HDZero Halo Mini Flight Controller with Gemini ELRS RX

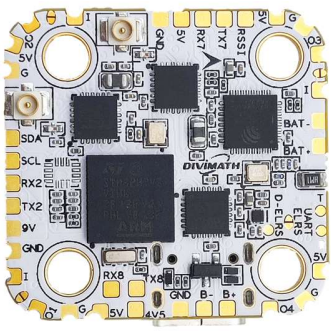
Introduction

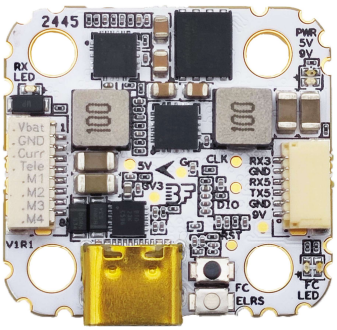
The HDZero Halo is a compact flight controller powered by the H743 MCU for high-performance computation. It integrates a Gemini ELRS receiver and features a switchable 9V/3A BEC output for video transmitters, along with a 5V/4A output for LED strips and other peripherals. The integrated ELRS RX simplifies quad assembly and ensures high-performance link quality with its Gemini.

The Halo Flight Controller makes connecting parallel LED strips for single colors straightforward and simplifies the routing of addressable LED strip wires. Designed for digital video systems, it eliminates the analog OSD chip to save space and reduce costs. It's particularly optimized for use with the HDZero Race v3 VTX, ensuring a low-profile stack.

The Halo Flight Controller features dedicated sockets for connecting ESCs with a maximum 4A included cable, as well as for connecting any digital VTXes. This design makes it a solderless flight controller, ensuring easy assembly and quick swaps in the field.

The Halo Flight Controller is available in two versions, MPU6000 and ICM42688, to meet different pilot preferences.





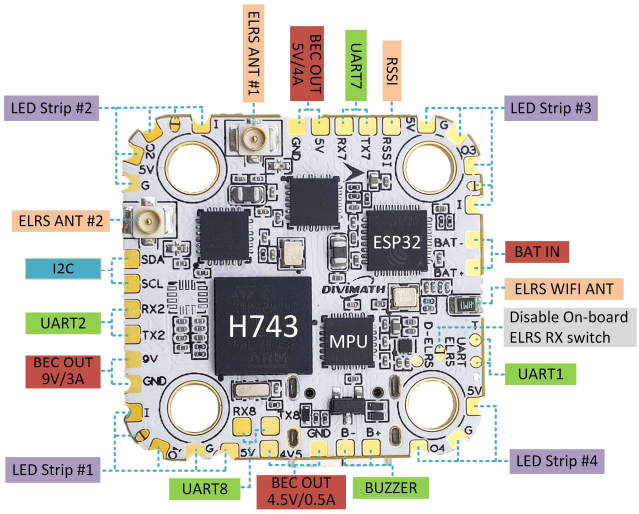
Specification

Model	HDZero Halo Flight Controller
Flight Controller	
CPU	STM32H743 (480MHz)
Gyro	MPU6000 or ICM42688
BEC output	DC 5V/4A DC 9V/3A DC 4.5V/0.5A
Black Box	16MB Flash memory
I2C Pads	Yes
UART Pads	TX2/RX2, TX7/RX7, TX8/RX8
ESC Telemetry	RX4
VTX MSP UART	TX5/RX5
DJI HDL	RX3
Buzzer Pads	Yes
LED Strip	Parallel or Serial
USB	Type-C
Analog OSD	No
FC Firmware	Betaflight: HDZERO_HALO
ELRS Receiver	
Chip Set	ESP32 + 2x SX1280
FC UART	TX1/RX1
Gemini RX	Yes
RF Frequency	2.4GHz
Max TX RF Power	10mW
Antenna Interface	2xU.FL
ELRS Firmware	HDZero Halo FC 2.4G Gemini RX
Dimensions	
Power Supply	3S ~ 8S
Size	29x30.5mm with 20x20 M4 mounting holes
Weight	5.6g
Dedicated sockets for	ESC, and HDZero and other Digital VTXes

