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

Flight ControllerCPUSTM32H743 (480MHz)GyroMPU6000 or ICM42688BEC outputDC SV/4ADC 9V/3ADC 4.SV/0.5ABlack Box16MB Flash memory12C PadsYesUART PadsTX2/RX2, TX7/RX7, TX8/RX8ESC TelemetryRX4VTX MSP UARTTX5/RX5DJI HDLRX3Buzzer PadsYesLED StripParallel or SerialUSBType-CAnalog OSDNoFC FirmwareBetaflight: HDZERO_HALOELRS ReceiverChip SetChip SetESP32 + 2x SX1280FC UARTTX1/RX1Gemini RXYesRF Frequency2.4GHzMax TX RF Power10mWAntenna Interface2xU.FLELRS FirmwareHDZero Halo FC 2.4G Gemini RXDimensionsPower SupplyS5 ~ 8SSizeVeight5.6g	Model	HDZero Halo Flight Controller
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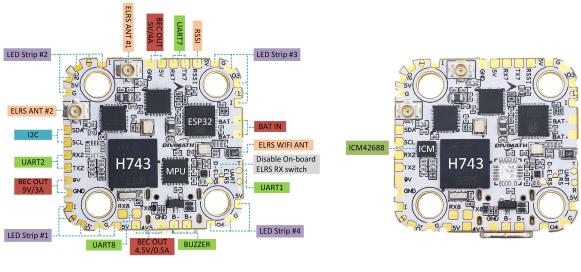
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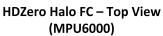
- 1x HDZero Halo FC
- 5x Rubber Grommet(6.6mm)
- 5x Rubber Grommet(8.0mm)
- 1x ELRS T-sharp short antenna (40mm)
- 1x ELRS T-sharp long antenna (90mm)
- 2x ELRS Antenna Strain
- 1x ESC Cable (8-pin SH1.0, 30mm)
- 1x 8-pin SH1.0 connector



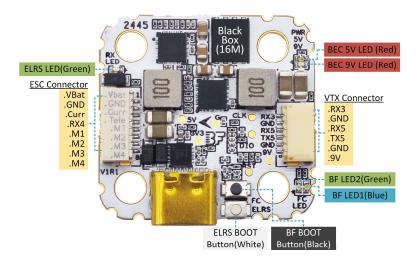


Diagram





HDZero Halo FC – Top View (ICM42688)

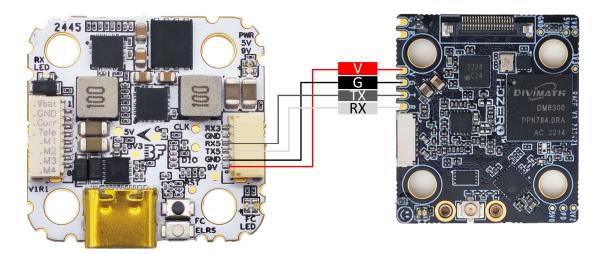


HDZero Halo FC – Bottom View



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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.

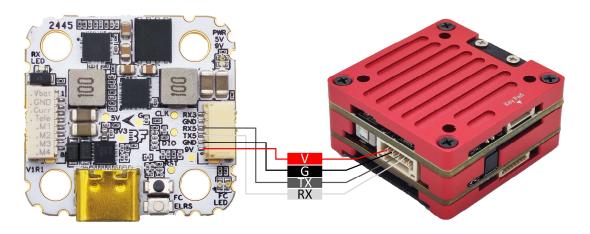


The previous batches of VTX-R3 (after re-pinning)

