
TBS XRACER Micro FPV Racer

Ready-to-fly micro fpv racer

Revision 2016-10-30



It's a parrot frame, that we build up with BetaFlight, Spektrum R/C receiver and a TBS UNIFY PRO VTX. Aimed at indoor office/warehouse race flying, or people getting started with carpark racing and other shenanigans.

Key features

- Ready-to-fly 120-size FPV racer
- Brushed motors, 56mm Props
- 32-bit Brushed CleanFlight Flight Controller
- BNF Spektrum R/C receiver
- 55g weight incl. battery



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Specifications

Type:	120-size micro quadrotor FPV racer
Propellers:	Ø56mm white propellers
Motors:	CK 20x8.5mm brushed coreless micro motors, 1x5mm shaft
Battery:	3.7V 600mAh 1S1P LiPo battery pack, 42 x 24 x 9 mm, 15 grams
Main board:	Pico STM32F1 32-bit brushed flight controller, MPU-6050 IMU sensor - BetaFlight (v2.6.1 as of Oct 2016) fully configurable
R/C system:	<p>FrSky Version: Built-in short-range FrSky receiver</p> <p>Futaba Version: Built-in short-range Futaba S-FHSS receiver</p> <p>Spektrum Version 1.0: Built-in Spektrum DSM2 7-channel R/C receiver, no bind button, >10s boot-up bind procedure</p> <p>Spektrum Version 1.1: Built-in Spektrum DSM2/DSMX 7-channel R/C receiver, no bind button, >10s boot-up bind procedure</p>
ESCs:	Max. 4.3A per brushed motor, 32KHz, built-in 5V 500mA BEC
Connectors:	JST-SH 1.25mm 4-pin
FPV camera:	Micro 600TVL FPV 5V camera
Video transmitter:	TBS UNIFY PRO 5G8 V2 24/40-ch user selectable 25/200/500/800 mW video transmitter, default channel 5860 MHz
VTX antenna:	On-board UNIFY PRO 5.8GHz FPV antenna
Flight time:	5.5 minutes (hover)
Range:	100 m - radio dependant
Max. altitude:	1300 m ASL
Working temperature:	0 - 40°C
Frame size:	Parrot 120 mm, diagonally
Size:	140 x 140 x 30 mm, prop tip-to-tip
Weight:	55 grams incl. battery
Kit contents:	1x TBS XRACER, 1x 600mAh battery, 4x Extra propellers (2x CCW, 2x CW), 2x Extra motors



Attention

Thank you for buying a TBS product! The TBS XRACER is a new micro racing multirotor aircraft from Team BlackSheep (TBS).

A general rule for RC aircrafts is that they must be controlled always under sight of view, check your RC regulation to keep up to date with regulations.

Please read this manual carefully before assembling and flying your new TBS XRACER quadcopter. Keep this manual for future reference regarding tuning and maintenance.

Disclaimer

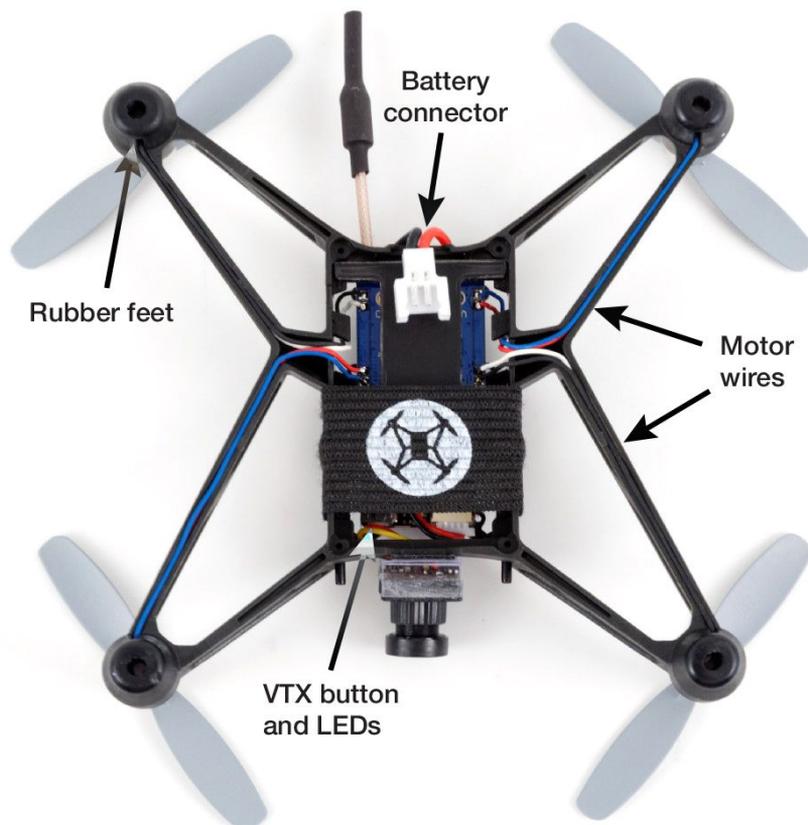
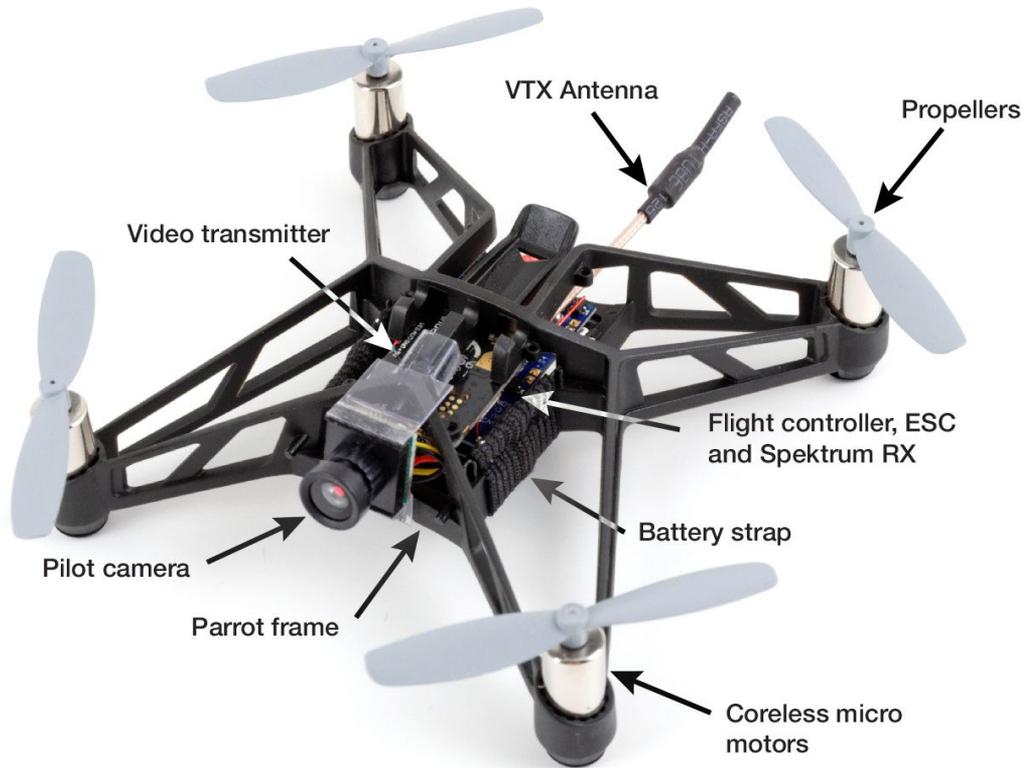
Our request to you; the aircraft may not be used to infringe on people's right to privacy. We have designed a toy with mind blowing capabilities. It is your responsibility to use it reasonably and according to your experience level. Use common sense. Fly safe. You are on your own. TBS has no liability for use of this aircraft.

- Locate an appropriate flying location
- Obtain the assistance of an experienced pilot
- Practice safe and responsible operation
- Always be aware of the rotating blades
- Prevent moisture
- Keep away from heat or excessive amounts of sunlight



Overview

The following diagram shows the main features of the TBS XRACER and the component layout.



Quick Start Guide - BNF set

The following steps will get you setup and ready to fly quickly. It is a condensed version intended for experienced pilots/builders. Each step is elaborated in more detail in this manual if you are new to this.

You will need to charge and mount the battery, bind the R/C receiver, configure the flight control, and potentially adjust VTX channel.

This section requires the following equipment.

- Depending on the version you have, 5-channel Spektrum, FrSky or Futaba S-FHSS R/C radio transmitter with one of the supported protocols (Check page 3)
- 5.8 GHz FPV receiver system/display/goggles
- [BetaFlight](#) on a computer (PC/Mac) for detailed configuration

Let's go!

1. Charge the battery with the supplied JST adapter cable on 1C/600mA rate using a LiPo charger
2. On the radio, hold the bind-button while powering on the transmitter
3. Plug in the battery on the frame and within 10 seconds the Spektrum receiver should bind to the transmitter, the red LED should stop flashing
4. On the radio change the end-points for all channels to 130%, if needed, to reach the approx. range of 1050 to 1950, connect to [BetaFlight \(SiLABS VCP drivers\)](#) and check under the "Transmitter"-tab to verify
5. Next, to set the video transmitter channel and power setting, hold the menu button for 3 seconds and use the table later in the manual to change the settings
6. Lastly, power on your vrx/goggle/display (default channel 5860 MHz) and spin up by holding throttle down-right (mode 2) and turn off by holding throttle down-left or turning off the radio (failsafe)



Setup

Getting set up and ready to fly is a quick and simple task, as mostly everything comes pre-built from the TBS factory. When using TBS equipment, it is plug & play to get ready. Follow these easy steps and you will be shredding the sky in just a few minutes!

