



Builders guide - FlightClub PROton (Witchcraft)

Safety First

Please build, fly and configure your drone safely. Moving propellers and mishandled lithium batteries can cause serious damage to person and property. It is your responsibility to operate **safely when flying and handling your 'drone'!**

Some related external resources (by no means exhaustive!): -

- The Home of British FPV Racing
- <u>Dronesafe</u>



Why build this quad?

FPV FlightClub is a US store who also design frames (and sponsor racing Pilots). The attention to detail FlightClub invest in their frames is spectacular, their Tokio was the first frame I was aware of to use chamfered edges on the carbon, they tried many different types of carbon (a lot of manufacturers say this but in FlightClubs case I was involved in some of the testing) and the "Buttermount" is just brilliant.

The Proton is the latest frame from FlightClub and is a light frame which can be configured a number of ways, the version we are building here is the Skeleton, the lightest one and I have to say, having built it if flies spectacularly well.

The frame has all the usual features from FlightClub such as Buttermount for the flight controller, countersunk screws so you have a flat bottom – no screw head damage to the LiPo, mounts for a micro cam, VTX antenna and RX antennae, a mount point for the VTX and an innovative aluminium plate which removes the requirement for lock nuts.

Quite honestly this is the cleanest build I have, nothing is held in place with zip ties, nothing is attached to the top plate, it just fits. On top of this it flies superbly, my first flight I referred to it as "Witchcraft" and honestly, I stick by it.

Don't be deceived by the description as being "Racing Quad", this thing makes an excellent acro quad, there are arms options that can be used to make it more suited to that. It is simply the best frame I have

Parts list

Frame: FlightClub PROton Ultralight Racing Quad

Flight Stack: Sunrise Siskin 4 in 1 30A ESC, F4 FC and OSD (2-4S)

Motors: BrotherHobby Returner R5 2306 2450kv (Deadpool are always popular but I prefer the RedHulks, the photos never do them justice, they are not flat scarlet but bright metallic red, see the photo at the front

VTX: TBS Unify Pro HV Race

Camera: Foxeer Arrow Micro (Runcam Swift Micro will fir just as well, but I prefer the Foxeer, it has proved more robust)

Receiver: FrSky XM+

VTX antenna: Lumenier Axii ufl

Ancillary Parts: XT60 connector, shorter standoffs (20mm) can be used

Tools: Soldering iron and solder, side trimmers, craft knife, hot glue gun, hex drivers, blue threadlock

Other useful stuff: files and wet-and-dry paper, hot air gun, tweezers.



Preparation and Dry Build

There is no prep work required on this quad, FlightClub are pretty good at making sure everything is right. Dry building the frame is always recommended to work out where everything fits. FlightClub have done a nice video that shows how to assemble the quad an in the interest of not reinventing the wheel it can be found here:

https://www.youtube.com/watch?v=XuWfn1731PA&t=29s

The xm+ sits below the flight controller with the bind button visible through the bottom of the frame (although the battery strap may need to be moved to access it). There is a carbon plate which sits above the flight controller and the VTX comes with double sided tape which can be used to stick it to the plate.

Wiring Diagram

Below is the wiring diagram for the Quad:





The Build

It is important to check the flight controller can connect to Betaflight and the gyro is working correctly before soldering anything, once something is soldered to the board it will void any warranty.

Use of a flux pen and a small tip on the soldering iron is recommended as the pads on the flight controller are quite small.