HDZero Freestyle V2 VTX Wiring



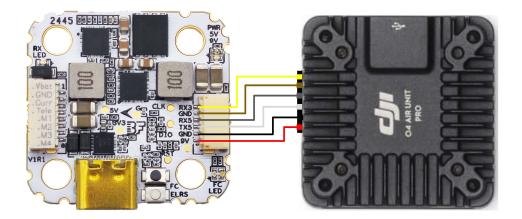
The newest batch of HDZero VTX-R3



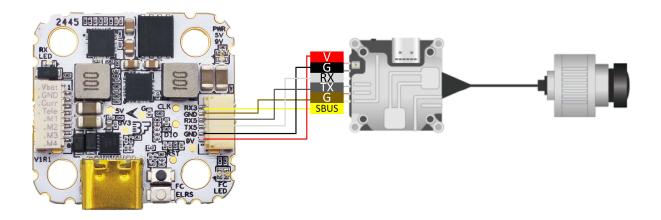




DJI O3/O4 Wiring

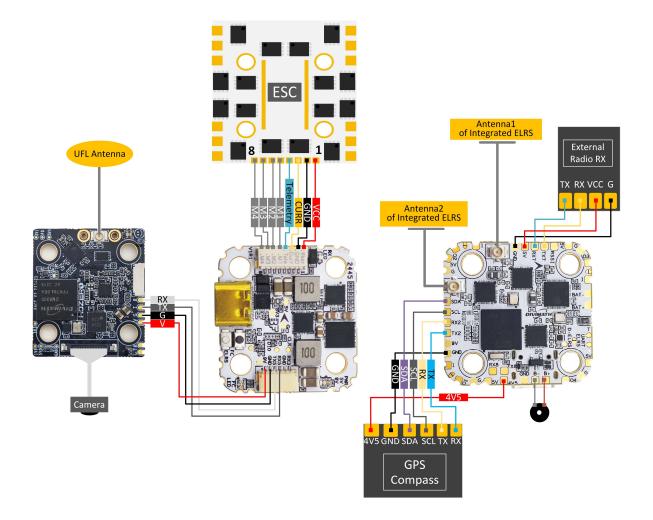


DJI VISTA Wiring





Peripheral Wiring



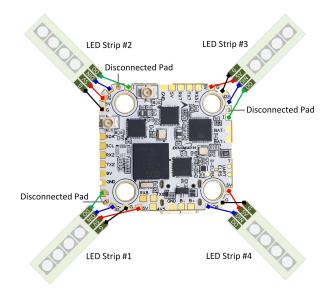


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Shorted Pad (Default) Shorted Pad (Default) Shorted Pad (Default)

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

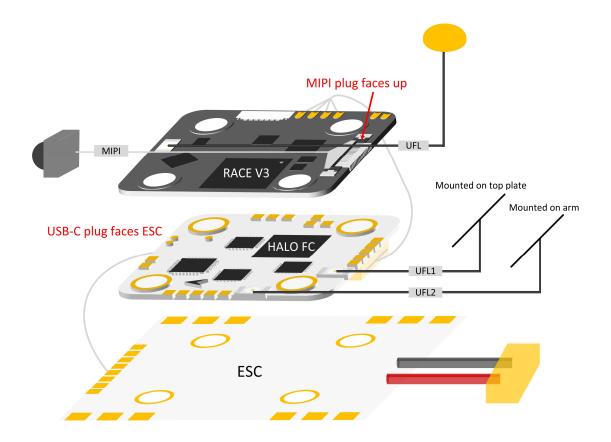
LED Strip Wiring (Individually, addressable LED strips)







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 <u>Betaflight Configurator</u>.
 - Launch the Betaflight Configurator
 - To flash firmware:

BETAFL Configurator: 10.10. Target: HDZO/HDZE	IGHT 0 (6978-641) R0 JALOISTAR2317-83)	Auto-Connect 115200 🗢 Upp	date tware									
2025-01-16 @17:03:39 - MultiWii Al 2025-01-16 @17:03:39 - Configurat 2025-01-16 @17:04:04 - Success: h	ved Information to preselect right firmware 9 version : 14.8 J or has successfully detected and verified the board: HDZERO JHALO trps://builds/2378e64f448L26fH1455f73cef1b66dns privindes/2378cef4data3ardH14387f2156f3dns		Hide Log									
∿e Welcome	Firmware Flasher		WIKI ^									
Privacy Policy												
Documentation & Support												
Options		Warning										
Firmware Flasher	Enable Expert Mode	Please do not try to flash non-Betaflight hardware with this firmware flasher.										
1	Show release candidates	Do not disconnect the board or turn off your computer while flashing.										
` `	HDZERO HALO	Note: STM32 bootloader is stored in ROM, it cannot be bricked. Note: Auto-Connect is always disabled while you are inside firmware flasher.										
2	4.5.1 [27-Jul-2024]	Note: Make sure you have a backup; some upgrades/downgrades will wipe your configuration. Note: If you have problems flashing try disconnecting all cables from your FC first, try rebooting, upgrade drivers.										
	No reboot sequence	Note: When flashing boards that have directly connected USB sockets (most newer boards) ensure you have read the USB Flashing section of the Betaflight manual and have the correct softs installed	ware and drivers									
	Flash on connect	IMPORTANT: Ensure you flash a file appropriate for your target. Flashing a binary for the wrong target can cause bad things to happen.										
	Full chip erase 💿											
	Manual baud rate 256000 V											
	Core Only 💿	Build Configuration										
	Radio Protocol	Telemetry Protocol										
	CRSF	✓ Ø Automatically Included	¥ (i)									
	Other Options ×Acro Trainer ×GPS ×LED Strip ×OSD (Analog) ×OSD (Digital)	Notor Protocol DSHOT DSHOT	v @									
		IN DIROL DIROL										
	Custom Defines	0										
		5_ 4										
		Release and Build info	nd Build info									
	Target: HDZERO_HALO Manufacturer ID: HDZO		Wiki 😡									
	Menden AFA	<u>¥</u> ,										
	Loaded Online Firmware: betaflight_4	L3.1 3TM32H743_H0ZERO_HALO_42376e64.hex (429149 pytes) Exit DHU Mode Filesh Firmware [Online]	Load Firmware (Local)									

