# Introduction To Quadcopters

16th March, 2016

Electroholics

Electronics Club | IIITD

# Overview

- Function of each part
- Basic Materials Required
- How to control the direction and speed
- Applications
- Flight Dynamics
- Assembling Quadcopter

# Introduction

- Also called **Quad**rotor Multi**copter**.
- It is lifted and propelled by four rotors.
- It uses two pairs of identical fixed pitched propellers: two clockwise and two counter-clockwise.
- It can fly and move only by changing motor speed.

# Applications

- Bomb Search and disposal if possible.
- Search and Rescue operations.
- Amazon is planning for a drone based delivery.
- Camera holder
- Spraying of pesticides/fertilizers over vast field of crops.
- Pollution monitoring.
- DRONE FIGHTS.
- 3D image processing.


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# Basic Materials Required

- Naze 32 Controller.
- Brushless Motors-1100 kV
- Power Supply
- 2.4 GHz Transmitter & Receiver
- Electronic Speed Controllers(ESC)
- Bullet Connectors
- Propellers
- Gyroscope
- Accelerometer
- Magnetometer
- Frame

# Structure Of Quadcopter

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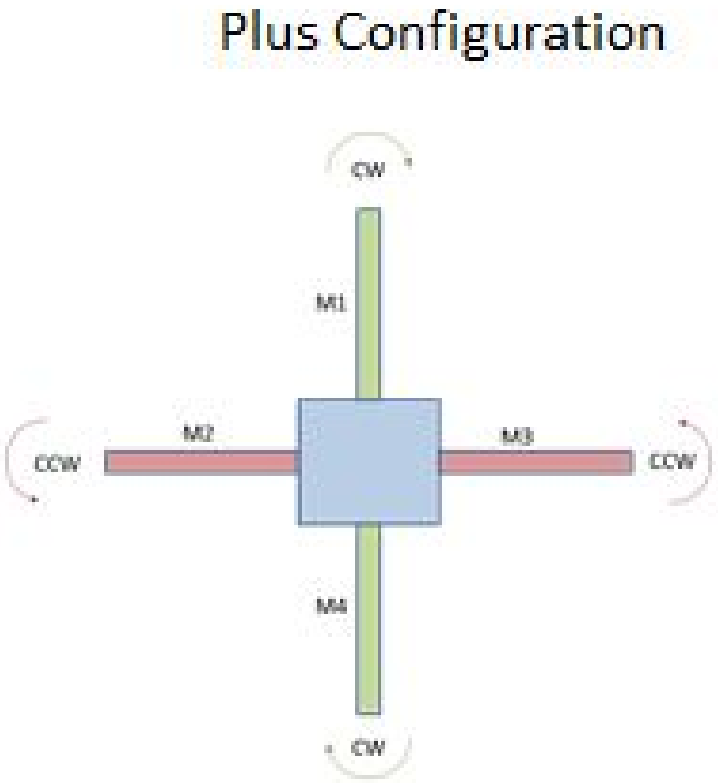
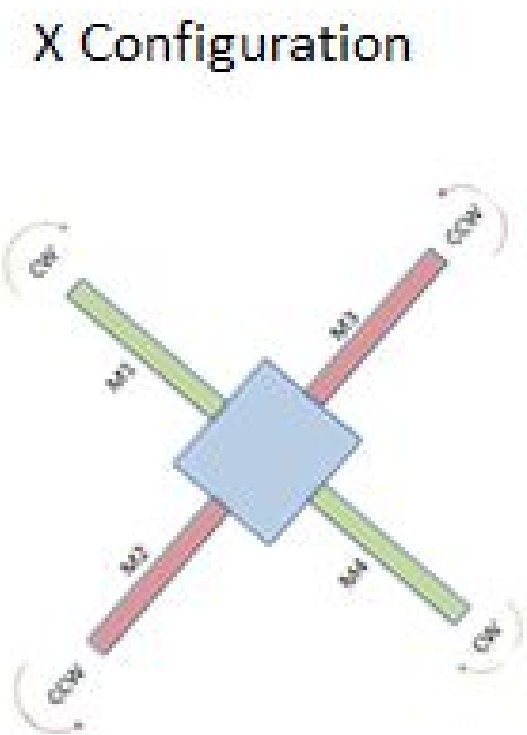