I found it easiest to mount the flight controller and motors and then cut wires and solder. The order which is easiest is:

- XT60 connector
- Motors
- The rest

This approach means you will not be applying a lot of heat to the board to connect something like an XT60 ground when something has a much smaller connection and could get de-soldered by heat wicked from the XT60

It is generally good practice to use the following approaches:

- Use a smoke stopper during testing
- Use a multimeter to check the continuity (or lack of) before testing anything
- Do one component at a time and test before moving on to the next one

Configuration

There are three things to configure; the Flight controller, the ESCs and the FPV components, a couple of general rules:

- 1. PROPS -never ever ever plug the LiPo in with props on when you are working on your quad. Quite aside from any damage to your equipment, this is likely to cause a very angry, sharp and fast moving set of blades to make contact with your face or hands and result in very serious injury. Always remove the props when working on the quad, it is a pain in the bum but you do not want to learn the lesson the hard way. Make it a habit.
- 2. It is assumed the radio has been bound to the receiver, there are many guides available on how to do this as well as instructions that come with the receiver

Configuring the Flight controller - Butterflight?

First we are going to use Butterflight here. I have set the quad up using Betaflight and it worked fantastically. However there are builders guides already which explain how to flash and configure Betaflight and the can be used for this quad just fine. Butterflight is the new kid on the block so it is being used as an example.

To install Butterflight you need to download the Butterflight configurator from here and install it



http://butterflight.co/

Go to the "get Butterflight Configurator" **button and click it then click on the version** of configurator for your operating system and it will download, then run the install program in the download and the configurator will install.

When you open the configurator it will look very familiar:



Notice the white panel on the left side entitled "Starter settings for Butter", it is worth taking a copy of these, although we are going to adjust them slightly.

Plug the flight controller into the PC go to the "Flash Firmware" tab.

From the top drop down select OMNIBUS F4

From the second drop down select the latest stable version, then click on Load Firmware (online) at the bottom and once the firmware has loaded click on Flash Firmware





The firmware should flash but if it is the first time Butterflight has been flashed the board may not go into DFU mode (because it does not match the existing firmware), this can be fixed by either using the boot button when you plug the USB in or by using Betaflight configurator and using the DFU command then switching to the Butterflight configurator.

The latest version of Butterflight will then flash to the board.

Make use the com port is shown at the top and then click on Connect

Go to the ports tab and set UART1 to Serial rx and click Save and Reboot



S Butterflight Configurator										-	٥	×
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🖆 Ports	Ports										WI	IKI
Configuration	Note: not	all combinations	are valid. When the i	flight controller firm	ware detects this the serial po	rt configuration	will be reset.	nuration if you do				
Power & Battery	Note: Do		on the first serial po	rt uniess you know	what you are doing. You may r	iave to renash a	no erase your coniț	guration ir you do				
ដំ PID Tuning	Identifier	Con	figuration/MSP	Serial Rx	Telemetry Output		Sensor In	put	Perip	herals		
n Receiver	USB VCP		115200 🔻		Disabled v AUTO	•	Disabled 🔻 A	NUTO ▼	Disabled	 AUTC 	T	
B Modes	UART1	0	115200 🔻		Disabled • AUTO	•	Disabled ¥ A	VTO ▼	Disabled	▼ AUTC	T	
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III Blackbox												
🖭 CLI												
										Save a	nd Repo	ot
Port utilization: D: 21% U: 1%	Packet error: 0	I2C error: 0	Cycle Time: 128	CPU Load: 7%				Firmwa	re: BTTR 3.4.2 (Target: O	BF4), Config	urator: 1	10.2.0

Once the board has rebooted, reconnect and go to the Configuration tab

In the mixer pane, enable "Motor Direction is Reversed"

In the ESX/Motor Features select DShot1200 from the drop down.

I also enable motor stop because I prefer to use Air Mode on a switch so I can disable it for landing, this stops the infamous Air Mode bounce landings and allows me to stop the motors by dropping the throttle when I land.



