TINY WHOOP NANO

The smallest most versatile brushed quadcopter! The Tiny Whoop Nano!

Revision 2019-04-06



Tiny Whoop and Team BlackSheep have joined forces to create the Tiny Whoop Nano, an even-tinier, turtle-able Tiny Whoop!

With a 55mm diagonal motor-to-motor measurement, the Tiny Whoop Nano is almost a new class of aircraft. In its stock state it's built for accurate and agile angle-mode cruising, exploring, and spec racing. The power system can also be upgraded and tuned for more speed or endurance.

In the air you'll feel even tinier, and the world around you will feel even bigger. This nano-size aircraft is meant to slip thru the moving sea of ankles in a busy crowds, negotiate the dense foliage of your houseplants or trees, and race room to room through your home. Almost every part of the aircraft was reinvented and redesigned for this project.

Key features

- 55mm motor to motor, 18g dry weight. Smallest & lightest stock Tiny Whoop!
- First stock Turtle-able brushed fpv drone
- RTF, BNF and PNP options available
- True 25mW & 50mW output power VTx for extreme range
- FrSky D16 receiver (binds only "with telemetry", FCC firmware, upgradeable)

Specifications

	TINY WHOOP NANO
Size	55mm Motor to Motor
Weight	28g dry
VTX	TBS Unify Pro Nano 25mW 5.8GHz
FPV camera	700TVL
Motors	0615 17,000kV stock
Motor compatibility	0615 - 0617
Battery	1S 260mAh TBS Graphene
Battery compatibility	up to 1S 300mAh
Flight time	Up to 4 minutes per charge

Table of Contents

Specifications

Table of Contents

Getting Started

- What's in the box
- Charging your battery
- Getting ready
- Video Goggles basic use
- The basics of Flight!
- Charging your remote & goggles

Binding to a custom Radio (BNF)

- Binding to the kit remote control (X8)
- Custom controller setup
- TBS Tango Setup

Video Frequencies

Repairs and Maintenance

- The anatomy of a Tiny Whoop Nano

Propeller and Motor direction

- Replacing propellers
- Replacing motors

Changing canopies

Flight Control Configuration

- Installing TBS Agent X
- Updating Firmware
- Flight controller settings
- Stick-Mode Accessible Frequencies

Declaration of Conformity

Getting Started

Thanks for choosing the Tiny Whoop Nano, the world's smallest FPV quadcopter. In this manual we'll walk you through setting up all the way through your first flight.

What's in the box







Charging your battery

Plug the included USB charger to any USB source. Connect a battery to it. The light will start to flash. The light turns green when the battery is ready to go!



For more fun, we recommend purchasing a 6-way charger and additional batteries. TBS Charger options.

Getting ready

If you have bought the BNF set or want to use your own remote control, follow the binding instructions first.

Start by turning on the remote control and placing it about 1 meter (3 feet) away from the aircraft. Plug in the Tiny Whoop Nano and place it on an even surface to initialize. Towards the rear of the aircraft you should see a green shimmering LED. This indicates that you are bound, the gyro and accelerometers are initialized and your Tiny Whoop Nano is ready to take to the skies! Due to the third-party protocol of the remote and the Tiny Whoop Nano, it's possible that the bind is not always successful. If the LED flashes red, simply reconnect the battery while gradually increasing the distance between drone and remote. The lock should happen within a few seconds of powerup.

Video Goggles basic use

Turn on your goggles and ensure you are on the right channel. From the factory, the goggles are restricted to 6 channels and you can toggle through them using the up and down bottom.



