



# ALIENWHOOP ZERO

PILOT'S HANDBOOK  
ALIENWHOOP TEAM

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## INTRO

Welcome to AlienWhoop and congratulations on your purchase! Your AlienWhoop flight controller was built by pilots for pilots. The AlienWhoop team loves to fly and has spent many hours reviewing and refining the design of the ZERO to provide a top performing flight controller.

The AlienWhoop team is here to support you and can be reached in the following ways

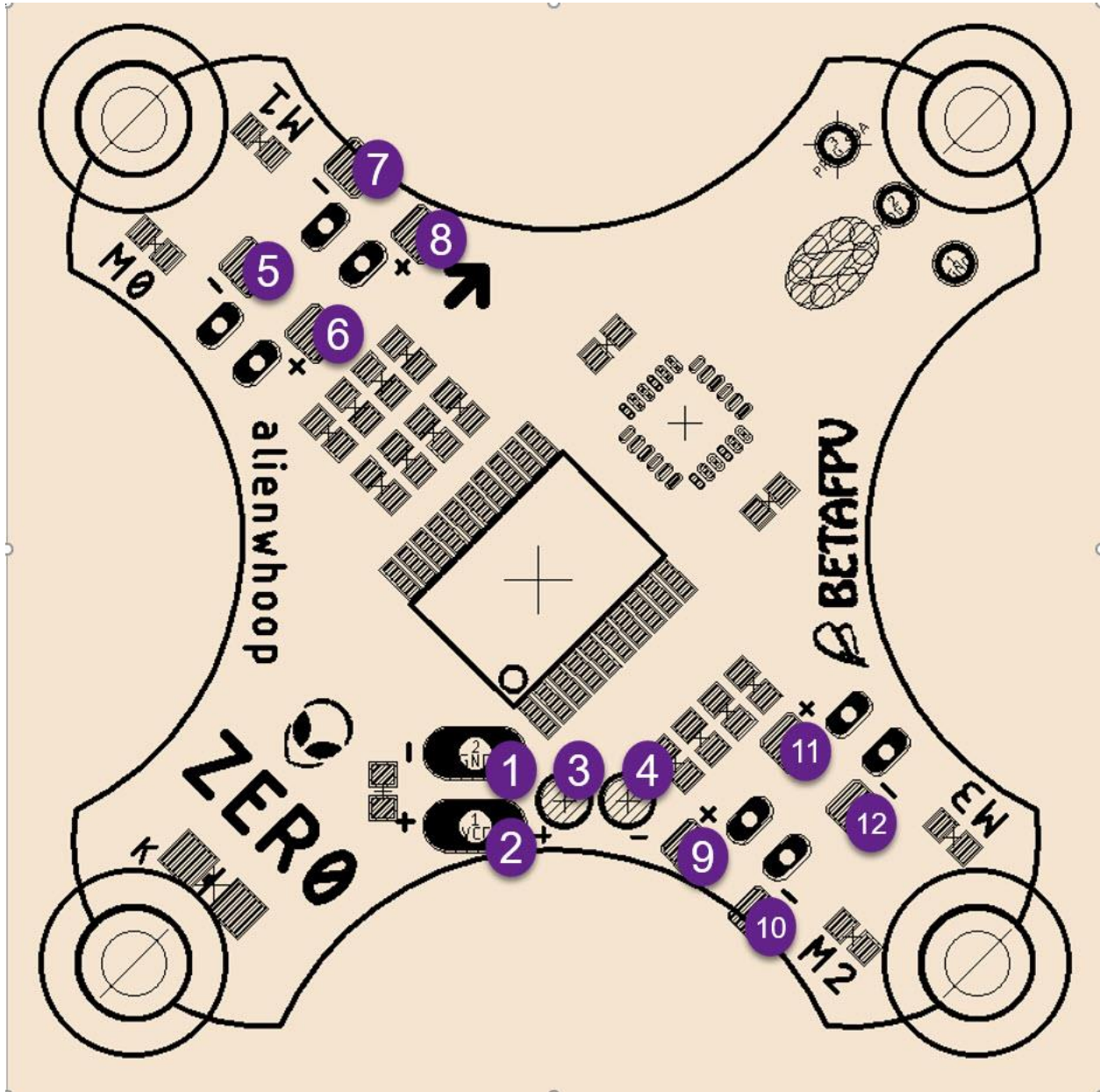
- Discord – <http://alienwhoop.us/discord> (best way to reach us)
- Facebook – <http://fb.me/alienwhoop>
- Email – [support@alienwhoop.us](mailto:support@alienwhoop.us)
- Store - <https://shop.alienwhoop.us/>