S Butterflight Configurator					– 🗗 🗙
Configurator: 10.2.0 Firmware: BTTR 3.4.3	G H T C Target: OBF4)	• • v • • •	Syro Accel	No dataflash chip found	E Mode Disconnect
2018-03-10 @ 23:35:37 Arming D	sabled				Show Log
🗲 Setup	Carlin				
🖌 Ports	Configuration				
Configuration	Note: Not all combinations of features are valid. When the	e flight controller firmware detects inval	id feature combinations conflicting features	will be disabled.	
Power & Battery	Hore: compare series ports series e maxing the reateres	and the are porte.			
ដំ PID Tuning	Mixer		ESC/Motor Features		
na Receiver	Quad X	۲	DSHOT1200 ESC/Motor prot	ocol	0
a Modes			MOTOR_STOP Do	n't spin the motors when arn	ned
🛔 Motors			4.3 🔶 Motor Idle Throttle Value [p	ercent]	0
🚥 OSD	+				
📲 Blackbox					
🖻 CLI	3 reversed				
	Motor direction is reversed	0	Board and Sensor Alignment		0
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	System configuration		0 🗘 🜒 Pitch Degrees	ACCEL Alignment	Default 🔻
					Save and Reboot
Port utilization: D: 21% U: 1% Pa	:ket error: 0 12C error: 0 Cycle Time: 125 CPU Lo	ad: 7%		Firmware: BTTR 3.4.2 (Targe	et: OBF4), Configurator: 10.2.0

Scroll down, in the System Configuration panel set the PID loop Frequency to 8Khz and disable the Barometer and Magnetometer

In the personalisation Panel enter the Quad or Pilot name

S Butterflight Configurator		- 0 ×
Configurator: 10.2		ov X A B X No dstaflach Chip found X
Firmware: BTTR 3.		
2018-03-10 @ 23:35:37 Arming	Disabled	Show Log
	System configuration	0 CRO Alignment Default V
Nº Ports		0 CEL Alignment Default
Configuration	Note: Make sure your FC is able to operate at these speeds! Check CPU and cycletim stability. Changing this may require PID re-tuning. TIP: Disable Accelerometer and ot sensors to gain more performance.	other 0 ♀ Yaw Degrees MAG Alignment Default ▼
🖾 Power & Battery	Enable grap 22kHz campling mode	Accelerometer Trim
	Chable gyro 32kHz sampling mode	
📩 Receiver	8 KHZ V Gyro update frequency	0
8 Modes	8 kHz PID loop frequency	Accelerometer Pitch Trim
🛓 Motors	Accelerometer	Arming
© OSD	Barometer (if supported)	Arning
Blackbox	Magnetometer (if supported)	25 🗘 Maximum ARM Angle [degrees]
	Personalization	
	Adam Craft name	
	Camera	
	0 \$ FPV Camera Angle [degrees]	
	Receiver	RSSI (Signal Strength)
		Save and Reboot
Port utilization: D: 21% U: 1%	acket error: 0 12C error: 0 Cycle Time: 125 CPU Load: 7%	Firmware: BTTR 3.4.2 (Target: OBF4), Configurator: 10.2.

Scroll down, in the Receiver Panel set the Serial Receiver Provider to SBus



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2018-03-10 @ 23:35:37 Arming Disabled	Show Log
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≰ Ports Receiver	RSSI (Signal Strength)
Configuration Serial-based receiver (SPEKSAT, S Receiver Mode	RSSI ADC Analog RSSI input
🖾 Power & Battery	
A PID Tuning Note: Remember to configure a Serial Port (via Ports tab) and choose a Serial Rec Provider when using RX_SERIAL feature.	eiver
da Receiver SBUS Serial Receiver Provider	
Modes	
Motors Other Features	3D ESC/Motor Features
OSD Note: Not all features are supported by all flight controllers. If you enable a speci- feature, and is indicabled after you bit "Save and Reboot" is meaner that this feature	ic 3D 3D mode (for use with reversible ESCs)
: III: Blackbox	
CLI INFLIGHT_ACC_CAL In-flight level calibration	GPS
SERVO_TILT Servo gimbal	GPS GPS for navigation and telemetry
SOFTSERIAL Enable CPU based serial ports	0
SONAR Sonar	
TELEMETRY Telemetry output	
LED_STRIP Multi-color RGB LED strip support	*
	Save and Report
Port utilization: D: 21% U: 1% Packet error: 0 I2C error: 0 Cycle Time: 129 CPU Load: 7%	Firmware: BTTR 3.4.2 (Target: OBF4), Configurator: 10.2.0

