



**Cobra F405 60A Stack
Cobra F405 V4.0 & V4.1
Flight Controller
Cobra 60A V3 4-in-1 ESC
User Manual**

Table of contents

Revision History	3
Introduction	4
Part 1 - Overview	5
Part 2 - Hardware description.....	6
Part 3 - Specifications	12
Part 4 - Pin mapping.....	13
Part 5 - Standard settings	14
Part 6 – ESC Software update	24
Part 7 – Package.....	30

Revision history

Version	Date	Author	Notes
1.0	2025-12-10	AeroThink P.S.A	Initial release of the manual.

Introduction

About this Manual

This manual describes the setup, wiring, configuration and operation of the **FC Flight Controller**

Features Overview

- Compatible firmware: **INAV** / **Betaflight** / (optionally **ArduPilot**)
- Multiple UARTs for GPS, RC link, telemetry
- Integrated OSD / VTX control (if applicable)
- Servo outputs for elevon / aileron / rudder / throttle
- Onboard **barometer** (if fitted) and **IMU**

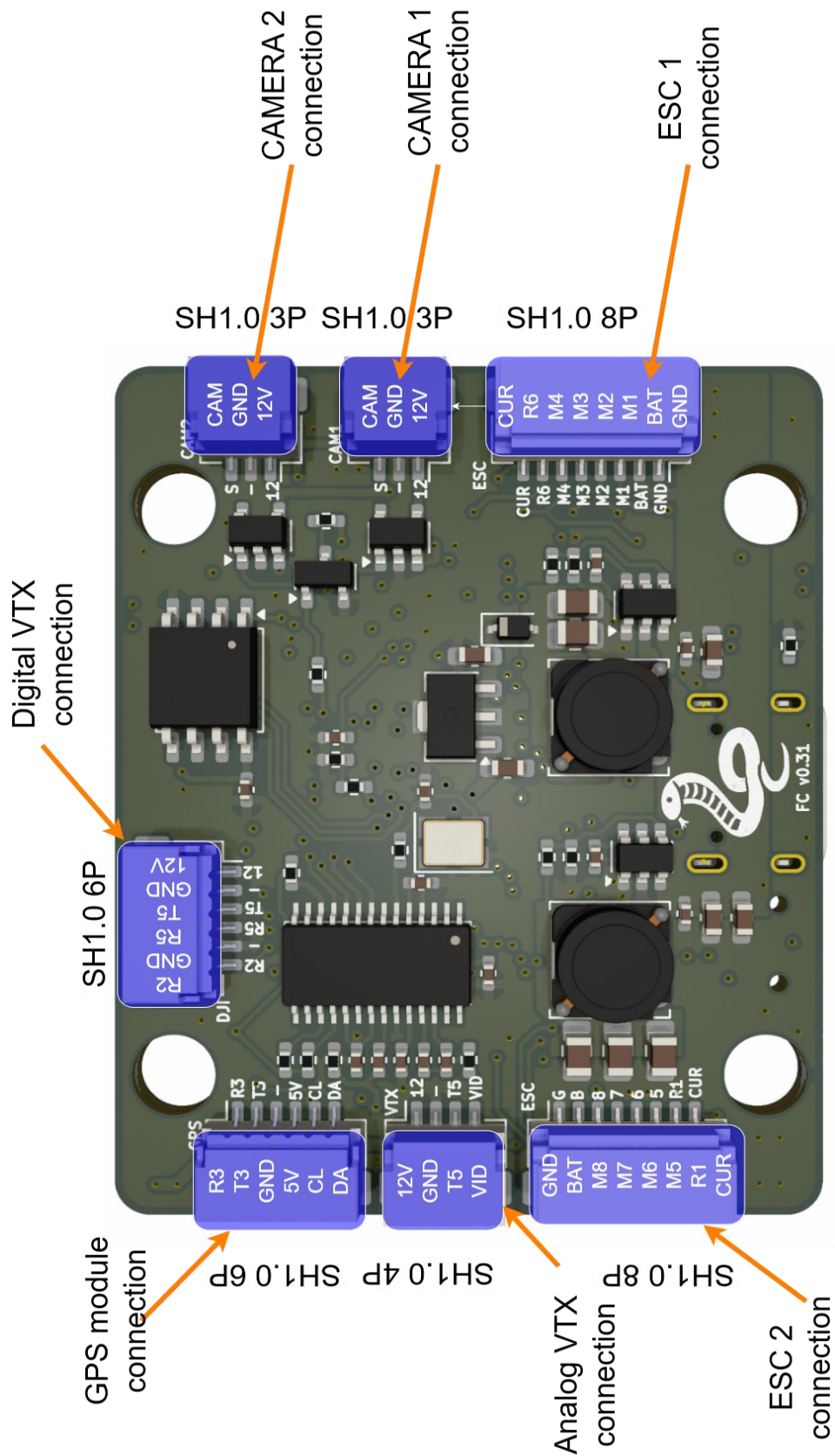
Safety Information

- Always remove propellers during bench tests.
 - Verify **polarity** and **voltage ranges** before powering the board.
 - Perform a full **pre-flight checklist** before the maiden flight.
-

Part 1 - Overview

Product	Product Name
FC Board	COBRA F405 FC Board
ESC Board	COBRA 60A ESC Board
LED strip controller	Supported
Battery level indicator	Supported
FC Firmware	INAV / Ardupilot / Betaflight
FC Power Input	2-8S LiPo
ESC Power Input	2-6S LiPo
Dimension	52 (L) x 33 (W) x 24 (H)

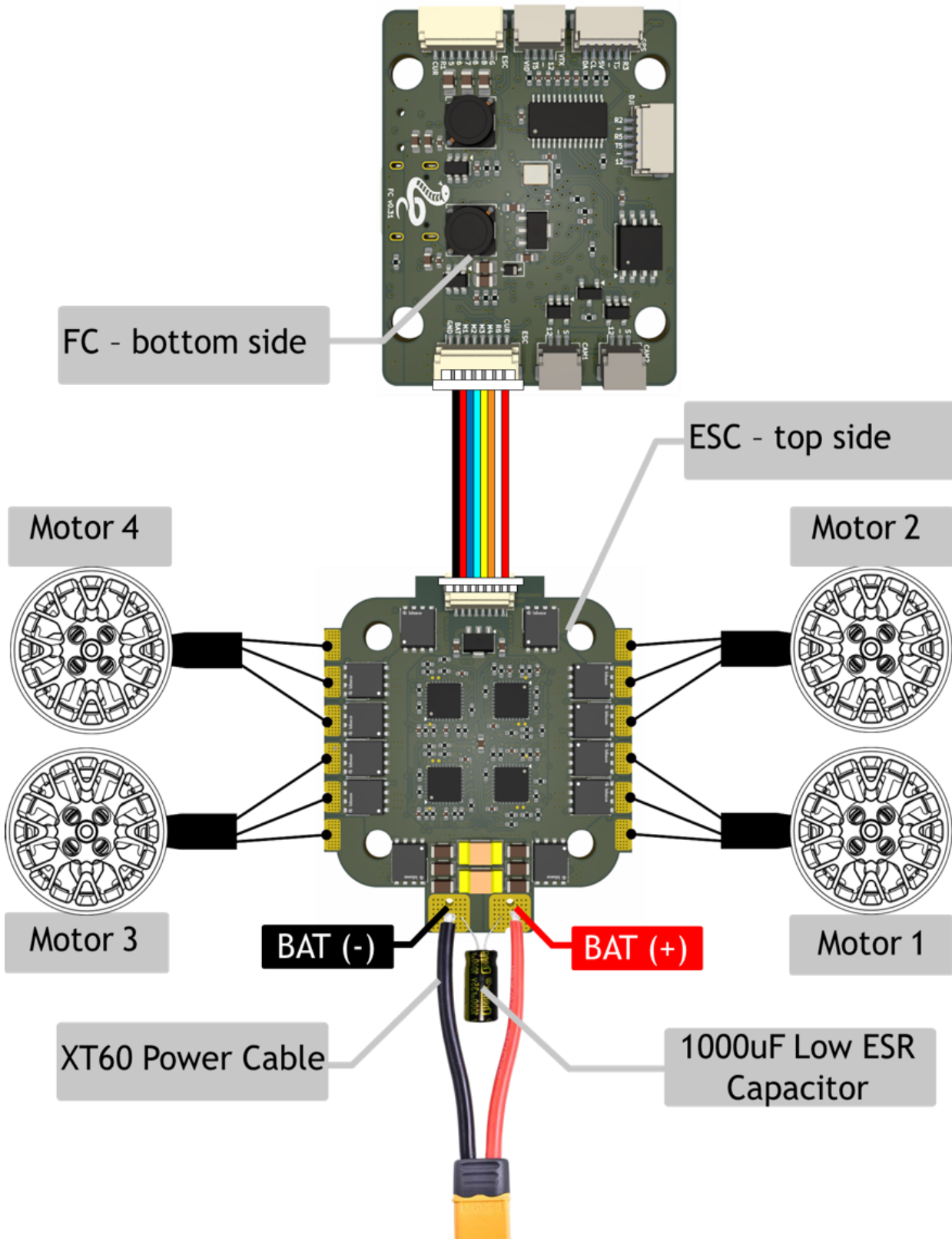
FC board back



NOTE: BEC Output 9V +/- 0.2V DC Continuous current 1.8 Amps (Version 4.0) or BEC Output 12.6V +/- 0.2V DC Continuous current 1.8 Amps (Version 4.1)