Charging battery

The supplied 1S 600mAh battery is charged for storage and transportation (50%). It needs to be charged at 1C, 600mA, before being used. You can still setup and configure the XRACER but it is not recommended to fly without charging the battery fully first.



The kit comes with a white spade type male plug to JST male plug adapter to make it easier to connect to a LiPo charger (charger not supplied). You can use any regular R/C LiPo charger or a simple USB stick charger. The size of the battery is x x x mm.

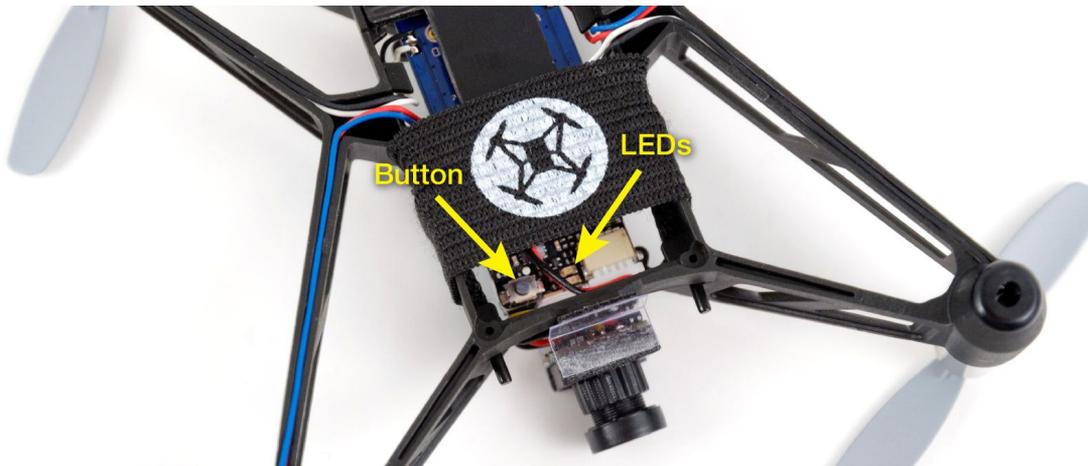
Mounting battery

Getting the battery mounting is easily done by connecting the two spade connectors (always check the cable polarity, red-to-red) and slipping the battery into the black battery strap on the underside of the XRACER.



Changing video transmitter settings

On the underside of the XRACER is a slot to access the menu button and two status LEDs for the VTX.



In the menu there are categories and setting entries. Pressing the button for 3 seconds will toggle between categories, pressing it for a short (1 second) press toggles between settings. To enter the menu, hold the button for 3 seconds. LED colors will signal the state of the menu, for an overview see the following table.

Channel select mode

Enter menu by pressing the button for 3s. Red LED will flash 1 time. Select channels by simple short presses.

Band select mode

Press the button for an additional 3s. Red LED will flash 2 times. Select band by simple short presses.

Unlock and power select mode

The default VTX power level is 25mW and is fine for all close proximity flight where there are no other FPV pilots around. To change this value you need to unlock the VTX.

(FOR HAM USERS ONLY!) To unlock, press button for 20 to 25 seconds. The Red LED will flash 3 times to confirm. You have unlocked the video transmitter for use with all frequencies (see frequency table below).

The power select mode is now accessible. Once unlocked, you can select the power level according to the table below. To lock the transmitter, go back into band select menu and press the button for 20 to 25 seconds again.

Saving settings

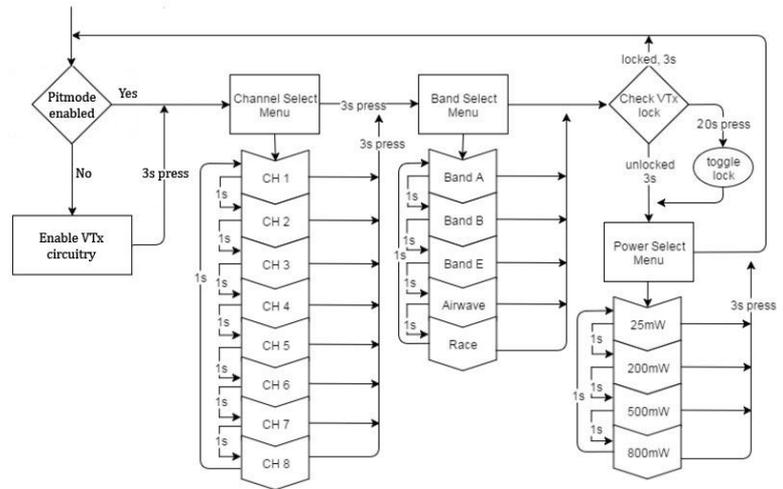
Press button for 3 seconds. Blue LED will turn on, settings are saved and it will exit the menu.



LED flash codes for channel, band and power

The TBS UNIFY PRO 5G8 signals selected channel, band and power levels using a startup sequence of LED codes. The same sequence is also repeated in the menu to make it unified. First the **RED** LED flashes to indicate the item being shown. One flash for channel, two flashes for band, three flashes for power level.

Subsequently, the **BLUE** LED will indicate the value.



Red LED:	Indicate item - Channel, band or power setting
Blue LED:	Indicate value

For example, Channel 6, Band B, Power of 500mW, will have the following startup LED code:

- 1x **Red** and 6x **Blue** = Channel, 6
- 2x **Red** and 2x **Blue** = Band, 2 (=B)
- 3x **Red** and 3x **Blue** = Power, 3 (= 500mW)

Once the Video transmitter has successfully booted up, it will show a constant **BLUE** for locked state, and a constant **RED + BLUE** for unlocked state. For reference, see the following menu tables.

RED LED		BLUE LED							
		1x	2x	3x	4x	5x	6x	7x	8x
1x	Channel	1	2	3	4	5	6	7	8
2x	Band	A	B	E	Airwave	Race			
3x	Power Level*	25	200	500	800				

Channel	1	2	3	4	5	6	7	8	
Band A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
Band B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
Band E	5705	5685	5665	5645	5885	5905	5925	5945	MHz
Airwave	5740	5760	5780	5800	5820	5840	5860	5880	MHz
Race Band	5658	5695	5732	5769	5806	5843	5880	5917	MHz
PowerLevel	25	200	500	800					mW



The selections in orange requires HAM license to operate legally. The video transmitter ensures that you cannot select illegal channels or power levels by accident:

- When controlled by the push button, you will need to confirm having a HAM license by following the steps described above to unlock your video transmitter
- Through the CORE PRO, you are required to enter your HAM license number under the “Callsign” menu before you can access the high power transmission settings and the locked out channels

For further details on the TBS UNIFY PRO, see the official manual:

<http://www.team-blacksheep.com/tbs-unify-pro-5g8-manual.pdf>

Radio channel setup

On the radio, especially on the DX6/DX7/DX8/DX9 models, you need to reverse 2 channels and extend the end-points 125% in both directions for all 4 main channels. In BetaFlight, the end-points should be in the 1050-1950 range.

Channel	Direction	End-point
Throttle	Normal	125% / 125%
Aileron	Reversed	125% / 125%
Elevator	Normal	125% / 125%
Rudder/yaw	Reversed	125% / 125%

Binding Spektrum receiver

The main controller board has a receiver on-board that is based on the either Spektrum DSM2(V1.0 & V1.1)/DSMX(V1.1), FrSky or Futaba S-FHSS protocol. To bind the receiver you need a compatible radio or transmitter module.

To bind the XRACER to a **Spektrum** radio:

1. Power on the XRACER, either by connecting the battery or USB power, and wait 10 seconds or longer for the receiver to enter bind mode, indicated by rapid red LED flashing
2. Now, on the radio, hold the bind-button while powering on the radio (or what it takes to enter bind-mode)
3. The red light on the XRACER should stop blinking when the bind is completed.

To bind the XRACER to a **Futaba** S-FHSS radio:

1. Power on XRacer while holding down the bind button. XRacer is now in bind mode.
2. For binding instructions with your remote control, please refer to the transmitter manual. For



example, p.42, [T10J manual](#)

To bind the XRACER to a **FrSky** radio:

1. Push and hold bind button while plugging in the battery. XRacer is now in bind mode. Orange LED is on, Red LED is flashing rapidly.
2. If you are using XJT module, dipswitch 1 is up and dipswitch 2 is down (D8). In FrSky Taranis, select "D8" protocol. Then press "BIND" on Taranis, or turn on XJT module with BIND button pressed
3. Red LED is flashing slowly to indicate successful bind. Orange LED is on. Cycle power on both your radio and the XRacer to complete the binding procedure.



Flight controller setup

The main flight controller board comes pre-flashed with BetaFlight and proper settings for the XRACER already set up but you still need to configure the receiver settings. Also if you upgrade the firmware or reset settings, you will lose the receiver settings and need to set them up again.

