



ALIENWHOOP V2.1

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 V2.1 to provide a top performing flight controller.

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

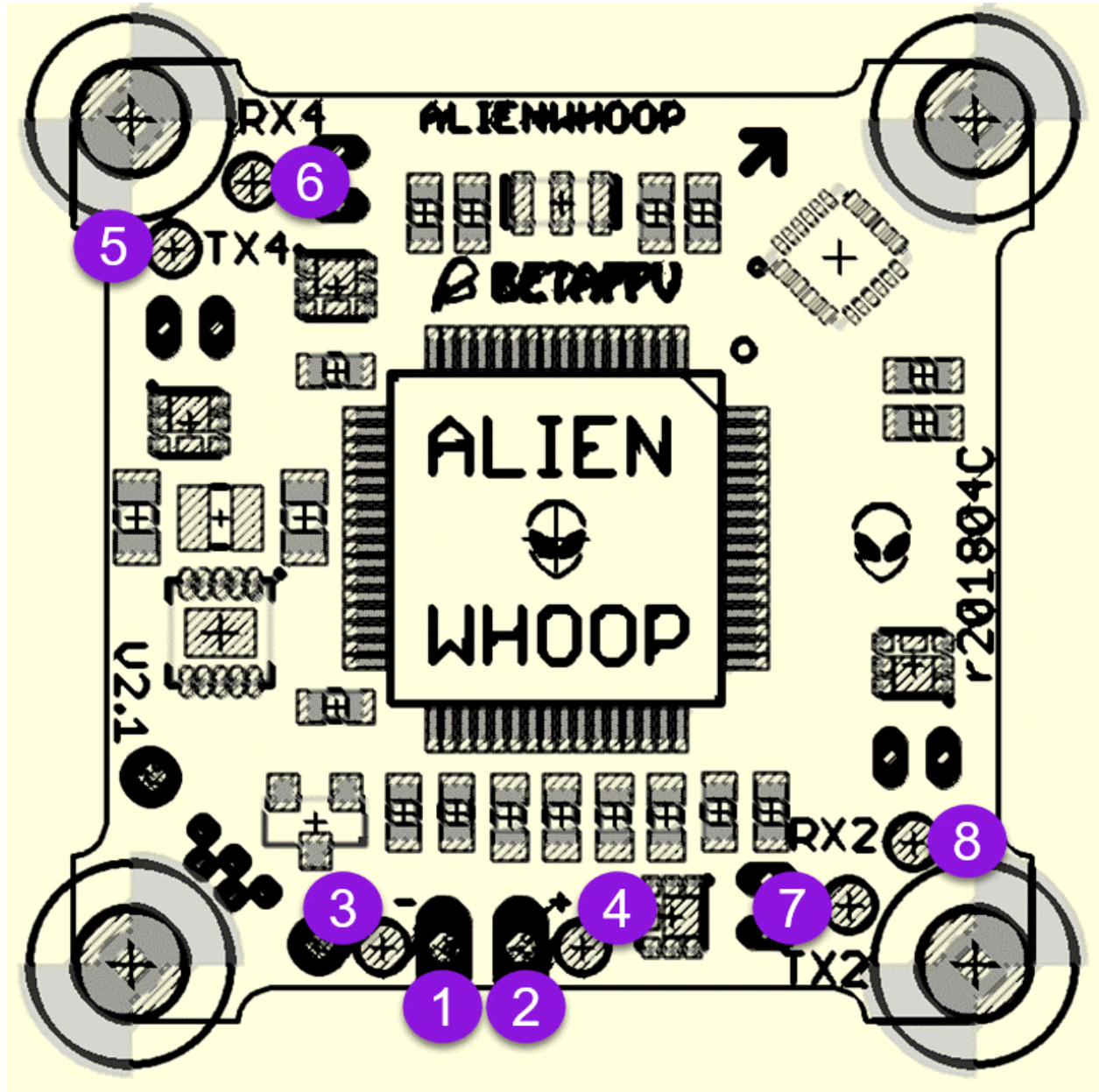
- Discord – <http://alienwhoop.us/discord> (best way to reach us)
- Facebook – <http://fb.me/alienwhoop>
- Email – support@alienwhoop.us
- Store - <https://shop.alienwhoop.us/>