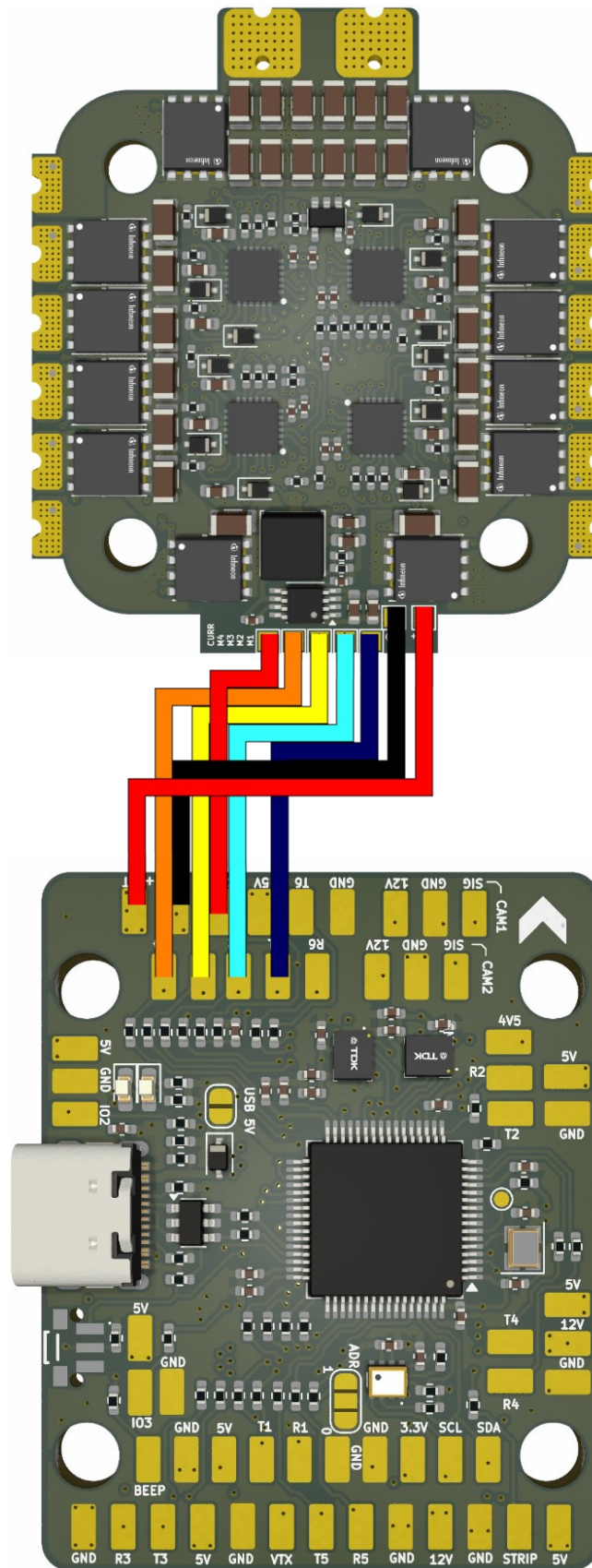
ESC board front and FC connection

Method 1: Plug and play



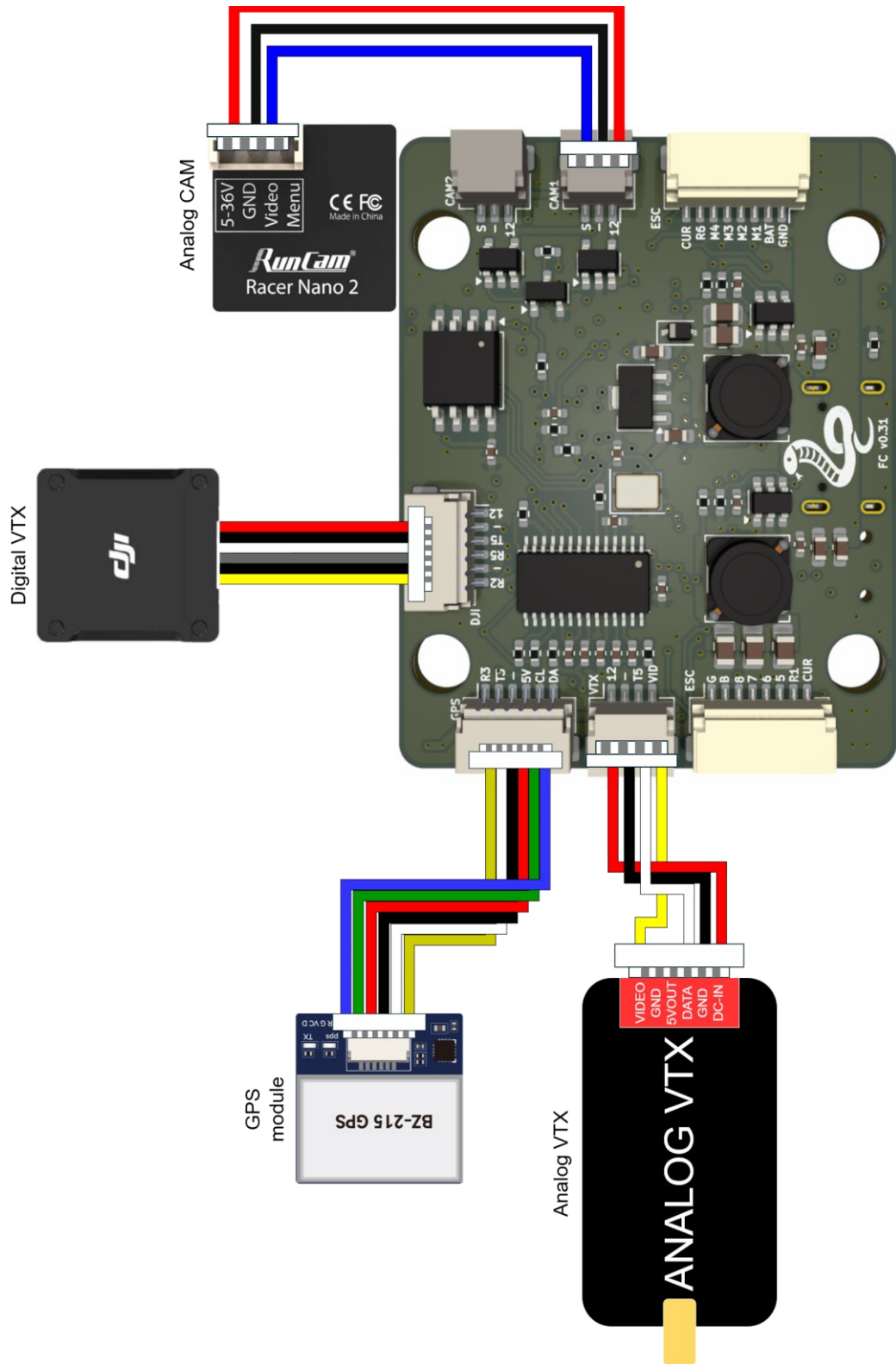
NOTE: In order to prevent the stack from being burnt out by voltage spikes on powering up, it is strongly recommended to use the Low ESR capacitor in the package.

Method 2: Direct soldering

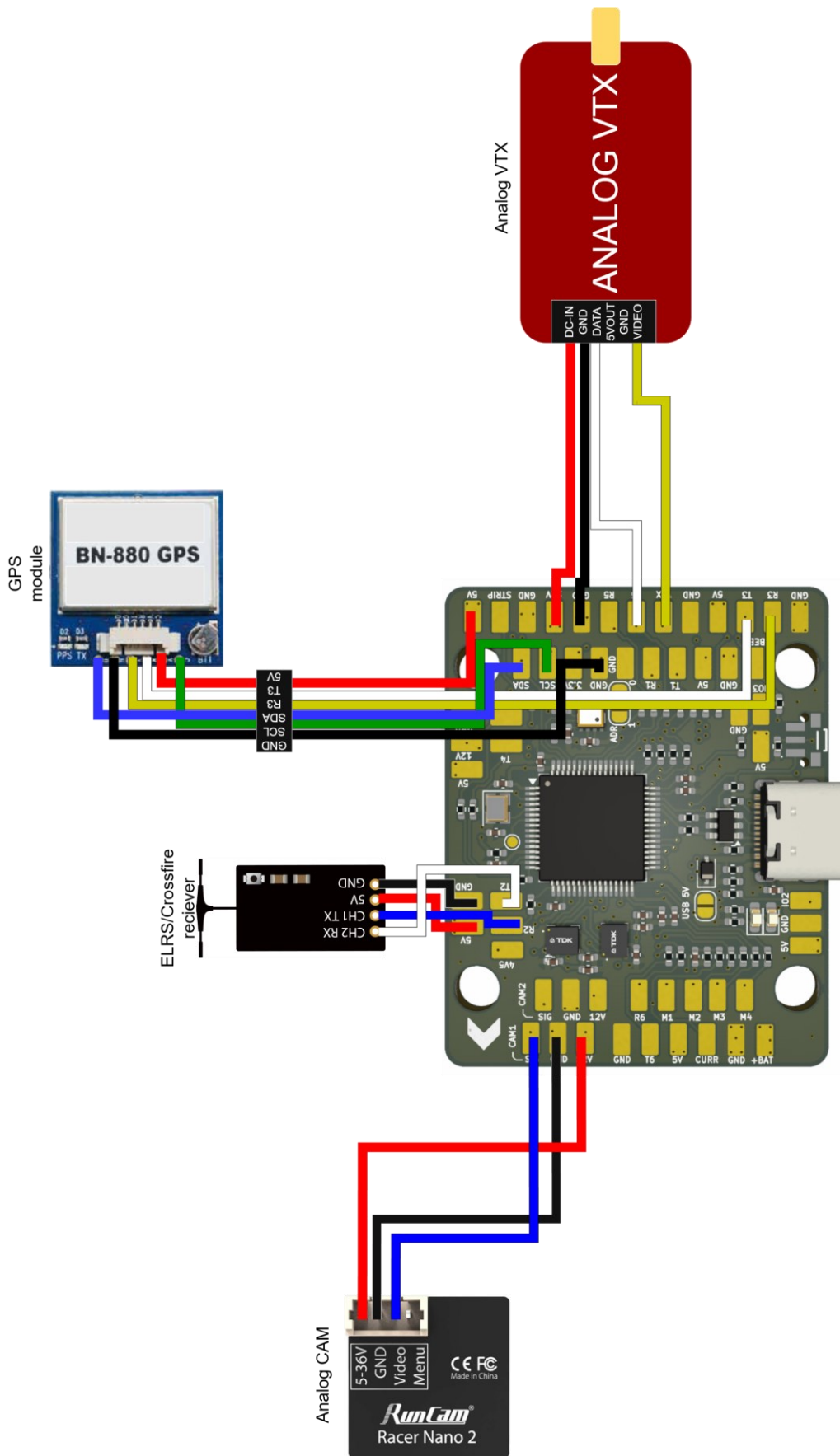


Wiring Diagram

Method 1: Plug and play



Method 2: Direct soldering



Part 3 - Specifications

Cobra F405 FC Board (Version 4.0 and 4.1)

