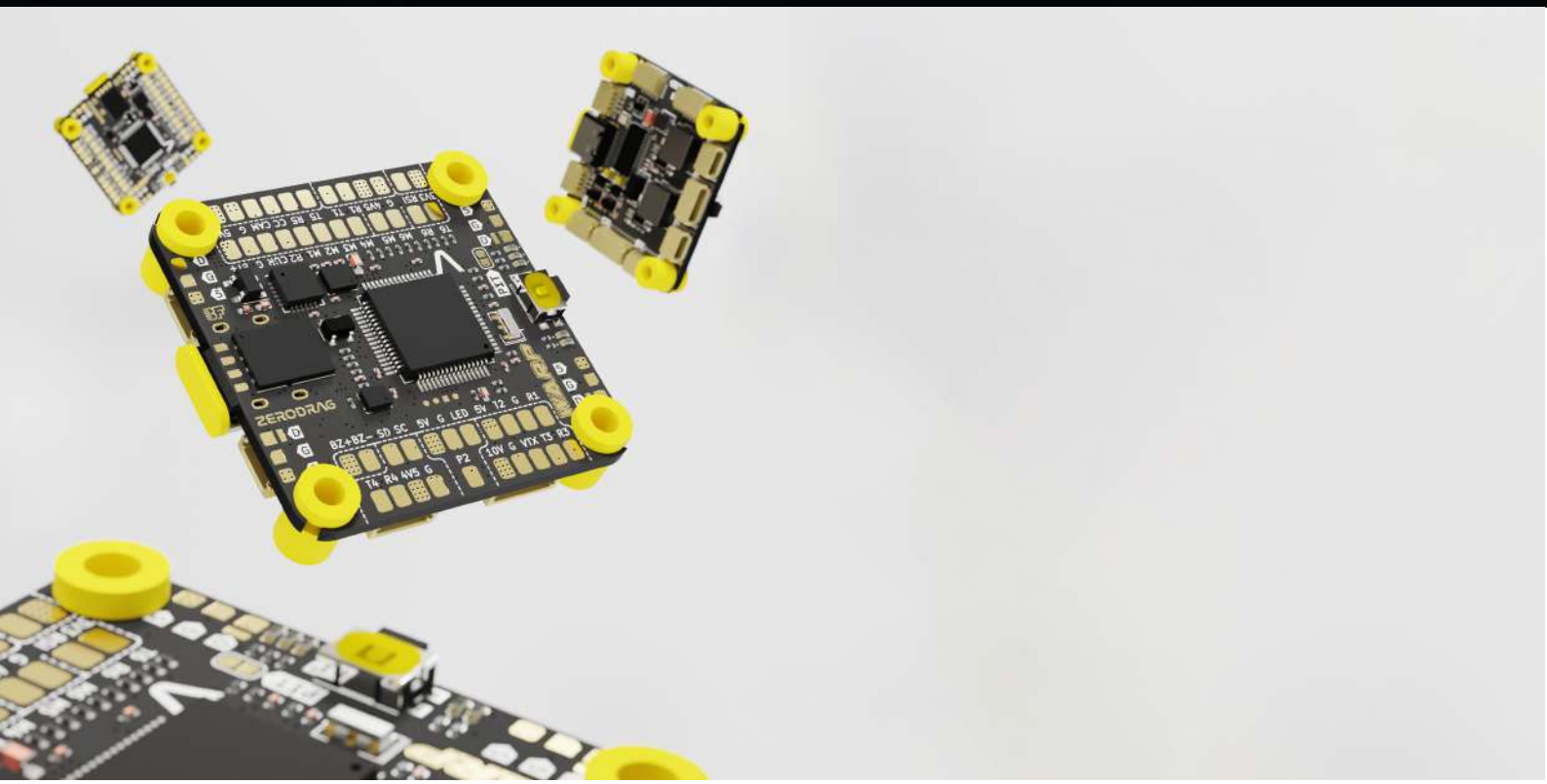
ZERODRAG

WARP F7



USER MANUAL

VERSION 1.3
4/12/2024

INDEX

1. Product Description

The ZERODRAG WARP F7 is a cutting-edge flight controller designed for UAVs. It offers advanced capabilities with robust performance powered by the STM32F722 microcontroller, two gyro options (ICM42688P and MPU6000), and an integrated BMP280 barometer. The controller supports a wide range of power inputs (3-6S LiPo) and features a compact form factor (37mm x 38.5mm x 7.1mm), making it an ideal choice for high-precision flight operations.

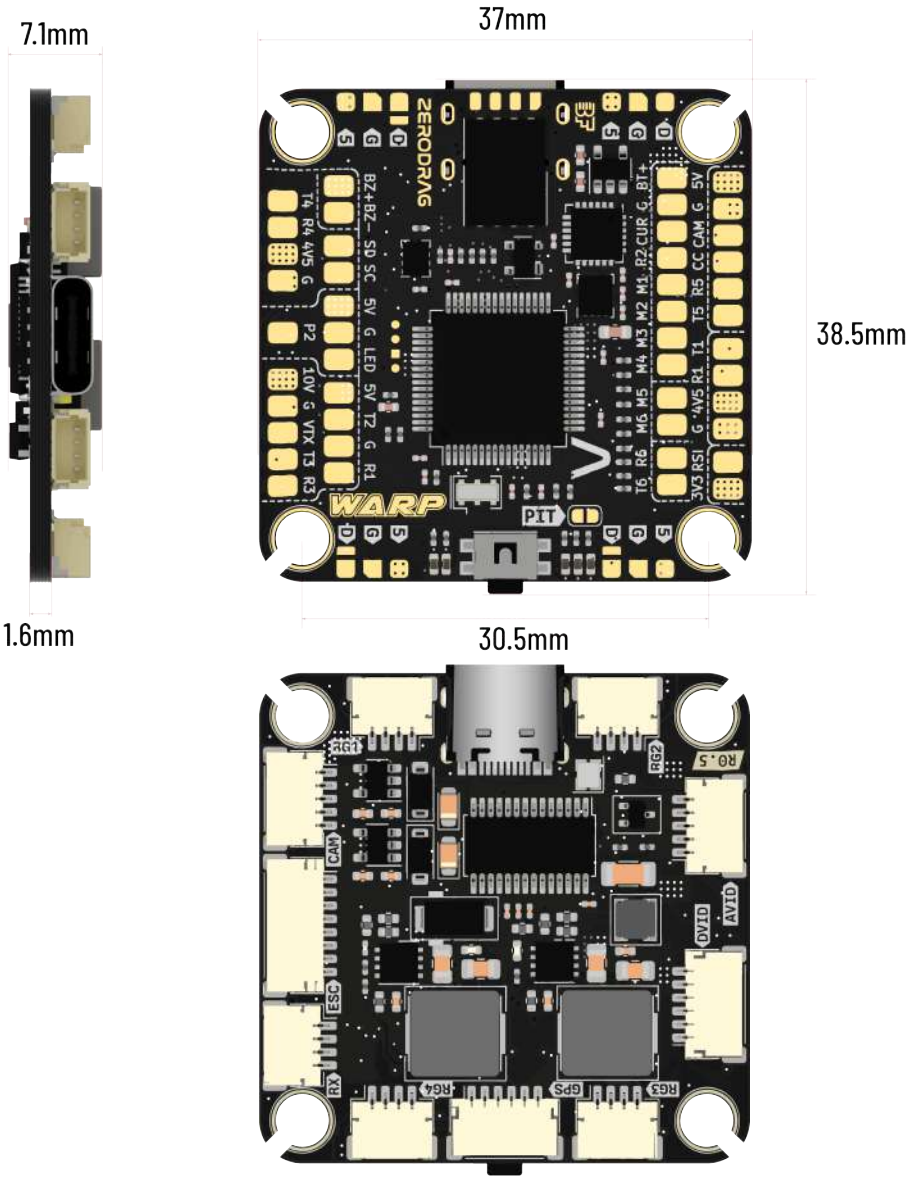
Enhanced with an AT7456E OSD chip, 32MB BlackBox-Flash for flight data logging, and multiple BEC outputs, the ZERODRAG WARP F7 ensures comprehensive functionality for various UAV applications. Its connectivity options include up to 6 UARTs, up to 8 Motor outputs, and I2C pads for additional sensors. The flight controller is optimized for Betaflight firmware and compatible with iNav, providing seamless integration and easy configuration for all your UAV needs.

2. Specification

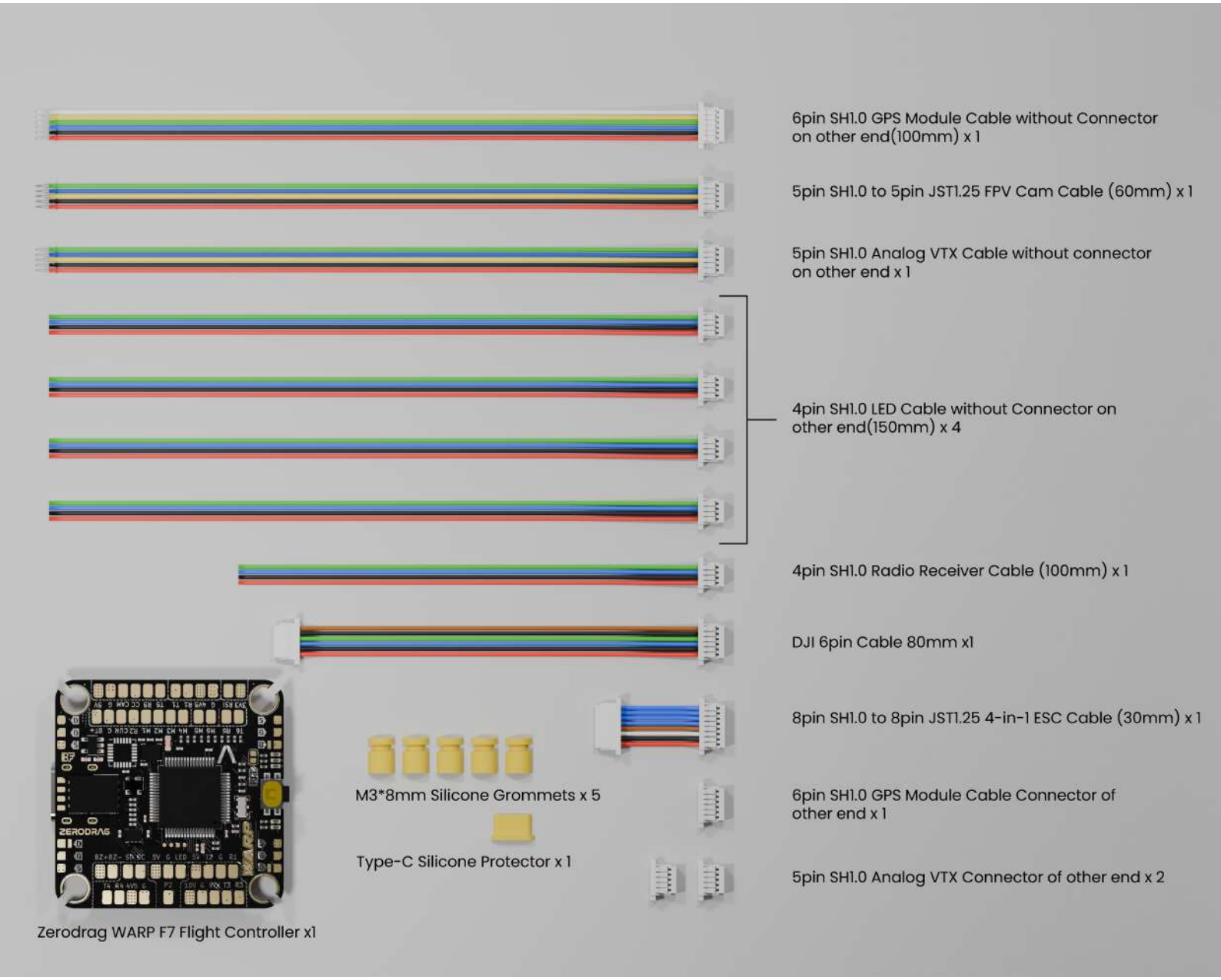
ZERODRAG WARP F7 Flight Controller

- **Product Name:** ZERODRAG WARP F7
- **Power Input:** 3-6S LiPo
- **Mounting:** 30.5 x 30.5mm (4mm hole size)
- **Dimension:** 37 x 38.5 x 7.1 mm
- **Weight:** 9.35g
- **MCU:** STM32F722
- **GYRO (IMU):** ICM42688P / MPU6000
- **Barometer:** BMP280
- **OSD Chip:** AT7456E
- **USB Port:** Type-C
- **BlackBox-Flash:** 32MB
- **Camera Control:** Pad
- **5V Bec:** 3 Amp
- **10V Bec:** 2.5 Amp
- **3.3V Regulator:** 500 mA
- **USB 4.5V:** For Receiver and GPS module
- **ESC Signal Pads:** M1 - M6 on top side and M7-M8 as T6 & R6
- **UARTs:** 6 UARTs with 6 motor pads / 5 UARTs with 8 motor pads

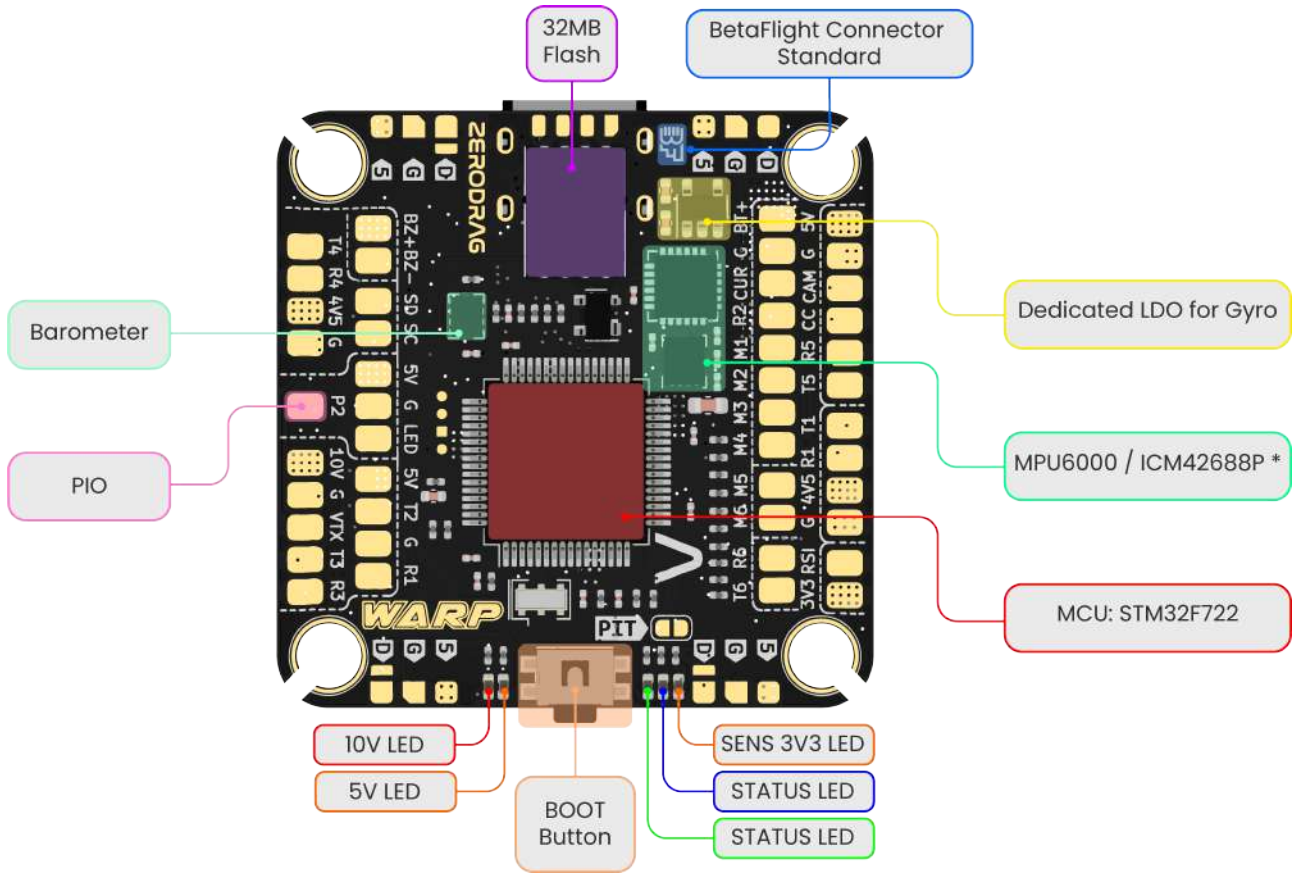
- **I2C Pads:** SDA & SCL Pads for sensors like Magnetometer, Sonar, etc.
- **Buzzer:** Used for 5V Buzzer
- **5 x LED Pad:** Supported by Betaflight firmware
- **RSSI:** RSI on the pad
- **Supported Firmware:** Betaflight and iNav
- **Target Name:** ZeroDrag WARP F7
- **BOOT Button:** Press boot button, then power FC to activate DFU mode for flashing.
- **Connector:** BetaFlight Standard

