Crazyflie 2.1 kit user manual

Document version 1.0

Safety and Regulatory information

Crazyflie 2.1 was designed by Bitcraze AB Södra Bulltoftavägen 46, 212 22 Malmö, Sweden and is assembled in China.

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FCC Statement

For regulatory identification purposes, Crazyflie 2.1 is assigned a model number of CF21KIT. Crazyflie 2.1 FCC ID is 2AUV3CF21KIT. This FCC ID can only be found printed on the product box.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or an experienced radio/TV technician for help

Safety precautions

Read and follow the this manual before using the Crazyflie. Do not use the Crazyflie if it has been damaged.

Handle battery packs carefully. The product contains a lithium-ion polymer battery.
There is a risk of fire and burns if the battery is handled improperly.

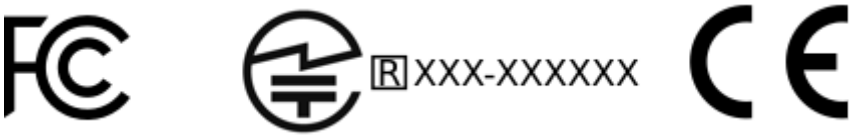
To avoid damaging the product or the battery, this product can only be used with compatible battery.

Warning: To reduce the risk of fire or burns, do not disassemble, crush, puncture, short external contacts or circuit, expose to temperature above 60°C (140°F), or dispose of in fire or water. Do not expose the battery to extremely low air pressure as this may result in an explosion or leakage of flammable liquid or gas.
Recycle or dispose of used batteries according to the local regulations or reference guide supplied with your product.

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS

Warning: Do not operate the Crazyflie outside the temperature range specified in the Specifications section below.

Warning: Do not charge the Crazyflie unattended.



Assembly

Assembling your Crazyflie 2.1 will probably take less than 10 minutes, but there are a few pitfalls. So make sure to follow the instructions below!

Unpacking the box

Start by unpacking the box. It should contain the following items:

- 1 x Crazyflie 2.1 control board
- 1 x 250mAh LiPo battery
- 5 x 7mm DC coreless motor (1 spare)
- 6 x 7mm motor mounts (2 spare)
- 1 x Foam battery pad
- 5 x CCW propellers (3 spare)
- 5 x CW propellers (3 spare)
- 1 x Battery holder deck
- 2 x Short male deck connectors
- 2 x Long male deck connectors
- 1 x micro-USB cable (48cm)

Twisting the motor wires

Start by twisting the wires of the four motors. This will reduce electronic noise and make the wires fit better in the motor mount “hooks”.

Mount the motors in the motor mounts

Push the four motors into the motor mounts. You will need some force to insert them. It is possible to place the motor against a table edge and press on the mount to get some more force, however don’t press on the motor axis while inserting them as it might damage the motor. The motor should be inserted all the way to the stop in the mount.

Attach the twisted wire

Attach the twisted wire into the two small “hooks” that are underneath the motor mount.