To configure the XRACER via [BetaFlight](#):

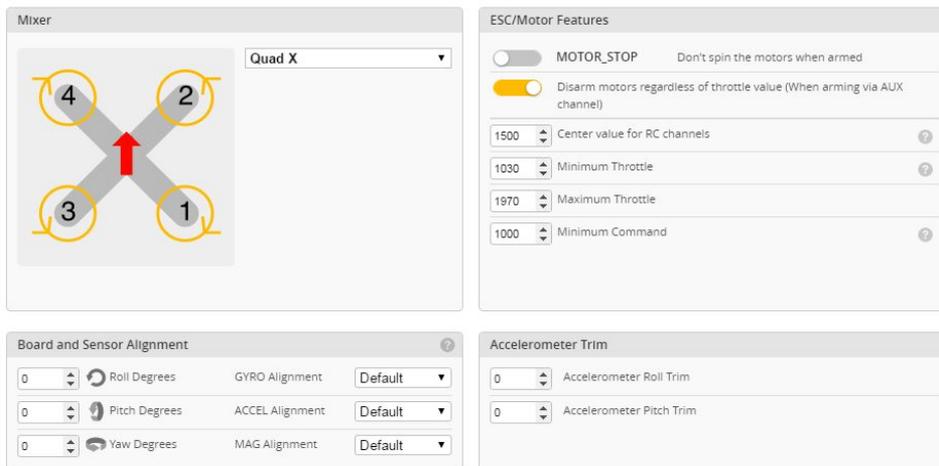
1. Open BetaFlight, hit "Connect" and check "Enable Expert mode"



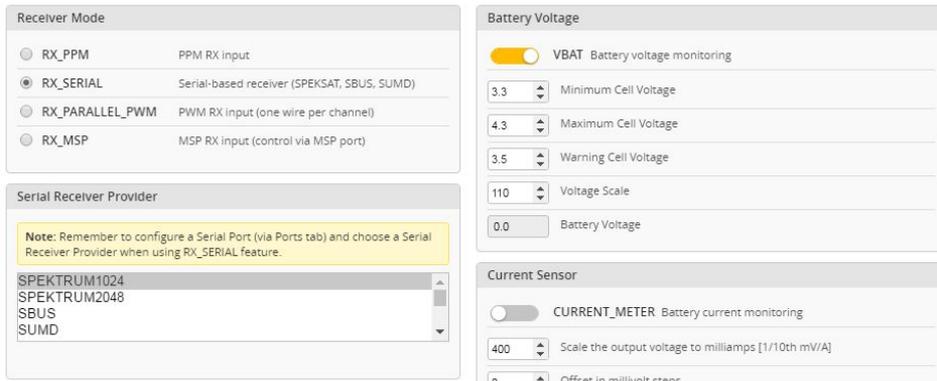
2. Open the "Ports"-tab and enable "Serial RX" for UART2, hit "Save and Reboot"

Identifier	Data	Logging	Telemetry	RX	GPS
UART1	<input checked="" type="checkbox"/> MSP 115200 ▼	<input type="checkbox"/> Blackbox 115200 ▼	Disabled ▼ AUTO ▼	<input type="checkbox"/> Serial RX	<input type="checkbox"/> 57600 ▼
UART2	<input type="checkbox"/> MSP 115200 ▼	<input type="checkbox"/> Blackbox 115200 ▼	Disabled ▼ AUTO ▼	<input checked="" type="checkbox"/> Serial RX	<input type="checkbox"/> 57600 ▼

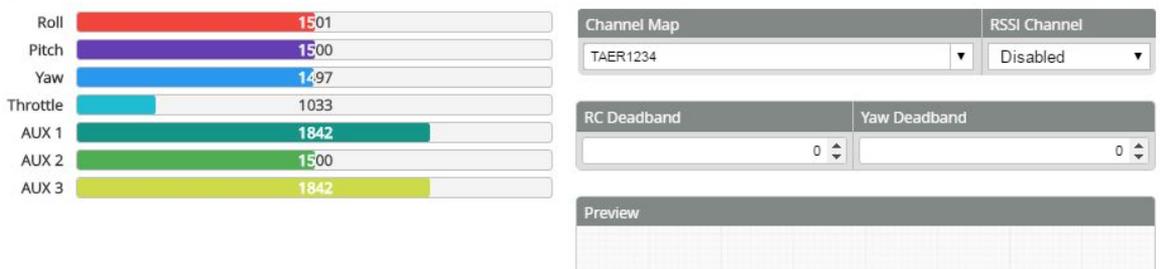
3. Open the "Configuration"-tab, disable "MOTOR_STOP" and set "Minimum throttle" to 1030 and "Maximum throttle" to 1970 for max. ESC throttle range.



- For V1.0, in the same tab, change “Receiver Mode” to “RX_SERIAL” and “Serial Receiver Provider” to “SPEKTRUM1024” for DSM2 or “SPEKTRUM2048” for DMSX, hit “Save and Reboot”. For all V1.1, please set the “Receiver mode” to PPM.



- Now, power up the the radio and open the “Receiver”-tab, the stick movements should now show on the screen - the channel mapping is probably wrong, in the “Channel Map”-field, select “Spektrum TAER123” to change the channel order, click “Save and Continue”



For reference, see the Spektrum receiver channel mapping, aka. TAER123-layout:

Channel	Spektrum receiver	BetaFlight Spektrum map
Ch. 1	Throttle	T
Ch. 2	Aileron	A
Ch. 3	Elevator	E
Ch. 4	Rudder/Yaw	R
Ch. 5	Aux. 1	1
Ch. 6	Aux. 2	2
Ch. 7	Aux. 3	3

- Open the “Modes”-tab, assign one of the Aux-switches to Arm and another switch to command Acro, Horizon and Air-mode. Flip the switches and watch the indicator in the view underneath the slider move to activate the different modes, click “Save”





7. Finally, disconnect the USB and try to power up the radio first then the XRACER. Toggle the flight mode-switch, the green LED should blink momentarily when moving through the modes. Toggle the arm-switch and the green LED will turn on when armed.



Low battery warning

The green LED on the back will start to flash/turn off momentarily when the battery voltage is under 3.5V. This is a good time to land and recharge/change battery.

Accelerometer and gyro calibration

Before the first flight, the FC needs to know the absolute flat and level position relative to the earth's surface. Calibrating the accelerometer and gyro is easily done using a bubble/spirit level on a flat surface.

Calibrate in BetaFlight:

1. Open BetaFlight and hit "Connect"
2. Put a spirit level on a surface and make it level, place the XRACER on the level surface
3. In the first tab, click "Calibrate Accelerometer"

Calibrate Accelerometer	Place board or frame on leveled surface, proceed with calibration, ensure platform is not moving during calibration period
Calibrate Magnetometer	Move multirotor at least 360 degrees on all axis of rotation, you have 30 seconds to perform this task

Using radio sticks:

1. Power up the radio and XRACER, remaining disarmed for the duration of this process
2. Put a spirit level on a surface and make it level, place the XRACER on the level surface
3. For the accelerometer, move the **throttle stick up-left** and **pitch down-center**, you will see the green LED blink for confirmation
4. Now for the gyro, move the **throttle stick down-left** and the **pick down-center**

For reference, see this list for all the CleanFlight stick operations (credit CleanFlight repository):

Mode 2 Stick Functions

Arm		In-flight Calibration Controls	
Disarm		Trim Acc Left	
Profile 1		Trim Acc Right	
Profile 2		Trim Acc Forwards	
Profile 3		Trim Acc Backwards	
Calibrate Gyro		Disable LCD Page Cycling	
Calibrate Acc		Enable LCD Page Cycling	
Calibrate Compass		Save Setting	

Flight modes

The XRACER now has 3 flight modes to accommodate most flying styles.

- **Acro**: full manual mode, simple but allows full acrobatics, for experienced pilots/racing
- **Horizon** (recommended): This mode is very flexible, there is no angle limit, you can do roll and barrels but if you let go of the sticks (hands off the radio), the X-Racer will stabilize automatically
- **Angle**: Easy mode, similar to DJI Attitude auto correction mode, the roll and pitch axis are limited to 45° angle



Status LED

The LEDs on the main controller board shows the state of the system, according the following table. The red LED is located on the front while the blue and green is located on either side of the micro-USB connector.

LED Color	Description
Red slow flashing	No transmitter detected
Red rapid flashing	Bind mode (>10 sec. after power on if no radio detected)
Red solid	Bound to transmitter and active
Green off	Flight controller disarmed
Green solid	Flight controller armed - ready to fly
Green flashing	Gyro calibration (on power up) or low battery (when armed)
Blue off	Accelerometer inactive - rate/acro flight mode
Blue solid	Accelerometer active - angle/horizon/air mode

Ready to fly!

With the receiver bound to the radio, video feed set up, and battery charged, you are ready to fly!