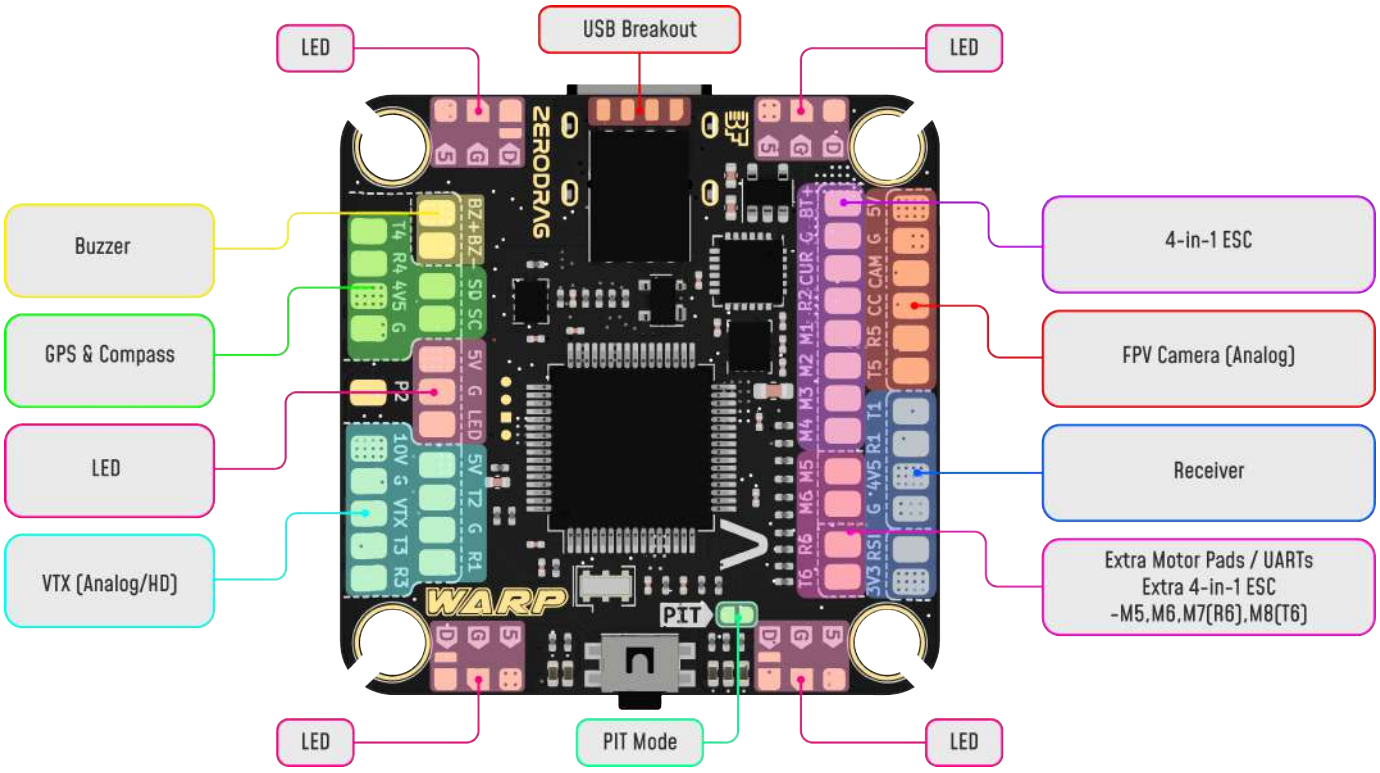


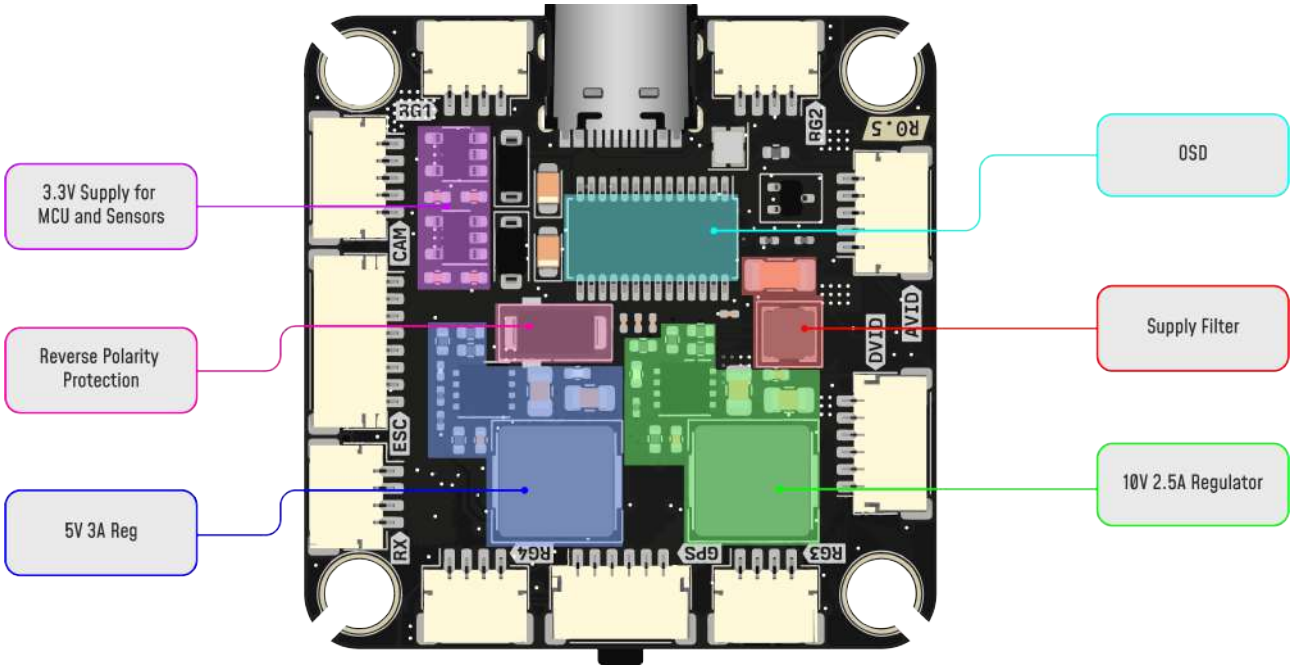
3. In The Box

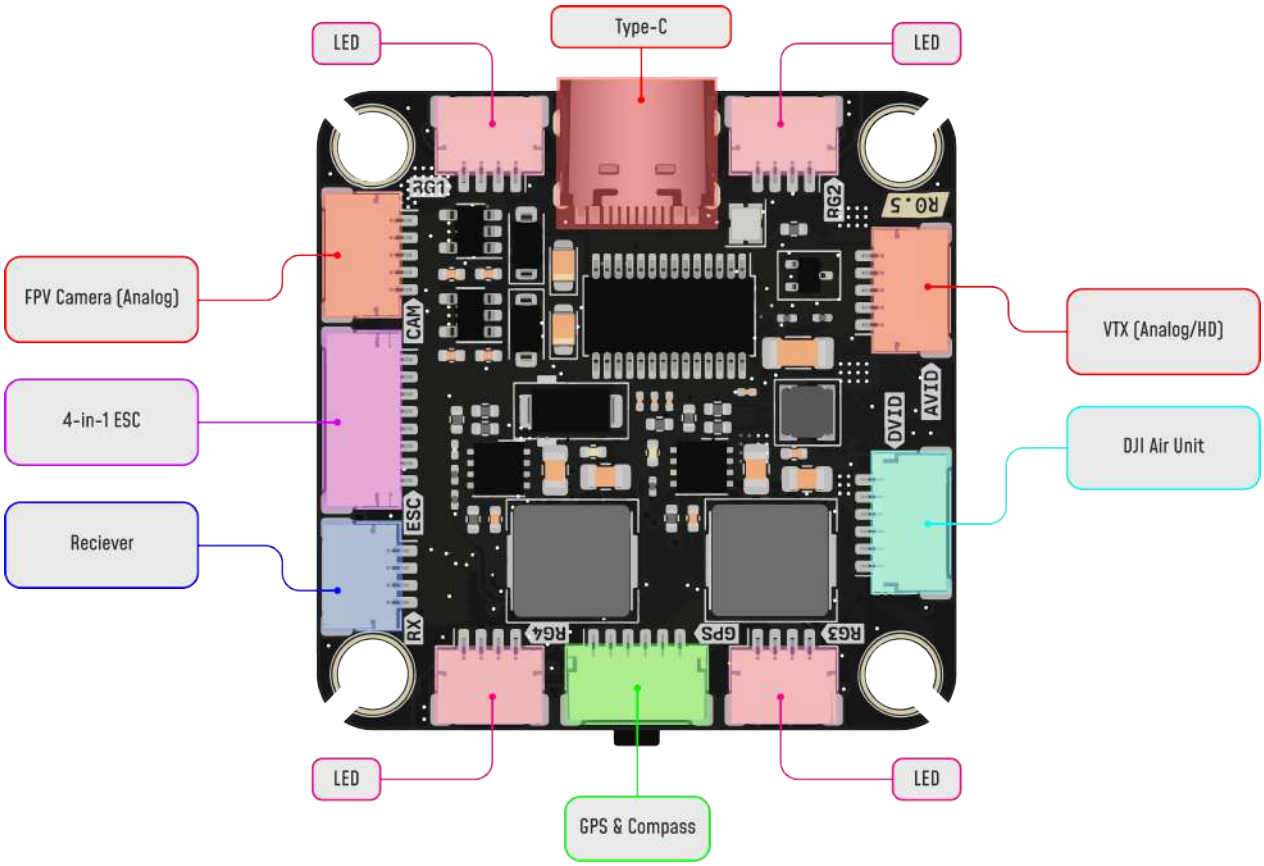

6pin SH1.0 GPS Module Cable without Connector on other end(100mm) x 1
5pin SH1.0 to 5pin JST1.25 FPV Cam Cable (60mm) x 1
5pin SH1.0 Analog VTX Cable without connector on other end x 1
4pin SH1.0 LED Cable without Connector on other end(150mm) x 4
4pin SH1.0 Radio Receiver Cable (100mm) x 1
DJI 6pin Cable 80mm x1
8pin SH1.0 to 8pin JST1.25 4-in-1 ESC Cable (30mm) x 1
6pin SH1.0 GPS Module Cable Connector of other end x 1
5pin SH1.0 Analog VTX Connector of other end x 2
M3*8mm Silicone Grommets x 5
Type-C Silicone Protector x 1
Zerodrag WARP F7 Flight Controller x1

4. Layout


32MB Flash
BetaFlight Connector Standard
Barometer
PIO
Dedicated LDO for Gyro
MPU6000 / ICM42688P *
MCU: STM32F722
10V LED
5V LED
BOOT Button
SENS 3V3 LED
STATUS LED
STATUS LED


LED
USB Breakout
LED
Buzzer
GPS & Compass
LED
VTX (Analog/HD)
4-in-1 ESC
FPV Camera (Analog)
Receiver
Extra Motor Pads / UARTs
Extra 4-in-1 ESC
-M5,M6,M7(R6),M8(T6)
LED
PIT Mode
LED


3.3V Supply for MCU and Sensors
Reverse Polarity Protection
5V 3A Reg
OSD
Supply Filter
10V 2.5A Regulator
RG1
RG2
RO.5
CAM
DVID
AVID
ESC
RX
RG4
GPS
RG3


LED
Type-C
LED
FPV Camera (Analog)
4-in-1 ESC
Reciever
VTX (Analog/HD)
DJI Air Unit
RG1
RG2
RO.5
CAM
DVID
AVID
ESC
RX
RG4
GPS
RG3
LED
GPS & Compass
LED

LED Indication

ORANGE LED 1 - Sensor 3.3 Voltage indication

BLUE LED - FC Status Light.

Unlit: USB disconnected and disarmed,

Lit: USB disconnected and armed,

Flashing: USB connected and disarmed,

5x Rapid Flash then Flashing: USB connected and arming command prevented

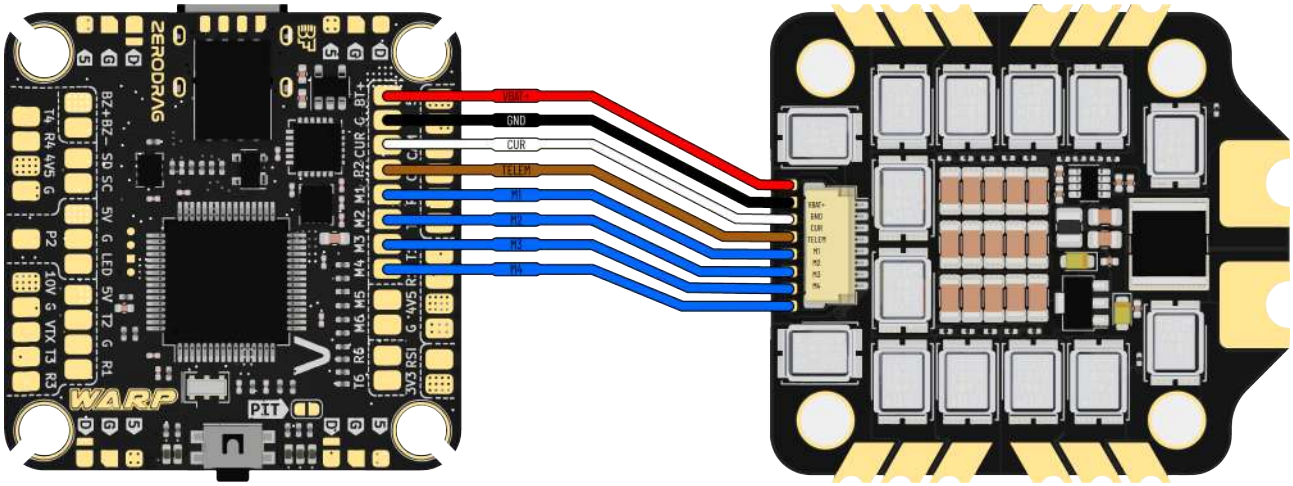
GREEN LED - FC Status Light

ORANGE LED 2 - 5V Power Indicator.

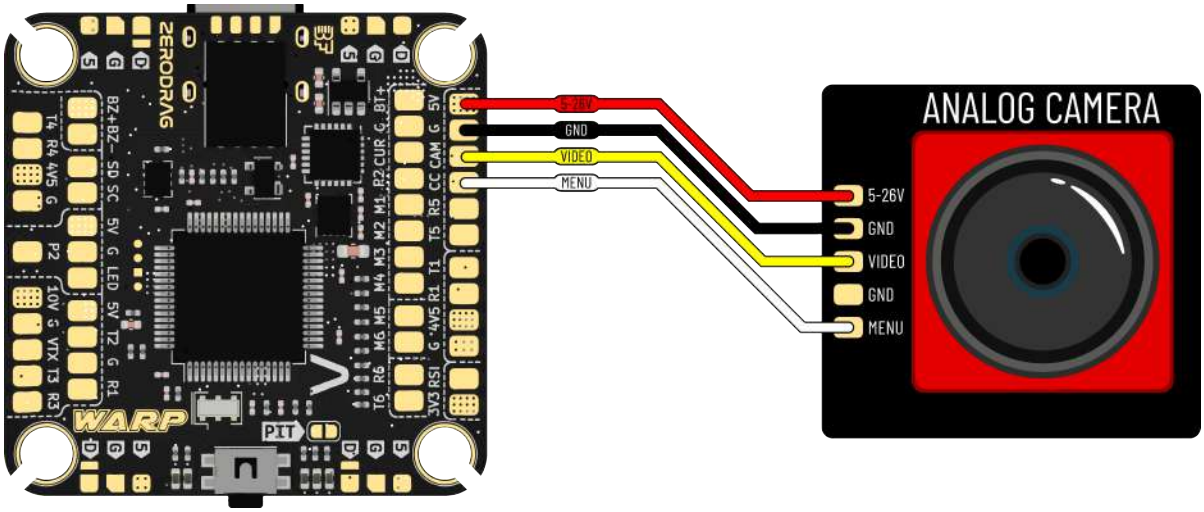
RED LED - 10V Power Indicator.

