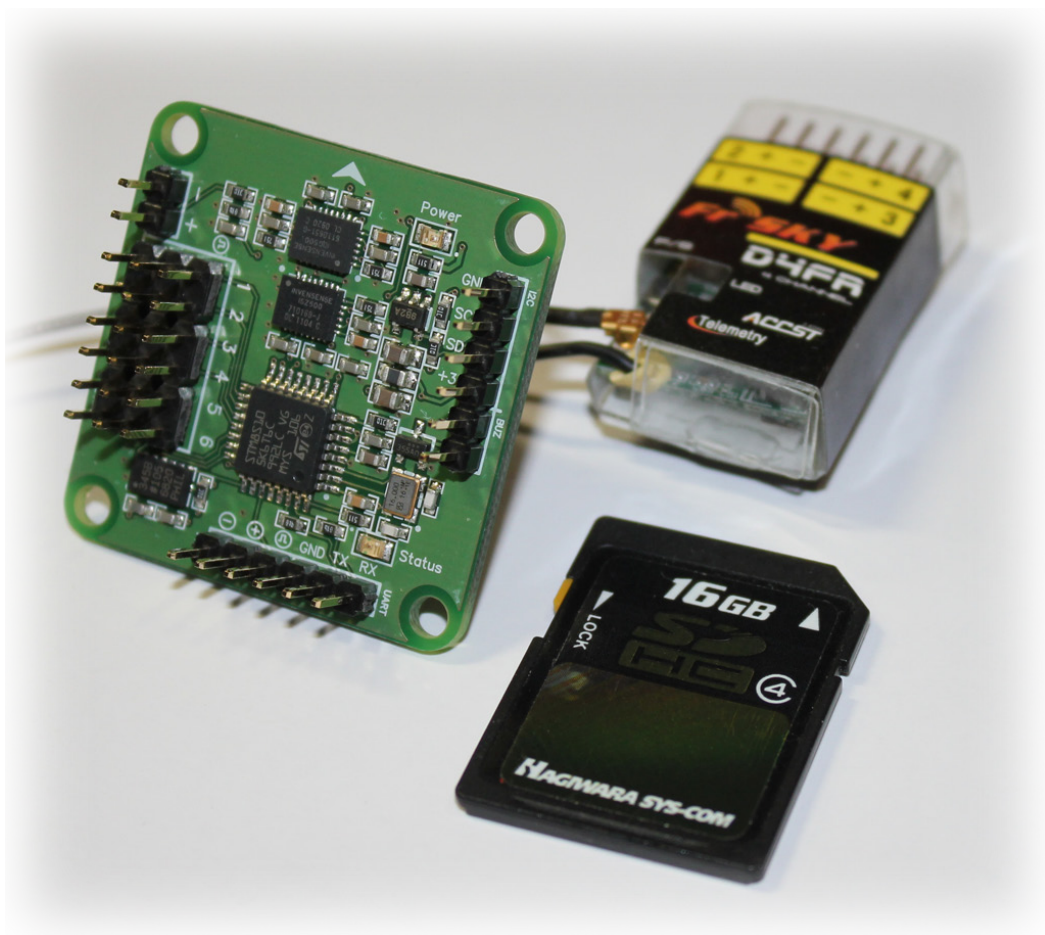


Flight Controller 「なぜ」 「Naze」

Mini Fun Fly



Create by AbuseMarK 2011

Mini FunFly Flight Controller "Naze" (なぜ) Introduction

Mini Flight Controller 「なぜ」 (pronounced 「Naze」)

36x36mm.

5 grams.

500 degrees/second 3-axis gyro.

auto-level capable (3-axis accelerometer).

6 motor outputs, support quad/hexa/tri/Y4/Y6/camera gimbal.

battery voltage monitoring.

PPM input from FrSky D4FR micro receiver.

optional I2C expansion header for additional sensors.

modern STM8 processor running at 3.3V/16MHz.

MultiWii-based configuration software for easy setup.