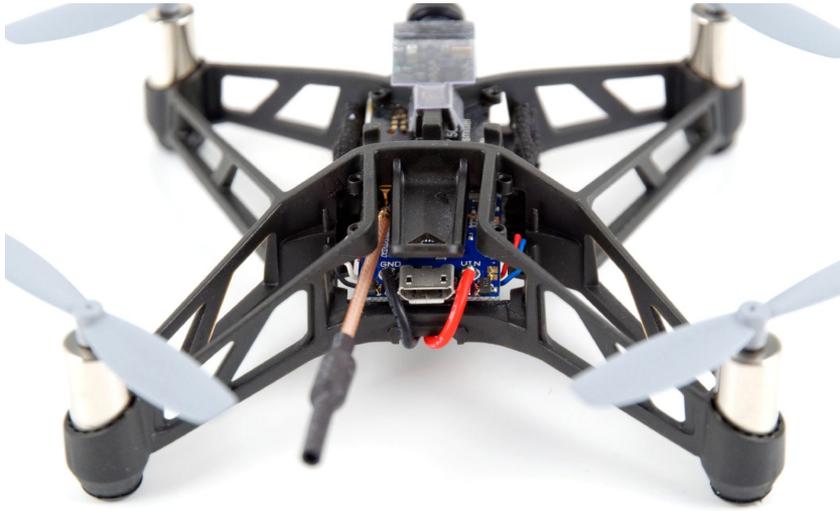
Advanced configuration

Flight controller configuration

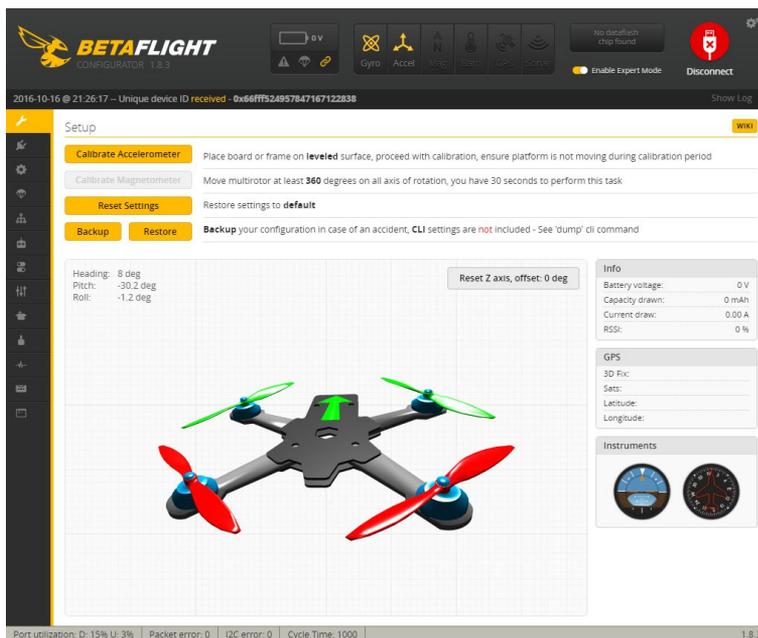
The XRACER comes preconfigured with tuned BetaFlight settings. Changing the essential flight controller settings such as PID, rates, filters, general settings and accelerometer calibration can be done in the BetaFlight configurator interface. If required, download and install the [SiLABS VCP drivers](#) first.

Changing settings via USB:

1. Connect a micro-USB cable to the rear of the X-Racer



2. Download the [Chrome](#) and the [BetaFlight](#) app from the Google Chrome Web Store
3. Hit "Connect" to get access to all the settings



Advanced settings:

1. Open the "CLI"-tab and type the following to enable brushed motors and press enter:
"set motor_pwm_rate=32000"
"save"
2. Open the "PID"-tab and change the PID and rates values to the following and hit "Save":

PID Tuning WIKI

Profile: Profile 1 PID Controller: Integer Reset all profile values Hide unused PIDs

	Proportional	Integral	Derivative	RC Rate	Rate	RC Expo
Basic/Acro						
ROLL	85	40	60	0.60	0.60	0.60
PITCH	85	40	60		0.60	
YAW	90	40			0.50	
Yaw Jump Prevention			0			
Barometer & Sonar/Altitude						
ALT		50		0		0
VEL		55		55		75
Magnometer/Heading						
MAG		40				
GPS Navigation						
Pos		15				
PosR		34		14		53
NavR		25		33		83
Angle/Horizon						
Angle			25			
Horizon			50			100

Rates

Throttle MID: 0.50 Throttle EXPO: 0.00

Throttle

Settings dump

Complete list of the BetaFlight FC settings for Spektrum XRacer (V1.0).

```
# version
# BetaFlight/NAZE 2.6.1 Apr 8 2016 / 22:44:36 (bda8ec)
# dump master

# mixer
mixer QUADX
mmix reset
smix reset

# feature
feature -RX_PPM
feature -VBAT
feature -INFLIGHT_ACC_CAL
feature -RX_SERIAL
feature -MOTOR_STOP
feature -SERVO_TILT
feature -SOFTSERIAL
feature -GPS
feature -FAILSAFE
feature -SONAR
feature -TELEMETRY
feature -CURRENT_METER
feature -3D
feature -RX_PARALLEL_PWM
feature -RX_MSP
feature -RSSI_ADC
feature -LED_STRIP
feature -DISPLAY
```



```
feature -ONESHOT125
feature -BLACKBOX
feature -CHANNEL_FORWARDING
feature -TRANSPONDER
feature VBAT
feature INFLIGHT_ACC_CAL
feature RX_SERIAL
feature FAILSAFE
```

```
# beeper
beeper GYRO_CALIBRATED
beeper RX_LOST
beeper RX_LOST_LANDING
beeper DISARMING
beeper ARMING
beeper ARMING_GPS_FIX
beeper BAT_CRIT_LOW
beeper BAT_LOW
beeper GPS_STATUS
beeper RX_SET
beeper ACC_CALIBRATION
beeper ACC_CALIBRATION_FAIL
beeper READY_BEEP
beeper MULTI_BEEPS
beeper DISARM_REPEAT
beeper ARMED
beeper SYSTEM_INIT
beeper ON_USB
```

```
# map
map TAER1234
```

```
# serial
serial 0 1 115200 57600 0 115200
serial 1 64 115200 57600 0 115200
```

```
# led
led 0 15,15:ES:IA:0
led 1 15,8:E:WF:0
led 2 15,7:E:WF:0
led 3 15,0:NE:IA:0
led 4 8,0:N:F:0
led 5 7,0:N:F:0
led 6 0,0:NW:IA:0
led 7 0,7:W:WF:0
led 8 0,8:W:WF:0
led 9 0,15:SW:IA:0
led 10 7,15:S:WF:0
led 11 8,15:S:WF:0
led 12 7,7:U:WF:0
led 13 8,7:U:WF:0
led 14 7,8:D:WF:0
led 15 8,8:D:WF:0
led 16 8,9::R:3
led 17 9,10::R:3
led 18 10,11::R:3
led 19 10,12::R:3
led 20 9,13::R:3
led 21 8,14::R:3
led 22 7,14::R:3
led 23 6,13::R:3
led 24 5,12::R:3
led 25 5,11::R:3
led 26 6,10::R:3
led 27 7,9::R:3
led 28 0,0:::0
led 29 0,0:::0
led 30 0,0:::0
led 31 0,0:::0
```

```
# color
color 0 0,0,0
color 1 0,255,255
color 2 0,0,255
color 3 30,0,255
color 4 60,0,255
color 5 90,0,255
color 6 120,0,255
color 7 150,0,255
color 8 180,0,255
color 9 210,0,255
color 10 240,0,255
color 11 270,0,255
color 12 300,0,255
color 13 330,0,255
color 14 0,0,0
```



```

color 15 0,0,0

# aux
aux 0 0 0 900 1300
aux 1 1 1 900 1300
aux 2 2 1 1300 1700
aux 3 0 0 900 900
aux 4 0 0 900 900
aux 5 0 0 900 900
aux 6 0 0 900 900
aux 7 0 0 900 900
aux 8 0 0 900 900
aux 9 0 0 900 900
aux 10 0 0 900 900
aux 11 0 0 900 900
aux 12 0 0 900 900
aux 13 0 0 900 900
aux 14 0 0 900 900
aux 15 0 0 900 900
aux 16 0 0 900 900
aux 17 0 0 900 900
aux 18 0 0 900 900
aux 19 0 0 900 900

# adjrange
adjrange 0 0 0 900 900 0 0
adjrange 1 0 0 900 900 0 0
adjrange 2 0 0 900 900 0 0
adjrange 3 0 0 900 900 0 0
adjrange 4 0 0 900 900 0 0
adjrange 5 0 0 900 900 0 0
adjrange 6 0 0 900 900 0 0
adjrange 7 0 0 900 900 0 0
adjrange 8 0 0 900 900 0 0
adjrange 9 0 0 900 900 0 0
adjrange 10 0 0 900 900 0 0
adjrange 11 0 0 900 900 0 0
adjrange 12 0 0 900 900 0 0
adjrange 13 0 0 900 900 0 0
adjrange 14 0 0 900 900 0 0

# rxrange
rxrange 0 1000 2000
rxrange 1 1000 2000
rxrange 2 1000 2000
rxrange 3 1000 2000

# servo
servo 0 1000 2000 1500 90 90 100 -1
servo 1 1000 2000 1500 90 90 100 -1
servo 2 1000 2000 1500 90 90 100 -1
servo 3 1000 2000 1500 90 90 100 -1
servo 4 1000 2000 1500 90 90 100 -1
servo 5 1000 2000 1500 90 90 100 -1
servo 6 1000 2000 1500 90 90 100 -1
servo 7 1000 2000 1500 90 90 100 -1

set mid_rc = 1500
set min_check = 1040
set max_check = 1900
set rssi_channel = 0
set rssi_scale = 30
set rssi_ppm_invert = OFF
set input_filtering_mode = OFF
set rc_smoothing = OFF
set roll_yaw_cam_mix_degrees = 0
set max_aux_channels = 6
set debug_mode = NONE
set min_throttle = 1030
set max_throttle = 1970
set min_command = 1000
set servo_center_pulse = 1500
set 3d_deadband_low = 1406
set 3d_deadband_high = 1514
set 3d_neutral = 1460
set 3d_deadband_throttle = 50
set use_oneshot42 = OFF
set use_multishot = OFF
set motor_pwm_rate = 32000
set servo_pwm_rate = 50
set disarm_kill_switch = ON
set gyro_cal_on_first_arm = OFF
set auto_disarm_delay = 5
set small_angle = 25
set fixedwing_althold_dir = 1
set reboot_character = 82
set serialrx_provider = SPEK1024
set sbus_inversion = ON
set spektrum_sat_bind = 0
set spektrum_sat_bind_autoreset = 1
set telemetry_switch = OFF