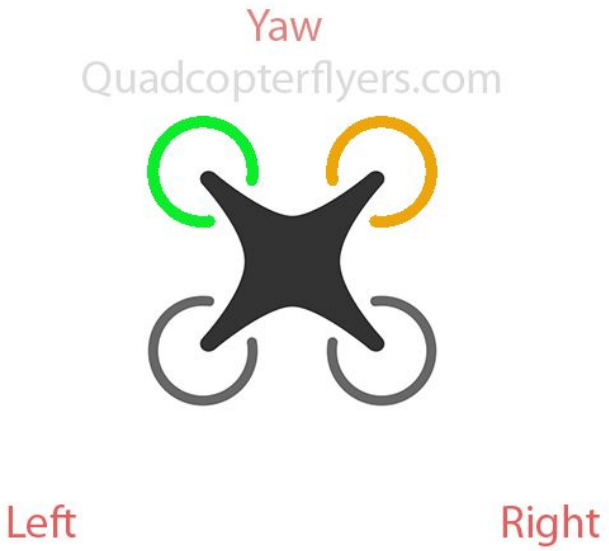



# Questions

- What will happen when all the four propellers move in same direction ?
- How can we move the quadcopter in forward or backward direction ?
- What does 3-channel or 4-channel mean ?

# What is Yaw ?

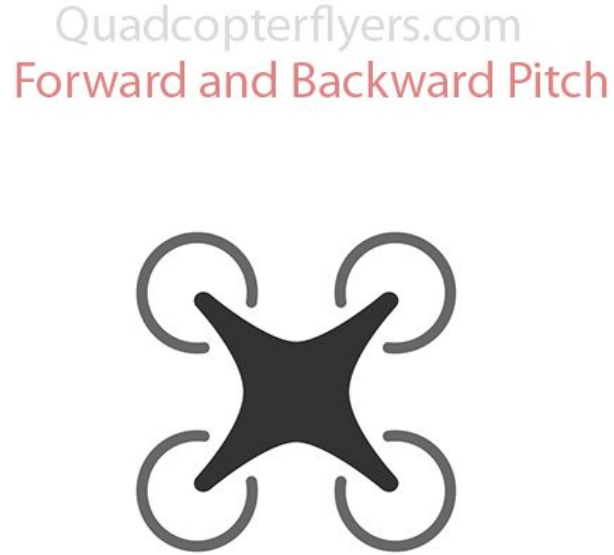
Yaw is the deviation/Rotating the head of the quadcopter either to right or left, Yaw can be controlled through the throttle stick, also called rudder, making it to rotate either to the left or right. See the below animation to understand more.



## What is Pitch ?

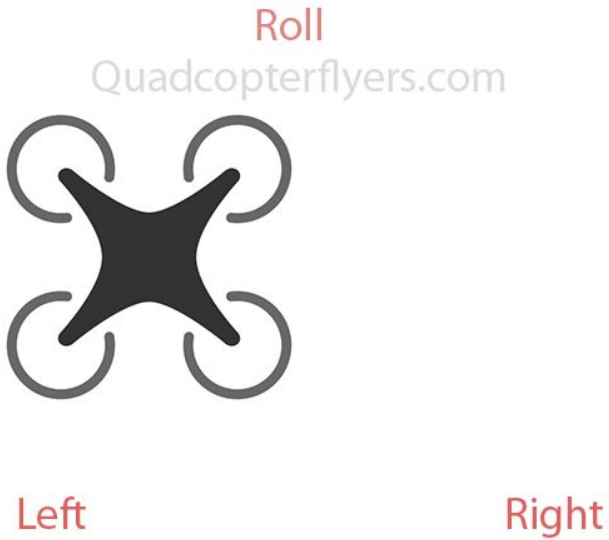
Pitch is the movement of quadcopter either forward and backward. Forward Pitch is achieved by pushing the aileron stick forward, which makes the quadcopter tilt and move forward, away from you.

