

X-Rotor
Flight Controller F7
USER MANUAL

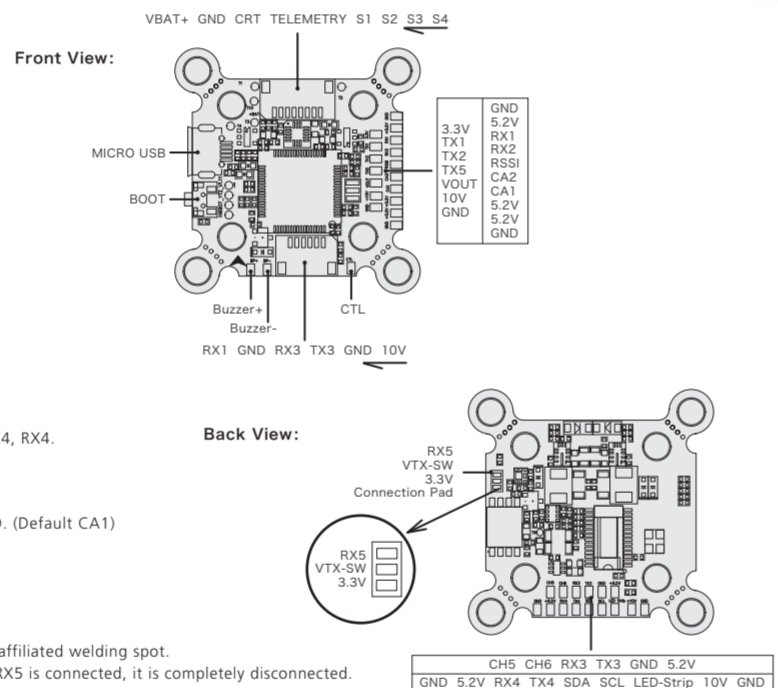
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02 FEATURES

- STM32 F722 MCU allows the FC to run the PID looptime and gyro with higher frequency.
- Onboard OSD microchip which supports the DMA mode allows users to adjust its parameters via the Betaflight software. (Note: the OSD is controlled by the F4 MCU.)
- The FC which supports Betaflight firmware & allows parameter adjustment via Betaflight software is more applicable to FPV racing.
- Onboard Flash chip can record and save flight/black box data allows users to adjust the setup of their aircraft easily.
- Compatible with various receivers like SBus, SUMH, SUMD, SPEKTRUM1024/2048, XBUS and etc.
- LED strip signal output port allows users to adjust the color & flash mode of the LED strip via the FC.
- Volt/Amp monitoring port allows users to check the battery voltage (BAT port) and current (CRT port, extra current meter is needed).
- Buzzer output port allows users to connect external buzzer(s) to the FC for warning or informing the flight status of the aircraft.
- Micro USB port allows users to connect the FC to a PC to flash firmware and adjust parameters.
- Board load 5V & 10V BEC, both can output 2A. It can supply power for receiver, VTX, LED lamp and others devices.
- Switch module of board load graphic transmission (VTX) can use remote control to control switch of graphic transmission.
- Double M3 mounting holes with damping aprons.
- Fit for DJI VTX system plug and play port. (Need fit line).
- Fit for XRotor Micro 40A (20x20) BLHeli_32 4in1 DShot1200 ESC plug and play port.