```



```

set telemetry_inversion = OFF
set frsky_default_latitude = 0.000
set frsky_default_longitude = 0.000
set frsky_coordinates_format = 0
set frsky_unit = IMPERIAL
set frsky_vfas_precision = 0
set frsky_vfas_cell_voltage = OFF
set hott_alarm_sound_interval = 5
set battery_capacity = 0
set vbat_scale = 110
set vbat_max_cell_voltage = 43
set vbat_min_cell_voltage = 33
set vbat_warning_cell_voltage = 35
set vbat_hysteresis = 1
set vbat_pid_compensation = OFF
set current_meter_scale = 400
set current_meter_offset = 0
set multiwii_current_meter_output = OFF
set current_meter_type = ADC
set align_gyro = DEFAULT
set align_acc = DEFAULT
set align_mag = DEFAULT
set align_board_roll = 0
set align_board_pitch = 0
set align_board_yaw = 0
set max_angle_inclination = 700
set gyro_lpf = OFF
set gyro_sync_denom = 8
set gyro_lowpass_hz = 80.000
set moron_threshold = 32
set imu_dcm_kp = 2500
set imu_dcm_ki = 0
set alt_hold_deadband = 40
set alt_hold_fast_change = ON
set deadband = 0
set yaw_deadband = 0
set throttle_correction_value = 0
set throttle_correction_angle = 800
set yaw_control_direction = 1
set yaw_motor_direction = 1
set yaw_jump_prevention_limit = 200
set tri_unarmed_servo = ON
set servo_lowpass_freq = 400
set servo_lowpass_enable = OFF
set super_expo_factor = 30
set failsafe_delay = 10
set failsafe_off_delay = 10
set failsafe_throttle = 1000
set failsafe_kill_switch = OFF
set failsafe_throttle_low_delay = 100
set failsafe_procedure = OFF
set rx_min_usec = 900
set rx_max_usec = 2100
set gimbal_mode = NORMAL
set acc_hardware = AUTO
set acc_lpf_hz = 10.000
set accxy_deadband = 40
set accz_deadband = 40
set acc_unarmedcal = ON
set acc_trim_pitch = 0
set acc_trim_roll = 0
set baro_tab_size = 21
set baro_noise_lpf = 0.600
set baro_cf_vel = 0.985
set baro_cf_alt = 0.965
set baro_hardware = AUTO
set mag_hardware = AUTO
set mag_declination = 0
set pid_process_denom = 1
set blackbox_rate_num = 0
set blackbox_rate_denom = 0
set blackbox_device = SERIAL
set magzero_x = 0
set magzero_y = 0
set magzero_z = 0

```

```

# rxfail
rxfail 0 a
rxfail 1 a
rxfail 2 a
rxfail 3 a
rxfail 4 h
rxfail 5 h
rxfail 6 h
rxfail 7 h
rxfail 8 h
rxfail 9 h
rxfail 10 h
rxfail 11 h
rxfail 12 h
rxfail 13 h

```



```

rxfail 14 h
rxfail 15 h
rxfail 16 h
rxfail 17 h

# profile
profile 0
##### PROFILE VALUES #####
profile 0

set yaw_p_limit = 400
set pid_delta_method = MEASUREMENT
set dterm_lowpass_hz = 70.000
set dterm_average_count = 4
set iterm_reset_degrees = 200
set yaw_iterm_reset_degrees = 50
set yaw_lowpass_hz = 70.000
set pid_controller = MWREWRITE
set p_pitch = 85
set i_pitch = 40
set d_pitch = 60
set p_roll = 85
set i_roll = 40
set d_roll = 60
set p_yaw = 90
set i_yaw = 40
set d_yaw = 0
set p_alt = 50
set i_alt = 0
set d_alt = 0
set p_level = 25
set i_level = 50
set d_level = 100
set p_vel = 55
set i_vel = 55
set d_vel = 75
rateprofile 0

# rateprofile
rateprofile 0

set rc_rate = 60
set rc_expo = 60
set rc_yaw_expo = 20
set thr_mid = 50
set thr_expo = 0
set roll_rate = 60
set pitch_rate = 60
set yaw_rate = 50
set tpa_rate = 0
set tpa_breakpoint = 1500

```

Complete list of BetaFlight settings for TBS XRacer V1.1 FrSky:

```

# version
# BetaFlight/BEEBRAIN 3.0.1 Oct 27 2016 / 23:13:02 (11090a4)

# name
name -

# mixer
mixer QUADX

mmix reset

# servo
servo 0 1000 2000 1500 90 90 100 -1
servo 1 1000 2000 1500 90 90 100 -1
servo 2 1000 2000 1500 90 90 100 -1
servo 3 1000 2000 1500 90 90 100 -1
servo 4 1000 2000 1500 90 90 100 -1
servo 5 1000 2000 1500 90 90 100 -1
servo 6 1000 2000 1500 90 90 100 -1
servo 7 1000 2000 1500 90 90 100 -1

# servo mix
smix reset

# feature

```



```

feature -RX_PPM
feature -VBAT
feature -INFLIGHT_ACC_CAL
feature -RX_SERIAL
feature -MOTOR_STOP
feature -SERVO_TILT
feature -SOFTSERIAL
feature -GPS
feature -FAILSAFE
feature -SONAR
feature -TELEMETRY
feature -CURRENT_METER
feature -3D
feature -RX_PARALLEL_PWM
feature -RX_MSP
feature -RSSI_ADC
feature -LED_STRIP
feature -DISPLAY
feature -OSD
feature -BLACKBOX
feature -CHANNEL_FORWARDING
feature -TRANSPONDER
feature -AIRMODE
feature RX_PPM
feature FAILSAFE

# beeper
beeper GYRO_CALIBRATED
beeper RX_LOST
beeper RX_LOST_LANDING
beeper DISARMING
beeper ARMING
beeper ARMING_GPS_FIX
beeper BAT_CRIT_LOW
beeper BAT_LOW
beeper GPS_STATUS
beeper RX_SET
beeper ACC_CALIBRATION
beeper ACC_CALIBRATION_FAIL
beeper READY_BEEP
beeper MULTI_BEEPS
beeper DISARM_REPEAT
beeper ARMED
beeper SYSTEM_INIT
beeper ON_USB

# map
map ETAR1234

# serial
serial 0 1 115200 57600 0 115200
serial 1 64 115200 57600 0 115200

# led
led 0 0,0::C:0
led 1 0,0::C:0
led 2 0,0::C:0
led 3 0,0::C:0
led 4 0,0::C:0
led 5 0,0::C:0
led 6 0,0::C:0
led 7 0,0::C:0
led 8 0,0::C:0
led 9 0,0::C:0
led 10 0,0::C:0
led 11 0,0::C:0
led 12 0,0::C:0
led 13 0,0::C:0
led 14 0,0::C:0
led 15 0,0::C:0
led 16 0,0::C:0
led 17 0,0::C:0
led 18 0,0::C:0
led 19 0,0::C:0
led 20 0,0::C:0
led 21 0,0::C:0
led 22 0,0::C:0
led 23 0,0::C:0
led 24 0,0::C:0
led 25 0,0::C:0
led 26 0,0::C:0
led 27 0,0::C:0
led 28 0,0::C:0
led 29 0,0::C:0
led 30 0,0::C:0
led 31 0,0::C:0

# color
color 0 0,0,0
color 1 0,255,255
color 2 0,0,255

