

BumbleBee BumbleBlog - HD DJI Setup Guide

or how to get your Bumblebee in the air without stings by Pat Byars



This is an ongoing blog sharing how to setup and enjoy iFlight's BumbleBee HD BNF HD 😊. It does not cover flight skills or basic knowledge but is instead a guide to the pieces needed to get it working and some experience or study is needed prior. First some do's and don'ts:

Do not work on the quad with the props attached, even though it is ducted.

Do not power the quad ever without the antennas attached.

Do know your switches and controls like how to arm and disarm.

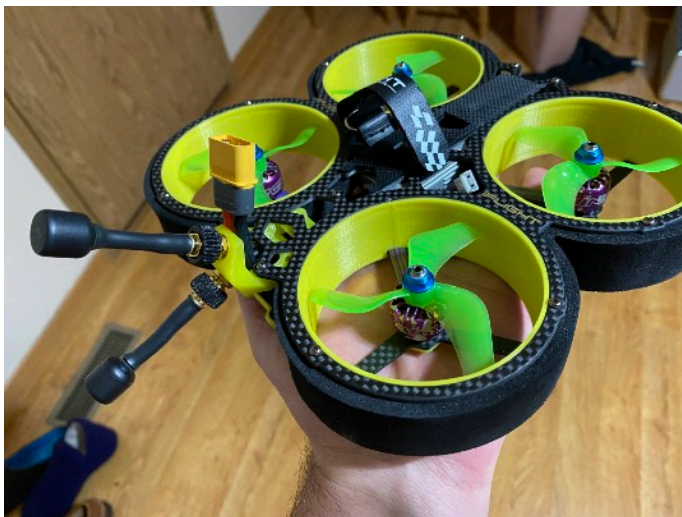
Do review your setup in betaflight before flight. maybe save a "diff" file in the CLI as a backup point. Do not use dump all or diff all as the resource / config file is part of the target firmware (loads after flashing on first connection).

I received my BumbleBee HD from iFlight recently and am excited to share my steps to setting it up including changes that I personally make (not necessarily needed to get started but always good to know how to do kind of stuff).

First steps I took when I opened my bumblebee box up. I inventoried what I had received noting several interesting items including a much needed L shaped USB-C adapter as the ducts are in the way (true for all quads of this type). Taking a look at the electronics stack I note another different USB-C adapter is already in place to connect up and activate



the air unit. That is definitely one of the first orders of business that we will take care of soon along with a quick “pre-flight review” of settings and any needed personal changes like what switch does what and the OSD info and where it goes on the screen. There are also in the box parts to install a long range receiver like the TBS crossfire or FrSky R9. Plus extra strap, props and other parts like replacement cables and screws (nice 😊). I also put 3-1 shrink sleeving over the thin DJI antenna shafts (this is totally optional but I’m good a breaking stuffs) to make them more rugged and to automatically return to center when bent (vs stay bent). I had done these prior, and there are great pre built antennas like the ones from TrueRC of Canada and many others if you want to upgrade but are not a DIY’er. More on this on a later bumble-blog update.



Next is activation and binding. There are great videos on how to do this from DJI and others, here (<https://www.dji.com/fpv/info#downloads>) is a link to the DJI page, a new pilot should watch all of these (they are pretty straightforward to understand). But I'll show also you the steps, as it's really pretty simple: Activate. Power up Quad, Goggles and DJI controller. use the clip and press the link button in the center of the air unit



above the sd card slot that should be lit green (if not wait till it is). Press and note it has turned red. Go to goggles and find the recessed red button under where the battery cable connects



to the goggles and press once, wait to hear beeps, hear air unit respond with beeps and note the goggles now have video. You are almost done... go to air unit again, the led should have turned green again. Press again with paperclip or blunt not sharp and point tool, and get the red light. Got to the transmitter (controller) and do the “three finger salute” (my words not DJI or iFlight) by pressing once these three buttons



once at the same time - Record button on left side of transmitter plus the unlabeled big silver button next to the power button and the Click Wheel (like a PC mouse click-wheel) all together. Unit will make beeps, air unit will make beeps and then a happy beep beep that its ok and linked.

How to arm, and what switches do what on your transmitter out of the box:
Out of the box the switches are set very basic, SwA is the arm switch. SwB is set to angle for all switch positions (flight modes), the other switches are undefined.

I recommend this configuration for for the switches once your comfortable using the Betaflight configuration tool:

SwA is Flight modes with up being Angle mode (seasoned pilots may prefer a different order, this is for newer pilots),

SwB is Arm,

SwC is “Turtle Arming Mode” or crash recovery arm mode,

SwD is buzzer (motors or beeper). Here are my aux settings, cut & paste into the CLI (command line in betaflight) hit enter, stuff will scroll, hit save and enter.

Betaflight reboots, go modes and note new settings.

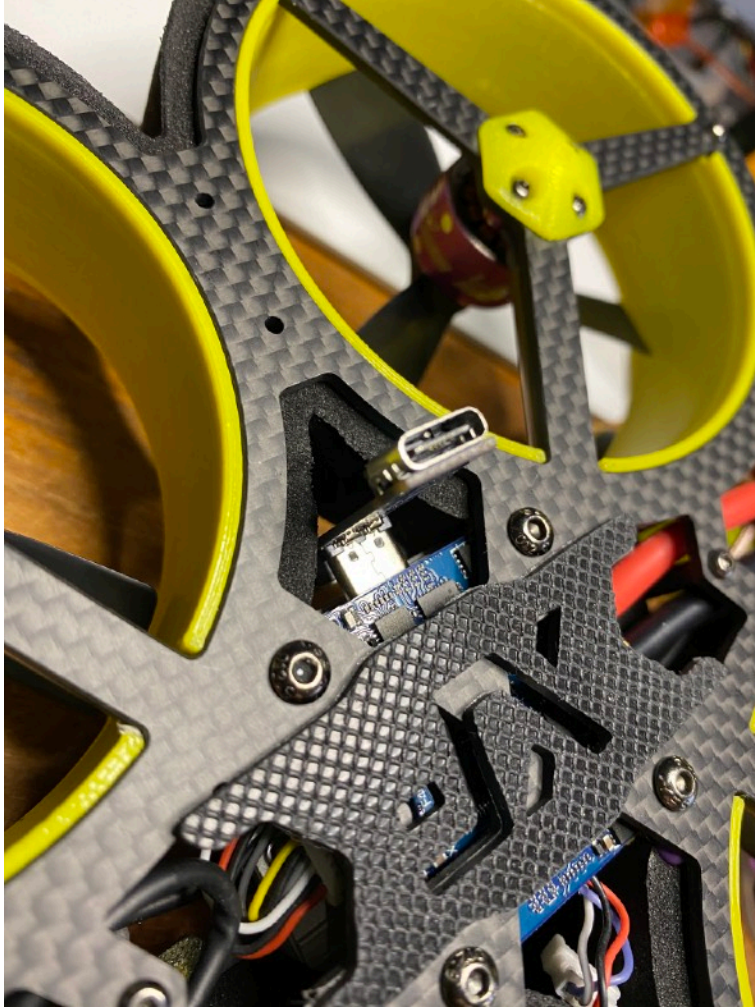
```
# aux
aux 0 0 0 1700 2100 0 0
aux 1 1 1 900 1300 0 0
aux 2 2 1 1700 2100 0 0
aux 3 13 3 1700 2100 0 0
aux 4 28 1 1300 1700 0 0
aux 5 35 2 1700 2100 0 0
```