## FEATURES

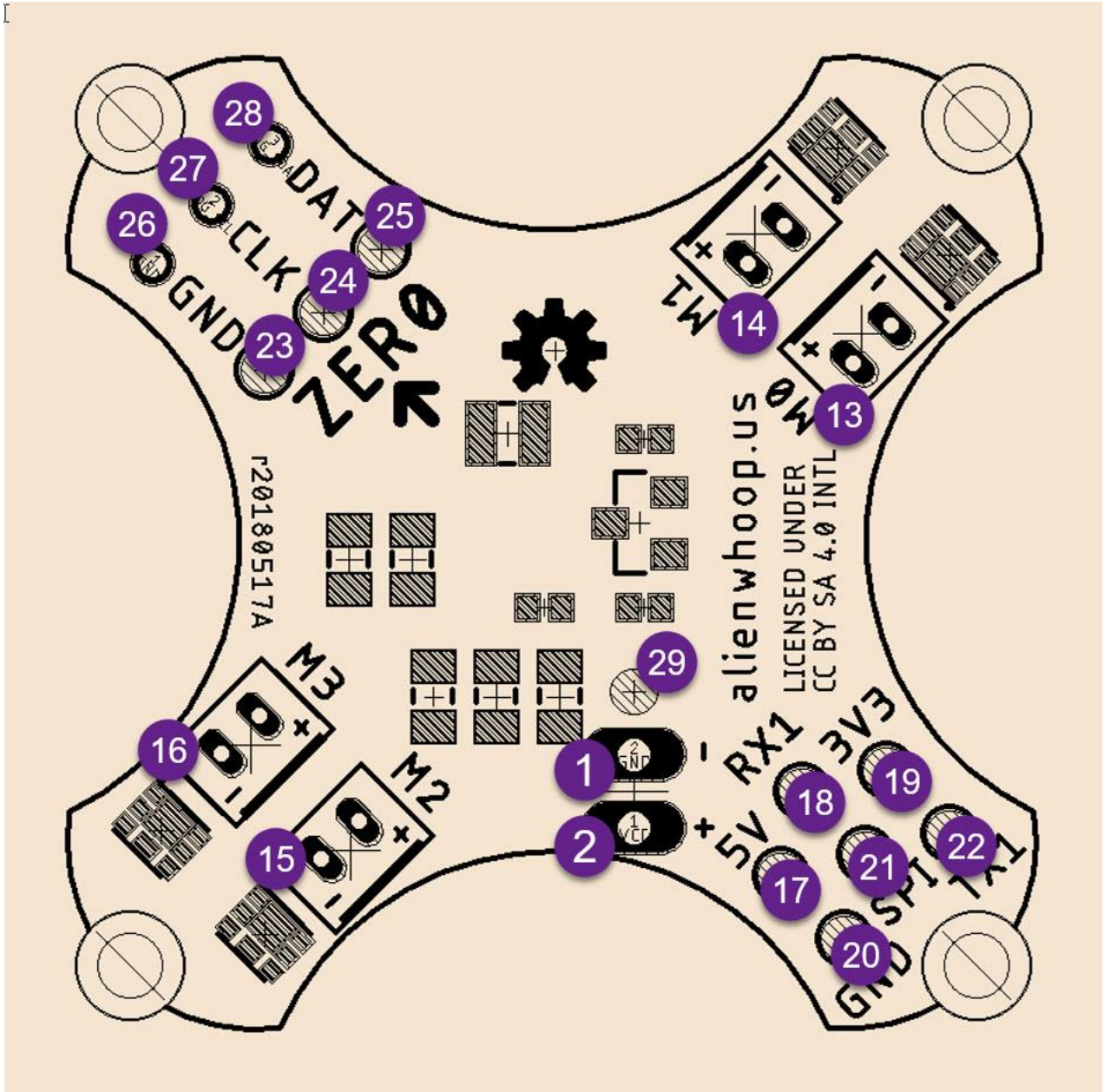
AlienWhoop ZERO blends the power and performance of AlienWhoop hardware running NotFastEnuf (NFE) tuned Silverware.