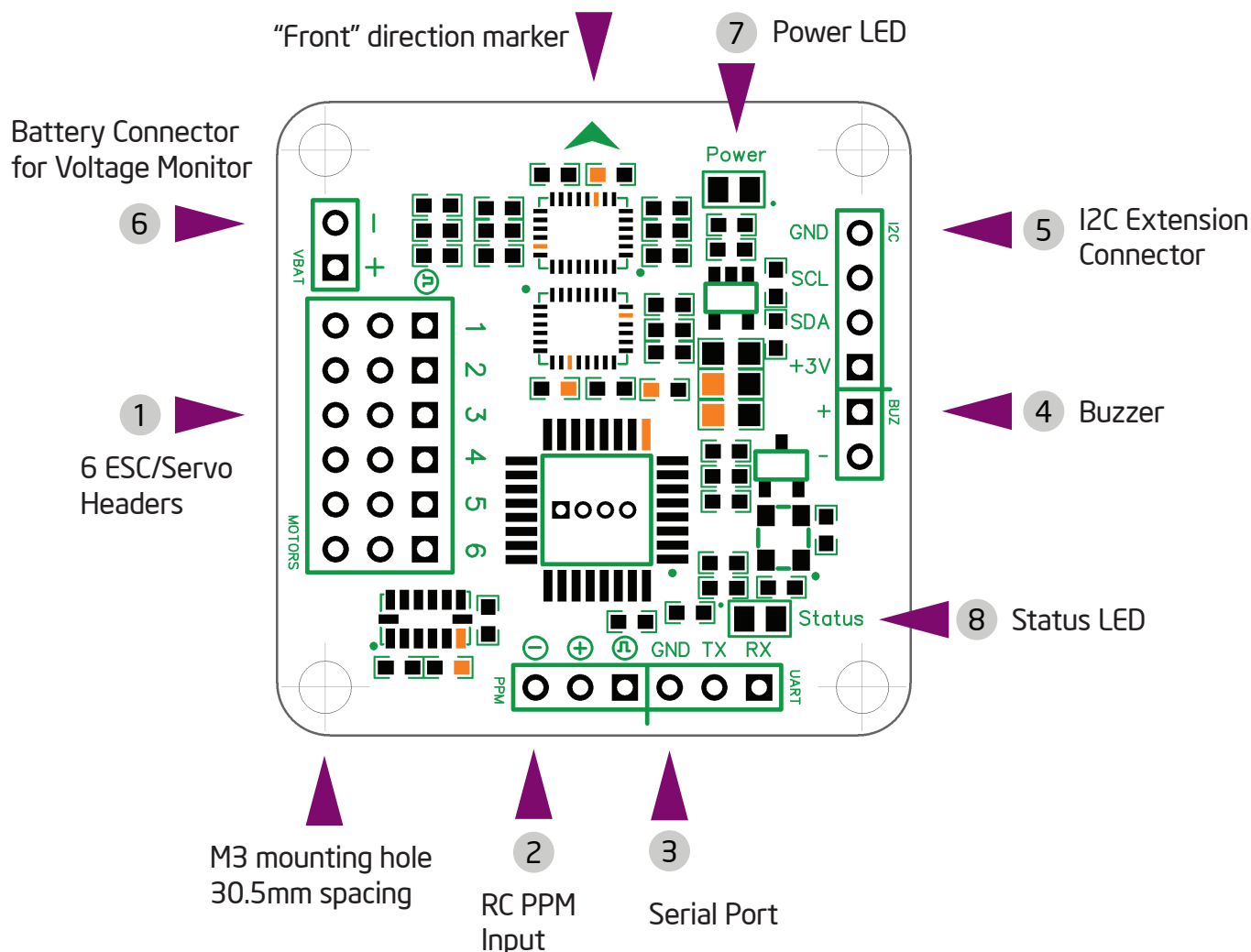
Designed for use with small indoor or small to mid-sized outdoor multicopter craft, or as a standalone camera stabilizer, the Naze flight control is simple to setup, with configuration based on the familiar "MultiWii" software.

WARNING Do not use this hardware for serious business, commercial aerial photography, or anything else where its usage could endanger the end user, spectators, inanimate objects, aircraft flying overhead, etc.

NOTE While the flight controller firmware and configuration software is based on the MultiWii system, the processor is not Atmel AVR, and this hardware cannot be programmed through the Arduino development environment or any AVR development tools. For more information on STM8S development, see the following link:
<http://code.google.com/p/afrodevices/wiki/STM8Development>

NOTE This hardware is provided as-is and end-user is expected to have reasonable technical knowledge to complete set-up and reasonable R/C experience to operate multi-rotor aircraft.

Mini FunFly Flight Controller "Naze" (なぜ) Hardware and Connection (Top)



Board is 36x36mm square, with mounting holes for M3 screws, spaced 30.5mm.

[1] ESC / Servo Headers

6 motors or 4 motors and up to 2 servos can be connected here. The pins towards center of the board and closest to numbers are signal pins. Following that is 5V, and then Ground/GND pins.

[2] RC PPM Input

Standard servo pinout for connecting PPM receiver, such as FrSky D8R or D4FR.