FEATURES

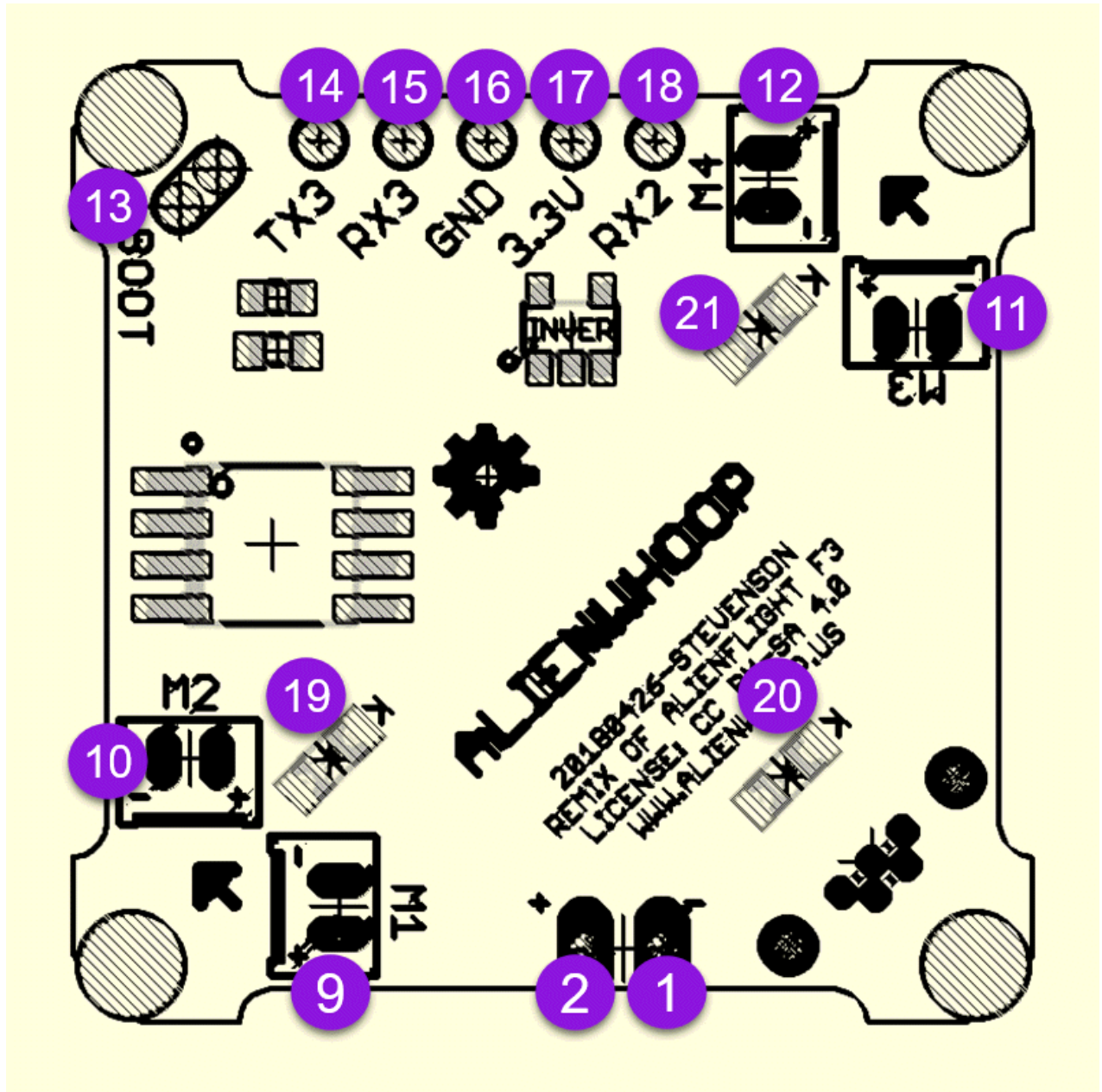
The V2.1 flight controller builds on the success of the V2.0 with the addition of an inverted UART for SBUS protocol receivers and onboard memory for Blackbox logging.

- F4 Processor
 - High-performance ST Microelectronics ARM Cortex-M4 core F4 168 MHz CPU (safely overclocked to 216MHz)
- 32kHz Gyro
 - Invensense MPU-6500 Six-Axis (Gyro + Accelerometer) low power consumption MEMS MotionTracking™ Device
- Fully Customizable Firmware
 - Factory loaded with BetaFlight and tuned for performance
 - Butterflight ready - <http://butterflight.co/>
 - (iNav under final testing)
- Designed to provide maximum power for both freestyle and racing
 - High amp, Low on-resistance MOSFETs
 - Supports brushed motors 6mm up to 10mm coreless
- Multiple UARTs for receivers and other devices (e.g. LED strip, beeper)
 - Dedicated UART with inverter for FrSky and Futaba SBUS. No receiver inverter hack required!
 - UART pads on top conveniently located for SmartAudio VTX control
 - Including two USARTs for bidirectional serial communication (selectable as UARTs in BetaFlight Configurator)
- Blackbox
 - 8MB onboard lightweight dataflash chip
 - Analyze your logs to optimize your PIDs and filters
- High Quality PCB
 - 0.8mm 2oz Copper ENIG (gold) finish purple PCBs
 - Total Weight with pigtail 3.75g