5. Connections

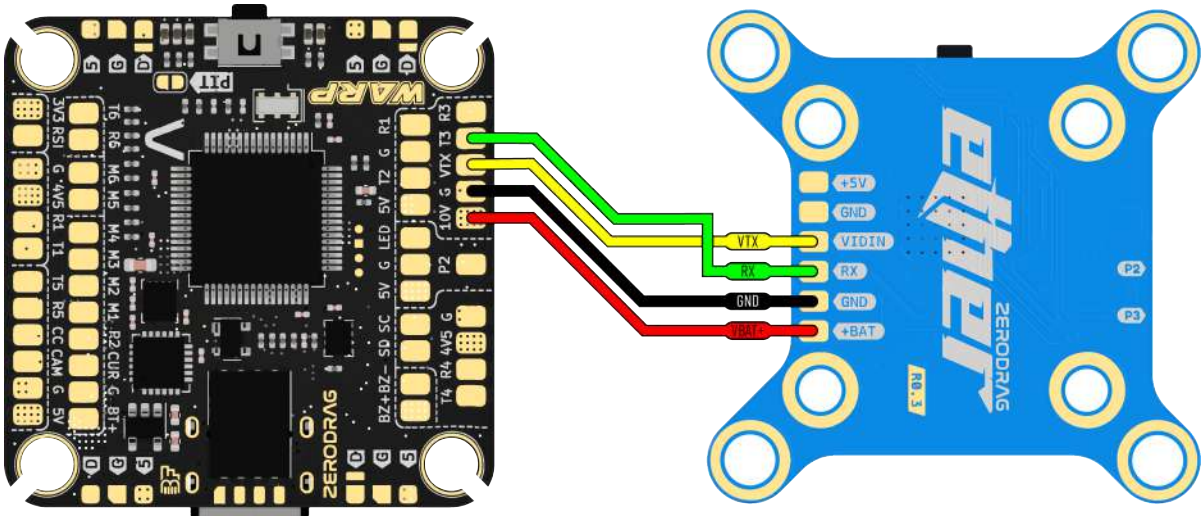
Method 1 - Direct Soldering



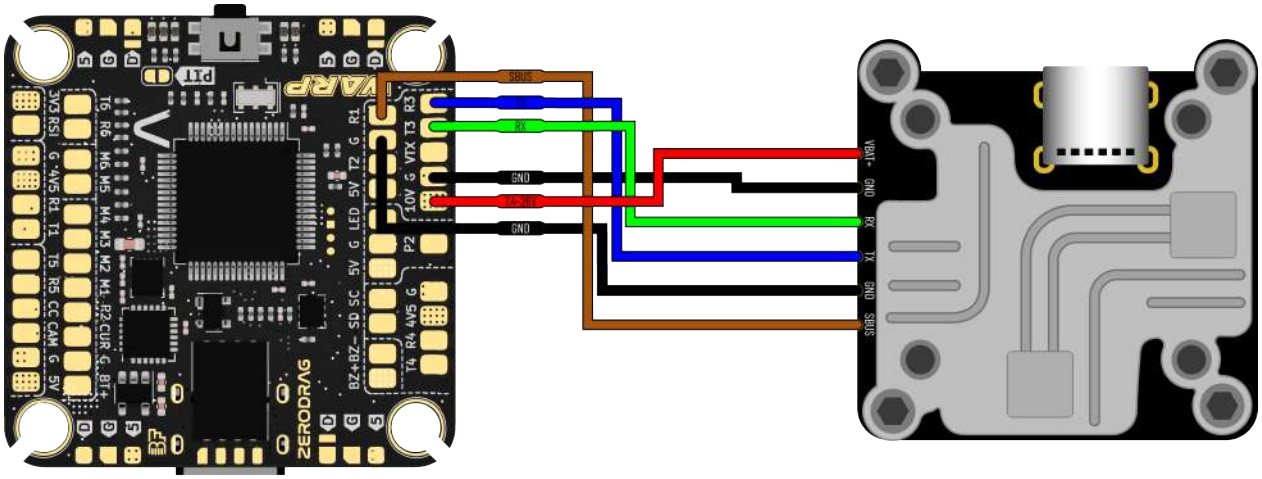
FC-ESC


5-26V
GND
VIDEO
MENU
ANALOG CAMERA
5-26V
GND
VIDEO
GND
MENU

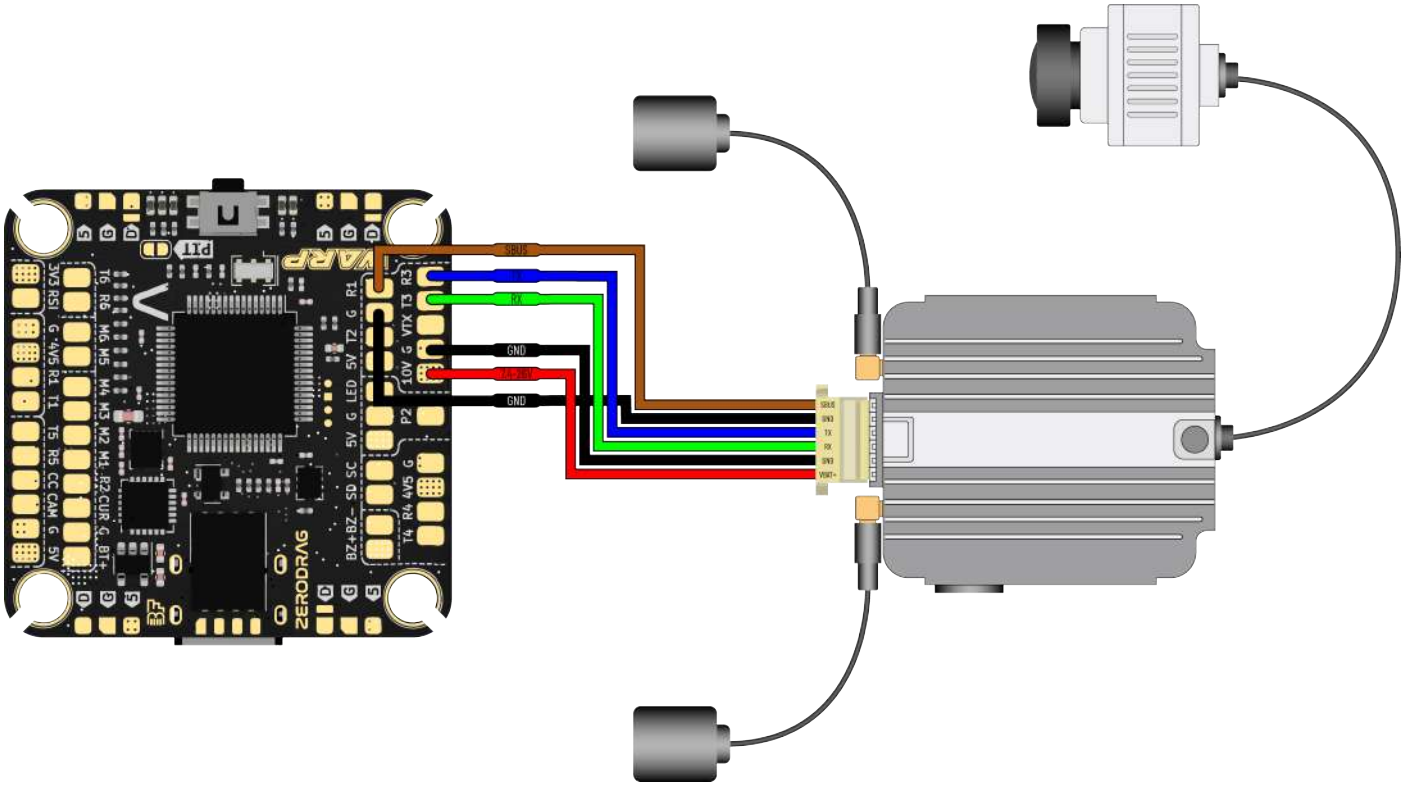
FC-CAM


VTX
RX
GND
+BAT
+5V
GND
VIDIN
RX
GND
+BAT
P2
P3

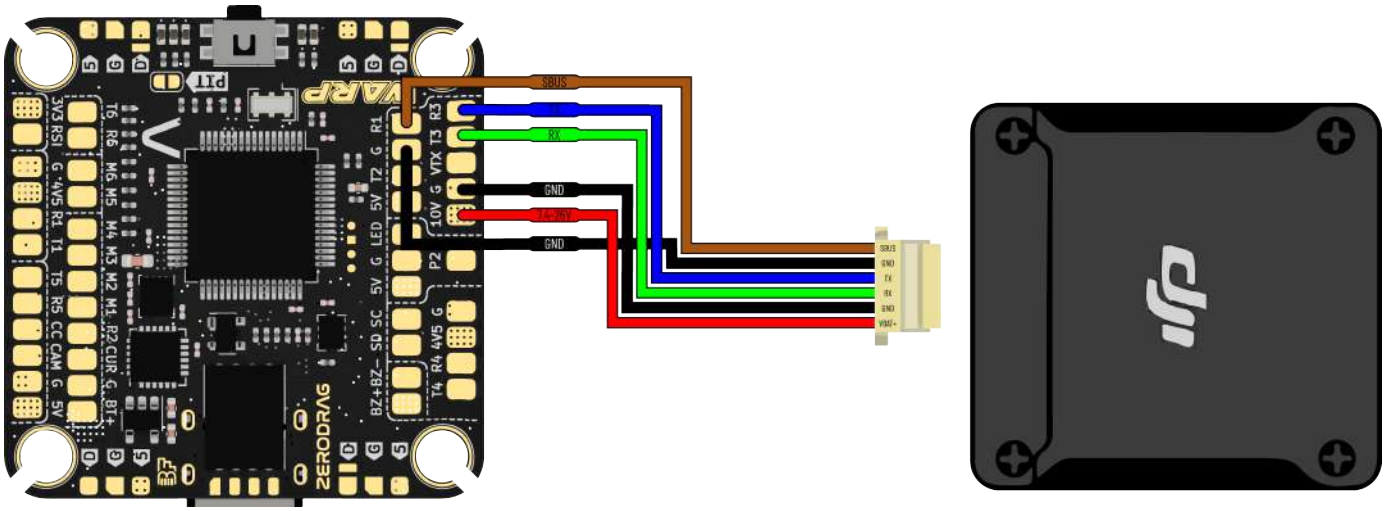
FC-VTX

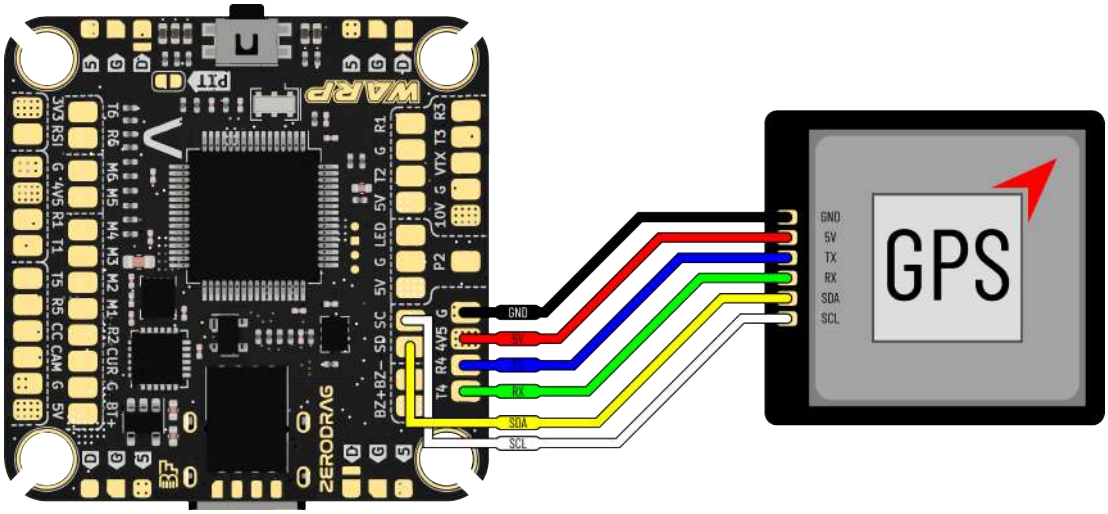


FC-Caddx Vista

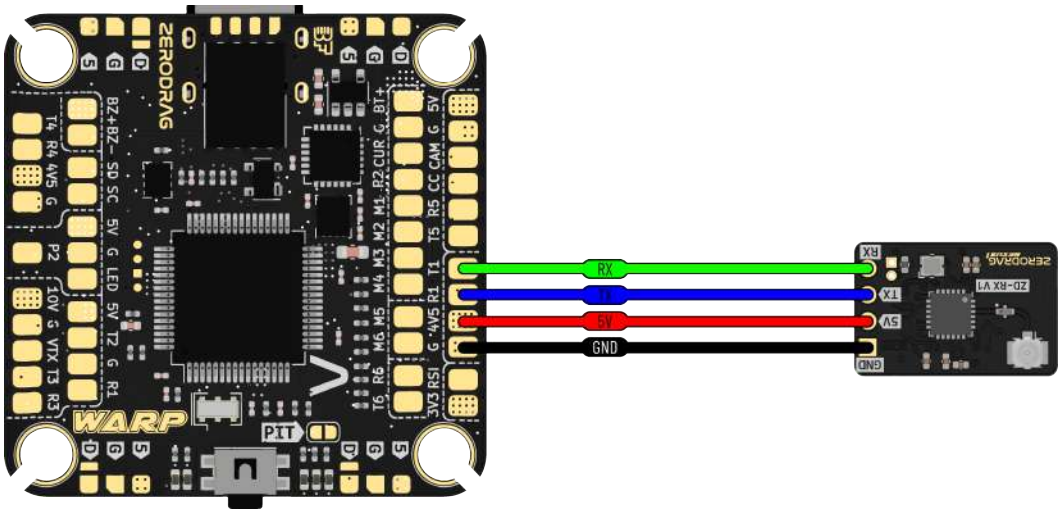


FC-DJI AirUnit

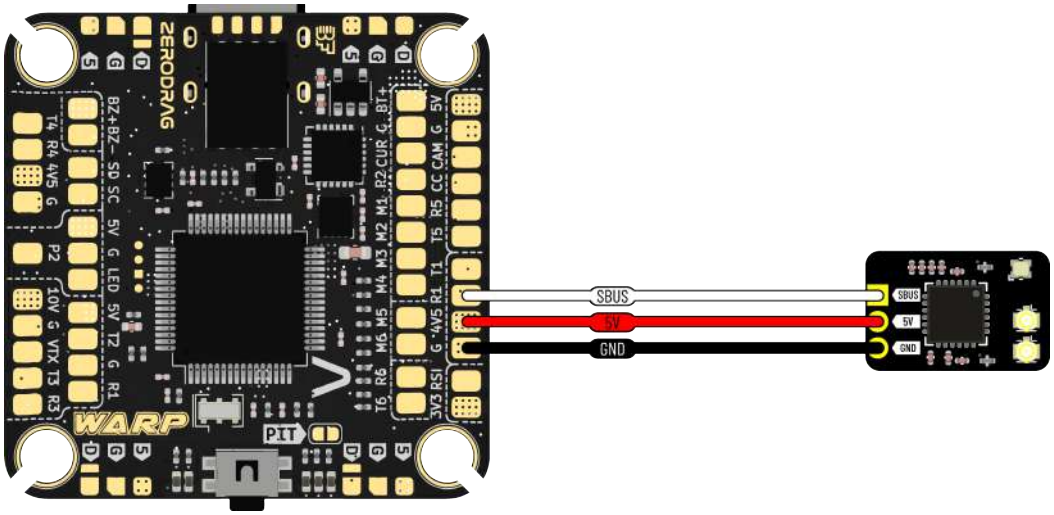




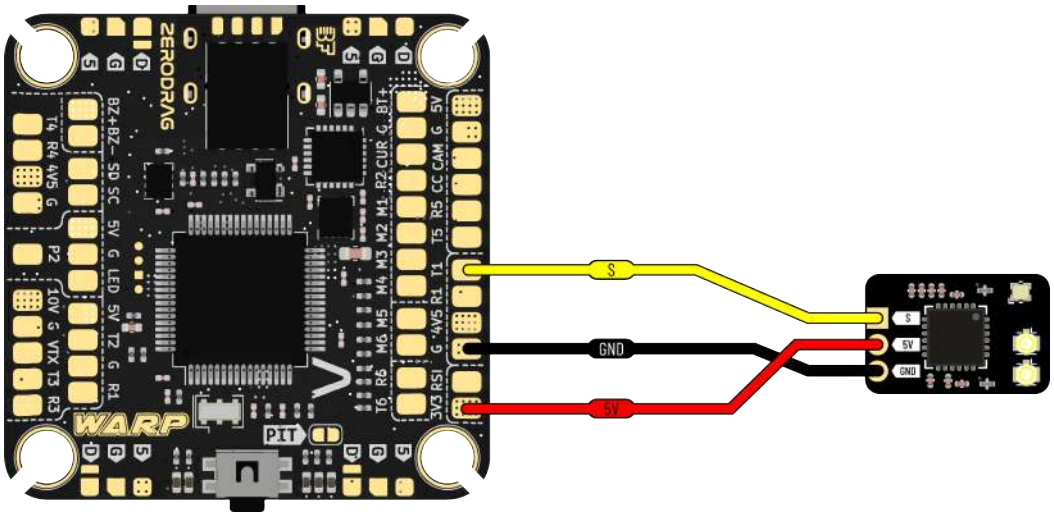
FC-GPS



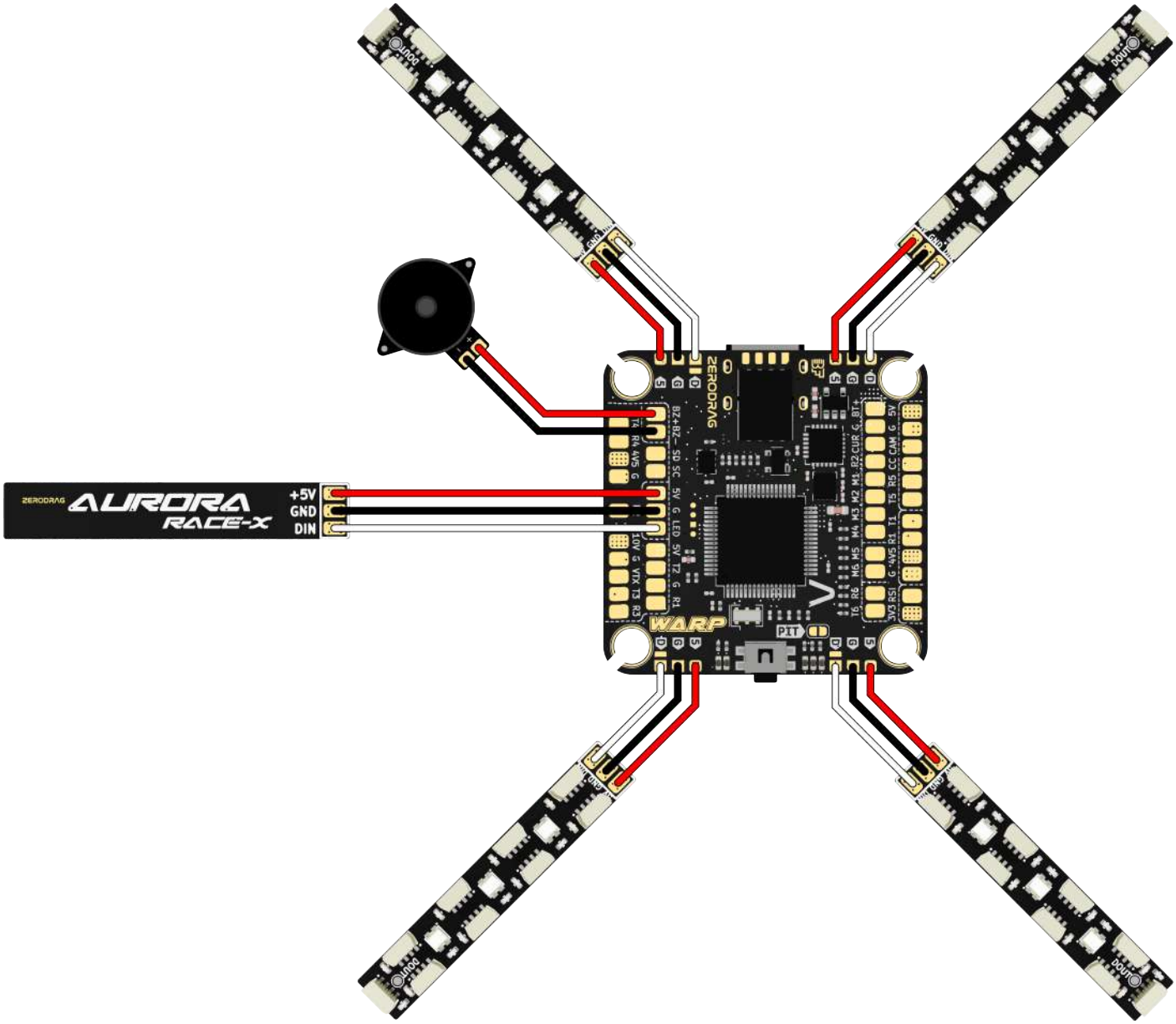
FC-ELRS/CRSF Receiver



FC-SBUS

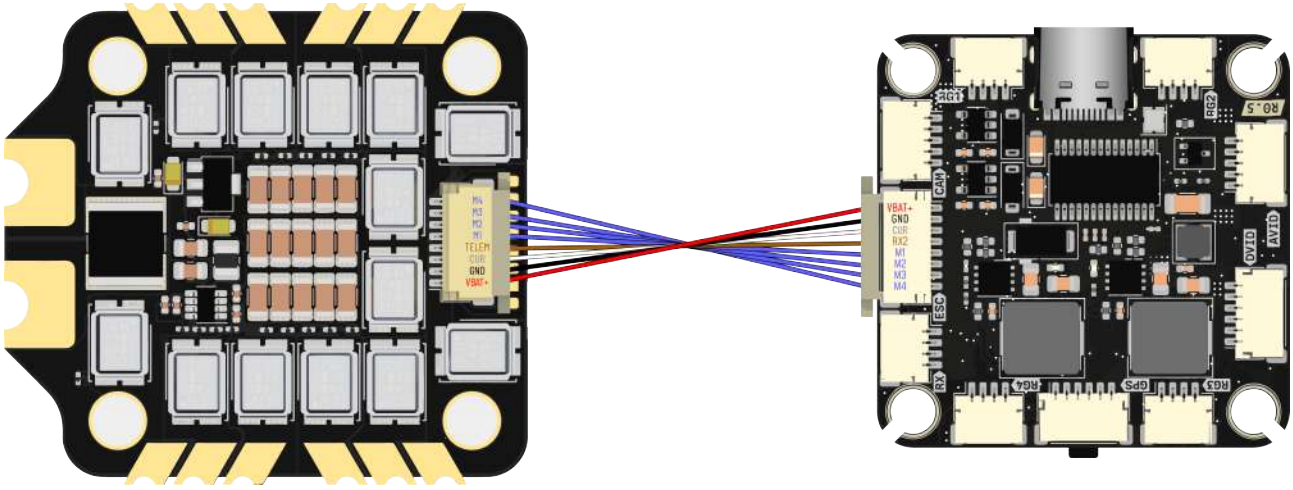


FC-Spectrum

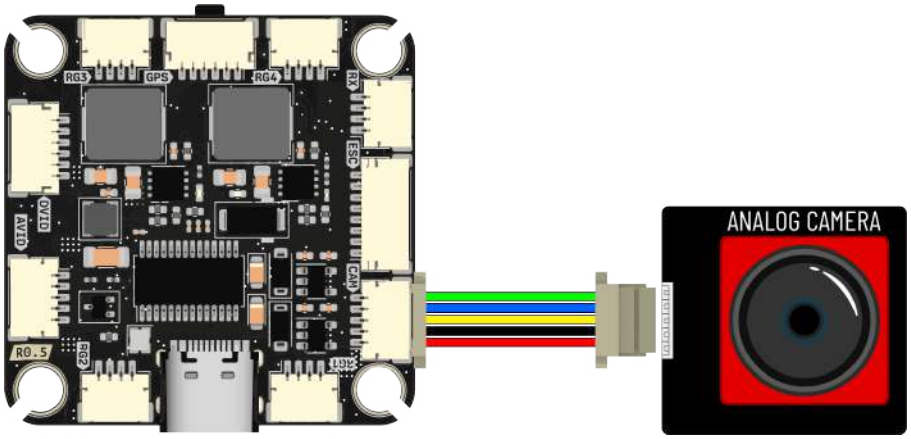