[3] Serial Port

Servo-style header for a serial port - RX, TX, GND pins are available. Connect to any USB-serial adapter to use configuration GUI. Do NOT connect serial port header before powering the board.

[4] Buzzer

5V Buzzer, connect a header here, + and - are marked and should be followed.

Mini FunFly Flight Controller "Naze" (なぜ) Hardware and Connection (Top, Bottom)

[5] I2C Extension Connector

This connector carries standard 3.3V I2C bus connectors (SDA, SCL) as well as provides ~50mA of 3.3V power and ground. This can be used for extension sensor boards, like magnetometer or pressure sensor.

[6] Battery Voltage Monitor

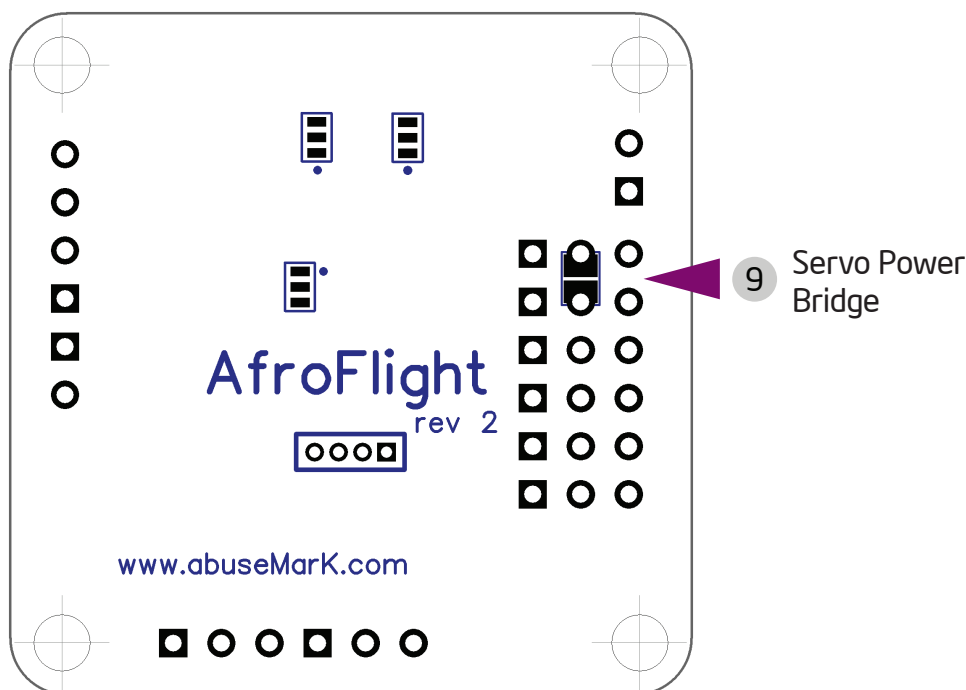
Optionally connect + and - from battery pack here to be able to use in-flight battery voltage monitoring and alarm. Battery monitor is pre-configured for 3S LiPo levels, and will sound different pattern of beeps depending on battery voltage.

[7] Power LED

Green LED which is always on when board has power.

[8] Status LED

Red LED controlled by software to show various modes of the board. Light depends on configuration and current settings.

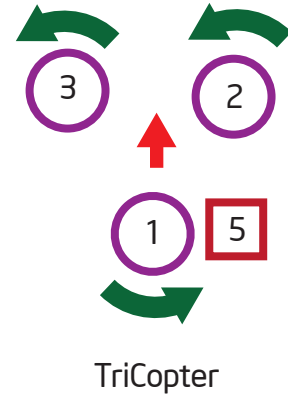
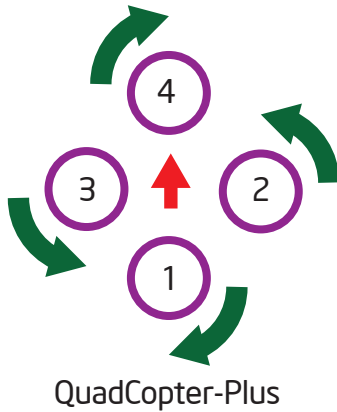
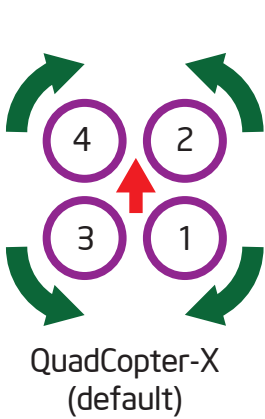


[9] Servo Power Bridge

By default, board is powered by the 1st motor ESC, and this power source is separate from the remaining 5 ESCs. By bridging this connector, all 5V outputs from motors 1 to 6 are connected together. When using camera outputs on motors 5 and 6, 5V for servo is taken from the motor 2 through 4 BECs, so a servo overloading 5V supply does not cause reset of the flight controller, which is still powered by 1st BEC.