MCU	STM32F405,168MHz,1MB Flash
IMU(Gyro&Accelerometer)	2x ICM-42688-P or 2x ICM-42605
Barometer	BMP280
OSD Chip	AT7456E
Blackbox	FLASH 16MB
UARTs	6 sets(UART1, UART2, UART3, UART4, UART5, UART6)
I2C	1x Used for magnetometer, digital airspeed sensor
ADC	2x(VBAT, 2x Current)
PWM	12x
ELRS/CRSF receiver	Supported
SBUS	Built in inverter for SBUS input (UART2-RX)
LED	2xLEDs for FC STATUS (Red, Green)
Supported FC Firmware	INAV:COBRA F405, BETAFLIGHT: COBRA F405 (default), ArduPilot: COBRA F405
Input voltage range	7~33.6V (2~8S LiPo)
9V BEC (Version 4.0) or 12V BEC (Version 4.1)	Output 9V +/- 0.2V DC Continuous current 1.8 Amps (Version 4.0) or Output 12.6V +/- 0.2V DC Continuous current 1.8 Amps (Version 4.1)
Mounting	30.5 x 30.5 mm (4mm hole size)

Cobra F405 ESC Board

Input voltage range	7~26V (2~6S LiPo)
Channels	4x 3-Phase BLDC
Supported ESC protocols	PWM, Dshot300, Dshot600
Continuous Current	60A
Burst Current	80A (10 seconds)
Firmware	AM32
Working Frequency	16kHz-128kHz
External capacitor	25V min 1000µF low ESR
Current Measurement	Yes
Mounting	30.5 x 30.5 mm (4mm hole size)

Part 4 - Pin mapping

Part5-Pin out

INAV/BetaFlight mapping

UARTs			
USB		USB	
TX1 RX1	5V tolerant I/O	UART1	USER UART
TX2 RX2 SBUS	5V tolerant I/O	UART2	ELRS/TBS receiver
		SBUS pad	SBUS receiver, SBUS pad = RX2 with inverter
		TX2	SmartPort Telemetry, enable Softserial TX2
TX3 RX3	5V tolerant I/O	UART3	GPS
TX4 RX4	5V tolerant I/O	UART4	USER
TX5 RX5	5V tolerant I/O	UART5	DJI OSD/VTX
TX6 RX6	5V tolerant I/O	UART6	USER UART

PWM		INAV MultiRotor
M1	5V tolerant I/O	Motor/Servo
M2	5V tolerant I/O	Motor/Servo
M3	5V tolerant I/O	Motor/Servo
M4	5V tolerant I/O	Motor/Servo
M5	5V tolerant I/O	Motor/Servo
M6	5V tolerant I/O	Motor/Servo
M7	5V tolerant I/O	Motor/Servo
M8	5V tolerant I/O	Motor/Servo
IO1	5V tolerant I/O	CAM1/CAM2 switch
IO2	5V tolerant I/O	USER IO
IO3	5V tolerant I/O	USER IO

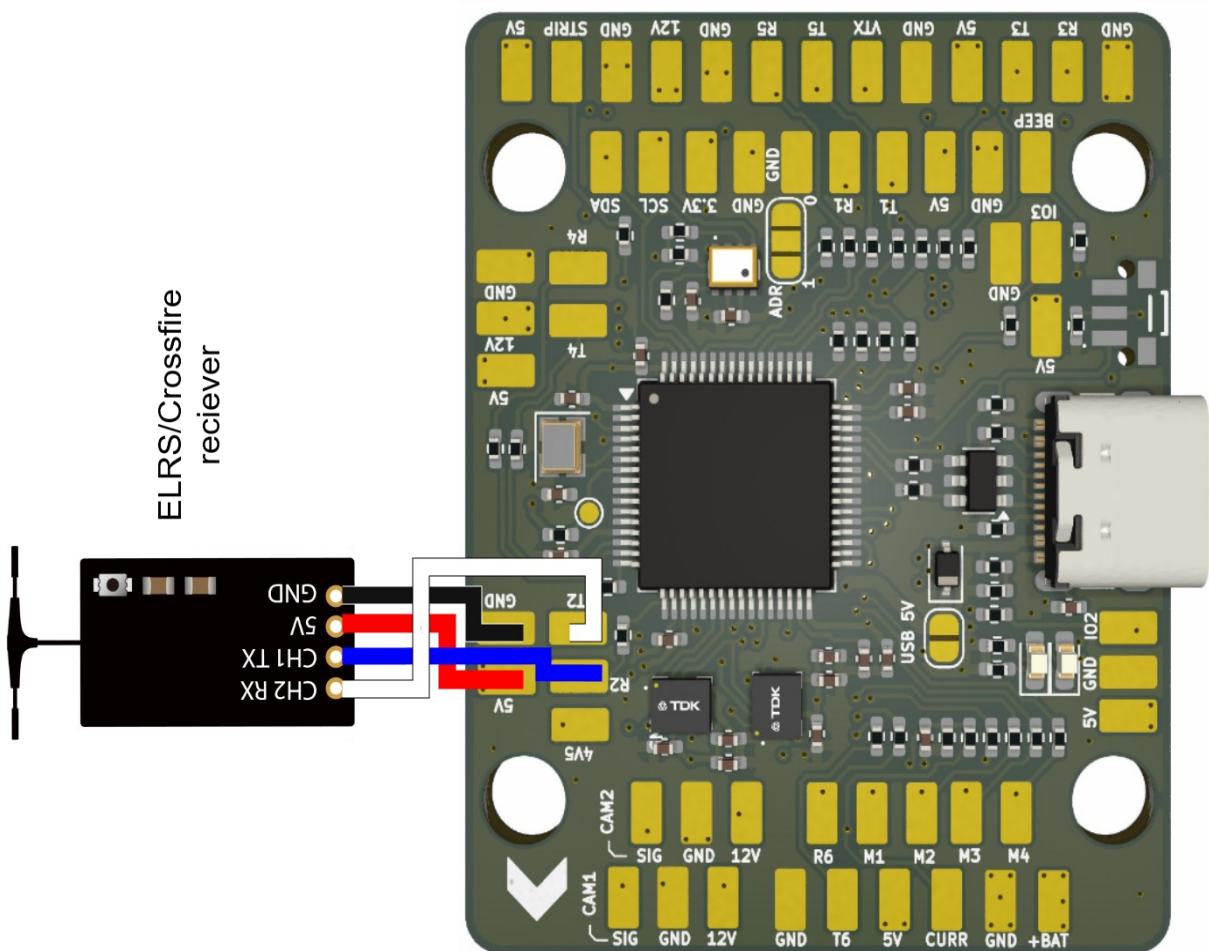
ADC			
VBAT	10K:100K divider builtin 0~30V	VBAT ADC ADC_CHANNEL_1	voltage scale 1100
CURR	0~3.3V	CURRENT_METER ADC ADC_CHANNEL_2	Current scale
I2C			
I2C1	5V tolerant I/O	onboard Barometer	BMP280
		Compass	QMC5883 / HMC5883 / MAG3110 / LIS3MDL
		Digital Airspeed sensor	MS4525
		OLED	0.96"

Part 5 – INAV Standard settings – example

- **Receiver settings**

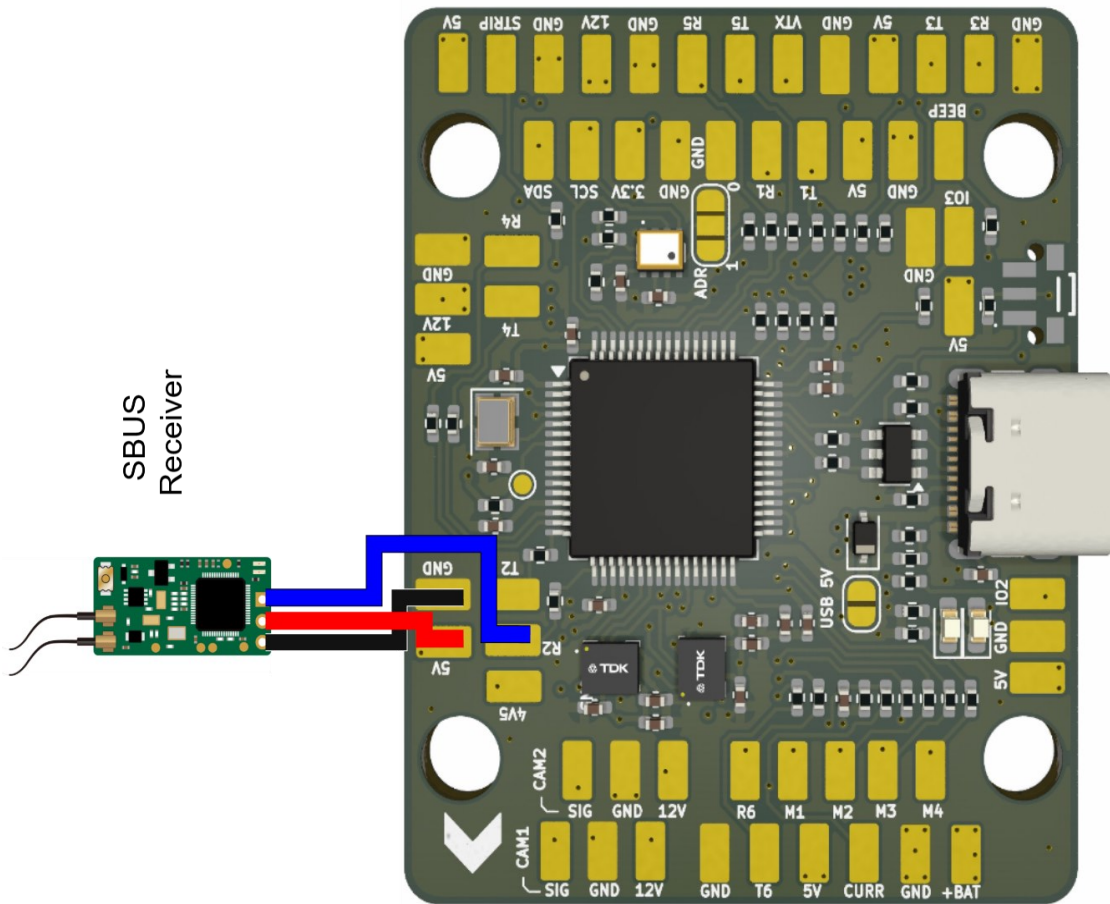
- ***ELRS/TBS CF***

Hardware Connection: Solder the receiver using a 4-pin Dupont single-head cable, then plug the Dupont cable into the corresponding pin header.



