

SINGLE CAMERA

AI + BetaFlight

2-in-1 flight controller

MANUAL

2-in-1 design - no separate FC required

Plug and play - replaces a standard FC

Standard interfaces; direct replacement for mainstream FCs; easy installation

Simple operation; no extra training required

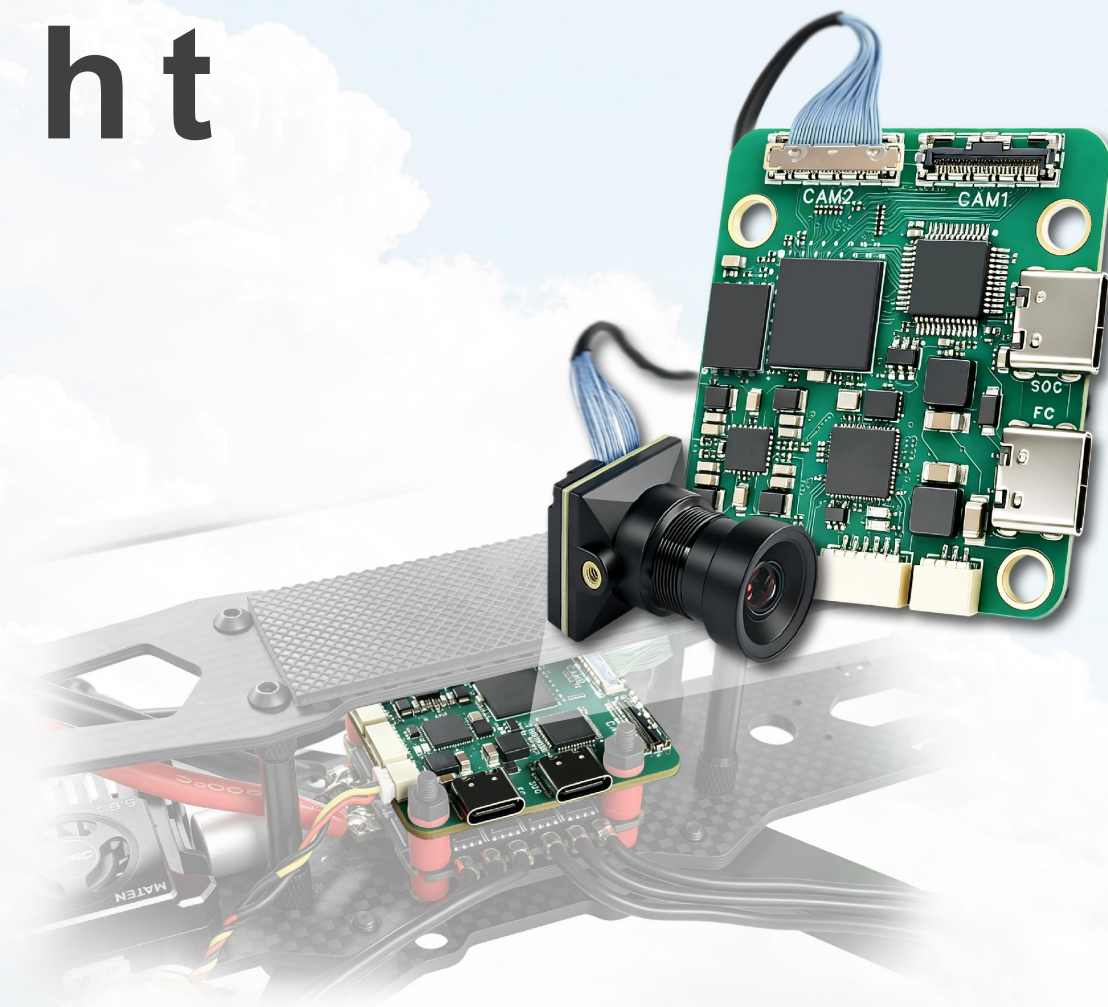
Built-in AI visual tracking engine

Autonomous target lock and tracking

Compatible with standard analog (CVBS) video

