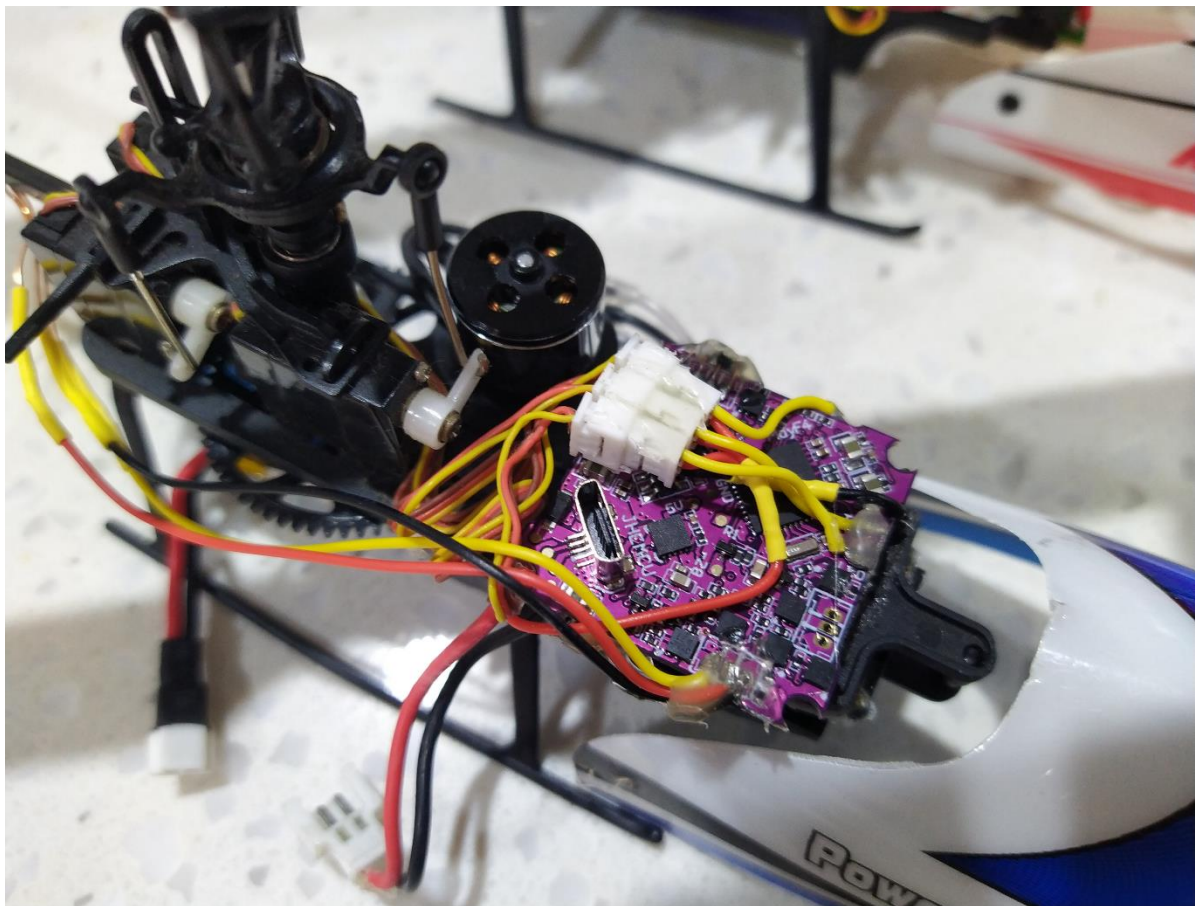


Set Up process for Heliflight-3d running on a JHEMCU Play F4 Flight controller in a K110 helicopter. This flight controller is a 5A 4 in 1 ESC for 1-2s. It is only 5A but I have flown this a dozen or more times now and it is still going ok (although my batteries are quite old and the headspeed is quite sluggish as a result). If it proves too small and burns out I will just add an external 6-7A esc to power the main motor.

Heliflight-3D is a betaflight fork by RC groups member 'eqtrian' to be specifically for single rotor helicopters.

[https://www.rcgroups.com/forums/showthread.php?3535457-Introducing-the-Heliflight-3D-\(HF3D\)-open-source-Helicopter-flight-controller-\(FBL\)](https://www.rcgroups.com/forums/showthread.php?3535457-Introducing-the-Heliflight-3D-(HF3D)-open-source-Helicopter-flight-controller-(FBL))



Specification:

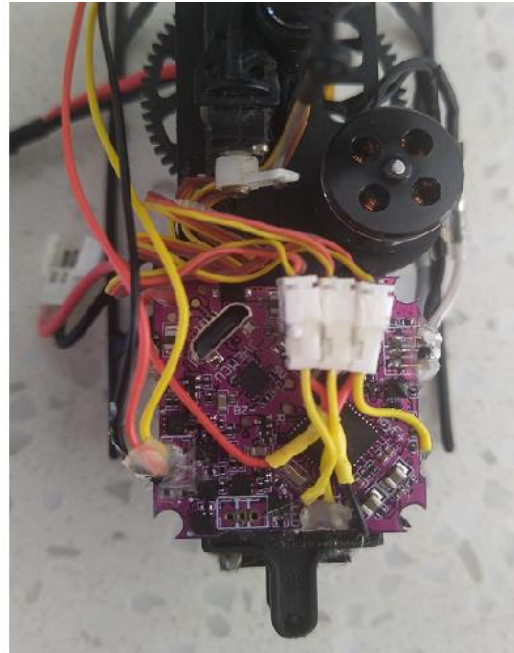
Brand Name: JHEMCU
Model: Play F4 Whoop
Item Name: F4 Flight Controller Built-in 5A 4In1 ESC
Board Size: 28,5x28,5mm
Screw Hole Spacing: 24,5x24,5mm (M3)
Board Weight: 3g

F4 Flight Controller

CPU: STM32F411CEU6
Sensor: MPU6000 Triaxial accelerometer/ Triaxial Gyroscope (SPI Connection)
Input Voltage: 1-25 Lipo
BEC: 0,5A (15) ; 1,5A (25)
Built-in OSD interface
- Support BLHeli Suite ESC programming
- Support Voltage Detection
- Support LED Strip
- Support Smart Audio OSD Control
- Support Buzzer
- Support Compatible PPM, SBUS, IBUS, DSM2/DSMX Receiver

5A ESC:

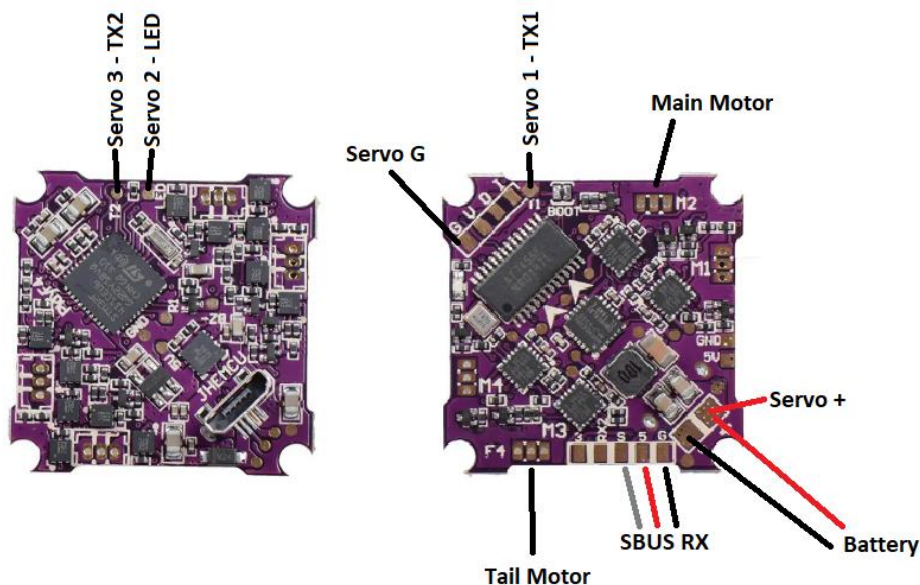
Input Voltage: 1-25
Con. Current: 5A
Peak Current: 7A (25)
Support BLHeliSuite Programmable
- Support Oneshot125, Multishot, DShot150, DShot300, DShot600, PWM



Motor and Servo Wiring.

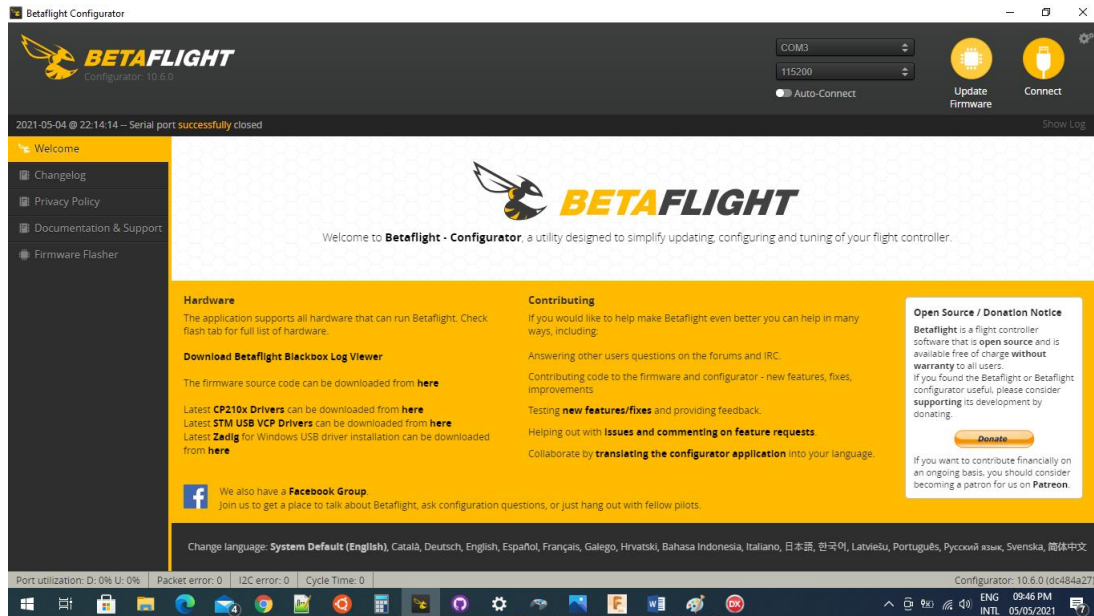
I used 3 Micro JST 1.25 plug connectors to suit the k110 servos. The signal wires of these sockets are connected to the pins shown below. The servos on the k110 are 1s so I connected the positive of each connector to the battery supply. GND for each socket are wired together then to GND.

Please note the Main Motor (assigned motor 1 in the code) is connected to the Motor 2 on the ESC and the Tail Motor (assigned motor 2 in the code) is connected to the motor 3 on the esc.

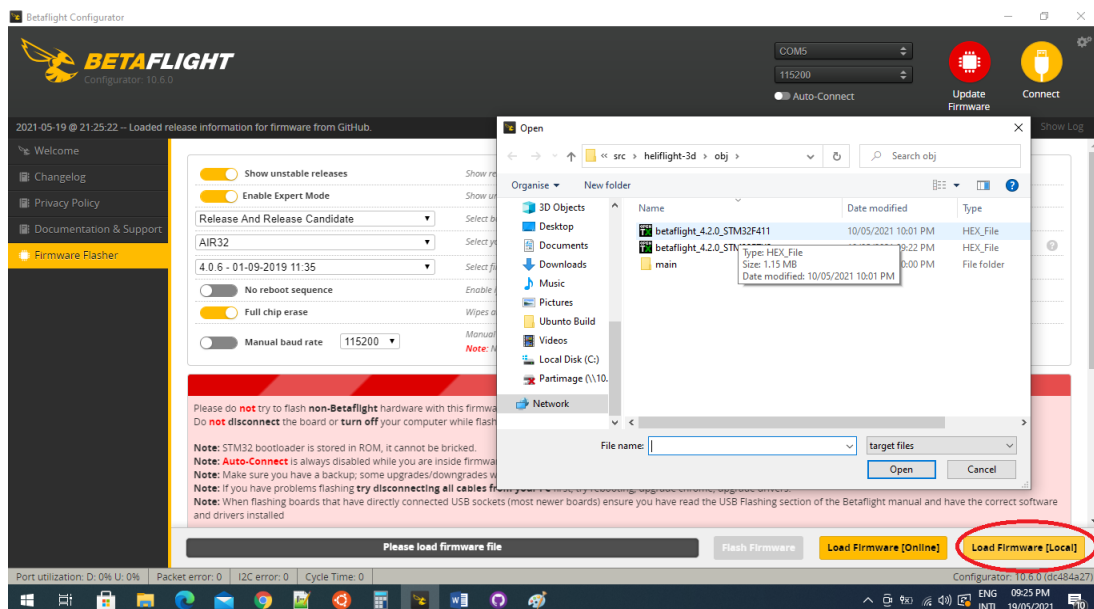


Configuration:

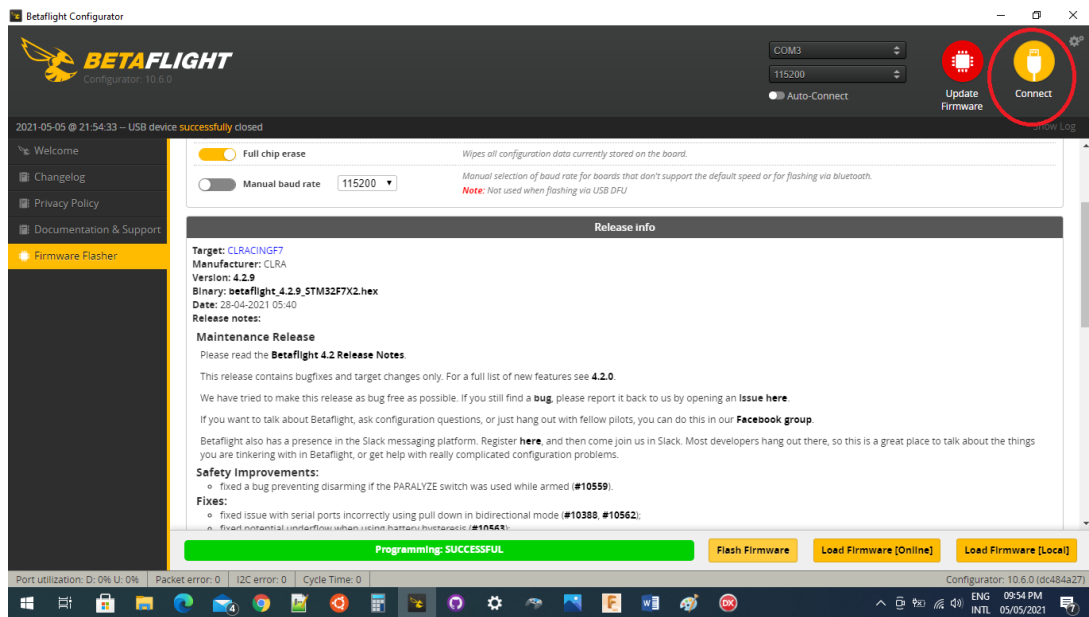
1. Download Betaflight. I'm using version 10.6.0
2. Open and select Update firmware



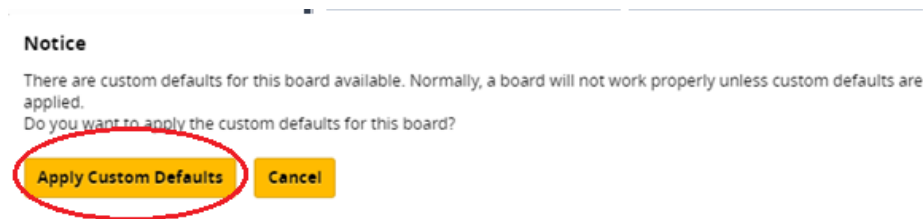
3. Load Firmware [LOCAL] and select the Hex file from the Zip files. This processor is the STM32F411 target. Set the "Full Chip Erase"



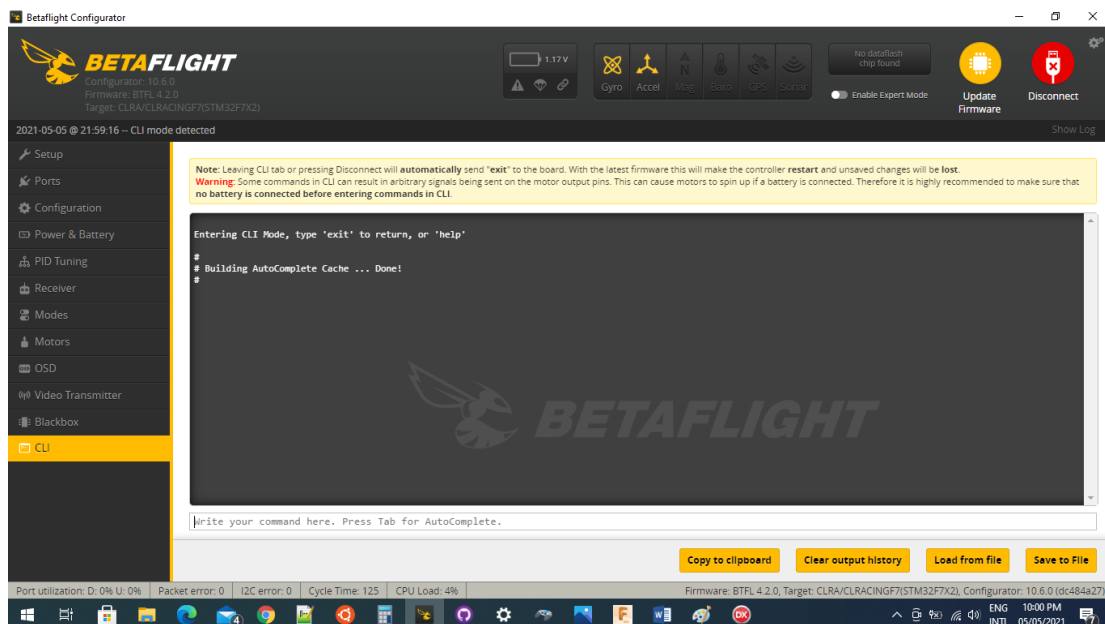
4. Wait for the Programming Successful and click “Connect”



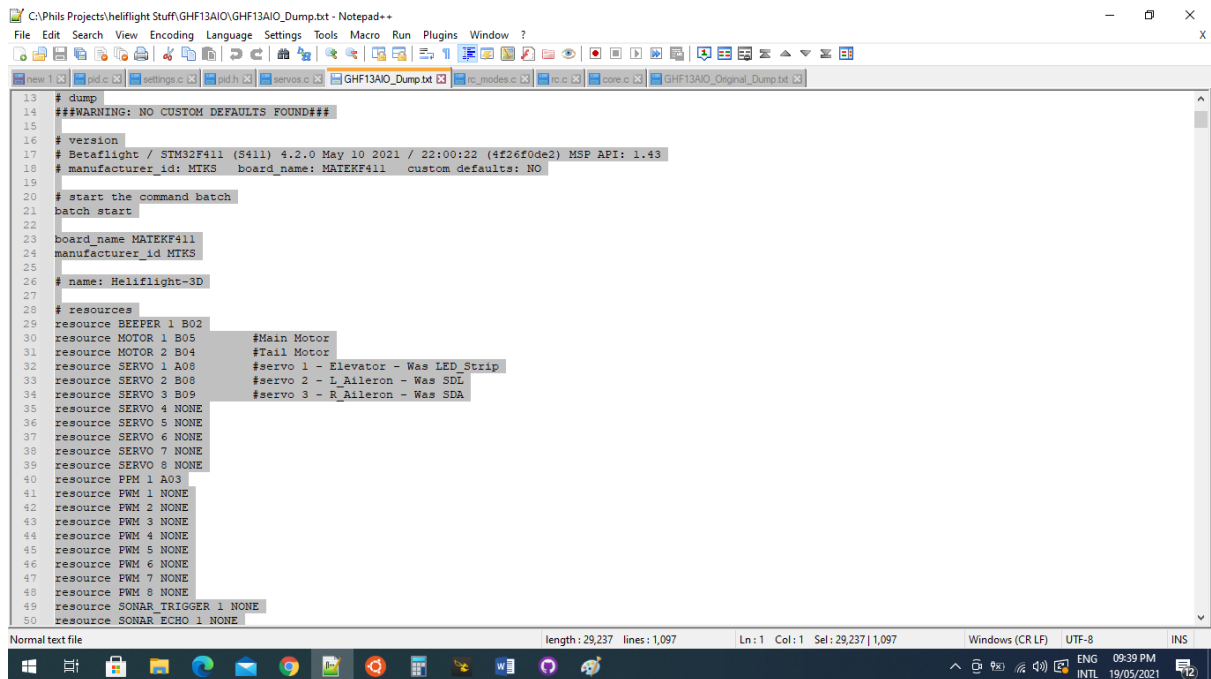
5. Apply custom defaults (it will say there are none which is ok)