- 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 <u>USB Flashing</u> 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 <u>https://www.hd-zero.com/document</u>, 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"

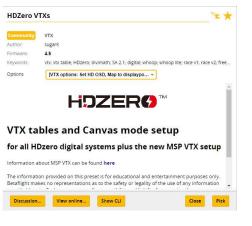
💧 Motors		CID-				
📼 OSD						
ዓø Video Transmitter	Vrite your command here.	Press Tab for Å	utoComplete.	2		
III: Blackbox	_1					
🗉 CU 🥓	Subm	it Support Data	Copy to clipboard	Clear output history	Load from file	Save to File
Port utilization: D: 0 % U: Packet	I2C error: Cycle Time:	CPU Load: 46	Configurator: 10.10.0-R	C2 (norevision) , Firmware: 4	4.2 BTFL , Target:	

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

 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
 The CLI file HDZERO_HALO.txt provides, or

3) Use Betaflight Configurator preset, search for HDZero VTXs to find this preset

BETAI Configurator 10 Firmware 45.1																			
2025-01-21 @11:09:16 - Board 2025-01-21 @11:09:17 - Uniqu 2025-01-21 @11:09:17 - Build M 2025-01-21 @11:09:17 - Craft r 2025-01-21 @11:09:17 - Armin	e device ID: 0x1f004332 (ey: 8c63024f828fd1dd) Jame: g Disabled	33511 1065a	836353 005ead	1832 1c06	fd														
	5. Click 'Save' to 6. Optionally cli										ile you	can	use w	vith	the be	tafili	zht lua	e scr	ipts (See more l
	Selected Mod	e																	
			Enter fr	equ	ency d	lired	tly												
	RACEBAND		Band																
	Channel 1 ~	1	Channe	el :															
	25 ~		Power																
		- 3	Pit Mod	le															
	0 \$	C.	Pit Mod	le fr	equen	cy													
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	VTX Table																		
	6 🗘 Numb	er of I	bands	8	0	lum	nber of	cha	innels t	y b	and								
00 Video Transmitter	Name	Letter	1		2		3		4		5		6		7		8		
🗍 LED Strip	BOSCAM_A	A	0	\$	0	\$	0		0		0	\$		\$		-	0		Band 1
	BOSCAM_B BOSCAM E	B	0 5705	-	0	•	0	\$	0	•	0	\$	0	\$	0	-	0		Band 2 Band 3
	FATSHARK	F	5740		5760	*	0	*		*	0	*	0	•	0	•	0		Band 4
	RACEBAND	R	5658	\$	5695	\$	5732			\$	5806	\$	5843		5880	\$	5917		Band 5
	LOWBAND	L	0	\$	0	\$	0	\$	0	\$	0	\$	0	\$	0	\$	0	\$	Band 6
	3 C Numb	er of p	oower I	evel	s														
	1	2		3															
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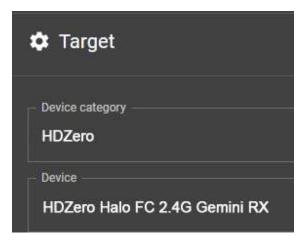


3. Flash ELRS firmware

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 (<u>Typical Updating Steps</u>), 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