Highly integrated single-board design, low mass and power

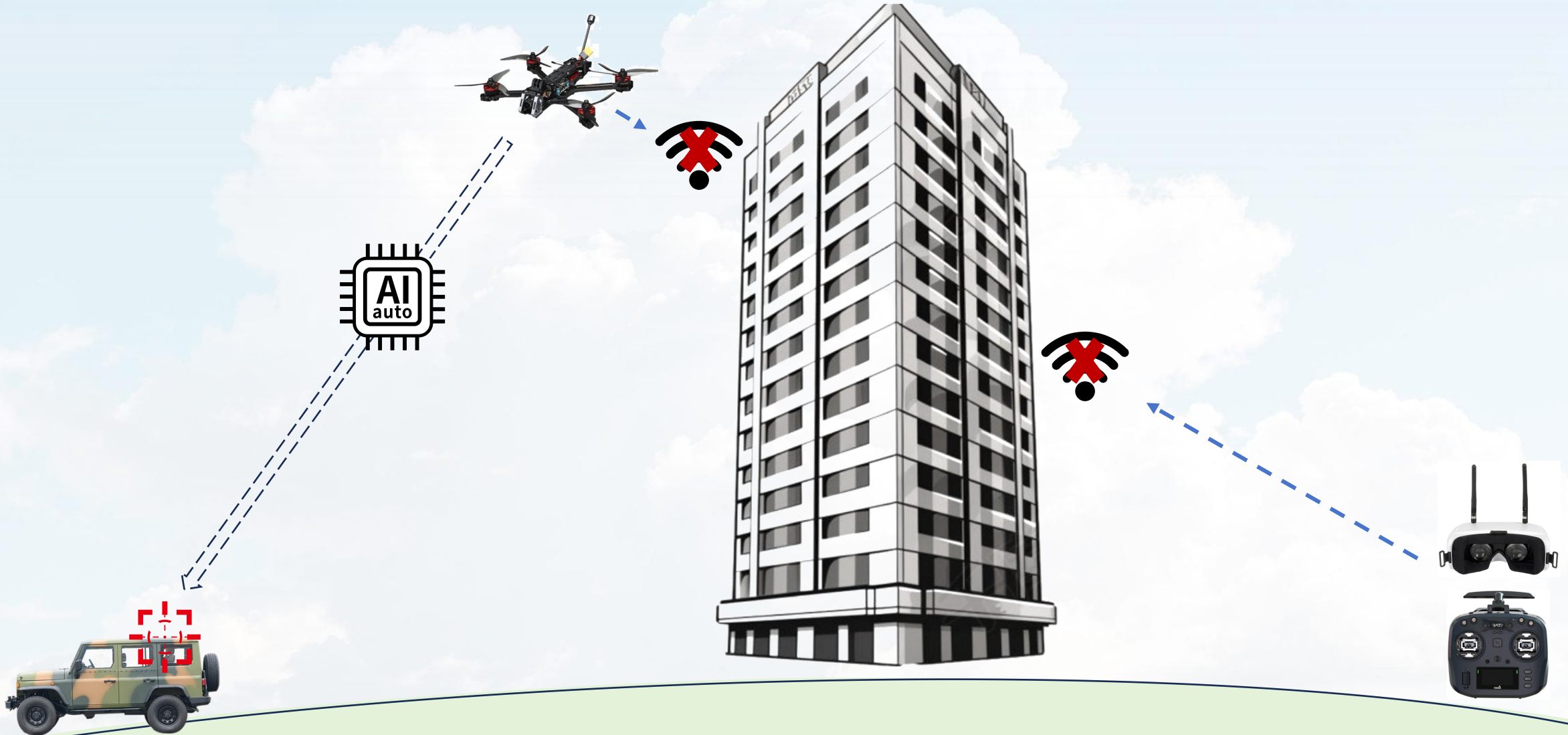
Excellent value



AI control through signal blind zones

The AI flight controller supports seamless pilot-machine cooperation. Before entering a signal blind zone, the pilot can switch to AI control.

If radio control and video are lost, onboard AI can continue approaching the captured target.