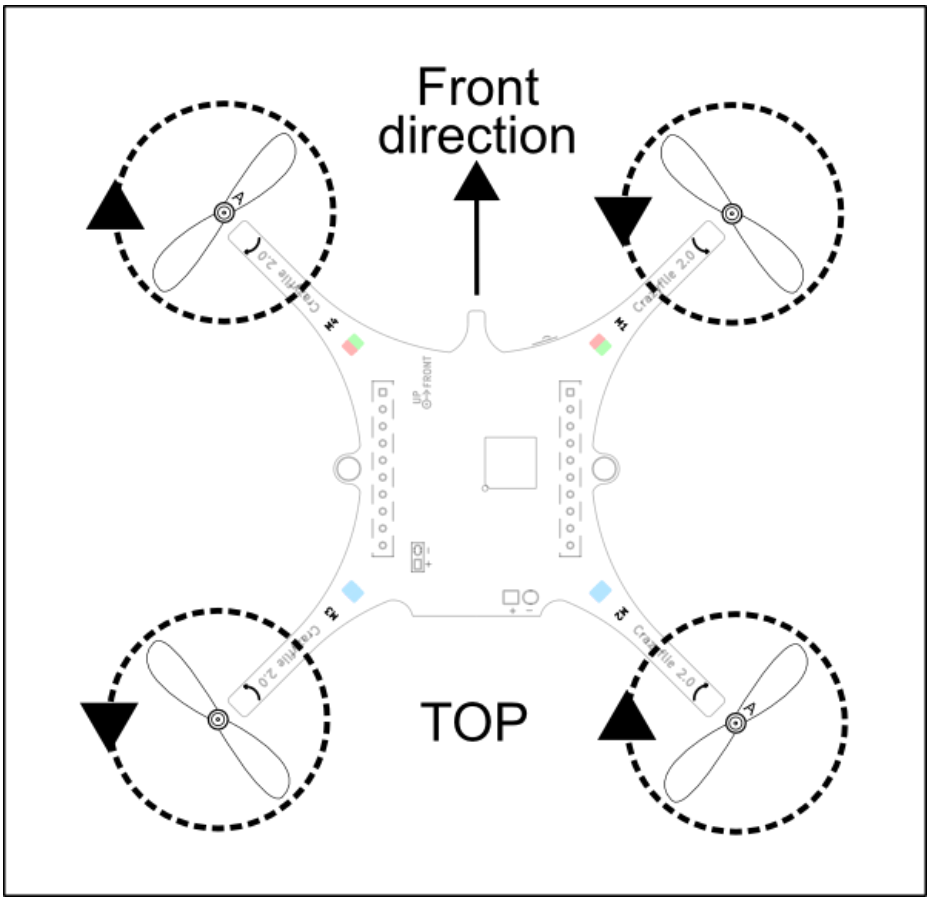
Insert the motor in the motor mount

Insert the motor mounts on the Crazyflie 2.1 wings. They are press fit and might need a small amount of force. Make sure they go all the way to the stop. It’s not important which motor you put where. After it’s been inserted, connect the motor connectors to the Crazyflie 2.1.

Attach the propellers

Note: There are two kinds of propellers, the clock wise (CW) and counter clock wise (CCW) propellers, each kind has their own bag in the box. Notice the shape of the tips, the sharper corner is on the back side of the rotation direction. The CW propellers are also usually marked with an “A”, “A1” or “A2”, while the CCW propellers are marked with “B”, “B1” or “B2” (the number is irrelevant).
Also make sure that the correct side is facing up, the top side should be convex.

Here’s a detailed view of where to attach CW and CCW propellers.



Attach the foam pad

The rubber pad should be attached to the Crazyflie 2.1 between the expansion headers on the top side. This will create friction to keep the battery from slipping out and also protect the electronics.

Attach headers

There are two types of headers in the box, long and short ones. Find the two short ones and insert them into the expansion connector.

Attach the battery

Place the battery between the headers inserted into the expansion connector and insert the battery holder board onto the headers. Watch out for the pins that can be a bit sharp when inserting it. The friction should hold the battery in place so tighten it until it does.

Now connect the battery and you are finished with the assembly. The battery wires can preferably be bent and placed underneath the PCB to be out of the way.

Assembled Crazyflie 2.1 should look like this

Power on!

The assembly is finished, now it’s time to power it on! Note that the power button is a push button, not a sliding button. During the power-on self-test all the propellers will spin in sequence. Make sure they all spin, if they don’t then check the motor connections.

Getting to know your Crazyflie

First of all, let’s look at what is front and back, this is important when flying and also when mounting expansion decks. The small “bump” (the antenna) is on the front and the blue LEDs are at the back.

