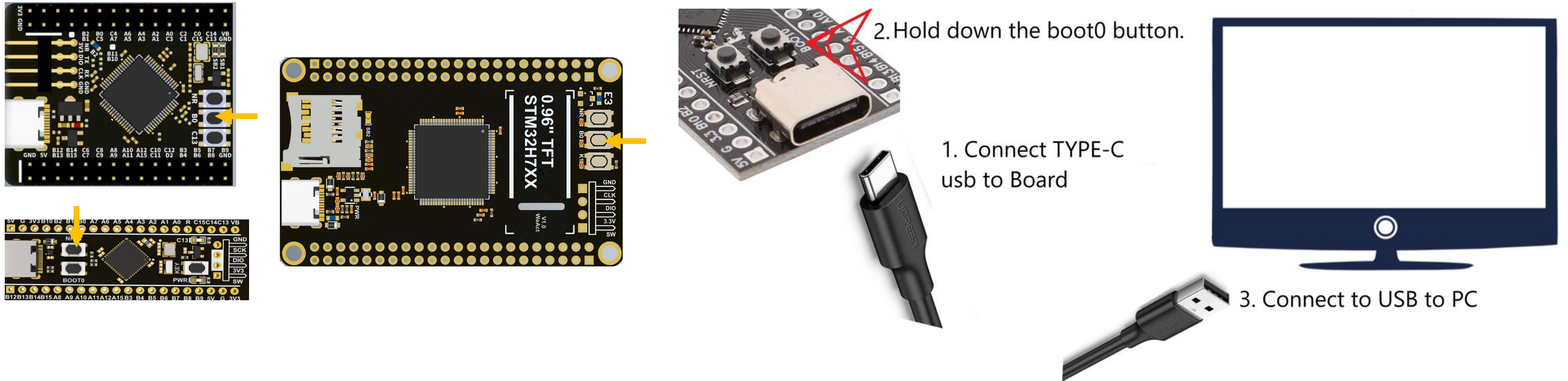


ImpulseRC Driver Fixer

https://impulserc.blob.core.windows.net/utilities/ImpulseRC_Driver_Fixer.exe

- 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



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
(only to be use on a pre flashed blackpill)

F411 DFU mode can sometimes take several attempts as Windows may not recognize the device mode
Its require to preheat heat the chip to 25c with your finger for some Reason.

Synerduino STMF411board a preheat can be made by running the board with the battery for 1 min

FIRMWARE INSTALLATION



- Start INAV configurator
- Connect the FC USB to the PC while holding the boot button in.
- INAV configurator should show it's connected in DFU mode in the top right corner (DO NOT click the CONNECT button)
- Choose the latest hex file for your FC and then "Load Firmware local". Once loaded, click "Flash Firmware".

Download Configurator for Windows platform (win32 or win64 is present) Extract ZIP archive Run INAV Configurator app from unpacked folder Configurator is not signed, so you have to allow Windows to run untrusted application. There might be a monit for it during first run

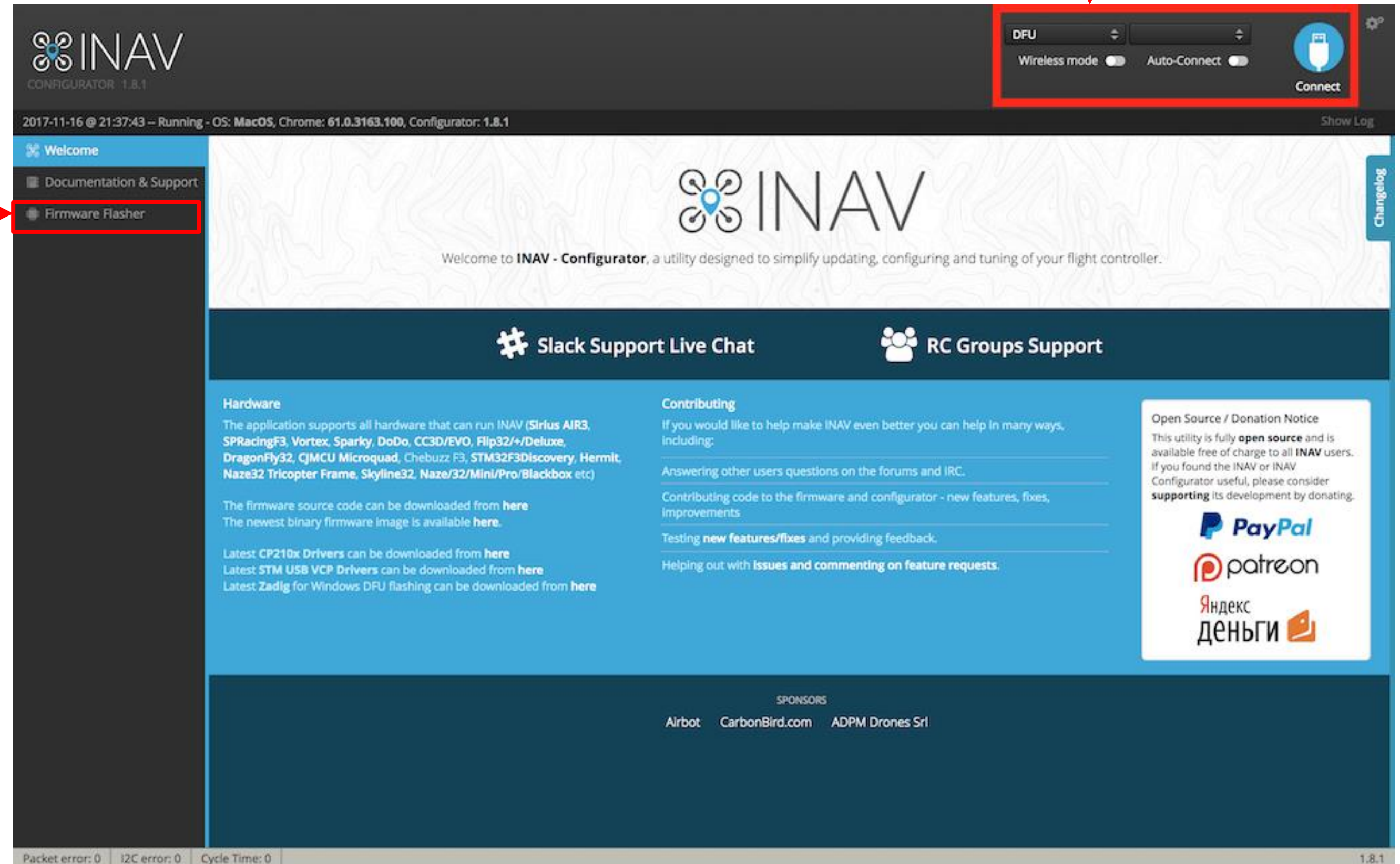
FIRMWARE INSTALLATION

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

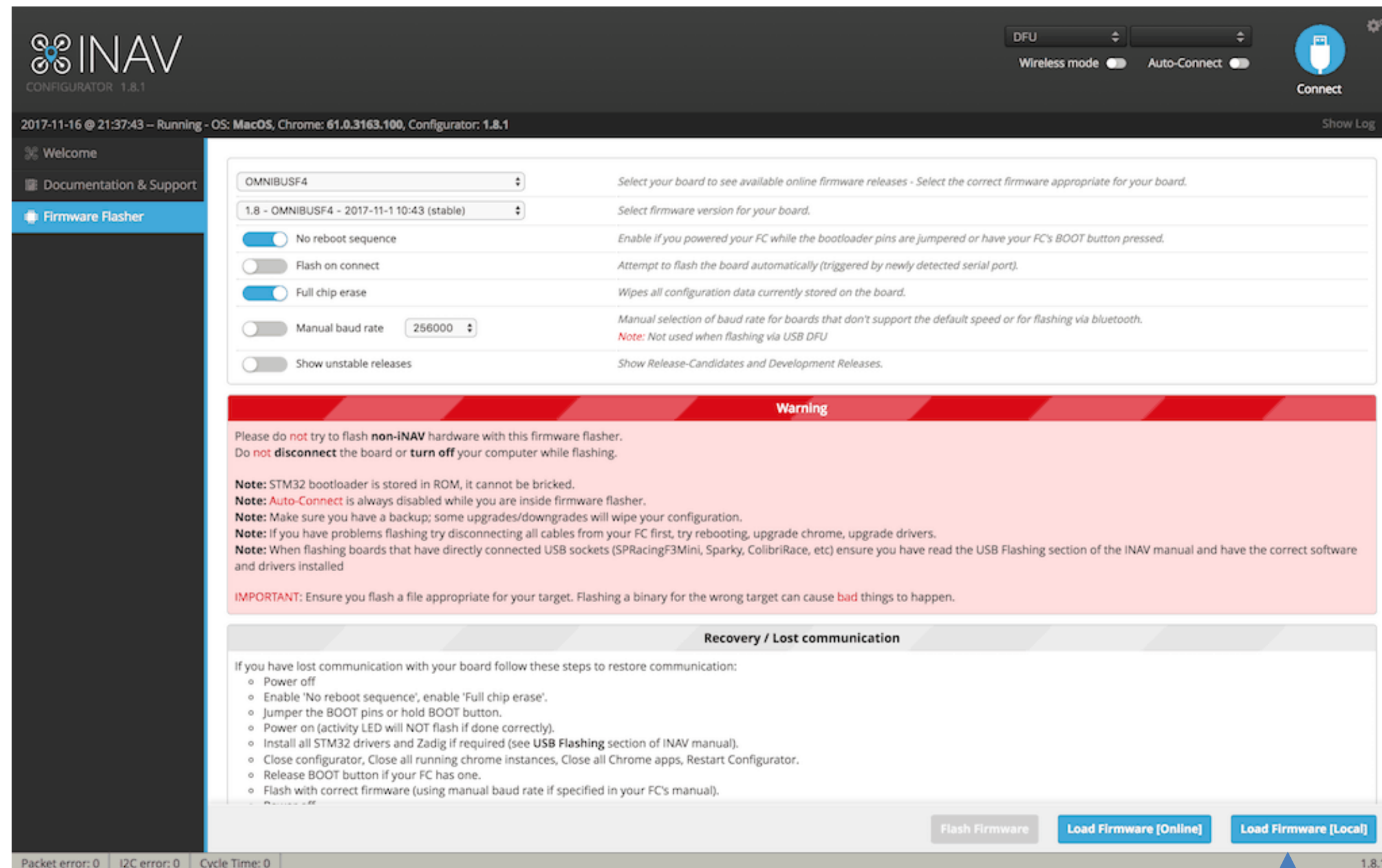
Next, click on the Firmware Flasher tab

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

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



FIRMWARE INSTALLATION



Synerduino STM Hex files are available at Downloads Tab

Next, click on the Firmware Flasher tab and select your correct board and the latest release of the firmware, make sure “Full Chip Erase” is selected and click Load Firmware Local and Select the hex File that matches the version of your configurator and Shield Board

Once this process is Done and Rebooted you can now select your Serial Com port and Connect to the Synerduino STM Shield

Load Firmware [Local]

Look for the

INAV 5.1.0 – INAV8.0.0
SynerduinoSTMF411.hex
SynerduinoSTMF405.hex
SynerduinoSTMH743.hex

SETTING UP YOUR DRONE

SETUP

After the Firmware installation you may connect normally to the board using the Com and baud assign to it (115600) default baud

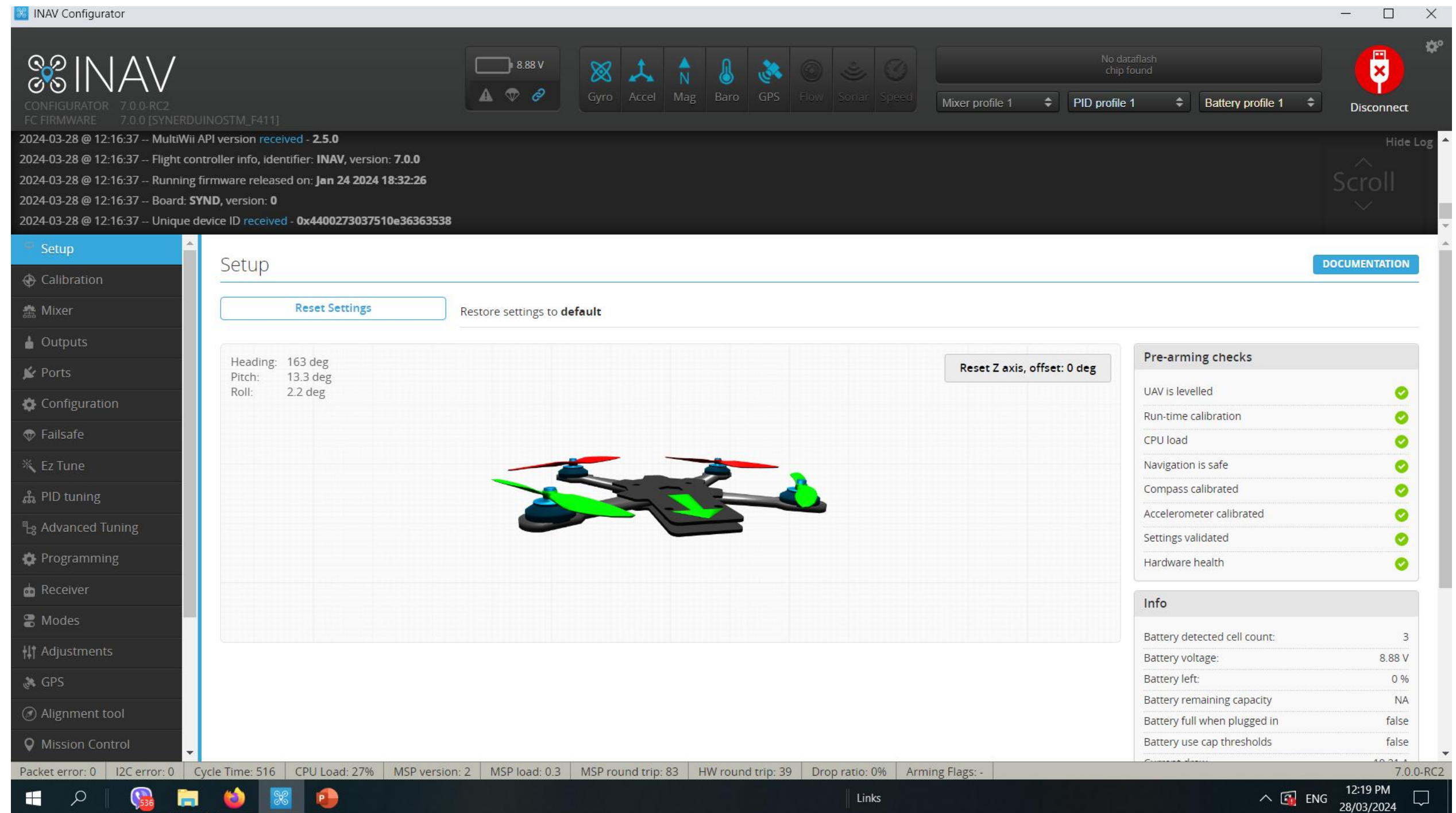
This is where you check the Status of your drone

Frame type ,orientation and other important information

Ensure all Pre-Arming checks are in the Green otherwise pls check the configuration or hardware of issue

The Tab on top indicates the Sensors and status

Red means it has issue
Blue is Active
Grey out is not available



SETTING UP YOUR DRONE

CALIBRATION

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

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 7.0.0-RC2, and flight controller information. A sidebar on the left lists various setup options, with 'Calibration' selected. The main area shows six calibration steps, each with a drone icon and a checkmark indicating completion. Below the steps is a table for 'Accelerometer Values'. On the right, there are sections for 'Calibrate Compass' and 'Optic Flow Calibration'.

INAV Configurator
CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0
2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26
2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Calibration Steps:

- Step 1: [Drone icon] ✓
- Step 2: [Drone icon] ✓
- Step 3: [Drone icon] ✓
- Step 4: [Drone icon] ✓
- Step 5: [Drone icon] ✓
- Step 6: [Drone icon] ✓

Accelerometer Values

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

Calibrate Compass

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

Optic Flow Calibration

After pressing the button you have 30 seconds to hold the model in the air and tilt it to sides without moving it horizontally. Note that optic flow sensor needs to observe the surface at all times.

Calibrate Optic Flow sensor

Scale: 10.5

Save and Reboot

Packet error: 0 | I2C error: 0 | Cycle Time: 527 | CPU Load: 28% | MSP version: 2 | MSP load: 0.7 | MSP round trip: 107 | HW round trip: 38 | Drop ratio: 0% | Arming Flags: - | 7.0.0-RC2

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

SETTING UP YOUR DRONE

MIXER (INAV5-6)

Airframe or
Vehicle type
Preset and mix
selection

Load and apply
when selected
then Save
Reboot

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

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.97V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The left sidebar contains navigation options: Setup, Calibration, Mixer (selected), Outputs, Ports, Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD. The main content area is titled 'Mixer' and includes a 'Platform configuration' section with a dropdown menu set to 'Multirotor'. Below this is a 'Mixer preset' section with a 'Quad X' diagram showing four motors (1, 2, 3, 4) and a red arrow pointing up. The 'Output Mapping' section shows a table with columns S1 through S7 and rows for Output and Function. The 'Motor Mixer' section shows a table with columns for Motor, Throttle [T], Roll [A], Pitch [E], and Yaw [R]. The bottom status bar displays system metrics: Packet error: 0, I2C error: 0, Cycle Time: 3246, CPU Load: 90%, MSP version: 2, MSP load: 0.1, MSP round trip: 48, HW round trip: 18, Drop ratio: 0%, and version 5.0.0. The bottom right corner shows the date and time: 6:07 PM, 23/07/2022.

INAV Configurator

INAV
CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

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

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

Mixer

Platform configuration

Multirotor Platform type
Multirotor
Airplane
Tricopter
Rover
Boat
Other

Mixer preset

Quad X

Mixer wizard Load and apply Load mixer

Output Mapping

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

Motor Mixer

Motor	Throttle [T]	Roll [A]	Pitch [E]	Yaw [R]
1	1	-1	1	-1

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 3246 CPU Load: 90% MSP version: 2 MSP load: 0.1 MSP round trip: 48 HW round trip: 18 Drop ratio: 0% 5.0.0

Links ENG 6:07 PM 23/07/2022

SETTING UP YOUR DRONE

MIXER Applicable for (INAV5-INAV6)

Note INAV5-INAV6 SynerduinoSTM has Two Firmware with different output arrangement for different vehicle types , (You can get creative in mixing for custom frame designs)

SYNERDUINOSTM.Hex (Default Loaded)

```
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S1
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S2
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S3
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S4
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S5
(TIM_USE_MC_MOTOR | TIM_USE_FW_SERVO), // S6
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S7
```

Vehicle Preset Mix

QUAD X	FlyingWing
QUAD +	Airplane
QUAD A-Tail	Airplane No Rudder
Y4	Airplane V-Tail 2 Aileron Servo
Y6	Airplane V-Tail 1 Aileron Servo
Hex X	Other Stuff
Hex +	
Hex H	

SYNERDUINOSTMSV.Hex

```
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S1
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S2
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S3
(TIM_USE_MC_MOTOR | TIM_USE_FW_MOTOR), // S4
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S5
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S6
(TIM_USE_MC_SERVO | TIM_USE_FW_SERVO), // S7
```

Vehicle Preset Mix

Quad X W/ Gimbal	FlyingWing Differential thrust
Quad + W/ Gimbal	Airplane Differential Thrust
Single Copter	Airplane V-Tail Differential Thrust
Bi-Copter	Other Stuff
Tricopter	
Rover	
Boat	
Camera Gimbal	

SETTING UP YOUR DRONE

MIXER (INAV7-8)

Airframe or Vehicle
time Preset and mix
selection

Load and apply when
selected then Save
Reboot

- Multicopter
- Airplane
- Tricopter
- Rover
- Boat
- Others

Mixing is now color
coded to timer
availability

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 7.0.0-RC2, and flight controller information. The left sidebar contains a menu with options like Setup, Calibration, Mixer (selected), Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment tool, and Mission Control. The main area is titled 'Mixer' and contains several sections: 'Platform configuration' with a dropdown for 'Multicopter' and checkboxes for 'Normal motor direction / Props In configuration' and 'PID Profile will use same index as Mixer Profile index'; 'Timer outputs' with a list of timers (Timer 1 to Timer 5) each with an 'AUTO' dropdown; 'Mixer preset' with a 'Quad X' dropdown and a diagram of a quadcopter with numbered motors (1, 2, 3, 4) and a red arrow pointing to the center; and 'Output Mapping' with a table mapping timer outputs to motor functions. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, Arming Flags, and the current version 7.0.0-RC2. The Windows taskbar is visible at the bottom.