FC-LED's/Buzzer

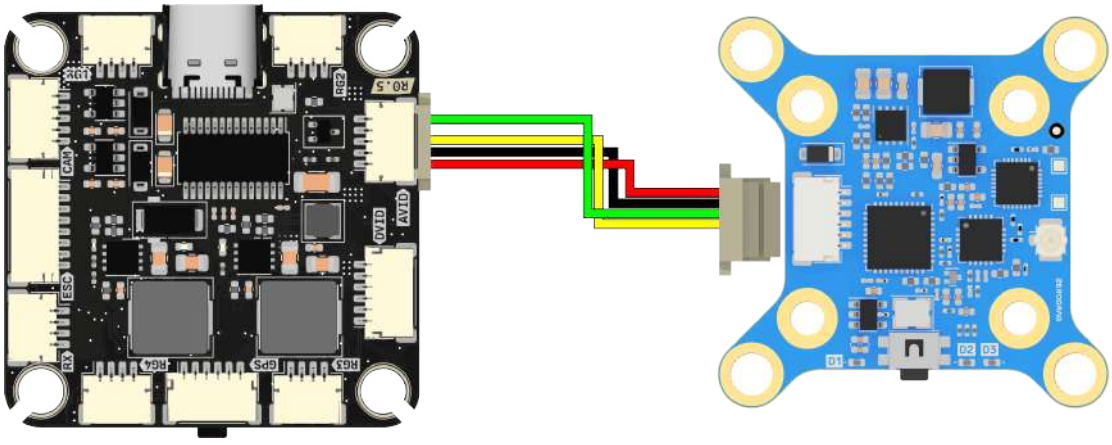
Method 2 - Direct Connector wiring.



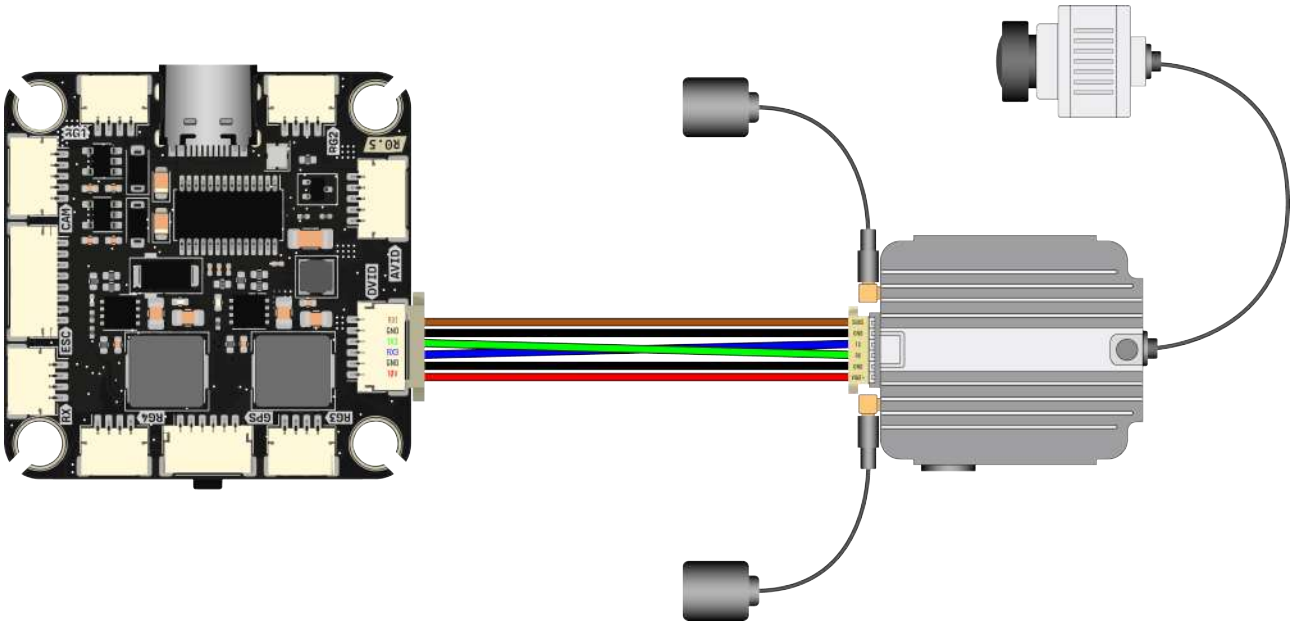
FC-ESC



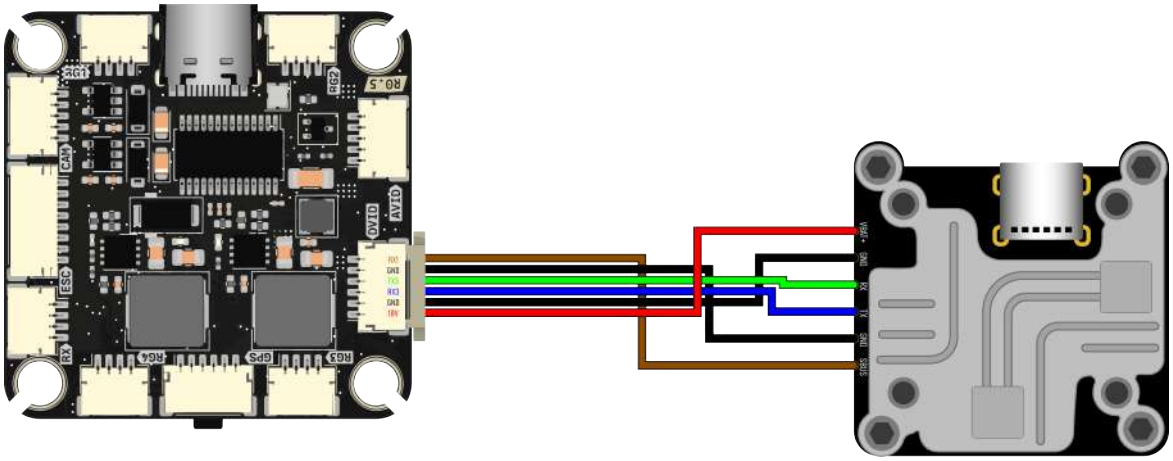
FC-CAM



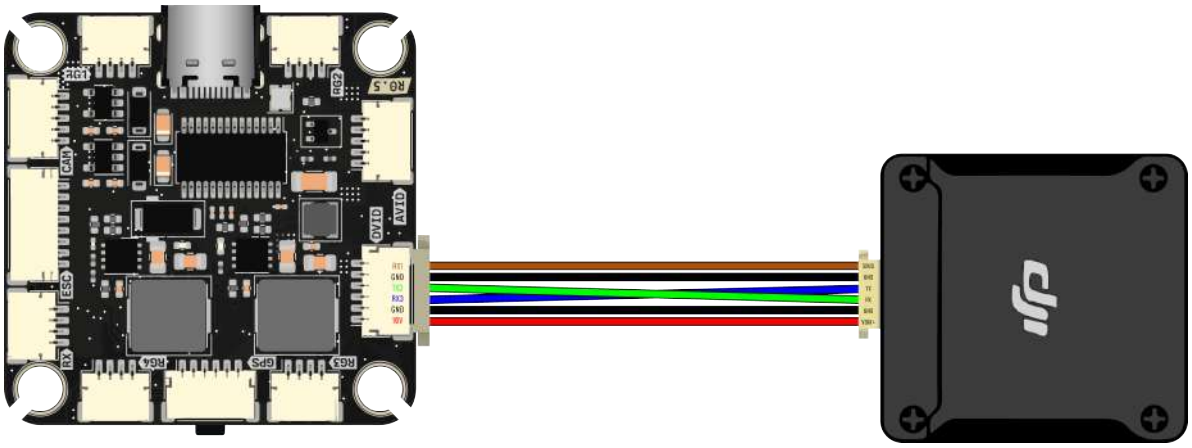
FC-VTX



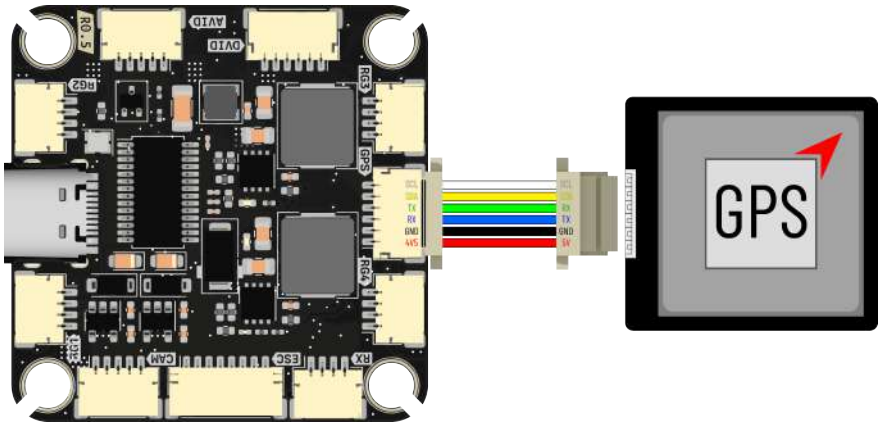
FC-DJI AirUnit



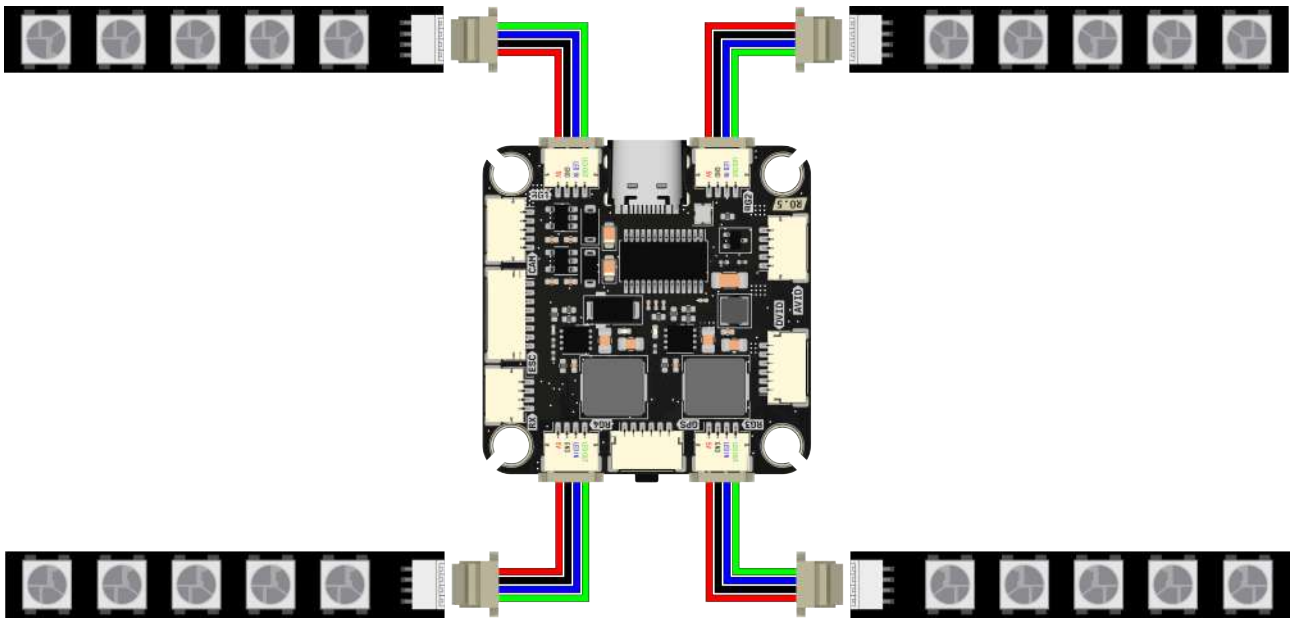
FC-Caddx Vista



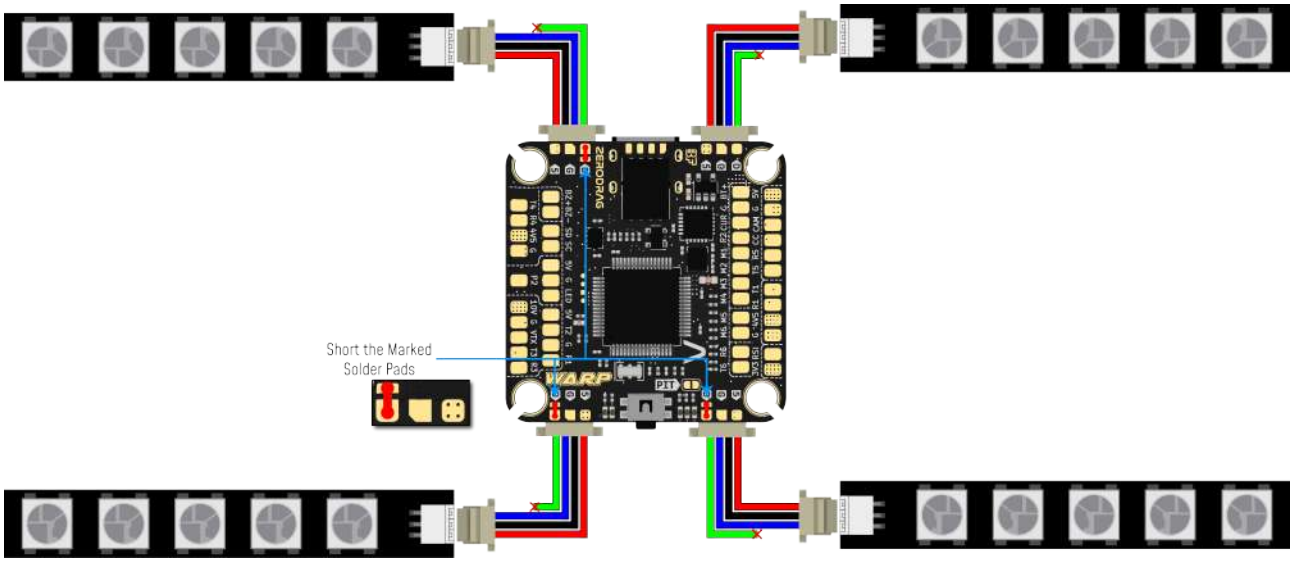
FC-DJI O3



FC-GPS



FC-4pin LED's



FC-Standard LED's

LED Connection Options:

You have two options for connecting LEDs to your flight controller:

1. **Soldering:**
   - Use the three solder pads: 5V, Ground, and Signal.
2. **Connector:**
   - Use the 4-pin connector with pins for 5V, Ground, Signal In, and Signal Out.