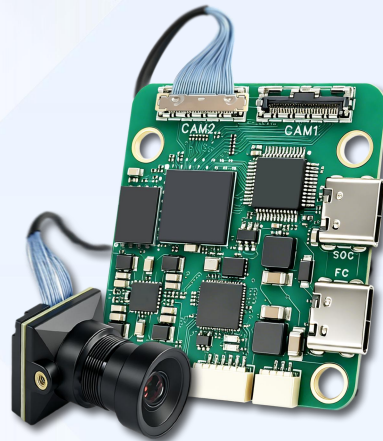


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PART 1

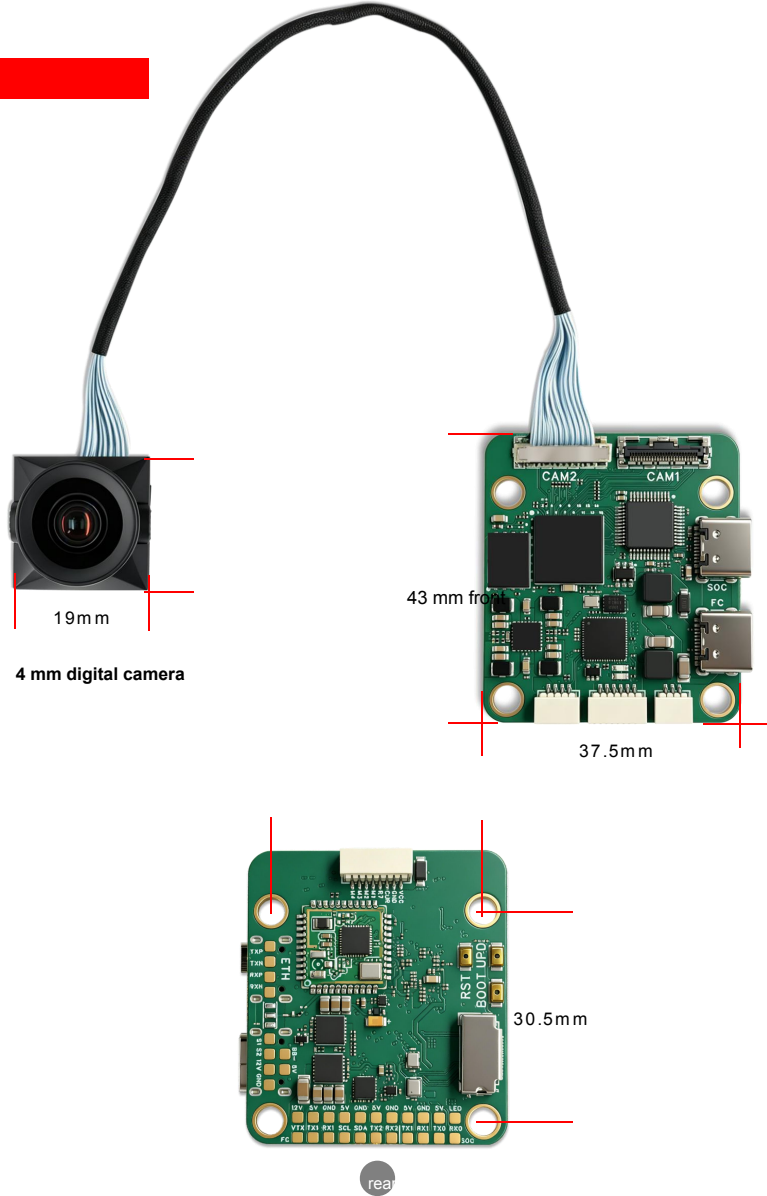
MAIN SPECIFICATIONS





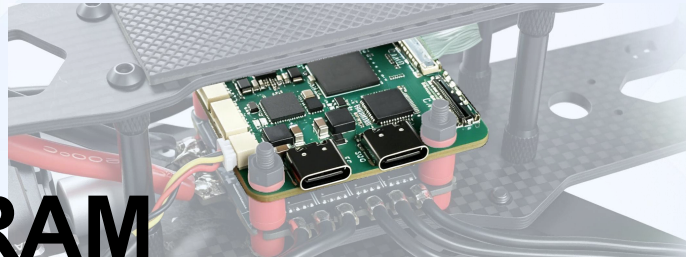
1 - Main specifications - single camera

Category	Parameter	Value	Dimensions
Basic	Supported aircraft	5-18 in quadcopters	
	Built-in firmware	Betaflight (no separate FC required)	
	Operating voltage	4S-8S LiPo	
	Module power	2 W	
	Mass	10 g	
Camera	1080P digital camera		
	Focal length	4 mm	
	Frame rate	60 FPS	
	Installation angle	20-60°	
	Field of view (FOV)	96°	
	Video output	CVBS	
	Low-light night vision	Yes	
AI	Lock distance	Vehicle 450 m; person 150 m	
	Minimum target size	16 x 16 pixels	
	Maximum target speed	>80 km/h	
	AI guidance modes	Mode 1 CH10 assisted lock: AI box snaps to vehicles and people Mode 2 CH11 forced crosshair lock for any moving or stationary target	
Connectivity	Receiver	ELRS (CRSF)	
	ESC protocol	DSHOT 300/600	
	Servo	2 PWM control outputs	
Environment	Temperature	-25°C to +55°C	