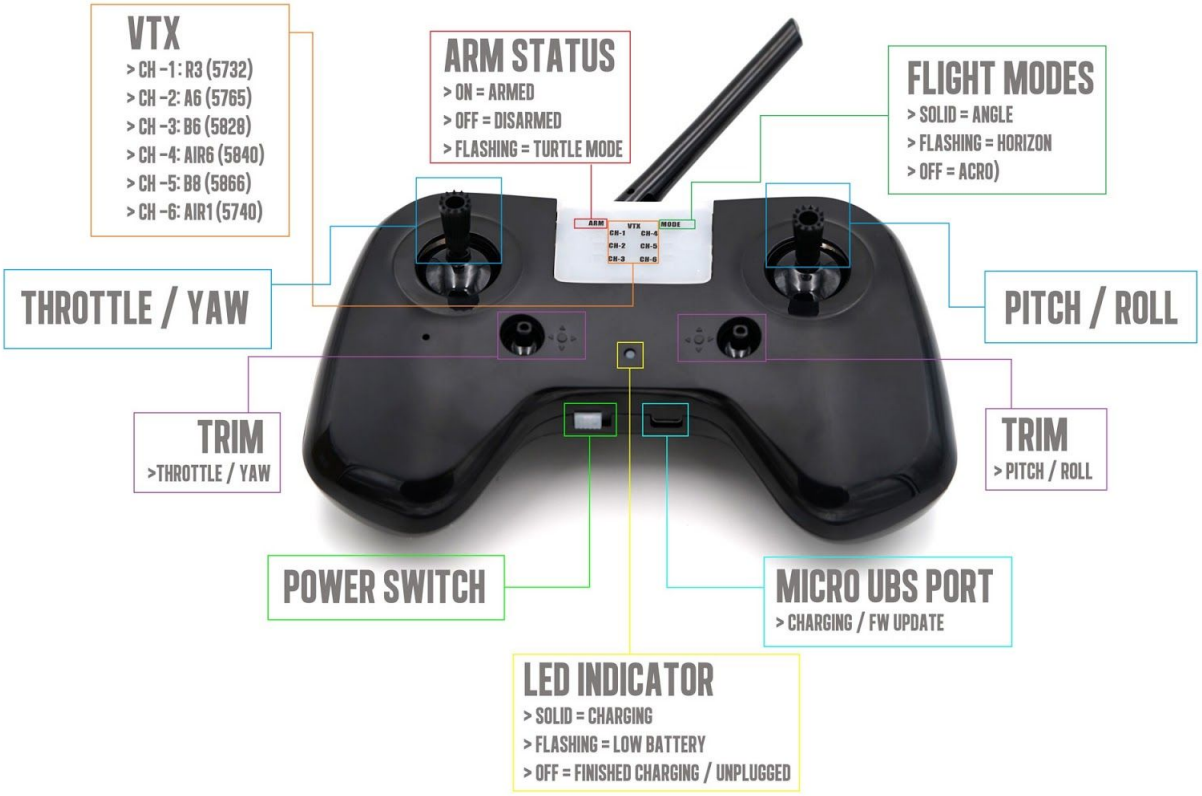
You will see a video from the front of the drone. Wave across the camera to make sure it's really your

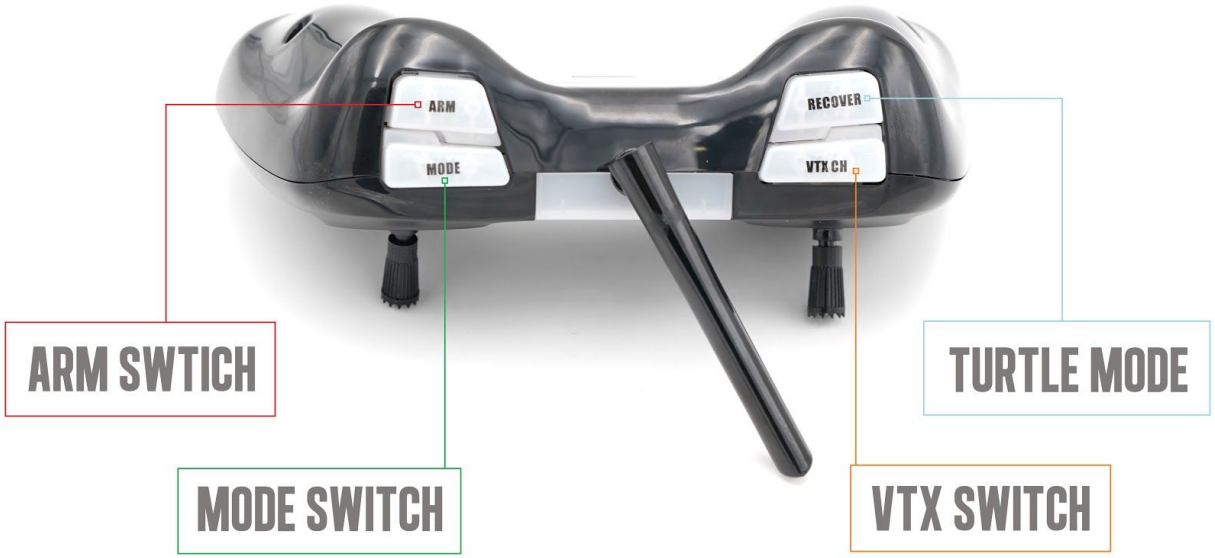
drone you're looking at and not your friend's!