Daisy Chain Feature:

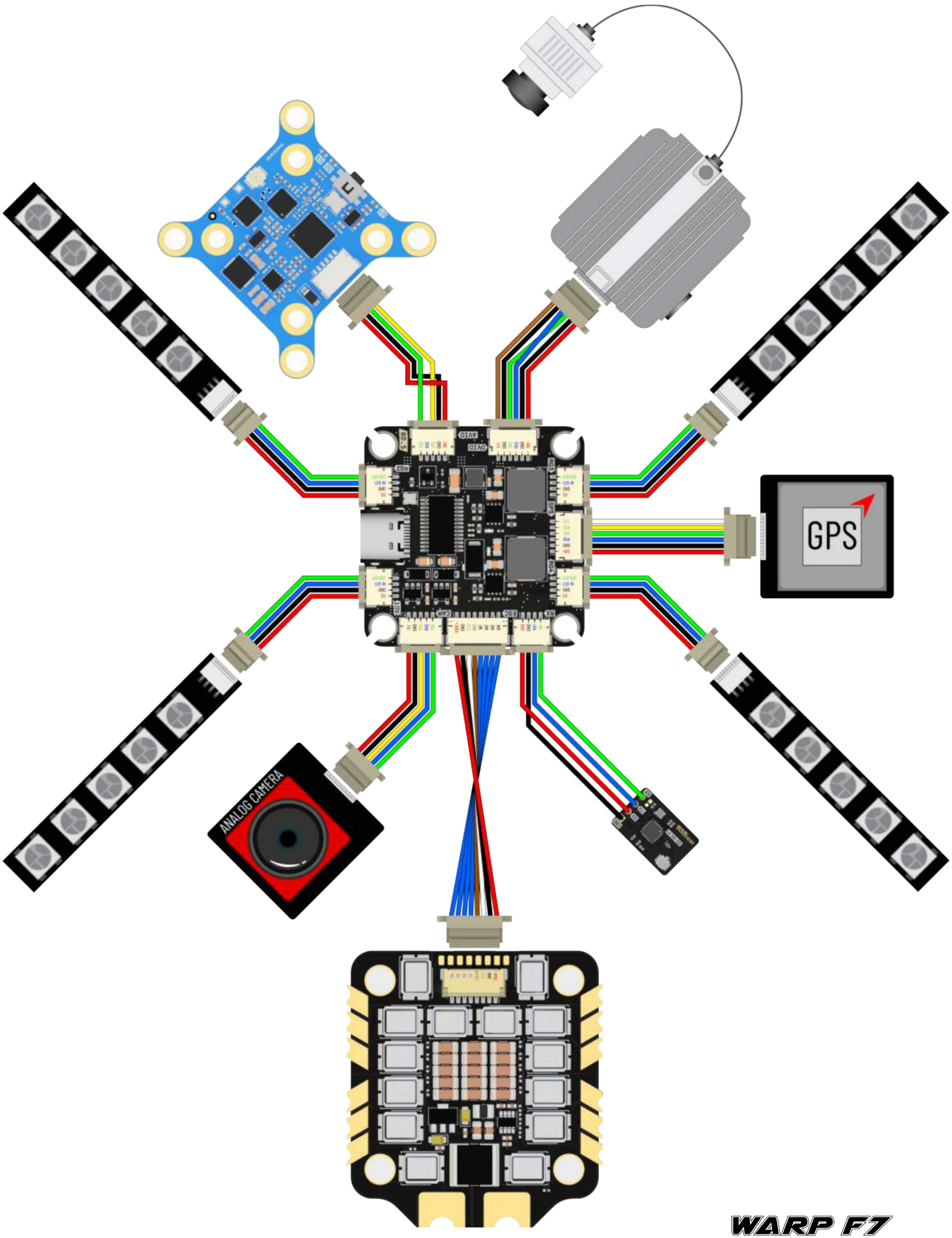
- By default, the connectors are daisy-chained, meaning each connector can control LEDs independently.
- If you prefer to use standard LEDs and control all connectors simultaneously, follow these steps:

Steps to Use Standard LEDs in Parallel:

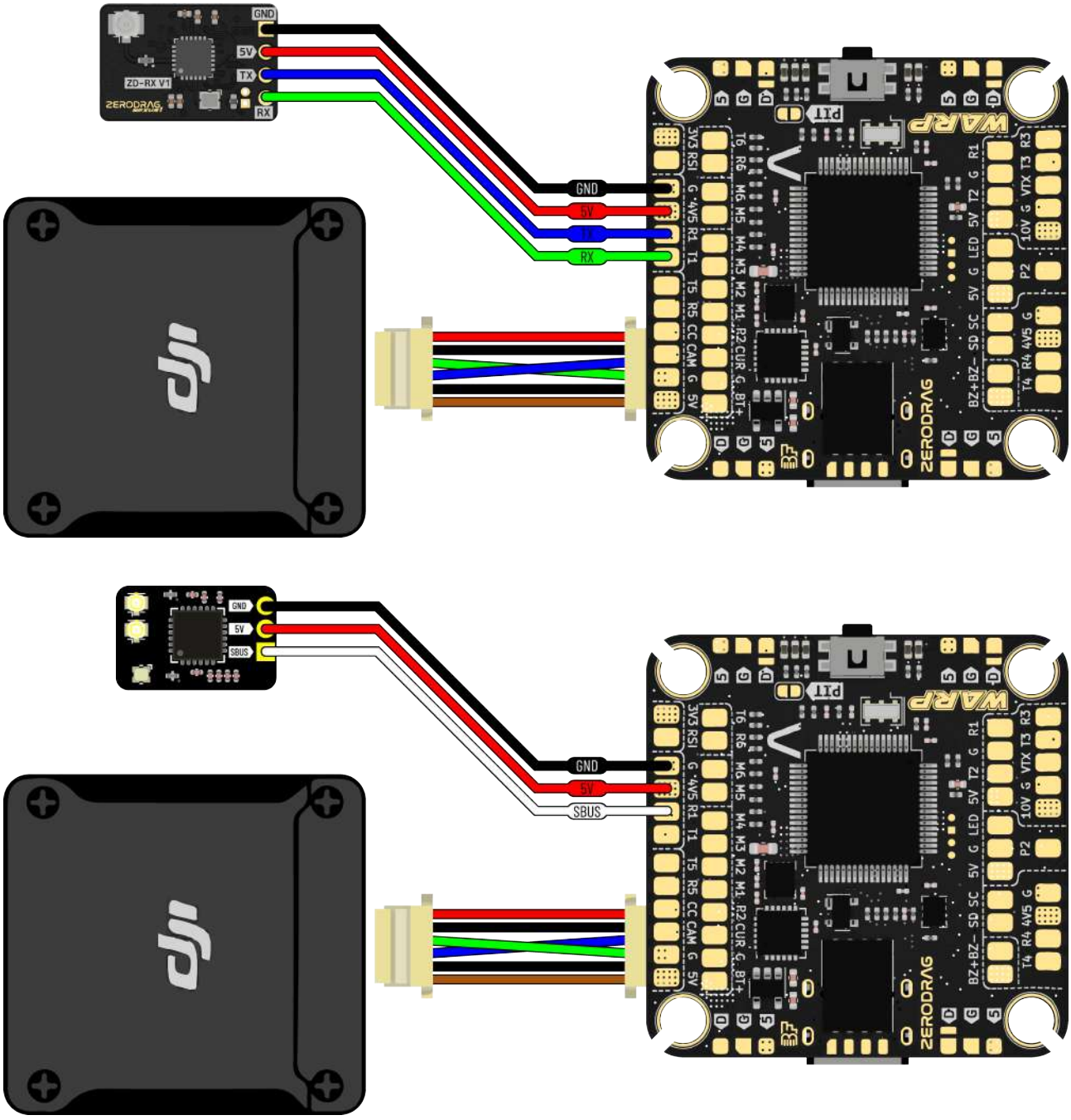
1. On each of the three connectors (except the first one), cut the Signal Out wire.
2. Bridge the small pad next to the Signal pad on the flight controller.
3. This will set all connectors to use the same signal, allowing them to operate in parallel.

Important:

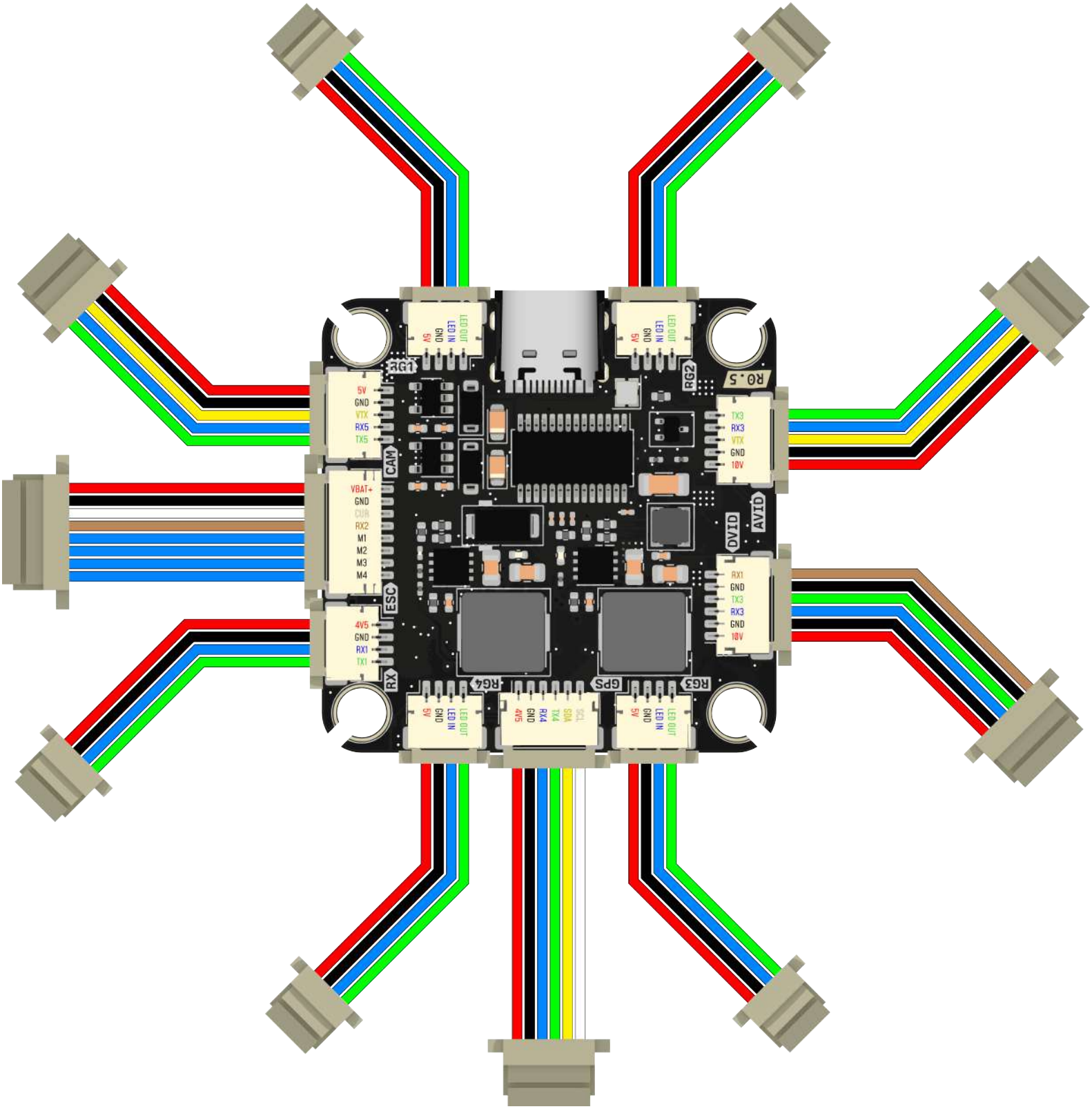
- You only need to do this on three connectors, as the first connector already provides the signal.


GPS
ANALOG CAMERA

Avoid Sbus or RX use with DJI or Vice versa.



When using an SBUS receiver, connect its SBUS signal wire to the SBUS pad on the front side of the flight controller, utilizing UART2 internally. If employing the DJI Air Unit (O3/Link/Vista/Air Unit V1), disconnect the SBUS signal wire from the Air Unit harness to ensure proper recognition by the flight controller. Use tweezers to remove or cut this wire from the 6-pin harness connector, and insulate the exposed part meticulously. Similarly, when utilizing ELRS receivers, connect their TX and RX to the T2 and R2 pads on the flight controller. However, in case of recognition issues with ELRS receivers when using the DJI Air Unit simultaneously, repeat the process of disconnecting the SBUS signal wire from the Air Unit harness to resolve the issue.


RG1
RG2
RO.5
CAM
ESC
RX
RG4
GPS
RG3
DVID
AVID
5V
GND
VTX
RX5
TX5
VBAT+
GND
CUR
RX2
M1
M2
M3
M4
4V5
GND
RX1
TX1
TX3
RX3
VTX
GND
10V
RX1
GND
TX3
RX3
GND
10V
LED OUT
LED IN
GND
5V
4V5
GND
RX4
TX4
SDA
SCL

6. Firmware Update

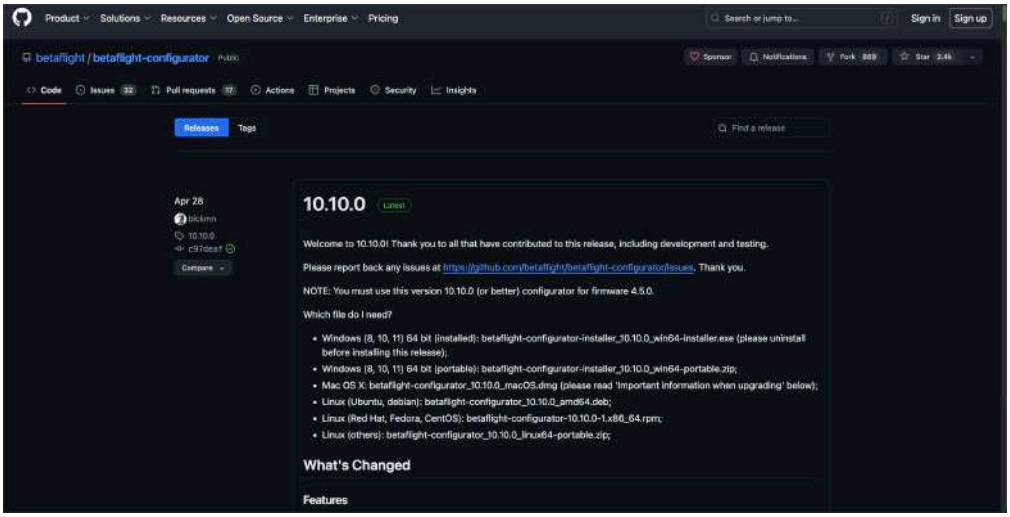
Step-by-Step Guide to Flash WARP F7 Firmware in Betaflight

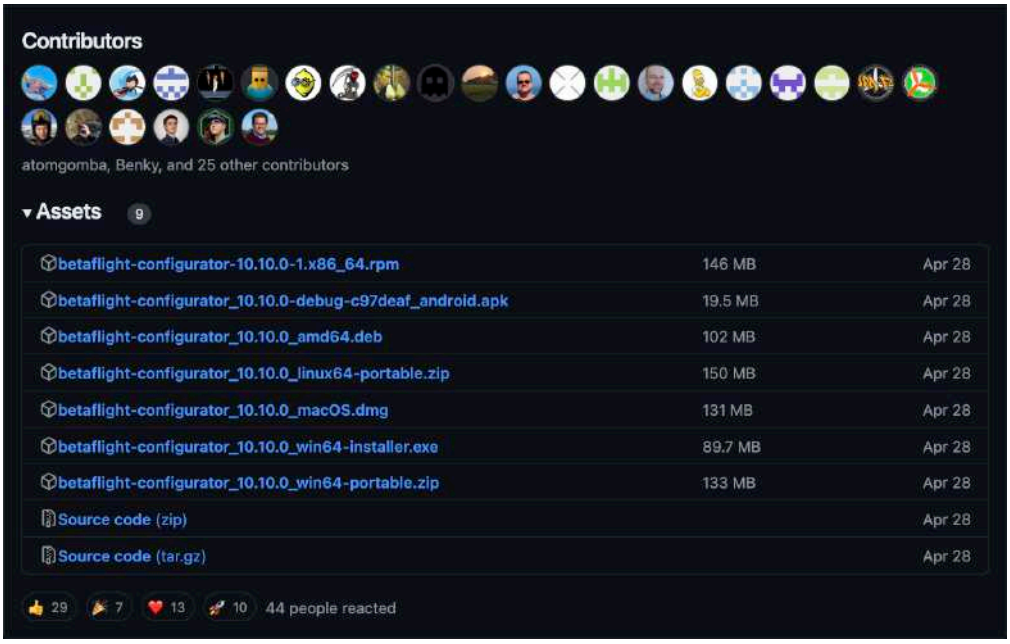
Requirements:

1. WARP F7 Flight Controller
2. USB Type-C Cable
3. Computer with Betaflight Configurator installed
4. WARP F7 Firmware file

Step 1: Install Betaflight Configurator

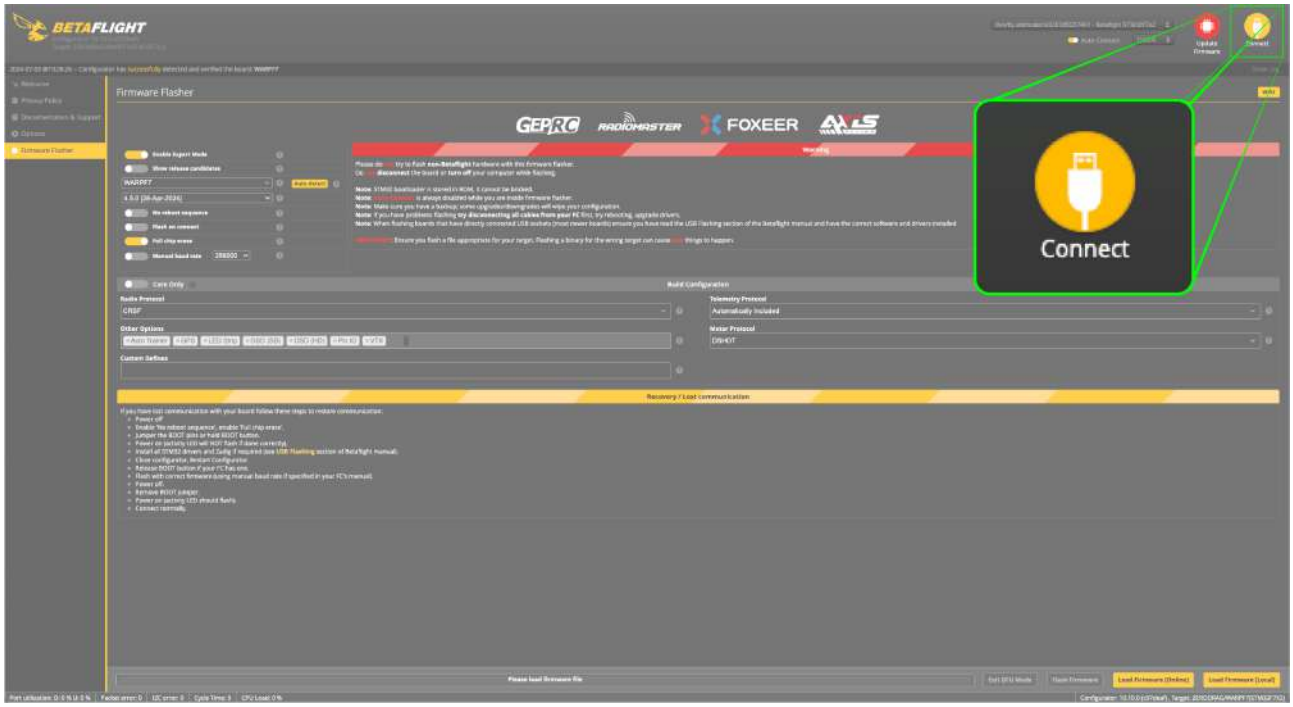
1. Download and install the Betaflight Configurator from the official Betaflight GitHub repository.