03 Layout & Different Ports of the FC

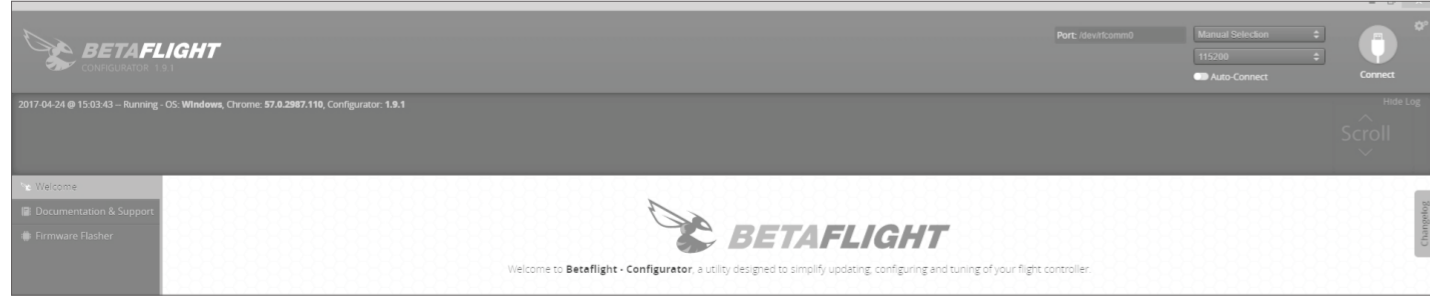
- **Name:** F7 Flight Controller
- **Size:** 32x30mm
- **Mounting Holes:** 30.5x30.5mm & 20x20mm
- **Firmware Version:** HOBBYWING_XROTORF7CONV
- **VBAT+:** voltage monitoring / FC on board BEC powered port. In general, it's directly connected to the battery's "Positive" pole (at this point, the scale value for voltage monitoring on the FC software is set to 110.);
- **CRT:** Current Sensor in port. It's connected to the current signal output port of the external voltmeter (at this point, please set the scale value for current monitoring on the FC software as per the voltmeter's instructions.)
- **GND:** Ground wire of the FC.
- **S1/S2/S3/S4:** throttle signal output ports. S1 for ESC#1, S2 for ESC#2, S3 for ESC#3 and S4 for ESC#4.
- **TELEMETRY:** Use UART6-Rx, receive 4in1 ESC telemetry data.
- **RSSI:** RSSI signal input.
- **5V:** 5V BEC output.
- **3.3V:** 3.3V output (it will be available only if the FC inputs the voltage of 5V first).
- **TX1, RX1 / TX2, RX2 / TX3, RX3 / TX4, RX4:** UART serial port.
- **SCL, SDA:** IIC clock and data port, it can connect GPS/Magnetic compass with TX4, RX4.
- **VOU:** Video-output port of the on-board OSD video signals.
- **10V:** 10V BEC output.
- **TX5:** UART5-TX, can be used for VTX Control (IRC/SA)
- **CA1, CA2:** Connect Camera 1 and Camera 2 input video signal for on-board OSD. (Default CA1)
- **CTL:** FC-Camera Control.
- **Buzzer+ & Buzzer-:** for connecting the buzzer's "Positive/Negative" poles.
- **LED-Strip:** for outputting control signals to control the WS2812B LED strip.
- **Micro-USB:** Micro-USB port.
- **Boot:** Bootloader button.
- **RX5-VTX-SW-3.3V Connection pad:** 3.3V and VTX-SW or VTX-SW and RX5 are affiliated welding spot. Short connection is connected, otherwise disconnected. When neither 3.3V nor RX5 is connected, it is completely disconnected.



Note:
 1) RX5-VTX-SW-3.3V Connection pad can only choose short connect 3.3V and VTX-SW or VTX-SW and RX5. It cannot short connect all together, otherwise it will damage flight control.
 2) Under default status, VTX-SW connect 3.3V, VTX switch module is open. When RX5-VTX-SW-3.3V Connection pad completely disconnected, picture transfer switch module is closed.

04 How to Adjust Parameters

The Betaflight software (as shown below) is needed whether you're planning to adjust parameters (of the FC) or flash firmware, you can download it from this website: <https://github.com/Betaflight>.



You need to run this software in Google Chrome, because it's an extended software of Google. In regard to the software, you can download it from the Google App Store or this website: <https://github.com/betaflight/betaflight-configurator>. After connecting the FC to a computer, you can click to enter relevant web pages (as shown below) and download the software if you need.

Latest CP210x Drivers can be downloaded from [here](#).
 Latest STM USB VCP Drivers can be downloaded from [here](#).
 Latest Zadig for Windows DFU flashing can be downloaded from [here](#).

You can start to adjust relevant parameters after you successfully connect the FC to the Betaflight software. Please visit the following websites to download the latest version of Betaflight software: <https://github.com/betaflight/betaflight-configurator> <https://github.com/betaflight/betaflight-configurator/releases>

Thank you for purchasing this HOBBYWING product! We strongly recommend reading through this user manual before use. Because we have no control over the use, installation, or maintenance of this product, no liability may be assumed for any damage or losses resulting from the use of the product. We do not assume responsibility for any losses caused by unauthorized modifications to our product. Besides, we have the right to modify our product design, appearance, features and usage requirements without notification. We, HOBBYWING, are only responsible for our product cost and nothing else as result of using our product.