• **SBUS**

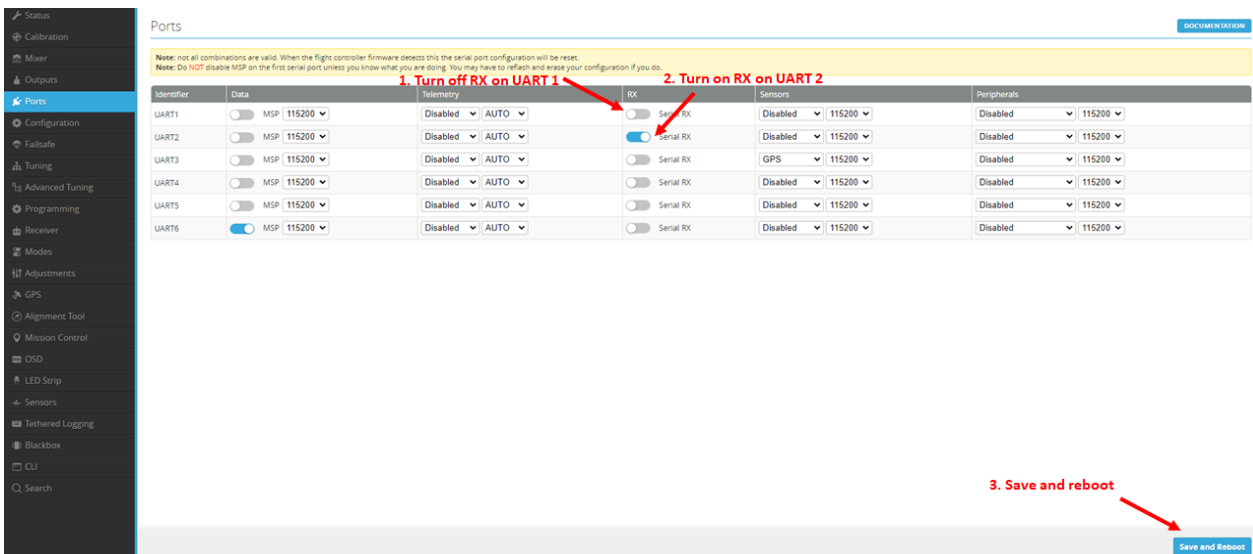
Hardware Connection: Use a 3-pin Dupont male-to-male cable and plug it into the SBUS input pin header.



• **INAV settings**

ELRS/TBS: Detectable with default settings.

SBUS: In the Ports tab, disable Serial RX for UART1, enable Serial RX for UART2, then save and reboot. Switch the CRSF protocol to SBUS in the Receiver tab, then save and reboot.



Receiver

Please read receiver chapter of the documentation. Configure serial port (if required), receiver mode (serial/pwm), provider (for serial receivers), bind receiver, set channel map, configure channel endpoints/range on TX so that all channels go from -1000 to +2000. Set midpoint (default 1500), trim channels to 1500. configure stick deadbands, verify behaviour when TX is off or out of range. Make sure that the channel values all increase when you push the sticks up and to the right. If not, reverse the channel in the TX. Do not apply any other mixing in the TX. **IMPORTANT:** Before flying read failsafe chapter of documentation and configure failsafe.

Channel Map

Channel	Value
Roll (A)	1500
Pitch (E)	1500
Yaw (R)	1500
Throttle (T)	885
CH 5	1500
CH 6	1500
CH 7	1500
CH 8	1500
CH 9	1500
CH 10	1500
CH 11	1500
CH 12	1500
CH 13	1500
CH 14	1500
CH 15	1500
CH 16	1500
CH 17	1500

Receiver Mode

Receiver type: SERIAL

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

Serial Receiver Provider: CRSF

Serial Port Inverted (comparing to protocol default):

Serial receiver half-duplex:

Auto Smoothing Factor:

Throttle MID: 0.50 | Throttle EXPD: 0.00

RC Deadband: 2 | Yaw Deadband: 2

4. Choose appropriate protocol

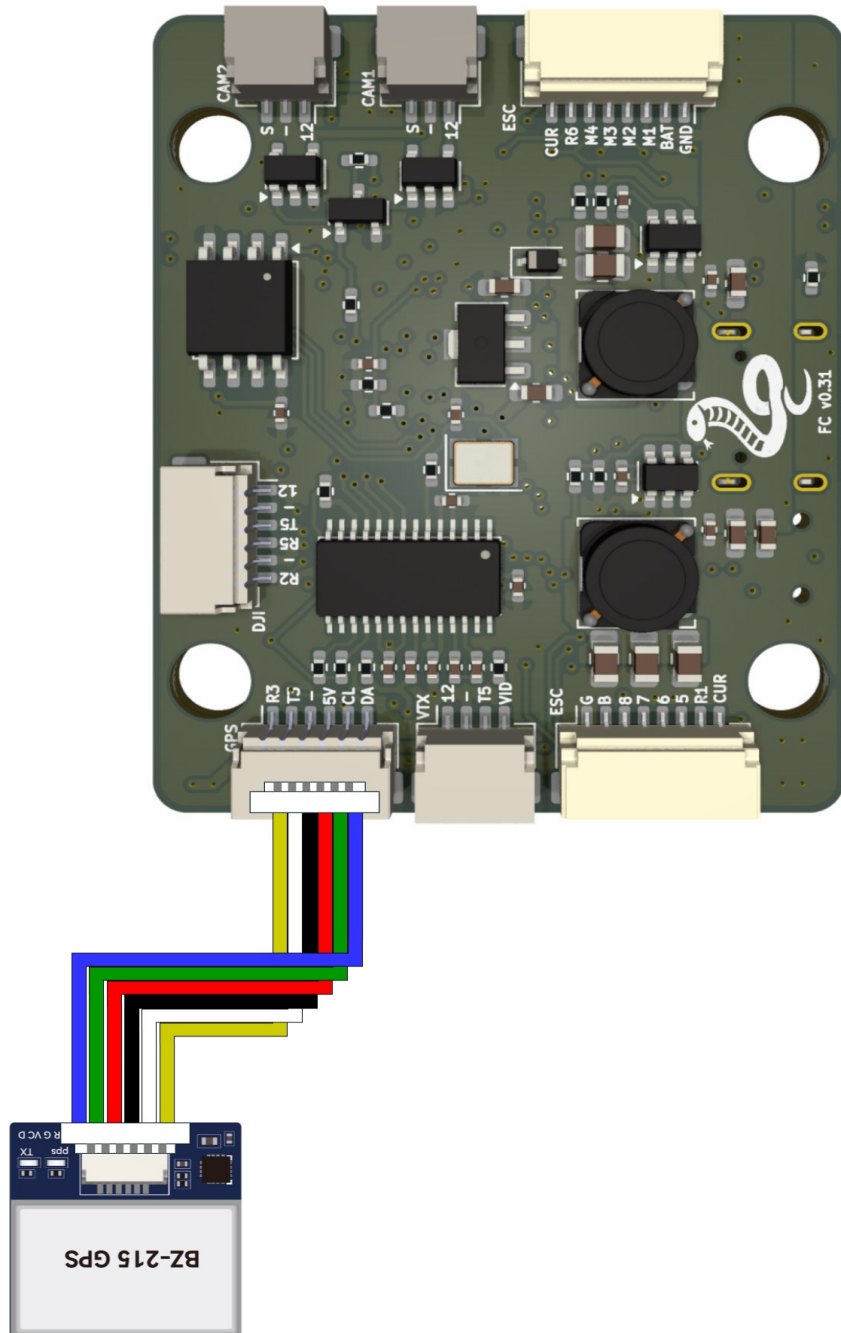
5. Save and reboot

Save and Reboot

GPS Settings

Hardware Connection:

Rearrange the pre-crimped JST SH1.0 cables of the GPS Module Cable according to the GPS module's pin layout. Insert them into the 6-pin JST SH1.0 housing. The BZ-251 GPS module is recommended.



INAV settings

In the GPS tab, enable GPS for navigation and telemetry, then save and reboot. If not using a UBLOX module, refer to the specifications of the corresponding module and select the appropriate baud rate and protocol.

1. Enable

2. Choose UART

3. Choose Satellite

4. Save and reboot

5. Choose GPS UART

6. Save and reboot

Identifier	Data	Telemetry	RX	Sensors	Peripherals
UART1	MSP 115200	Disabled AUTO	Serial RX	Disabled 115200	Disabled 115200
UART2	MSP 115200	Disabled AUTO	Serial RX	Disabled 115200	Disabled 115200
UART3	MSP 115200	Disabled AUTO	Serial RX	GPS 115200	Disabled 115200
UART4	MSP 115200	Disabled AUTO	Serial RX	Disabled 115200	Disabled 115200
UART5	MSP 115200	Disabled AUTO	Serial RX	Disabled 115200	Disabled 115200
UART6	MSP 115200	Disabled AUTO	Serial RX	Disabled 115200	Disabled 115200

Magnetometer

Hardware Connection:

Use the recommended BZ-251 GPS module with an integrated QMC5883 compass. Install the GPS module away from the power supply lines, Motors, ESCs, and hatch magnets to avoid electromagnetic interference. Confirm the signal lines are connected as SDA to SDA, SCL to SCL.