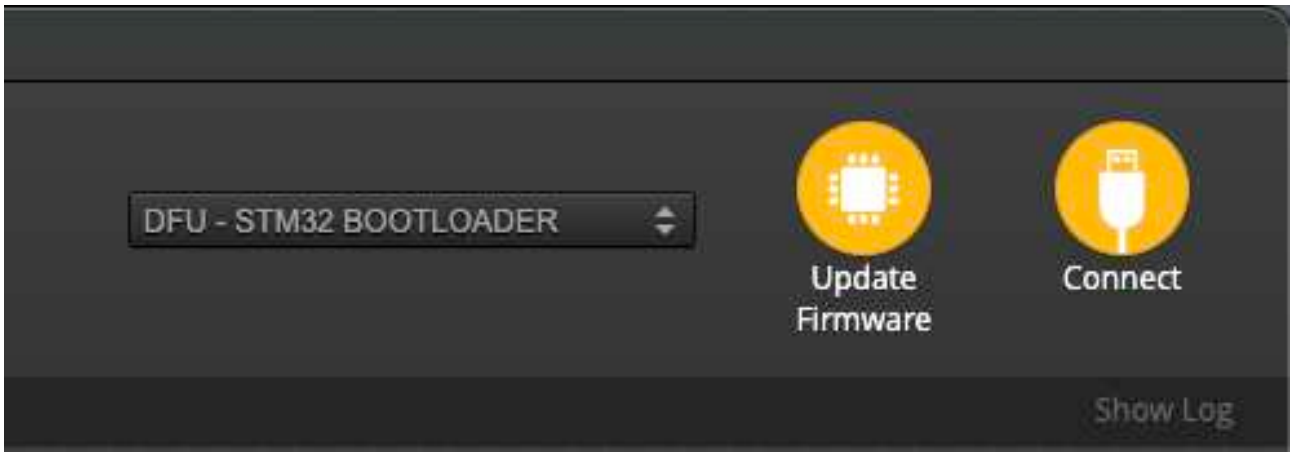
Step 2: Connect the Flight Controller

1. Use a USB Type-C cable to connect the WARP F7 flight controller to your computer.
2. Open Betaflight Configurator.



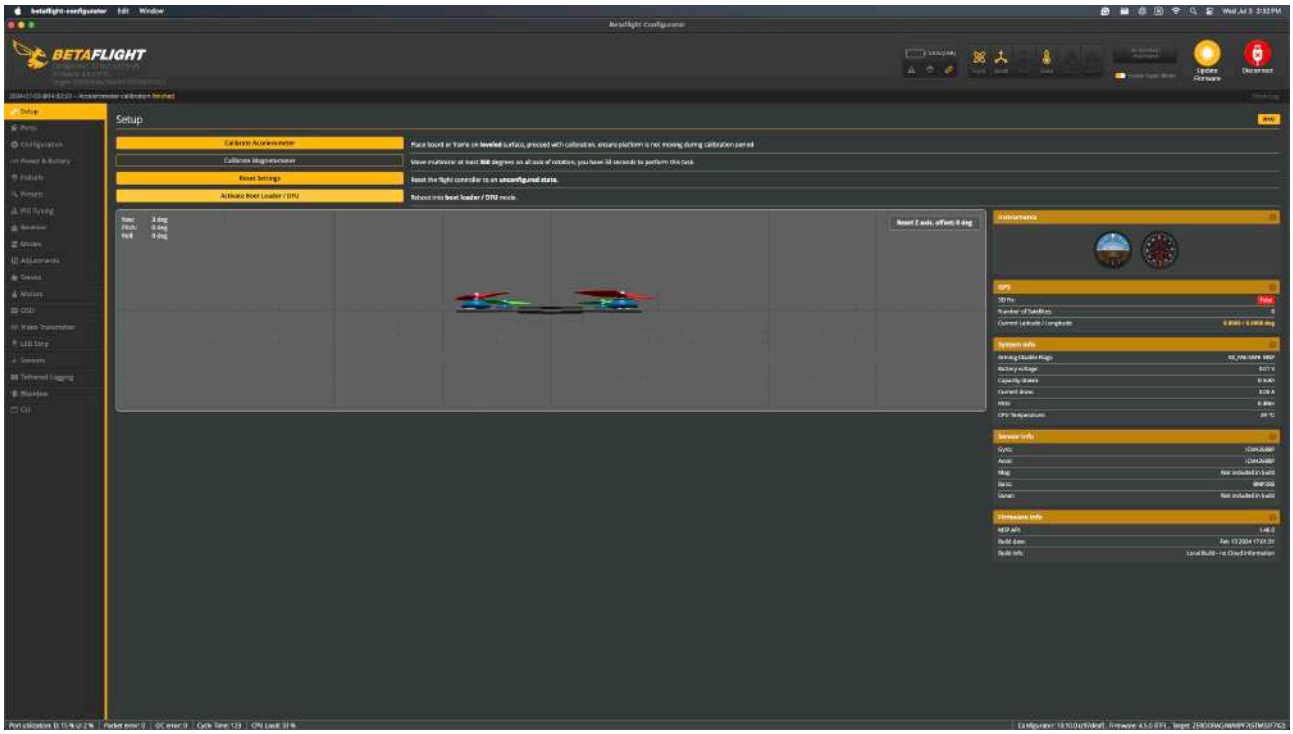
Step 3: Enter Bootloader Mode

1. Locate the **BOOT** button on the WARP F7 flight controller.
2. Press and hold the BOOT button, then connect the USB cable to power up the flight controller. This will put the flight controller in DFU (Device Firmware Upgrade) mode.

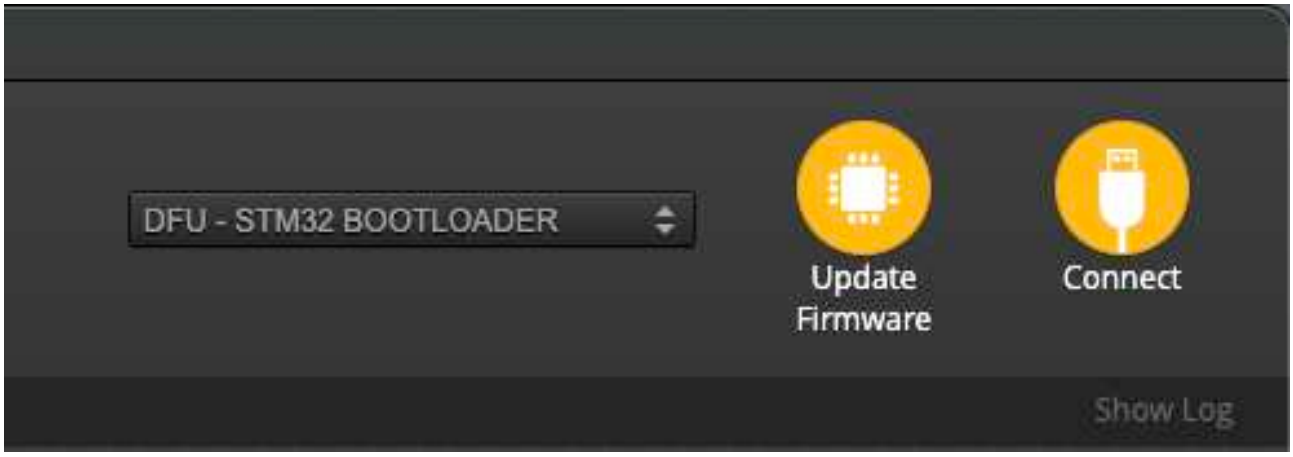


Step 4: Select DFU Mode in Betaflight Configurator

1. In the Betaflight Configurator, look for the **"Manual Bootloader (DFU)"** option under the **"Ports"** section.

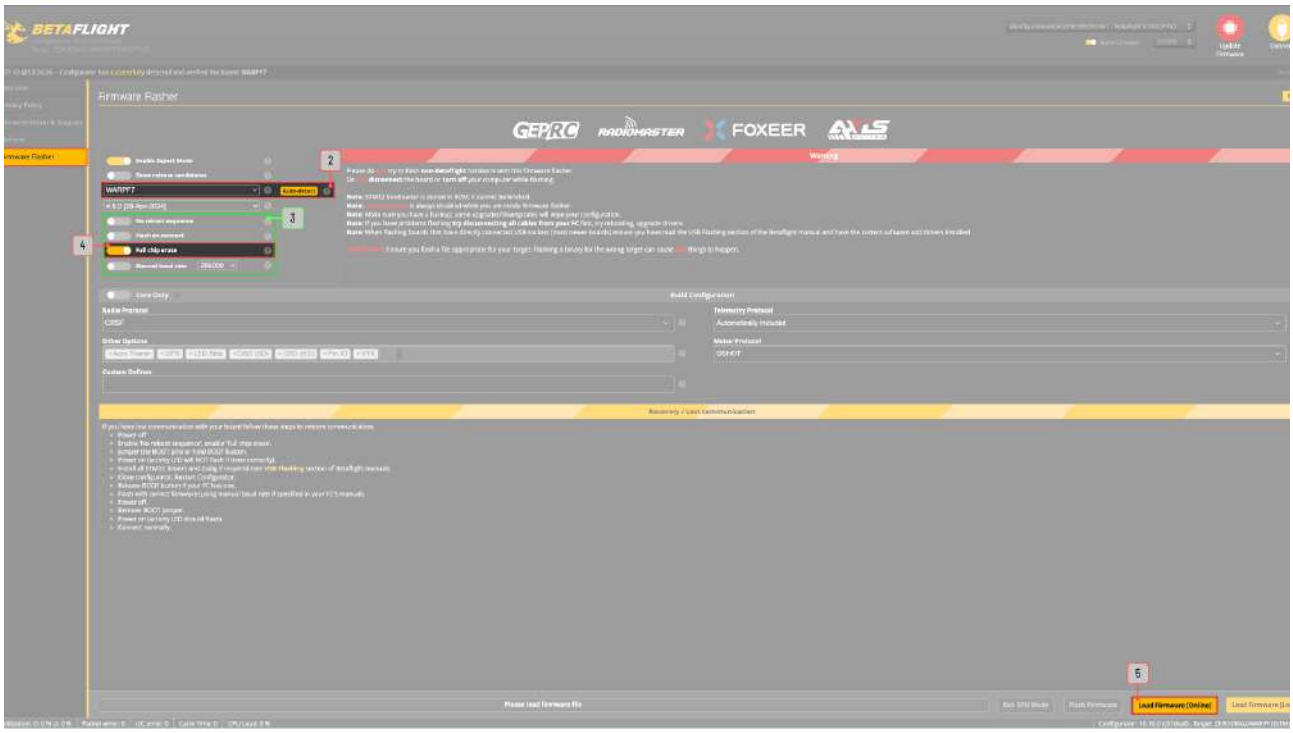


2. Ensure the configurator recognizes the flight controller in DFU mode (you should see "DFU" in the top right corner).



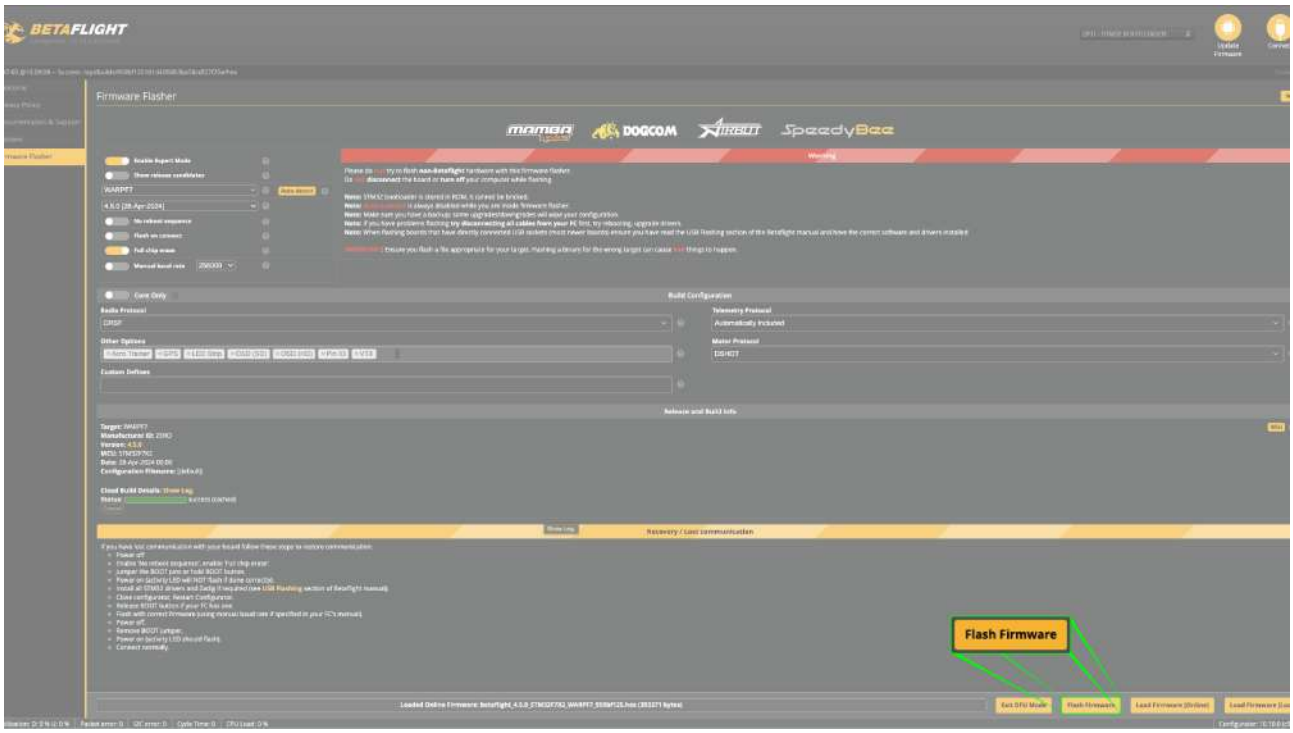
Step 5: Load Firmware

1. Go to the **"Firmware Flasher"** tab in Betaflight Configurator.
2. Under "Choose a board", select "WARP F7".
3. Under **"Choose a firmware version"**, select the desired firmware version.
4. Enable the option **"Full chip erase"** to ensure a clean installation.
5. Click on **"Load Firmware (Online)"** to download the firmware from the internet, or **"Load Firmware (Local)"** if you have the firmware file saved on your computer.



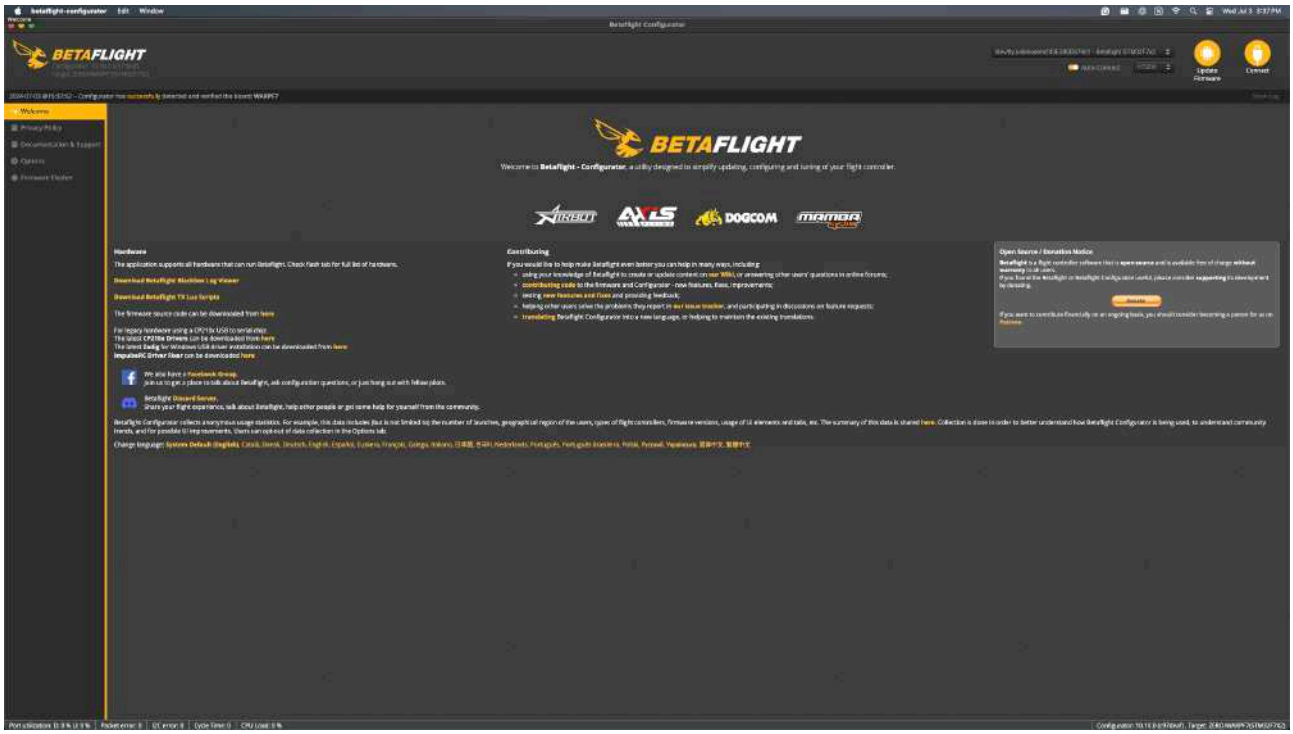
Step 6: Flash Firmware

1. Once the firmware is loaded, click on **"Flash Firmware"**.
2. The flashing process will begin, and you will see a progress bar indicating the status.
3. Wait for the flashing process to complete. You will see a confirmation message once it's done.



Step 7: Reconnect and Configure

1. After flashing, disconnect and reconnect the USB cable to restart the flight controller.
2. Betaflight Configurator should now recognize the WARP F7 flight controller.
3. Proceed with the initial setup and configuration of your flight controller in Betaflight.