Scroll down and in the Other Features Panel, ensure the follow are the features that are enabled:

OSD

Anti_Gravity

Dynamic_Filter

I also disable all beeper settings (because there isn't a beeper on the quad)

Then click on Save and Reboot



S Butterflight Configurator						– o ×
Configurator: 10.2.0 Firmware: BTTR 3.4.2 (TER 5 H T		•ov ▲ ♥ <i>⊘</i>	Gyro Accel Mag	No dstaflach chip found Daro SPS Sonar	Disconnect
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🖌 Setup	Note: Not all features are supported by feature, and it is disabled after you hit supported on your board.	r all flight controllers. If you enable Save and Reboot', it means that th	e a specific his feature is not	3D	3D mode (for use with reversible ESCs)	A
🖌 Ports				GPS		
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Power & Battery	SERVO_TILT	Servo gimbal		dis	di 5 toi navigation and telenically	
♣ PID Tuning	SOFTSERIAL	Enable CPU based serial ports	0			
n Receiver	SONAR	Sonar				
2 Modes	TELEMETRY	Telemetry output				
 ▲ Motors	LED_STRIP	Multi-color RGB LED strip suppo	rt			
	DISPLAY	OLED Screen Display	0			
	CHANNEL_FORWARDING	Forward aux channels to servo o	outputs			
E Blackbox	TRANSPONDER	Race Transponder	0			
🖻 CLI	AIRMODE	Permanently enable Airmode				
	OSD	On Screen Display				
	ESC_SENSOR	Use KISS/BLHeli_32 ESC telemet	ry as sensor			
	ANTI_GRAVITY	Temporary boost I-Term on high	throttle changes			
	DYNAMIC_FILTER	Dynamic gyro notch filtering				
Port utilization: D: 21% U: 1% Packe	et error: 0 I2C error: 0 Cycle Time: 1	28 CPU Load: 7%			Firmware: BTTR 3.4.2 (Target: OB	F4), Configurator: 10.2.0

When the Flight Controller has rebooted, reconnect.

Go to the PID tuning tab, the PIDS show below are ballpark, it will vary depending on what props you are using as well as if you use different arms, different lipos, etc:

The rates are what I use for general flying, you should put your own rates in

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2018-03-10 @ 23:35:37 Arming	Disabled Show Log
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ភ្នំ PID Tuning	PID Settings Filter Settings
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🖀 Modes	Proportional integral Derivative RC nate Super nate [deg/s] RC CXp0
🛔 Motors	Basic/Adv
🚥 OSD	PITCH 38
Blackbox	YAW 67 < 45 < 1.30 < 0.80 < 1262 0.00 < 0 deg/s
🖻 CLI	Angle/Horizon
	Strength Transition
	Angie 50 ¢
	Horizon 50 ¢ 75 ¢
	Angle Limit
	PID Controller Settings Throttle MID Throttle EXPO
Port utilization: D: 32% U: 3% F	acket error: 0 12C error: 0 Cycle Time: 125 CPU Load: 7% Firmware: BTTR 3.4.2 (Target: OBF4), Configurator: 10.2.0



Then go to the Filter Settings section and ensure it is set up as shown below and click on Save