with props off (especially this part) power up BumbleBee and your transmitter and if you go to the modes tab you can see the switches in action. Verify everything is in order. You can also go to the receiver tab and note that throttle, yaw, pitch and roll respond correctly and the switches and their channels. Next up is the configuration tab/page. Settings are good but a few changes will make them better and enable stuff like a buzzer. Here I want you to find the elements you need to change using the gui. First is Motor Stop, I recommend for beginners that motor stop be enabled so that at zero throttle the props stop vs keep spinning/idle. Another important thing to note is prop spin direction. It is reversed as it is for all whoops and many other (I reverse all of mine, better to push out when in branches than pull in). Reverse direction means motor1 has ccw, 2 cw, 3 cw, 4 ccw props on. (insert pic below). I like to put a craft name in, it helps to see what is what when you backup your settings in the CLI. For beginners I strongly recommend turning off air mode (it is still available as the middle switch position of SwB) that makes air mode permanently on.

Do turn on Rx Set and Rx Lost switches under the air mode switch. I turn off the Armed and USB switches - too much beeping re the next section. Review all other settings but don't forget to hit the Save and Reboot button before moving off the config page. Save and it reboots. Test that SwD makes the motors make a beeping sound.

How to plug in the L shaped USB-C up/down adapter:

Turn over the Bumblebee and note the AIO FC and the USB-C connector. You will need to press (gently and lined up with the usb port) into the foam so that you can slide it down so that it is positioned in front of the port. Do not insert sideways and be gentle the adapter is thin.



(replace pic with batt pad removed, makes confusing; focus is USB-C)

So you did all this and went to test fly and... it wouldn't arm.

Like mine just did. Luckily I've seen this many times and there are things like the first screen in betaflight that tells you the arming status flags (reason to not arm) and it says strongly "Throttle"...

Well remember the receiver tab? We need to go there and verify that when we move the throttle that it responds and not something else. Probably the issue is that it doesn't say AETR1234.

Change to that and verify that throttle, yaw, pitch and roll all work correctly. Don't forget to hit save at the bottom of the page too.

Betaflight Configurator

Configurator: 10.6.0
Firmware: BFL 4.1.3
Target: IFRC/FF7_TWIN_G_D(STM32F7X2)

2020-02-27 @ 20:57:29 - Arming Disabled

Receiver

Please read receiver chapter of the documentation. Configure serial port (if required), receiver mode (serial/ppm/pwm), provider (for serial receivers), bind receiver, set channel map, configure channel endpoints/range on TX so that all channels go from -1000 to -2000. Set midpoint (default: 1500), trim channels to 1500, configure stick deadband, verify behaviour when TX is off or out of range.
IMPORTANT: Before flying read failsafe chapter of documentation and configure failsafe.


Roll [A]	1501
Pitch [E]	1093
Yaw [R]	1098
Throttle [T]	1003
AUX 1	1000
AUX 2	1000
AUX 3	1000
AUX 4	1000
AUX 5	1000
AUX 6	1000
AUX 7	1000
AUX 8	1000
AUX 9	1000
AUX 10	1000
AUX 11	1000
AUX 12	1000
AUX 13	988
AUX 14	988

Channel Map: AETR1234 | RSSI Channel: AUX 1

'Stick Low' Threshold: 1050 | Stick Center: 1500 | 'Stick High' Threshold: 1900

RC Deadband: 0 | Yaw Deadband: 0 | 3D Throttle Deadband: 50

RC Smoothing: Filter: RPYT | Smoothing Type: Channels Smoothed | Auto: Input Cutoff Type | BIQUAD: Input Filter Type | Auto: Derivative Cutoff Type | BIQUAD: Derivative Filter Type | 10: Auto Smoothness

Preview: 

Refresh Save

Port utilization: D: 40% U: 3% | Packet error: 0 | I2C error: 1 | Cycle Time: 245 | CPU Load: 3% | Firmware: BFL 4.1.3, Target: IFRC/FF7_TWIN_G_D(STM32F7X2), Configurator: 10.6.0 (dc484a27)

Now it will arm. Verify this by going to the modes tab and flipping arm switch, value should go to the arm block that has turned red saying armed.

Betaflight Configurator

Configurator: 10.6.0
Firmware: BFL 4.1.3
Target: IFRC/FF7_TWIN_G_D(STM32F7X2)

2020-02-27 @ 21:08:48 - Arming Disabled

Modes

Configure modes here using a combination of ranges and/or links to other modes (links supported on BF 4.0 and later). Use ranges to define the switches on your transmitter and corresponding mode assignments. A receiver channel that gives a reading between a range min/max will activate the mode. Use a link to activate a mode when another mode is activated. **Exceptions:** ARM cannot be linked to or from another mode, modes cannot be linked to other modes that are configured with a link (chained links). Multiple ranges/links can be used to activate any mode. If there is more than one range/link defined for a mode, each of them can be set to **AND** or **OR**. A mode will be activated when:
- ALL AND ranges/links are active; OR
- at least one OR range/link is active.