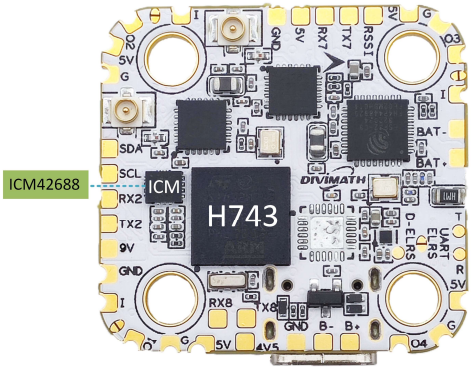
Includes

- 1x HDZero Halo FC
- 5x Rubber Grommet(6.6mm)
- 5x Rubber Grommet(8.0mm)
- 1x ELRS T-sharp short antenna (40mm)
- 1x ELRS T-sharp long antenna (90mm)
- 2x ELRS Antenna Strain
- 1x ESC Cable (8-pin SH1.0, 30mm)
- 1x 8-pin SH1.0 connector

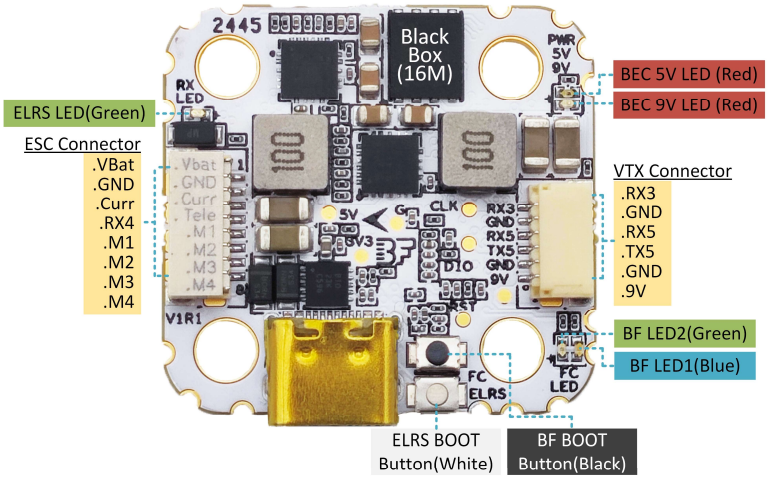
Diagram



HDZero Halo FC – Top View (MPU6000)

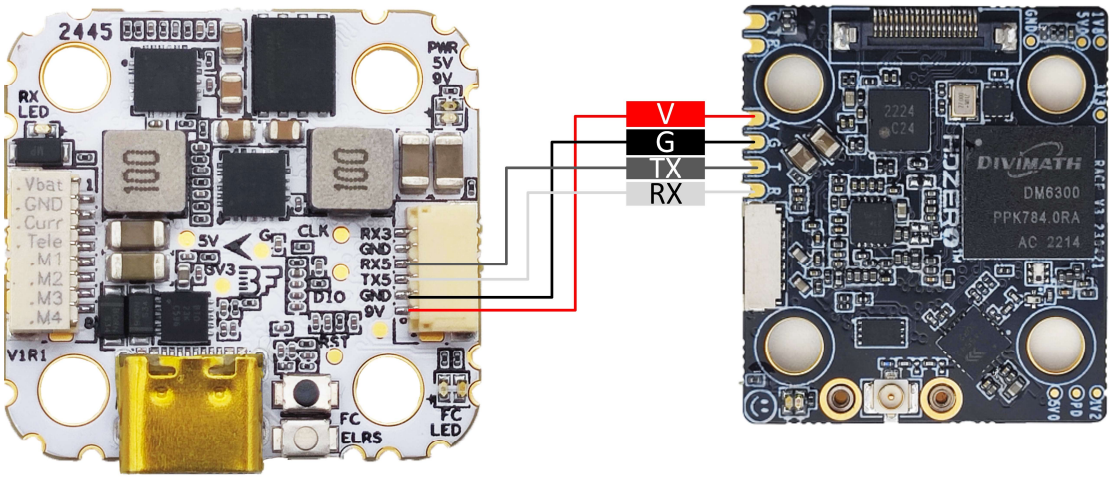


HDZero Halo FC – Top View (ICM42688)