```



```
color 3 30,0,255
color 4 60,0,255
color 5 90,0,255
color 6 120,0,255
color 7 150,0,255
color 8 180,0,255
color 9 210,0,255
color 10 240,0,255
color 11 270,0,255
color 12 300,0,255
color 13 330,0,255
color 14 0,0,0
color 15 0,0,0
```

```
# mode_color
mode_color 0 0 1
mode_color 0 1 11
mode_color 0 2 2
mode_color 0 3 13
mode_color 0 4 10
mode_color 0 5 3
mode_color 1 0 5
mode_color 1 1 11
mode_color 1 2 3
mode_color 1 3 13
mode_color 1 4 10
mode_color 1 5 3
mode_color 2 0 10
mode_color 2 1 11
mode_color 2 2 4
mode_color 2 3 13
mode_color 2 4 10
mode_color 2 5 3
mode_color 3 0 8
mode_color 3 1 11
mode_color 3 2 4
mode_color 3 3 13
mode_color 3 4 10
mode_color 3 5 3
mode_color 4 0 7
mode_color 4 1 11
mode_color 4 2 3
mode_color 4 3 13
mode_color 4 4 10
mode_color 4 5 3
mode_color 5 0 9
mode_color 5 1 11
mode_color 5 2 2
mode_color 5 3 13
mode_color 5 4 10
mode_color 5 5 3
mode_color 6 0 6
mode_color 6 1 10
mode_color 6 2 1
mode_color 6 3 0
mode_color 6 4 0
mode_color 6 5 2
mode_color 6 6 3
mode_color 6 7 6
mode_color 6 8 0
mode_color 6 9 0
mode_color 6 10 0
```

```
# aux
aux 0 1 0 900 1300
aux 1 2 0 1300 1700
aux 2 0 0 900 900
aux 3 0 0 900 900
aux 4 0 0 900 900
aux 5 0 0 900 900
aux 6 0 0 900 900
aux 7 0 0 900 900
aux 8 0 0 900 900
aux 9 0 0 900 900
aux 10 0 0 900 900
aux 11 0 0 900 900
aux 12 0 0 900 900
aux 13 0 0 900 900
aux 14 0 0 900 900
aux 15 0 0 900 900
aux 16 0 0 900 900
aux 17 0 0 900 900
aux 18 0 0 900 900
aux 19 0 0 900 900
```

```
# adjrange
adjrange 0 0 0 900 900 0 0
adjrange 1 0 0 900 900 0 0
adjrange 2 0 0 900 900 0 0
adjrange 3 0 0 900 900 0 0
adjrange 4 0 0 900 900 0 0
```



```

adjrange 5 0 0 900 900 0 0
adjrange 6 0 0 900 900 0 0
adjrange 7 0 0 900 900 0 0
adjrange 8 0 0 900 900 0 0
adjrange 9 0 0 900 900 0 0
adjrange 10 0 0 900 900 0 0
adjrange 11 0 0 900 900 0 0
adjrange 12 0 0 900 900 0 0
adjrange 13 0 0 900 900 0 0
adjrange 14 0 0 900 900 0 0

# rxrange
rxrange 0 1000 2000
rxrange 1 1000 2000
rxrange 2 1000 2000
rxrange 3 1000 2000

# rxfail
rxfail 0 a
rxfail 1 a
rxfail 2 a
rxfail 3 a
rxfail 4 h
rxfail 5 h
rxfail 6 h
rxfail 7 h
rxfail 8 h
rxfail 9 h
rxfail 10 h
rxfail 11 h
rxfail 12 h
rxfail 13 h
rxfail 14 h
rxfail 15 h
rxfail 16 h
rxfail 17 h

# master
set mid_rc = 1500
set min_check = 1100
set max_check = 1900
set rssi_channel = 0
set rssi_scale = 30
set rc_interpolation = AUTO
set rc_interpolation_interval = 19
set rssi_ppm_invert = OFF
set input_filtering_mode = OFF
set roll_yaw_cam_mix_degrees = 0
set max_aux_channels = 6
set debug_mode = NONE
set min_throttle = 1000
set max_throttle = 2000
set min_command = 1000
set servo_center_pulse = 1500
set max_esc_throttle_jump = 0
set 3d_deadband_low = 1406
set 3d_deadband_high = 1514
set 3d_neutral = 1460
set 3d_deadband_throttle = 50
set use_unsynced_pwm = ON
set motor_pwm_protocol = BRUSHED
set motor_pwm_rate = 32000
set servo_pwm_rate = 50
set disarm_kill_switch = ON
set gyro_cal_on_first_arm = OFF
set auto_disarm_delay = 5
set small_angle = 25
set fixedwing_althold_dir = 1
set reboot_character = 82
set serialrx_provider = SPEK1024
set sbus_inversion = ON
set spektrum_sat_bind = 0
set spektrum_sat_bind_autoreset = 1
set telemetry_switch = OFF
set telemetry_inversion = ON
set frsky_default_latitude = 0.000
set frsky_default_longitude = 0.000
set frsky_coordinates_format = 0
set frsky_unit = IMPERIAL
set frsky_vfas_precision = 0
set frsky_vfas_cell_voltage = OFF
set hott_alarm_sound_interval = 5
set battery_capacity = 0
set vbat_scale = 110
set vbat_max_cell_voltage = 43
set vbat_min_cell_voltage = 33
set vbat_warning_cell_voltage = 35
set vbat_hysteresis = 1
set current_meter_scale = 400
set current_meter_offset = 0
set multiwii_current_meter_output = OFF

```



```

set current_meter_type = ADC
set align_gyro = DEFAULT
set align_acc = DEFAULT
set align_mag = DEFAULT
set align_board_roll = 0
set align_board_pitch = 0
set align_board_yaw = 0
set max_angle_inclination = 700
set gyro_lpf = 188HZ
set gyro_sync_denom = 1
set gyro_lowpass_type = PT1
set gyro_lowpass = 100
set gyro_notch1_hz = 0
set gyro_notch1_cutoff = 300
set gyro_notch2_hz = 0
set gyro_notch2_cutoff = 100
set moron_threshold = 32
set imu_dcm_kp = 2500
set imu_dcm_ki = 0
set alt_hold_deadband = 40
set alt_hold_fast_change = ON
set deadband = 0
set yaw_deadband = 0
set throttle_correction_value = 0
set throttle_correction_angle = 800
set yaw_control_direction = 1
set yaw_motor_direction = 1
set tri_unarmed_servo = ON
set servo_lowpass_freq = 400
set servo_lowpass_enable = OFF
set airmode_activate_throttle = 1350
set failsafe_delay = 2
set failsafe_off_delay = 0
set failsafe_throttle = 1000
set failsafe_kill_switch = OFF
set failsafe_throttle_low_delay = 100
set failsafe_procedure = DROP
set rx_min_usec = 885
set rx_max_usec = 2115
set gimbal_mode = NORMAL
set acc_hardware = AUTO
set acc_lpf_hz = 10.000
set accxy_deadband = 40
set accz_deadband = 40
set acc_unarmedcal = ON
set acc_trim_pitch = 0
set acc_trim_roll = 0
set pid_process_denom = 1
set blackbox_rate_num = 1
set blackbox_rate_denom = 1
set blackbox_device = SERIAL
set blackbox_on_motor_test = OFF
set ledstrip_visual_beeper = OFF

# profile
profile 0

set pid_delta_method = MEASUREMENT
set yaw_p_limit = 500
set pidsum_limit = 700
set dterm_lowpass_type = BIQUAD
set dterm_lowpass = 100
set dterm_notch_hz = 260
set dterm_notch_cutoff = 160
set vbat_pid_compensation = OFF
set pid_at_min_throttle = ON
set iterm_throttle_gain = 0
set setpoint_relax_ratio = 100
set dterm_setpoint_weight = 254
set yaw_rate_accel_limit = 220
set rate_accel_limit = 0
set accum_threshold = 130
set yaw_accum_threshold = 32
set yaw_lowpass = 0
set pid_controller = BETAFLIGHT
set p_pitch = 80
set i_pitch = 40
set d_pitch = 60
set p_roll = 80
set i_roll = 40
set d_roll = 60
set p_yaw = 90
set i_yaw = 40
set d_yaw = 20
set p_alt = 50
set i_alt = 0
set d_alt = 0
set p_level = 25
set i_level = 50
set d_level = 100
set p_vel = 55

```



```

set i_vel = 55
set d_vel = 75
set level_sensitivity = 1.000
rateprofile 0

# rateprofile
rateprofile 0

set rc_rate = 60
set rc_rate_yaw = 60
set rc_expo = 40
set rc_yaw_expo = 0
set thr_mid = 50
set thr_expo = 0
set roll_srate = 30
set pitch_srate = 30
set yaw_srate = 30
set tpa_rate = 10
set tpa_breakpoint = 1650

```

TBS XRacer V1.1 Futaba & Spektrum DSM2/DSMX

```

# version
# BetaFlight/BEEBRAIN 3.0.1 Oct 27 2016 / 23:13:02 (11090a4)

# name
name -

# mixer
mixer QUADX

mmix reset

# servo
servo 0 1000 2000 1500 90 90 100 -1
servo 1 1000 2000 1500 90 90 100 -1
servo 2 1000 2000 1500 90 90 100 -1
servo 3 1000 2000 1500 90 90 100 -1
servo 4 1000 2000 1500 90 90 100 -1
servo 5 1000 2000 1500 90 90 100 -1
servo 6 1000 2000 1500 90 90 100 -1
servo 7 1000 2000 1500 90 90 100 -1

# servo mix
smix reset

# feature
feature -RX_PPM
feature -VBAT
feature -INFLIGHT_ACC_CAL
feature -RX_SERIAL
feature -MOTOR_STOP
feature -SERVO_TILT
feature -SOFTSERIAL
feature -GPS
feature -FAILSAFE
feature -SONAR
feature -TELEMETRY
feature -CURRENT_METER
feature -3D
feature -RX_PARALLEL_PWM
feature -RX_MSP
feature -RSSI_ADC
feature -LED_STRIP
feature -DISPLAY
feature -OSD
feature -BLACKBOX
feature -CHANNEL_FORWARDING
feature -TRANSPONDER
feature -AIRMODE
feature RX_PPM
feature FAILSAFE

# beeper
beeper GYRO_CALIBRATED
beeper RX_LOST
beeper RX_LOST_LANDING
beeper DISARMING
beeper ARMING
beeper ARMING_GPS_FIX
beeper BAT_CRIT_LOW
beeper BAT_LOW