- F0 Processor
  - High-performance ST Microelectronics STM32F030F4P ARM® 32-bit Cortex®-M0 CPU, frequency up to 48 MHz (can be overclocked to 64MHz)
- 8kHz Gyro
  - Invensense MPU-6881 Six-Axis (Gyro + Accelerometer) precision temperature compensating MotionTracking™ Device
- Pre-Tuned Firmware
  - Factory loaded with NFE (NotFastEnuf) Silverware tuned for ultimate whoop performance.
- Designed to provide maximum power for both freestyle and racing
  - High amp, Low on-resistance MOSFETs
  - Supports brushed motors 6mm up to 10mm coreless
- High Quality PCB
  - 0.8mm 2oz Copper ENIG (gold) finish purple PCBs
  - Total Weight (with pigtail) 2.66 grams
  - Supports 1S or 2S LIPO (JST 2.0 PH aka PowerWhoop connector factory installed)
  - 5V 2.25A BEC with 3.3V regulator
- Lightweight Modern Design
  - Designed by two of the top sixteen fastest pilots at the 2018 Tiny Whoop Invitational championship teamed up with NotFastEnuf and MontiFPV.

TOP



# Bottom



## TOP OF THE BOARD

Label #	Label Name	Description
1	-(Bat)	battery pad – negative wire
2	+(Bat)	battery pad – positive wire
3	+(Camera)	camera pad – positive wire
4	-(Camera)	camera pad – negative wire
5	M0	Motor 0 - negative wire
6	M0	Motor 0 – positive wire
7	M1	Motor 1 - negative wire
8	M1	Motor 1 – positive wire
9	M2	Motor 2 - positive wire
10	M2	Motor 2 – negative wire
11	M3	Motor 3 - positive wire
12	M3	Motor 3 – negative wire

## BOTTOM OF THE BOARD

Label #	Label Name	Description
13	M0	JST1.25 plug for motor 0
14	M1	JST1.25 plug for motor 1
15	M2	JST1.25 plug for motor 2
16	M3	JST1.25 plug for motor 3
17	5V	5V 2.25A BEC power
18	RX1 (UART1)	Receive - UART1/SPI DAT
19	3.3V	3.3V power
20	GND	Ground
21	SPI	SPI CSn
22	TX1 (UART1)	Transmit - UART1/SPI CLK
23	GND	Ground
24	CLK	Prog. SCL/GPIO A14
25	DAT	Prog. DAT/GPIO A13
26	GND (Hole)	Factory Programming Header
27	CLK (Hole)	Factory Programming Header
28	DAT (Hole)	Factory Programming Header
29	BOOT	DFU Override (bridge to 3.3V)



## FUNCTIONAL QUICK REFERENCE

The table below provides suggested uses for the PADs and UART on the AlienWhoop ZERO flight controller.