INAV Configurator

INAV
CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
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2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

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

Mixer

Platform configuration

Multicopter Platform type

Normal motor direction / Props In configuration

PID Profile will use same index as Mixer Profile index

Timer outputs

AUTO Timer 1

AUTO Timer 2

AUTO Timer 3

AUTO Timer 4

AUTO Timer 5

Mixer preset

Quad X

Mixer wizard Load and apply Load mixer

Output Mapping

Output (timer)	S1 (Timer 1)	S2 (Timer 2)	S3 (Timer 2)	S4 (Timer 2)	S5 (Timer 5)	S6 (Timer 3)	S7 (Timer 3)	S8 (Timer 4)
Function	Motor 1	Motor 2	Motor 3	Motor 4	-	-	-	-

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 759 CPU Load: 29% MSP version: 2 MSP load: 1.1 MSP round trip: 102 HW round trip: 45 Drop ratio: 0% Arming Flags: - 7.0.0-RC2

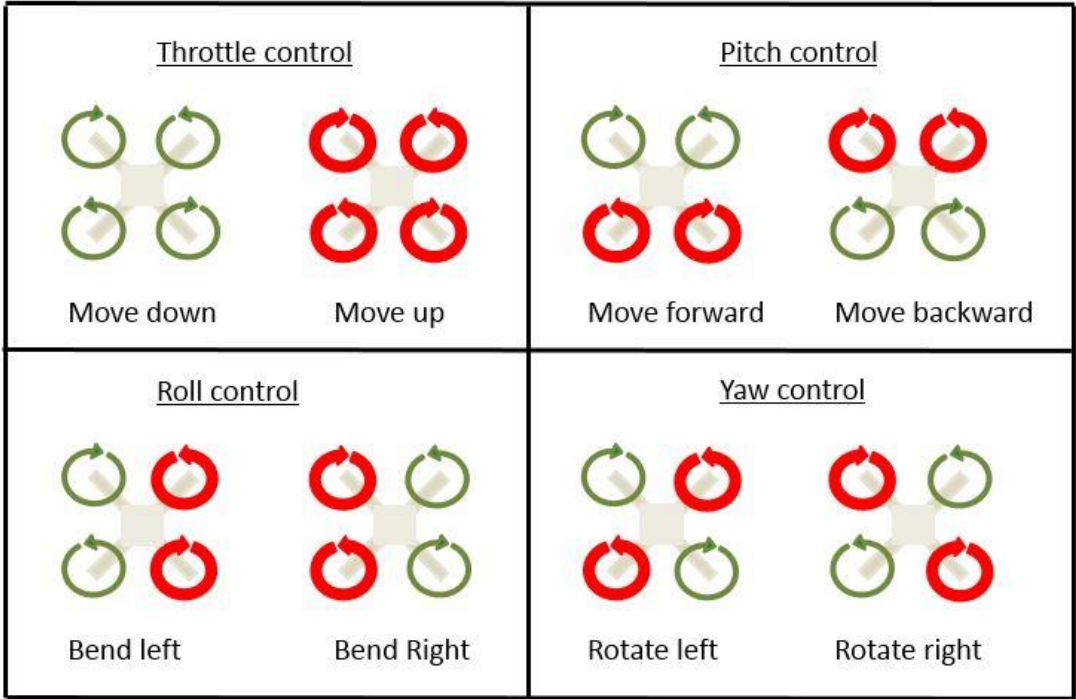
This allows you to assign motor and servo function to your custom drone frame or payload requirement this eliminates the need to recompile a new firmware for custom frame types

SETTING UP YOUR DRONE

MOTOR MIX FOR QUAD X (INAV 5-6)

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

(-) REDUCE RPM
(+) INCREASE RPM



Normal Speed
High Speed

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

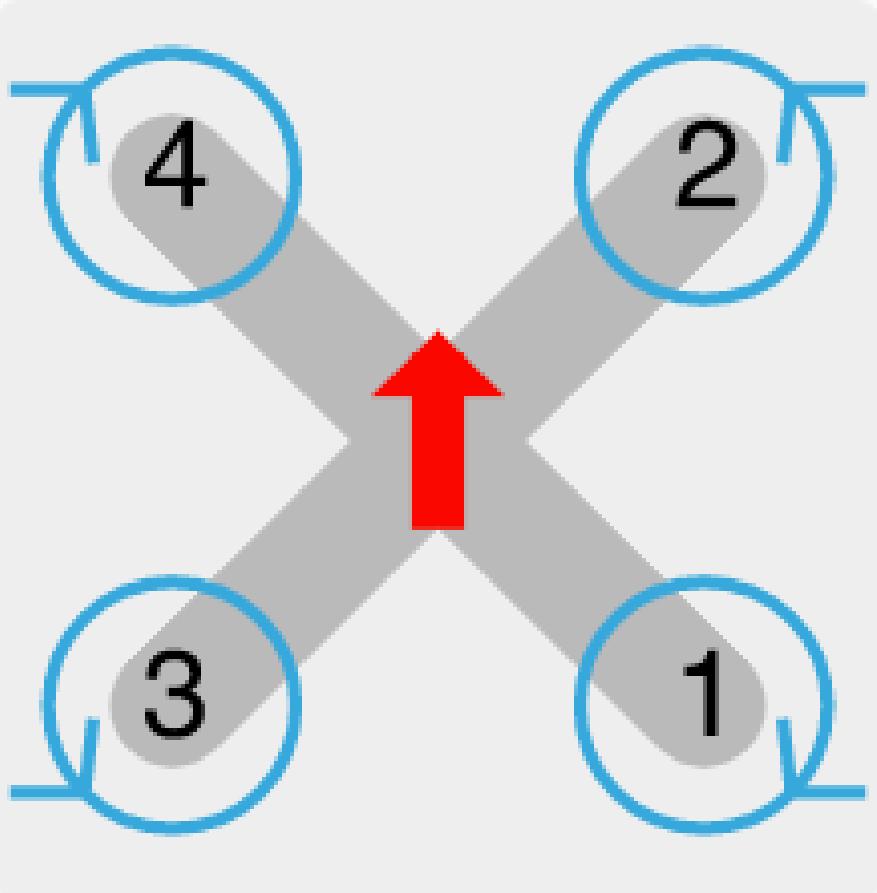
Motor	Throttle [T]	Roll [A]	Pitch [E]	Yaw [R]	
1	1	-1	1	-1	Delete
2	1	-1	-1	1	Delete
3	1	1	1	1	Delete
4	1	1	-1	-1	Delete

Add new mixer rule

Servo	Input	Weight (%)	Speed (10µs/s)	Active	
1	RC Channel 6	100	0	Always	Delete

Logic conditions

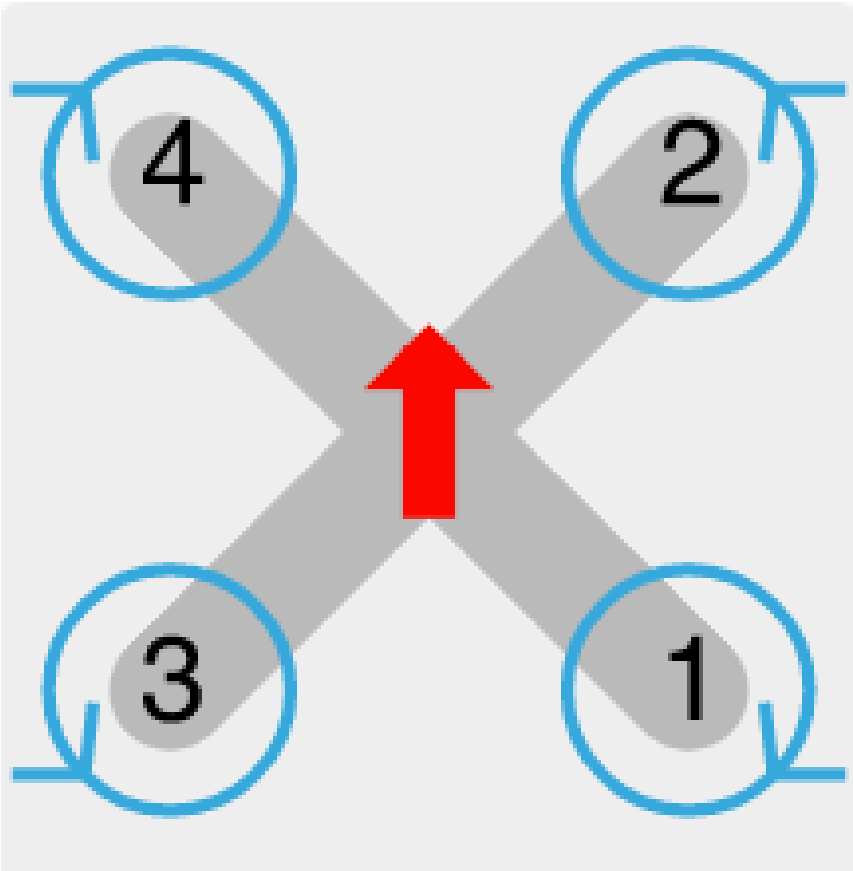
Add new mixer rule



SETTING UP YOUR DRONE

MOTOR MIX FOR QUAD X (INAV 7-8)

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



INAV Configurator

8.93 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

No dataflash chip found

Mixer profile 1 PID profile 1 Battery profile 1 Disconnect

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
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2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26
2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
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Setup Calibration Mixer Outputs Ports Configuration Failsafe Ez Tune PID tuning Advanced Tuning Programming Receiver Modes Adjustments GPS Alignment tool Mission Control

Output Mapping

Output (timer)	S1 (Timer 1)	S2 (Timer 2)	S3 (Timer 2)	S4 (Timer 2)	S5 (Timer 5)	S6 (Timer 3)	S7 (Timer 3)	S8 (Timer 4)
Function	Motor 1	Motor 2	Motor 3	Motor 4	-	-	-	-

Motor Mixer

Motor	Throttle [T]	Roll [A]	Pitch [E]	Yaw [R]	
1	1	-1	1	-1	Delete
2	1	-1	-1	1	Delete
3	1	1	1	1	Delete
4	1	1	-1	-1	Delete

Add new mixer rule

Servo mixer

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

Logic conditions

Add new mixer rule

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 516 CPU Load: 29% MSP version: 2 MSP load: 0.0 MSP round trip: 387 HW round trip: 41 Drop ratio: 0% Arming Flags: - 7.0.0-RC2

12:20 PM 28/03/2024

SETTING UP YOUR DRONE

OUTPUT

This Tab is use to calibrate and Test ESC, Motors and Servos assignment

Enable Motor and Servo Output must be on

ESC Protocol

- STANDARD
- STANDARD
- ONESHOT125
- MULTISHOT
- BRUSHED
- DSHOT150
- DSHOT300
- DSHOT600

Servo Refresh rate

- 50Hz
- 50Hz
- 60Hz
- 100Hz
- 160Hz
- 330Hz

INAV

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

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

Setup

Calibration

Mixer

Outputs

Ports

Configuration

Failsafe

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Magnetometer

Mission Control

OSD

8.96 V

Gyro

Accel

Mag

Baro

GPS

Flow

Sonar

Speed

IMU2

No dataflash chip found

Profile 1

Battery profile 1

Disconnect

Enable motor and servo output

STANDARD

ESC protocol

50Hz

Servo refresh rate

Stop motors on low throttle

For analog protocols, IDLE can be lowered below 10% if motors are working smooth without stuttering. If a drone wobbles after pulling throttle low, try increasing IDLE to tune this behavior out.

15.00

Motors IDLE power [%]

14

Number of motor poles (number of magnets)

Reversible motors mode (for use with reversible ESCs)

Motors

1 2 3 4

0% 0% 0% 0%

4 2 3 1

Acc. noise RMS 0.0030
Current [A] 0.00
Voltage [V] 8.94

Save and Reboot

Save

Packet error: 0 I2C error: 0 Cycle Time: 3517 CPU Load: 102% MSP version: 2 MSP load: 2.6 MSP round trip: 54 HW round trip: 14 Drop ratio: 21%

5.0.0

Links ENG 6:09 PM 23/07/2022

SETTING UP YOUR DRONE

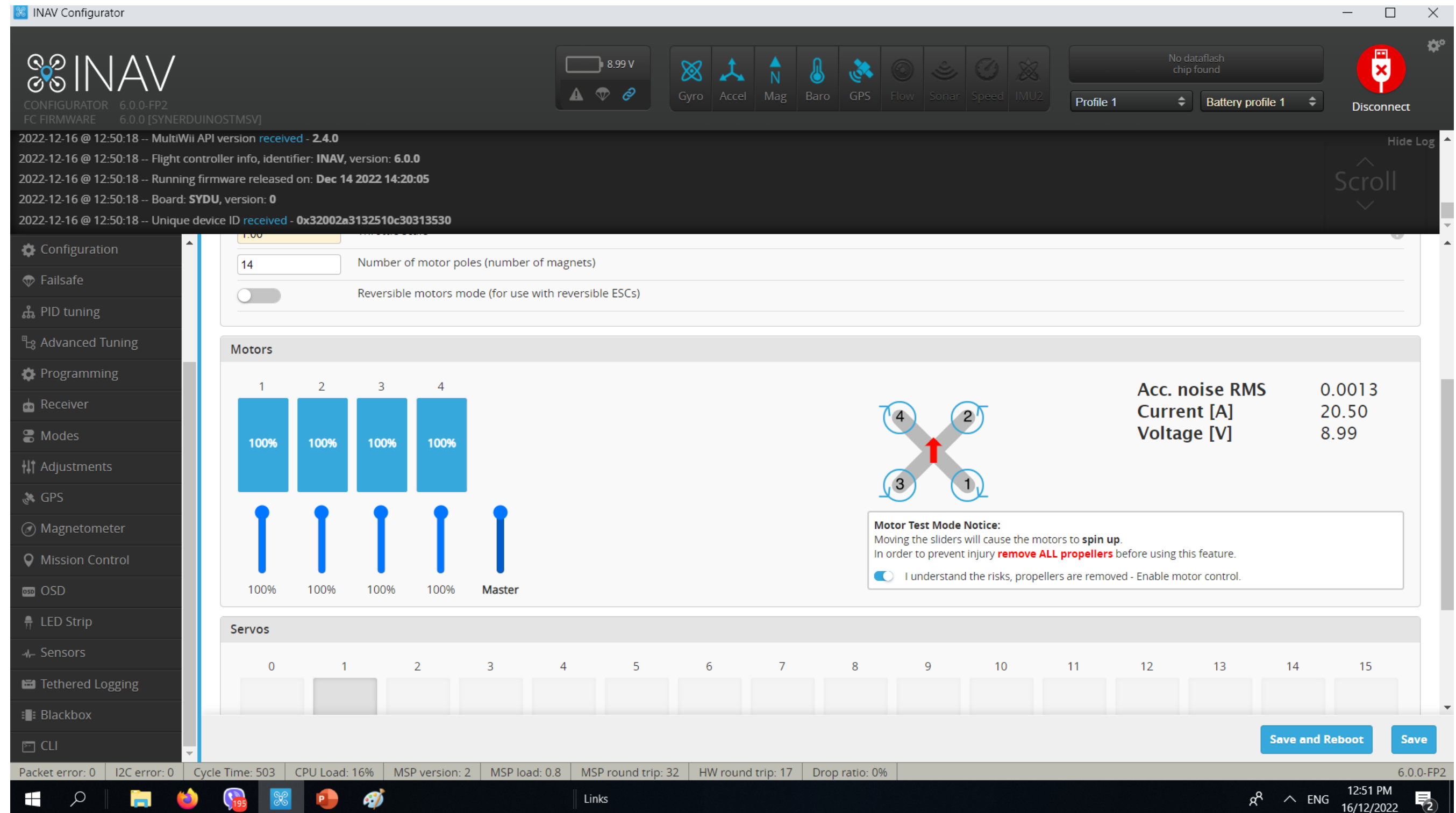
OUTPUT

This Tab is use to calibrate and Test ESC, Motors and Servos assignment

Calibrate ESC:

Remove all props

1. Activate motor Test mode
2. Master throttle up 100%
3. Plug in Battery and wait for the calibration Tune
4. Master throttle down 0%
5. Deactivate motor Test mode
6. Test the motor again by reactivating test motor test mode after the boot up tune start slowly throttling up




SETTING UP YOUR DRONE

Electronic Speed Controller CALIBRATION

Its required that all speed controllers must be calibrated in order the motors to spool up at the same RPM and improve stability of the vehicle and the ease of tuning.

1. Plug Synerduino in with USB and Connect INAV Configurator
2. Go to Output Tab
3. Activate motor Test mode (Remove Props)
4. move Master throttle up 100%
5. Plug in Battery and wait for the calibration Tune
6. After the Program tune completed move Master throttle down 0%
7. Allow ESC to exit Programming mode with a Bleep
8. Test the motor again to ensure all motors start running at the same time and speed
9. Then Deactivate Motor Test mode an Disconnect Battery
10. Calibration complete

🔌 Outputs





Motor Test Mode Notice:
Moving the sliders will cause the motors to **spin up**.
In order to prevent injury **remove ALL propellers** before using this feature.
☒ I understand the risks, propellers are removed - Enable motor control.

1 2 3 4

100% 100% 100% 100%



100% 100% 100% 100% Master




1 2 3 4

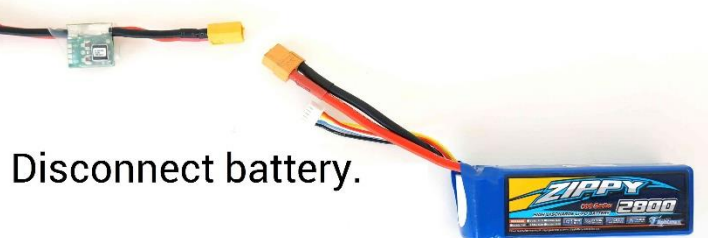
0% 0% 0% 0%

0% 0% 0% 0% Master





Connect battery to power module.



Disconnect battery.

SETTING UP YOUR DRONE

PORTS

The Number of Ports is relation to the specification of the Synerduino Board. Pls see data sheet

Dont Touch USB VCP connection for the STM board . Leave MSP On 115200 (changing this would disconnect the Board and Require Reflashing firmware to fix)

INAV

CONFIGURATOR 5.0.0
FC FIRMWARE 5.1.0

2022-10-14 @ 15:06:32 -- MultiWii API version received - 2.4.0
2022-10-14 @ 15:06:32 -- Flight controller info, identifier: INAV, version: 5.1.0
2022-10-14 @ 15:06:32 -- Running firmware released on: Sep 11 2022 13:15:57
2022-10-14 @ 15:06:32 -- Board: SYDU, version: 0
2022-10-14 @ 15:06:32 -- Unique device ID received - 0x4400273037510e36363538

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

5.48 V

Gyro Accel Mag Baro GPS Flow Sonar Speed IMU2

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

Hide Log
Scroll

Ports

DOCUMENTATION

Note: not all combinations are valid. When the flight controller firmware detects this the serial port configuration will be reset.
Note: Do NOT disable MSP on the first serial port unless you know what you are doing. You may have to reflash and erase your configuration if you do.