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 – negative wire
4	+(Camera)	camera pad – positive wire
5	TX4 (UART4)	(uninverted) transmit pad for UART4
6	RX4 (UART4)	(uninverted) receive pad for UART4
7	TX2 (UART2)	(uninverted) transmit pad for UART2
8	RX2 (UART2)	(uninverted) receive pad for UART2

BOTTOM OF THE BOARD

Label #	Label Name	Description
1	-(Bat)	battery pad – negative wire
2	+(Bat)	battery pad – positive wire
9	M1	JST1.25 plug for motor 1
10	M2	JST1.25 plug for motor 2
11	M3	JST1.25 plug for motor 3
12	M4	JST1.25 plug for motor 4
13	BOOT	allow access to DFU mode
14	TX3 (UART3)	(uninverted) transmit pad for UART3
15	RX3 (UART3)	(uninverted) receive pad for UART3
16	GND	Ground pad
17	3.3v	3.3-volt pad for powering a 3.3-volt receiver
18	RX2 (UART2)	(inverted) receive pad for UART2
19	K	onboard LED
20	K	onboard LED
21	K	onboard LED

FUNCTIONAL QUICK REFERENCE

The table below provides suggested uses for the PADS and UARTs on the AlienWhoop V2.1 flight controller.

Function	UART	PAD
Battery pigtail – negative wire	-	1
Battery pigtail – positive wire	-	2
Camera – negative wire	-	3
Camera – positive wire	-	4
SBUS (serial based) receiver (inverted signal only)	2	18
DSM2, DSMX, or iBus receiver	3	15
Crossfire receiver	2	7 and 8 (not 18)
	3	14 and 15
	4	5 and 6

Pro-Tip

- UART2 has three pads assigned to it for specific usage scenarios. RX2 is located on both the top of the board and the bottom of the board.
 - RX2 (pad 7) and TX2 (pad 8) on the top of the board (uninverted signal). This should be used for items which require an uninverted signal.
 - RX2 (pad 18) on the bottom of the board has an onboard inverter for SBUS signal.
 - Only one RX2 pad can be used at any time!
 - If RX2 (pad 18) on the bottom of the board is used for SBUS signal, do not also use RX2 (pad 8).
 - If RX2 (pad 8) on the top of the board, do not also use RX2 (pad 18) on the bottom of the board.

PRE-BUILD SUGGESTIONS

The AlienWhoop V2.1 flight controller has a flexible design and pilots can solder their AIO cameras and receivers to several different places.

PRO-TIP

- Planning out ahead of time ensures a smooth build experience.

The table below highlights possible UART and pad combinations.

Protocol	UART/PAD NAME/PAD#
SBUS (inverted signal)	UART2/RX2/Pad18
	GND/Pad16
	3.3V/Pad17
DSM2, DSMX, iBUS, F.PORT (uninverted signal)	UART3/RX3/Pad15
	GND/Pad16
	3.3V/Pad17
CRSF	UART3/TX3/Pad14
	UART3/RX3/Pad15
	GND/Pad16
	3.3V/Pad17

PRO-TIPs

- **LEDs**
 - The Four LED harness, LED Headlight, and Laser kit from Tinywhoop.com can be connected to the Bat+/Bat- pads or the Camera+/- pads.
 - If you wish to use a three wire LED strip you can solder to the Bat+/- pads, as well as any open pad such as TX4.
- **Beeper**
 - The V2.1 board can utilize an active, low power beeper. The beeper ground wire goes to any ground pad. The beeper positive wire goes to any open pad.
- **5V Power**
 - The V2.1 board does not provide 5V power.
 - We have extensively flown both FrSky and FlySky receivers on 3.3V successfully.

There are many ways to build a whoop. The V2.1 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.

We have included critical build info for all to review.

Parts Needed for a 6mm Build

- ✓ (1) Frame
 - 6mm whoop frame
- ✓ (4) Motors
 - 6mm brushed motors
- ✓ (4) Propellers
 - 31mm three or four blade props
- ✓ (1) AIO Camera (Camera and VTX Combo)
- ✓ (1) Receiver
 - Choose the receiver which best fits your needs
- ✓ (1) AlienWhoop V2.1 Flight Controller (includes screws and grommets)
- ✓ Optional
 - Canopy

Important Items to Consider

- **Propeller Rotation**
 - ***IMPORTANT*** The default propeller rotation for the V2.1 is propellers out. The AlienWhoop team has found props out rotation provides better flight characteristics.
 - When you mount your props make sure you place them in the props out fashion.
- **Telemetry**
 - The V2.1 board does not provide vBat telemetry or current sensing.