The basics of Flight!

Place the goggles comfortably on your head, and push the ARM button to activate the motors. Remember, for safety your throttle stick has to be all the way at the bottom for arming to work!

Flying a Tiny Whoop NANO is an excellent introduction into the world of FPV drone racing. This world is all about throttle management. The throttle controls how much thrust your motors create. Pitch and Roll correct your trajectory. Yaw allows you to look left and right. The combination of all 4 axis provides the joy of flight!





To start off, we suggest only gently sliding across the floor to get yourself familiar with the movement of the aircraft. Remember, first-person view flight is a little harder than driving a car, so if it seems difficult to you at first, stick with it! Even the worst pilots can learn in a few hours, and FPV drone flight feels a little strange for everyone in the beginning. Once you are airborne, it's all about throttle management. As you move forward, left or right, your aircraft will tend to drop. Correct by applying more throttle (gently does it!). As you level out, ease off the throttle. Practice makes perfect!

Choosing the right flight mode is crucial. Angle mode is computer-assisted, where the angle of the drone follows the angle of your stick input. This prevents you from over-shooting, and always brings your drone back to level when you let go of your sticks. Horizon mode is a mix between angle and acro mode. At the center of the sticks, the drone is in angle mode and therefore always hovers levelled. At the outer edges of the stick inputs the drone turns to acro mode, which gives you 100% freedom of control of the drone's attitude, allowing you to do tricks suck as flips or rolls. Letting go of the sticks always finds the quickest route back to level flight. Acro mode is completely unassisted mode, and only recommended as you get more experienced.

If you have "landed" upside down, put your throttle stick all the way down, push (and hold) down on the TURTLE button and try to flip the aircraft by using roll and pitch movements. If that doesn't work, you'll need to do the "walk of shame" to pick up and flip your aircraft!

Charging your remote & goggles

The remote control and goggles will give you at least an hours worth of joy per charge. When it's time to charge, simply connect them to any USB micro cable to charge. It takes about 1 hour to fully charge.