Identifier	Data	Telemetry	RX	Sensors	Peripherals
USB VCP	<input checked="" type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial RX	Disabled 115200	Disabled 115200
UART1	<input checked="" type="checkbox"/> MSP 38400	Disabled AUTO	<input type="checkbox"/> Serial RX	Disabled 115200	Disabled 115200
UART2	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input checked="" type="checkbox"/> Serial RX	Disabled 115200	Disabled 115200
SOFTSERIAL1	<input type="checkbox"/> MSP 57600	Disabled AUTO	<input type="checkbox"/> Serial RX	GPS 57600	Disabled 115200

UART1 use for MSP Telemetry as it removes the extra CPU load
Bluetooth (115200)
SIK Serial Radio (57600)

UART2 can be use for Serial RC receiver by switching On Serial RX Baud 115200
Telemetry AUTO

SOFT SERIAL 1 / UART3 can be use for GPS (57600)
Optical Flow (19200)

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 660 CPU Load: 23% MSP version: 2 MSP load: 0.2 MSP round trip: 56 HW round trip: 16 Drop ratio: 0% 5.0.0

Links ENG 3:06 PM 14/10/2022

BN 880 GPS / Baud 57600

CXFO Optical Flow / Baud 19200

Bluetooth / Baud 115200

SIK Radio / Baud 75600

SETTING UP YOUR DRONE

CONFIGURATION

Sensors would depend on the board installation
Synerduino support the following

ACC – MPU9250 or BMI160

MAG – MPU9250 , HMC5883 or QMC5883

BARO – BMP180 or BMP280

PitotTube – AirSpeed sensor both ADC and i2C

RangeFinder – Ultrasonic and Lidar

Optical Flow - Option installation CXFO Sensor

I2C speed 400hz

Board and Sensor alignment

0.0 Yaw Degrees

CW180 Mag Alignment

Features (Synerduino STM)

Enable CPU based serial ports

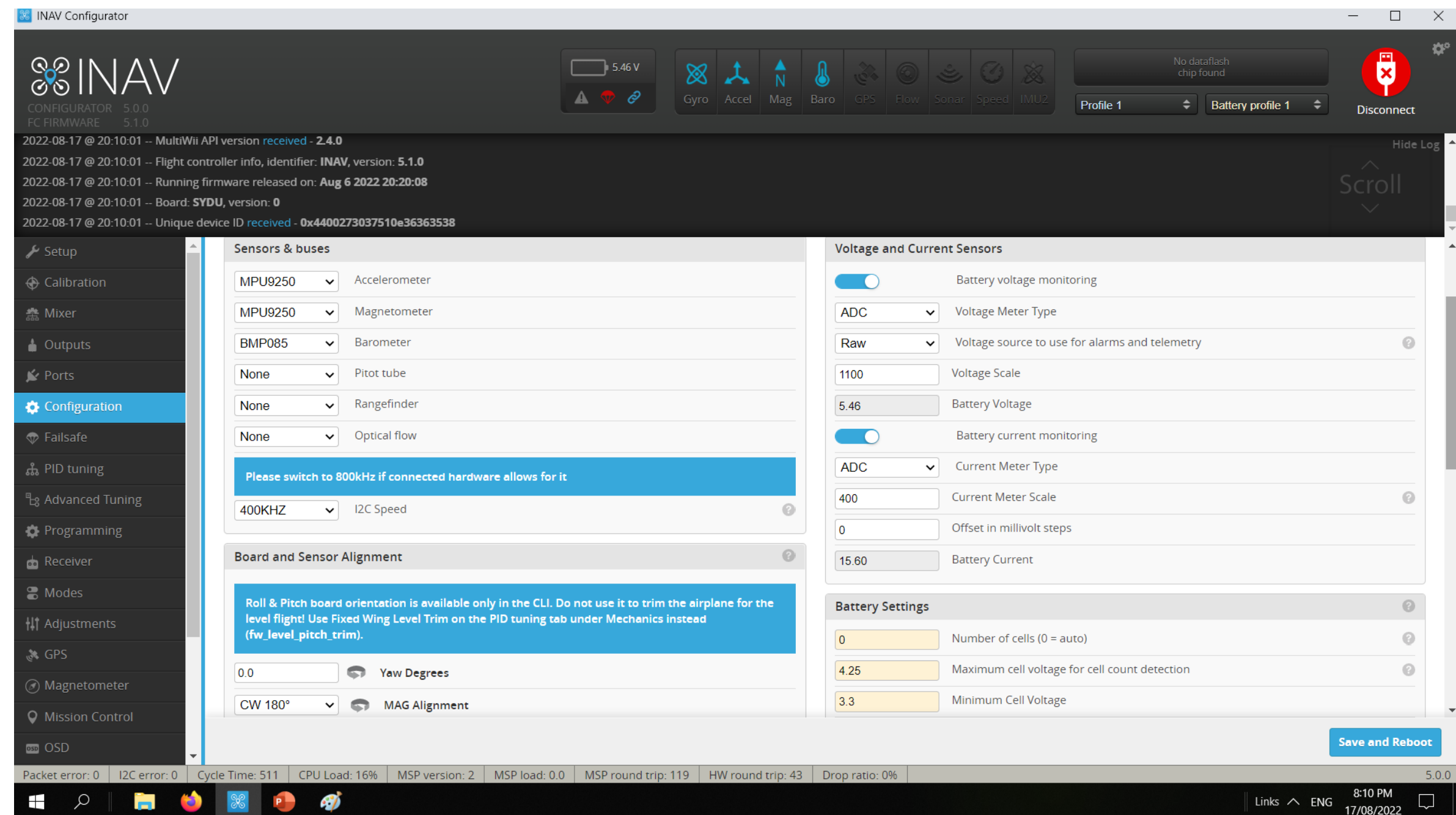
GPS for navigation and telemetry

Telemetry output

Multi-color RGB LED strip support

Enable motor and servo output

This also Contains the Multiplier setting for the Battery Voltage and Current and can be utilize for External ADC sensors applications

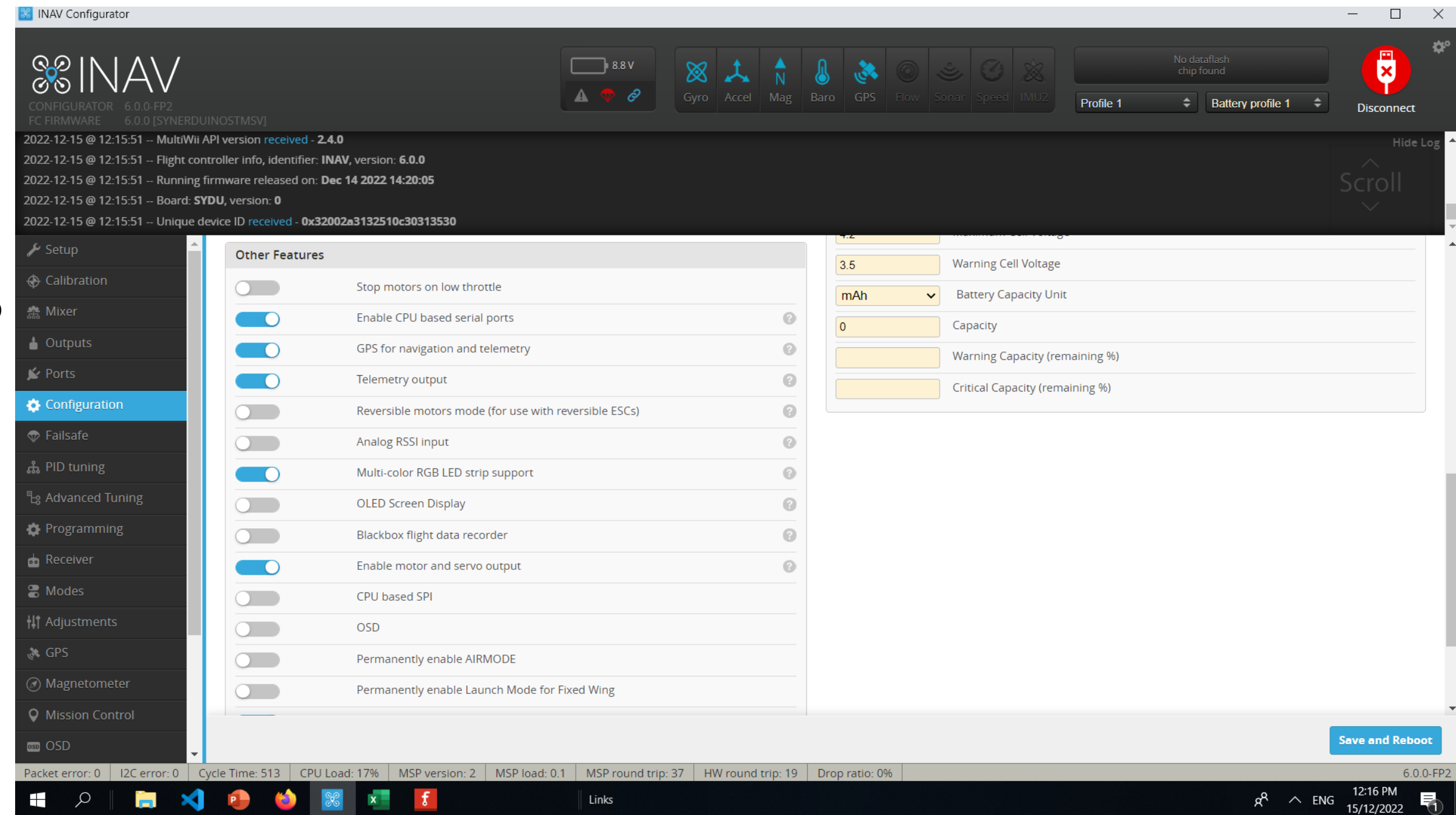


SETTING UP YOUR DRONE

CONFIGURATION

OTHER FEATURES

- **Stop motors on low throttle** – no Idle speed motor is shut off on throttle down
- **Enable CPU based serial ports** – Activate Serial 1 , 2 , Soft serial
- **GPS for navigation and telemetry** – Activate GPS navigation function
- **Telemetry output** – activate MSP protocol for Telemetry use
- **Reversible motors mode** - for use with reversible ESCs)
- **Analog RSSI input** – signal strength of your radio
- **Multi-color RGB LED strip support** – support for WS2811 LED
Note : it would reduce useable PWM output to 5
- **OLED Screen Display** – small screen support
- **Blackbox flight data recorder** - use with Flash or SD Card SPI to save log flight and sensor data
- **Enable motor and servo output** – activate all PWM pins (Required)
- **CPU based SPI** – to use the CPU to added extra processing to ISP
- **OSD** – Screen Display
- **Permanently enable AIRMODE** - allows motor idle to control the aircraft (Multirotor)
- **Permanently enable Launch Mode for Fixed Wing** – allows to Autolaunch
- **Profile selection with TX stick command** – Stick command profile
- **Throttle voltage compensation** – throttle compensator to power fluctuation
- **Automatic battery profile selection** – Battery Profile setup
- **Continuously trim servos on Fixed Wing** – Automatic Trim to the aircraft Level flight



SETTING UP YOUR DRONE

CONFIGURATION

Voltage and Current sensors

Battery Voltage monitoring (Vbat)

RAW = ADC V – Voltage 0-5V

Voltage scale= this is adjusted to calibrate your actual battery voltage to the GUI as identify by the Battery voltage indicator

Battery Current Monitoring (Current)

RAW = ADC I – Current 0-5V

Current meter scale this is adjusted to calibrate your actual battery Current to the GUI as identify by the Battery Current indicator

Battery Settings

This is the base battery parameters it should match the specs of your battery

Voltage and Current Sensors

Battery voltage monitoring

ADC

Voltage Meter Type

Raw

Voltage source to use for alarms and telemetry

450

Voltage Scale

11.66

Battery Voltage

Battery current monitoring

ADC

Current Meter Type

400

Current Meter Scale

0

Offset in millivolt steps

48.40

Battery Current

Battery Settings

3

Number of cells (0 = auto)

4.25

Maximum cell voltage for cell count detection

3.3

Minimum Cell Voltage

4.2

Maximum Cell Voltage

3.5

Warning Cell Voltage

mAh

Battery Capacity Unit

0

Capacity

Warning Capacity (remaining %)

Critical Capacity (remaining %)

SETTING UP YOUR DRONE

PID Tuning

Synerduino Mini Kwad

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

PITCH
Proportion 15
Integral 30
Derivative 15
Feedforward 87

ROLL
Proportion 15
Integral 30
Derivative 15
Feedforward 60

YAW
Proportion 35
Integral 80
Derivative 0

ANGLE/HORIZON
Strength 40
LPF Cutoff (Hz) 10
Transition (Horizon)

INAV CONFIGURATOR 5.0.0
FC FIRMWARE 5.1.0

2022-08-17 @ 10:52:07 -- Flight controller info, identifier: INAV, version: 5.1.0
2022-08-17 @ 10:52:07 -- Running firmware released on: Aug 6 2022 20:20:08
2022-08-17 @ 10:52:07 -- Board: SYDU, version: 0
2022-08-17 @ 10:52:07 -- Unique device ID received - 0x4400273037510e36363538
2022-08-17 @ 10:52:32 -- EEPROM saved: PID Tuning

5.46 V

Gyro Accel Mag Baro GPS Flow Sonar Speed IMU2

No dataflash chip found

Profile 1 Battery profile 1 Disconnect

Setup Calibration Mixer Outputs Ports Configuration Failsafe

PID tuning Advanced Tuning Programming Receiver Modes Adjustments GPS Magnetometer Mission Control OSD

Roll

Proportional 15 Integral 30 Derivative 15 FeedForward 87

Pitch

Proportional 15 Integral 30 Derivative 15 FeedForward 60

Yaw

Proportional 35 Integral 80 Derivative 0

Refresh Save

Packet error: 0 I2C error: 0 Cycle Time: 511 CPU Load: 17% MSP version: 2 MSP load: 0.0 MSP round trip: 159 HW round trip: 56 Drop ratio: 0%

Show advanced PID controllers

Name	Proportional	Integral	Derivative	FeedForward
Barometer & Sonar/Altitude				
Position Z	50	0	0	
Velocity Z	100	50	10	
Magnetometer/Heading				
Heading Hold	60			
Nav Heading	0	0	0	
Angle/Horizon				
Level	40	10	75	

SETTING UP YOUR DRONE

ADVANCE PID CONTROLLERS

Synerduino Mini KWAD PID

☒ Show advanced PID controllers

Name	Proportional	Integral	Derivative	FeedForward
Barometer & Sonar/Altitude				
Position Z	50	0	0	
Velocity Z	100	50	10	
Magnetometer/Heading				
Heading Hold	60			
Nav Heading	0	0	0	
GPS Navigation				
Position XY	46			
Velocity XY	40	15	100	40
Surface	0	0	0	
Angle/Horizon				
	Strength	LPF cutoff (Hz)	Transition (Horizon)	
Level	25	15	75	

This is the Main Flight mode tuning

Barometer & Sonar / Altitude

- Position -Vertical tuning strength
- Velocity - how much responds and the duration of that respond to hold an altitude

Magnetometer / Heading

- Heading hold
- Nav Heading

GPS Navigation

- Position XY – this is the strength of the responds to hold position (too tigh it would over correct , too low it would under responds)
- Velocity XY – how fast it would respond to the deviation
- Surface XY – works with optical sensor

Angle / horizon

- Level – how quick the drone returns to level flight

SETTING UP YOUR DRONE

PID TUNING

Filters adjustment for Sensor
respond rate

The screenshot displays the INAV Configurator software interface. The top status bar shows a battery level of 8.97 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The left sidebar contains a menu with options like Configuration, Failsafe, PID tuning (selected), Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox, and CLI. The main area is divided into tabs: PID gains, Rates & Expo, Filters (active), and Mechanics. Under the 'Filters' tab, there are three sections: Gyro filters, D-term filters, and Gyro RPM filters. Each section contains adjustable parameters with input fields and sliders. The bottom status bar provides system metrics: Packet error: 0, I2C error: 0, Cycle Time: 2674, CPU Load: 68%, MSP version: 2, MSP load: 0.4, MSP round trip: 96, HW round trip: 30, Drop ratio: 0%, and the version number 5.0.0. The Windows taskbar at the very bottom shows the time as 9:10 AM on 30/07/2022.

INAV Configurator

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

2022-07-30 @ 09:08:10 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-30 @ 09:08:10 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-30 @ 09:08:10 -- Board: ST41, version: 0
2022-07-30 @ 09:08:10 -- Unique device ID received - 0x4400273037510e36363538
2022-07-30 @ 09:10:33 -- EEPROM saved: PID Tuning

Configuration
Failsafe
PID tuning
Advanced Tuning
Programming
Receiver
Modes
Adjustments
GPS
Magnetometer
Mission Control
OSD
LED Strip
Sensors
Tethered Logging
Blackbox
CLI

PID gains Rates & Expo Filters Mechanics DOCUMENTATION

Gyro filters

Main gyro filter cutoff frequency	110	
Matrix Filter Min Frequency	120	
Matrix Filter Q Factor	250	
Unicorn Filter Q Factor	200	

D-term filters

D-term LPF cutoff frequency	100	
-----------------------------	-----	--

Gyro RPM filters

Gyro RPM filter (requires ESC telemetry)	<input type="checkbox"/>	
Gyro RPM filter min. frequency	100	

Refresh Save

Packet error: 0 I2C error: 0 Cycle Time: 2674 CPU Load: 68% MSP version: 2 MSP load: 0.4 MSP round trip: 96 HW round trip: 30 Drop ratio: 0% 5.0.0

Links ENG 9:10 AM 30/07/2022

SETTING UP YOUR DRONE

Rate and Expo pertain to the sensitivity on each behavior and limits set on each flight modes

This can set for Aggressive for sport flying

Or

Relax for beginner training to mission-oriented flight

The screenshot shows the INAV Configurator software interface. The left sidebar contains a menu with options: Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, PID tuning (highlighted), Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD. The main area displays the 'Rates & Expo' tab, which includes a table of settings for Roll, Pitch, and Yaw rates and limits. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and the current version (5.0.0).

Setting	Value	Unit
ROLL rate	600	° per second
PITCH rate	600	° per second
YAW rate	600	° per second
Roll & Pitch Expo	75	%
Yaw Expo	75	%
Max. ROLL angle	30	°
Max. PITCH angle	30	°
Heading Hold rate limit	90	° per second
Manual ROLL rate	100	%
Manual PITCH rate	100	%
Manual YAW rate	100	%

Roll, Pitch, Yaw Rate = Horizon mode on how fast the drone rotate on its axis (can cause drone to flip mid flight if set too high)

Roll,Pitch,Yaw Manual = this is much basic stabilize mode (none self leveling)

Roll,Pitch,Yaw Angle = in Angle mode sets the max limit on the drone Tilt from level axis (self leveling)

SETTING UP YOUR DRONE

EZ PID Tuning

Synerduino Mini KWAD PID

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

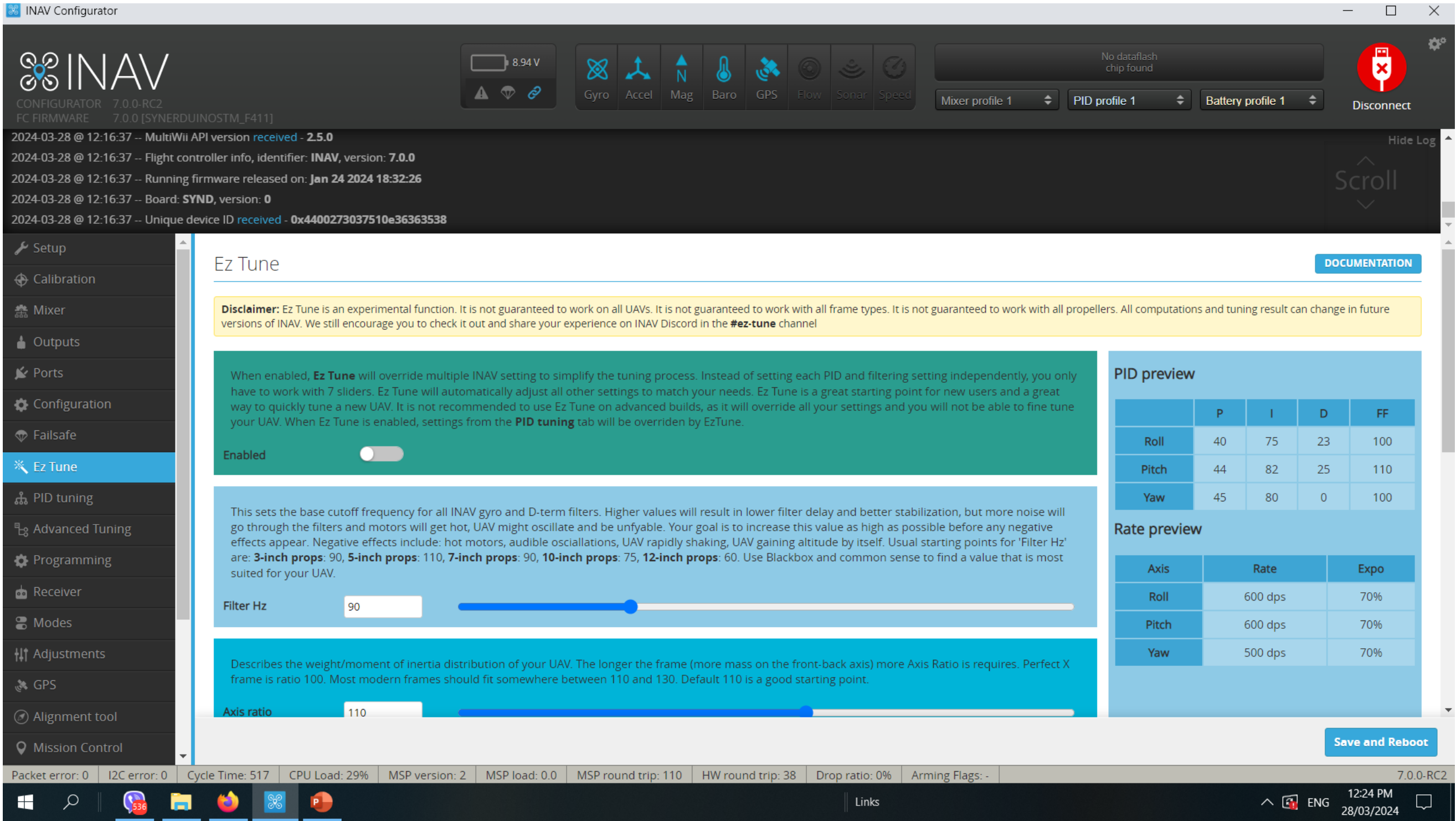
When Enable it automatically override the standard PID process associated to the older INAV 5 and 6

Descriptions are listed

However this is still a work in progress it works well for small drones

Large drones may or may not tune correctly with this , due to wildly varied inertias and weight.