01 WARNINGS

- Read through this user manual before use.
- Ensure all wires and connections are well insulated before connecting the unit to related devices, as short circuit will damage it.
- Please ensure to solder all the wires & connectors well and not get soldering tin on any electronic components if necessary. We won't be responsible for any damage resulting from soldering and installation.
- Never use the joint pins beyond the ones included in the product box to fix or connect the FC (Flight Controller), ESC and image-transferring board because the heights from pins to sockets between image-transferring board and FC, FC and ESC board is regulated/fixed. If the joint pins are too short, then they will cause the PCBs to deform; if they are too long, then they will affect the connection between pins and sockets and cause damage to relevant devices. We won't be responsible for the damage or losses resulting from users' carelessness.
- Never fly the aircraft near crowd; we won't assume any losses resulting from the crash of the aircraft.
- Never use this unit near heat, moisture, strong acid or alkali and under other environmental conditions that bad for electronic components.
- The unit is ready-to-use (it's flashed with firmware before leaving the factory), we won't be liable for any damage resulting from firmware flashing which is carried out by users.
- The FC firmware is an open-source program, users can search relevant technical information on the internet and we won't provide any technical support beyond the FC hardware.
- This user manual is based on the operation manual for Betaflight and only for reference. For more detailed information, please refer to the original Betaflight manual. Due to firmware update or other reasons, the descriptions for functions may differ, so please always take the official Betaflight manual as standard.

05 How to this FC to Connect Different Receivers

- 1. How to Set a SBus receiver**
 If you're planning to use a SBus receiver, please solder the GND/Power/Signal Wire of the receiver to the GND/5V/RX1 points on the FC first, then push the "Serial Rx" option button under "UART1" from Gray to Yellow on the "Ports Interface" of the Betaflight software, and set the "Receiver Mode", "Serial Receiver Provider" on the receiver to "Serial-based Receiver", "SBus" respectively on the "Configuration Interface" at last.
- 2. How to Set a Spektrum 1024/2048 Receiver**
 If you're planning to use a Spektrum DSM2/DSMX receiver, then please solder the GND/Power/Signal Wire of the receiver to the GND/3.3V/RX1 points (on the FC) first, and then push the "Serial Rx" option button under "UART1" from Gray to Yellow on the "Ports Interface" of the Betaflight software. And set the "Receiver Mode", "Serial Receiver Provider" on the receiver to "Serial-based Receiver", "SPEKTRUM1024/2048 (1024 for DSM2, 2048 for DSMX)" respectively on the "Configuration Interface" at last.
 How to bind the Spektrum receiver and transmitter:
 Please key in the following codes on the CLI (Command Line Interface) of the Betaflight software.
 - Key in "set spektrum_sat_bind= 9, and then press the "Enter" button on the keyboard.
 - Key in "set spektrum_sat_bind_autorst= 0, and then press the "Enter" button on the keyboard.
 - Key in "save", and then press the "Enter" button on the keyboard.
 Please wait for the FC to restart, disconnect the FC from all the power supplies (including the USB port), and re-connect the FC to the power supply, then you can see the LED on the Spektrum satellite receiver flashes rapidly, turn on the transmitter to bind the transmitter and receiver. If the LED dies out and then comes on solid, then it means that the binding is succeeded. Otherwise, change the number in the code "set spektrum_sat_bind = 9" to any other number (from 1 to 9) and try again.
 Please connect the FC to the Betaflight software, and key in the following codes on the CLI (Command Line Interface) of the Betaflight software after successfully binding the transmitter and receiver.
 - Key in "set spektrum_sat_bind = 0", and then press the "Enter" button on the keyboard. ,
 - Key in "save", and then press the "Enter" button on the keyboard.
 After that, you can use your spektrum satellite receiver to receive signals.

06 How to use VTX Switch module

In CLI: Type: **resource**
 Locate UART TX/RX pad resource ID you are using. We wired to RX5 in this demo. RX5 is D02. Note the name of resource and ID.
 " resource SERIAL_RX 5 D02 "
 Next we will clear that pad from its assigned resource.
 Type: **resource SERIAL_RX 5 NONE**
 Next we need to assign the Resource ID to the Custom Mode switch. Using the Resource ID from above. "D02"
 Type: **resource PINIO 1 D02**
 Type: **save** in CLI and then press enter. Your FC will reboot after applying changes.
 Now go to Modes and Assign an AUX channel to the USER1 mode. Just like an arm or turtle mode switch. Click SAVE.

Now you can control VTX power (10V) turn on or turn off with your transmitter.

07 How to use Camera Switch module

Camera signal default Camera 1 ;
 through Betaflight Modes setting USER2 Select Switch Camera 1 or Camera 2 .

08 How to Flash the Firmware

You need to enter the so-called "DFU" mode when flashing the FC firmware. A software tool called Zadig (you can download it from this website: <http://zadig.akeo.ie/>) will be needed to switch the driver (of the FC) to the "DFU" mode. In order to switch the driver, you need to take the following steps.