6. Reconnect and select CLI

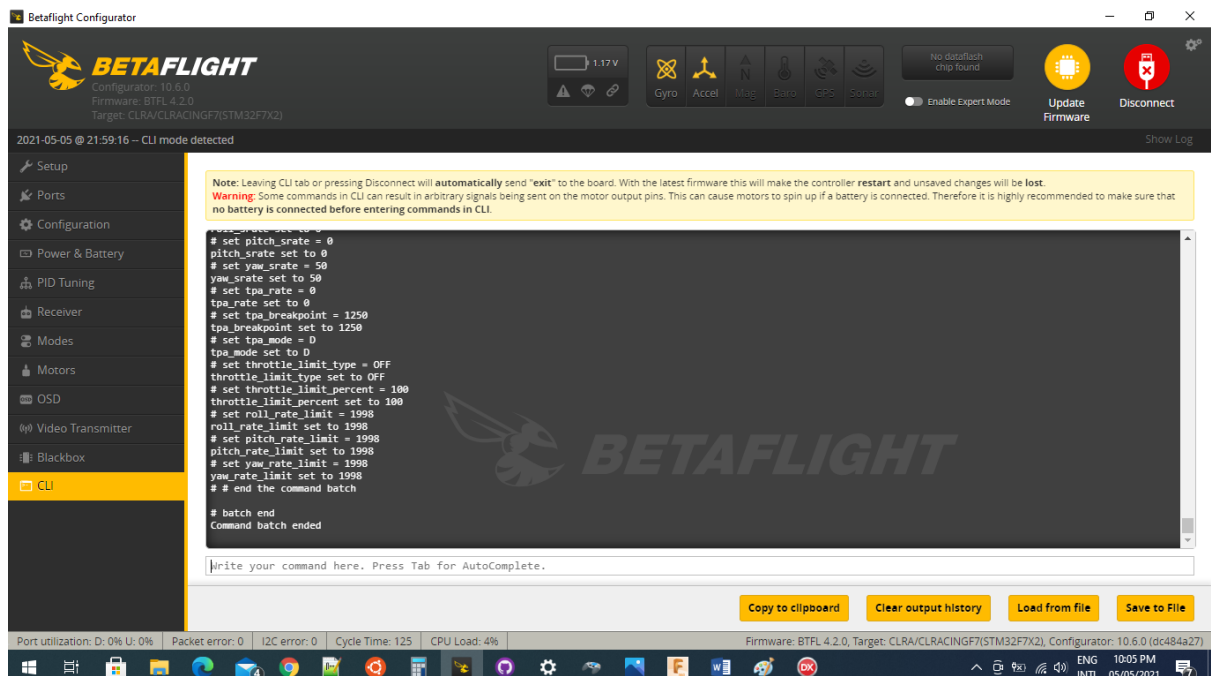


7. Open the PlayF4_Dump.txt file. Select all of the text in the file (ctrl A) and copy (ctrl C).



```
13 # dump
14 ###WARNING: NO CUSTOM DEFAULTS FOUND###
15
16 # version
17 # Betaflight / STM32F411 (S411) 4.2.0 May 10 2021 / 22:00:22 (4f26f0de2) MSP API: 1.43
18 # manufacturer_id: MTKS board_name: MATEKF411 custom defaults: NO
19
20 # start the command batch
21 batch start
22
23 board_name MATEKF411
24 manufacturer_id MTKS
25
26 # name: Heliflight-3D
27
28 # resources
29 resource BEEPER 1 B02
30 resource MOTOR 1 B05 #Main Motor
31 resource MOTOR 2 B04 #Tail Motor
32 resource SERVO 1 A08 #servo 1 - Elevator - Was LED Strip
33 resource SERVO 2 B08 #servo 2 - L_Aileron - Was SDL
34 resource SERVO 3 B09 #servo 3 - R_Aileron - Was SDA
35 resource SERVO 4 NONE
36 resource SERVO 5 NONE
37 resource SERVO 6 NONE
38 resource SERVO 7 NONE
39 resource SERVO 8 NONE
40 resource PWM 1 A03
41 resource PWM 1 NONE
42 resource PWM 2 NONE
43 resource PWM 3 NONE
44 resource PWM 4 NONE
45 resource PWM 5 NONE
46 resource PWM 6 NONE
47 resource PWM 7 NONE
48 resource PWM 8 NONE
49 resource SONAR_TRIGGER 1 NONE
50 resource SONAR_ECHO 1 NONE
```

8. Paste this into the Betaflight CLI and click ENTER (down the bottom where it says write your command here). The settings will then be loaded.



```
2021-05-05 @ 21:59:16 -- CLI mode detected

Note: Leaving CLI tab or pressing Disconnect will automatically send "exit" to the board. With the latest firmware this will make the controller restart and unsaved changes will be lost.
Warning: Some commands in CLI can result in arbitrary signals being sent on the motor output pins. This can cause motors to spin up if a battery is connected. Therefore it is highly recommended to make sure that no battery is connected before entering commands in CLI.

# set pitch_rate = 0
pitch_rate set to 0
# set yaw_rate = 50
yaw_rate set to 50
# set tpa_rate = 0
tpa_rate set to 0
# set tpa_breakpoint = 1250
tpa_breakpoint set to 1250
# set tpa_mode = D
tpa_mode set to D
# set throttle_limit_type = OFF
throttle_limit_type set to OFF
# set throttle_limit_percent = 100
throttle_limit_percent set to 100
# set roll_rate_limit = 1998
roll_rate_limit set to 1998
# set pitch_rate_limit = 1998
pitch_rate_limit set to 1998
# set yaw_rate_limit = 1998
yaw_rate_limit set to 1998
# # end the command batch

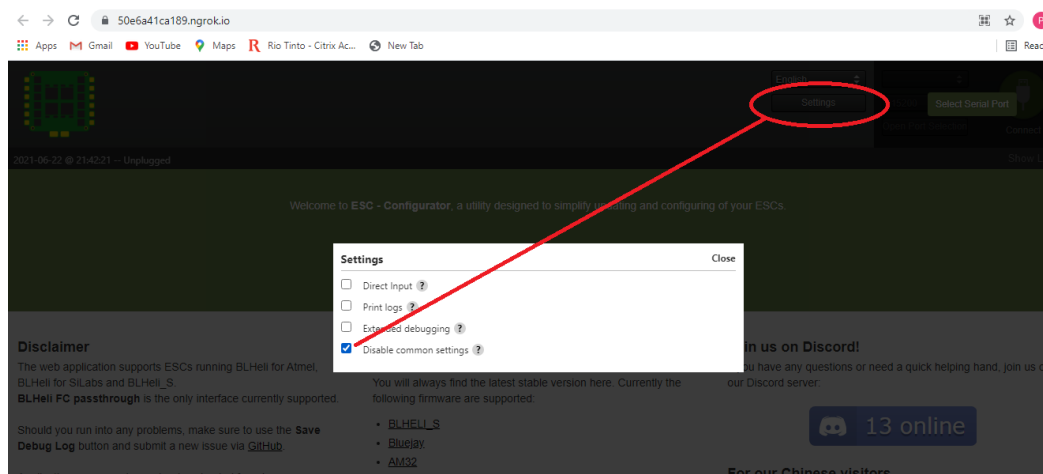
# batch end
Command batch ended

Write your command here. Press Tab for AutoComplete.
```