Recommend to use conventional PID tuning method



SETTING UP YOUR DRONE

INAV

CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.94 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

No dataflash chip found

Disconnect

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0

2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0

2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26

2024-03-28 @ 12:16:37 -- Board: SYND, version: 0

2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Setup

Calibration

Mixer

Outputs

Ports

Configuration

Failsafe

Ez Tune

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Alignment tool

Mission Control

Describes the weight/moment of inertia distribution of your UAV. The longer the frame (more mass on the front-back axis) more Axis Ratio is requires. Perfect X frame is ratio 100. Most modern frames should fit somewhere between 110 and 130. Default 110 is a good starting point.

Axis ratio110

This setting defines how fast the UAV will react to stick movements and gyro signal. Higher values will result in faster reaction, but also in more overshoots and oscillations. If UAV feels sluggish or has a slow wobble, increase the Response. If it has hot motors, audibly osciallates, overshoots or feels too nervous, decrease the Response. Most modern quads should beefy motors will fly best with Response below 80. Should be tuned together with Damping. It is a P-term equivalent.

Response100

Describes the stengths of a force that opposes any rotation speed change. It dampens roll and pitch acceleration and causes smoother and more stable flight. Your task during tuning is to find out how much you can increase it before any negative symptoms appear: hot motors, audible osciallations, overshoot. Most modern quads should accept 'Damping' up to 150-180. It is a D-term equivalent.

Damping100

Defines long-term stabilization strength. Most modern quads should tolerate 'Stability' even up to 120-130. Usually does not have to be tuned at all. If UAV suffers from heavy propwash during vertical descent, lowering 'Stability' might help. It is a I-term equivalent

Stability100

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

Aggressiveness100

Yaw500 dps70%

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 516 CPU Load: 29% MSP version: 2 MSP load: 0.6 MSP round trip: 110 HW round trip: 38 Drop ratio: 0% Arming Flags: -

7.0.0-RC2

Links

ENG12:24 PM28/03/2024

SETTING UP YOUR DRONE

INAV

CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.94 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

No dataflash chip found

Disconnect

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0

2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0

2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26

2024-03-28 @ 12:16:37 -- Board: SYND, version: 0

2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Setup

Calibration

Mixer

Outputs

Ports

Configuration

Failsafe

Ez Tune

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Alignment tool

Mission Control

Describes the strengths of a force that opposes any rotation speed change. It dampens roll and pitch acceleration and causes smoother and more stable flight. Your task during tuning is to find out how much you can increase it before any negative symptoms appear: hot motors, audible oscillations, overshoot. Most modern quads should accept 'Damping' up to 150-180. It is a D-term equivalent.

Damping100

Defines long-term stabilization strength. Most modern quads should tolerate 'Stability' even up to 120-130. Usually does not have to be tuned at all. If UAV suffers from heavy propwash during vertical descent, lowering 'Stability' might help. It is a I-term equivalent

Stability100

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

Aggressiveness100

Defines how fast your UAV will rotate around roll, pitch and yaw axis. Higher 'Rate' results in faster rotation. Value of 0 is the equivalent of 300dps, 100 is the equivalent of 600dps, 200 is the equivalent of 900dps.

Rate100

Defines expo of the RC input. Lower values result in more sensitive stick in the center. Higher values result in less sensitive center and more rapid response at the end of the stick. Value of 0 is the equivalent of 0 expo, 100 is the equivalent of 0.7 expo, 200 is the equivalent of 1.0 expo.

Expo100

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 518 CPU Load: 28% MSP version: 2 MSP load: 0.0 MSP round trip: 110 HW round trip: 38 Drop ratio: 0% Arming Flags: - 7.0.0-RC2

Links

ENG 12:25 PM 28/03/2024

SETTING UP YOUR DRONE

INAV

CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

8.91 V

Gyro Accel Mag Baro GPS Flow Sonar Speed

No dataflash chip found

Mixer profile 1 PID profile 1 Battery profile 1

Disconnect

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0

2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0

2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26

2024-03-28 @ 12:16:37 -- Board: SYND, version: 0

2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

Setup

Calibration

Mixer

Outputs

Ports

Configuration

Failsafe

Ez Tune

PID tuning

Advanced Tuning

Programming

Receiver

Modes

Adjustments

GPS

Alignment tool

Mission Control

PID gains Rates & Expo Filters Mechanics

DOCUMENTATION

Reset PID Controller Select New Defaults Show all PIDs

Roll

Proportional 40

Integral 75

Derivative 26

FeedForward 60

Pitch

Proportional 44

Integral 85

Derivative 28

FeedForward 60

Yaw

Proportional 40

Refresh Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 521 CPU Load: 28% MSP version: 2 MSP load: 0.0 MSP round trip: 115 HW round trip: 40 Drop ratio: 0% Arming Flags: -

7.0.0-RC2

Windows Taskbar

Links

ENG 12:25 PM 28/03/2024

SETTING UP YOUR DRONE

ADVANCE TUNING

Advance tuning for all
navigational settings

Recommended changes for
Synerduino 250mm Quad

300cm/s Nav speed
1000cm/s Max Nav speed
500cm/s Max Cruise Speed
30 Degree Max bank Angle MC

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 5.0.0, and FC FIRMWARE 5.1.0. A status bar at the top right indicates a battery level of 5.43 V and a 'No dataflash chip found' warning. The main interface is divided into a left sidebar with navigation options (Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD) and a main content area. The 'Advanced Tuning' section is selected, showing 'Multirotor Navigation Settings' and 'Multirotor braking mode configuration'. The 'Multirotor Navigation Settings' section includes fields for ATTI (User Control Mode), Default navigation speed (300 cm/s), Max. navigation speed (1000 cm/s), Max. CRUISE speed (500 cm/s), Multirotor max. banking angle (30 degrees), Use mid. throttle for ALTHOLD (disabled), Hover throttle (1400 uS), and Slow down when approaching waypoint (enabled). The 'Multirotor braking mode configuration' section includes fields for Min. speed threshold (100 cm/s), Braking disengage speed (75 cm/s), Max. braking duration (2000 ms), Boost factor (100), Max. braking boost duration (750 ms), Boost min. speed threshold (150 cm/s), Braking boost disengage speed (100 cm/s), and Max. bank angle (40 degrees). The 'Generic settings' section includes 'RTH settings' with fields for RTH altitude mode (AT_LEAST), RTH altitude (1000 cm), RTH Home altitude (0 cm), and Climb before RTH (ON). The 'General Navigation Settings' section includes fields for Max. Alt-hold climb rate (200 cm/s) and Max. navigation climb rate (500 cm/s). The 'Waypoint Navigation Settings' section is currently empty. A 'Save and Reboot' button is located at the bottom right of the settings area. The bottom status bar shows various system metrics: Packet error: 0, I2C error: 0, Cycle Time: 517, CPU Load: 16%, MSP version: 2, MSP load: 1.0, MSP round trip: 115, HW round trip: 42, Drop ratio: 0%, and version 5.0.0. The Windows taskbar at the bottom shows the time as 8:17 PM on 17/08/2022.

INAV Configurator

INAV
CONFIGURATOR 5.0.0
FC FIRMWARE 5.1.0

2022-08-17 @ 20:10:01 -- MultiWii API version **received - 2.4.0**
2022-08-17 @ 20:10:01 -- Flight controller info, identifier: **INAV**, version: **5.1.0**
2022-08-17 @ 20:10:01 -- Running firmware released on: **Aug 6 2022 20:20:08**
2022-08-17 @ 20:10:01 -- Board: **SYDU**, version: **0**
2022-08-17 @ 20:10:01 -- Unique device ID **received - 0x4400273037510e36363538**

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

Multirotor Navigation Settings

ATTI User Control Mode
300 cm/s Default navigation speed
1000 cm/s Max. navigation speed
500 cm/s Max. CRUISE speed
30 Multirotor max. banking angle
Use mid. throttle for ALTHOLD
1400 uS Hover throttle
Slow down when approaching waypoint

Multirotor braking mode configuration

100 cm/s Min. speed threshold
75 cm/s Braking disengage speed
2000 ms Max. braking duration
100 Boost factor
750 ms Max. braking boost duration
150 cm/s Boost min. speed threshold
100 cm/s Braking boost disengage speed
40 Max. bank angle

Generic settings

RTH settings

AT_LEAST RTH altitude mode
1000 cm RTH altitude
0 cm RTH Home altitude
ON Climb before RTH

General Navigation Settings

200 cm/s Max. Alt-hold climb rate
500 cm/s Max. navigation climb rate

Waypoint Navigation Settings

Save and Reboot

Packet error: 0 I2C error: 0 Cycle Time: 517 CPU Load: 16% MSP version: 2 MSP load: 1.0 MSP round trip: 115 HW round trip: 42 Drop ratio: 0% 5.0.0

Links ENG 8:17 PM 17/08/2022

SETTING UP YOUR DRONE

ADVANCE TUNING

Fixwing settings

This is for fixwing application
Selecting the info button brings
up the information of each
setting

Fixed Wing Auto Launch Settings

1000	uS	Idle Throttle	?
0	ms	Idle Throttle Delay	?
45	°	Max Throw Angle	?
500	ms	Motor Delay	?
0	ms	Minimum Launch Time	?
100	ms	Motor Spinup Time	?
1700	uS	Launch Throttle	?
18	°	Climb Angle	?
5000	ms	Launch Timeout	?
0	cm	Maximum Altitude	?
3000	ms	End Transition Time	?

Fixed Wing Landing Settings

35000	cm	Final approach length	?
100	%	Modifier for pitch to throttle ratio at final approach	?
200	cm	Initial altitude of the glide phase	?
150	cm	Initial altitude of the flare phase	?
0	°	Pitch value for glide phase	?
8	°	Pitch value for flare phase	?
140	cm/s	Max. tailwind	?

SETTING UP YOUR DRONE

ADVANCE TUNING

Fixwing settings

This is for fixwing application
Selecting the info button brings
up the information of each
setting

Fixed Wing Navigation Settings		
<input type="text" value="1200"/>	<input type="text" value="uS"/>	Min. throttle
<input type="text" value="1700"/>	<input type="text" value="uS"/>	Max. throttle
<input type="text" value="1400"/>	<input type="text" value="uS"/>	Cruise throttle
<input type="checkbox"/>		Allow manual throttle increase ?
<input type="text" value="0"/>	<input type="text" value="deci°"/>	Min Throttle Down Pitch ?
<input type="text" value="10"/>	<input type="text" value="uS"/>	Pitch to throttle ratio ?
<input type="text" value="6"/>		Throttle smoothing ?
<input type="text" value="50"/>	<input type="text" value="deci°"/>	Instantaneous throttle adjustment threshold ?
<input type="text" value="35"/>	<input type="text" value="°"/>	Max. navigation bank angle ?
<input type="text" value="20"/>	<input type="text" value="°"/>	Max. navigation climb angle ?
<input type="text" value="15"/>	<input type="text" value="°"/>	Max. navigation dive angle ?
<input type="text" value="7500"/>	<input type="text" value="cm"/>	Loiter radius
<input type="text" value="RIGHT"/>	<input type="text" value="v"/>	Loiter direction ?
<input type="text" value="0"/>		Control Smoothness ?
<input type="checkbox"/>		Soaring Mode Motor Stop ?
<input type="text" value="5"/>	<input type="text" value="°"/>	Soaring Mode Pitch Deadband ?

SETTING UP YOUR DRONE

ADVANCE TUNING

Multicopter Setting

This is for fixwing application
Selecting the info button brings
up the information of each
setting

Stick Position on Althold hover

STICK – ideal if your switching
between manual and althold
often in flight

MID STICK – Ideal if your
Controller uses Neutral throttle
position , with althold being
active from Arm

HOVER – this uses the set hover
position regardless of user input
on throttle stick

Multicopter Navigation Settings

ATTI	▼	User Control Mode	
300	cm/s	Default navigation speed	?
1000	cm/s	Max. navigation speed	
500	cm/s	Max. CRUISE speed	?
30	°	Multicopter max. banking angle	?
STICK	▼	Stick position for althold hover	
1300	µs	Hover throttle	
<input checked="" type="checkbox"/>		Slow down when approaching waypoint	?

Multicopter braking mode configuration

100	cm/s	Min. speed threshold	?
75	cm/s	Braking disengage speed	?
2000	ms	Max. braking duration	?
100		Boost factor	?
750	ms	Max. braking boost duration	?
150	cm/s	Boost min. speed threshold	?
100	cm/s	Braking boost disengage speed	?
40	°	Max. bank angle	?

SETTING UP YOUR DRONE

ADVANCE TUNING

Multicopter Setting

This is for fixwing application
Selecting the info button brings
up the information of each
setting

General Navigation Settings			
200	cm/s	Max. Alt-hold climb rate	?
500	cm/s	Max. navigation climb rate	?
0	cm	Max Altitude for Navigation	?
ALL_NAV	▼	Navigation Motor Stop Override	?

Waypoint Navigation Settings			
100	cm	Waypoint radius	?
100	m	Waypoint safe distance	?
<input type="checkbox"/>		Load Waypoints on Boot	?
0	cm	Enforce Altitude at Waypoint	?
0		Waypoint Tracking Accuracy	?
60	°	Waypoint Tracking Angle	?
OFF	▼	Waypoint Turn Smoothing	?
RESUME	▼	Restart Waypoint Mission	?

SETTING UP YOUR DRONE

ADVANCE TUNING

Multicopter Setting

This is for fixwing application
Selecting the info button brings
up the information of each
setting

RTH settings	
AT_LEAST	RTH altitude mode
1000 cm	RTH altitude ?
0 cm	RTH Home altitude ?
ON	Climb before RTH ?
AT_LEAST	Climb First Stage Method ?
0 cm	Climb First Stage Altitude ?
<input type="checkbox"/>	Use Linear Descent ?
0 m	Linear Descent Start Distance ?
<input type="checkbox"/>	Climb regardless of position sensors health
<input type="checkbox"/>	Override RTH altitude and climb setting with roll/pitch stick ?
OFF	RTH Track Back Mode ?
500 m	RTH Track Back Distance ?
RTH	Safe Home Mode ?
20000 cm	Safe Home Max Distance ?
<input type="checkbox"/>	Tail first
ALWAYS	Land after RTH
500 cm	Min. RTH distance ?
50000 cm	RTH abort threshold ?
0 s	Failsafe Mission Delay ?

SETTING UP YOUR DRONE

RECEIVER

Serial Receiver as SBUS

Be aware of your radio format

AETR = Futaba format

TAER = JR format

EATR = Walkera Format

This is to check if there is signal coming from the receiver

Also to adjust the Expo rate of your RC controls

The screenshot displays the INAV Configurator software interface. The top status bar shows the battery level at 8.96 V and various sensor icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The left sidebar contains a menu with options like Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver (highlighted), Modes, Adjustments, GPS, Magnetometer, Mission Control, and OSD. The main area is divided into several sections:

- Channel Map:** A table showing channel assignments for Roll [A], Pitch [E], Yaw [R], Throttle [T], and channels CH 5 through CH 18. Values are shown in red or green text.
- Receiver Mode:** A section for configuring the receiver type (SERIAL, SBUS, OFF, AUTO) and other settings like Serial Receiver Provider, Serial Port Inverted, and Serial receiver half-duplex.
- Graphs:** Two graphs showing throttle and yaw curves.
- Expo Settings:** A table for adjusting Expo rates for Throttle, RC, and Manual RC.

The bottom status bar displays system metrics: Packet error: 0, I2C error: 0, Cycle Time: 640, CPU Load: 226%, MSP version: 2, MSP load: 0.2, MSP round trip: 35, HW round trip: 15, Drop ratio: 0%, and the version number 5.0.0. The bottom right corner shows the date and time: 9:28 AM 29/07/2022.

RECEIVER FORMAT

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

RX > SBUS input	Futaba Format (AETR)	JR Format (TAER)	Walkera Format (EATR)	SBUS/PPM/PWM Converter may be required if your receiver don't support SBUS Pls Check the output pin from your Radio Rx manual	
Throttle	Ch3	Ch1	Ch3		
Aileron	Ch1	Ch2	Ch2		
Elevator	Ch2	Ch3	Ch1		
Rudder	Ch4	Ch4	Ch4		
Aux1	Ch5	Ch5	Ch5		
Aux2	Ch6	Ch6	Ch6		
Aux3	Ch7	Ch7	Ch7		
Aux4	Ch8	Ch8	Ch8		

SETTING UP YOUR DRONE

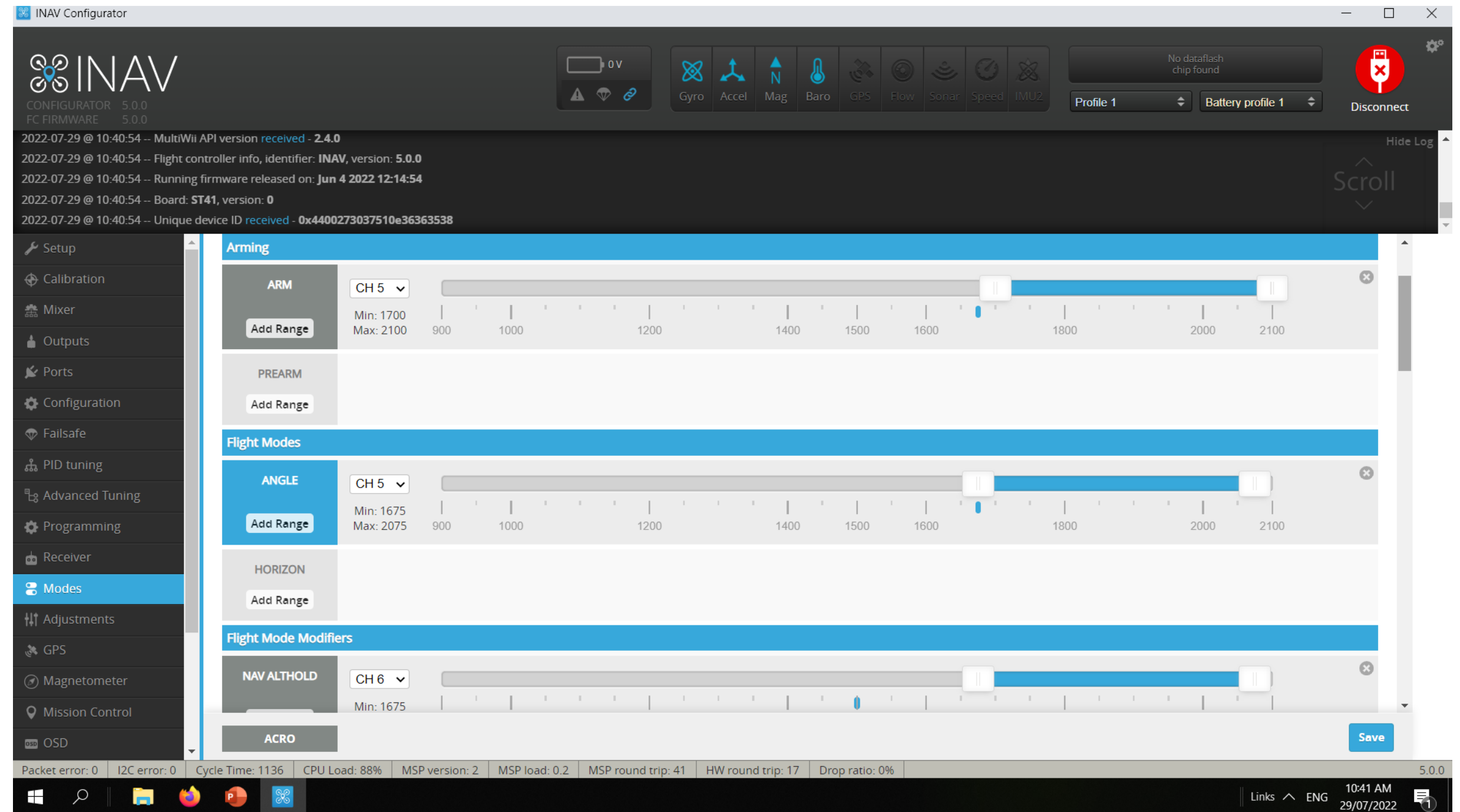
MODES

Flight modes

This is where you set the Aux switch on your transmitter commands

For Beginners we advice to have Turn **ANGLE Flight Mode** on

- [NAV ALTHOLD - Altitude hold](#)
- [NAV POSHOLD - Horizontal position hold](#)
- [NAV COURSE HOLD - Fixed Wing Heading Hold](#)
- [NAV CRUISE - Fixed Wing Heading + Altitude Hold](#)
- [NAV RTH - Return to home](#)
- [NAV WP - Autonomous waypoint mission](#)
- [WP PLANNER - On the fly waypoint mission planner](#)
- [GCS NAV - Ground control station](#)



ADJUSTMENTS

Configure adjustment switches. See the 'in-flight adjustments' section of the manual for details. The changes that adjustment functions make are not saved automatically. There are 4 slots. Each switch used to concurrently make adjustments requires exclusive use of a slot.