Backward pitch is achieved by moving the aileron stick backwards(towards you), making the quadcopter, come closer to you.see the below animation to know more about the Pitch movement in quadcopter



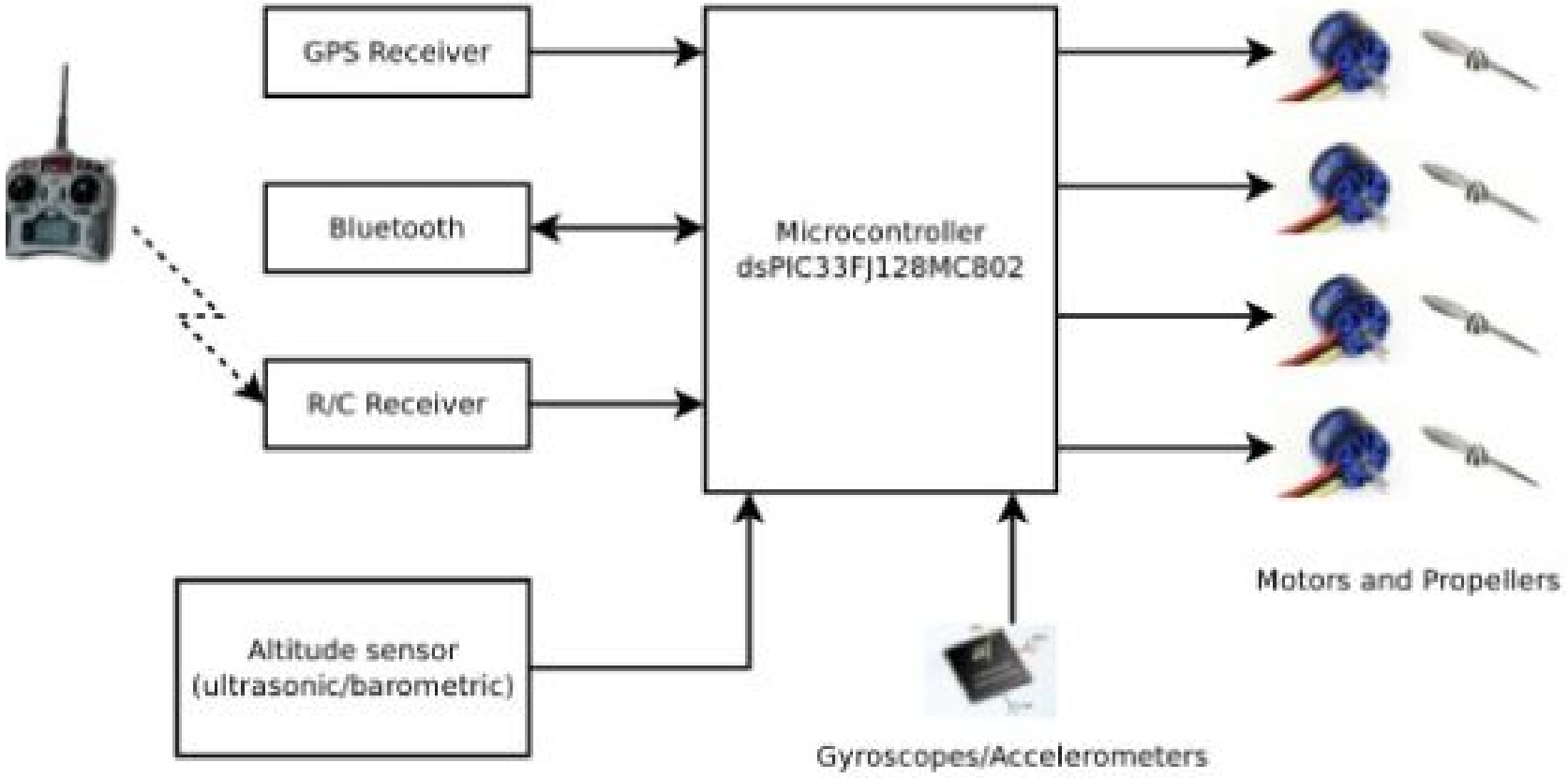
## What is Roll ?