1

- Press and hold the "BOOT" button on the FC board to connect the FC to a PC.
- Start the "Zadig" software tool on the computer.
- Click "Options", and then check "List All Devices".

2

- Select "STM32 BOOTLOADER" on the list.
- Select "WinUSB" under "Driver", and then click "Reinstall Driver".

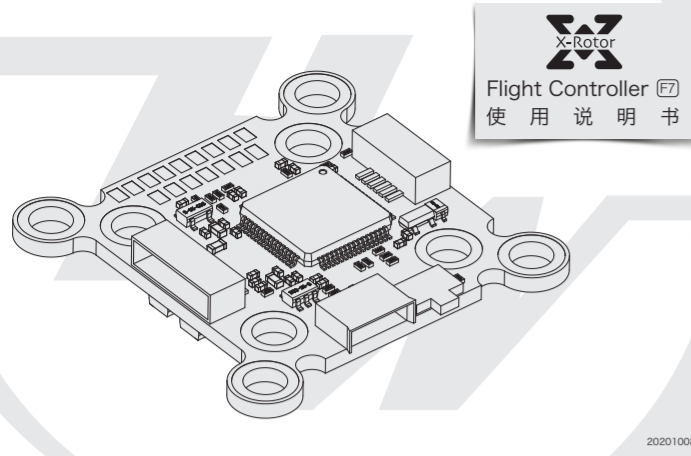
3

- Close the "Zadig" software tool, and then disconnect the FC from the computer.
- Press and hold the "BOOT" button on the FC board, and then connect the FC to a PC.
- Start the "Betaflight" software on the computer and check if the FC is connected to the computer in the "DFU" mode. If yes, then you can flash the firmware.

• For avoiding any damage to the FC, please do not flash the unit with any firmware besides "FLYWOOF7DUAL".
 • The firmware flashing can be carried out in the "online" mode or the "offline mode", click this link: <https://github.com/betaflight/betaflight/releases> to download the offline firmware if necessary.

09 More Info

Please refer to the following websites:
<http://www.betaflight.ch/>
<https://github.com/betaflight/betaflight-configurator/releases>
<https://github.com/betaflight/betaflight>
<https://github.com/betaflight/betaflight-configurator>
<https://github.com/betaflight/betaflight/releases>



X-Rotor
Flight Controller F7
使用说明书

20201008



感谢您购买本产品！使用设备前请仔细阅读本说明书，并严格遵守规定的操作程序。我们不承担因使用本产品或擅自对产品进行改造所引起的任何责任，包括但不限于对附带损失或间接损失的赔偿责任。我们有权在不通知的情况下变更产品设计、外观、性能及使用要求。

01 注意事项

- 使用本产品前请仔细阅读说明书；
- 请确保所有电线和连接部件绝缘良好，短路将会损坏本产品；
- 需对线材、插头做相关焊接时，请确保焊接牢靠，并注意不要将焊锡甩到设备的电子原件上，如果安装焊接过程中出现短路或损坏电子原件的情况，我们将不承担保修与赔偿责任；
- 飞控与电调板结合的插针插座有规定的高度，请勿使用除了套装内附带的以外的连接柱固定或连接飞控、电调、图传板，过短的连接柱会造成PCB板变形损坏原件，过长的会影响插针与插座连接，若因此造成设备损坏，我们将不承担保修与赔偿责任；

- 请勿在人群附近飞行，我们不承担因飞行器坠毁所造成的一切损失；
- 勿在高温、潮湿、强酸或强碱等不利于电子原件工作或绝缘的环境下使用本设备；
- 飞控出厂时已写入固件可以直接使用，若用户自行升级刷写固件过程中，造成飞控损坏的，我们将不承担保修与赔偿责任；
- 飞控固件为开源程序，用户可以自行查找相关技术资料，我们不提供除了飞控硬件以外的技术支持；
- 本说明书依据Betaflight官方说明书编写而来，仅作参考使用，更多更详细的说明请参考Betaflight官方原文档，随着Betaflight固件更新等原因，可能会出现功能或描述不同的情况，一切请以Betaflight的官方文档为准。