Remember to save your settings using the Save button.

Hide unused modes

ARM (DISABLED) | AUX 2 : Min: 1700 Max: 2100

ANGLE | AUX 1 : Min: 1300 Max: 1700

BEEPER | AUX 4 : Min: 1700 Max: 2100

AIR MODE | AUX 1 : Min: 1700 Max: 2100

FLIP OVER AFTER CRASH | AUX 3 : Min: 1700 Max: 2100

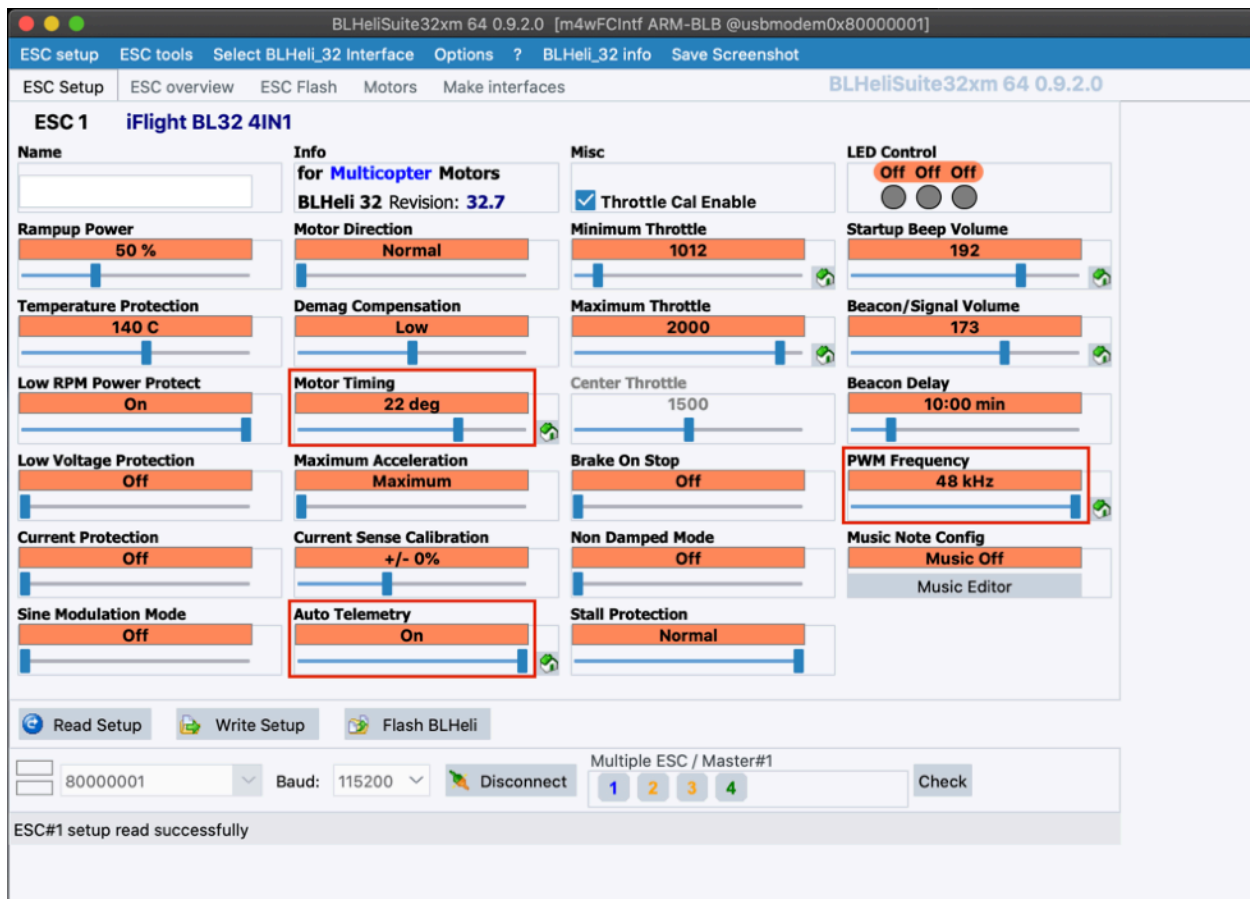
Save

Port utilization: D: 37% U: 2% | Packet error: 0 | I2C error: 1 | Cycle Time: 252 | CPU Load: 3% | Firmware: BFL 4.1.3, Target: IFRC/FF7_TWIN_G_D(STM32F7X2), Configurator: 10.6.0 (dc484a27)

Time to #SendIt 😊 **BUT NOT JUST YET**, we need to setup the ESCs and configure to run RPM filtering.

The following is from Oscar Liang's excellent guide.

Do the ESC setup first the Betaflight after. Personally I had a issue that I thought was the gyros but it wasn't it was tuning. After performing these steps my only Bumblebee issue is resolved and bonus, motors don't get hot and its super smooth now.



In BLHeli32 configurator (connect then read all 4 escs) configure these items

- **PWM Frequency: 48KHz for freestyle;** Default (or higher) for racing
- **Motor Timing: 22 or Auto for freestyle;** 25 (or higher) for racing

You must **Flash update your BLHeli_32 ESCs to version 32.7 or newer** in order to use bidirectional DShot & RPM Filtering.

If you need to update to Betaflight 4.1.x (4.1.4 as of this update) please see section at the end “How to Update BF”

Update your FC to Betaflight 4.1 or newer

Use 4KHz gyro sampling rate and 4KHz looptime.

With faster looptime (e.g. 8K) you could get jitters, 4K is a safer option and most people probably won't notice the difference anyway.

System configuration

Note: Make sure your FC is able to operate at these speeds! Check CPU and cycletime stability. Changing this may require PID re-tuning. TIP: Disable Accelerometer and other sensors to gain more performance.

Note about 32 kHz gyro sampling mode: Support for 32 kHz gyro sampling mode was added to Betaflight as an experimental feature. In the years that it was available, it has never shown that it has any advantage over 8 kHz gyro sampling mode, due to its susceptibility to vibrations, and its high noise level which require aggressive filtering, causing delays in the control loop. For this reason, **support for 32 kHz gyro sampling mode has been dropped** in Betaflight 4.0.