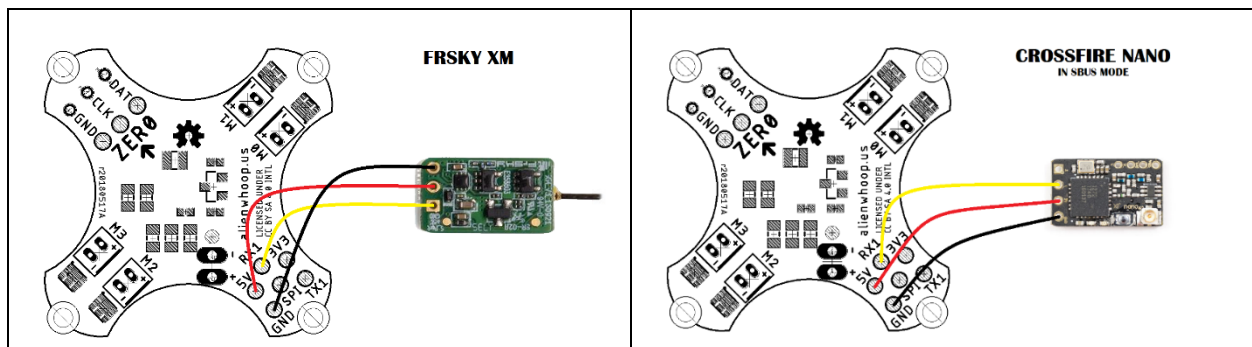
Function	UART	PAD
Battery pigtail – negative wire	-	1
Battery pigtail – positive wire	-	2
Camera – positive wire (1S LIPO only!)	-	3
Camera – negative wire (1S LIPO only!)	-	4
SBUS - serial based receiver (inverted signal only)	1	17, 18 and 20
Crossfire (SBUS only, no CRSF)	1	17, 18 and 20
DSMX	1	17,18,19,20 and 22
SPI – Bayang Protocol	1	18,19, 20, 21 and 22

**Important Note:** The ZERO is flashed at the factory with either SBUS or DSMX configured firmware. Other supported protocols will require an update to the firmware.

## Receiver Wiring

### SBUS Receiver – Factory Default

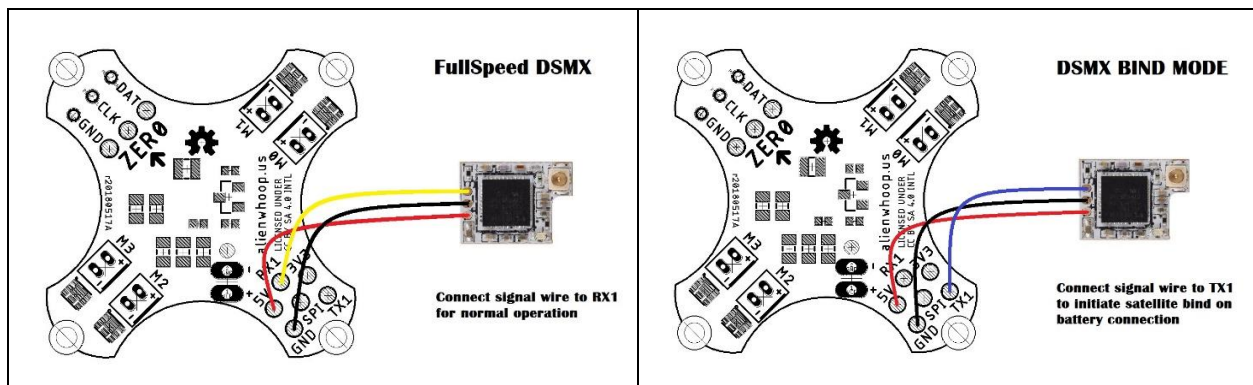
FC PAD	FC Pad #	Description
5V	17	-
GND	20	-
RX1	18	UART1