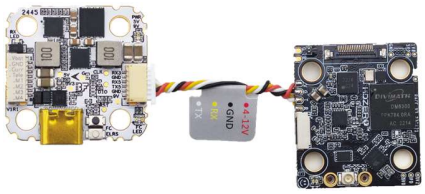


HDZero Halo FC – Bottom View

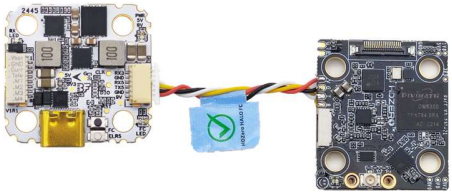
HDZero RACE V3 VTX Wiring



Unfortunately, the previous batches of HDZero VTX-R3 have different signal definitions for its connector, requiring users to re-pin it (see picture below) to match the correct connections. However, the latest HDZero Race v3 VTX features an updated connector that perfectly matches the Halo FC, enabling seamless plug-and-play installation.

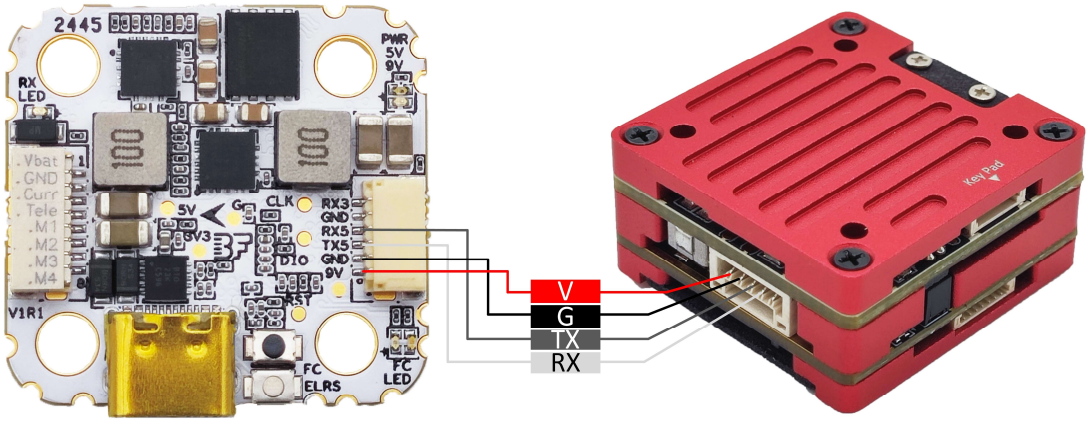


The previous batches of VTX-R3 (after re-pinning)