S Butterflight Configurator					- 0	×
Configurator: 10. Firmware: BTR 3	TTER I G H T 1.0 4.2 (Target: OBF4)	□ ov 🐹 🙏 ▲ 🗇 🖉 Gyro Accel		No datafiash chip found	Disconnect	¢°
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Configuration	Tuning tinc					
Power & Battery	IMPORTANT: It is important to verify motor temperatures during Default value of 100Hz is optimal, but for poiser setures you can	the first flights. The higher the filter value gets the bet	ter it may fly, but you also the syro filter	will get more noise into the motors.		
☆ PID Tuning	D-Term Lowpass Filter	.,				
📩 Receiver	PT1 V					
🖀 Modes	Profile independent Filter Settings					
hotors	90 \$	Gyro Soft Lowpass Frequency [Hz]	0			
-		Enable Gyro Notch Filter 1				
w OSD	0 🌩	Gyro Notch Filter 1 Frequency [Hz]	0			
📳 Blackbox	0 ‡	Gyro Notch Filter Cutoff 1 Frequency [Hz]	0			
🖻 CLI		Enable Gyro Notch Filter 2	0			
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	Filter Settings					
	100 ‡	D Term Lowpass Frequency [Hz]	0			
		Enable D Term Notch Filter				
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	160 🌩	D Term Notch Filter Cutoff [Hz]	0			
	0 *	Yaw Lownass Frenuency [Hz]	0			Ŧ
				Re	fresh Save	
Port utilization: D: 34% U: 3%	Packet error: 0 12C error: 0 Cycle Time: 128 CPU Load: 7%		F	irmware: BTTR 3.4.2 (Target: OBF4	, Configurator: 10).2.0

Go to the Receiver Tab

From the Channel map drop down select Spktrum / Graupner / JR

From the RSSI channel drop down select Aux 12

Click on Save



Sutterflight Configurator											- 0	×
Configurator: 10. Firmware: BTR 3	2.0 3.4.2 (Target: OBF4	-l)		■ •v ▲ ♥ ∂	Syro Accel	A N Mag Ba	ro GPS	Sonar	No data chip fo	lash und pert Mode	Disconn	¢° ect
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🖌 Setup	Receive	۶r									v	лкі 🔺
¥ Ports												_
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W Conliguration	range.	T: Before flying read failsafe chapter (- of documentation and co	onfigure failsafe								
Power & Battery		read randore righting read randore enapter t		oningure tonsure.								
♣ PID Tuning	Roll [A]		1500		Channel Map					RSSI Chan	nel	. I
& Receiver	Pitch [E]		1500		TAER1234				•	AUX 12		•
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	AUX 4		1500		RC Deadband	,	Yaw Deadt	and	3D Thrott	le Deadband	i	
Elackbox	AUX 5		1500		3	0 0		3 👌 (0		50 💲	0
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	AUX 7		1500		RC Interpolatio	'n						
	AUX 8		1500									-
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	AUX 10		1500									
	AUX 11		15 00		Preview							
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	AUX 13		15 00									
	AUX 14		15 00									-
										Ret	fresh	Save
Port utilization: D: 10% U: 0%	Packet error: 0	I2C error: 0 Cycle Time: 125	CPU Load: 7%					Firmware	: BTTR 3.4.2 (T	arget: OBF4)	, Configura	or: 10.2.0

Go to the Modes Tab

Set up the modes as required, in the screen shot below I am using:

A three position switch on Aux 1 to give Disarmed / Armed / Armed and Air Mode

A three position switch on Aux 2 to give Rate mode / Horizon Mode / Angle mode

A momentary switch on Aux 3 to give Pre Arm

Click Save when done



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Configurator: 10.2 C Firmware: BTTR 3.4	GHT 2(Target: OBF4)					••• • • •	Syro	Accel			ar 🕞 i	No datafiash chip found inable Expert Mode	Discon	nect
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🖋 Setup	Modos													
🗩 Ports	Modes													WIN
Configuration	Use ranges to defi	ine the switches o	n your transr	nitter and corr	esponding	mode assignmen	s. A receiver	channel tha	t gives a readi	ng between a ra	ange min/max	will activate the m	ode. Rememi	ber
Power & Battery	to save your settin													
င္ဆီ PID Tuning	ARM	AUX 1 🔻												8
n Receiver	Add Range	Min: 900 Max: 1700	900	' 1000	1	200	' 1400	' 1500	1600		800	2000	 2100	
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🚥 OSD	Add Range	Min: 900 Max: 1300	900	I 1000	1	1 200	1400	1500	1600		1800	1 2000	1 2100	
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🖻 CLI	HURIZON	AUX 2 V		1.2		<u>, , , , , , , , , , , , , , , , , , , </u>	· 1	1.0			1			
	Add Range	Max: 1700	900	1000	1	200	1400	1500	1600		1800	2000	2100	
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Port utilization: D: 27% U: 2% Pa	acket error: 0 12C e	rror: 0 Cycle	Time: 128	CPU Load: 7	96					Firn	nware: BTTR	3.4.2 (Target: OBF	4), Configura	ator: 10.2.0