Step 8: Verify the Firmware

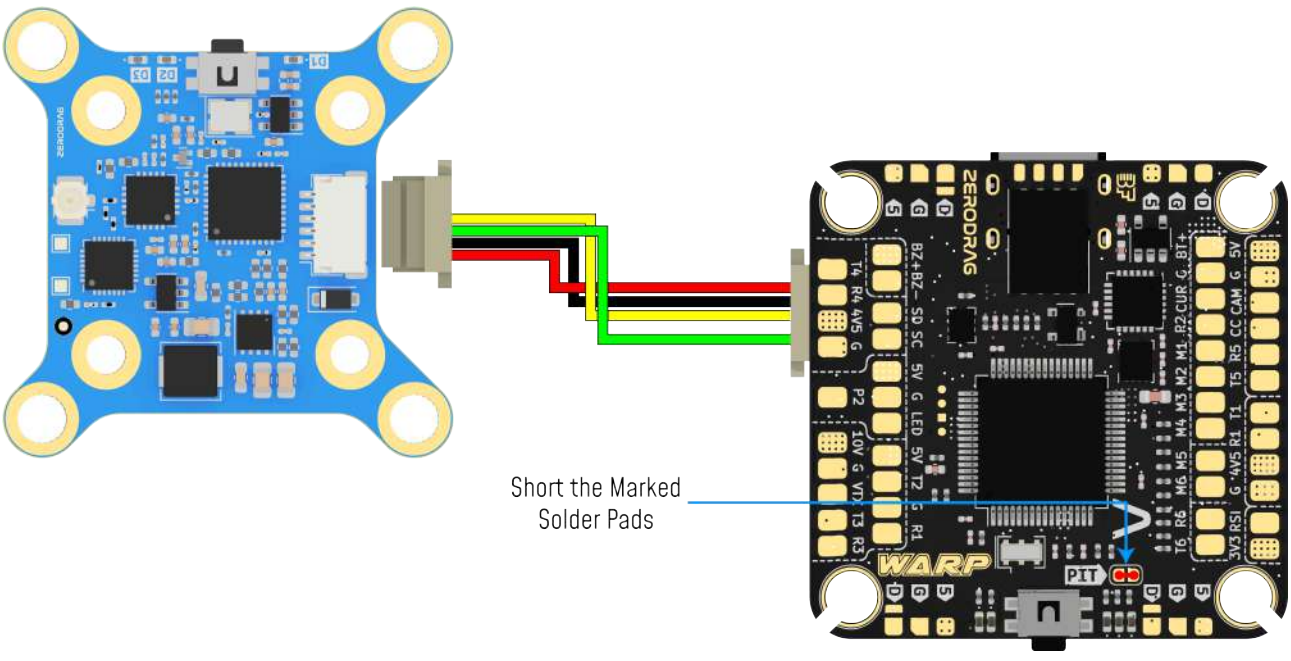
1. Go to the **"Setup"** tab in Betaflight Configurator.
2. Verify that the correct firmware version is installed and that all sensors and peripherals are functioning correctly.

7. Configure Pit Mode

Connecting the Video Transmitter:

1. **Connection Options:**
   - Refer to the connection options described in **Step 5: Connections**, where the two methods for connecting peripherals were outlined. Choose the connection method that best suits your setup:
     - **Connector Method:** Connect your video transmitter (VTX) to the designated connector on the WARP F7 flight controller.
     - **Soldering Method:** Alternatively, solder the VTX power wires to the 10V, Ground, and Signal pads on the flight controller.

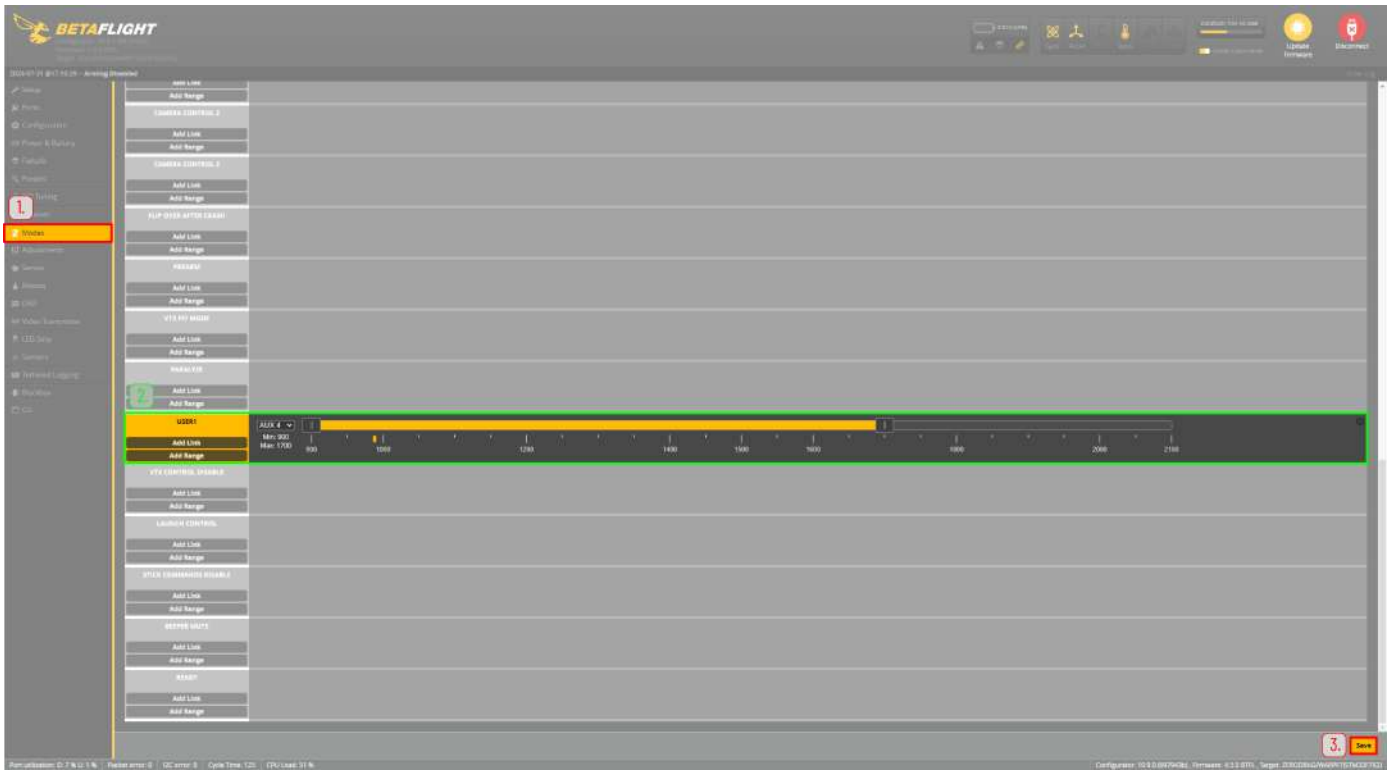
2. **Enable Pit Mode:**
   - Locate the **Pit Mode solder pad** on the WARP F7.
   - Solder/bridge this pad to enable Pit Mode.



Configure Pit Mode in Betaflight:

1. **Open Betaflight Configurator:**
   - Connect your flight controller to the computer and open Betaflight Configurator.

2. **Set Up the AUX Channel:**
   - Navigate to the **"Modes"** tab in Betaflight Configurator.
   - Find the **"User 1"** mode and set it to the preferred AUX channel on your radio transmitter.



3. **Save Configuration:**
   - Click **"Save"** to store the settings.
   - **Screenshot:** Save button in Betaflight Configurator highlighted.

Verify Pit Mode Functionality:

1. **Test the Setup:**
   - Turn on your quadcopter.
   - Flick the switch on your radio transmitter that corresponds to the assigned AUX channel.
   - **Verification:**
     - When the switch is **ON**, you should see video transmission.
     - When the switch is **OFF**, the video transmission should stop.

8. Using USB Breakout Pads for Extended USB Connectivity

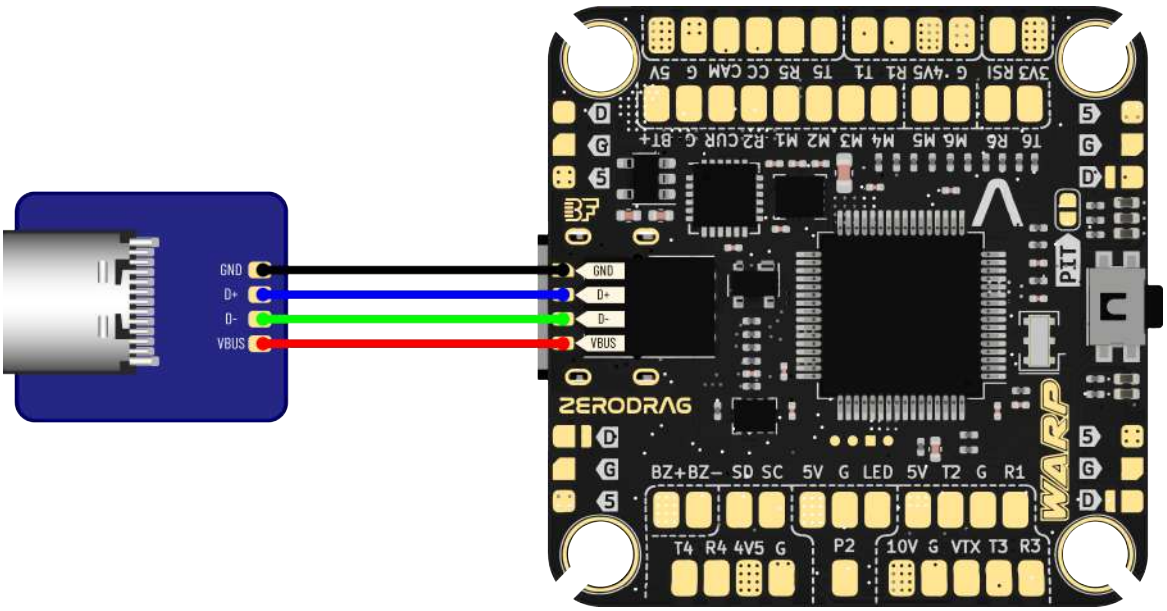
In certain situations, such as when dealing with large builds or a broken USB connector on the flight controller, the WARP F7 offers USB breakout pads as an alternative way to connect your flight controller to a computer for updates and configuration changes.

How to Use USB Breakout Pads:

1. **Locate the USB Breakout Pads:**
   - The WARP F7 flight controller features dedicated USB breakout pads on the board.
2. **Connecting to USB Breakout Pads:**
   - **Soldering:** Carefully solder a USB cable's corresponding wires to the breakout pads (D+, D-, 5V, and GND).
     - D+ and D-: Data lines for USB communication.
     - 5V: Power supply line.
     - GND: Ground line.
3. **Using the Extended USB Connection:**
   - Once connected, use this extended USB setup to link the flight controller to your computer, just like you would with the onboard USB connector.
   - This setup allows you to access Betaflight Configurator for firmware updates and configuration changes.

Important Considerations:

- Ensure secure and accurate soldering to avoid shorts or connectivity issues.
- Double-check the USB wiring connections to the breakout pads to prevent damage to the flight controller or connected devices.

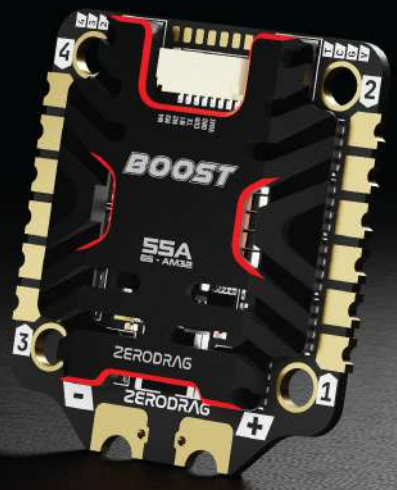


9. Contact

Website: https://zerodrag.in/
Instagram: https://www.instagram.com/zerodrag.in/
LinkedIn: https://www.linkedin.com/company/zerodrag/
WhatsApp: https://wa.me/9821734544

ZERODRAG

BOOST



WHEN
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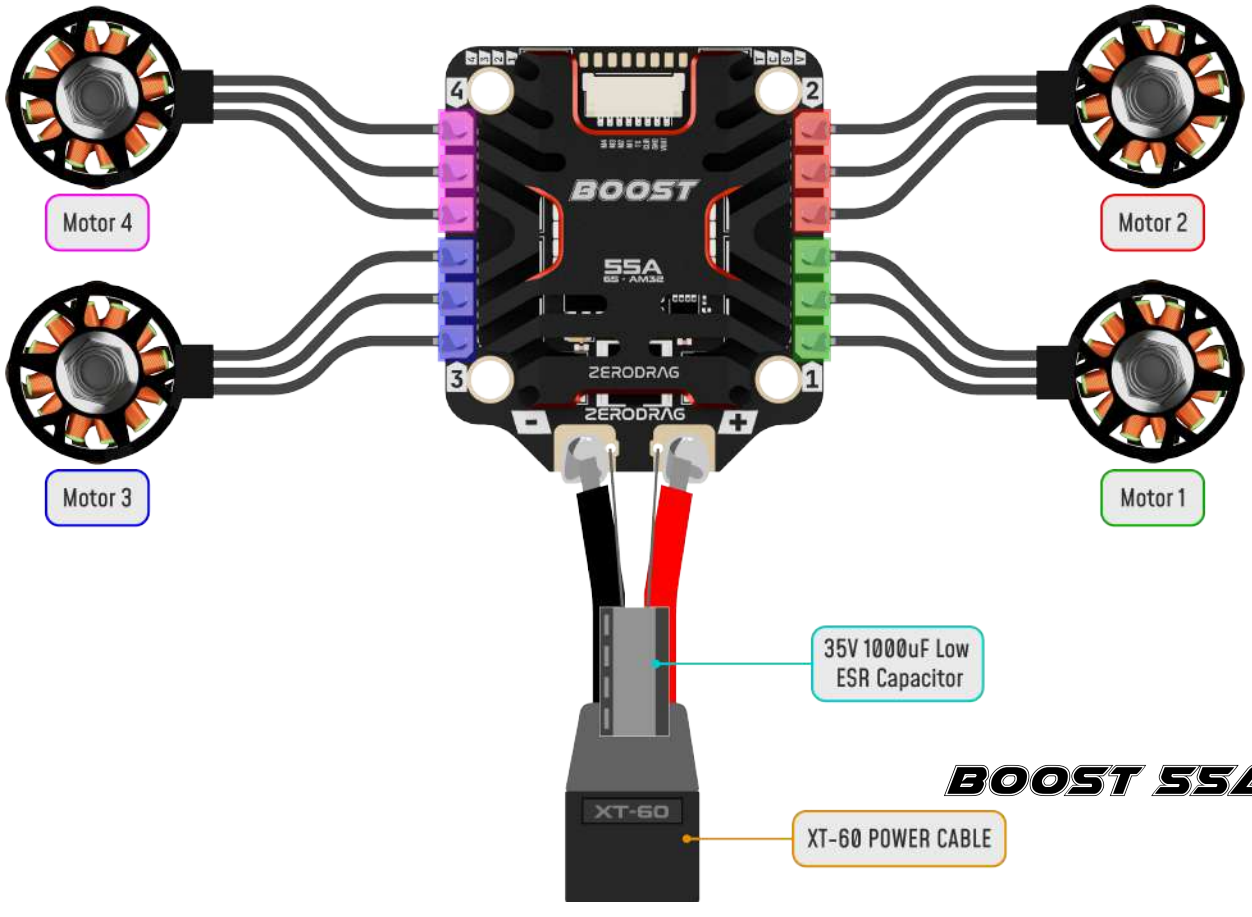
MATTERS