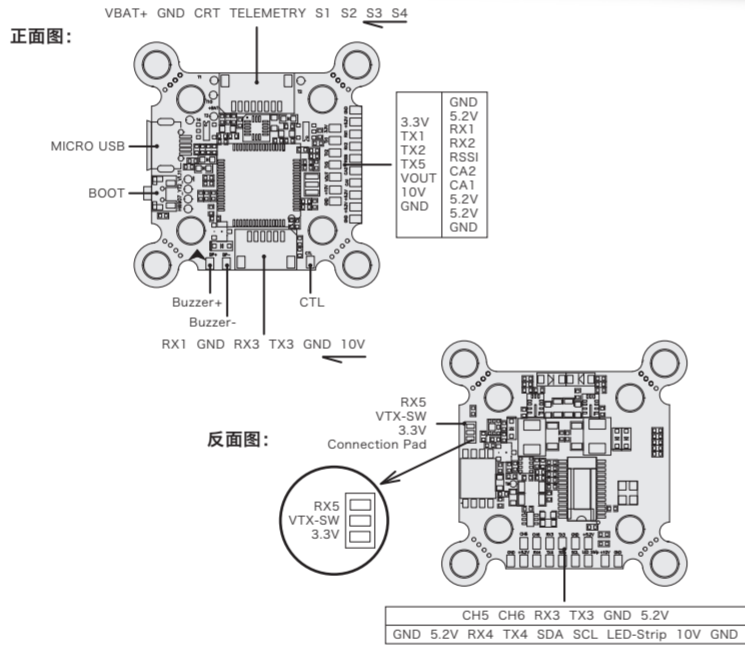
02 飞控简介

- 使用STM32 F722主控芯片，可以运行更高频率的PID循环时间和陀螺仪；
- 板载OSD芯片，可以使用BetaFlight调参软件调整参数；
- 支持BetaFlight固件，可使用BetaFlight调参软件方便调节各种参数，更适合FPV飞行与竞赛；
- 板载存储芯片，可记录飞行日志，方便用户基于飞行数据调试飞机；
- 支持多种类型接收器（如：SBUS, SUMH, SUMD, SPEKTRUM1024/2048, XBUS等类型的接收机）；
- 具有LED编程信号输出口，支持可编程LED灯带，可通过飞控调整灯带颜色和闪光灯模式；
- 具有电压监测端口（BAT）和电流监测端口（CRT），蜂鸣器输出口，Micro USB接口；
- 板载5V，10V 双BEC，输出电流均可达2A，可为飞控、接收机、图传、LED灯等设备供电；
- 板载图传开关模块，可使用遥控器控制图传开关。
- 30.5x30.5mm、20x20mm两种规格带减震胶圈M3安装孔。
- 适配DJI天空端即插即用插座。（需搭配适配线）
- 适配好盈XRotor Micro 40A (20x20)BLHeli_32 4in1 DShot1200电调即插即用插座。