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ஃ PID Tuning	Add Range									
n Receiver	CAMERA									
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🚥 OSD	FLIP OVER AFTER CRASH									
📲 Blackbox	Add Range									
🖻 CLI	PREARM	AUX 3 🔻							•	
	Add Range	Min: 1500 Max: 2100	 900 1000	1200	' 1400	1500 16	00 1800	2000	2100	
	VTX PIT MODE									
	Add Range									
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									Save	
Port utilization: D: 23% U: 2%	Packet error: 0 I2C e	rror: 0 Cycle	Time: 128 CPU Load	: 7%			Firmwa	re: BTTR 3.4.2 (Target: OB	F4), Configurator: 10.2	2.0



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Configurator: 10.2 C Firmware: BTTR 3.4	G H T 2 (Target: OBF4)			••• •• •• ••	Syro Acce			No dataflash chip found	Disconnect	¢°
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nd Receiver	And Hange									
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		and Carls Time 425	CDULL and TA				-	DTTD 0 4 0 (Tourse 0054)	Sa	ve
Port utilization: D: 26% U: 2% Pa	acket error: 0 12C er	Cycle Time: 125	CPU Load: 7%				Firmware:	BTTR 3.4.2 (Target: OBF4)	, configurator:	10.2.0

Go to the Motor Tab

Here we are going to check the direction of rotation of the motors

Make sure you have removed your props

Click the I understand the risks switch in the bottom right quarter of the window,

Plug the lipo in.

One motor at a time, slowly raise the slider, until the motor starts to turn smoothly

Compare the direction the motor turns in to the corresponding arrow in the diagram at the top left,

Take a note of any motors that are spinning in the wrong direction

Stop that motor and go on to the next one

When all four motors are done disconnect the lipo



Sutterflight Configurator										– 🛛 ×
Configurator: 10 Firmware: BTTR	JTTER IGHT).2.0 3.4.2 (Target: OBI									Syro Accel Mag Earo CHS Sonar Image: Sonar Image: Sonar Disconnect
2018-03-11 @ 01:14:17 Runa	way Takeoff Prev	ention ter	mporari	ly Disable	d					Show Log
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Configuration			2000							RESET gyro V
Power & Battery	4	2	1000							Refresh: 20 ms 🔻
ஃ PID Tuning		1	0							Scale: 2000 ¥
de Receiver	(3)	1	-1000							Y: -0.24(0.73)
Modes		reversed	-2000	2	200		250		300	350 400 450 Z: 0.24 (0.49)
💧 Motors										
OSD OSD					Motors		_			Servos
: Blackbox	1	2	3	4	5	0	/	8		
🖾 CLI	1000	1000	1000	1000	0	0	0	0		
					-	-		-		
										Motor Test Mode / Arming Notice: Moving the sliders or arming your craft with the transmitter will cause the motors to spin up.
							-			In order to prevent injury remove ALL propellers before using this feature. Enabling motor test mode will also temporarily disable Runaway Takeoff Prevention, to stop
	1000	1000	1000	1000	1000	1000	1000	1000	Master	it from disarming the craft when bench testing without propellers.
										arming, and disable Runaway Takeoff Prevention.
Port utilization: D: 11% U: 1%	Packet error: 0	I2C error	r: 0 C	ycle Time:	127	CPU Load	d: 7%			Firmware: BTTR 3.4.2 (Target: OBF4), Configurator: 10.2.0

Go to the OSD tab and set up the OSD as required (features are enabled on the left and then can be drag and dropped on the screen).