Examples

- Use Slot 1 and a 3POS switch on CH5 to select between Pitch/Roll P, I and D and another 3POS switch on CH6 to increase or decrease the value when held up or down.
- Use Slot 2 and a 3POS switch on CH8 to select enable Rate Profile Selection via the same 3POS switch on the same channel.

The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 7.1.0, and various system status icons like battery (1.99 V), gyro, accel, mag, baro, GPS, flow, sonar, and speed. A sidebar on the left contains navigation links: Setup, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Ez Tune, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments (highlighted), GPS, Alignment tool, and Mission Control. The main area is titled 'Adjustments' and contains a yellow informational box with text about configuring adjustment switches. Below this, there are four identical rows for configuring adjustment slots. Each row has a toggle switch, a dropdown menu set to 'CH 5', a range slider from 900 to 2100, a 'then apply' dropdown set to 'No changes', a 'using slot' dropdown set to 'Slot 1', and a 'via channel' dropdown set to 'CH 5'. A 'Save' button is at the bottom right. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and Arming Flags.

INAV Configurator

INAV
CONFIGURATOR 7.1.0
FC FIRMWARE 7.1.0 [SYNERDUINOSTM_H743]

2024-11-21 @ 14:11:37 -- MultiWii API version received - 2.5.0
2024-11-21 @ 14:11:37 -- Flight controller info, identifier: INAV, version: 7.1.0
2024-11-21 @ 14:11:37 -- Running firmware released on: May 28 2024 20:32:38
2024-11-21 @ 14:11:38 -- Board: SYNH, version: 0
2024-11-21 @ 14:11:38 -- Unique device ID received - 0x1900293133510334393330

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

Adjustments

Configure adjustment switches. See the 'in-flight adjustments' section of the manual for details. The changes that adjustment functions make are not saved automatically. There are 4 slots. Each switch used to concurrently make adjustments requires exclusive use of a slot.

Examples
Use Slot 1 and a 3POS switch on CH5 to select between Pitch/Roll P, I and D and another 3POS switch on CH6 to increase or decrease the value when held up or down.
Use Slot 2 and a 3POS switch on CH8 to select enable Rate Profile Selection via the same 3POS switch on the same channel.

If enabled	when channel	is in range	then apply	using slot	via channel
<input type="checkbox"/>	CH 5 Min: 900 Max: 950		No changes	Slot 1	CH 5
<input type="checkbox"/>	CH 5 Min: 900 Max: 950		No changes	Slot 1	CH 5
<input type="checkbox"/>	CH 5 Min: 900 Max: 950		No changes	Slot 1	CH 5
<input type="checkbox"/>	CH 5 Min: 900 Max: 950		No changes	Slot 1	CH 5

Save

Packet error: 0 | I2C error: 50 | Cycle Time: 501 | CPU Load: 1% | MSP version: 2 | MSP load: 0.2 | MSP round trip: 249 | HW round trip: 35 | Drop ratio: 0% | Arming Flags: ARMING_DISABLED_RC_LINK | 7.1.0

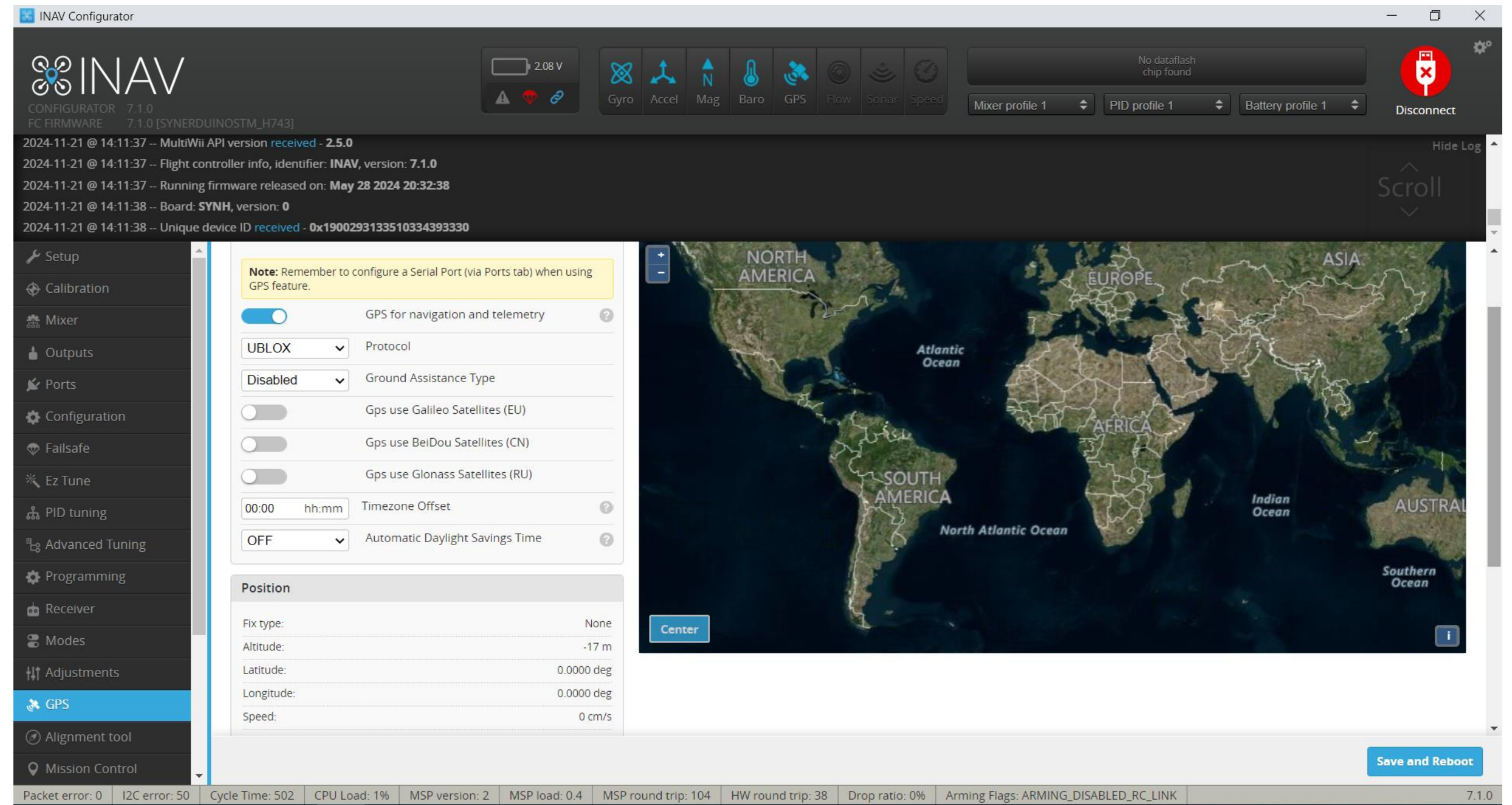
GPS

GPS settings

Note: Remember to configure a Serial Port (via Ports tab) when using GPS feature

Here is where you setup your GPS base off the GPS module function.

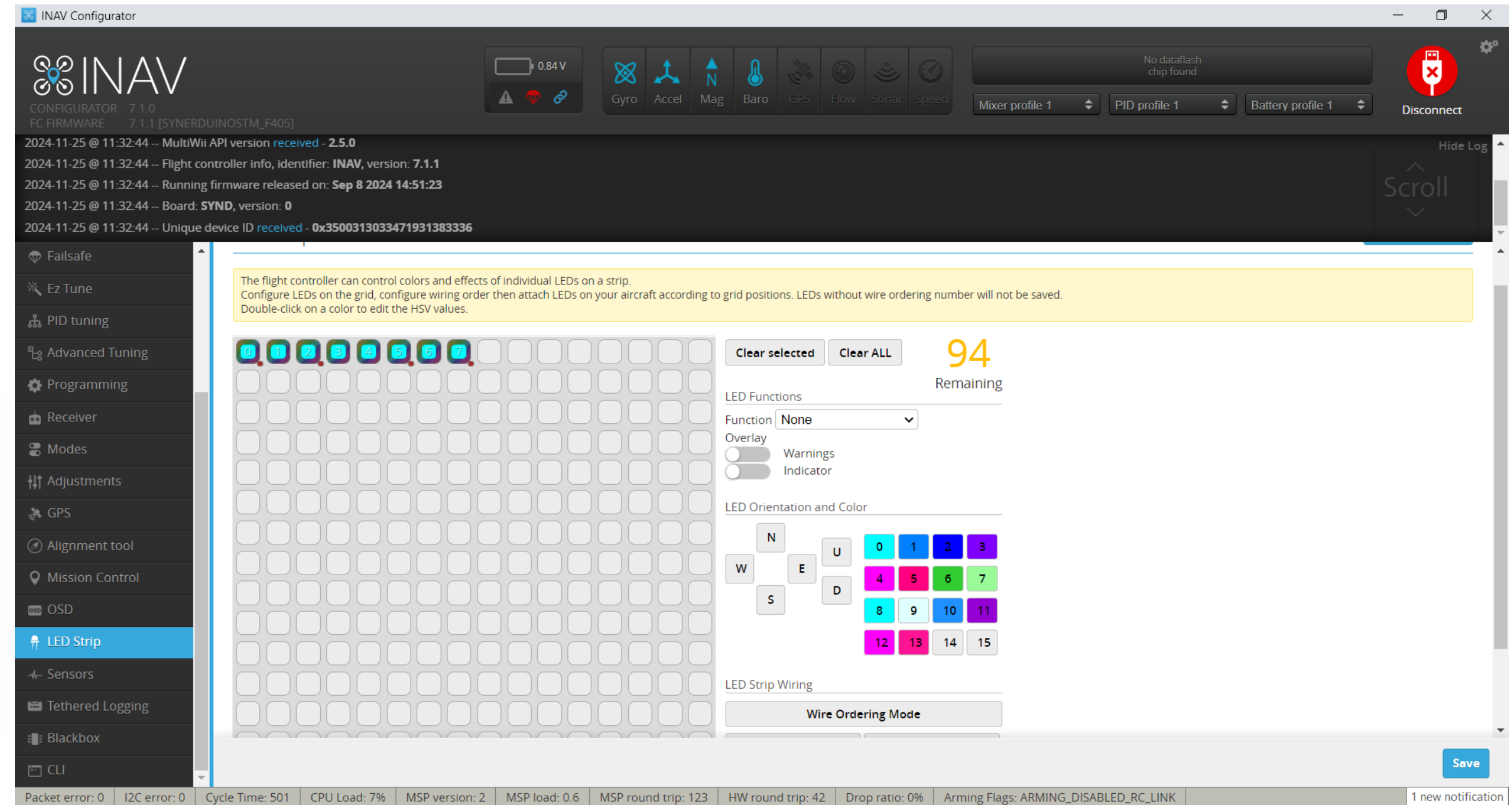
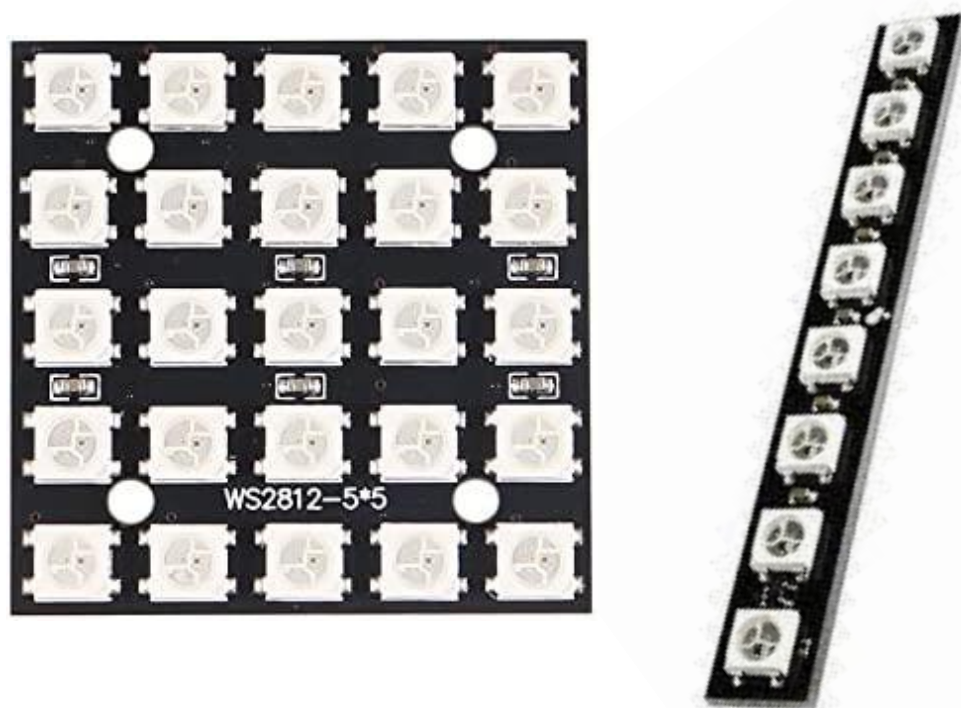
Its also to check if GPS is working correctly



SETTING UP YOUR DRONE

LED STRIP

WS2811/WS2812 – Led strip
programming upto
32 LEDs F411
102 LEDs F405 / H743



WS2811 – Led strip this needs to be activated on the Configure Tab before you can use this function

Note: F411 this will reduce the PWM availability to just 5 Pins removes S6 and S7 (this is because it requires 2 Timers to run the WS2811)

SETTING UP YOUR DRONE

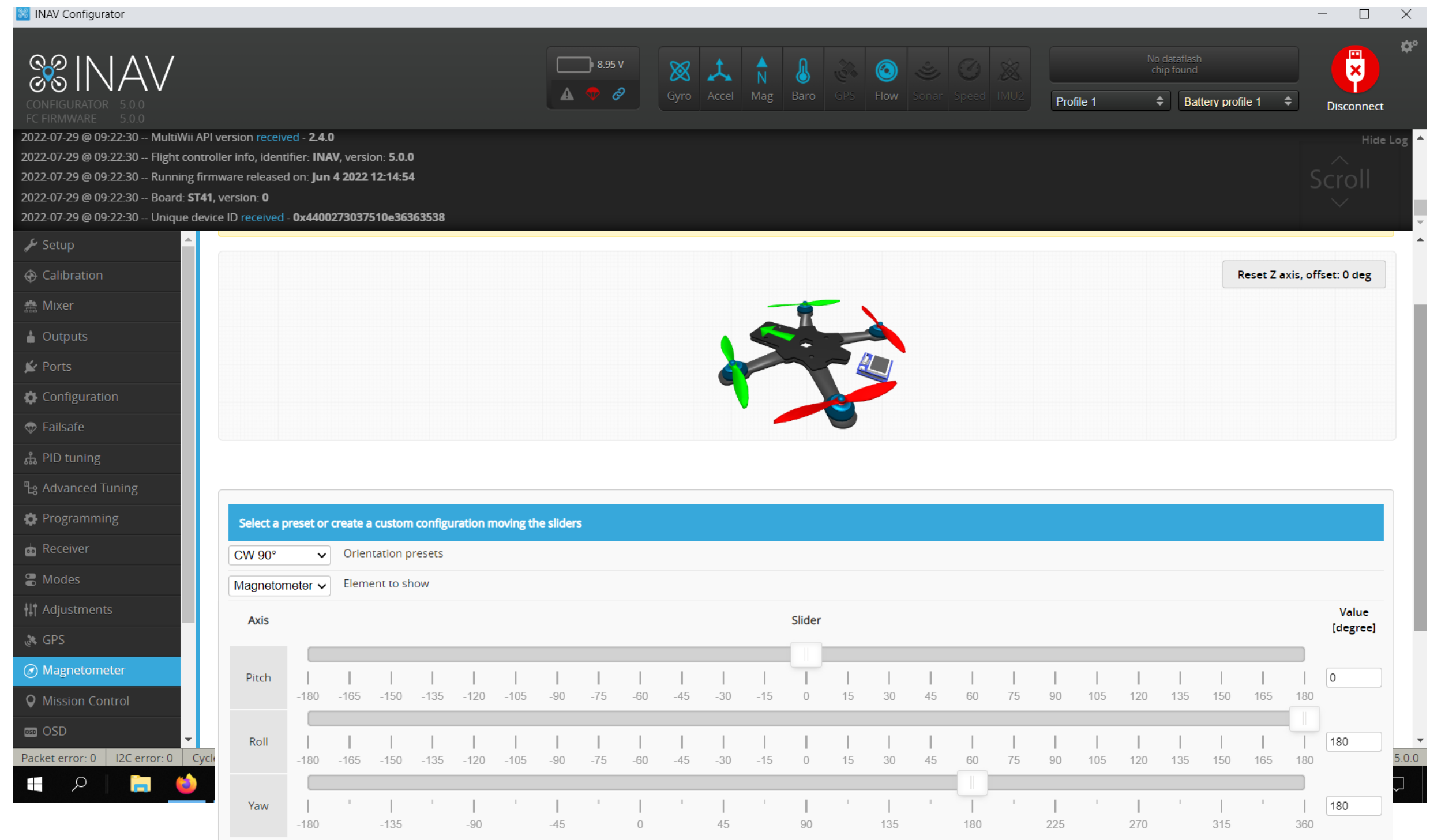
MAGNETOMETER (INAV5-6)

This is where you set the orientation of your Mag sensor , should you use the GPS with a build in MAG

Also the Mag orientation Can vari from Flight controller to Flight controller. Pls be aware of this

This can be verified From the setup Tab look at heading it should follow when the Drone is pointing toward a heading

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



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

SETTING UP YOUR DRONE

ALIGNMENT TOOL (INAV7-8)

This replaces the old magnetometer Tab with the addition of Board Orientation

In an situation you needed to Reorientation of the Flight controller to fit your vehicle

This can be verified From the setup Tab look at heading it should follow when the Drone is pointing toward a heading