03 飞控布局及接口定义图

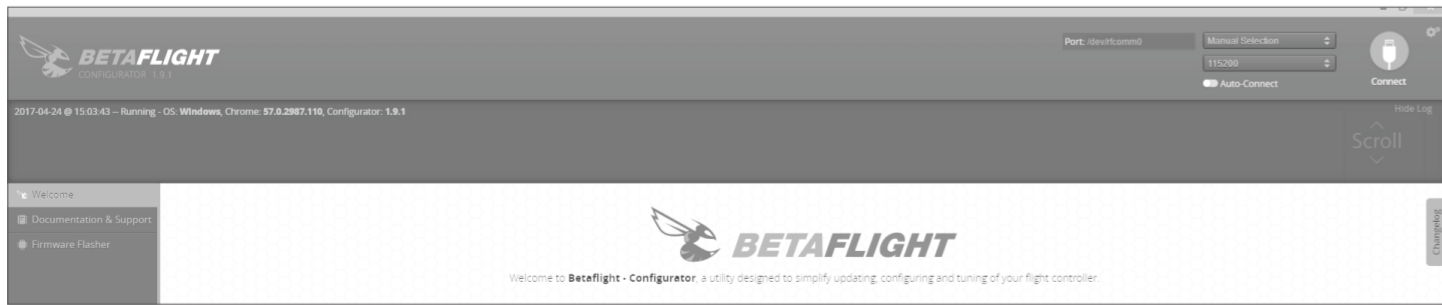
- 飞控名称:** F7 飞行控制器
- 尺寸:** 32x30mm
- 安装孔:** 30.5x30.5mm & 20x20mm
- 固件版本:** HOBBYWING_XROTORF7CONV
- VBAT+:** 电压监测口/飞控BEC供电输入口；直接连接电池正极既做为飞控电压检测又作为飞控BEC电源输入。（此时飞控软件内电压监测scale值设置为110）
- CRT:** Current Sensor in 电流监测口；连接外置电量计电流信号输出口（此时飞控软件内电流监测scale值设置参考电量计说明）。
- GND:** 飞控地线。
- S1-4:** 油门信号输出口，S1对应1号电调，S2对应2号电调，S3对应3号电调，S4对应4号电调。
- TELEMETRY:** 为UART6-Rx，作为接收4in1电调的telemetry数据使用。
- RSSI:** RSSI信号输入。
- 5V:** 5V BEC输出
- 3.3V:** 3.3V输出（需要飞控先输入5V后才有输出）。
- TX1,RX1:** UART1串口的输出，输入。
- TX2,RX2:** UART2串口的输出，输入。
- TX3,RX3:** UART3串口的输出，输入。
- TX4,RX4:** UART4串口的输出，输入。
- SCL,SDA:** IIC通讯的时钟与数据口，配合TX4，RX4可连接外置GPS/罗盘模块。
- VOUT:** video-out，板载OSD视频信号输出口。
- 10V:** 10V BEC输出。
- TX5:** UART5串口的输出，可连接VTX实现SA/IRC功能。
- CA1,CA2:** 连接Camera 1和Camera 2 输入视频信号给板载OSD。（可在飞控内设置Camera 1输入还是Camera 2输入，默认Camera 1）
- CTL:** FC-Camera Control，飞控-摄像头控制口。
- Buzzer+ ,Buzzer-:** 连接蜂鸣器对应正负极。
- LED-Strip:** 可以输出控制信号控制WS2812B LED灯带；
- Micro-USB:** Micro-USB接口。
- Boot:** Bootloader按键。
- RX5-VTX-SW-3.3V Connection pad:** 3.3V与VTX-SW或者VTX-SW与UART5-Rx关联焊点，短接即为连通，反之断开。既不连接3.3V,也不连接UART5-Rx时，为完全断开，此时VTX-SW模块为关闭状态。

- 注意:**
- 1) RX5-VTX-SW-3.3V Connection pad只能选择短接3.3V与VTX-SW或者VTX-SW与RX5，不可全部短接在一起，否则会损坏飞控。
 - 2) 默认状态下VTX-SW连接3.3V（出厂状态时使用0R电阻短接），VTX开关模块为打开状态



04 参数调节

飞控调参与固件升级都需要用到BetaFlight的调参软件（官方地址：<https://github.com/Betaflight>），如图所示：



该软件需要在谷歌浏览器（Google Chrome）内运行，属于谷歌的一个扩展程序，软件可从谷歌商店（需翻墙）下载，或从如下地址下载：<https://github.com/betaflight/betaflight-configurator>，下载完成后拖入谷歌浏览器扩展程序内即可。

飞控连接电脑时如需要驱动软件，可从如图所示的位置点击进入网页进行下载：

Latest **CP210x Drivers** can be downloaded from [here](#).
Latest **STM USB VCP Drivers** can be downloaded from [here](#).
Latest **Zadig** for Windows DFU flashing can be downloaded from [here](#).

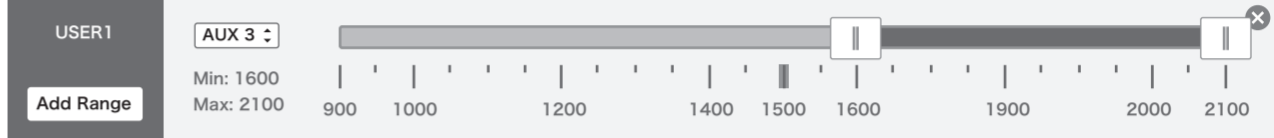
成功连接飞控与调参软件后即可进行参数调节。
最新版的Betaflight调参软件下载地址为：
<https://github.com/betaflight/betaflight-configurator>
<https://github.com/betaflight/betaflight-configurator/releases>