4 kHz ▼ Gyro update frequency

4 kHz ▼ PID loop frequency ?

Accelerometer

Barometer (if supported)

Magnetometer (if supported)

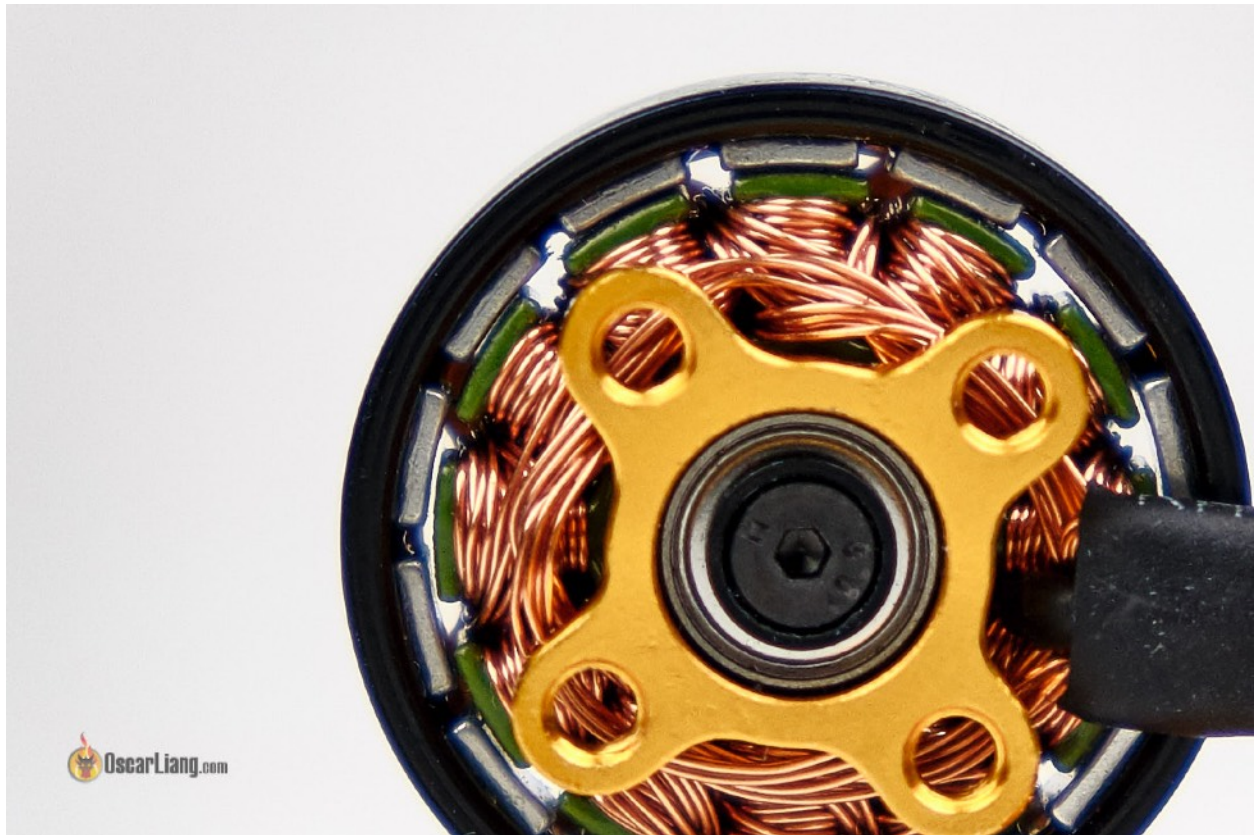


For 4K looptime, **DShot300** ESC Protocol is fast enough. You only have to use DShot600 if you are using 8K looptime. Enable “**Bidirectional DShot**“, and set **Motor poles**.

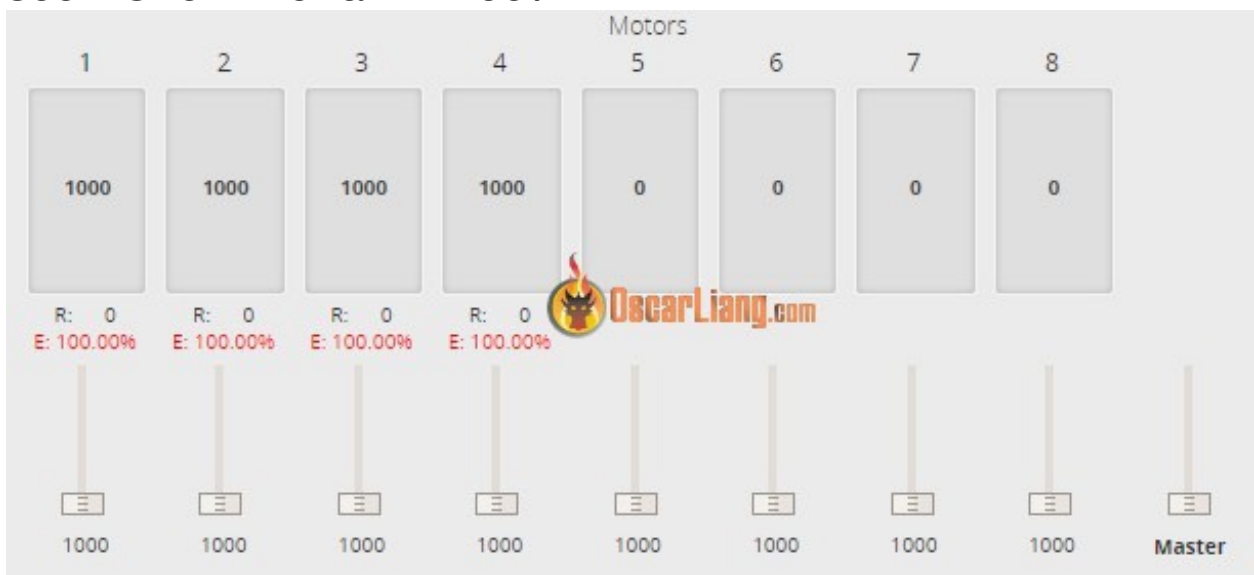


Simply count how many magnets you have in the motor bell, that's the number you have to enter in **Motor Poles**. If you put the wrong number in, filtering is not going to work properly. As a general guideline:

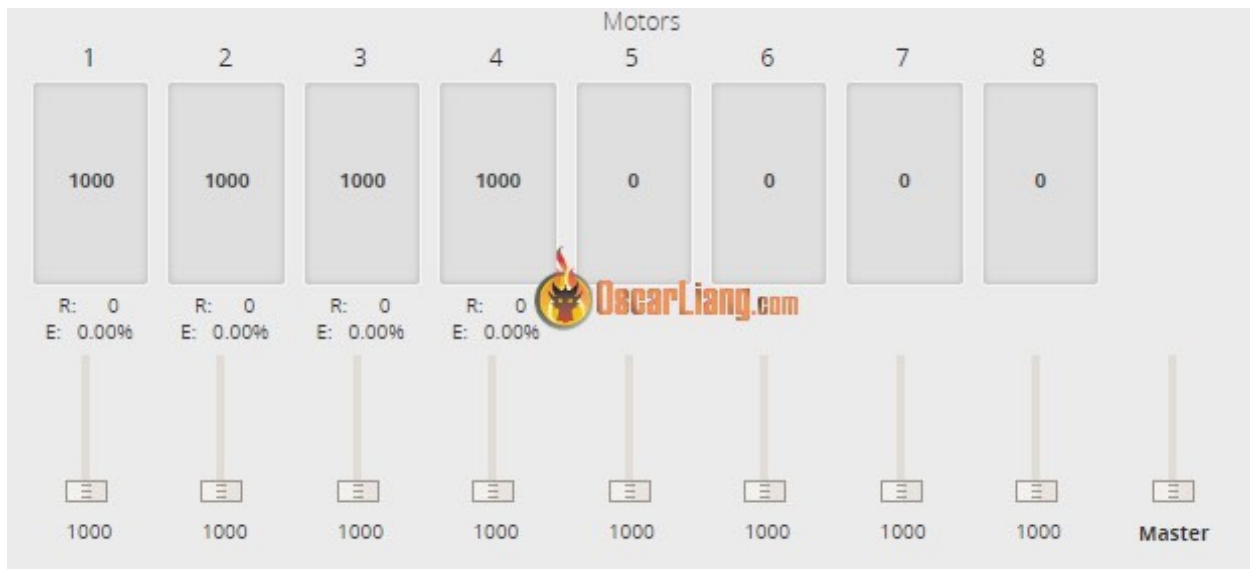
- 14 poles in 22XX, 23XX, 24XX motors
- 12 poles in 08XX, 11XX, 12XX motors



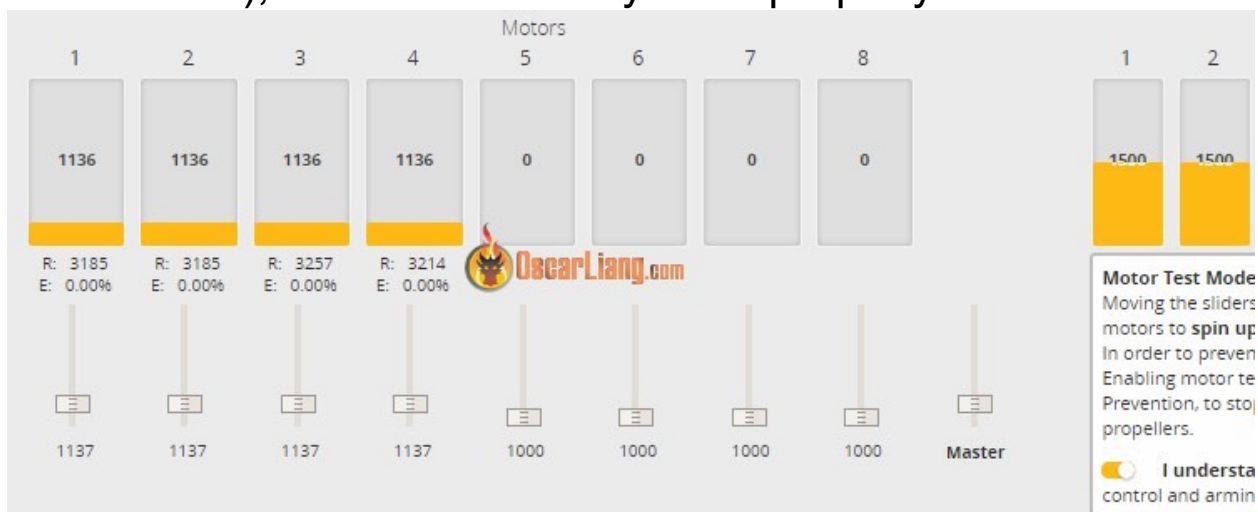
Now go to the motors tab, on top of the sliders, you might see DShot Error at “E:100%”.



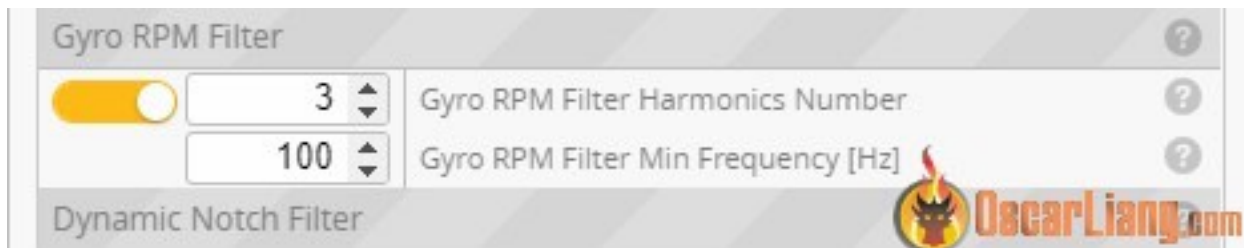
As soon as you plug in the battery, they should all go to 0%. If they don't, something is wrong. You might want to use a slower looptime if you are running 8K/8K.