USER MANUAL

VERSION 1.0
01/01/2025

BOOST 55A

INDEX

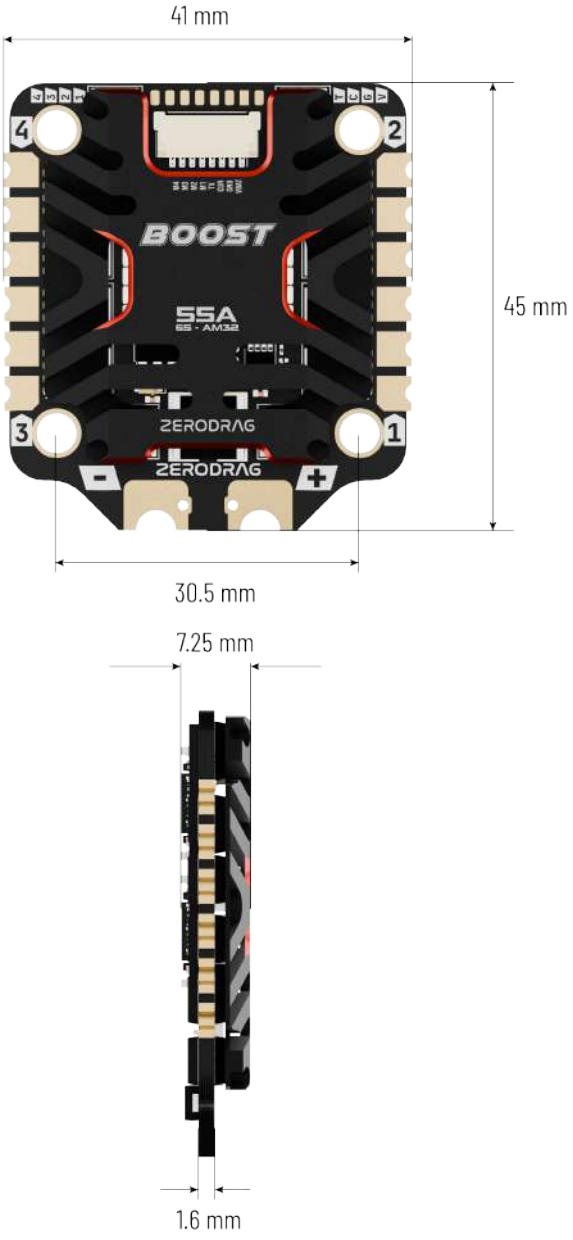


1. Product Description

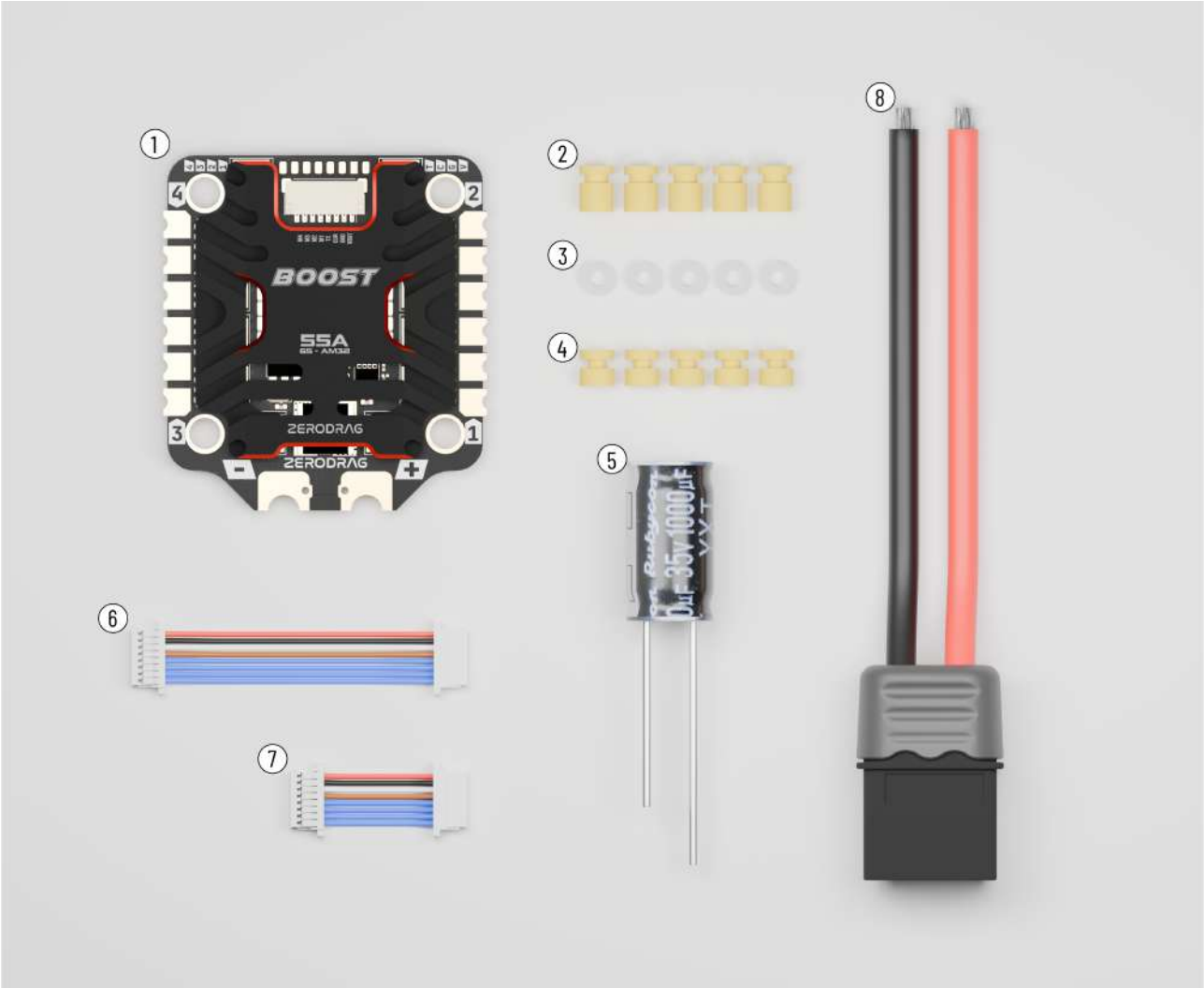
The Zerodrag BOOST AM32 55A 4-in-1 ESC is a high-performance electronic speed controller designed for various UAVs and remote control applications. This ESC supports a 3s-6s LiPo power input and uses reliable AM32 firmware, providing smooth throttle response and precise control. With current sensing and ESC telemetry support, this ESC offers advanced monitoring capabilities for optimized performance.

2. Specification

Power Input	3s-6s LiPo
Mounting Pattern	30.5 x 30.5mm, with 4mm hole size
Weight	17g
MCU	QF32 (AT32 target)
Protocols	DSHOT 150/300/600
Firmware	AM32
Features	Current Sensing, ESC Telemetry
TVS Protective Diode	Yes
Heat Sink	Yes
External Capacitor	35V 1000uF Rubycon capacitor

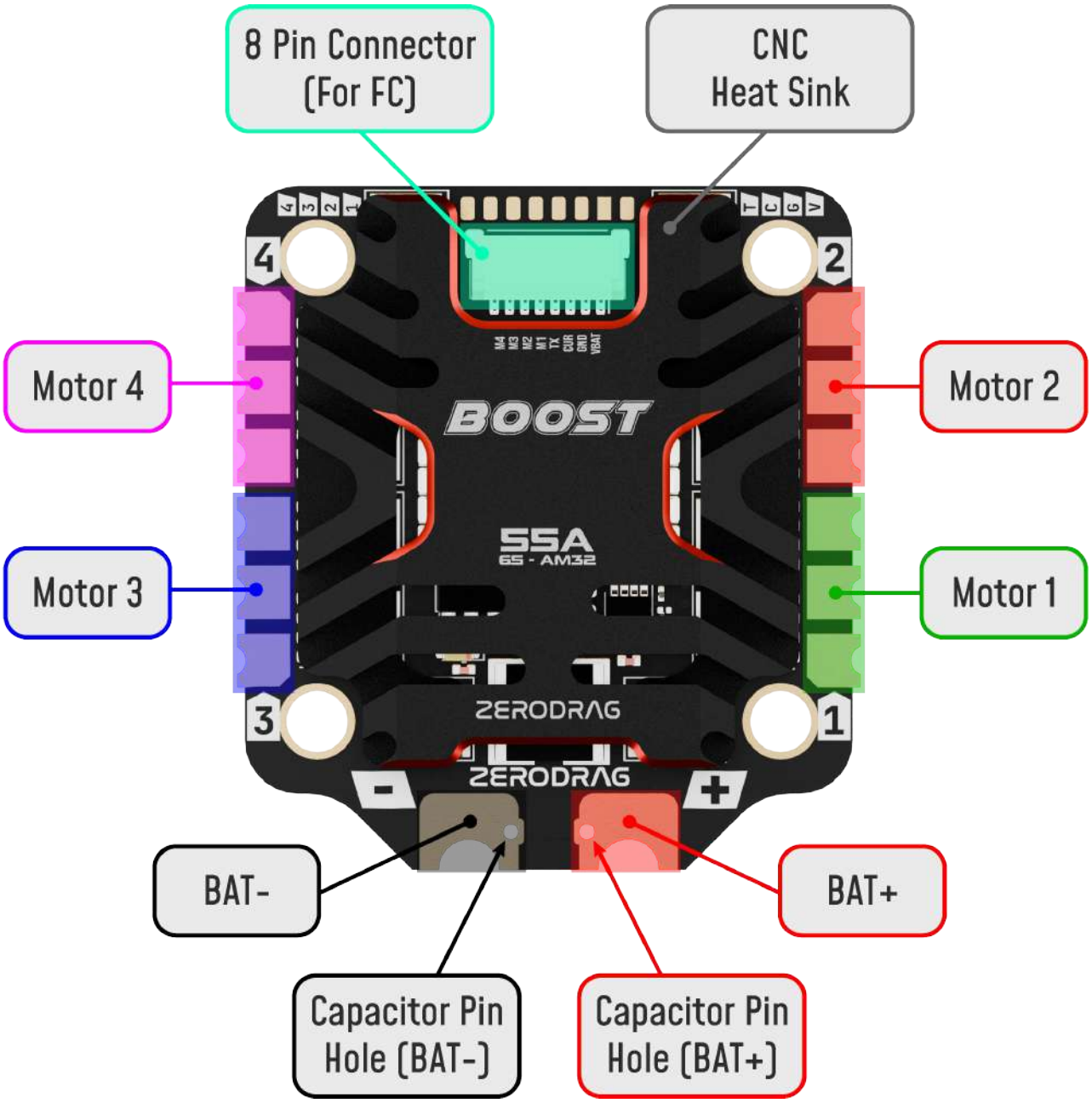


3. In The Box



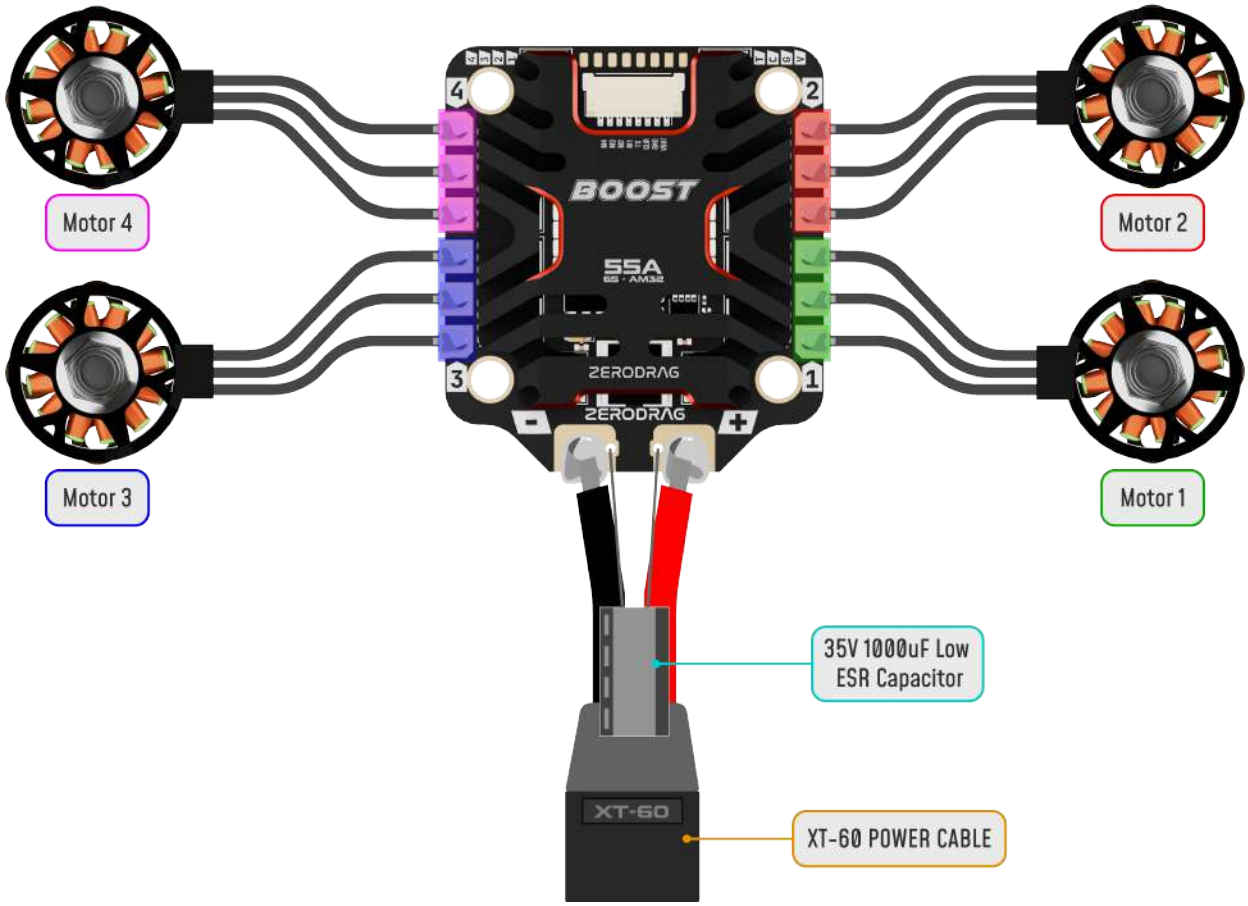
- 1 x Zerodrag BOOST AM32 55A 4-in-1 ESC
- 1 x XT60H Pigtail
- 1 x Capacitor (35V 1000uF Rubycon)
- 5 x Short Gummies (6mm)
- 5 x Tall Gummies (8mm)

4. Layout

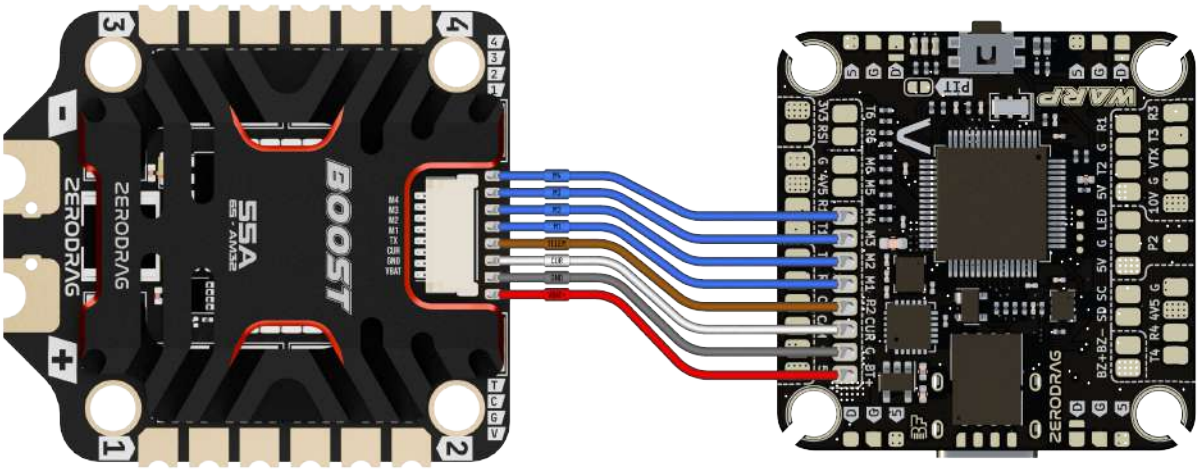

8 Pin Connector
(For FC)
CNC
Heat Sink
Motor 4
Motor 2
Motor 3
Motor 1
BOOST
55A
6S - AM32
ZERODRAG
ZERODRAG
BAT-
BAT+
Capacitor Pin
Hole (BAT-)
Capacitor Pin
Hole (BAT+)

5. Installation Guide

1. Mounting the ESC:
    - Attach the ESC securely to the frame, aligning it with the 30.5 x 30.5mm mounting pattern. Use screws with a 4mm diameter hole.
    - Ensure that the ESC is oriented correctly, as incorrect orientation can impact performance.
    - Use the provided Low ESR 35V 1000uF Rubycon capacitor to prevent voltage spikes that could damage the ESC, especially during power-ups.



2. Connecting to the Flight Controller:
    - The BOOST ESC uses the Betaflight JST SH connector standard, making connection to the flight controller easy and streamlined.
    - Ensure the connector is oriented correctly and verify the pin configuration described below.

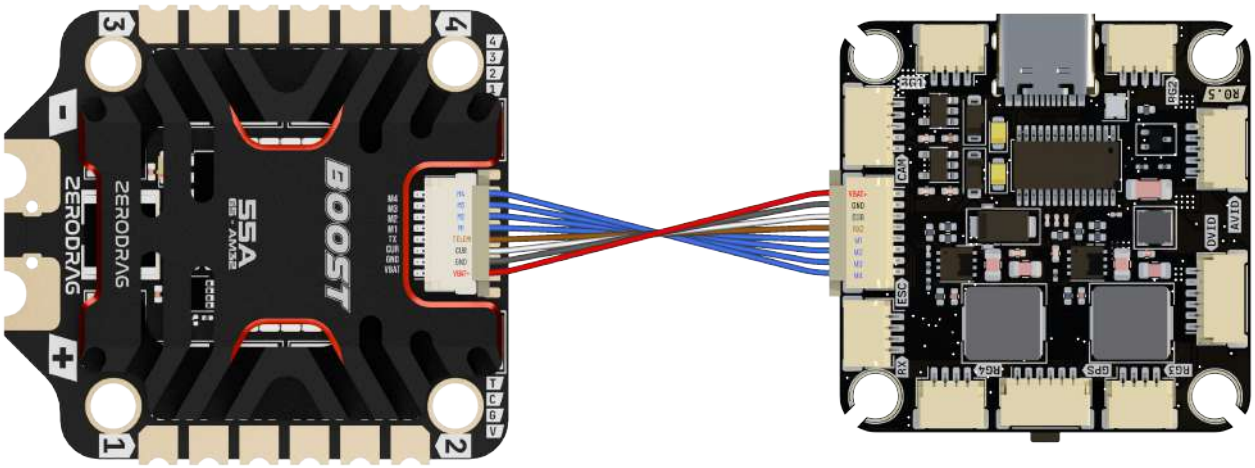


6. Wiring and Connection Diagram

The pin configuration for the ESC-to-FC connection, using the Betaflight JST SH standard, is as follows:

Pin #	Signal Name	Description
1	V+ (VBAT)	Power
2	GND	Ground
3	Current	Current sensing
4	Telemetry	Telemetry data
5	Signal 1	Motor 1 control signal
6	Signal 2	Motor 2 control signal
7	Signal 3	Motor 3 control signal
8	Signal 4	Motor 4 control signal

Note: The **+** connection carries the VBAT voltage directly from the battery. It is recommended to use twisted wires to prevent connection mirroring errors and ensure consistent wiring order. Additionally, while the VBAT connection can power other components, it's advisable to use a regulated 10V/2A power source for sensitive devices like VTX or cameras to minimise voltage fluctuation risks.



7. Firmware and Protocols

The BOOST 55A ESC uses AM32 firmware, which enhances the responsiveness and compatibility of this ESC across various flight controllers. The firmware supports DSHOT 150/300/600 protocols, allowing users to select the preferred protocol based on their system requirements.

- AM32 Firmware Updates and Configuration:
  - Download and install the AM32 configuration tool or visit the online configurator. [Link]
  - Use the tool to configure ESC parameters, adjust motor direction, and perform firmware updates.

8. Current Sensing and Telemetry

This ESC includes built-in current sensing and telemetry capabilities to provide real-time data on power consumption and performance. For optimal use:

- Connecting Telemetry: Attach the telemetry wire to the appropriate input on the flight controller.
- Monitoring Data: View telemetry data through the flight controller's interface, displaying information such as current draw and voltage levels.

9. ESC Calibration and Configuration

- Calibration: Most DSHOT-enabled ESCs, including the BOOST 55A, do not require manual calibration. However, you may need to update the firmware or recalibrate if issues occur.
- Motor Direction Adjustment: Motor direction can be changed directly in the AM32 configuration software without physical rewiring. Simply connect to the AM32 tool, navigate to the motor configuration page, and adjust direction as needed.

10. Safety and Precautions

To ensure safe operation, follow these precautions:

- Voltage Limits: Operate only within the recommended 3s-6s LiPo voltage range.
- Avoid Overcurrent Situations: Ensure proper motor and propeller pairing to prevent overcurrent.
- Environmental Conditions: Avoid exposure to extreme temperatures and moisture, which may damage the ESC.

11. Troubleshooting

If you encounter any issues, refer to the solutions below:

- ESC Not Responding: Verify wiring connections and check for correct polarity.
- Telemetry Not Showing: Ensure the telemetry wire is properly connected to the flight controller.
- Error Signals: Check for any unusual beeping patterns, indicating a connection or protocol mismatch.

12. Contact

Website: https://zerodrag.in/
Instagram: https://www.instagram.com/zerodrag.in/
LinkedIn: https://www.linkedin.com/company/zerodrag/
WhatsApp: https://wa.me/9821734544