## DSMX Receiver – Factory Default

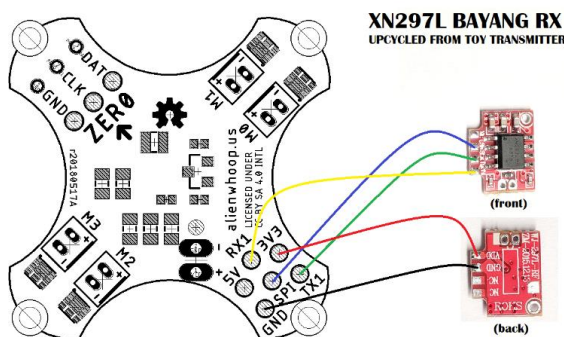
IMPORTANT – Some DSMX receivers require 5V power however, most DSMX receivers will tolerate up to 3.3V maximum. Follow receiver manufacturer guidelines for correct voltage, use either pad 17 or 19 as described below.

FC PAD	FC Pad #	Description
3.3V	19	3.3V most DSMX
5V	17	5V if supported
GND	20	GND
TX1	22	Used for BIND Only
RX1	18	Used for normal operation



## Bayang XN297L SPI Receiver (Firmware Configuration Required)

FC PAD	FC Pad #	Description
3.3V	19	-
GND	20	-
TX1	22	SPI CLK
RX1	18	SPI DAT
SPI	21	SPI CSn



There are many ways to build a whoop. The ZERO flight controller is engineered to power 6mm – 10mm brushed motors. The AlienWhoop team has put together the following build guide to help pilots build a standard 6mm whoop.

### Parts Needed for a 6mm Build

- ✓ (1) Frame
  - Whoop frame for 6mm motors
- ✓ (4) Motors
  - 6mm brushed motors
- ✓ (4) Propellers
  - 31mm three or four blade props
- ✓ (1) AIO Camera (Camera and VTX Combo)
- ✓ (1) Receiver
  - Choose a supported receiver which best fits your needs
- ✓ (1) AlienWhoop ZERO Flight Controller (includes screws and grommets)
- ✓ Optional
  - Canopy

### Build Video

Team Captain: Brian "VELCROFPV" Pichardo's – AlienWhoop ZERO Build

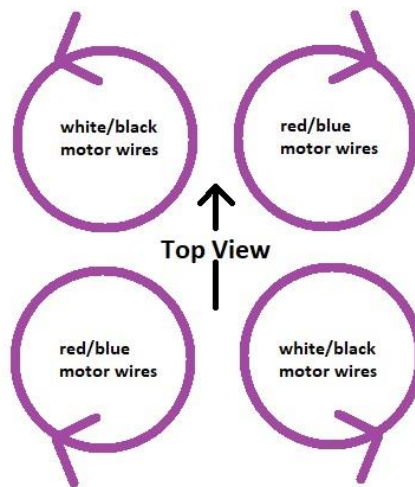


AlienWhoop ZERO Build

## Important Items to Consider

### ➤ Propeller Rotation

- **\*IMPORTANT\*** The default propeller rotation for the ZERO is “props out”. The AlienWhoop team has found props out rotation provides better flight characteristics.
- When you position your motors and mount your props, make sure you place them according to the diagram below.



### ➤ Noisy Video or 2S LIPO Usage

- **Noisy Video** - Certain AIO cameras have been known to suffer from horizontal banding when connected directly to the battery of brushed quadcopters. Most AIO cameras are properly designed to prevent this from occurring.
- **Connect the AIO to the 5V (pad 17) and GND (pad 20). Do not exceed 2.25A on pad 17.**
- **2S LIPO Usage** – most micro sized AIO cameras do not support a direct connection to 2S LIPO. Do not smoke your camera!

SBUS RECEIVER

In your transmitter, RC channels 1 through 4 must be mapped in the correct order AETR. RC channels 5 through 9 provide auxiliary control of flight modes and features. The ZERO flight controller is preprogrammed with the features listed below and requires a corresponding transmitter configuration. Follow the QuickStart steps below to get in the air.