Click Save when done





Go to the CLI tab.

It is possible to copy and paste the recommended settings from the front screen before connecting here, however we are going to change a little:

This is the current recommended settings:

Set dterm_lowpass_type = PT1 We have already set this on the filter tab, but by all means do it again if you want

Feature AIRMODE This sets AirMode to be always on, as discussed above, this makes landing very difficult, instead we have set it up on a switch

Feature ANTI We have set this up already

Feature DYNAMIC Again we have already set this up

Set gyro__stage2_filter_type = FAST_KALMAN type this in and press return

Set gyro_filter_q = 400

Set gyro_filter_r = 88 these are the recommended filter settings, however I have had quads where these produce heat in the motors, I strongly recommend q = 300 and r=80, type the two lines in and hit return after each.

(note you can choose to use the recommended settings from butter flight, in the majority of quads these have been fine, but do keep an eye on motor temp)

Type Save and hit return

Configuring ESCs – BLHeli32

To configure the ESCS we are going to use BLHeliSuite32. This is not the same software as BLHeliSuite used for BLHeli or BLHeli_S. It can be downloaded from here:

https://www.mediafire.com/folder/dx6kfaasyo24l/BLHeliSuite

Download it, unzip it and run the BLHeliSuite32.exe.



BLHeliSuite32 32.3.	0.2 [4way @CC	DM16]							_		×
ES <u>C</u> setup ESC <u>t</u> ools	S <u>e</u> lect BLHeli	i_32 Interface	<u>O</u> ptions	? <u>B</u>	LHeli_32 info	Save Scree	enshot				
ESC setup	Motors	Mak	e interface:	5							
ESC# 1 - Name	[Unknown ES for ??? M	otors		Misc						
ENPTY		BLHeli_32 R	evision:	xx.x	✓ Thrott	tle Cal Enab	le				
Rampup Power		Motor Direct	tion		Minimum	Throttle	_	Startup	Beep Vo	olume	
< 50 %	>	< Norr	nal 2	•	<	1000	>	<	40	>	
Temperature Prote	ection	Demag Com Lov	pensation N		Maximum	n Throttle 2000		Beacon	/Signal V 80	/olume	
<	>	c 👘	2	•	<		>	<		>	
Low RPM Power P	rotect	Motor Timin	g		Center T	hrottle		Beacon	Delay		
<	>	(2	•	<	1500	>	<	0.00 1111	>	
		Maximum Ac	celeration		Brake On	Stop	_	PWM Fr	equency		
		Maxin	num	•	<	Off	>	<	24 kHz	<u> </u>	
			-		-		-				
Read Setup Write Setup											
Port: COM 16 V Baud: 115200 V Connect											
ESC Data loaded.											

Click on Select BLHeli_32 Interface and from the drop down select BLHeli32 Bootloader (Cleanflight/Betaflight)

MAKE SURE THE PROPS ARE REMOVED

Plug in the lipo

Click on Connect

Click on Read Setup



BLHeliSuite32 32.3.	0.2 [m4wFCIntf ARM-	BLB @COM16]	· · · · · · · · · · · · · · · · · · ·		- 🗆 X			
ES <u>C</u> setup ESC <u>t</u> ools S <u>e</u> lect BLHeli_32 Interface <u>O</u> ptions ? <u>B</u> LHeli_32 info <u>S</u> ave Screenshot								
ESC setup	ESC overview	Motors	Make interfaces					
ESC# 1 - Name EMPTY Rampup Power 50 %	Unkno for ?? BLHei	Part Information Found M ESC# 1:	Misc Iultiple ESC configurat Siskin_ST - Rev. 32.3 -	× le tion:	Startup Beep Volume			
Temperature Prote	Demaged bettion bettion contect bettion contect con	ESC# 2 : T ESC# 3 : ESC# 4 :	[MASTER] (BLHeli32 Bootloader Siskin_ST - Rev. 32.3 - [SLAVE] (BLHeli32 Bootloader Siskin_ST - Rev. 32.3 - [SLAVE] (BLHeli32 Bootloader Siskin_ST - Rev. 32.3 - [SLAVE]	g) Multi > g) Multi > g) Multi >	Beacon/Signal Volume 80 Comparison Beacon Delay 10:00 min Comparison PWM Frequency 24 kHz Comparison Comp			
Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of the setup Image: Control of th								

Click on OK on the popup.