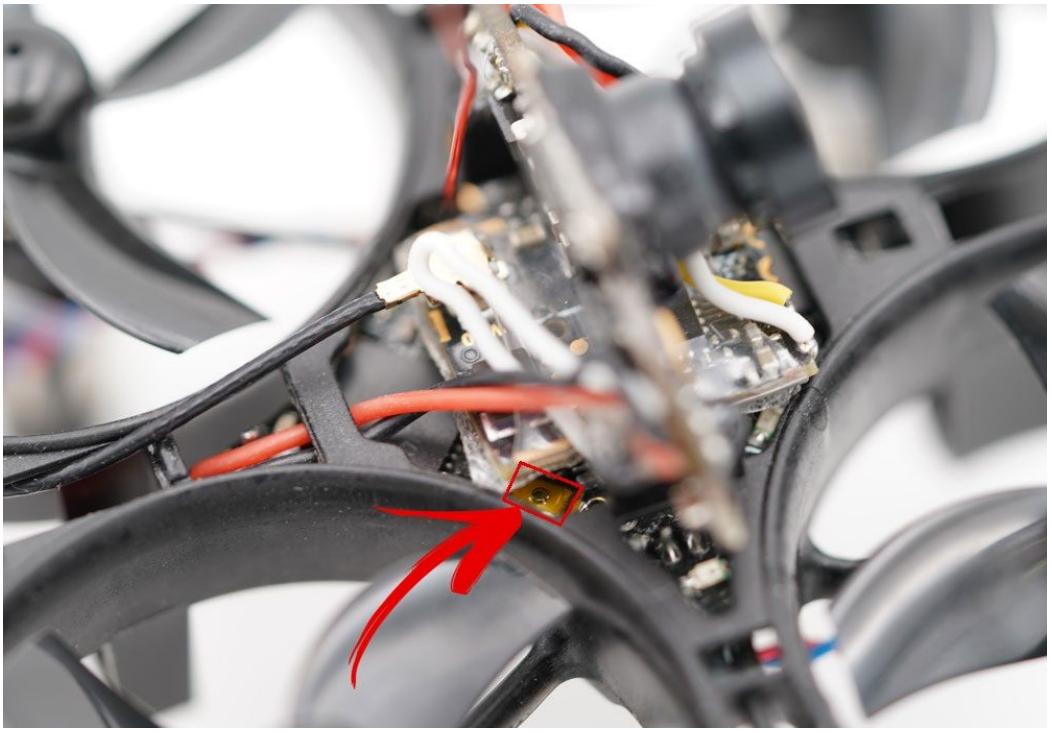


Binding to a custom Radio (BNF)

The Tiny Whoop Nano is a FrSky D16 protocol compatible drone. The controller that comes with the RTF set is compatible, as are all radios in the FrSky lineup that support D16 protocol, and any JR-module compatible radio such as the Jumper T12 / T16 with multi-protocol modules, or the TBS Tango with the XJT JR module.

We have a template available for OpenTX compatible remote controls on our Tiny Whoop Nano product page. You can load this file into your SD card, folder MODELS, and that should successfully configure your model. Then you can begin the binding procedure.

The binding procedure is always the same. Put your transmitter (or transmitter module) into the D16 bind mode, then power up your drone while holding the bind button pressed. Use non-conductive materials (e.g. a toothpick) to push the bind button, and if necessary ask someone to help you as it usually requires three hands and not everyone has that many!



The bind procedure can take a couple of seconds. The Tiny Whoop Nano and remote usually both confirm the binding was successful, but not on every remote control system. Power cycle both and ensure that the LED lights up green to signal a successful bind. After the bind, you have to make sure that the channels are correctly mapped in your specific model setup - if you haven't already done that by uploading the BIN file as explained above. Follow the instructions below on setting up the model correctly for your remote

control system.

Binding to the kit remote control (X8)

[todo]

Custom controller setup

If you are using a custom radio, configure your radio model settings to match the following outputs:

Ch	Function	Notes
1	Roll (AIL)	
2	Pitch (ELE)	
3	Throttle (THR)	
4	Yaw (RUD)	
5	Flight Mode	3 position switch (Angle, Horizon, Acro)
6	VTX Control	6 position output. 1000 / 1200 / 1400 / 1600 / 1800 / 2000 uS
7	Arming	2 position switch
8	Turtle mode	2 position momentary switch

TBS Tango Setup

Update your TBS Tango to the latest firmware. Ensure that you have a XJT module installed and set to the D16 jumper. Add a new Drone to the remote, and select “TW Nano” as type. The layout will be as follows:





Check the video frequencies chapter to find the correct video frequency setting on your TBS Tango.