RECEIVER CONFIGURATIONS

DSM2/DSMX RECEIVERS

IMPORTANT - DSM2/DSMX receivers require special configuration in BetaFlight in order for the binding process to be successful.

- In BetaFlight Configurator, click on the CLI tab and enter the following commands using the table below to set the Spektrum Bind Mode as required
- Prior to binding, enter the following commands into the BetaFlight Configurator CLI tab
 - `resource RX_BIND_PLUG 1 B11`
 - `set spektrum_sat_bind = <number of pulses>`
 - `save`
- Once binding is completed, enter the following commands into the BetaFlight Configurator CLI tab
 - `resource RX_BIND_PLUG 1 B11`
 - `set spektrum_sat_bind = 0`
 - `save`

DSMX Bind Modes

Pulses	Serial Receiver Provider	Protocol Type
7	SPEKTRUM2048	DSMx 22ms
9	SPEKTRUM2048	DSMx 11ms

DSM2 Bind Modes

Pulses	Serial Receiver Provider	Protocol Type
3	SPEKTRUM1024	DSM2 22ms
5	SPEKTRUM2048	DSM2 11ms

FRSKY F.PORT

FrSky has released a new RC protocol called F.PORT which combines SmartPort and SBUS over a single serial connection. If you plan to use F.Port with an R-XSR receiver we have provided an example configuration below.

See the BetaFlight wiki for more info: <https://github.com/betaflight/betaflight/wiki>

Requirements

- ✓ FrSky F.Port capable receiver such as the R-XSR (with un-inverted S.PORT pad)
- ✓ Un-inverted Bi-directional serial UART
- ✓ F.Port firmware from FrSky
- ✓ BetaFlight 3.3 or higher

Process

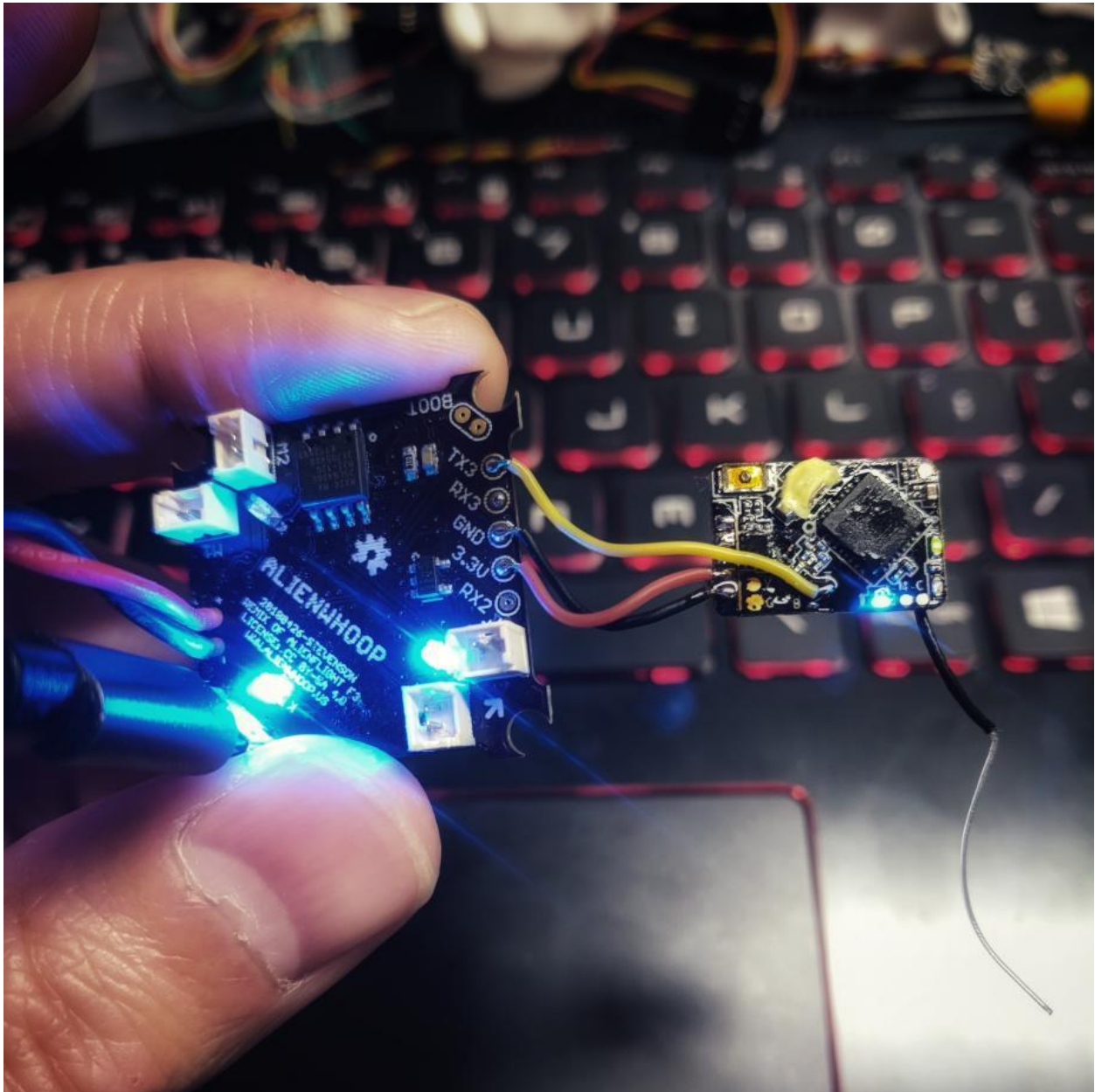
- 1) Update the FrSky R-XSR receiver firmware with the latest F.PORT protocol firmware. You must do this first.
- 2) Use the table below as a guide on how to properly wire the R-XSR to the Alienwhoop V2.1 flight controller.