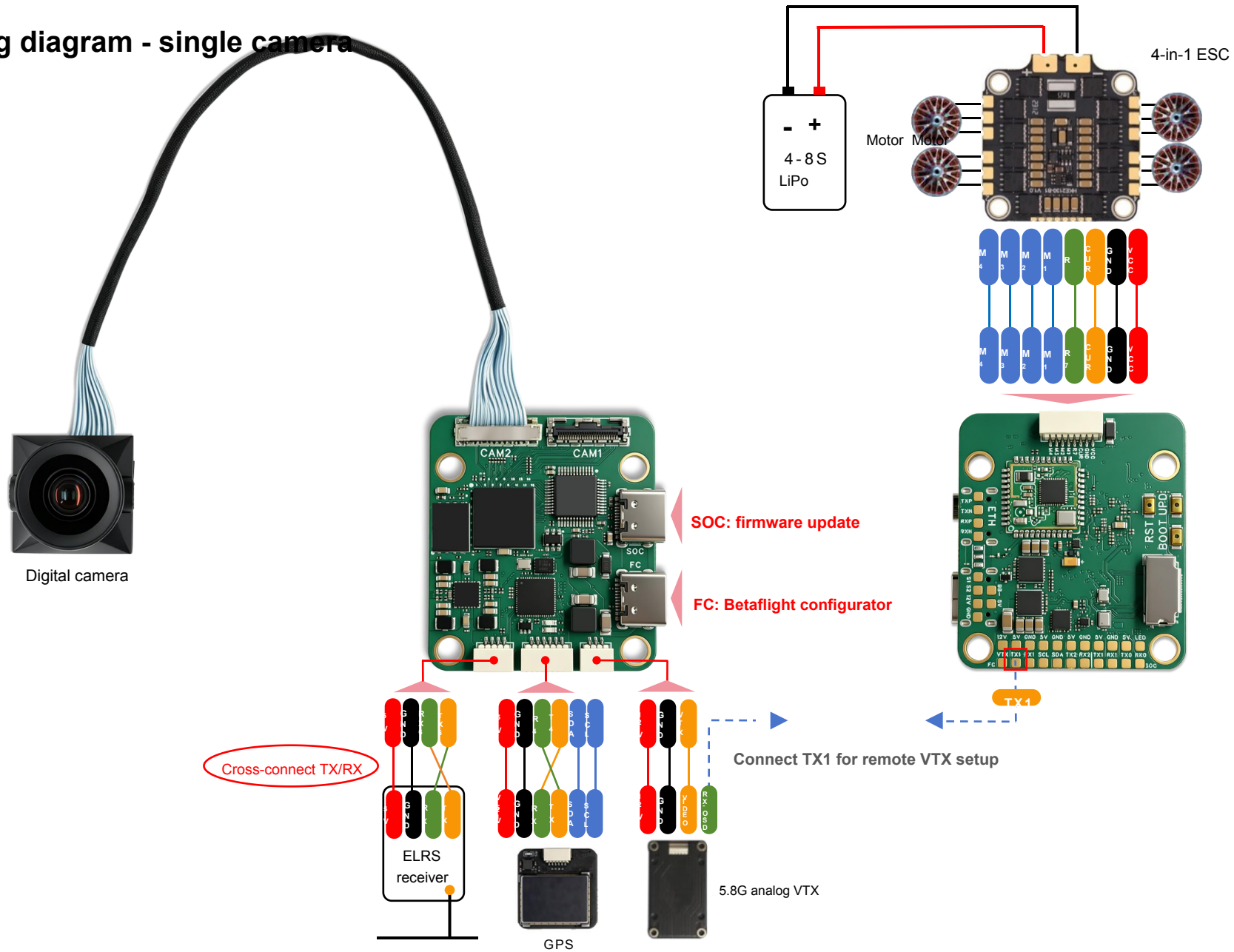
PART 2

WIRING DIAGRAM





2 - Wiring diagram - single camera



PART 3

INITIAL SETUP AND CALIBRATION

*** Use the Betaflight configurator**





3 - Initial setup and calibration (Betaflight configurator)

Step 1: Connect to Betaflight

IMPORTANT: Configure BF 4.6 only with the official web configurator at <https://betaflight.am32.ca/> in Chrome or Edge; the desktop configurator is no longer supported.

If connection fails, check the USB data cable, controller power and driver installation.