```



```

beeper GPS_STATUS
beeper RX_SET
beeper ACC_CALIBRATION
beeper ACC_CALIBRATION_FAIL
beeper READY_BEEP
beeper MULTI_BEEPS
beeper DISARM_REPEAT
beeper ARMED
beeper SYSTEM_INIT
beeper ON_USB

# map
map AETR1234

# serial
serial 0 1 115200 57600 0 115200
serial 1 64 115200 57600 0 115200

# led
led 0 0,0::C:0
led 1 0,0::C:0
led 2 0,0::C:0
led 3 0,0::C:0
led 4 0,0::C:0
led 5 0,0::C:0
led 6 0,0::C:0
led 7 0,0::C:0
led 8 0,0::C:0
led 9 0,0::C:0
led 10 0,0::C:0
led 11 0,0::C:0
led 12 0,0::C:0
led 13 0,0::C:0
led 14 0,0::C:0
led 15 0,0::C:0
led 16 0,0::C:0
led 17 0,0::C:0
led 18 0,0::C:0
led 19 0,0::C:0
led 20 0,0::C:0
led 21 0,0::C:0
led 22 0,0::C:0
led 23 0,0::C:0
led 24 0,0::C:0
led 25 0,0::C:0
led 26 0,0::C:0
led 27 0,0::C:0
led 28 0,0::C:0
led 29 0,0::C:0
led 30 0,0::C:0
led 31 0,0::C:0

# color
color 0 0,0,0
color 1 0,255,255
color 2 0,0,255
color 3 30,0,255
color 4 60,0,255
color 5 90,0,255
color 6 120,0,255
color 7 150,0,255
color 8 180,0,255
color 9 210,0,255
color 10 240,0,255
color 11 270,0,255
color 12 300,0,255
color 13 330,0,255
color 14 0,0,0
color 15 0,0,0

# mode_color
mode_color 0 0 1
mode_color 0 1 11
mode_color 0 2 2
mode_color 0 3 13
mode_color 0 4 10
mode_color 0 5 3
mode_color 1 0 5
mode_color 1 1 11
mode_color 1 2 3
mode_color 1 3 13
mode_color 1 4 10
mode_color 1 5 3
mode_color 2 0 10
mode_color 2 1 11
mode_color 2 2 4
mode_color 2 3 13
mode_color 2 4 10
mode_color 2 5 3
mode_color 3 0 8
mode_color 3 1 11

```



```
mode_color 3 2 4
mode_color 3 3 13
mode_color 3 4 10
mode_color 3 5 3
mode_color 4 0 7
mode_color 4 1 11
mode_color 4 2 3
mode_color 4 3 13
mode_color 4 4 10
mode_color 4 5 3
mode_color 5 0 9
mode_color 5 1 11
mode_color 5 2 2
mode_color 5 3 13
mode_color 5 4 10
mode_color 5 5 3
mode_color 6 0 6
mode_color 6 1 10
mode_color 6 2 1
mode_color 6 3 0
mode_color 6 4 0
mode_color 6 5 2
mode_color 6 6 3
mode_color 6 7 6
mode_color 6 8 0
mode_color 6 9 0
mode_color 6 10 0
```

```
# aux
aux 0 1 0 900 1300
aux 1 2 0 1300 1700
aux 2 0 0 900 900
aux 3 0 0 900 900
aux 4 0 0 900 900
aux 5 0 0 900 900
aux 6 0 0 900 900
aux 7 0 0 900 900
aux 8 0 0 900 900
aux 9 0 0 900 900
aux 10 0 0 900 900
aux 11 0 0 900 900
aux 12 0 0 900 900
aux 13 0 0 900 900
aux 14 0 0 900 900
aux 15 0 0 900 900
aux 16 0 0 900 900
aux 17 0 0 900 900
aux 18 0 0 900 900
aux 19 0 0 900 900
```

```
# adjrange
adjrange 0 0 0 900 900 0 0
adjrange 1 0 0 900 900 0 0
adjrange 2 0 0 900 900 0 0
adjrange 3 0 0 900 900 0 0
adjrange 4 0 0 900 900 0 0
adjrange 5 0 0 900 900 0 0
adjrange 6 0 0 900 900 0 0
adjrange 7 0 0 900 900 0 0
adjrange 8 0 0 900 900 0 0
adjrange 9 0 0 900 900 0 0
adjrange 10 0 0 900 900 0 0
adjrange 11 0 0 900 900 0 0
adjrange 12 0 0 900 900 0 0
adjrange 13 0 0 900 900 0 0
adjrange 14 0 0 900 900 0 0
```

```
# rxrange
rxrange 0 1000 2000
rxrange 1 1000 2000
rxrange 2 1000 2000
rxrange 3 1000 2000
```

```
# rxfail
rxfail 0 a
rxfail 1 a
rxfail 2 a
rxfail 3 a
rxfail 4 h
rxfail 5 h
rxfail 6 h
rxfail 7 h
rxfail 8 h
rxfail 9 h
rxfail 10 h
rxfail 11 h
rxfail 12 h
rxfail 13 h
rxfail 14 h
rxfail 15 h
rxfail 16 h
```



```

rxfail 17 h

# master
set mid_rc = 1500
set min_check = 1100
set max_check = 1900
set rssi_channel = 0
set rssi_scale = 30
set rc_interpolation = AUTO
set rc_interpolation_interval = 19
set rssi_ppm_invert = OFF
set input_filtering_mode = OFF
set roll_yaw_cam_mix_degrees = 0
set max_aux_channels = 6
set debug_mode = NONE
set min_throttle = 1000
set max_throttle = 2000
set min_command = 1000
set servo_center_pulse = 1500
set max_esc_throttle_jump = 0
set 3d_deadband_low = 1406
set 3d_deadband_high = 1514
set 3d_neutral = 1460
set 3d_deadband_throttle = 50
set use_unsynced_pwm = ON
set motor_pwm_protocol = BRUSHED
set motor_pwm_rate = 32000
set servo_pwm_rate = 50
set disarm_kill_switch = ON
set gyro_cal_on_first_arm = OFF
set auto_disarm_delay = 5
set small_angle = 25
set fixedwing_althold_dir = 1
set reboot_character = 82
set serialrx_provider = SPEK1024
set sbus_inversion = ON
set spektrum_sat_bind = 0
set spektrum_sat_bind_autoreset = 1
set telemetry_switch = OFF
set telemetry_inversion = ON
set frsky_default_latitude = 0.000
set frsky_default_longitude = 0.000
set frsky_coordinates_format = 0
set frsky_unit = IMPERIAL
set frsky_vfas_precision = 0
set frsky_vfas_cell_voltage = OFF
set hott_alarm_sound_interval = 5
set battery_capacity = 0
set vbat_scale = 110
set vbat_max_cell_voltage = 43
set vbat_min_cell_voltage = 33
set vbat_warning_cell_voltage = 35
set vbat_hysteresis = 1
set current_meter_scale = 400
set current_meter_offset = 0
set multiwii_current_meter_output = OFF
set current_meter_type = ADC
set align_gyro = DEFAULT
set align_acc = DEFAULT
set align_mag = DEFAULT
set align_board_roll = 0
set align_board_pitch = 0
set align_board_yaw = 0
set max_angle_inclination = 700
set gyro_lpf = 188HZ
set gyro_sync_denom = 1
set gyro_lowpass_type = PT1
set gyro_lowpass = 100
set gyro_notch1_hz = 0
set gyro_notch1_cutoff = 300
set gyro_notch2_hz = 0
set gyro_notch2_cutoff = 100
set moron_threshold = 32
set imu_dcm_kp = 2500
set imu_dcm_ki = 0
set alt_hold_deadband = 40
set alt_hold_fast_change = ON
set deadband = 0
set yaw_deadband = 0
set throttle_correction_value = 0
set throttle_correction_angle = 800
set yaw_control_direction = 1
set yaw_motor_direction = 1
set tri_unarmed_servo = ON
set servo_lowpass_freq = 400
set servo_lowpass_enable = OFF
set airmode_activate_throttle = 1350
set failsafe_delay = 2
set failsafe_off_delay = 0
set failsafe_throttle = 1000
set failsafe_kill_switch = OFF

```



```

set failsafe_throttle_low_delay = 100
set failsafe_procedure = DROP
set rx_min_usec = 885
set rx_max_usec = 2115
set gimbal_mode = NORMAL
set acc_hardware = AUTO
set acc_lp_hz = 10.000
set accxy_deadband = 40
set accz_deadband = 40
set acc_unarmedcal = ON
set acc_trim_pitch = 0
set acc_trim_roll = 0
set pid_process_denom = 1
set blackbox_rate_num = 1
set blackbox_rate_denom = 1
set blackbox_device = SERIAL
set blackbox_on_motor_test = OFF
set ledstrip_visual_beeper = OFF

# profile
profile 0

set pid_delta_method = MEASUREMENT
set yaw_p_limit = 500
set pidsum_limit = 700
set dterm_lowpass_type = BIQUAD
set dterm_lowpass = 100
set dterm_notch_hz = 260
set dterm_notch_cutoff = 160
set vbat_pid_compensation = OFF
set pid_at_min_throttle = ON
set iterm_throttle_gain = 0
set setpoint_relax_ratio = 100
set dterm_setpoint_weight = 254
set yaw_rate_accel_limit = 220
set rate_accel_limit = 0
set accum_threshold = 130
set yaw_accum_threshold = 32
set yaw_lowpass = 0
set pid_controller = BETAFLIGHT
set p_pitch = 80
set i_pitch = 40
set d_pitch = 60
set p_roll = 80
set i_roll = 40
set d_roll = 60
set p_yaw = 90
set i_yaw = 40
set d_yaw = 20
set p_alt = 50
set i_alt = 0
set d_alt = 0
set p_level = 25
set i_level = 50
set d_level = 100
set p_vel = 55
set i_vel = 55
set d_vel = 75
set level_sensitivity = 1.000
rateprofile 0

# rateprofile
rateprofile 0

set rc_rate = 60
set rc_rate_yaw = 60
set rc_expo = 40
set rc_yaw_expo = 0
set thr_mid = 50
set thr_expo = 0
set roll_srate = 30
set pitch_srate = 30
set yaw_srate = 30
set tpa_rate = 10
set tpa_breakpoint = 1650

```



Maintenance

Replacing propellers

The propellers on a quadcopter have two rotational profiles, counterclockwise and clockwise. Getting these right is important for proper flight. Take note, or use the picture below, to find out which way the leading edge of the propeller should turn. The kit comes with two sets of propellers.