Start up sequence

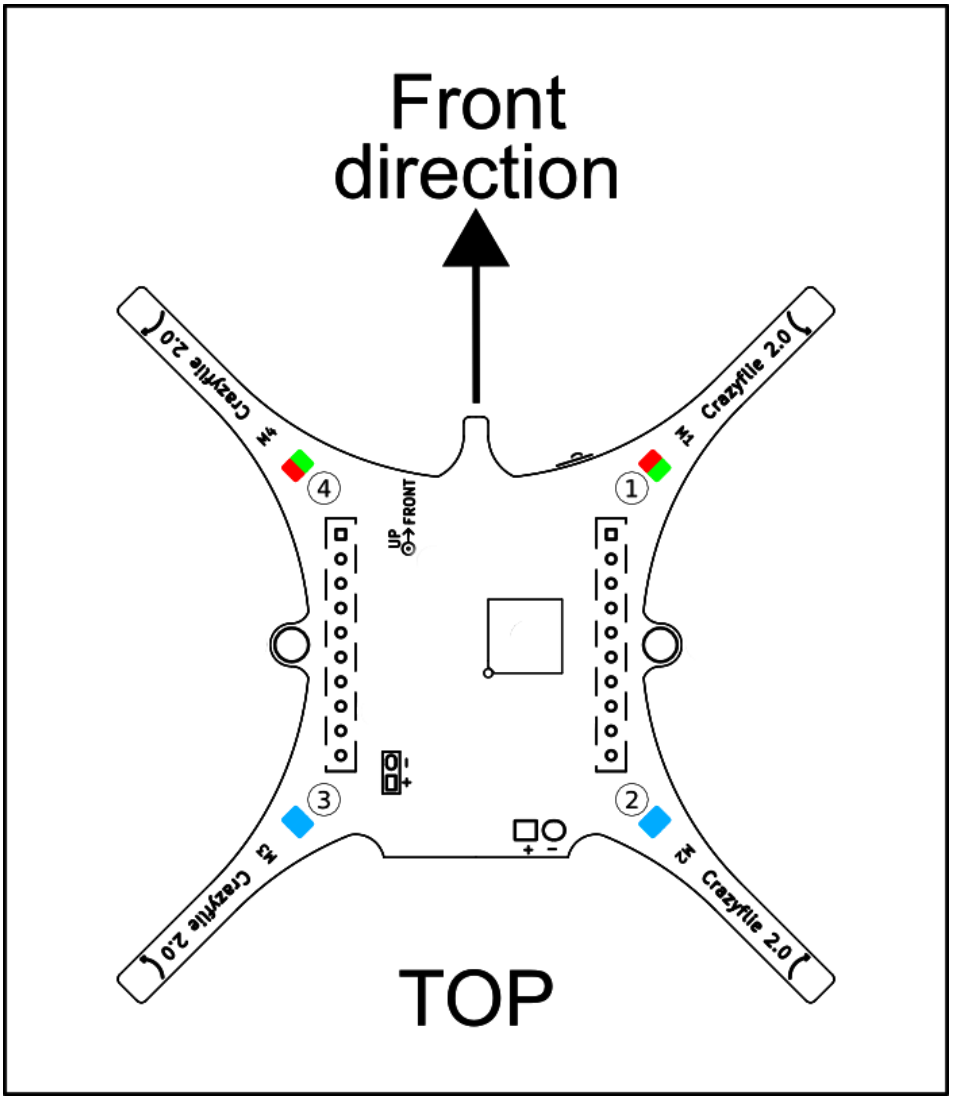
When the Crazyflie 2.1 is powered on it will automatically go through a short sequence of events to get ready for flight.

1. Run self tests - the Crazyflie 2.1 checks that the hardware is OK
2. Calibrate sensors - the Crazyflie 2.1 reads its sensors to get base values. It must be absolutely still to do this, so it’s best to put it on a level surface for a second.
3. The front left LED blinks Green multiple times. Crazyflie 2.1 is ready to fly!

Understanding LEDs

You also need to understand what the LEDs mean.

- Power on and all is good: The blue LEDs (2 and 3) are fully lit and the front right LED (1) is blinking red twice every second.
- Power on and all is good but sensors are not yet calibrated: The blue LEDs (2 and 3) are fully lit and the front right LED (1) is blinking red with 2 seconds interval. Put the Crazyflie 2.1 on a level surface and keep it absolutely still to calibrate.
- Radio connected: The front left LED (4) is flickering in red and/or green.
- Battery low: The front right LED (1) is fully lit in red. It's time to land and re-charge the battery.
- Charging: The back left blue LED (3) is blinking while the right back blue LED (4) is lit.
- Bootloader mode: The blue LEDs (2 and 3) at the back are blinking approximately once every second.
- Self test fail: The right front LED (1) is repeatedly blinking five short red pulses with a longer pause between groups.