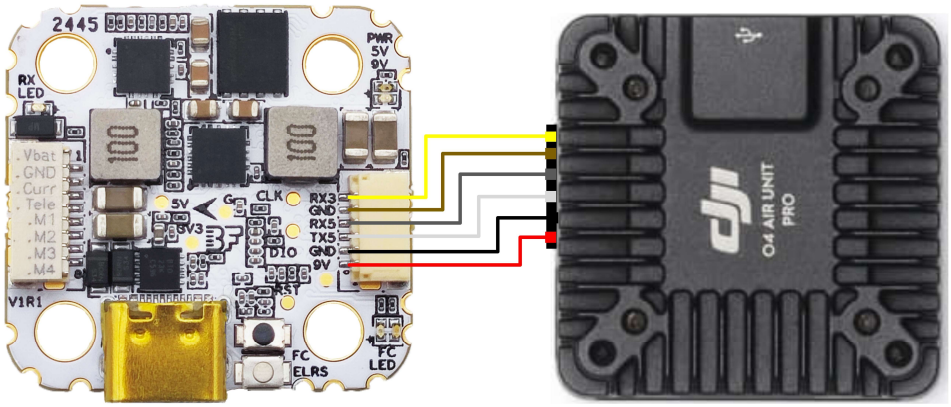


The newest batch of HDZero VTX-R3

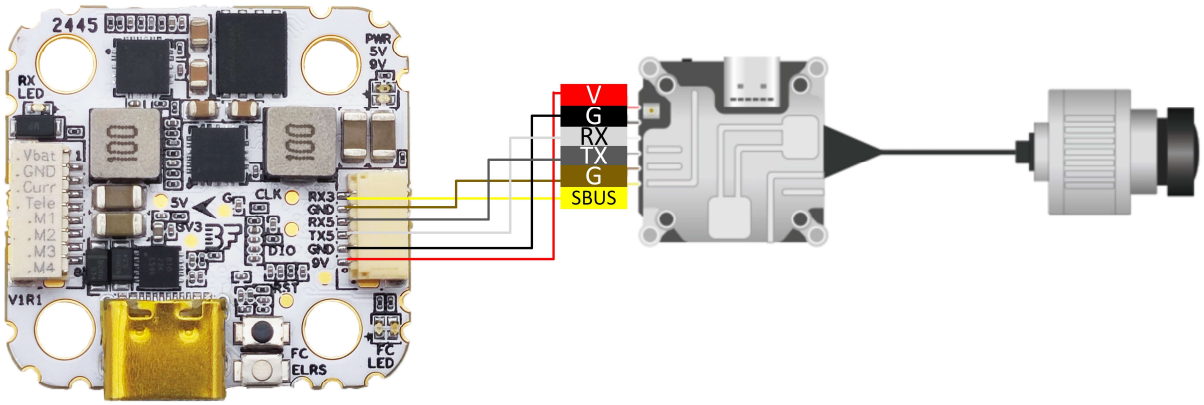
HDZero Freestyle V2 VTX Wiring



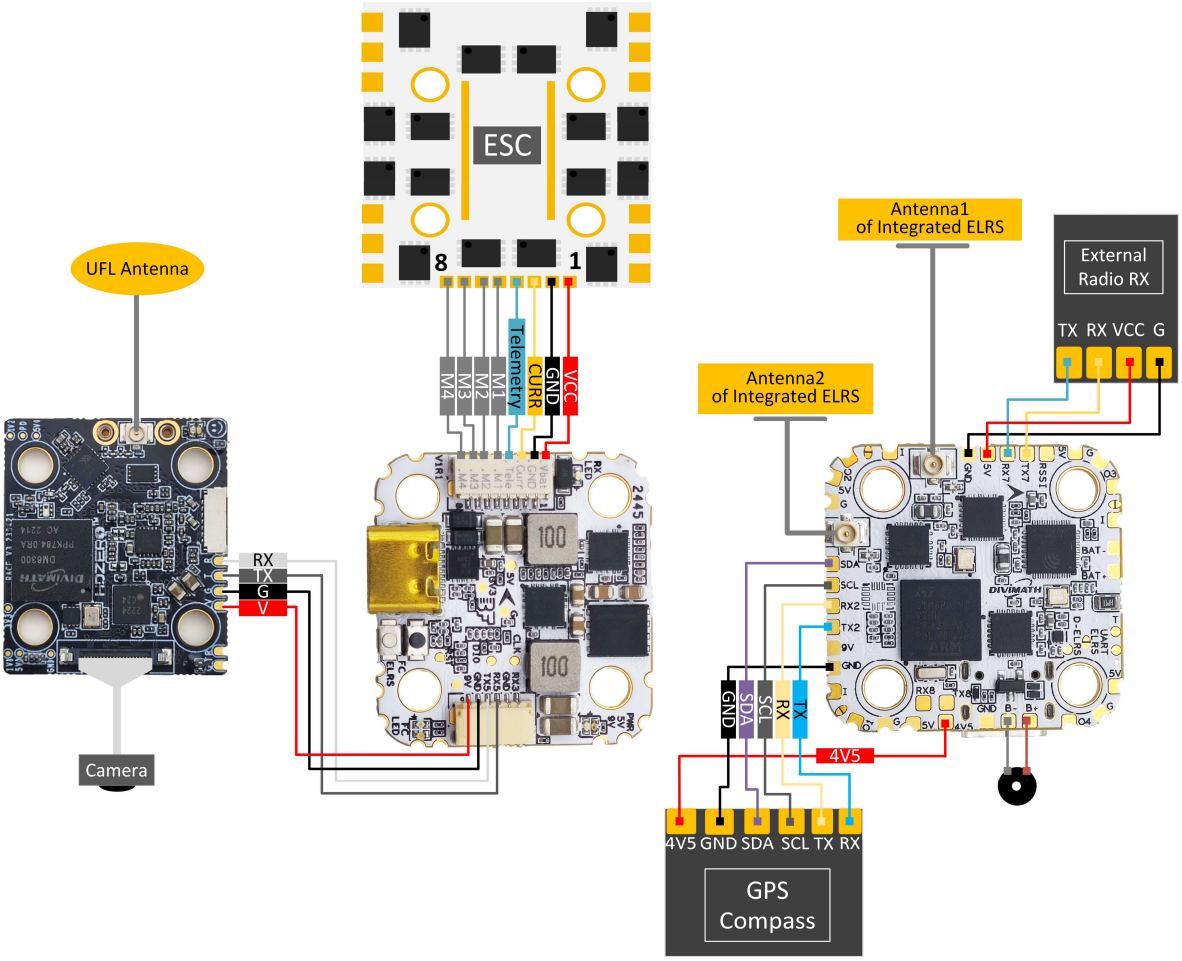