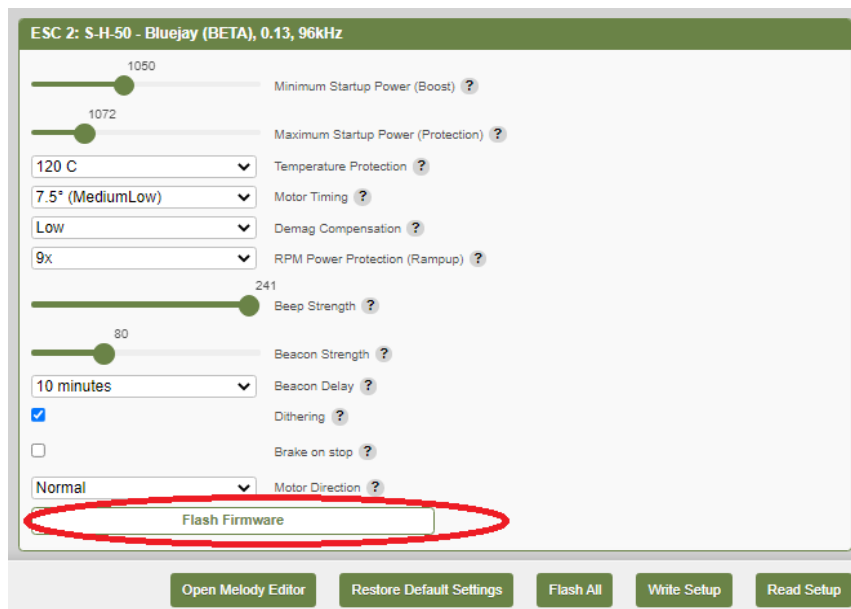
9. In the CLI type: save [ENTER] (really important. Config won't be saved if you don't save....)

10. Now we need to set up the bi-directional Dshot so that the motor speed telemetry functions. This FC has BLHeli_s ESC's which don't natively implement bi-directional Dshot. There are three options for this. JESC (paid), BLHeli_M or Bluejay like I have used.....

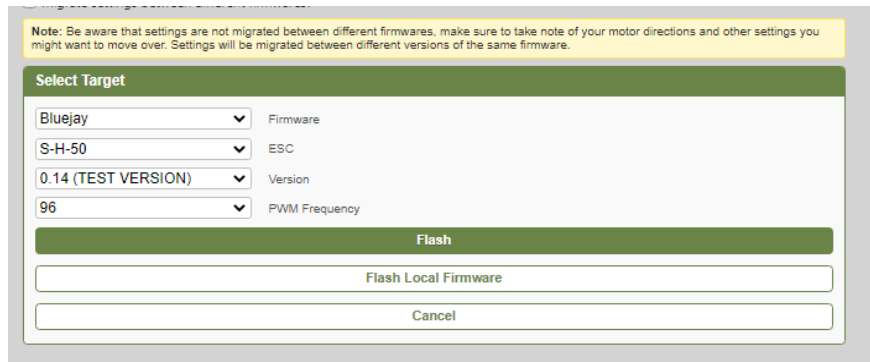
Go to the Bluejay configurator. Please note this is a test version which enables each ESC to be loaded with different settings. <https://50e6a41ca189.ngrok.io/>. (Eventually this will be added to the official release at <https://esc-configurator.com/>). Click on Settings and tick the disable common settings so you can load different settings for the tail and main motors.



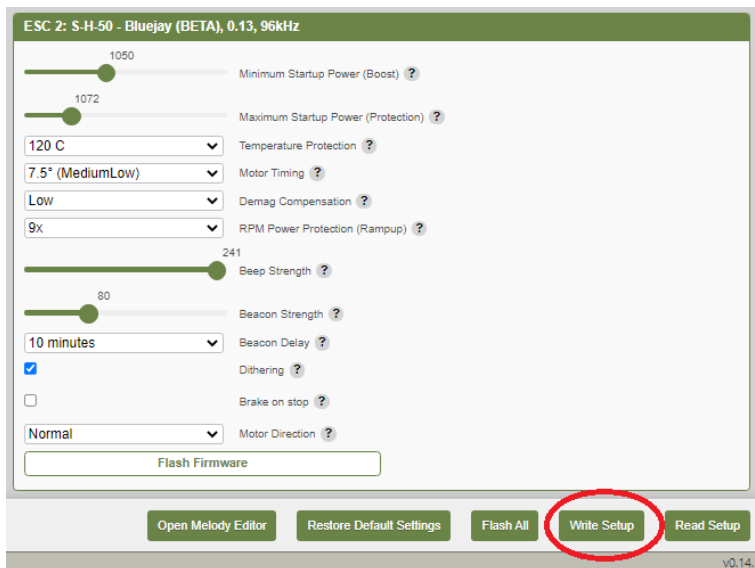
11. Connect and read setup. Scroll down to the ESC 2: Select firmware



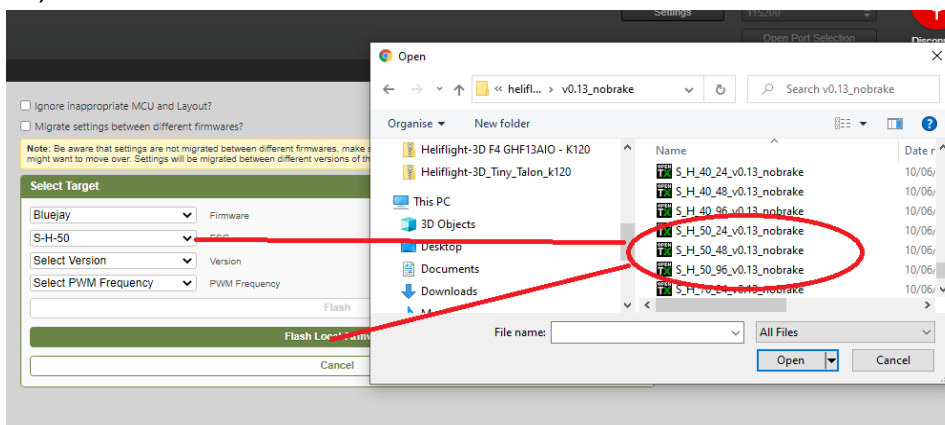
12. Select [Flash] as below. Version 0.13 or 0.14 (TEST VERSION) implements the Bi-directional Dshot. I used the 96kHz for the tail.