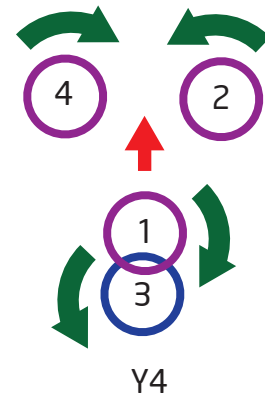
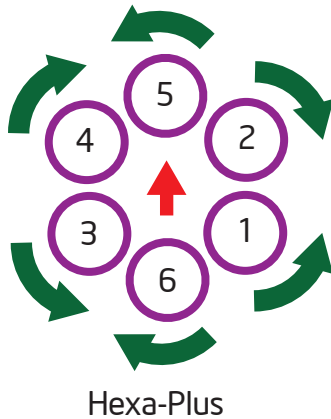
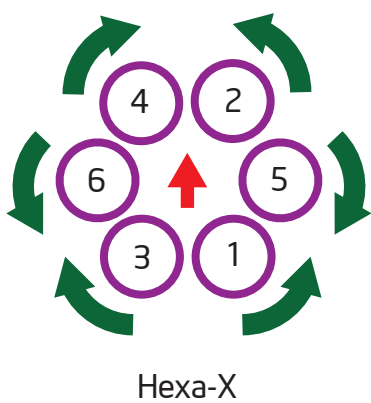
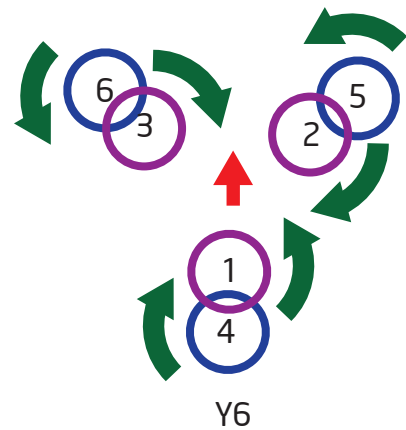
Mini FunFly Flight Controller "Naze" (なぜ) Motor Mixer Settings

Images below show motor numbering and propeller rotation for various supported mixes. The number corresponds to the motor index (1 to 6) printed on the motor connectors. In all cases, the "front" arrow on flight control board should point in same direction as red arrow in these illustrations. For Y4 and Y6 mixes, purple motors are top, and blue is bottom. For Quad-X and Quad-Plus, motor outputs 5 and 6 can be used for camera stabilization, if enabled.



	GND	5V	Signal	
Motors 1..4	○	○	○	1
	○	○	○	2
	○	○	○	3
	○	○	○	4
Servo 1 or Motor 5	○	○	○	5
Servo 2 or Motor 6	○	○	○	6

- 1st ESC BEC used to power FC only
- ESC 2 to 6 connected together to power servo if needed



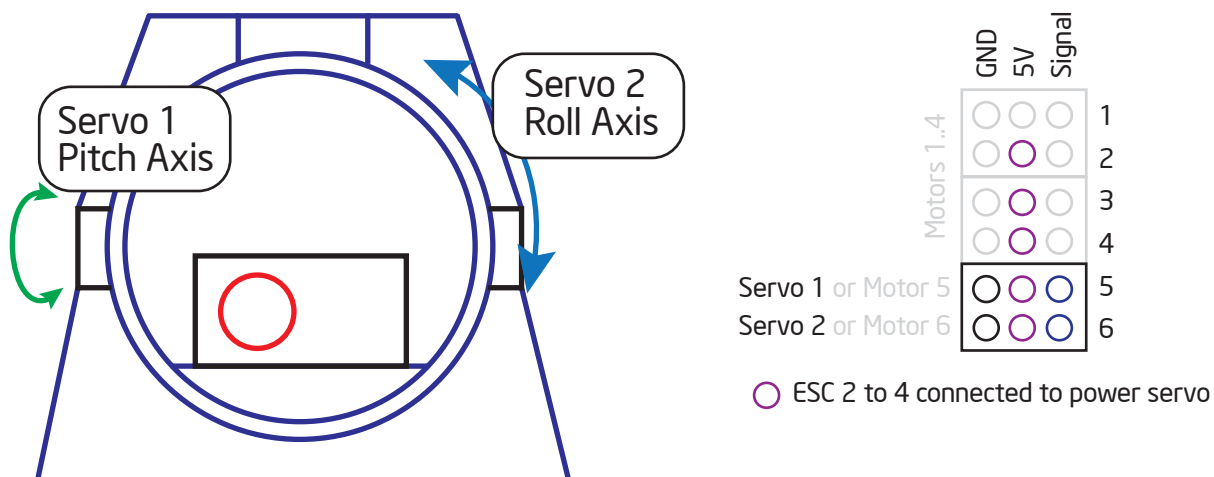
NOTE In Tri-Copter mode, tail tilt servo connects to Motor 5. When camera stabilization is enabled in either of QuadCopter modes, pitch/roll servos connect to Motor 5/6.