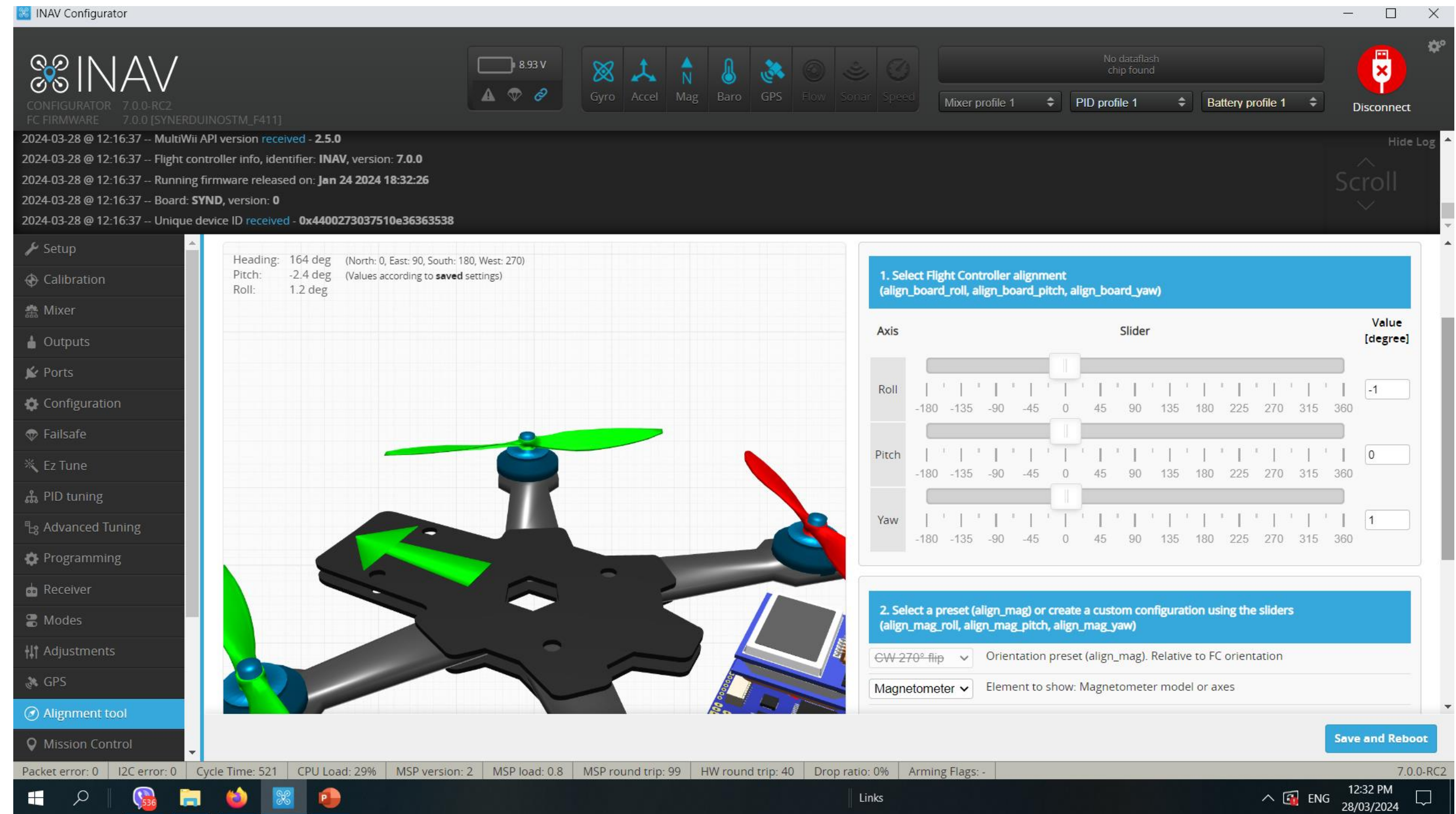
Mag relationship

0 Degrees = North

90 Degrees = East

180 Degrees = South

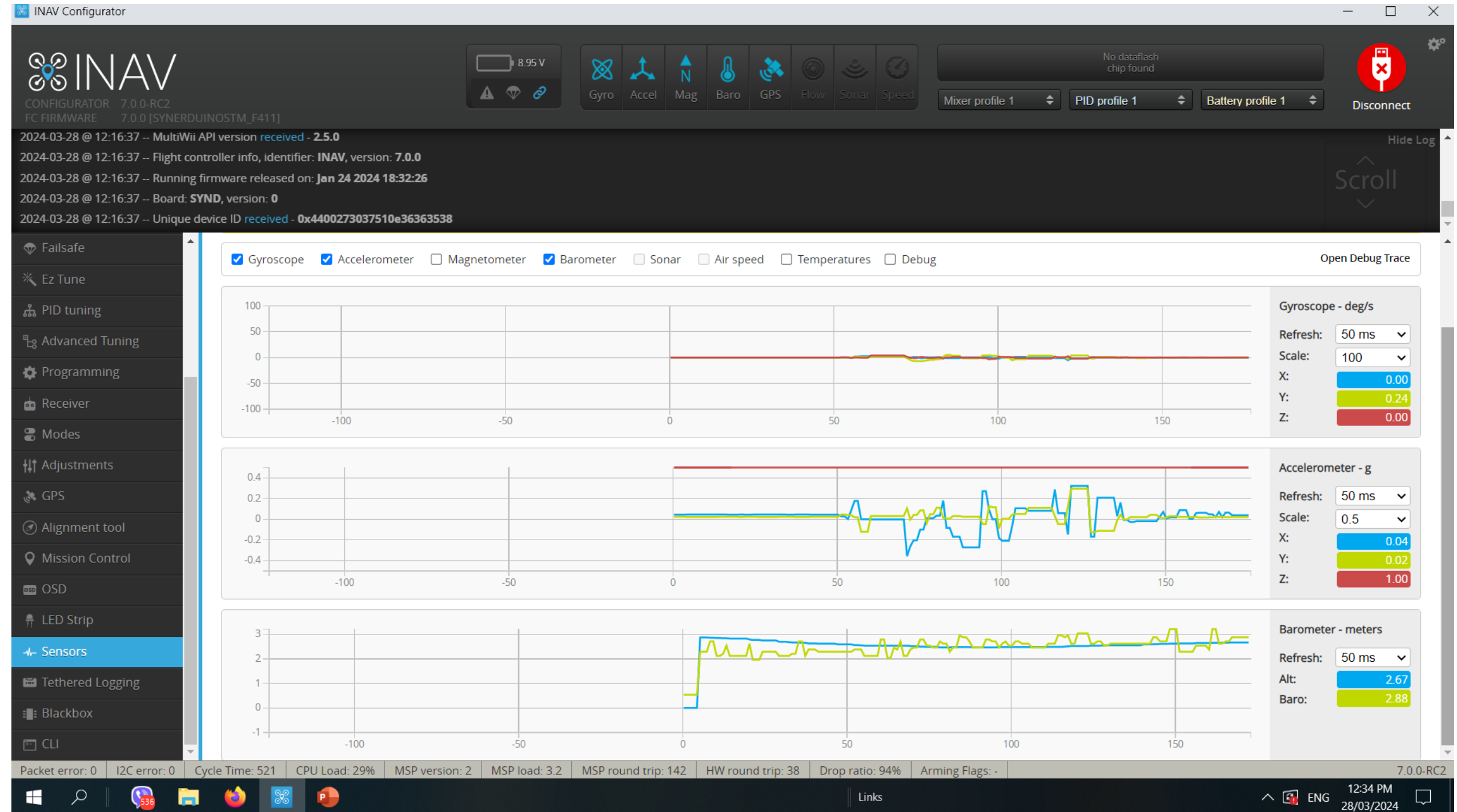
270 Degrees = West



SETTING UP YOUR DRONE

SENSORS

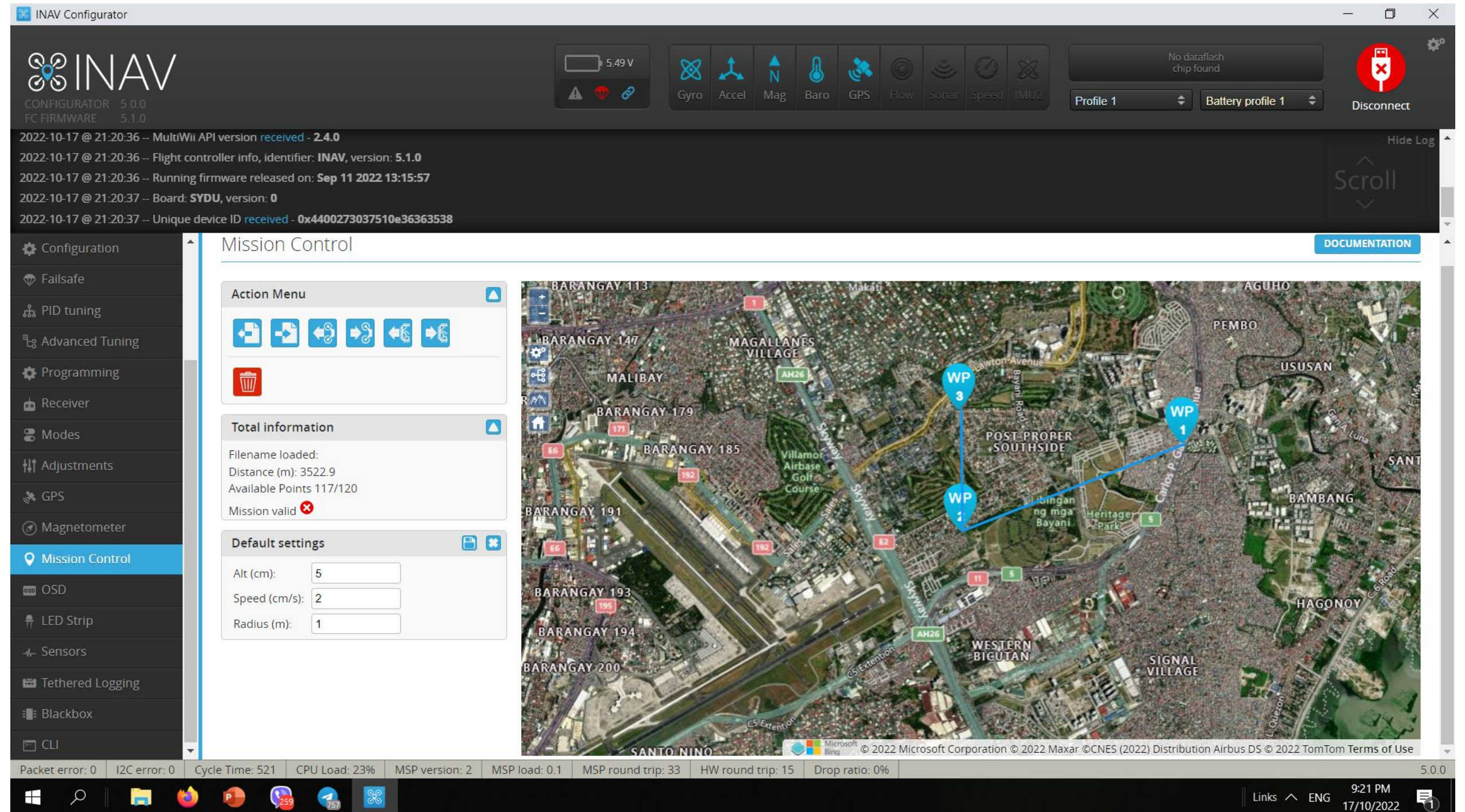
This is to visualize your Sensors input and aid for orientation



SETTING UP YOUR DRONE

MISSION CONTROL

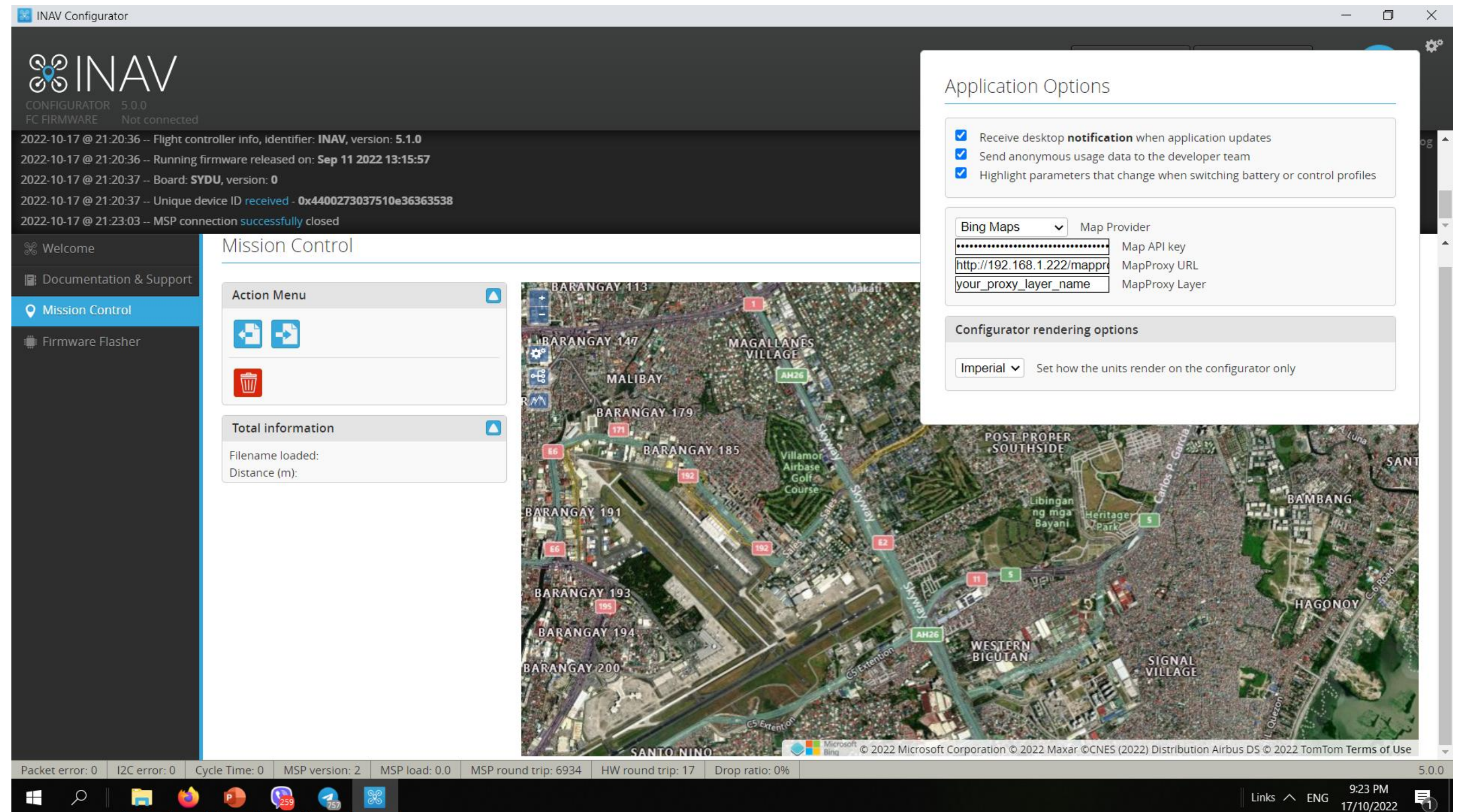
NAV Configurator allows to choose between OpenStreetMap, Bing Maps, and MapProxy map providers. INAV Configurator is shipped **WITHOUT** API key for Bing Maps. That means: every user who wants to use Bing Maps has to create own account, agree to all *Terms and Conditions* required by Bing Maps and configure INAV Configurator by himself.



SETTING UP YOUR DRONE

How to choose Map provider

1. Click **Settings** icon in the top-right corner of INAV Configurator
2. Choose provider: OpenStreetMap, Bing, or MapProxy
3. In the case of Bing Maps, you have to provide your own, personal, generated by you, Bing Maps API key
4. For MapProxy, you need to provide a server URL and layer name to be used



How to get Bing Maps API key

- 1.Go to the Bing Maps Dev Center at <https://www.bingmapsportal.com/>.
 1. If you have a Bing Maps account, sign in with the Microsoft account that you used to create the account or create a new one. For new accounts, follow the instructions in [Creating a Bing Maps Account](#).
- 2.Select **My keys** under **My Account**.
- 3.Select the option to create a new key.
- 4.Provide the following information to create a key:
 1. Application name: Required. The name of the application.
 2. Application URL: The URL of the application. This is an optional field which is useful in helping you remember the purpose of that key in the future.
 3. Key type: Required. Select the key type that you want to create. You can find descriptions of key and application types here.
 4. Application type: Required. Select the application type that best represents the application that will use this key. You can find descriptions of key and application types [here](#).
- 5.Click the **Create** button. The new key displays in the list of available keys. Use this key to authenticate your Bing Maps application as described in the documentation for the Bing Maps API you are using.

Application Options

☒

Receive desktop **notification** when application updates

☒

Send anonymous usage data to the developer team

☒

Highlight parameters that change when switching battery or control profiles

Bing Maps

▼

OpenStreetMap

Bing Maps

MapProxy

Map Provider

.....

/mappro

your_proxy_layer_name

Map API key

MapProxy URL

MapProxy Layer

Configurator rendering options

Imperial

▼

Set how the units render on the configurator only

SETTING UP YOUR DRONE

Programming

This is the definitive feature of INAV combine with the Synerduino Shield .

This PLC function allows you to program upto 8 GVAR and instructions from timer to sensor conditions to trigger a Flight mode action or control action of your Drone

The screenshot displays the INAV Configurator software interface. The top bar shows the INAV logo, version 5.0.0, and FC FIRMWARE 5.1.0. A status bar at the top right indicates a battery level of 5.48 V and a 'No dataflash chip found' warning. The left sidebar contains a menu with options: Configuration, Failsafe, PID tuning, Advanced Tuning, Programming (selected), Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox, and CLI. The main area is divided into two tabs: 'Logic Conditions' and 'PID Controllers'. The 'Logic Conditions' tab is active, showing a table of 8 GVARs. The first seven GVARs are enabled and have various conditions and actions defined. The eighth GVAR is disabled. The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 517, CPU Load: 22%, MSP version: 2, MSP load: 2.0, MSP round trip: 66, HW round trip: 17, Drop ratio: 7%, and version 5.0.0. The Windows taskbar at the bottom shows the time as 9:22 PM on 17/10/2022.

#	Enabled	Operation	Operand A	Operand B	Active	Flags	Status
0	<input checked="" type="checkbox"/>	Increase GVAR	Value	0	Value	1	Always
1	<input checked="" type="checkbox"/>	Greater Than	Global Variable	0	Value	55	Always
2	<input checked="" type="checkbox"/>	Set GVAR	Value	0	Value	0	Logic Condition 1
3	<input checked="" type="checkbox"/>	Set GVAR	Value	1	Flight	Vbat [centi-Volt] [1V = 100]	Always
4	<input checked="" type="checkbox"/>	Greater Than	Global Variable	1	Value	545	Always
5	<input checked="" type="checkbox"/>	Override RC Channel	Value	6	Value	55	Logic Condition 4
6	<input type="checkbox"/>	True					
7	<input type="checkbox"/>	True					
8	<input type="checkbox"/>	True					

SETTING UP YOUR DRONE

Java Programming

INAV 9

Java script programming this allows one to import export scripts which also reflect the PLC tab of programming

The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 9.0.0, and various system status icons including battery level (18.34 V), gyro, accel, mag, baro, GPS, flow, sonar, and speed. A sidebar on the left lists configuration options: Status, Calibration, Mixer, Outputs, Ports, Configuration, Failsafe, Tuning, Advanced Tuning, Programming, JavaScript Programming (highlighted), Receiver, Modes, Adjustments, GPS, Alignment Tool, Mission Control, OSD, LED Strip, and Sensors. The main area is the JavaScript Editor, which contains a code editor with the following JavaScript code:

```
1 // Multiple conditions example
2 const { flight, override } = inav;
3
4 // Only boost VTX if far AND high
5 if (flight.homeDistance > 200 && flight.altitude > 50) {
6   override.vtx.power = 4;
7 }
8
9 // Reduce throttle if battery low OR RSSI weak
10 if (flight.cellVoltage < 350 || flight.rssi < 40) {
11   override.throttleScale = 60;
12 }
```

Below the code editor are buttons for "Transpile to INAV", "Load from FC", "Save to FC", and "Clear". The bottom status bar shows system metrics: Packet error: 0, I2C error: 0, Cycle Time: 523, CPU Load: 8%, MSP version: 2, MSP load: 0.3, MSP round trip: 72, HW round trip: 16, and Arming Flags: ARMING_DISABLED_HARDWARE_FAILURE, ARMING_DISABLED_RC_LINK. The bottom right corner shows the date and time: 9:14 PM, 20/12/2025.

SETTING UP YOUR DRONE

CLI Command Line – Aircraft Status

This is where you can import PID setting , check status or Adjust parameters

Open the CLI command line. Enter the command below.

Tasks – check if everything is with in CPU load should be with in 70%

Status – Check if all systems are active , Gyro/ACC/MAG/BARO/GPS or Flow

And to identify errors

The screenshot shows the INAV Configurator software interface. The top bar displays the INAV logo, version 5.0.0, and various status indicators like battery level (8.97 V) and sensor status (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed, IMU2). The left sidebar contains a menu with options like Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox, and CLI (selected). The main area shows the CLI output, which includes a list of tasks and their status, a note about leaving the CLI tab, and a command prompt. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and the current version (5.0.0).