13. After flashing is complete. Set up parameters for the tail and write setup. These are what I have.



14. Scroll up to ESC 1: This ESC should be set up without damped-light mode. This is done by flashing the ESC firmware file as supplied in the zip file. Select either the 24, 48 or 96 kHz version. I used for the 48kHz for the main.



ESC 1: S H-50 - Bluejay (TEST), 0.13, 48kHz

1125

Minimum Startup Power (Boost) ?

1284

Maximum Startup Power (Protection) ?

120 C

Temperature Protection ?

15° (Medium)

Motor Timing ?

Low

Demag Compensation ?

9x

RPM Power Protection (Rampup) ?

241

Beep Strength ?

80

Beacon Strength ?

10 minutes

Beacon Delay ?

☒

Dithering ?

☐

Brake on stop ?

Reversed

Motor Direction ?

Flash Firmware

Open Melody Editor

Restore Default Settings

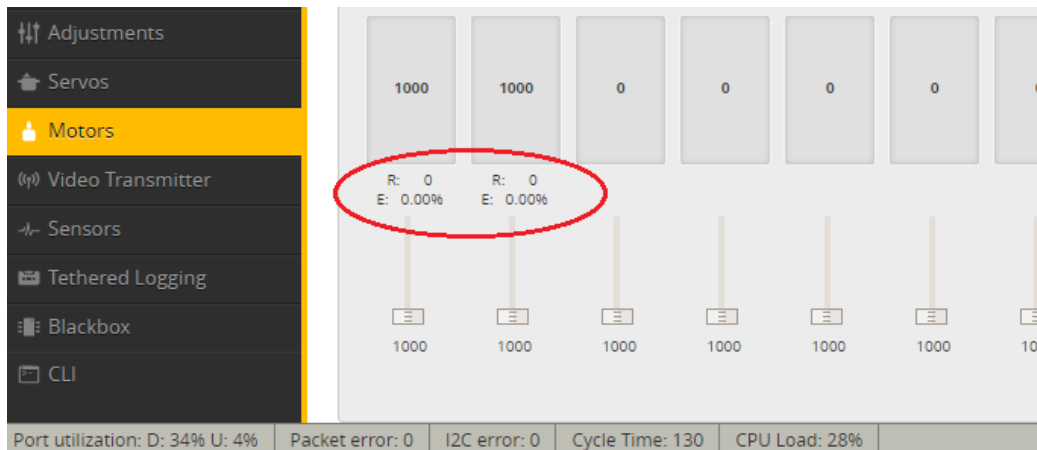
Flash All

Write Setup

Read Setup

The screenshot shows the 'esc-configurator' web application. A 'Melody Editor' dialog box is open in the center. It has a 'Close' button in the top right corner. Inside the dialog, there is a checkbox for 'Synchronize Melodies' with a question mark icon. Below it is a 'Select a melody' dropdown menu that is currently open, showing a list of melodies: 'Bluejay Default', '1000 Miles - Vanessa Carlton', 'Blackheart - Two Steps From Hell', 'Blue - Eiffel65', 'Hall of Fame - The Script', 'Never gonna give you up - Rick Astley', 'Simpsons Theme', 'Starwars Theme', 'Till It's Over - Tristram', 'Una Mattina - Ludovico Einaudi', 'Saved melodies', and 'Rick&Morty2'. To the right of the dropdown is a 'Delete' button. Below the dropdown is a 'Save as...' button. The dialog also contains two text input fields for 'ESC 1' and 'ESC 2', each with a 'Play' button to its right. The 'ESC 1' field contains the text 'Melody:b=349,o=2,d=2:1a#5,'. The 'ESC 2' field contains the text 'Melody:b=349,o=2,d=2:8f4,8p,8a#4,8f5,8f4,8p,8a#4,8f5,8f4,8p,8a#4,8f5,8f4,8p,8a#4,8f5,8f4,8p,8a#4,8a#4,1f4'. At the bottom of the dialog are two buttons: 'Play all' and 'Write Melodies'. In the background, the main interface of the configurator is visible, showing 'Common Parameters' on the left and a 'Beacon Strength' slider set to 80. At the bottom of the main interface, there is a 'Save Debug Log' button and a red circle highlighting the 'Open Melody Editor' button.

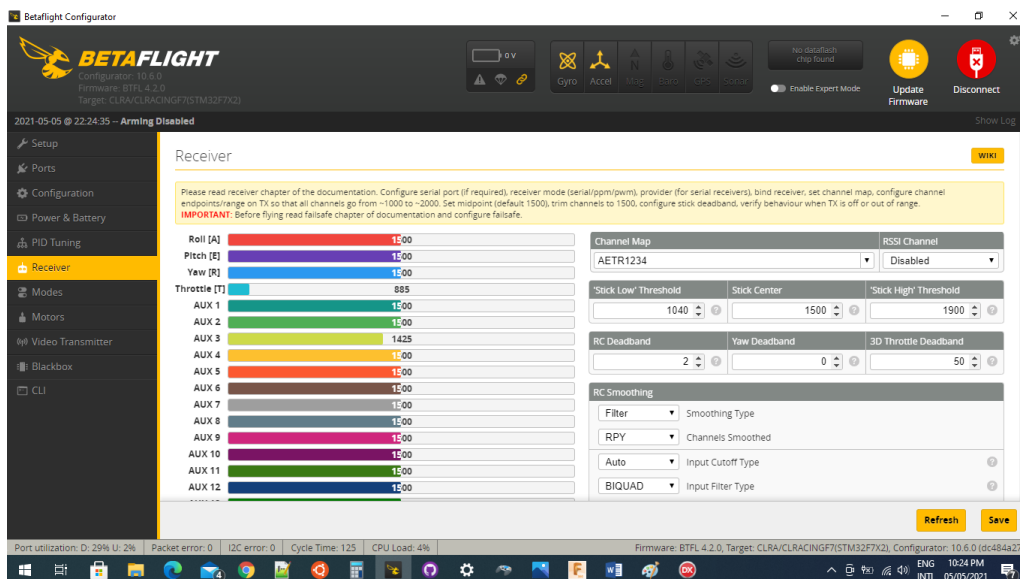
- Open Betaflight again and connect. In the Configuration tab select the Motors tab. With the battery powered on, check the bi-directional Dshot is working. It should look like this (E: 0.00%). If it is (E: **100.0%**) it is not working and you should review loading Bluejay.