Most people get confused with Roll and Yaw, Roll is making the quadcopter fly sidewards, either to left or right. Roll is controlled with the aileron stick, making it move left of right, if you move the aileron stick to the left, the quadcopter will fly left, if you move the aileron stick to right, the quadcopter will fly right.



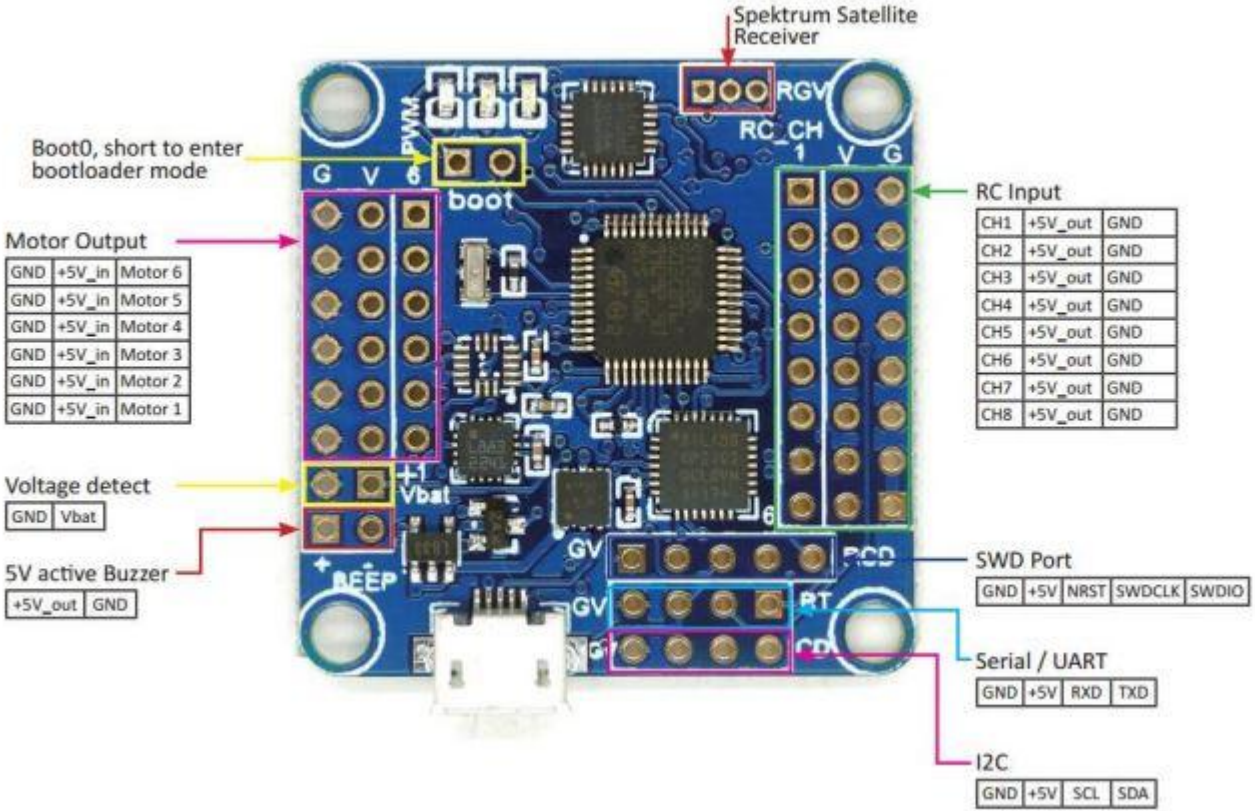
# Questions

- Difference between drone and quadcopter?
- Helicopter ?
- Working principle of sensors?