Installing on a mobile device

It is really easy to install the app and connect to the Crazyflie 2.1. All you need is an Android or iPhone/iPad device that supports Bluetooth Low Energy (BLE).

Install the app

The Crazyflie client is available for Android and iOS. Search for it on Google Play and Apple iTunes.

- The Android client can be downloaded from Google Play: https://play.google.com/store/apps/details?id=se.bitcraze.crazyfliecontrol2
- The iPhone and iPad client can be downloaded from the Apple App Store: https://apps.apple.com/us/app/crazyflie-2-0/id946151480

Connect to the Crazyflie 2.X

Start the app and click the connect button. The buttons have different appearances in the Android and iOS apps, you can see them below.

When connected, the front left LED will blink mostly green with occasional red blink.

Flying

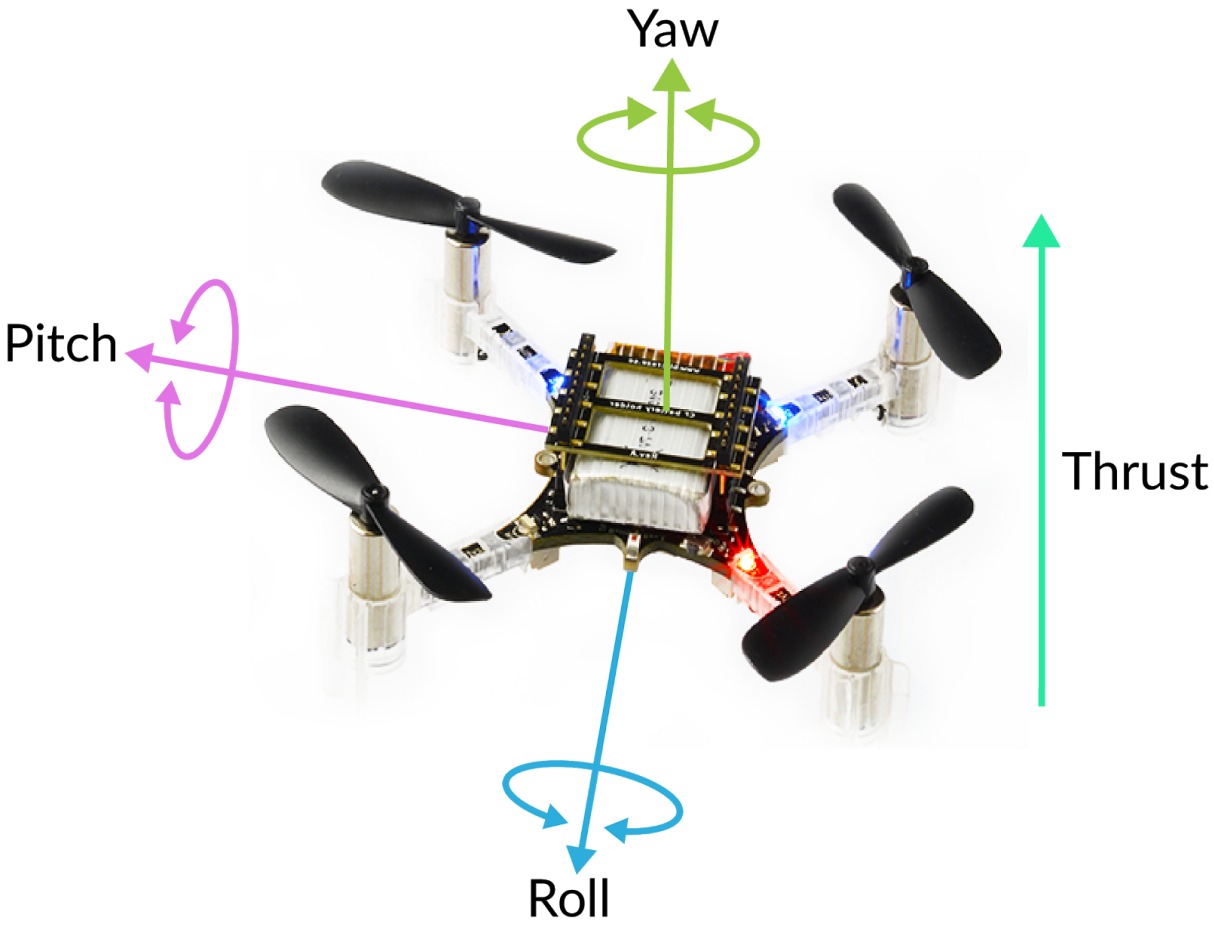
Now it’s time to do some flying, but first there are some basics you need to know about.