You can now spin the motors up with the sliders (apply just a little throttle), to make sure they work properly.



Now go to the PID tuning page, under Filter Setting, enable “**Gyro RPM Filter**“. Just leave the two settings at default. By default, RPM filter is set to target 3 harmonics for each motor (4 motors), on each axis (pitch, roll, yaw), so it gives you a total of 36 notch filters!



After your flight controller reboots, go to the CLI and enter tasks

Check if the value of “**Gyro/PID rate/hz**” is close to your looptime. For example, For 4K/4K it should read around 4000. It doesn’t have to be exactly the same, but the difference should be less than 1%, otherwise you should lower looptime until it is. (as recommended by Betaflight devs)

```
#
# tasks
Task list      rate/hz  max/us  avg/us  maxload  avgload  total/ms
00 - (        SYSTEM)    9      4       0    0.5%    0.0%     0
01 - (        SYSTEM)  999    316     1    32.0%   0.5%    68
02 - (        GYRO/PID) 4000    80     67    32.5%  27.3%  1164
03 - (         ACC)    998    17     12     2.1%   1.6%    66
04 - (    ATTITUDE)    99     10      7     0.5%   0.5%     3
05 - (         RX)     32     34     19     0.6%   0.5%     3
06 - (        SERIAL)   99  176881    4  1751.6%  0.5%   335
07 - (    DISPATCH)   998      2      0     0.6%   0.0%     2
08 - (BATTERY_VOLTAGE)  49      3      1     0.5%   0.5%     0
09 - (BATTERY_CURRENT)  4       4      2     0.5%   0.5%     0
10 - ( BATTERY_ALERTS)  4       4      1     0.5%   0.5%     0
11 - (         BEEPER)   99      5      1     0.5%   0.5%     0
21 - (         OSD)     59    476    11     3.3%   0.5%     4
23 - (         CMS)     59      3      0     0.5%   0.0%     0
24 - (        VTXCTRL)   6       1      0     0.5%   0.0%     0
25 - (        CAMCTRL)   6       1      0     0.5%   0.0%     0
27 - (    ADCINTERNAL)   4       3      0     0.5%   0.0%     0
28 - (        PINIOBOX)  18      2      0     0.5%   0.0%     0
RX Check Function          2      1
Total (excluding SERIAL)          76.6%  32.9%
```

Write your command here. Press Tab for AutoComplete.

Now go out and fly your quad, it should feel pretty good. But we are not quite done yet, you can still tweak the filtering settings to get more performance out of it.

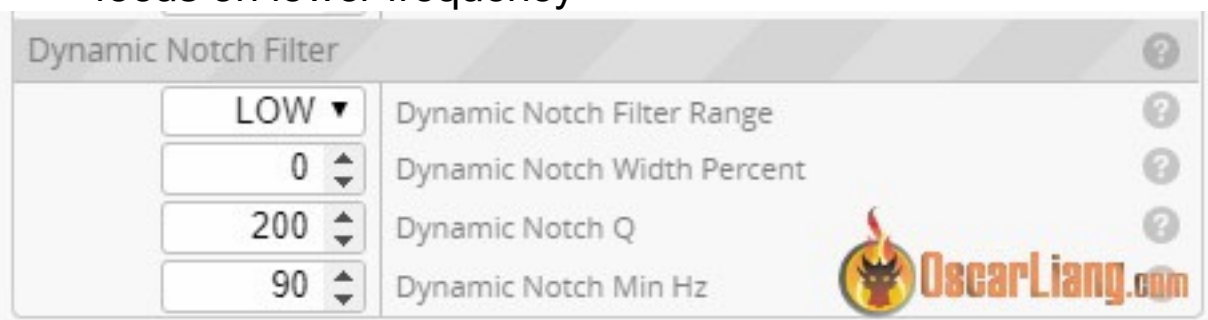
Removing Default Filtering

Simply adding RPM filters will certainly make your quad fly smoother and the motors cooler, but we should take advantage of the excellent noise rejection from RPM filter, and try to minimize the default filtering delay.

This is the part that actually makes your quad fly so good without propwash :)

Under **Dynamic Notch Filter**:

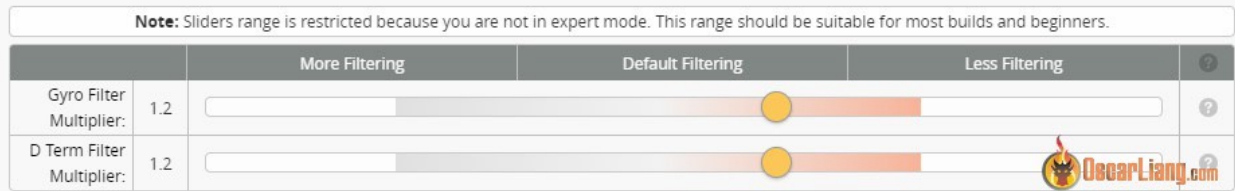
- **change range to LOW**
- **change percent to 0** (setting this to zero will remove one of the two dynamic filters and decrease latency)
- **Q factor to 200** or even 250 – for a narrower filter
- **set minimum frequency to 90** as there is less high frequency noise now thanks to RPM filter, and we want to focus on lower frequency



Test your quad again, I suggest doing this with used propellers as it will give you more objective results.

If the motors are cool, it probably means you can reduce filtering further. But this time we will use the two sliders on the top of the filter tab – **Gyro Filter Multiplier** and **D term filter multiplier**.

You don't have to change any of the check-boxes or numbers under the sliders. These adjust themselves as you move the sliders left and right.



Try dragging both of the sliders to the right for less filtering, just a tiny bit every time you test fly the quad. Check motor temperature and assess if you can reduce filtering further. Note that even if the motors don't get hot, without enough filtering, your quad can actually perform worse, so keep that in mind, motor temperature is not the only thing! Learn something in this tutorial? Sharing it with your friends is the best way to support me!

Parts and tools needed :

_PC or Mac with USB-C cable, and DJI Assistant 2 SW installed to activate and upgrade units if needed.

_Paperclip or iPhone sim card removal tool (yes there is a paperclip like thing in those thin white papers that came with your iphone lol a hidden gem).