Mini FunFly Flight Controller “Naze” (なぜ) Camera Stabilization and Gimbal Mode

Naze can be used as a standalone camera gimbal stabilization unit. By setting multirotor type to “Standalone Gimbal Stabilization”, servo outputs 1 and 2 can drive camera gimbal servos. Both analog (50Hz refresh) and digital (200Hz+ refresh) servos are supported. Servo gain (amount of servo travel for given angle of tilt) is configurable for both pitch and roll axis.

There are two options for controlling stabilization. In **standard mode**, pitch and roll inputs from PPM are used to adjust camera position from “level”, in addition to auto-stabilization. In **tilt-only mode**, **any channel** of a standard PWM receiver can be connected to the RC Input port, and control just the camera tilt. Of course, the camera is level-stabilized in both modes.

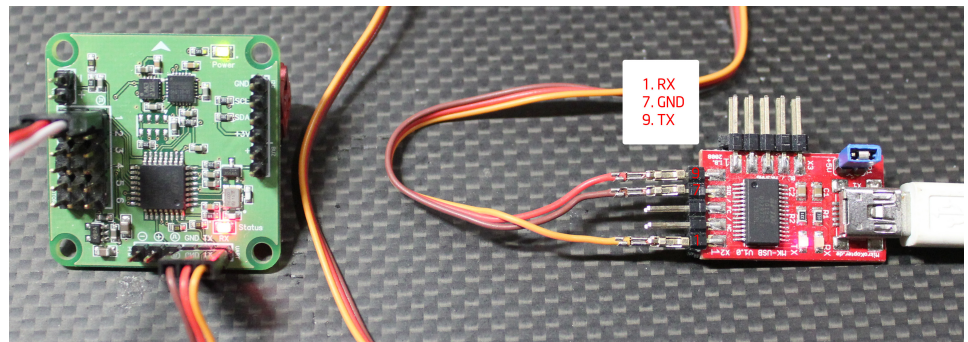
Camera stabilization can also be enabled in Quad Plus/Quad X modes. In this case, channels CAM1/CAM2 can be used to tilt/roll the camera mount.



WARNING In standalone stabilization mode, consider the power draw by gimbal pitch/roll servos. In case of high current draw, it's better to power the board separately (5V from a BEC connected to Motor 1) and connect a higher-current UBEC for the servos to any of available Motor 3-4 connectors.

Mini FunFly Flight Controller "Naze" (なぜ) Serial Port, Configuration and Firmware Upgrade

Serial port connector, labeled as "UART" on the board, is used for firmware upgrade and configuration via MultiWiiConf software. Use any USB to serial converter, such as FTDI, CP2102, etc breakout, MKUSB, etc. In the example image below, MKUSB is used. Connect RX, TX, GND pins to a 3-pin servo connector. After the board is powered up, connect to the UART socket, and try running MultiWiiConf. After selecting port number and clicking "START", if no data appears, swap RX/TX lines and try again. The board runs on 3V, but either 3V or 5V USB to Serial converter will work.



MultiWiiConf usage is standard, and all the basics are covered at MultiWii website, <http://www.multiwii.com/software>. There are no special requirements for this board, and default settings are sufficient for stable flight.



To update firmware,

1. Download AfroFlashFC from <http://code.google.com/p/afrodevices/downloads/list>
2. See readme.txt included with AfroFlashFC package for complete command-line instructions. This board requires the 'extended' firmware update method.
3. Connect serial cable to UART pins on board, prepare to power the board by ESC.
4. After typing in the update command, without pressing <Enter>, power up the board and press <Enter> key before the Status LED turns on.
5. After update is complete, disconnect power and USB Serial converter.

Currently, firmware update is by command-line only.