DJI O3/O4 Wiring



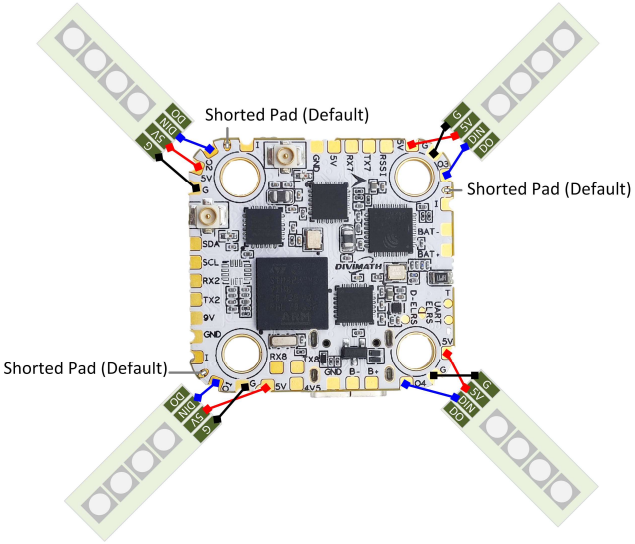
DJI VISTA Wiring



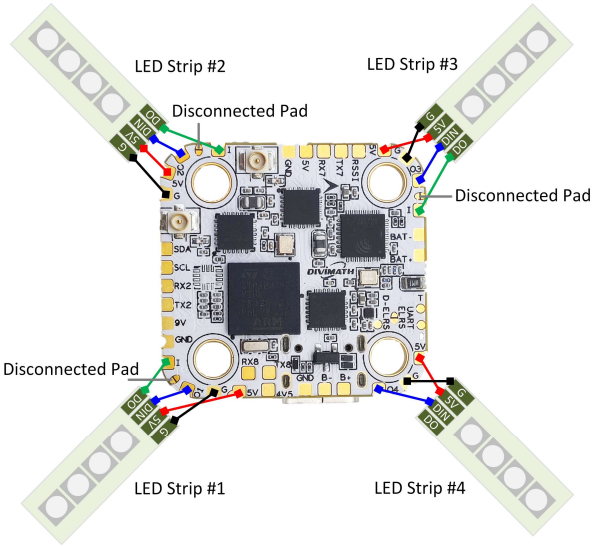
Peripheral Wiring



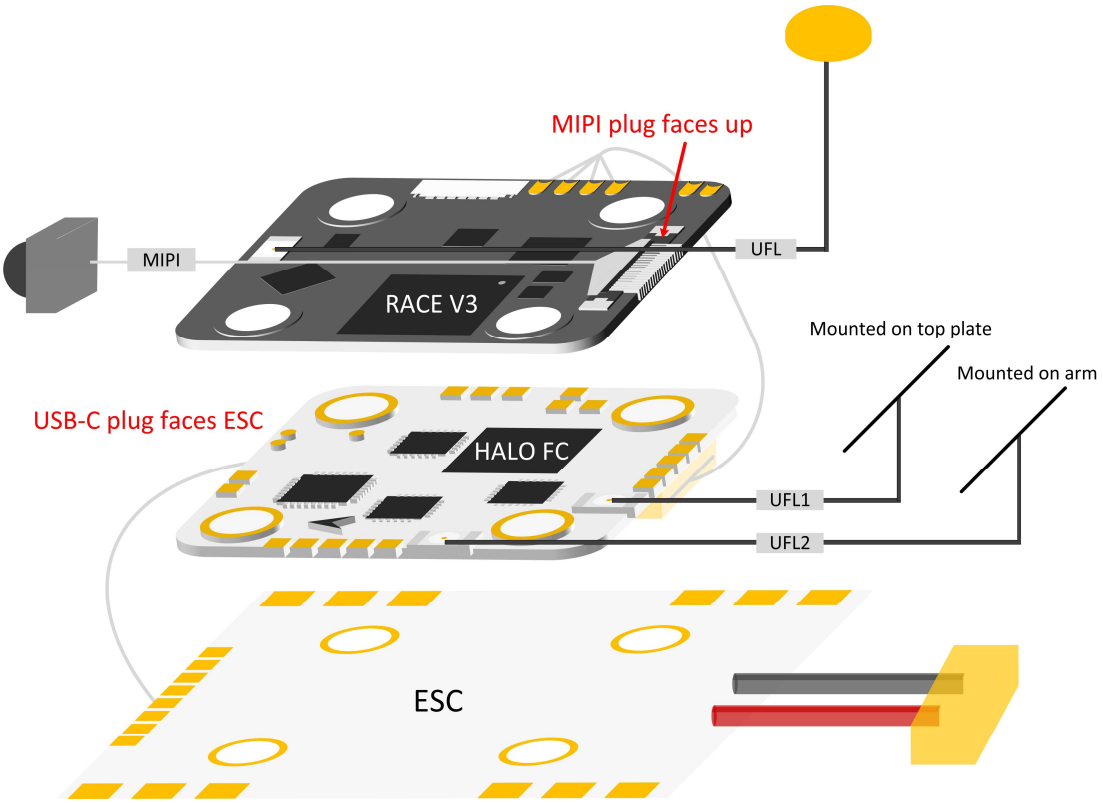