**Remove your props before configuring your transmitter**

**SBUS Auxiliary Control Mappings**

SBUS Mappings	5	6	7	8	9
disarm					
arm					
acromode					
levelmode					
racemode_angle					
racemode_horizon					
horizonmode					
"juicy" stick mode					
"full bronx" stick mode					

**Key**

AUX Low	
AUX High	

**SBUS Quick Start Steps**

- 1) Create a new model in your transmitter.
- 2) Critical - Ensure the new model is created with the following channel order – AETR.
- 3) Add a toggle switch for disarm/arm on channel five.
- 4) Add a toggle switch for level mode on channel six.
- 5) All other flight modes are optional.

**Pro-Tip**

- FrSKY XM Receivers – If you encounter an inability to use LevelMode or RaceMode Angle while using an XM receiver, you may need to flash the XM receiver with the latest XM firmware which moves RSSI from channel 8 to channel 16.

In your transmitter, RC channels 1 through 4 must be mapped in the correct order TAER. RC channels 5 through 10 provide auxiliary control of flight modes and features. The ZERO DSMX flight controller is preprogrammed to match the standard auxiliary order of a DSMX compatible transmitter. Follow the QuickStart steps below to get in the air.

**Remove your props before configuring your transmitter**

**DSMX Auxiliary Control Mappings**

DSMX Mappings	5	6	7	8	9	10
disarm						
arm						
acromode						
levelmode						
racemode_angle						
racemode_horizon						
horizonmode						
"juicy" stick mode						
"full bronx" stick mode						
LED off						
LED on						

**Key**

AUX Low	
AUX High	

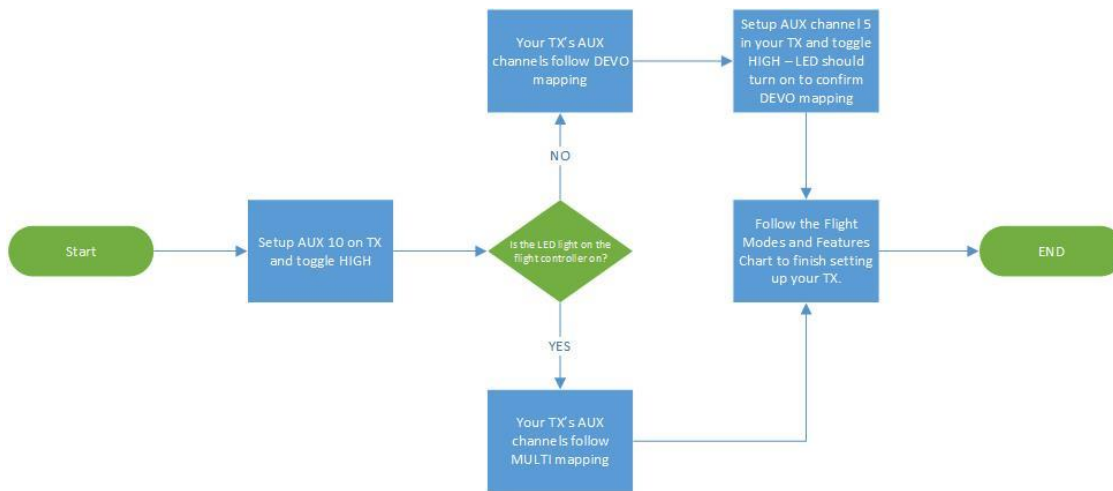
**DSMX Quick Start Steps**

- 1) Create a new model in your transmitter.
- 2) Critical - Ensure the new model is created with the following channel order – TAER.
- 3) Extend channel endpoints to 150% in your DSMX transmitter.
- 4) Add a toggle switch for disarm/arm on channel five.
- 5) Add a toggle switch for level mode on channel six.
- 6) All other flight modes are optional.

In your transmitter, RC channels 1 through 4 must be mapped in the correct order AETR. RC channels 5 through 10 provide auxiliary control of flight modes and features. The ZERO flight controller is preprogrammed to match the standard auxiliary order of an OpenTX transmitter. The default auxiliary channel mapping may differ on other transmitters such as those running DeviationTX firmware. Follow the QuickStart flowchart to determine your transmitter mapping order.