INAV settings

In the Configuration tab, select the appropriate compass option based on the compass model, then save and reboot. Adjust the compass orientation according to the specifications defined in the GPS module's documentation, then save and reboot.

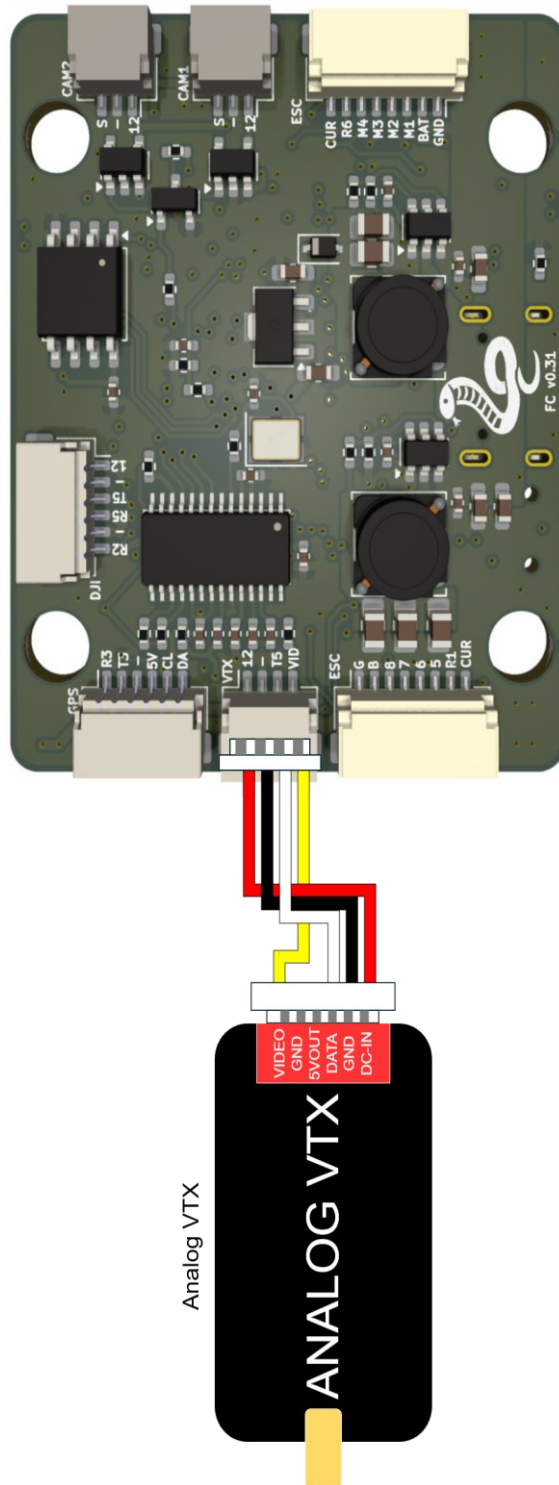
The screenshot shows the INAV Configuration interface. On the left, a sidebar lists various configuration categories, with 'Configuration' selected. The main area is titled 'Configuration' and contains several sections:

- Sensors & Buses:** A dropdown menu for 'Magnetometer' is open, showing options: None, ALTO, HMC5883, AK8975, **BZ251** (highlighted), AK8963, IST8310, QMC5883, MPU9250, IST8308, LIS3MDL, MSP, RM3100, VCM5883, MLX90393, and FAKE. A red arrow points to the 'BZ251' option with the text '1. Choose Appropriate compas option'.
- Voltage & Current Sensors:** This section includes settings for 'Battery voltage monitoring' (enabled), 'Voltage Meter Type' (ADC), 'Voltage source to use for alarms and telemetry' (Raw), 'Voltage Scale' (1100), 'Battery Voltage' (8.00), 'Battery current monitoring' (enabled), 'Current Meter Type' (ADC), 'Current Meter Scale' (195), 'Offset in millivolt steps' (0), and 'Battery Current' (37.74).
- Battery Settings:** This section includes settings for 'Number of cells (0 = auto)' (0), 'Maximum cell voltage for cell count detection' (4.25), 'Minimum Cell Voltage' (3.3), 'Maximum Cell Voltage' (4.2), 'Warning Cell Voltage' (3.5), 'Battery Capacity Unit' (mAh), 'Capacity' (0), and 'Warning Capacity (remaining %)'.

At the bottom right of the configuration area, a blue button labeled 'Save and Reboot' is visible. A red arrow points to this button with the text '2. Save and reboot'.

Analog VTX

Hardware Connection: Use the Analog VTX cable to connect the Analog VTX



INAV settings

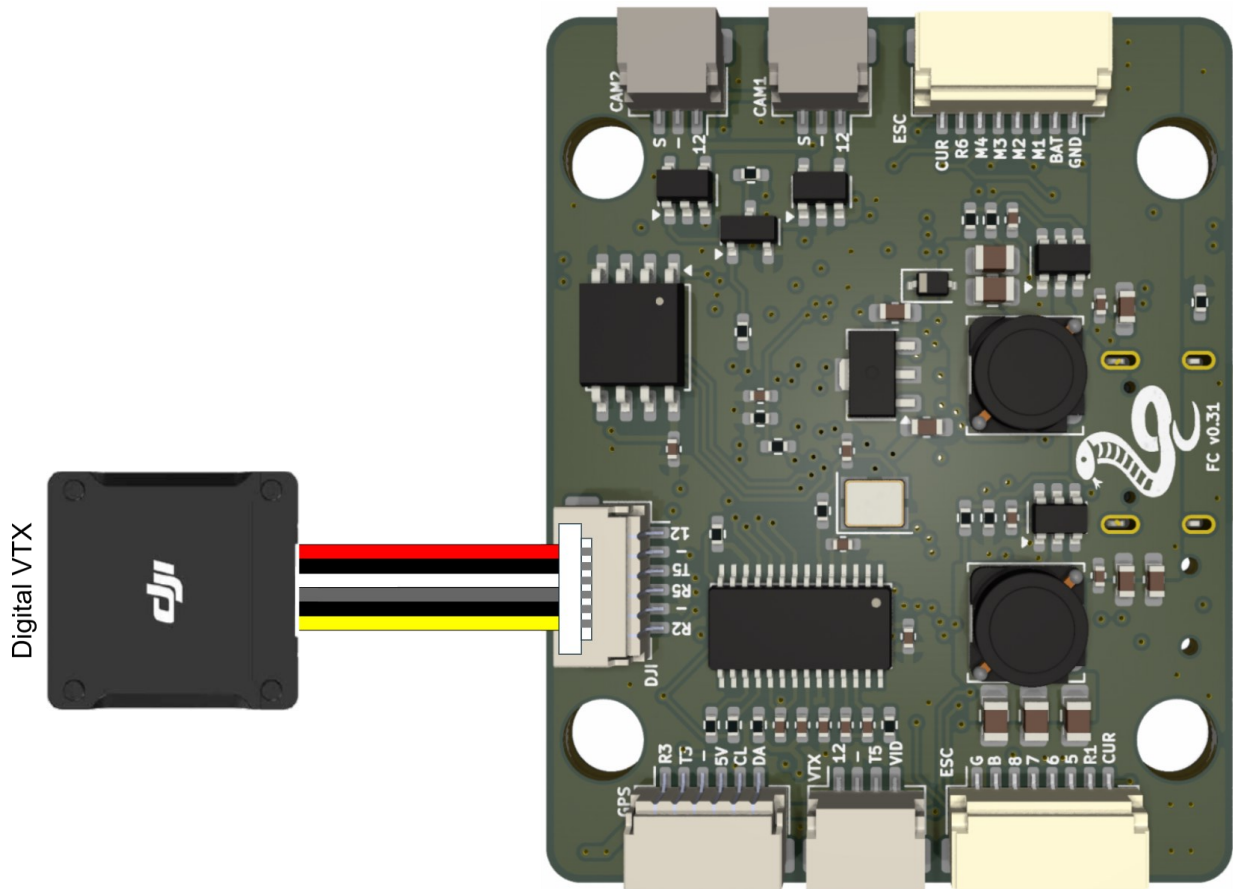
In the Ports tab, select "Peripherals" for UART5, choose the "IRC Tramp" option, then save and reboot. In the Configuration tab, select the desired VTX options, then save and reboot.

The screenshot shows the 'Ports' configuration page. A table lists UART ports with columns for Identifier, Data, Telemetry, RX, Sensors, and Peripherals. UART5 is selected. A dropdown menu for the Peripherals of UART5 is open, showing options like 'Disabled', 'Blackbox', 'RunCam Device', 'TBS SmartAudio', and 'IRC Tramp'. A red arrow points to the 'IRC Tramp' option with the text '1. Choose protocol'. Another red arrow points to the 'Save and Reboot' button at the bottom right with the text '2. Save and reboot'.

The screenshot shows the 'Configuration' page. The 'VTX' section is expanded, showing settings for Band (Boscam A), Channel (1), Power Level (5), and Headtracker (None). A red arrow points to the 'Automatic battery profile selection' toggle in the left sidebar with the text '3. Select desired functionality'. Another red arrow points to the 'Save and Reboot' button at the bottom right with the text '4. Save and reboot'.

Digital VTX

Hardware Connection: Use a Digital VTX cable to connect to the Digital VTX.



INAV settings

In the Ports tab, select "Peripherals" for UART5 and choose the "MSP DisplayPort" option, then save and reboot. In the OSD tab, scroll down to the "Video Format" option and select the appropriate option based on the following guidelines. Save and reboot.