LED Strip Wiring (Parallel, all strips share the same config)



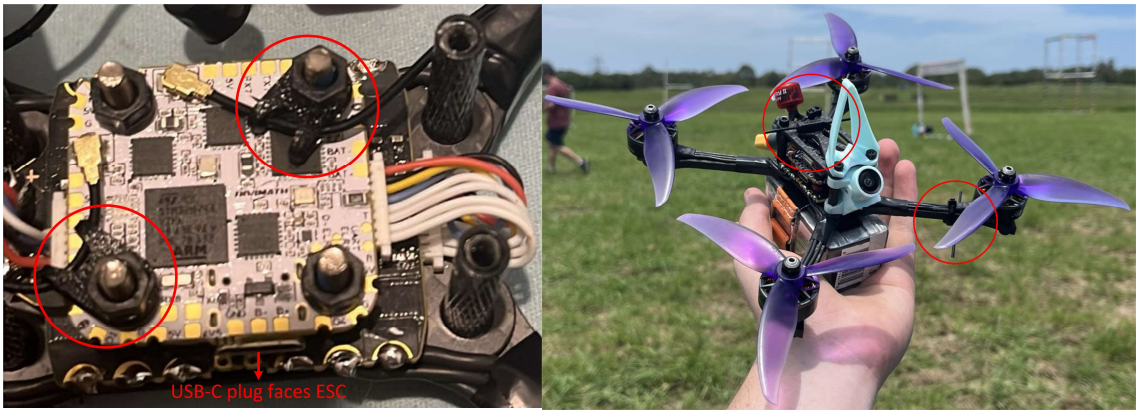
LED Strip Wiring (Individually, addressable LED strips)



Recommended Stack (RACE V3+HALO FC+ESC)