INAV Configurator 5.0.0

CONFIGURATOR 5.0.0
FC FIRMWARE 5.0.0

2022-07-21 @ 17:37:47 -- Flight controller info, identifier: INAV, version: 5.0.0
2022-07-21 @ 17:37:47 -- Running firmware released on: Jun 4 2022 12:14:54
2022-07-21 @ 17:37:47 -- Board: ST41, version: 0
2022-07-21 @ 17:37:48 -- Unique device ID received - 0x4400273037510e36363538
2022-07-21 @ 17:38:30 -- CLI mode detected

Note: Leaving CLI tab or pressing Disconnect will automatically send "exit" to the board. With the latest firmware this will make the controller restart and unsaved changes will be lost.

```
# taks
### ERROR: Unknown command, try 'help'
# tasks
Task list
0 - SYSTEM 9 12 0 0.5% 0.5% 228
1 - PID 316 66198 176 2092.3% 6.0% 2995
2 - GYRO 3906 66447 232 25954.6% 91.1% 41256
3 - RX 49 63 48 0.8% 0.7% 126
4 - SERIAL 97 102220 4 992.0% 0.5% 199
5 - BATTERY 49 40041 11 196.7% 0.5% 67
6 - TEMPERATURE 98 7 1 0.5% 0.5% 7
7 - BEEPER 98 14 7 0.6% 0.5% 33
8 - GPS 49 154 21 1.2% 0.6% 54
9 - COMPASS 9 197 187 0.6% 0.6% 95
10 - BARO 36 153 136 1.0% 0.9% 411
14 - TELEMETRY 448 25 3 1.6% 0.6% 131
18 - CMS 49 4 2 0.5% 0.5% 3
21 - VTCTRL 4 2 1 0.5% 0.5% 0
22 - PROGRAMMING 9 32 21 0.5% 0.5% 10
24 - AUX 98 10 3 0.5% 0.5% 14
25 - SPORT MASTER 480 12 1 1.0% 0.5% 22
Task check function
Total (excluding SERIAL) 28253.4% 105.0%

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

Write your command here

EXIT SAVE SETTINGS MSC Copy to clipboard Clear output history Load from file Save to File

Packet error: 0 I2C error: 0 Cycle Time: 3028 CPU Load: 90% MSP version: 2 MSP load: 0.0 MSP round trip: 34 HW round trip: 17 Drop ratio: 0% 5.0.0

Links ENG 5:39 PM 21/07/2022

Reason (CLI Mnemonic)	Bit Mask (Hex)	Explanation
FS	00000080	The RX is not recognised as providing a valid signal
ANGLE	00000100	The vehicle is not level as defined by the CLI small_angle setting
CAL	00000200	The pre-arm sensor calibration has not completed. The barometer is somewhat susceptible to lengthy calibration, which may be mitigated by the CLI setting baro_cal_tolerance, e.g. set baro_cal_tolerance = 500 (find a suitable value by experimentation).
OVRLD	00000400	The CPU load is excessive. May be caused by too an aggressive loop time setting.
NAV	00000800	Where the CLI setting nav_extra_arming_safety = ON is used, this may be caused by reasons shown in the <u>table below</u>
COMPASS	00001000	The compass is not calibrated. Perform the calibration procedure
ACC	00002000	The accelerometer is not calibrated. Perform the 6 point calibration procedure
ARMSW	00004000	The arm switch was engaged as the FC booted
HWFAIL	00008000	A required hardware device has failed / is not recognised (e.g. GPS, Compass, Baro)
BOXFS	00010000	A failsafe switch is engaged
KILLSW	00020000	A kill switch is engaged
RX	00040000	The RC link is not detected (RX not detected)
THR	00080000	The throttle setting is not a minimum
CLI	00100000	The CLI is active (note: you will always /unavoidably see this when in the CLI)
CMS	00200000	The CMS menu is active
OSD	00400000	The OSD menu is active
ROLL/PITCH	00800000	Roll and/or pitch is not centred
AUTOTRIM	01000000	Servo autotrim is engaged
OOM	02000000	The FC is out of memory
SETTINGFAIL	04000000	A CLI setting is out of range. The erroneous setting should be indicated in a CLI dump. If you can't then reset the offending setting, reflash with full chip erase and reapplying settings from scratch may help.
PWMOUT	08000000	PWM output error. Motor or servo output initialization failed. (cause by insufficient timers available : turn off unused function like LED strip or SPI device)
NOPREARM	10000000	PREARM is enabled and timed out

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

Type Status on the CLI to find the cause

SETTING UP YOUR DRONE

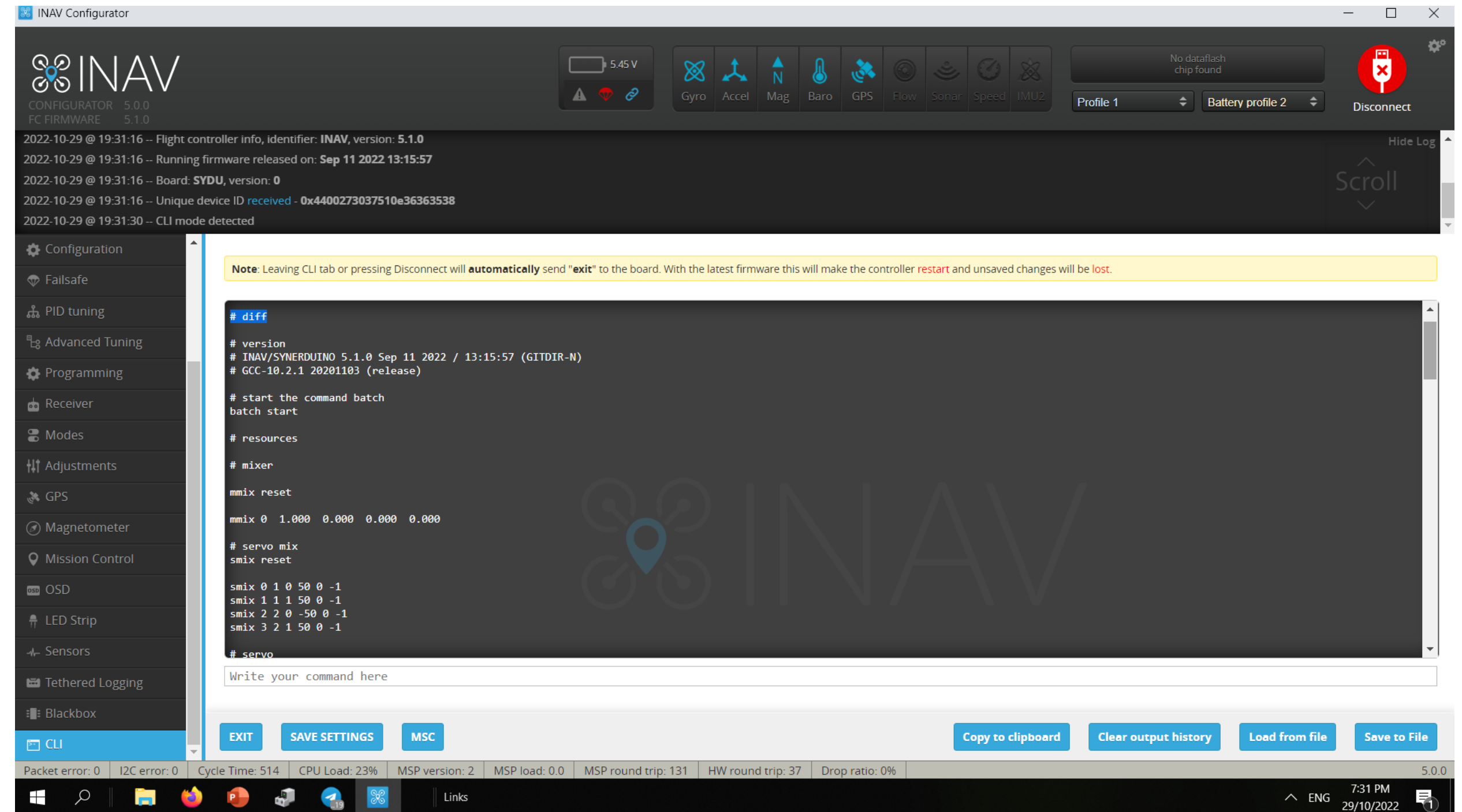
CLI Command Line Saving and Loading Parameters

You can download the Preset DIFF for the Synerduino STM Synerduino STM page

- DIFF - command to dump only those settings that differ from their default values (those that have been changed).
- DUMP – CLI Dump configuration

Then save the output on a notepad

The same output can be paste on the CLI and press ENTER to upload the Configuration , Save Settings then Reboot



Note: that we offer the Synerduino STM Diff .txt file available for those who wanted to use the pre-set for the 250mm synerduino drone

SETTING UP YOUR DRONE

Sometimes no matter how well you calibrate

Your aircraft may drift when your on neutral sticks

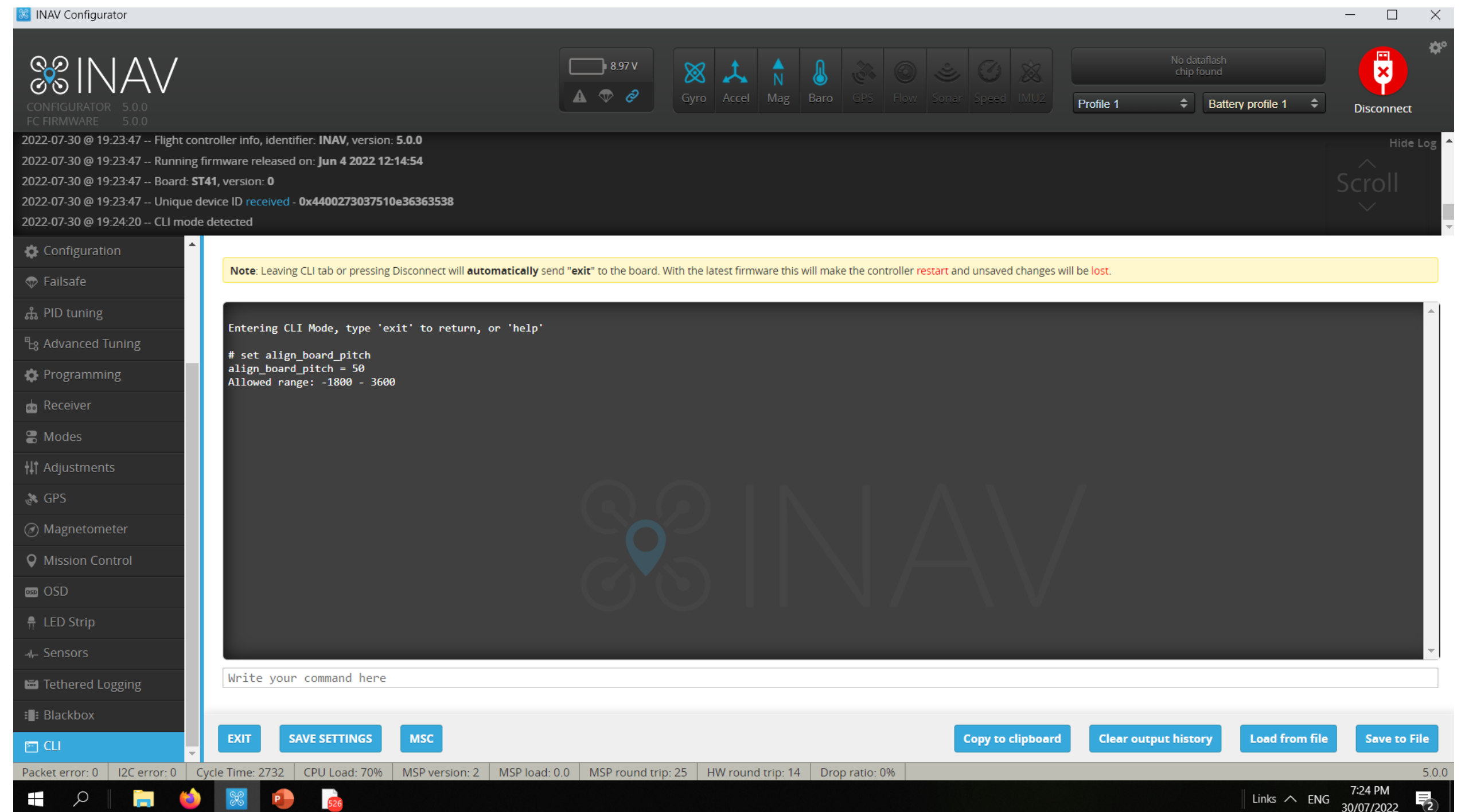
your ACC its not always perfect . You may need to trim your board for a good stability in flight

set align_board_pitch
set align_board_pitch = #
Allowed range: -1800 – 3600

set align_board_roll
set align_board_roll = #
Allowed range: -1800 – 3600

Pitch + # is Trim to the Back
Pitch – # is Trim to the Forward
Roll + # is Trim Left
Roll - # is Trim Right

CLI Command Line Trimming the Roll and Pitch Alignment



SETTING UP YOUR DRONE

CLI Command Line Landing setting

What your drone would do when Landing or RTH command is present

[nav_disarm_landing](#)

This shuts off the motor after touch down or contact solid . Means drone has no movement for 3 seconds or what ever you set it to

[nav_emerg_landing_speed](#)

The speed it descends on emergency

[nav_rth_allow_landing](#)

Should the drone land after reaching RTH

Note: Leaving CLI tab or pressing Disconnect will automatically send "exit" to the CLI

Entering CLI Mode, type 'exit' to return, or 'help'