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
UART1	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input checked="" type="checkbox"/> Serial Rx	Disabled 115200	Disabled 115200
UART2	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial Rx	Disabled 115200	Disabled 115200
UART3	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial Rx	GPS 115200	Disabled 115200
UART4	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial Rx	Disabled 115200	Disabled 115200
UART5	<input type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial Rx	Disabled 115200	MSP DisplayPort 115200
UART6	<input checked="" type="checkbox"/> MSP 115200	Disabled AUTO	<input type="checkbox"/> Serial Rx	Disabled 115200	Disabled 115200

1. Choose MSP DisplayPort

2. Save and reboot

Save and Reboot

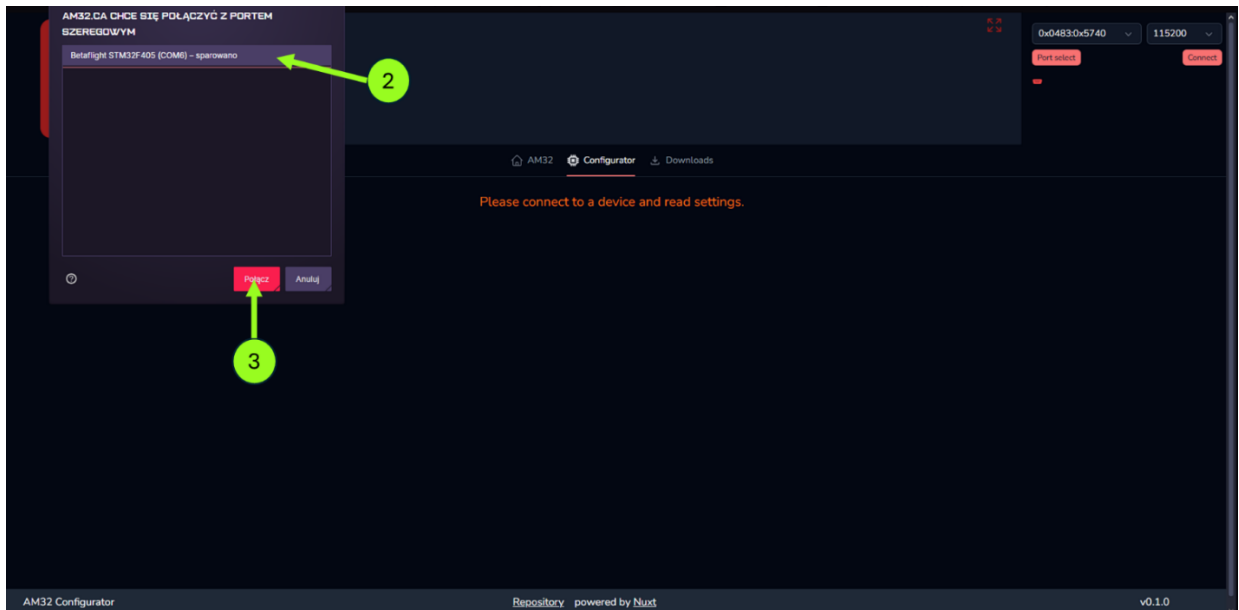
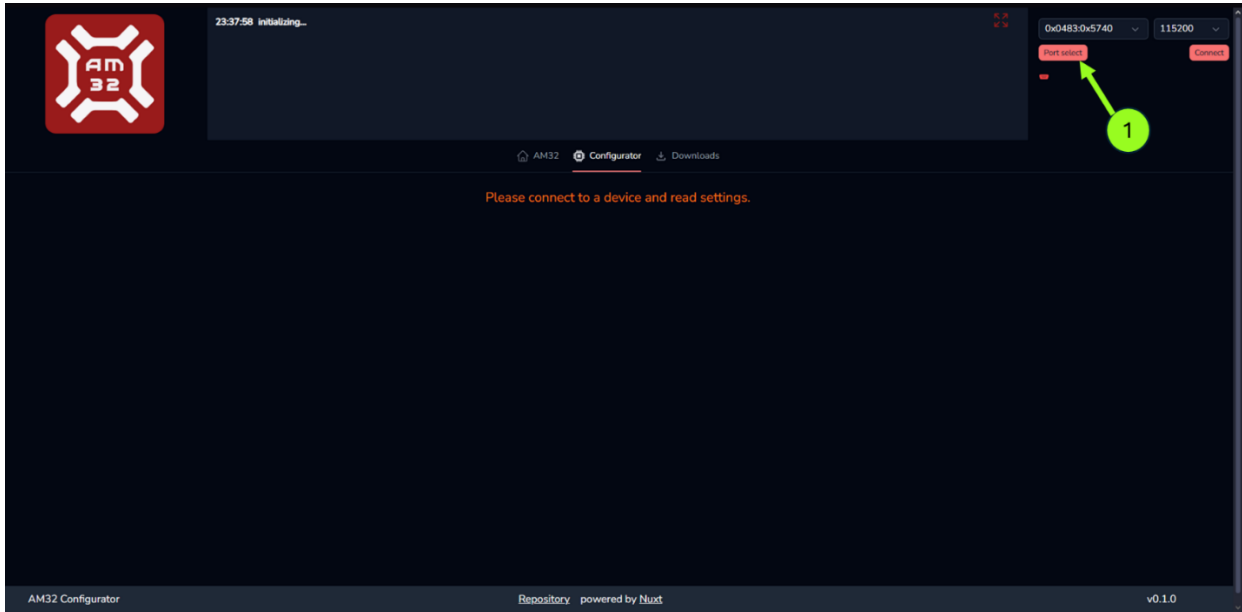
The screenshot displays the OSD (On-Screen Display) configuration menu. On the left is a dark sidebar with navigation options: Status, Calibration, Mixer, Outputs, Ports, Configuration, Fail-safe, Tuning, Advanced Tuning, Programming, Receiver, Modes, Adjustments, GPS, Alignment Tool, Mission Control, **OSD**, LED Strip, Sensors, Telemetry Logging, Blackbox, CLI, and Search. The main OSD area is titled 'OSD' and includes a 'Default Layout' dropdown, 'Copy', and 'Clear' buttons, along with a search bar. A central 'Preview (drag to change position)' window shows a first-person view of a drone in flight over a coastal area. To the right of the preview is the 'Video Format' configuration panel. This panel includes a dropdown menu for video format, currently set to 'HDZERO', with a list of options: PAL, HDZERO, DJI_VTFF, AVATAR, **BT4COMPAT**, BT100COMPAT, and DJI_NATIVE. Below this are fields for 'Pilot's Name', 'Use pilot logo', and 'Craft Name'. There are also sections for 'Metric' (Units), 'Crosshairs Style', 'Left Sidebar Scroll', 'Right Sidebar Scroll', 'Crossfire LQ Format', 'Sidebar Scroll Arrows', and 'Home Position on Arming Screen'. At the bottom of the panel is a 'Decimals' section with a list of settings: 1 Voltage Decimals, 3 Altitude Decimals, 3 Distance Decimals, 4 m/s Precision, 9 Coordinate Digits, and 11 Plus Code Digits. A red arrow points to the 'BT4COMPAT' option in the dropdown menu, with the text '3. Select desired functionality' above it. Another red arrow points to the 'Save' button at the bottom right of the OSD panel, with the text '4. Save and reboot' above it. The 'Save' button is located next to an 'Analogue Font Manager' button.

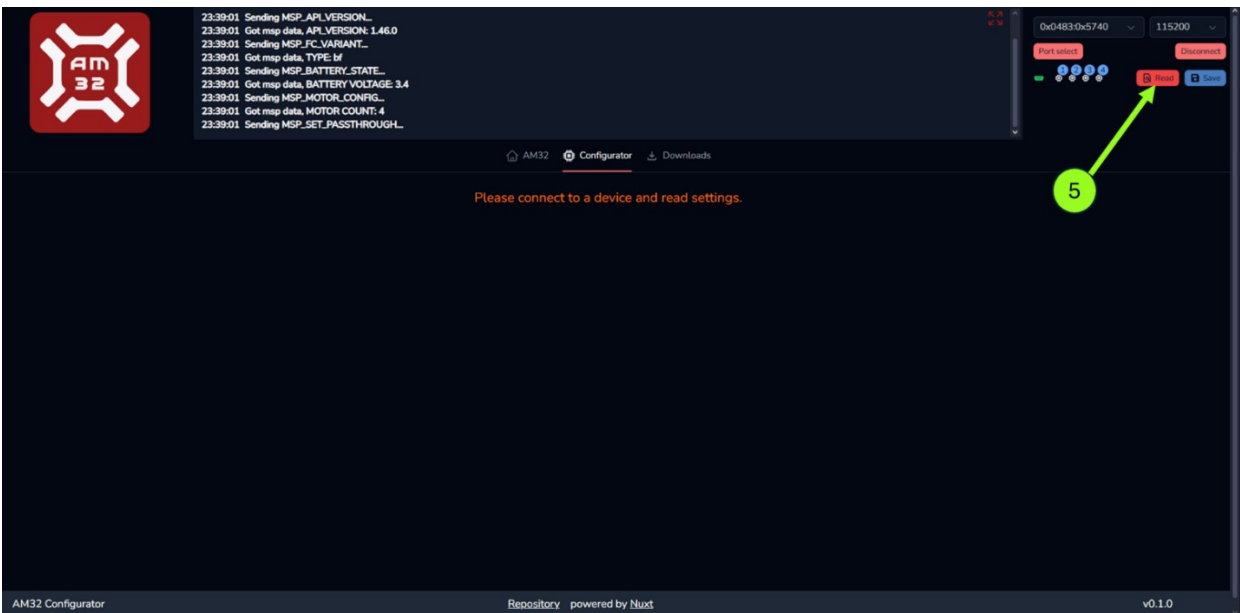
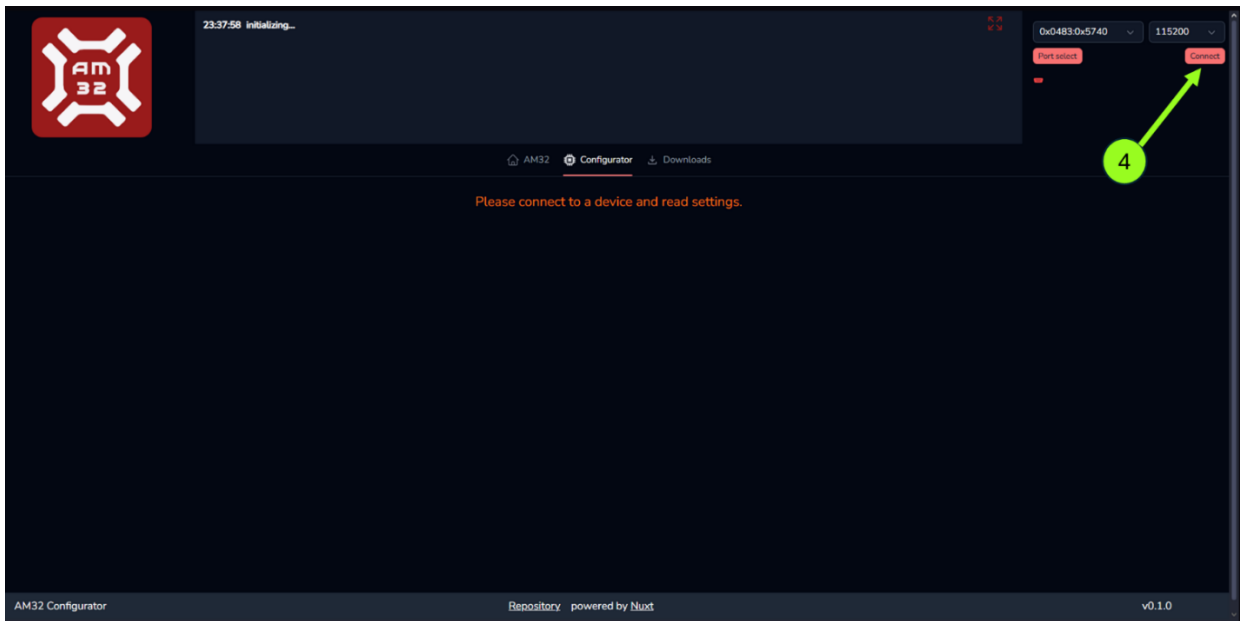
Part 6 – ESC Software update