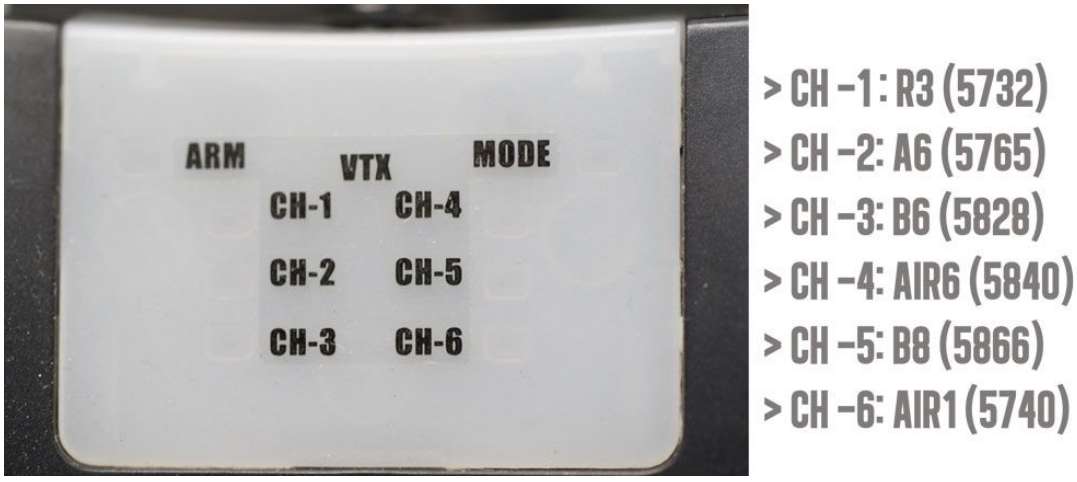
Video Frequencies

In its default setting, the Tiny Whoop NANO comes with a fixed group of 6 frequencies pre-set for a racing experience with up to 6 pilots and minimal interference and inter-modulation distortion (IMD). The frequencies were picked with assistance from Alex “IBCrazy” Greve, and they are matched with the goggles for easy and quick access as well as interference free racing. To break free of this simplification, please use the TBS Agent X to change your VTx behavior (requires a full-size remote control).

Ch	Frequency	Traditional Name	PWM Channel Pos
1	5732 MHz	R3	1000uS
2	5765 MHz	A6	1200uS
3	5828 MHz	B6	1400uS
4	5840 MHz	F6	1600uS
5	5866 MHz	B8	1800uS
6	5740 MHz	F1	2000uS

TBS IMD6 BAND

The included radio is programmed to work with this layout and show the frequencies in the following way:

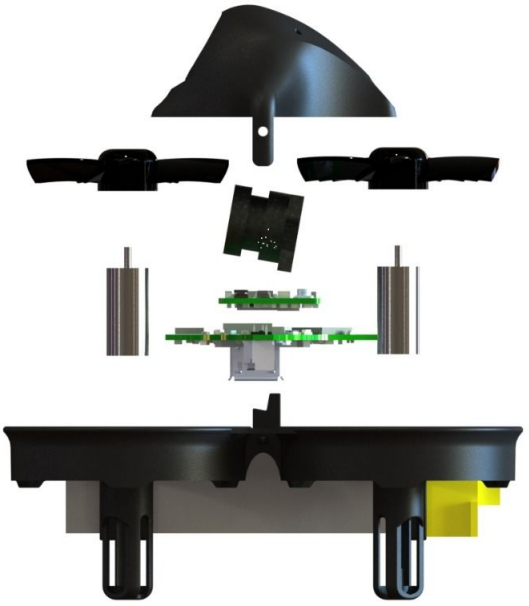


Repairs and Maintenance

The Tiny Whoop Nano is built of many individual parts, each one is replaceable, some are upgradeable. You can improve the motor power to get higher top end speed at the sacrifice of battery life, or play with different propellers to squeeze more performance out of your existing setup. Crashing and repairs are a part of being a Tiny Whoop pilot, tho they are much less common compared to larger drone flight. This

section will teach you how to perform repairs or upgrades on your Tiny Whoop Nano!

The anatomy of a Tiny Whoop Nano

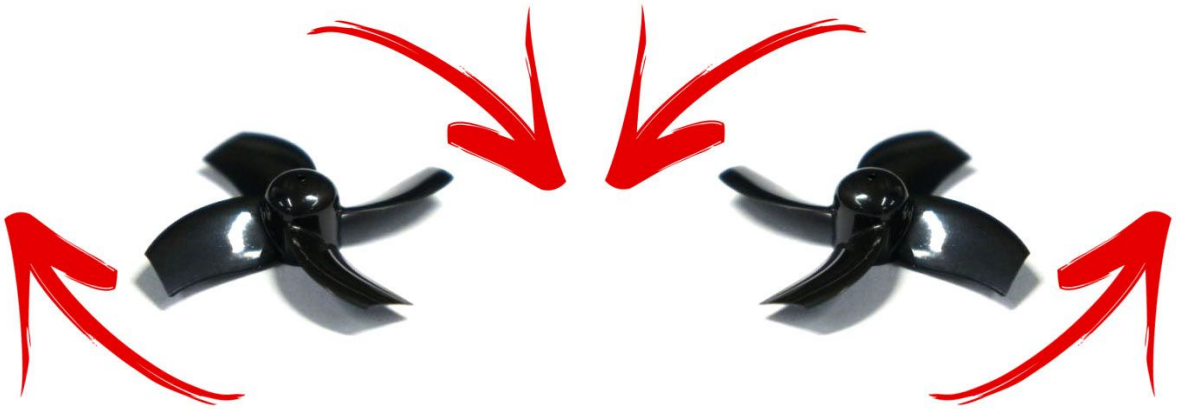


Propeller and Motor direction

The motors need to spin in the following direction to ensure stable flight:



The propellers have clockwise and counterclockwise pitch angle. This means that one type of propeller will only generate adequate thrust for flight when spun in one direction. Here is how you identify the correct propeller for the motor directions:



Replacing propellers

Pull propellers off the top of the motor by pulling gently on the blades from the top. We have a prop removal tool available as an accessory as well if needed.

Replacing motors

Brushed motors age over time. They have about a 150-250 flight endurance, depending on how much you push the motors. The wire colors indicate the default rotation direction of each motor. The replacement motor needs to have the same wire color.

Replace motors by first unplugging the motor. Then slide out the motor by giving it a gentle push vertically. Carefully pull the motor wire through the motor chute. Slide the cable of the new motor down the same way, and gently push it down. Then plug in the new motor. Ensure the motor spin direction by arming the quad and using a piece of paper or your fingers to feel the airflow below the prop pushing down.

Changing canopies

The canopy is what stands between your valuable electronics and the stationary or moving targets that are part of the life of a Tiny Whoop Nano! If a canopy happens to snap or break to the point where it needs replacing, gently pull the side of the canopy over the tab it is attached to. The canopy will then easily come off. Re-attach it in the same manner. We like to use tweezers to gently pull the sides of the canopy off of the tabs.

Flight Control Configuration

The Flight Controller by default is based on TBS Harold, a flight controller software developed by TBS. To configure it, use the TBS Agent X.

Installing TBS Agent X

Download the TBS Agent X from here. It works on any Windows or MacOS compatible computer:

- Download Agent X

Run the executable to install the application. Open it and connect your Tiny Whoop Nano via the micro USB socket located at the bottom of the drone.

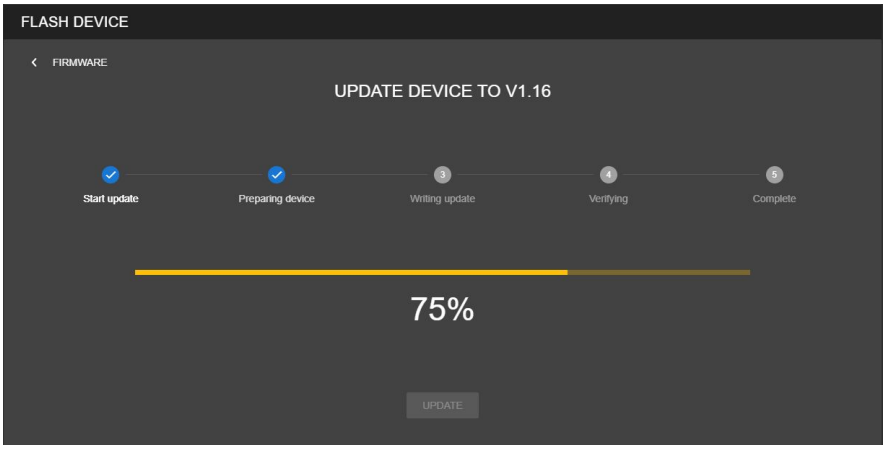
Updating Firmware

Connect your Tiny Whoop Nano to the USB port & opening the TBS Agent X. The Tiny Whoop Nano will appear within a few seconds. Click on MANAGE to enter the settings for the flight controller. Click the FIRMWARE tab and it should look like this:



CURRENT indicates your current flight controller version. If there are more recent versions we recommend upgrading. Press UPDATE next to the most recent firmware revision on the top to switch to the newest firmware. Click UPDATE on the bottom of the next screen and wait a about 30 seconds for the update to complete. During this time the USB device will disconnect and reconnect once.

To finalize the firmware upgrade, disconnect the USB and connect it again. You should now see it successfully updated and under CONFIGURE all the right settings will appear.