GPS Receiver
Bluetooth
R/C Receiver
Altitude sensor
(ultrasonic/barometric)
Microcontroller
dsPIC33FJ128MC802
Motors and Propellers
Gyroscopes/Accelerometers

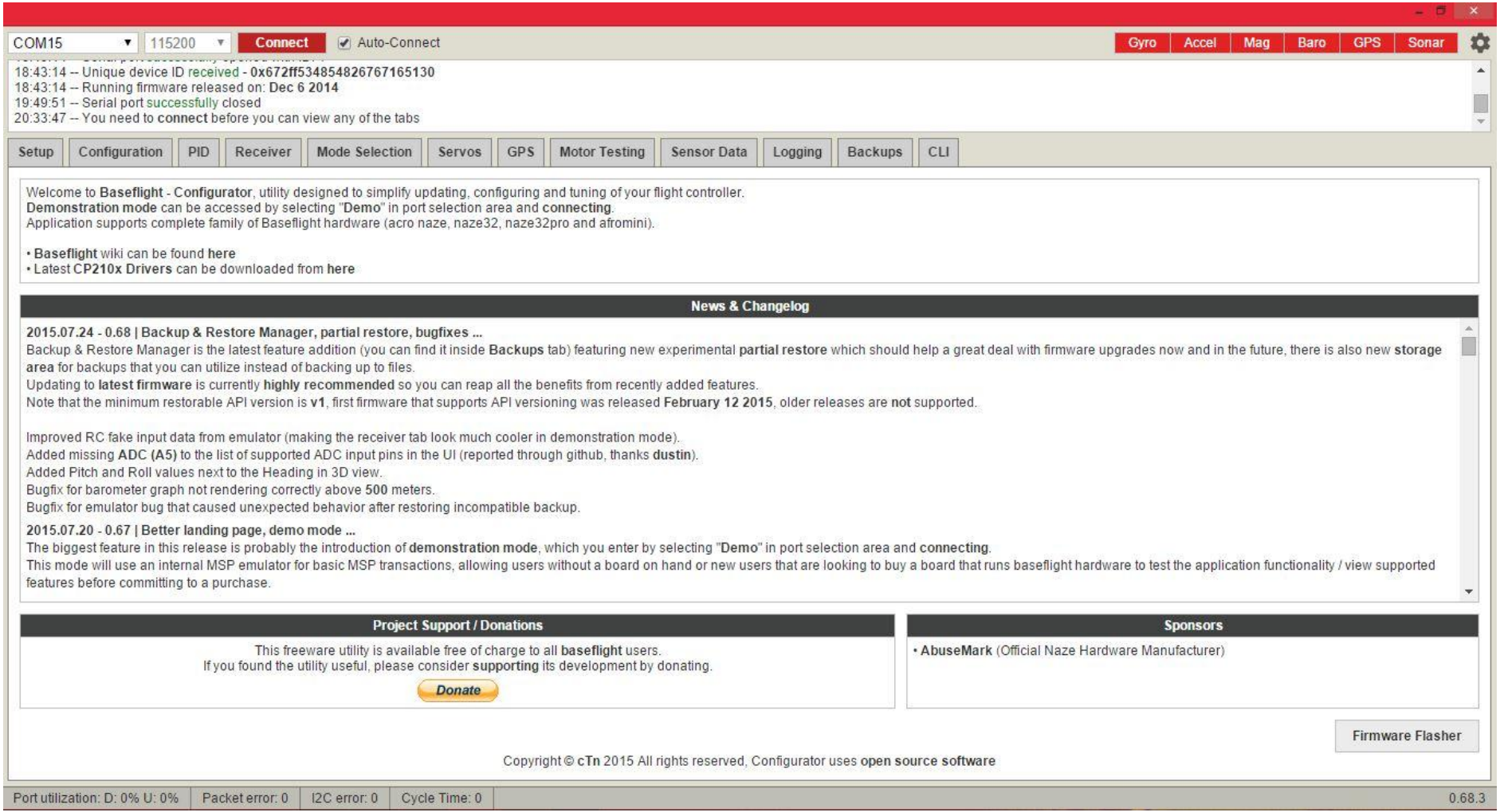
# ESC :**Electronic Speed Control**

- An **electronic speed control** or **ESC** is an electronic circuit with the purpose to vary an electric motor's speed, its direction and possibly also to act as a dynamic brake.
- ESCs are often used on electrically powered radio controlled models, with the variety most often used for brushless motors essentially providing an electronically generated three-phase electric power low voltage source of energy for the motor.
- The ESC generally accepts a nominal 50 Hz PWM servo input signal whose pulse width varies from 1 ms to 2 ms.