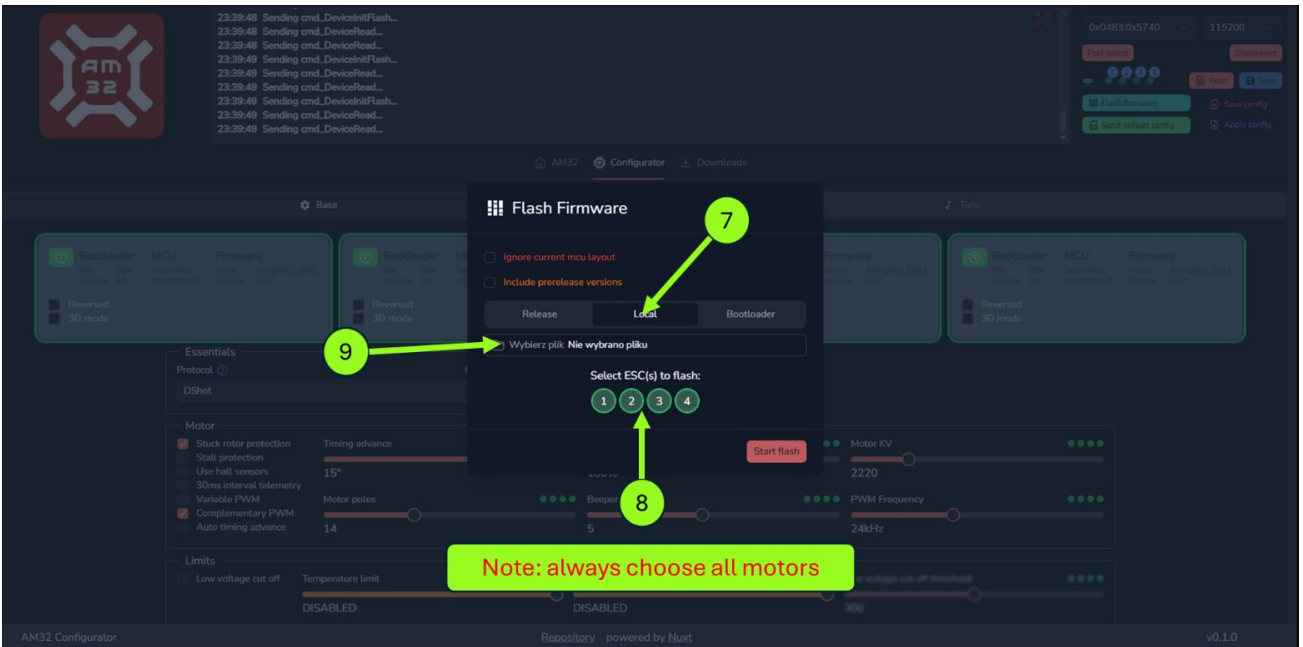
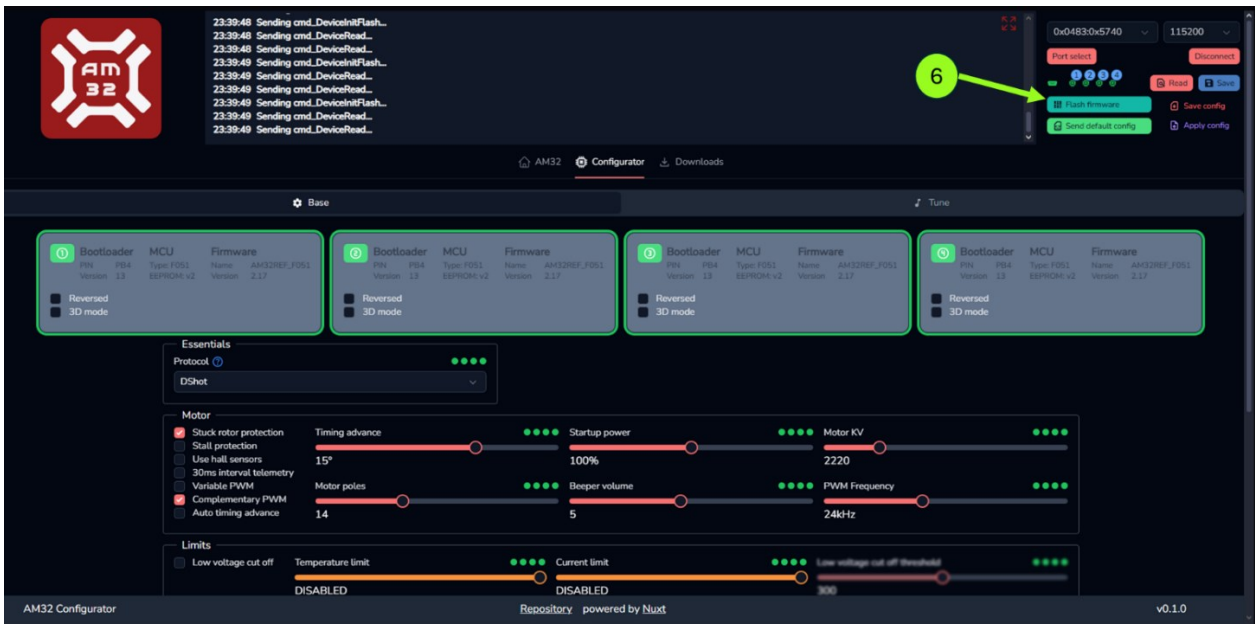
This 8-bit 60A ESC can run AM32 firmware. It is loaded with AM32 firmware by default.

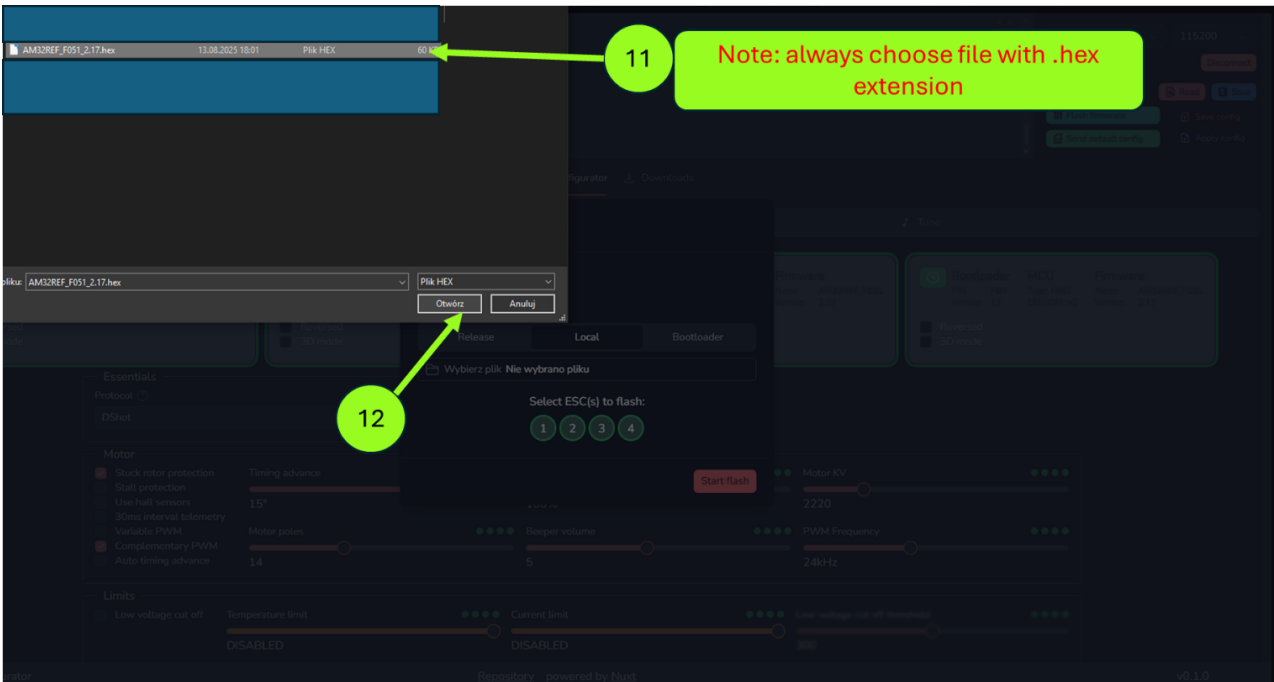
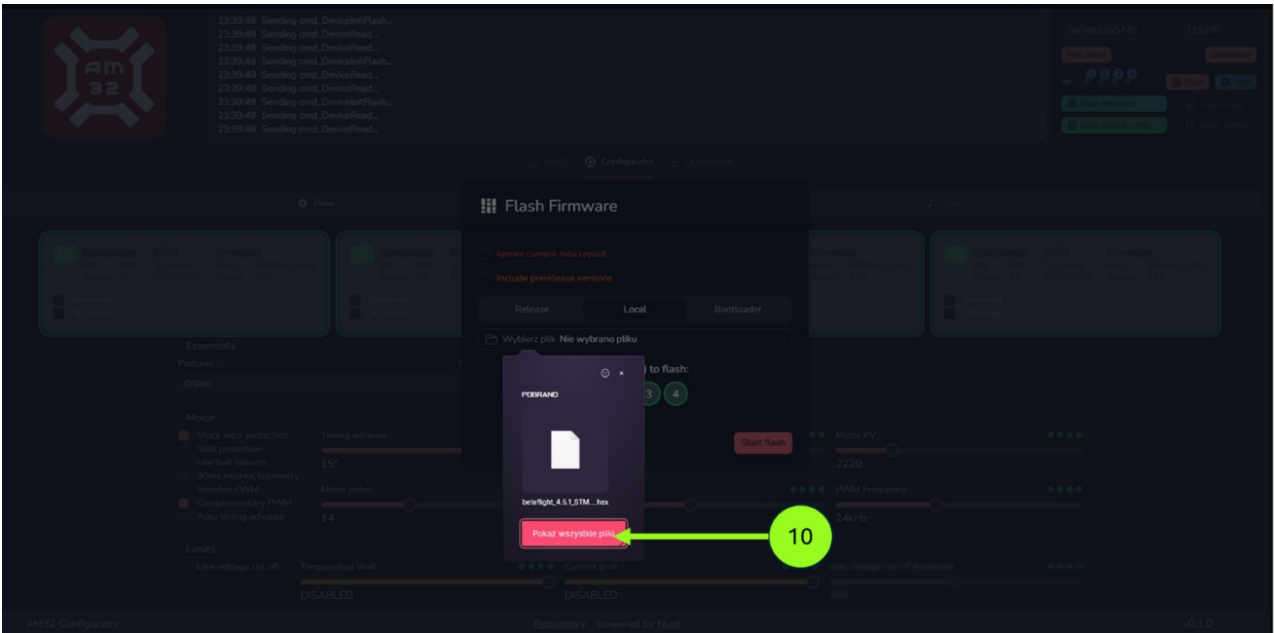
Firmware flashing steps are as follows:

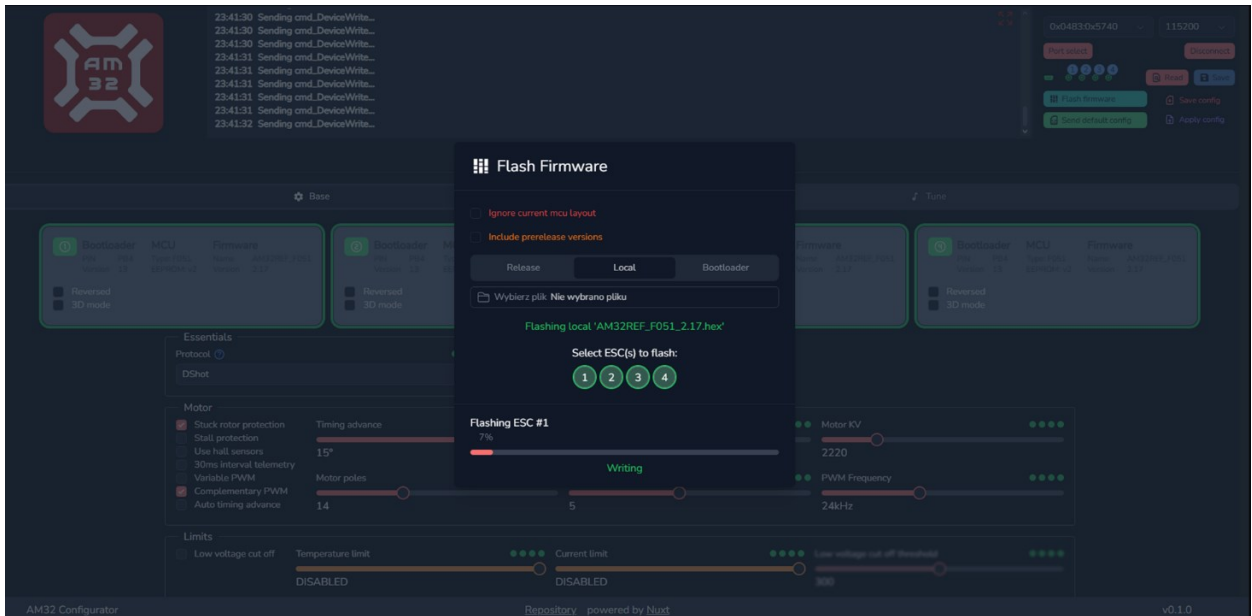
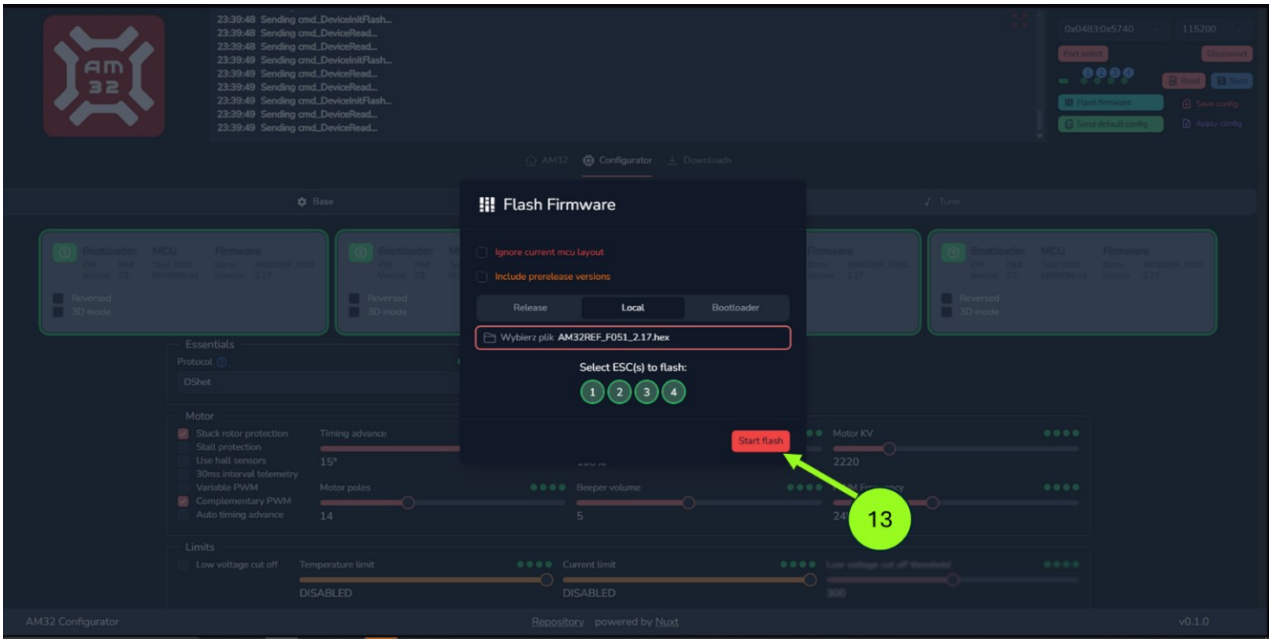
1. Remove all the propellers from your drone.
2. Ensure that the flight controller is connected properly to the ESC, then power up the drone. This step ensures that the ESC stacks up correctly.
3. Connect the flight controller to the computer using a USB Type-C cable.
4. Open the Chrome or Opera browser and visit the following website:
<https://am32.ca/configurator>
5. Follow the firmware flashing steps as shown in the screenshots below and steps .





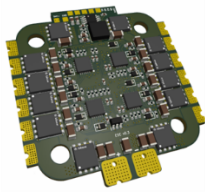




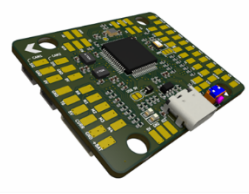


The screenshot shows the AM32 Configurator software interface. At the top left is the AM32 logo. A log window in the top left corner displays a series of messages: "23:39:48 Sending cmd_DeviceInitFlash...", "23:39:48 Sending cmd_DeviceRead...", "23:39:48 Sending cmd_DeviceRead...", "23:39:49 Sending cmd_DeviceInitFlash...", "23:39:49 Sending cmd_DeviceRead...", "23:39:49 Sending cmd_DeviceRead...", "23:39:49 Sending cmd_DeviceInitFlash...", "23:39:49 Sending cmd_DeviceRead...", "23:39:49 Sending cmd_DeviceRead...". The top right corner shows a dropdown menu with "Ox0483-0x5740" and "115200", and buttons for "Port select", "Disconnect", "Flash firmware", "Save config", "Send default config", and "Apply config". A red circle with the number "16" points to the "Disconnect" button. A yellow note box with the text "Note: always save after changes" is positioned in the upper right area. A red circle with the number "15" points to the "Save config" button. The main interface is divided into sections: "Essentials" with a "Protocol" dropdown set to "DSHOT"; "Motor" settings including "Stuck rotor protection" (checked), "Stall protection", "Use hall sensors", "30ms interval telemetry", "Variable PWM", "Complementary PWM" (checked), and "Auto timing advance"; and "Limits" settings including "Low voltage cut off" (checked), "Temperature limit" (DISABLED), "Current limit" (DISABLED), and "Low voltage cut off threshold" (300). A red circle with the number "14" points to the "Variable PWM" checkbox. The bottom of the screen shows "AM32 Configurator", "Repository powered by Nuxit", and "v0.1.0".

Part 7 - Package



Cobra F405 V4.0 & V4.1 Flight Controller



4x M3 plastic nuts



1x 25V 1000uF Low ESR Capacitor



1x XT60 Power Cable(70mm)



1x 8pin SH1.0 USB extender Cable



8x M3x8 mm Silicone Grommets



M3x35 DIN912 Screw