R-XSR Pad	UART/PAD NAME/PAD#
SBUS IN	N/A
SBUS OUT/CPPM	N/A
S.PORT	N/A
+5V	Pad 17
GND	Pad 16
UN-INVERTED S.PORT PAD	UART3/TX3/Pad14

PRO-TIPS

- Ensure the R-XSR has the new un-inverted SBUS and S.Port pads as outlined by Oscar Liang @ <https://oscarliang.com/uninverted-sbus-smart-port-frsky-receivers/> .

- 3) When the wiring is complete proceed to bind the R-XSR receiver to the transmitter.



- 4) Configure BetaFlight for F.Port protocol.
 - a. Ports Tab
 - i. In BetaFlight Configurator, click on the Ports tab and configure the following.
 - Remove Serial Rx from UART2
 - Set UART3 for Serial Rx
 - b. Configuration Tab
 - i. In BetaFlight Configurator, click on the Configuration tab and configure the following.
 - Receiver - set to Serial Based Receiver
 - Serial Receiver Provider – set to FrSky FPORT
 - c. CLI Tab
 - i. In BetaFlight Configurator, click on the CLI tab and enter the following commands:
 - `serial 2 64 115200 57600 0 115200`
 - `set serialrx_provider = FPORT`
 - `set serialrx_halfduplex = ON`
 - `set serialrx_inverted = OFF`
 - `save`
 - d. Receiver Tab
 - i. In BetaFlight Configurator, click on the Receiver tab
 - Power on the transmitter and move the sticks
 - Confirm Roll, Pitch, Yaw and Throttle all respond to the transmitter stick movements.
- 5) Continue Normal BetaFlight Configurations
- 6) Complete the build.

The AlienWhoop V2.1 flight controller is flashed at the factory with BetaFlight and has been put through the paces by the AlienWhoop team. The result is a flight controller which is delivered with tuned PIDs and is ready to rip!

We are pilots just like you! We maintain a GitHub repository to store our preferred and tested PIDs to help all AlienWhoop pilots. Check this link below often for the most current config files.

Download our latest configuration - <http://alienwhoop.us/git-config>

We know this can be overwhelming, if you have questions hop into the AlienWhoop Team Discord for assistance.

- Discord – <http://alienwhoop.us/discord> (best way to reach us)

SHOUTOUTS

"If I have seen further it is by standing on the shoulders of Giants." – Isaac Newton

THANK YOU

- Jesse Perkins (Mr. Tiny Whoop)
- Joshua Bardwell (inspiration for the pilot guide)
- BetaFPV Team
- AlienWhoop Dev Team
 - Charlie "AlienWhoop" Stevenson
 - Travis "NotFastEnuf " Schrock
 - Brian "VelcroFPV" Pichardo
 - Michael "MontiFPV" Montiverdi
- BetaFlight Dev team
- Butterflight Dev team
- Lance (old school Alienwii and Alienflight)
 - AlienWhoop v2.1 is inspired by [alienflight f3 quad brushed v1](#)

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:

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- Instagram - @alienwhoop
- Twitter - @alienwhoop