**Remove your props before configuring your transmitter**

**SPI Quick Start Flow Chart**



**SPI Auxiliary Control Mappings**

MULTI Mappings	5	6	7	8	9	10
DEVO Mappings	6	10	7	8	9	5
disarm						
arm						
acromode						
levelmode						
racemode_angle						
racemode_horizon						
horizonmode						
"juicy" stick mode						
"full bronx" stick mode						
LED off						
LED on						

**Key**

AUX Low	
AUX High	

- 1) **Disarm:** the motors are disabled and will not be allowed to run.
- 2) **Arm:** the motors and controls are enabled, and props will be spinning at an idle speed.
- 3) **Acromode:** a flight mode without auto-leveling, and stick deflection corresponds to a rotational rate around the input axis.
- 4) **Levelmode:** a flight mode in which the maximum tilt angle is limited to 65 degrees.
- 5) **Horizonmode:** a flight mode with leveling near center stick but the ability to roll or flip at full stick deflection.
- 6) **Racemode Angle:** a flight mode with levelmode behavior on roll axis and acromode behavior on pitch axis.
- 7) **Racemode Horizon:** a flight mode with horizonmode behavior on roll axis and acromode behavior on pitch axis.
- 8) **"Juicy" Stick Mode:** is a PID controller modifier which can be switched in-flight and uses a D term calculation based on "measurement". The result is a soft or "juicy" stick feel.
- 9) **"Full Bronx" Mode:** is a PID controller modifier which can be switched in-flight and uses a D term calculation based on "error". The result is an accelerated stick response which translates into a sharp and aggressive feel.



*Version 1.0 (Genesis) and 1.1 (Berzerker) ZERO Firmware – MODE 2*

- 1) **Calibrate Accelerometer:** Place your whoop on a flat, level surface. Using your right stick, the stick gesture down, down, down will calibrate the flight controller accelerometer.
- 2) **Stick Travel Check:** This feature has been added to give the ability to make sure your sticks are reaching 100% throws in the software. Using your right stick, the gesture RIGHT-RIGHT-DOWN will enter a mode where the throttle is inactive, and the LED will rapid blink when you move the sticks to 100% throws. If you do not see a rapid LED blink at stick extents, scale up your throws in your transmitter until you do. The gesture LEFT-LEFT-DOWN will exit this mode.

*Version 1.1 ZERO (Berzerker) Firmware – MODE 2*

- 3) **Props-out/Props-in:** Using your right stick, the gesture DOWN-UP-DOWN will change the default PROPS OUT configuration to PROPS IN – the flight controller LED will blink once to confirm the successful stick gesture. The setting must be saved to retain it permanently with the stick gesture, DOWN-DOWN-DOWN. The flight controller LED will blink multiple times to confirm the save. Repeating these steps will cause the flight controller LED to blink twice and restore the PROPS OUT setting.  
DO NOT FORGET TO MOVE YOUR MOTORS AND PROPS if you change from the default (props out).
- 4) **Low Voltage Cutoff/Forced Landing:** The ZERO is equipped with an LVC feature that can be activated to save batteries from over discharging. Using your right stick, the gesture LEFT-LEFT-LEFT will turn on the forced landing low voltage cutoff (LVC) feature that will reduce throttle when your estimated pack voltage reaches 3.3 volts or your raw unadjusted pack voltage sags to 2.7 volts the flight controller LED will blink once to confirm the successful stick gesture. The setting must be saved to retain it permanently with the stick gesture, DOWN-DOWN-DOWN. The flight controller LED will blink multiple times to confirm the save. Repeating these steps will cause the flight controller LED to blink twice and disable the LVC setting.
- 5) **Motor Filtering Adjustment:** The ZERO is equipped with a feature that changes the filtering applied to the motor outputs. The default setting is a more aggressive filter that should fly well on all whoop motor/prop combos. Entering the RIGHT-RIGHT-RIGHT stick gesture will blink the FC once to confirm and apply weaker filtering to motor outputs. The setting must be saved to retain it permanently with the stick gesture, DOWN-DOWN-DOWN. The flight controller LED will blink multiple times to confirm the save. 7mm motors or highly abused or off-balance props have been reported to fly better on the default heavy filtering. Repeating these steps will blink twice to restore heavy filtering.