05 连接接收机

- SBUS设置:**
 - 若使用SBUS接收机，请焊接GND、5V、RX1三点；
 - Beatflight软件Ports界面将UART1的Serial Rx选项按钮由灰色推至黄色；
 - Configuration界面将Receiver的Receiver Mode设置为Serial-based receiver，Serial Receiver Provider设置为SBUS即可。
 - SPEKTRUM1024/2048设置:**
 - 若使用Spektrum卫星接收，请焊接GND、3.3V、RX1三点，Beatflight软件Ports界面将UART1的Serial Rx选项按钮由灰色推至黄色，Configuration界面将Receiver的Receiver Mode设置为Serial-based receiver，Serial Receiver Provider设置为SPEKTRUM1024或2048（DSMX制式选择2048，DSM2制式选择1024）即可。
- SPEKTRUM 对频:**
- 在betaflight软件CLI 界面下，输入如下代码：
- 输入：set spektrum_sat_bind = 9 然后按下键盘上的回车键，
 - 输入：set spektrum_sat_bind autorst = 0 然后按下键盘上的回车键，
 - 输入：save 然后按下键盘上的回车键，
- 等待飞控重启，然后断开飞控的所有供电（包括USB），给飞控重新上电，此时看到卫星在快闪，打开遥控器对频，若卫星熄灭后常亮则对频成功，否则把代码set spektrum_sat_bind = 9中的数字换为其他数字（1-9）再次尝试。
- 成功对频后，连接Beatflight软件，在CLI 界面下如数如下代码：**
- 输入：set spektrum_sat_bind = 0 然后按下键盘上的回车键，
 - 输入：save 然后按下键盘上的回车键，
- 保存后，即可开始使用你的卫星接收了。

06 设置使用VTX开关模块

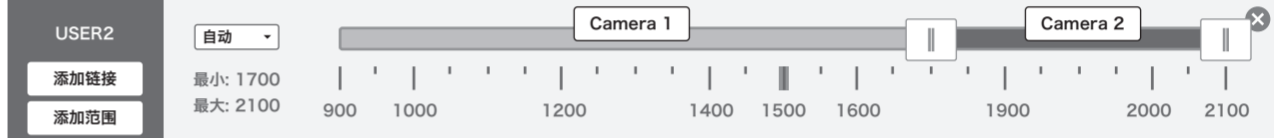
在CLI界面输入：**resource**
如果连接的是UART5-Rx（其他的请自行类比设置），找到UART TX/RX焊盘的资源ID，可以在资源列表中找到如此的内容：“resource SERIAL_RX 5 D02”，即RX5的ID是D02接下来，我们要释放掉被RX5占用的资源ID：
输入：**resource SERIAL_RX 5 NONE**
D02端口随即被释放。接下来需要将自定义的通道分配到刚才被释放D02端口：
输入：**resource PINIO 1 D02**
最后输入：**save**，飞控将会自动保存刚才的设置并重启。然后在Modes界面，为刚才设置的USER1分配一个遥控器的通道，并设置开启区域，然后点击保存，所有的设置到此完成。