_USB-C L shape angle adapter(s). USB-C to USB-C that are included with BumbleBee HD BNF.

_Prop wrench or other wrench like a crescent wrench to remove props prior to working on the quad.

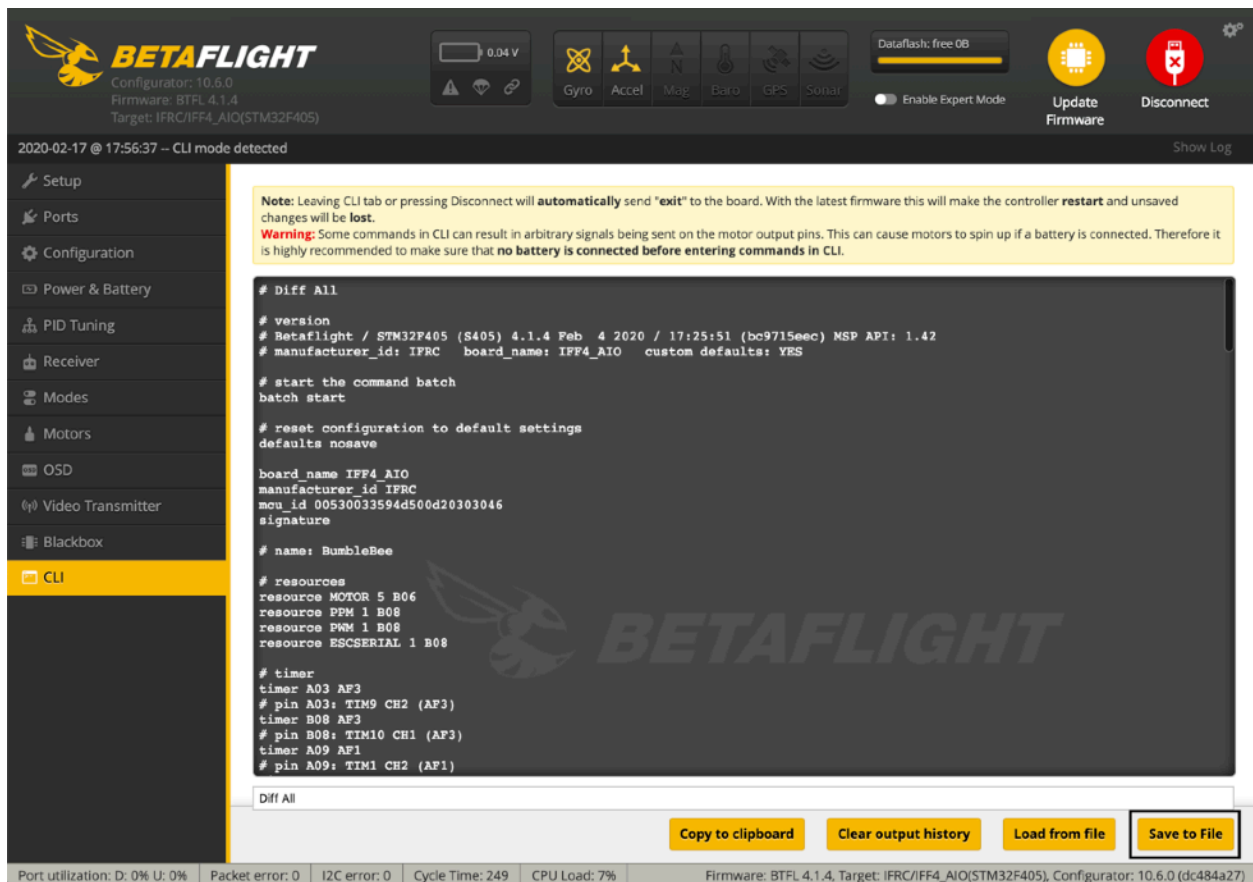
_Optional items, 3-1 shrink sleeving, heat shrink gun for antennas (be careful to not damage the PC plastic shell with DJI label that is the "active" part of the antenna).

Resources - DJI getting started videos: <https://www.dji.com/fpv/info#downloads>

On the downloads page note the tutorial videos at the top of the page (intro, activate, link, camera settings). These are a must watch.

“How to Update BF”

First go to the the CLI and clear the screen and then type Diff All and enter. Note the button at bottom right to save to file. Save your diff all where you can find it again.



The screenshot shows the Betaflight configurator interface. At the top, the Betaflight logo and version information are displayed: Configurator: 10.6.0, Firmware: BTFL 4.1.4, Target: IFRC/IFF4_AIO(STM32F405). The battery level is shown as 0.04V. A row of sensor status icons includes Gyro, Accel, Mag, Baro, GPS, and Sonar. A 'Dataflash: free 0B' indicator is present. On the right, there are buttons for 'Update Firmware' (a red circle with a white spot) and 'Disconnect'. The main area shows the CLI tab with the following output:

```
# Diff All
# version
# Betaflight / STM32F405 (S405) 4.1.4 Feb  4 2020 / 17:25:51 (bc9715eec) MSP API: 1.42
# manufacturer_id: IFRC  board_name: IFF4_AIO  custom defaults: YES

# start the command batch
batch start

# reset configuration to default settings
defaults nosave

board_name IFF4_AIO
manufacturer_id IFRC
mcu_id 00530033594d500d20303046
signature

# name: BumbleBee

# resources
resource MOTOR 5 B06
resource PPM 1 B08
resource PWM 1 B08
resource ESCSERIAL 1 B08

# timer
timer A03 AF3
# pin A03: TIM9 CH2 (AF3)
timer B08 AF3
# pin B08: TIM10 CH1 (AF3)
timer A09 AF1
# pin A09: TIM1 CH2 (AF1)
```

At the bottom right of the CLI output area, there are four buttons: 'Copy to clipboard', 'Clear output history', 'Load from file', and 'Save to File'. The 'Save to File' button is highlighted with a red border. The bottom status bar shows: Port utilization: D: 0% U: 0%, Packet error: 0, I2C error: 0, Cycle Time: 249, CPU Load: 7%, Firmware: BTFL 4.1.4, Target: IFRC/IFF4_AIO(STM32F405), Configurator: 10.6.0 (dc484a27).