## SAFETY FEATURES THAT SHUT DOWN MOTORS ON THE ZERO

- 1) Powering up while armed will cause the LED to blink rapidly and the FC will enter a failsafe. To correct disarm.
- 2) Arming with throttle above 10% will cause the LED to blink rapidly and the FC will enter a failsafe. To correct lower throttle.
- 3) If using a radio protocol other than the expected protocol the LED will blink rapidly and not arm. To correct, ensure that matching receiver output is wired as expected.
- 4) For SBUS firmware - If channels 1 through 4 are mapped in an order other than AETR, the FC will enter failsafe and the LED will blink rapidly.
- 5) For DSMX firmware - If channels 1 through 4 are mapped in an order other than TAER, the FC will enter failsafe and the LED will blink rapidly.

## FIRMWARE AND SETTINGS

The AlienWhoop ZERO flight controller is flashed at the factory with NFE Silverware and has been put through the paces by our team. Your ZERO has tuned PIDs and is ready to fly!

AlienWhoop does not officially support reflashing of Silverware to the ZERO flight controller. However, we do understand that this is a common practice and have provided easily accessible programming pins should you choose to explore that option on your own. We have carefully preconfigured the settings, rates, and tune of the ZERO to be race ready and freestyle ready for any whoop pilot. The ZERO is ready to rip out of the box and does not require reprogramming. Should you choose to become involved in the development side of Silverware to manipulate the way your ZERO operates, we encourage you to reach out to our team pilots who can guide you to Silverware social media communities. Many of our team pilots are active participants.

The original firmware version are available as both source code and pre-compiled hex files on the release page of the NotFastEnuf Silverware fork on GitHub [https://github.com/NotFastEnuf/NFE\\_Silverware/releases](https://github.com/NotFastEnuf/NFE_Silverware/releases).

## FIRMWARE VERSIONS

- V1.0 – *“Genesis”*
  - LED light is out during normal operation for version identification.
- V1.1 - *“Berzerker”*
  - LED light is on during normal operation for version identification.
  - Additional stick gestures have been added
  - DSMX support added

## SHOUTOUTS

*"Everything should be made as simple as possible, but not simpler" - Einstein*

### THANK YOU

- Silver13 (creator of Silverware flight controller firmware)
- Silverware Community
- BetaFPV Team
- AlienWhoop Dev Team
  - Charlie "Brucesdad" Stevenson
  - Travis "NotFastEnuf" Schrock
  - Brian "VelcroFPV" Pichardo
  - Michael "MontiFPV" Montiverdi
- Jesse Perkins (Mr. Tiny Whoop)
- Lance (old school Alienwii and Alienflight)
  - AlienWhoop ZERO is inspired by the [alienflight f3 quad brushed v1](#)
- Joshua Bardwell (inspiration for the pilot guide)

AlienWhoop Pilot's Guide created by the AlienWhoop Dev team. Please direct questions or comments to the AlienWhoop Discord.

AlienWhoop is here to grow the whoop community for racers and freestylers alike. We want your feedback and we want to see lots of videos posted with #alienwhoop.

Have fun and let it rip!

Follow us on:

- Facebook - <http://fb.me/alienwhoop>
- Instagram - @alienwhoop
- Twitter - @alienwhoop

## PILOT GUIDE – REVISIONS

Version	Date	Changes
1.0	07/10/2018	Initial Release of Pilot Guide
1.1	07/14/2018	Update to Flight Modes and Features
1.2	08/03/2018	Update to Receivers – added DSMX receivers