```
# get landing
```

```
nav_disarm_on_landing = OFF
```

```
Allowed values: OFF, ON
```

```
nav_emerg_landing_speed = 500
```

```
Allowed range: 100 - 2000
```

```
nav_rth_allow_landing = ALWAYS
```

```
Allowed values: NEVER, ALWAYS, FS_ONLY
```

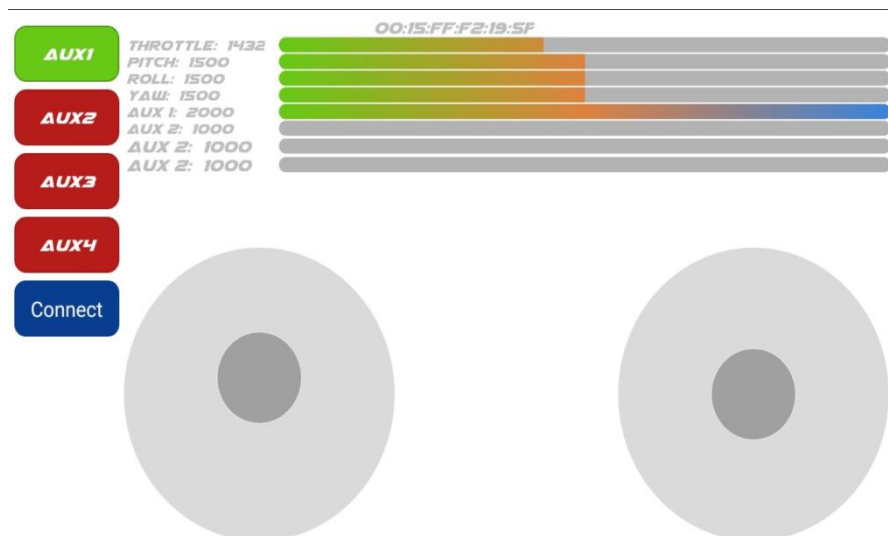
SETTING UP YOUR DRONE

`set rx_min_usec = 790`

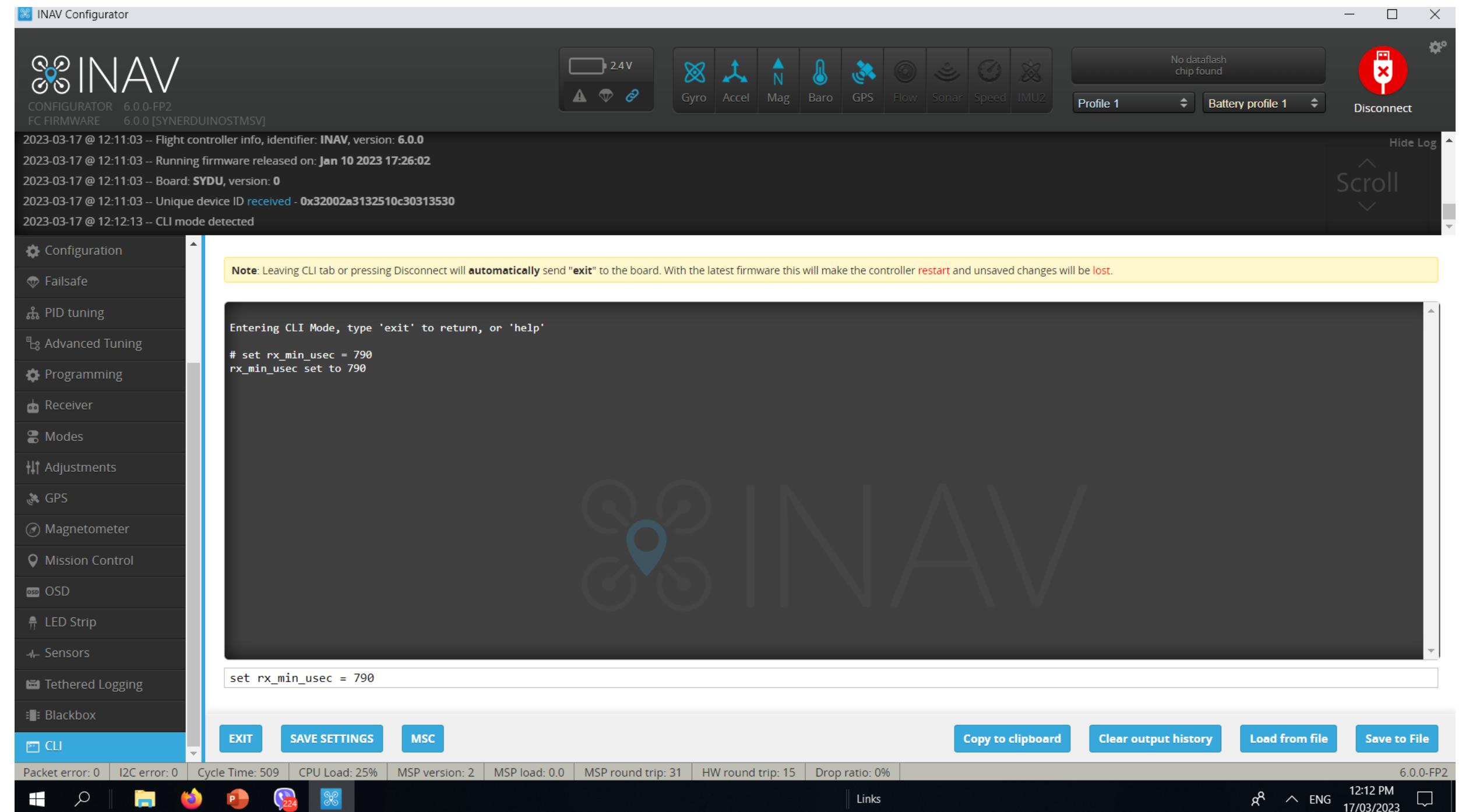
Because the Synerduino App sets RX min as 800 to accommodate Multiwii Serial RC switching

The INAV equivalent is to reduce the RC min to 790 to accommodate this buttons

This allows the use of the AUX buttons on the Left



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



SETTING UP YOUR DRONE

Its important to set this correctly to ensure proper GPS flights

Set `ahrs_gps_yaw_windcomp = ON`

Set `gps_provider = UBLOX7`

Allowed values: NMEA, UBLOX, UBLOX7, MSP

Set `gps_sbas_mode = AUTO`

Allowed values: AUTO, EGNOS, WAAS, MSAS, GAGAN, NONE

Set `gps_dyn_model = PEDESTRIAN`

PEDESTRIAN – multirotor hover or Slow Flg

AIR_1G – airplane slow to mid speed

AIR_4G – airplane fast speed

`gps_auto_config = ON`

Config GPS on bootup

`gps_auto_baud = ON`

`gps_ublox_use_galileo = OFF`

turn on only if GPS supports Galileo in your area

`gps_min_sats = 6`

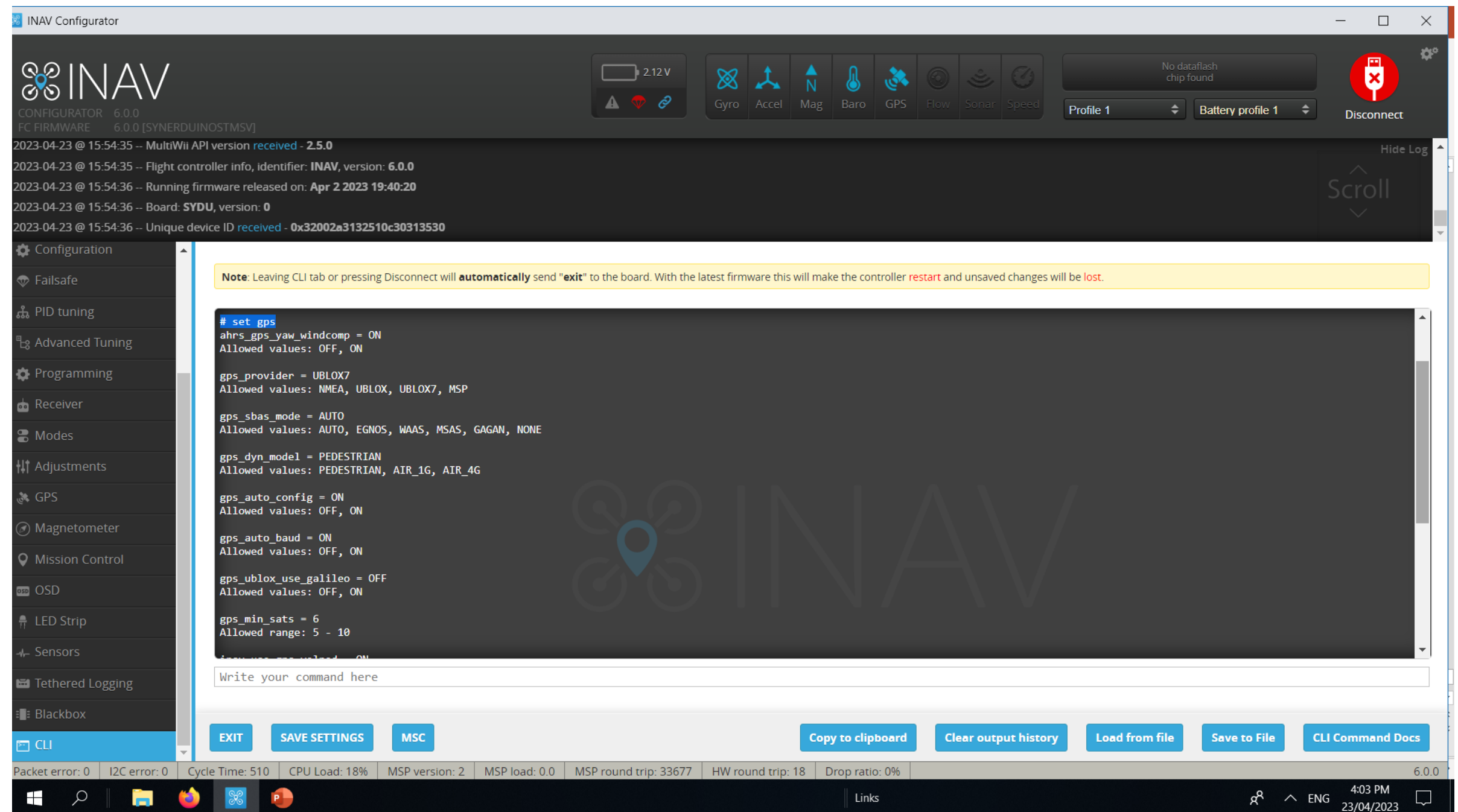
Minimum sats to arm gps flight mode

`inav_use_gps_velned = ON`

`inav_use_gps_no_baro = OFF`

turning this on would make your drone rely on GPS altitude instead of Baro – measure above sea level instead relative to bootup

CLI Command Line GPS setting

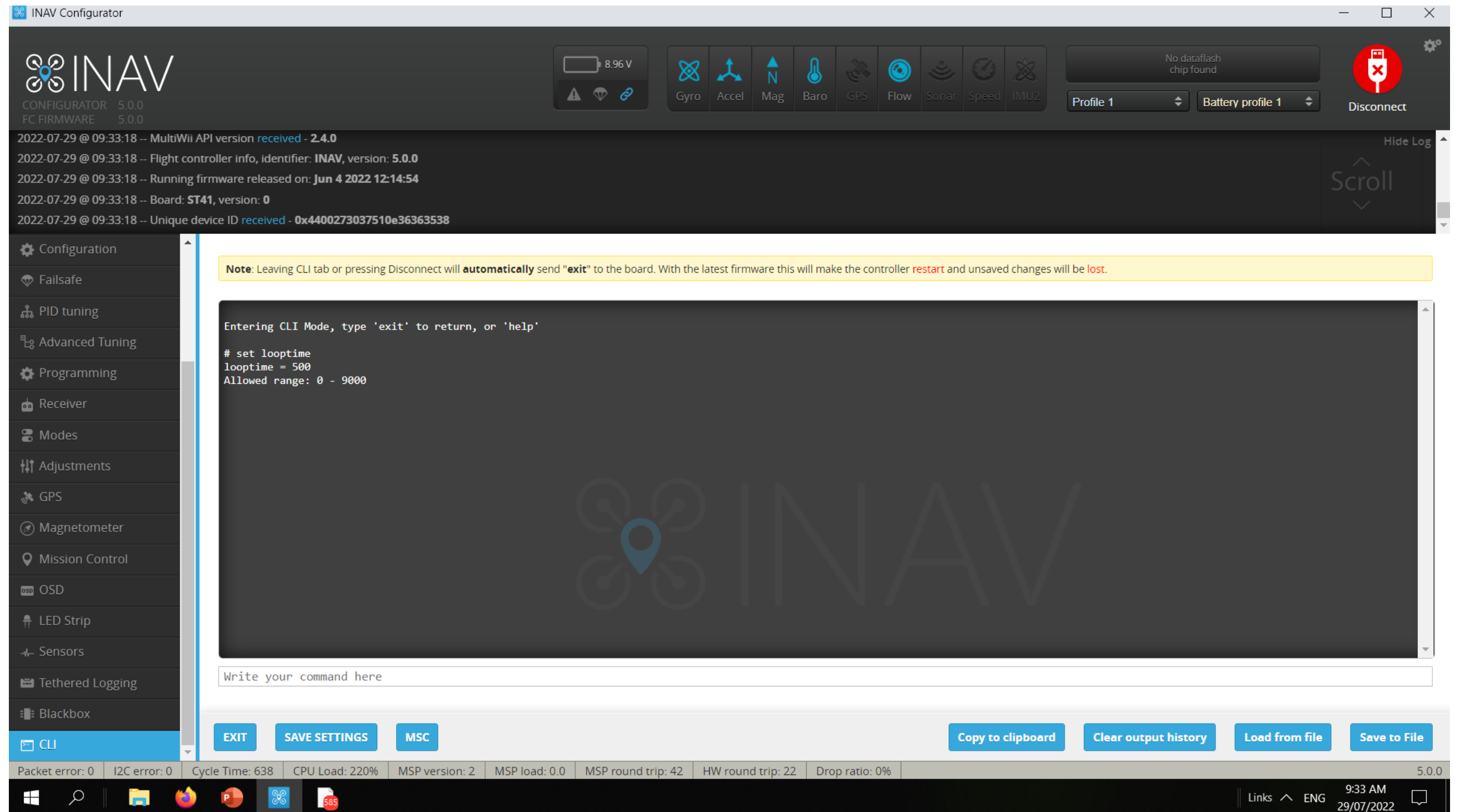


SETTING UP YOUR DRONE

CLI Command Line – Looptime and CPU Speed

LoopTime is the speed of processing allocation, this is adjusted depending on the sensors used or the number of peripherals

Looptime – Default 500 but you can get as slow as 2000 in worst case scenario



SETTING UP YOUR DRONE

Open the CLI command line.
Enter the command below.
Default: set looptime = 500 or
Synerduino: set looptime =
2800 - 3500 this would slow
down the refresh rate of the
gyro to give it enough time for
the cpu to load aswell as
reduce the sensitivity of Gyros
to Noise (Vibrations) that can
cause the drone to flip
Then save it by typing the
following command. save

This Adjust the sensor
Refresh rate to better
regulate the CPU Load
Speed , If CPU is above
100% its overloaded and
the failsafe would kick in
. The drone will not Arm

CLI Command Line – Looptime and CPU speed

The screenshot displays the INAV Configurator application window. The top bar shows the INAV logo and version (CONFIGURATOR 5.0.0, FC FIRMWARE 5.0.0). A status bar at the top right indicates a battery level of 8.97 V and a 'No dataflash chip found' warning. The main interface is divided into a left sidebar with various configuration tabs (Configuration, Failsafe, PID tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Magnetometer, Mission Control, OSD, LED Strip, Sensors, Tethered Logging, Blackbox, CLI) and a central area for the selected tab. The CLI tab is active, showing a terminal window with the following text:

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

Below the terminal window is a text input field labeled 'Write your command here'. At the bottom of the CLI tab, there are buttons for 'EXIT', 'SAVE SETTINGS', and 'MSC'. The bottom status bar of the application shows various system metrics: Packet error: 0, I2C error: 0, Cycle Time: 1640, CPU Load: 117%, MSP version: 2, MSP load: 0.0, MSP round trip: 72, HW round trip: 40, Drop ratio: 0%, and the version 5.0.0. The Windows taskbar is visible at the very bottom of the screen.

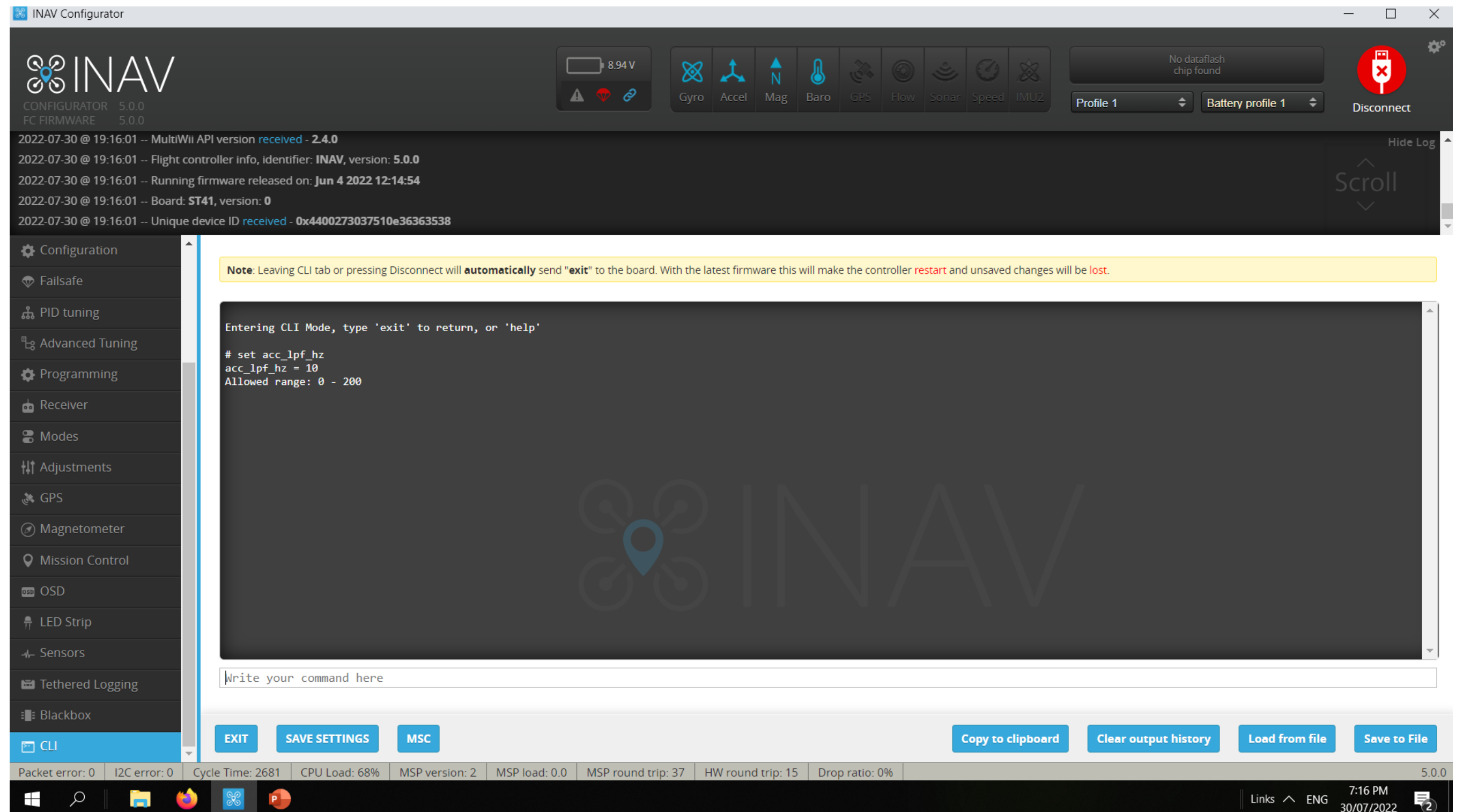
SETTING UP YOUR DRONE

CLI Command Line – Low Pass Filter

set acc_lpf_hz = 10 –

lower the number the less the sensitivity of the Acc to vibration cause by the motor , this may give a sluggish respond but it would settle the strange hiccups of INAV for Drifting Horizons

set acc_lpf_hz = 20 is Default



SETTING UP YOUR DRONE

Set `nav_mc_althold_throttle = MID_STICK`
Allowed values: STICK, MID_STICK, HOVER

Sometimes users preference or Radio Transmitter would determine what constitute an Altitude hold

STICK = this would rely on the hover throttle as set in ADVANCE PID to determine the hover with dead band +/-

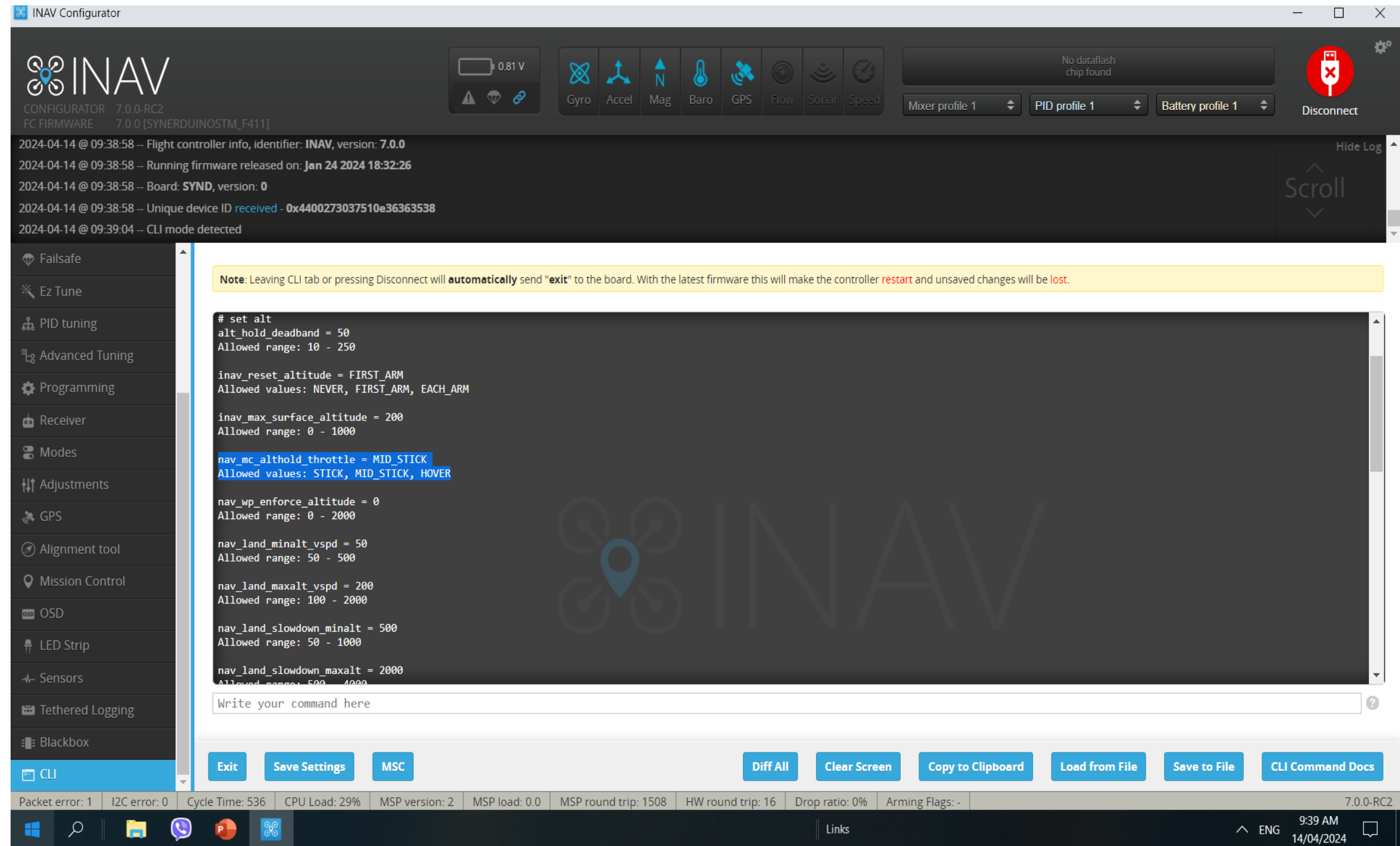
MID_STICK = this is common for Radios with throttle stick at center position with PWM 1500, means then throttle stick is at the center Altitude hold is active

HOVER = again is is Hover throttle Related

Set `alt_hold_deadband = 50`
Allowed range: 10 – 250

This is Dead band related it gives a deadregion in your throttle mid stick like 1450 to 1550 as MID stick position

Altitude hold



<https://github.com/iNavFlight/inav/discussions/8933>

SETTING UP YOUR DRONE

Finishing Note:

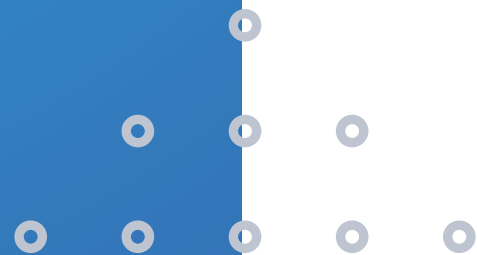
Should you use the Preset DIFF in CLI

You may need to check again the following

- Calibration
- PID Tuning
- PORTS – if the correct port selected depending on your serial hardware
- Receiver - RC mapping to match your radio
- Modes – Flight modes switch
- Configuration - Sensor Orientation /Mag Orientation
- Magnetometer - Orientation
- GPS – configuration should it match your GPS type
- CLI – Task and Status to make sure you didn't miss anything or having conflict
- INAV is a Active development and should be check for Updates from time to time

www.Synerflight.com

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

The screenshot displays the INAV Configurator software interface. At the top, the INAV logo and version information (CONFIGURATOR 7.0.0-RC2, FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]) are shown. A status bar indicates a battery voltage of 8.88 V and a 'No dataflash chip found' warning. A row of sensor status icons (Gyro, Accel, Mag, Baro, GPS, Flow, Sonar, Speed) is visible, with a blue arrow pointing to the 'Mag' (Magnetometer) icon. The main window is titled 'Setup' and contains a 'Reset Settings' button and a 'Restore settings to default' option. Below this, a 3D model of a drone is shown with green arrows indicating pitch and roll. To the right, a 'Pre-arming checks' section lists several checks, all of which are marked with green checkmarks, indicating they are all passed. Below this, an 'Info' section displays various system parameters. A green arrow points from the drone model towards the 'Pre-arming checks' section. The bottom status bar shows various system metrics like Packet error, I2C error, Cycle Time, CPU Load, MSP version, MSP load, MSP round trip, HW round trip, Drop ratio, and Arming Flags.

INAV Configurator

INAV
CONFIGURATOR 7.0.0-RC2
FC FIRMWARE 7.0.0 [SYNERDUINOSTM_F411]

2024-03-28 @ 12:16:37 -- MultiWii API version received - 2.5.0
2024-03-28 @ 12:16:37 -- Flight controller info, identifier: INAV, version: 7.0.0
2024-03-28 @ 12:16:37 -- Running firmware released on: Jan 24 2024 18:32:26
2024-03-28 @ 12:16:37 -- Board: SYND, version: 0
2024-03-28 @ 12:16:37 -- Unique device ID received - 0x4400273037510e36363538

8.88 V
No dataflash chip found

Gyro Accel Mag Baro GPS Flow Sonar Speed

Mixer profile 1 PID profile 1 Battery profile 1 Disconnect

Hide Log

Scroll

DOCUMENTATION

Setup

Reset Settings Restore settings to default

Heading: 163 deg
Pitch: 13.3 deg
Roll: 2.2 deg

Reset Z axis, offset: 0 deg

Pre-arming checks

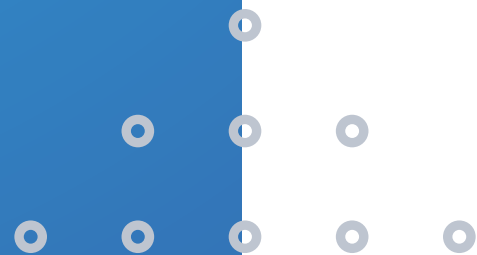
UAV is levelled	✓
Run-time calibration	✓
CPU load	✓
Navigation is safe	✓
Compass calibrated	✓
Accelerometer calibrated	✓
Settings validated	✓
Hardware health	✓

Info

Battery detected cell count:	3
Battery voltage:	8.88 V
Battery left:	0 %
Battery remaining capacity	NA
Battery full when plugged in	false
Battery use cap thresholds	false

Packet error: 0 I2C error: 0 Cycle Time: 516 CPU Load: 27% MSP version: 2 MSP load: 0.3 MSP round trip: 83 HW round trip: 39 Drop ratio: 0% Arming Flags: - 7.0.0-RC2

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*