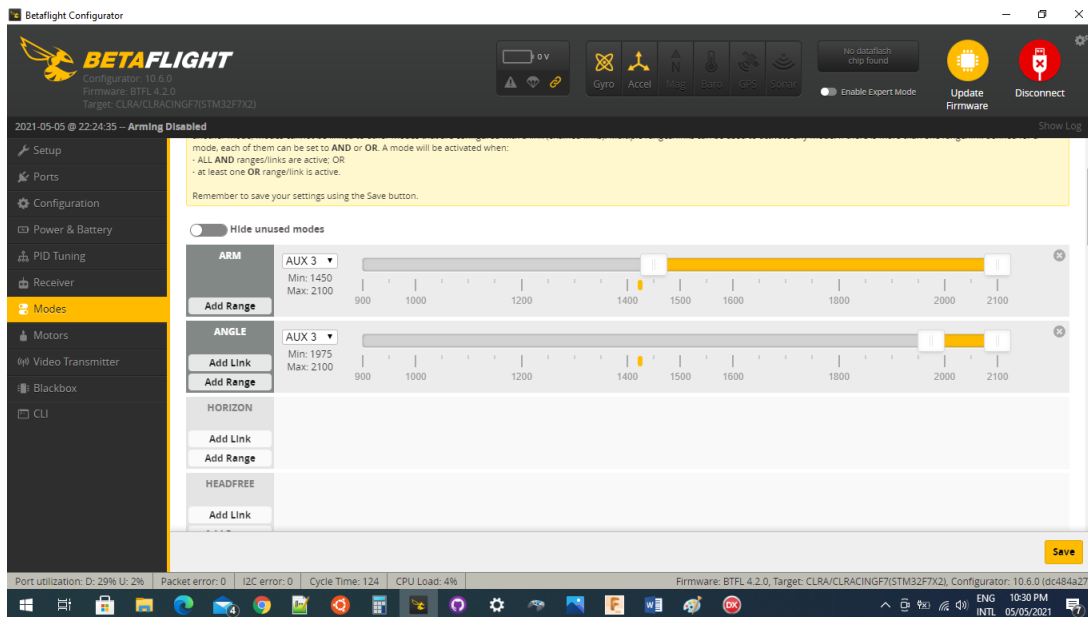
- Configuration tab select your preferred receiver. Mine is SBUS so that's what is configured in the dump file.

- Open the receiver tab and make sure your radio is set up to centres and operating correctly. The PITCH has to be on ch5. I have a FUTABA so pitch is natively CH6 so had to mix CH6 it to CH5. Your radio channel map needs to be AETR1234.

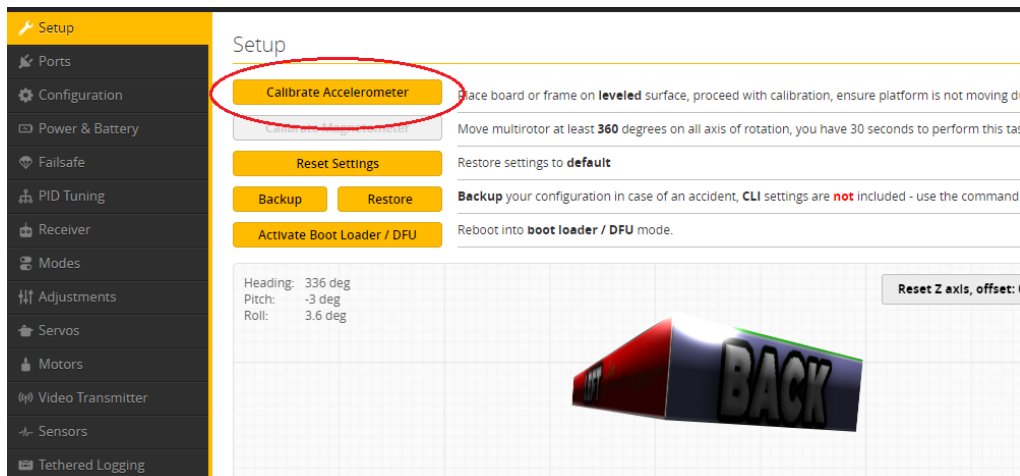
- Adjust the stick centre and trims on your radio so they are the same and the FC does not see a stick input with the sticks at centre.



21. In the modes tab set up switches to operate the ARM and ANGLE modes. Selecting the ANGLE mode enables the rescue mode. Horizon mode can be configured if 6G mode is desired.



22. On the Setup tab calibrate the accelerometer. Make sure it is nice and level

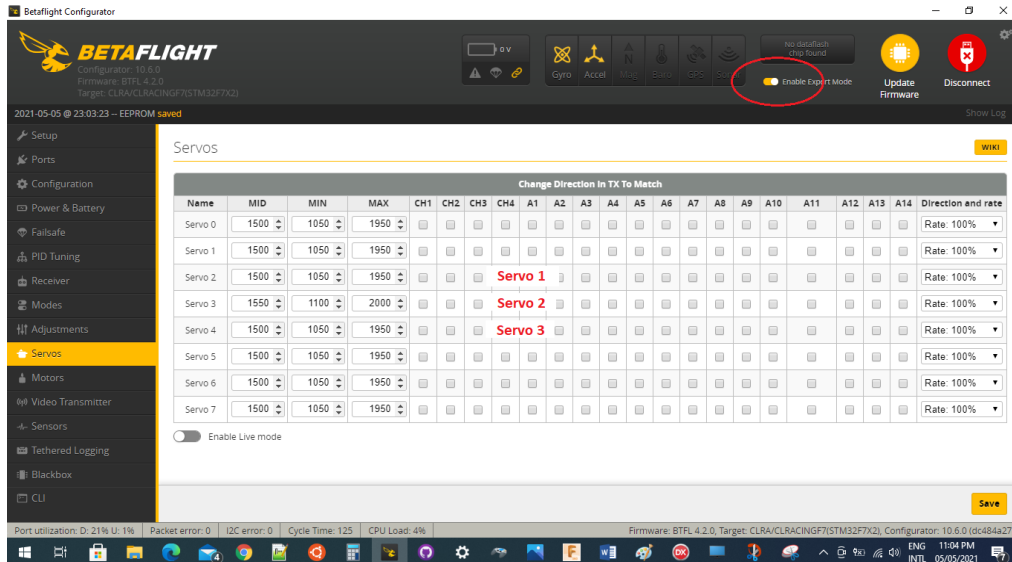


23. Setting up servos. Set the enable expert mode and click the servos tab. The servo numbering does not line up. Servo 1 is configured via Servo 2 etc shown in the pic below.