Spektrum Satellite Receiver
Boot0, short to enter bootloader mode
Motor Output
GND +5V_in Motor 6
GND +5V_in Motor 5
GND +5V_in Motor 4
GND +5V_in Motor 3
GND +5V_in Motor 2
GND +5V_in Motor 1
Voltage detect
GND Vbat
5V active Buzzer
+5V_out GND
RC Input
CH1 +5V_out GND
CH2 +5V_out GND
CH3 +5V_out GND
CH4 +5V_out GND
CH5 +5V_out GND
CH6 +5V_out GND
CH7 +5V_out GND
CH8 +5V_out GND
SWD Port
GND +5V NRST SWDCLK SWDIO
Serial / UART
GND +5V RXD TXD
I2C
GND +5V SCL SDA

# MOTORS

- Motors used are **Brushless 1100k**
  - Confusingly, Kv does not refer to kilovolts in this case. Rather, it's a motor velocity constant denoting the revolutions per minute (RPM) that a motor will turn when a 1 V potential difference.
  - A cylindrical shell of magnets rotates on precision bearings around a core of tightly and neatly coiled wire. (brushless)


COM15
115200
Connect
Auto-Connect
Gyro
Accel
Mag
Baro
GPS
Sonar
18:43:14 -- Unique device ID received - 0x672ff534854826767165130
18:43:14 -- Running firmware released on: Dec 6 2014
19:49:51 -- Serial port successfully closed
20:33:47 -- You need to connect before you can view any of the tabs
Setup
Configuration
PID
Receiver
Mode Selection
Servos
GPS
Motor Testing
Sensor Data
Logging
Backups
CLI
Welcome to Baseflight - Configurator, utility designed to simplify updating, configuring and tuning of your flight controller.
Demonstration mode can be accessed by selecting "Demo" in port selection area and connecting.
Application supports complete family of Baseflight hardware (acro naze, naze32, naze32pro and afromini).
• Baseflight wiki can be found here
• Latest CP210x Drivers can be downloaded from here
News & Changelog
2015.07.24 - 0.68 | Backup & Restore Manager, partial restore, bugfixes ...
Backup & Restore Manager is the latest feature addition (you can find it inside Backups tab) featuring new experimental partial restore which should help a great deal with firmware upgrades now and in the future, there is also new storage area for backups that you can utilize instead of backing up to files.
Updating to latest firmware is currently highly recommended so you can reap all the benefits from recently added features.
Note that the minimum restorable API version is v1, first firmware that supports API versioning was released February 12 2015, older releases are not supported.
Improved RC fake input data from emulator (making the receiver tab look much cooler in demonstration mode).
Added missing ADC (A5) to the list of supported ADC input pins in the UI (reported through github, thanks dustin).
Added Pitch and Roll values next to the Heading in 3D view.
Bugfix for barometer graph not rendering correctly above 500 meters.
Bugfix for emulator bug that caused unexpected behavior after restoring incompatible backup.
2015.07.20 - 0.67 | Better landing page, demo mode ...
The biggest feature in this release is probably the introduction of demonstration mode, which you enter by selecting "Demo" in port selection area and connecting.
This mode will use an internal MSP emulator for basic MSP transactions, allowing users without a board on hand or new users that are looking to buy a board that runs baseflight hardware to test the application functionality / view supported features before committing to a purchase.
Project Support / Donations
This freeware utility is available free of charge to all baseflight users.
If you found the utility useful, please consider supporting its development by donating.
Donate
Sponsors
• AbuseMark (Official Naze Hardware Manufacturer)
Firmware Flasher
Copyright © cTn 2015 All rights reserved, Configurator uses open source software
Port utilization: D: 0% U: 0%
Packet error: 0
I2C error: 0
Cycle Time: 0
0.68.3

# Queries ?