现在即可控制VTX开关模块开启或者关闭供电了。

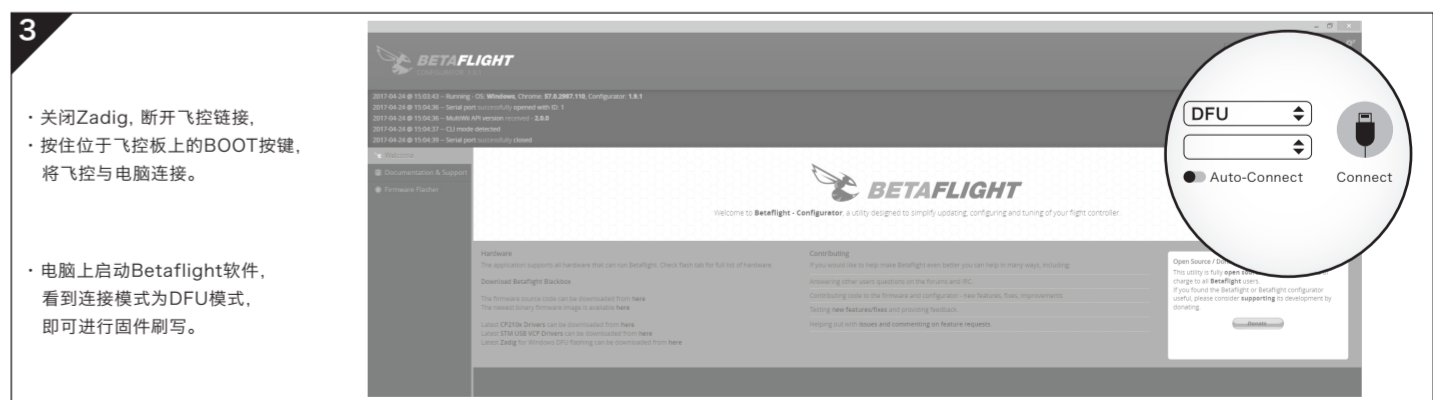
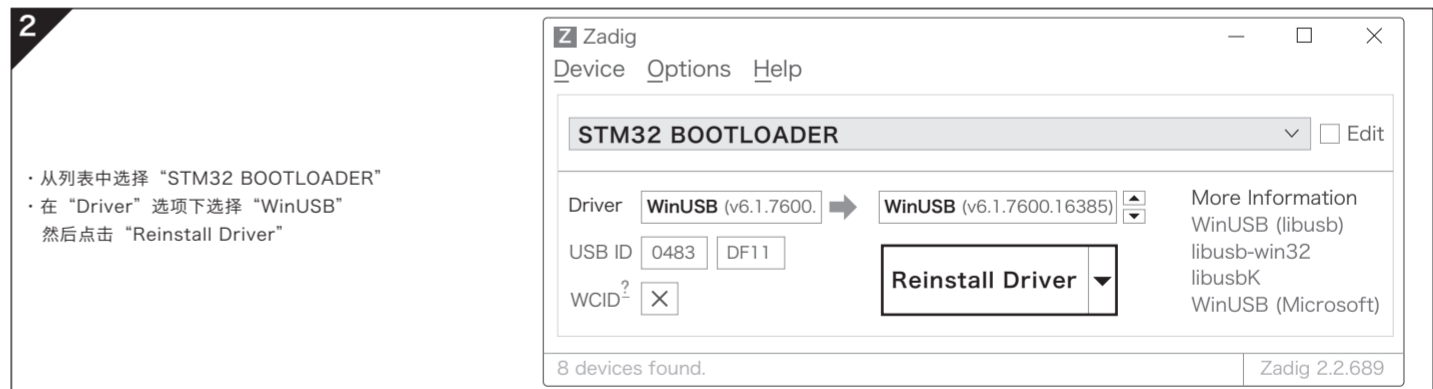
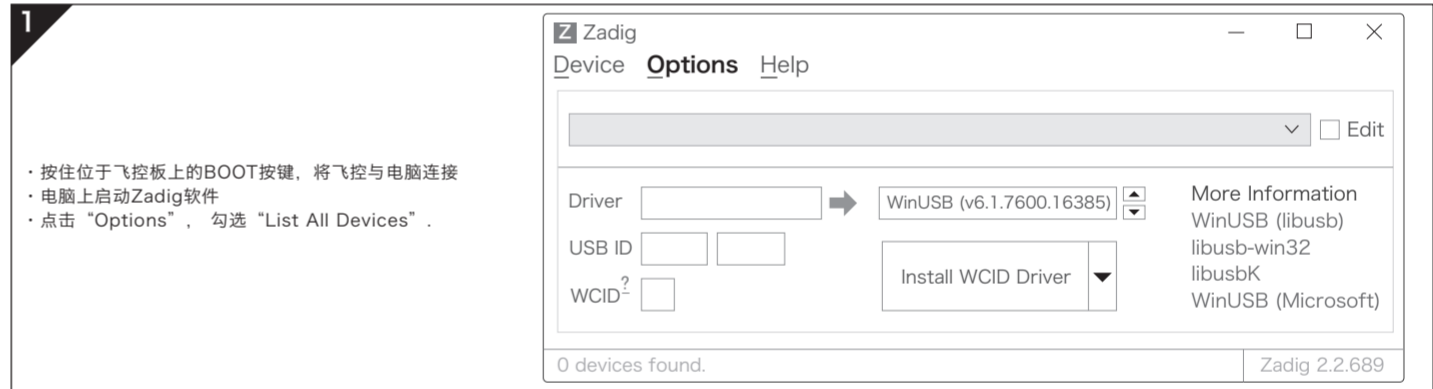
07 设置使用Camera 1 & 2切换

Video-in信号默认为Camera1，通过BetaFlight设置USER2 可以切换Camera1或者Camera 2切换。在Modes界面，为USER2分配一个遥控器的通道，并设置开启区域，然后点击保存，所有的设置到此完成。



08 固件刷写

刷写飞控固件时需要进入DFU模式。运用一个叫Zadig的工具（下载并启动它，下载地址：<http://zadig.akeo.ie/>）可以切换驱动模式为DFU模式。为了切换驱动程序，需要采取以下步骤：



请不要刷写除了FLYWOOFF7DUAL以外的固件，以免造成飞控损坏；
固件刷写分在线与离线两种模式，离线固件下载地址为：<https://github.com/betaflight/betaflight/releases>

09 更多信息

请参考：
<http://www.betaflight.ch/>
<https://github.com/betaflight/betaflight-configurator/releases>
<https://github.com/betaflight/betaflight>

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