Then click update firmware (red circle spot near top of screen) and select The iFlight Target for the F4 AIO board

!

When this finishes click the connect button. When Betaflight starts it will ask if you want to load the config files - Yes You do

When this finishes it will reboot. Note you have Gyro's etc. Go to the CLI and paste that Diff All that you save. and hit enter. Be sure to do save if the script

doesn't do it for you. You reboot and your just about ready to go. You should still review all the pages - is it setup they way you want?

Don't have a backup? 😊 Here is a diff all of my current setup as of 2/17/20:

Prerequisite is BL Heli32 MT = 22 PWM = 48 using BLHELI32 Configurator

This dump is from Betaflight 4.1.4. Use the Target You must accept the config file then paste this dump # and you have my full setup for bumblebee with RPM filtering

name: BumbleBee

resources

resource MOTOR 5 B06

resource PPM 1 B08

resource PWM 1 B08

resource ESCSERIAL 1 B08

timer

timer A03 AF3

pin A03: TIM9 CH2 (AF3)

timer B08 AF3

pin B08: TIM10 CH1 (AF3)

timer A09 AF1

pin A09: TIM1 CH2 (AF1)

timer A10 AF1

pin A10: TIM1 CH3 (AF1)

timer A02 AF2

pin A02: TIM5 CH3 (AF2)

timer B10 AF1

pin B10: TIM2 CH3 (AF1)

timer B11 AF1

pin B11: TIM2 CH4 (AF1)

dma

dma pin A09 0

pin A09: DMA2 Stream 6 Channel 0

dma pin A10 0

pin A10: DMA2 Stream 6 Channel 0

dma pin A02 0

pin A02: DMA1 Stream 0 Channel 6

dma pin B10 0

```
# pin B10: DMA1 Stream 1 Channel 3
dma pin B11 0
# pin B11: DMA1 Stream 7 Channel 3
```

```
# feature
feature -TELEMETRY
feature -LED_STRIP
feature -DISPLAY
feature -AIRMODE
feature MOTOR_STOP
```

```
# beeper
beeper -ARMED
beeper -ON_USB
```

```
# beacon
beacon RX_LOST
beacon RX_SET
```

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

```
# led
led 0 6,5::ATO:0
led 1 7,5::ATO:0
led 2 6,6::ATO:0
led 3 7,6::ATO:0
```

```
# mode_color
mode_color 6 0 10
mode_color 6 1 2
```

```
# aux
aux 0 0 1 1700 2100 0 0
aux 1 1 0 1300 1700 0 0
aux 2 13 3 1700 2100 0 0
aux 3 28 0 1700 2100 0 0
aux 4 35 2 1700 2100 0 0
```

```
# master
set gyro_sync_denom = 2
set gyro_lowpass_hz = 100
set gyro_lowpass2_hz = 275
set dyn_notch_range = LOW
set dyn_notch_width_percent = 0
set dyn_notch_q = 200
```

set dyn_notch_min_hz = 90
set dyn_lpf_gyro_min_hz = 220
set dyn_lpf_gyro_max_hz = 550
set acc_calibration = 162,-59,-265
set mag_bustype = I2C
set mag_i2c_device = 2
set mag_hardware = NONE
set baro_bustype = I2C
set baro_i2c_device = 2
set fpv_mix_degrees = 15
set sbus_baud_fast = ON
set dshot_idle_value = 600
set dshot_bidir = ON
set motor_pwm_protocol = DSHOT300
set failsafe_off_delay = 30
set failsafe_procedure = AUTO-LAND
set align_board_yaw = -180
set bat_capacity = 1300
set vbat_min_cell_voltage = 320
set vbat_warning_cell_voltage = 333
set vbat_scale = 105
set yaw_motors_reversed = ON
set small_angle = 180
set gps_provider = UBLOX
set gps_auto_baud = ON
set gps_rescue_allow_arwing_without_fix = ON
set osd_warn_core_temp = OFF
set osd_vbat_pos = 2465
set osd_rssi_pos = 417
set osd_link_quality_pos = 353
set osd_tim_2_pos = 2497
set osd_flymode_pos = 2489
set osd_throttle_pos = 461
set osd_vtx_channel_pos = 469
set osd_crosshairs_pos = 2253
set osd_current_pos = 2518
set osd_mah_drawn_pos = 455
set osd_craft_name_pos = 2061
set osd_display_name_pos = 33
set osd_gps_speed_pos = 472
set osd_gps_sats_pos = 410
set osd_home_dir_pos = 462
set osd_compass_bar_pos = 10
set osd_warnings_pos = 12745
set osd_battery_usage_pos = 488
set osd_disarmed_pos = 2379

```
set osd_esc_tmp_pos = 485
set osd_core_temp_pos = 502
set osd_stat_max_spd = OFF
set osd_stat_endbatt = ON
set osd_stat_battery = ON
set osd_stat_min_rssi = OFF
set osd_stat_max_curr = OFF
set osd_stat_used_mah = OFF
set osd_stat_bbox = OFF
set osd_stat_bb_no = OFF
set vcd_video_system = PAL
set dashboard_i2c_bus = 2
set gyro_1_sensor_align = CW180
set gyro_1_align_yaw = 1800
set name = BumbleBee
```

profile 0

```
# profile 0
set dyn_lpf_dterm_min_hz = 77
set dyn_lpf_dterm_max_hz = 187
set dterm_lowpass_hz = 100
set dterm_lowpass2_hz = 165
set feedforward_transition = 20
set p_pitch = 65
set i_pitch = 83
set d_pitch = 35
set f_pitch = 150
set p_roll = 63
set i_roll = 80
set d_roll = 33
set f_roll = 150
set p_yaw = 40
set i_yaw = 100
set d_min_roll = 0
set d_min_pitch = 0
```

profile 1

profile 2

```
# restore original profile selection
profile 0
```

rateprofile 0

```
# rateprofile 0
set roll_expo = 50
set pitch_expo = 50
set yaw_expo = 50
set roll_srate = 68
set pitch_srate = 68
set yaw_srate = 64
set tpa_breakpoint = 1270
```

```
# save configuration
save
```