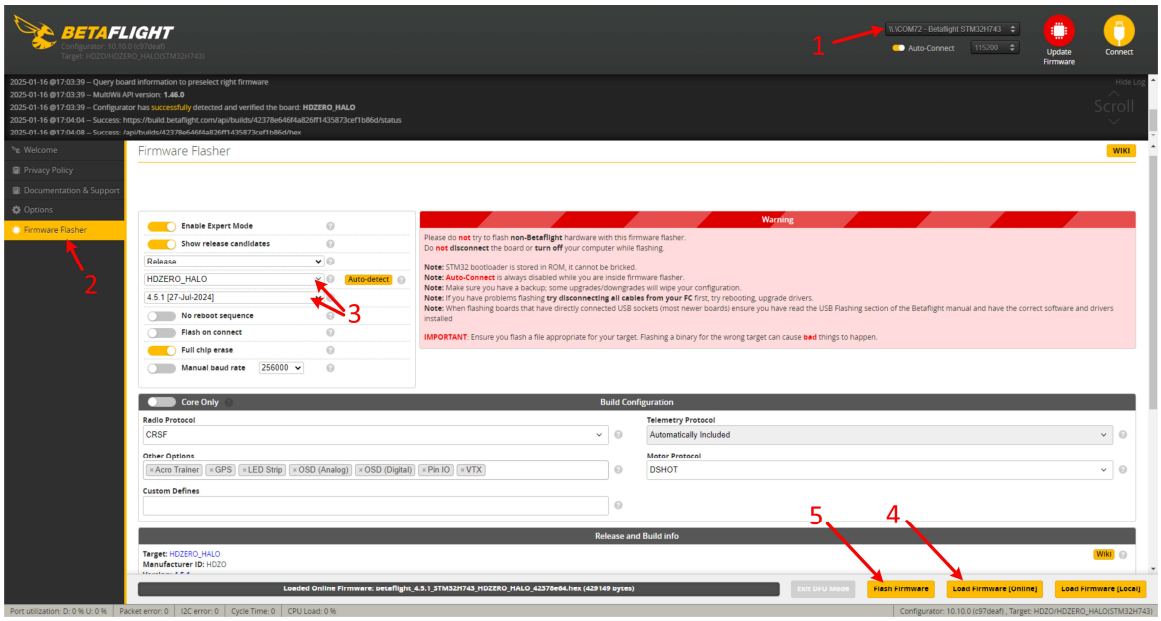
ELRS antennas mount with included strains, one on top plate and one on arm.



Firmware

1. Flash Betaflight firmware

- Download and install the Betaflight Configurator.
- Launch the Betaflight Configurator
- To flash firmware:



1) Select the target port
2) Click "Update Firmware" to enter Firmware Flasher tab
3) Select target "HAZERO_HALO" and version, The factory version is 4.5.1[27-Jun-2024]
4) Click "Load Firmware [Online] " to download the firmware
5) Click "Flash Firmware" to Flash the Flight controller

- DFU flash:

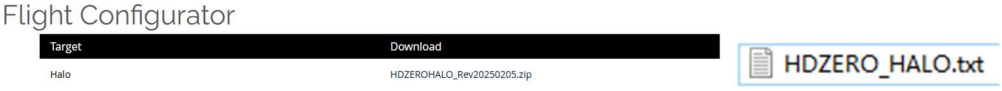
If you have lost communication with your board follow these steps to restore communication:

1) Power off HALO
2) Enable 'No reboot sequence', enable 'Full chip erase'
3) Hold FC BOOT button and Power on via USB-C into PC, then release BOOT button
4) Install all STM32 drivers and Zadig if required (see USB Flashing section of Betaflight manual)
5) Close Betaflight configurator, Restart Betaflight configurator
6) Click "Update Firmware" to enter Firmware Flasher tab
7) Select target " HAZERO_HALO " and version, The factory version is 4.5.1[27-Jun-2024]
8) Click "Load Firmware [Online] " to download the firmware
9) Click "Flash Firmware" to Flash the Flight controller

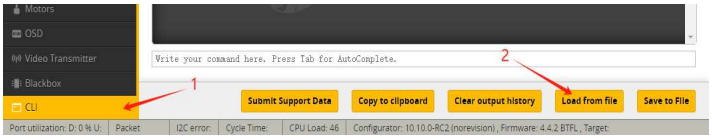
2. Execute CLI

- HDZero HALO online firmware already contains the required CLI, predefined cli are available if needed by following these steps:

  Download the file from Flight Configurator tab at https://www.hd-zero.com/document, and unzip HDZEROHALO_RevXYZ.zip into a temporary directory, i.e. c:\123

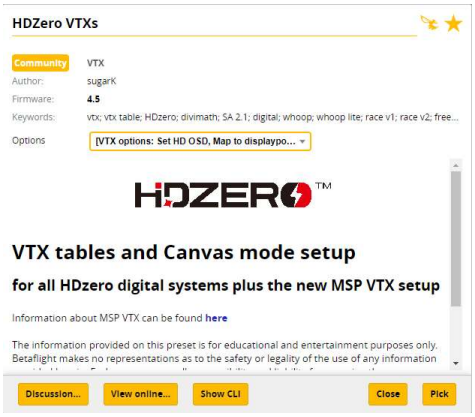


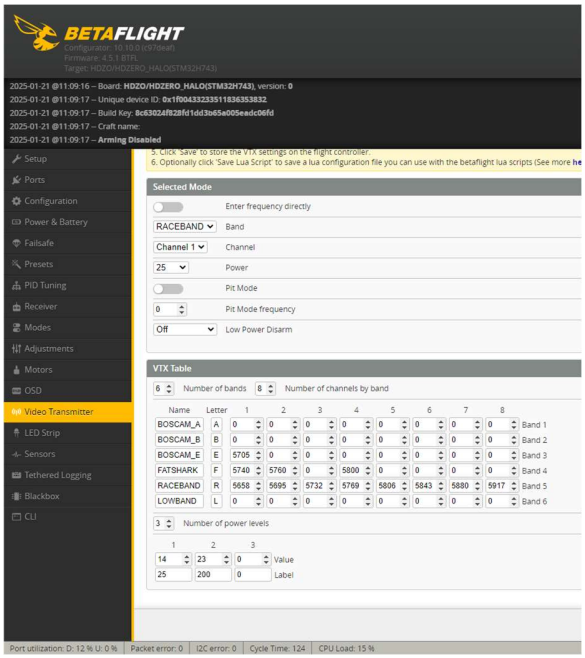
  1) Switch to Betaflight Configurator CLI tab
  2) Click “Load from file”, and select file c:\123\ HDZERO_HALO.txt for HDZero HALO
  3) Click “Execute”



- VTX table is not included in the HDZero HALO online firmware, but it can be added in several ways:

  1) When you use HDZero VTX with HDZero HALO, the VTX will provide this over MSP, and VTX firmware needs to be version 1.7.0 or newer, or
  2) The CLI file HDZERO_HALO.txt provides, or
  3) Use Betaflight Configurator preset, search for HDZero VTXs to find this preset



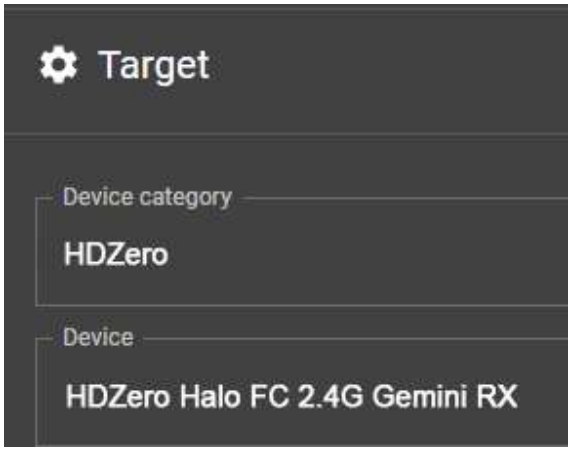


3. Flash ELRS firmware

The HDZero Halo factory ELRS firmware version is Released 3.5.1, If you need to update the firmware, please refer to the ELRS update tutorials (Typical Updating Steps), and the Device Category and Device target are as follow:

Device Category: HDZero

Device target: HDZero Halo FC 2.4G Gemini RX



Switchable 9v BEC

- Launch the Betaflight Configurator
- Switch to CLI tab
- Enter CLI:

  resource PINIO 1 E03

  set pinio_config = 1

  set pinio_box = 40

  save
- Switch to Modes tab
- Add Range for USER1 mode
- Then you can use the remote control to switch 9v BEC