The latest Version of BLHELI32 can be installed by using the Flash BLHeli button

However, what we really want to change here is the PWM Frequency on the bottom right which by default is 24khz, move the slider to the right so it is increased to 48khz

Click Write setup

IF any of your motors were spinning in the wrong direction this is the time to correct that. The four boxes at the bottom numbered 1 to 4 represent the four motors, by clicking on them you can deselect motors. Deselect all the motors apart from the one you want to change, use reverse motor direction to set the direction to reversed and click write setup then move on to the next motor



BLHeliSuite32 32.3	.0.2 [m4wFCIntf AR	M-BLB @COM16]		– 🗆 X			
ES <u>C</u> setup ESC <u>t</u> ools	Select BLHeli_32	nterface <u>O</u> ptions ?	<u>B</u> LHeli_32 info <u>Save Screenshot</u>				
ESC setup	ESC overview	Motors	Make interfaces				
ESC# 1 - Name	Siski for	n_ST Multicopter Moto	Misc				
EMPTY	BLH	eli_32 Revision: 32	2.3 🗹 Throttle Cal Enable				
Rampup Power	Mot	or Direction	Minimum Throttle	Startup Beep Volume			
50 %		Normal	1000	18			
<	> <	>	< >	< > %			
Temperature Prot	ection Dem	ag Compensation	Maximum Throttle	Beacon/Signal Volume			
140 C		Low	2000	80			
	Present Palari						
Low RPM Power P	rotect Mot	16 deg	Center Inrottie	10:00 min			
<	> <	>	< >>	<			
	Max	imum Acceleration	Brake On Stop	PWM Frequency			
		Maximum	Off	48 kHz			
	<	>	<	< > Š			
Read Setup Write Setup Setup							
Port: COM 16 v Baud: 115200 v Disconnect 1 2 3 4 Check							
ESC#1 setup read successfully							

When done click Disconnect and unplug the LiPo. If you changed any motor directions pop back into ButterFlight and retest them.

Configuring the FPV components

NOTE: Never power a video transmitter without an antenna attached, it will burn out the transmitter.

Set up your goggles and receiver on the channel and band you want to use. Following the instructions that came with the VTX, WITHOUT PROPS ON, plug the LiPo in and use the button on the the VTX to set the band and channel on the transmitter, the image will appear in the goggles when correct. (note that the image may appear when you are on the wrong band and channel because the frequency is close, this will be fine on the bench but will have dramatically less range. Use the LED on the VTX and whatever mechanism is on your goggles to confirm they are on the same band and channel with the image in the goggles as confirmation.

On the camera connect the OSD cable, and switch off the OSD components (you don't want two OSDs and the Flight controller OSD is more useful)



Final things

Before flying for the first time (and regularly thereafter) test your failsafe (if you don't you will have what is termed a "Flyaway" at some point where your quad departs like some homesick Mary Poppins and is never seen again.

To do this, WITH PROPS OFF, turn on your radio, power up the quad, arm it and give it a little throttle so the motors start spinning, then turn the radio off. Within a second or so the motors should stop dead.

Test Hover your quad somewhere safe. Do it Line of Sight, I usually do it in Angle mode and from a safe distance before taking it to the field to fly for the first time.

Once you have tested failsafe and test hovered. Make sure everything is screwed down tightly, use blue threadlock on the motor mount screws and the four screws holding the standoffs to the bottom plate.

You are now good to fly, please do it safely and legally and ensure you have appropriate insurance such as that provided by BMFA membership.