The screenshot shows the Betaflight web configurator interface. On the left, a sidebar contains a list of COM ports: '蓝牙外围设备 (COM196)', 'WCH-Link (COM64)', 'Betaflight Flight Controller (COM65) - 已配对', and 'MicoAir743v2-96577'. The 'Betaflight Flight Controller (COM65) - 已配对' option is highlighted with a red box. Below this list are buttons for '连接' (Connect) and '取消' (Cancel), with the '连接' button also highlighted by a red arrow. A red box with the text '2. Select the controller COM port, then click Connect' points to these elements.

In the center, the Betaflight logo is displayed above a list of instructions. The first instruction, '1. Connect the FC port to the computer with a USB data cable, open <https://betaflight.am32.ca/> select 'USB device not found' if required', is accompanied by an image of a flight controller board and a USB cable. A red circle and arrow point to the USB port on the board, with the text 'Connect to the FC port' below it.

On the right, a dropdown menu for '选择你的设备' (Select your device) is shown with options: '--- 找不到我的 USB 设备 ---', '--- 找不到我的 蓝牙 设备 ---', and '--- 找不到我的 DFU 设备 ---'. A red arrow points to the '连接' (Connect) button, which is also highlighted by a red box. A red box with the text '3. Click Connect; wait for communication' points to this button.

At the bottom, a status bar displays various system metrics: '端口利用率: 下:0%-上:0%', '数据包错误: 0', 'I2C 错误: 0', '循环时间: 0', 'CPU 负载: 0%', and '应用版本: 2025.12.0-beta (0fa6ca3f)'.



3 - Initial setup and calibration (Betaflight configurator)

Step 2: Setup

The Setup page shows controller information, sensor status and aircraft attitude.



应用版本: 2025.12.2 (a2d0f50)
固件: 4.6.0 BTFL

2026-04-16 @09:26:53 - 禁止解锁

设置

校准加速度计

校准磁力计

清除设置

激活启动引导程序/DFU

校准加速度计

把飞控或者飞机水平放置，再执行加速度计校准。校准过程中切勿移动飞控或者飞机。

校准磁力计

将飞控或者飞机在水平面上移动至少360度。你有30秒的时间可供进行这项操作。

清除设置

将飞控或者飞机重置为 未配置状态。

激活启动引导程序/DFU

重新启动飞控并进入启动引导程序/DFU 模式。

俯航: 358 度
俯仰: -0.2 度
横滚: 0 度

重置 Z 轴, 补偿: 0 度

1. Keep the board or aircraft level and still, then click Calibrate Accelerometer



Attitude display check

After calibration, check the attitude display:

- The model should be level when the controller is level
- Pitch and Roll should be close to 0°
- The model should follow slow controller movement
- If direction is wrong, correct board alignment on the Configuration page

仪表



GPS

3D 定位: 0
Number of Satellites: 0
Latitude: 0.0000 deg
Longitude: 0.0000 deg

系统信息

禁止解锁标志:	RX_FAILSAFE
电池电压:	24.36 V
已用容量:	146 mAh
耗电电流:	1.65 A
RSSI:	0 dBm
MCU:	CH32H415
CPU 温度:	72 °C

传感器信息

陀螺仪:	ICM42688P
加速度计:	未检测到或已禁用
磁力计:	未检测到或已禁用
气压计:	未检测到或已禁用
声纳:	未检测到或已禁用
光流计:	未检测到或已禁用

固件信息

MSP API:	1.47.0
构建日期:	Apr 3 2026 09:55:01
构建类型:	本地构建
构建信息:	没有可用的构建信息
固件:	

网络信息

状态:	在线
应用版本:	2025.12.2 (a2d0f50), 固件: 4.6.0 BTFL

端口利用率: 下:18%-上:2% 连接: 00:02 数据包错误: 0 I2C 错误: 1 循环时间: 124 CPU 负载: 25%



3 - Initial setup and calibration (Betaflight configurator)

Step 3: Ports

Assign each UART function on the Ports page. Correct port settings are required for peripherals.

BETAFLIGHT
应用版本: 2025.12.2 (a2d0f50)
固件: 4.6.0 BTF.L

2025-05-11 @09:51:27 - 禁止解锁

24.54V (6S)
陀螺仪 加速度计 磁力计 气压计 GPS 声响
Dataflash: free 0B
启用专家模式 更新固件 断开连接 显示日志

端口

注意: 不是所有的组合都是有效的。如果飞行检测到某组合不能同时工作, 对应端口的设置将会被重置。
注意: 不要关闭第一个端口的MSP选项。否则你可能要重新烧录固件并清空 (丢失) 所有设置。