Flight controller settings

TUNING

To alter the performance of your drone, there are several settings available on the flight controller. At the basis, there is a PID controller that manages the stability of the drone. A rate and expo controller manages the extent and linearity of response to your stick input.

RATES

The response of the drone to your stick inputs are defined by Rates (**Roll**, **Pitch** and **Yaw**). They define the rate of movement. The higher your rates, the more faster the drone will change its attitude. The **Leveling** setting defines how fast the drone snaps back to level under Angle and Horizon flight mode. **Angle Limit** limits the maximum angle (in degrees) that a drone can tilt under the Angle flight mode.

EXPO

The EXPO parameters determine the precision of each input axis around the center of the stick in favor of a lack of precision towards the edges of the stick. This gives you better control when precision is required, while it gives you the same rate of movement at the extremities. The idea is that you generally need high precision, unless you need to react quickly and then precision is secondary. Most people chose to use expo when flying in acro mode!

PIDs & Filters

It is not easy to explain PID controllers and filters in a few short sentences. We recommend the PID tuning video from StingersSwarm. While it explains the tuning steps for a different flight controller with different parameters, the core concepts are the same and will allow you to become a tuning ninja! Tiny Whoop and TBS have spent considerable effort finding the perfect PIDs, so we suggest to leave the PID values default unless you have changed motors, propellers or other aspects that may impact the response of the aircraft.

DRONE SETUP

This section determines the channels that correspond to the individual functions of the drone. If you can't change the channel assignment on your remote control, you can change the channel assignment under drone setup to make changes onboard the drone. Unless necessary, we don't recommend any changes here.

VTX

VTX is short for Video Transmitter. You can configure the default video transmitter channel and power level. Pit Mode is a safety feature that prevents the VTx from powering up when you plug in the drone. It is a recommended setting when you are participating in large events where you could potentially cause interference. We suggest to consult with the race directors of large events about how to handle the Pit Mode setting for this particular event. As a general rule, always show up with your VTx set to 25mW power output, as that is the standard power level on FPV races.

Control mode lets you change the VTx control mode from the default RANGE controls (6 predefined channels defined under the Video Frequencies chapter) to STICK controls.

Range Controls uses the buttons on the stock transmitter or channel 6 on your compatible transmitter to change vtx channels aboard the aircraft.

Stick Controls changes your VTX control channel to a 2 position switch (Channel 6) which enables the stick position input for changing video transmitter settings. That provides access to the full range of legal VTx channels that are standard on FPV aircraft. You will need a full-size remote controller for this to work. To set a new channel, activate the VTX control switch (Challen 6), and then move your sticks into the position that defines your desired channel and band combination to set the channel and band of your VTx.



Here is a table of all the available VTx channels. Please keep in mind that the stick control mode will allow you to access only 25 of them (channels highlighted white and yellow in table below).

Stick-Mode Accessible Frequencies

Channel	1	2	3	4	5	6	7	8	
Band A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
Band E	5705	5685	5665	5645	5885	5905	5925	5945	MHz
Band F	5740	5760	5780	5800	5820	5840	5860	5880	MHz
Race Band	5658	5695	5732	5769	5806	5843	5880	5917	MHz

(yellow channels require a HAM license, black channels are not accessible)



Declaration of Conformity

EU - DECLARATION OF CONFORMITY

We affirm that the electrical equipment manufactured by us complies with the requirements of the R&TTE Directive 1999/5/EC

Manufacturer:

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Unit 1204, Century Centre
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Tel: +852 5685 2608
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E-Mail: rpirker@team-blacksheep.com

Description of the appliance:
RTF Micro Brushed

Trade name and model of appliance:
Tiny Whoop Nano (PNP) (A-TBSS-TWNPN)
SNR 0741587433460

Applicable Standard (s):

- EN 300 440-1 V1.6.1; EN 300 440-2 V1.4.1 Article 3.2
- EN 301 489-1 V1.9.2; EN 301 489-3 V1.6.1 Article 3.1b
- EN 62311:2008 Article 3.1(a) - Health
- EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 Article 3.1a Safety

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community notified body certification, as shown in the attached schedule.

January 24th, 2018

CE

Raphael Pirker, CEO
TBS Avionics Co Ltd.