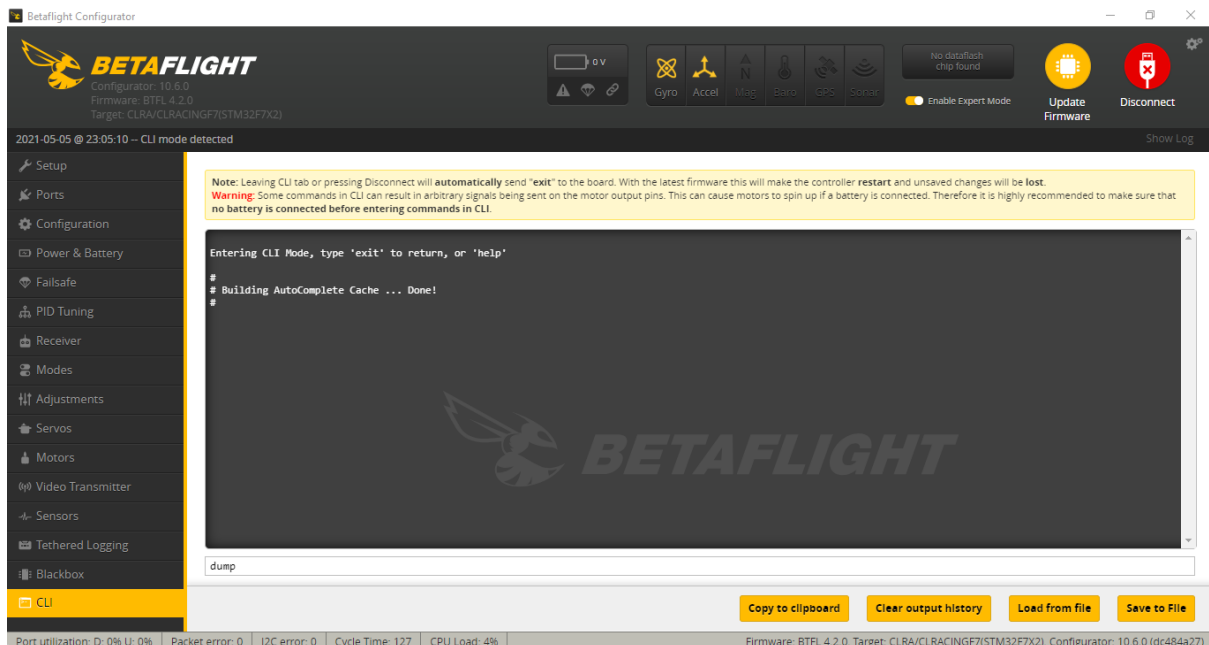
- Change the mid point until the servo horn is in the right position. [Save]
- Change the min and max to be equal values above and below the mid point. The range (difference between the min and max) for each servo can be changed so that the Blade angle positive and negative are the same depending

on head geometries. I'm not that technical so I just make them the same. In the example below I shifted the servo 2 up by 50. [Save]

c. Check the servos have full range of movement without binding. If not you will need to reduce the servo range.



24. Backup your files once you are done. Open the CLI and type: Dump [enter]. Select, copy and paste the entire output into a text file and save it. This is your dump file with all of your configuration. If you re-flash firmware or build another FC use your file at step 7.



That's it. Go fly.

PID tuning

It should be quite flyable with the PID parameters as they are. If you want to change these settings you can do it through the PID tuning tab.

The screenshot shows the Betaflight Configurator software interface. The top bar includes the Betaflight logo, version information (Configurator: 10.6.0, Firmware: BTFL 4.2.0, Target: AIRB/NOX/STM32F411), and various status icons like battery level, gyro, accel, mag, baro, GPS, and sonar. The left sidebar contains navigation options: Setup, Ports, Configuration, Power & Battery, PID Tuning (selected), Receiver, Modes, Motors, OSD, Video Transmitter, Blackbox, and CLI. The main area is titled 'PID Tuning' and features a 'WIKI' button. Below the title, there are dropdowns for 'Profile' (Profile 1) and 'Rateprofile' (Rateprofile 1), along with buttons for 'Copy profile values', 'Copy rateprofile values', 'Reset all profile values', and 'Show all PIDs'. The 'PID Profile Settings' tab is active, showing a table of PID parameters for Basic/Acro mode. The table has columns for Proportional, Integral, Derivative, and Feedforward. The rows are ROLL, PITCH, and YAW. The values are: ROLL (41, 150, 70, 160), PITCH (41, 150, 70, 180), and YAW (110, 50, 110, 5). A note states: 'Note: D Min feature is disabled and its parameters are hidden. To use D Min please enable it in PID Controller Settings.' Below the table, there is a section for 'Angle/Horizon' with a table showing Strength and Transition values. The Strength is 75 and the Transition is 75. A note states: 'Note: Sliders are disabled because values were changed manually. Clicking the 'Enable Sliders' button will activate them again. This will reset the values and any unsaved changes will be lost.' There is an 'Enable Sliders' button. To the right, the 'PID Controller Settings' tab is visible, showing various settings like Feedforward transition, Acro Trainer Angle Limit, Throttle Boost, Absolute Control, I Term Rotation, Vbat PID Compensation, Integrated Yaw, and I Term Relax. The bottom status bar shows port utilization (D: 39% U: 4%), packet error (0), I2C error (0), cycle time (128), CPU load (22%), and firmware information (Firmware: BTFL 4.2.0, Target: AIRB/NOX/STM32F411, Configurator: 10.6.0 (dc484a27)). The system clock shows 07:19 PM on 24/05/2021.

Betaflight Configurator
Configurator: 10.6.0
Firmware: BTFL 4.2.0
Target: AIRB/NOX/STM32F411

2021-05-24 @ 19:18:57 - Arming Disabled

PID Tuning [WIKI](#)

Profile: Profile 1 Rateprofile: Rateprofile 1
[Copy profile values](#) [Copy rateprofile values](#) [Reset all profile values](#) [Show all PIDs](#)

PID Profile Settings **Rateprofile Settings** **Filter Settings**

Note: D Min feature is disabled and its parameters are hidden. To use D Min please enable it in PID Controller Settings.

	Proportional	Integral	Derivative	Feedforward
Basic/Acro				
ROLL	41	150	70	160
PITCH	41	150	70	180
YAW	110	50	110	5

Note: Sliders are disabled because values were changed manually. Clicking the 'Enable Sliders' button will activate them again. This will reset the values and any unsaved changes will be lost. [Enable Sliders](#)

Angle/Horizon	Strength	Transition
Angle	75	75

PID Controller Settings

- Feedforward transition: 0
- Acro Trainer Angle Limit: 20
- Throttle Boost: 0
- Absolute Control: 5
- I Term Rotation: ☐
- Vbat PID Compensation: ☐
- Integrated Yaw: ☐
- I Term Relax: ☒ RP Axes, Setpoint Type, 20 Cutoff

[Refresh](#) [Save](#)

Port utilization: D: 39% U: 4% Packet error: 0 I2C error: 0 Cycle Time: 128 CPU Load: 22% Firmware: BTFL 4.2.0, Target: AIRB/NOX/STM32F411, Configurator: 10.6.0 (dc484a27)

ENG 07:19 PM 24/05/2021