Orientation

First of all, it is much easier to fly when the copter is pointing away from you. The blue LEDs are on the back, so keep them pointing in your direction when starting to fly.

Maneuvering a quadcopter

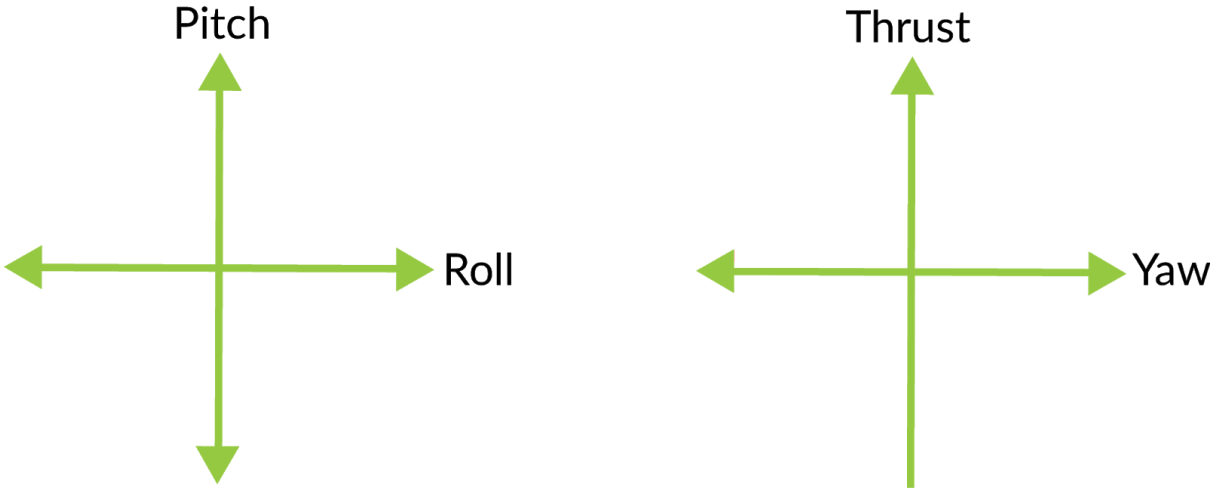
When flying a quadcopter there are four main dimensions of controls; roll, pitch, yaw and thrust.



- Roll - is the rotation around a horizontal axis going through the quadcopter from back to front. This literally rolls the Crazyflie and moves it left or right.
- Pitch - is the rotation around a horizontal axis going through the quadcopter from left to right. This tilts the Crazyflie and moves it forwards or backwards.
- Yaw - is the rotation around a vertical axis. This rotates the quadcopter left or right. Yaw is used when changing flying direction by pointing the front of the Crazyflie in different directions.
- Thrust - adjusts the altitude, or height, of the Crazyflie.

The mobile app controller

The controls on the gamepad or mobile app have the following mapping:



The ground effect

When the copter is flying close to the ground (less than a few decimeters above the ground) it is affected by what is called the ground effect. The feeling is that the air is slippery, almost as if it is gliding on ice. To avoid this, particularly when learning to fly, use a lot of thrust just when taking off and then ease off for level flight.

Charging the battery

To charge the battery of the Crazyflie 2.1, just plug in a micro USB cable. Make sure the Crazyflie is powered on. While the battery is charging, the back left blue LED will blink. When the LED is fully lit the battery is charged.

Specifications

Weight: 27g including battery
Size (WxHxD): 92x92x29mm (motor-to-motor and including motor mount feet)
Operational temperature range: 0°C to 50°C