1. Use a small piler to use as a lever to push the propeller off the motor shaft
2. Separate the new propellers into two batches, with the letters facing up; counter-clockwise (marked B1 or B2) and clockwise (marked A1 or A2) type



3. Use the picture above to install the propellers on the motor shafts. An easy way to remember the rotation is that the leading-edge/tip of the two front propellers always face each other and likewise on the tip of the two rear propellers.



Replacing motors

If you have a damaged motor or a bent shaft, you can replace it with one of the two extras supplied in the kit.

There are two brushed motor types, counterclockwise and clockwise rotation. Motor rotation and correct polarity is indicated by the wire color:

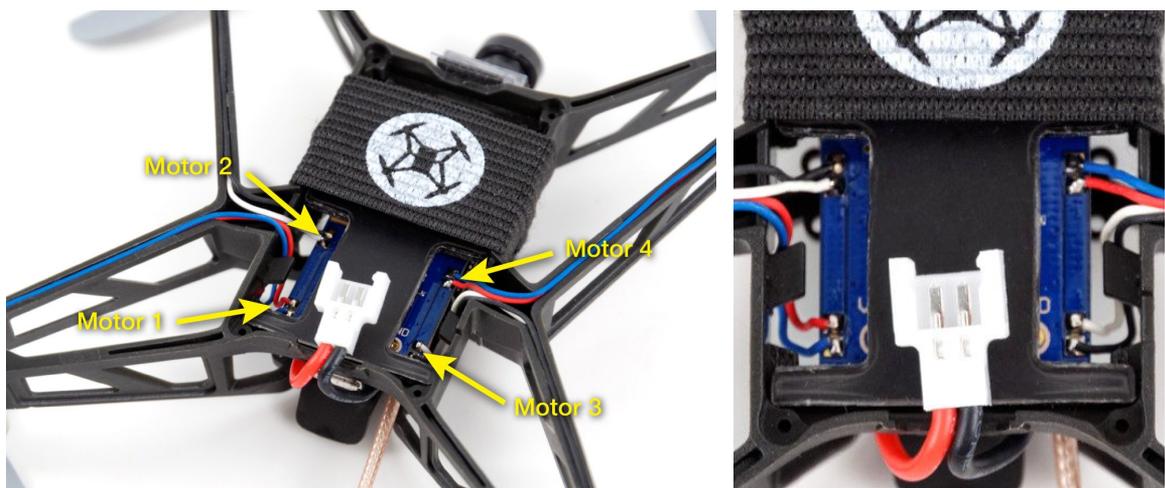
- Counterclockwise motor: **white** (+), **black** (-), grey back plate - for motor 3 and motor 2
- Clockwise motor: **red** (+), **blue** (-), white black plate - for motor 1 and motor 4

Note: running the motors in their wrong direction will dampen its performance and lifespan.

1. Remove the propeller from the shaft



2. Unsolder the two wires from the main controller board. Take note of which wire goes to each pad, as this dictates the direction of rotation. The numbers refers to the motor in BetaFlight.



3. Untangle the wires from the arm and use a small screwdriver and push the motor out of its socket.



4. Replace the motor and solder the wires in place and put on the propeller as shown in the following picture.



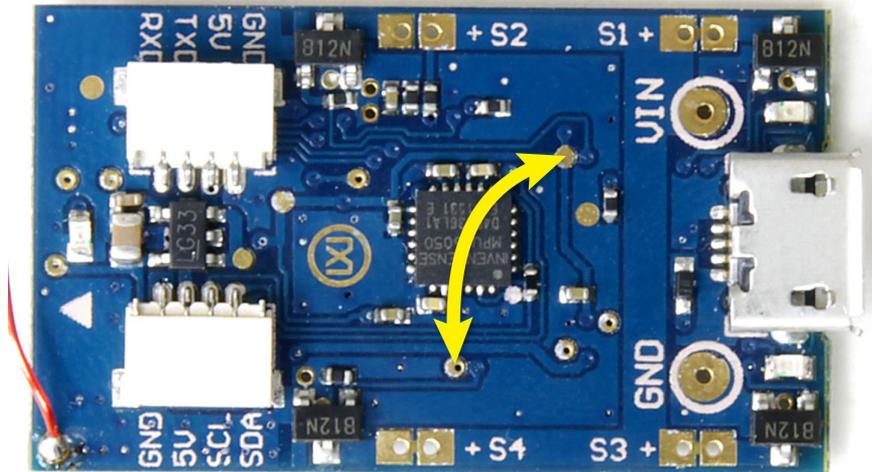
Firmware upgrade

Updating the firmware to the latest CleanFlight or BetaFlight is possible via the USB interface, as long as the board is in bootloader mode.

Bootloader mode

For this you need a soldering iron, solder and a piece of wire.

1. Remove the main board from the frame
2. Solder a wire between the two pads marked on the following picture



3. Connect the board to USB and open BetaFlight/CleanFlight, click the “Flash”-tab
4. Either download the latest firmware or pick a local firmware file and click “Flash Firmware”



Troubleshooting

- If the motors spin up when the battery is plugged in, connect the XRacer to CleanFlight. Open the "CLI"-tab and type the following to enable brushed motors and press enter:
"set motor_pwm_rate=32000"
"save"
- If you see lines on the video coming from the XRacer, the battery voltage is low and you need to charge it.
- If the video quality drops off quickly when you fly farther than 10m away, ensure that the pigtail is securely connected to the UFL plug on the VTx. If needed, you can glue it to the VTx.



Good practices

We have compiled a list of all of practices which have been tried and tested in countless environments and situations by the TBS crew and other experienced FPV pilots.

Follow these simple rules, even if rumors on the internet suggest otherwise, and you will have success in FPV.

- Start with the bare essentials and add equipment one step at a time, after each new equipment was added to proper range- and stress tests.
- Do not fly with a video system that is capable of outperforming your R/C system in terms of range.
- Do not fly with a R/C frequency higher than the video frequency (e.g. 2.4GHz R/C, 900MHz video).
- Monitor the vitals of your plane (R/C link and battery). Flying with a digital R/C link without RSSI is dangerous.
- Do not use 2.4GHz R/C unless you fly well within its range limits, in noise-free environments and always within LOS. Since this is most likely never the case, it is recommended to not use 2.4GHz R/C systems for longer range FPV.
- Do not fly at the limits of video, if you see noise in your picture, turn around and buy a higher-gain receiver antenna before going out further.
- Shielded wires or twisted cables only, anything else picks up RF noise and can cause problems.
- When using powerful R/C transmitters, make sure your groundstation equipment is properly shielded.
- Adding Return-To-Home (RTH) to an unreliable system does not increase the chances of getting your plane back. Work on making your system reliable without RTH first, then add RTH as an additional safety measure if you must.
- Avoid powering the VTx directly from battery, step-up or step-down the voltage and provide a constant level of power to your VTx. Make sure your VTx runs until your battery dies.
- Do not power your camera directly unless it works along the complete voltage range of your battery. Step-up or step-down the voltage and provide a constant level of power to your camera. Make sure your camera runs until your battery dies.
- A single battery system is safer than using two dedicated batteries for R/C and FPV. Two batteries in parallel even further mitigate sources of failure.
- For maximum video range and "law compatibility", use 2.4GHz video with high-gain antennas.
- When flying with R/C buddies that fly on 2.4GHz, or when flying in cities, it is perfectly possible to use 2.4GHz video provided you stick to the channels that do not lie in their band (CH5 to CH8 for Lawmate systems, available from TBS).
- Do not use diversity video receivers as a replacement for pointing your antennas, diversity should be used to mitigate polarization issues.



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- Improving the antenna gain on the receiver end is better than increasing the output power (except in RF-noisy areas). More tx power causes more issues with RF noise on your plane. 500mW is plenty of power!
 - Try to achieve as much separation of the VTx and R/C receiver as possible to lower the RF noise floor and EMI interference.
 - Do not buy cheap equipment unless it is proven to work reliably (e.g. parts falling off, multitudes of bug fix firmware updates, community hacks and mods are a good indicator of poor quality and something you do NOT want to buy for a safe system). Do some research before sending your aircraft skyward to insure both you and the people around you stay safe.

Manual written and designed by ivc.no in cooperation with TBS.