标识符	设置/MSP	串行接收机	遥测输出	传感器输入	外设
USB VCP	☒ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART1	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART2	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART3	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART4	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART5	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART6	☐ 115200	☒	已禁用 AUTO	已禁用 57600	已禁用 115200
UART7	☐ 115200	☐	已禁用 AUTO	已禁用 57600	已禁用 115200
UART8	☒ 500000	☐	已禁用 AUTO	已禁用 57600	已禁用 115200

1. Select the protocol required by the VTX

已禁用
已禁用
黑盒日志记录
摄像头(RunCam协议)
图传(RC Tramp)
图传(TBS SmartAudio)
Benevake LIDAR
OSD (FrSky 协议)
VTX (MSP + Displayport)

已禁用
已禁用
电调
GPS

2. Save and reboot after changing port settings

保存并重启

端口利用率: 下:15%-上:1% 连接: 00:12 数据包错误: 0 I2C 错误: 1 循环时间: 123 CPU 负载: 20%

应用版本: 2025.12.2 (a2d0f50), 固件: 4.6.0 BTF.L



3 - Initial setup and calibration (Betaflight configurator)

Step 4: Configuration

The Configuration page contains PID loop, feature and other core settings.

设置

端口

配置

动力 & 电池

失控保护

预设

PID 调校

接收机

模式

调整

舵机

GPS

电机

OSD

视频发送

LED 灯带

传感器

线传日志

黑盒子

CLI

BETAFLIGHT

应用版本: 2025.12.2 (a2d0f50)

固件: 4.6.0 BTF1

2025-04-16 @09:29:22 - 禁止解锁

24.32V (6S)

陀螺仪

加速度计

磁力计

气压计

GPS

声响

Dataflash: free 0B

更新固件

断开连接

启用专家模式

显示日志

配置

百科

注意: 不是所有的功能都能同时被启用。当飞控检测到有冲突时会禁用相应的功能。
注意: 先设置串口, 再启用需要用到串口的功能。

系统设置

注意: 确保你的飞控有能力运行在这些频率上! 检查 CPU 以及循环时间是否稳定。改变频率可能需要重新调校 PID。提示: 关闭加速度计和其他传感器可以节省运算资源以获得更高性能。

8.00 kHz

Gyro update frequency

8.00 kHz

PID 循环更新频率

加速度计

气压计 (如有)

磁力计 (如有)

个性化

飞行器名称

飞行员名称

摄像头

0

FPV摄像头角度 [degrees]

解锁

180

最大允许解锁角度 [degrees]

第一次解锁时校准陀螺仪

其他功能

AIRMODE

永久启用 Airmode

CHANNEL_FORWARDING

转发 Aux 通道信号到舵机输出

INFLIGHT_ACC_CAL

实时水平校准

LED_STRIP

彩色 RGB LED灯带

OSD

OSD

SERVO_TILT

舵机云台

飞控板校准

0

横滚度

0

俯仰度

270

偏航度

激活 IMU

Sensor Configuration

NONE

声响:

NONE

光流计:

加速度计微调

0

加速度计横滚微调

0

加速度计俯仰微调

Dshot 信标配置

1

信标音调

全部启用

全部禁用

已启用	功能	说明
☐	RX_LOST	遥控器关闭或信号丢失时持续鸣叫直到信号恢复
☒	RX_SET	通过辅助通道发出蜂鸣音

蜂鸣器配置

全部启用

全部禁用

已启用	功能	说明
☐	GYRO_CALIBRATED	陀螺仪校准完成后鸣叫
☒	RX_LOST	遥控器关闭或信号丢失时持续鸣叫直到信号恢复
☒	RX_LOST_LANDING	解锁后遥控器关闭或信号丢失 (自动降落/自动稳定) 时鸣叫 SOS 信号
☒	DISARMING	锁定飞控时鸣叫
☒	ARMING	解锁飞控时鸣叫
☒	ARMING_GPS_FIX	GPS 定位成功后解锁飞控时鸣叫特殊音调
☒	RAT CRIT LOW	当电池电压严重偏低时持续长鸣

保存并重启

If mounting orientation changes, set board alignment to match the actual installation

Save and reboot

端口利用率: 下:14%-上:0% 连接: 00:20 数据包错误: 0 I2C 错误: 1 循环时间: 125 CPU 负载: 24%

应用版本: 2025.12.2 (a2d0f50), 固件: 4.6.0 BTF1

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3 - Initial setup and calibration (Betaflight configurator)

Step 5: Power and battery

Use this page for battery parameters, voltage calibration and current sensing.

The screenshot shows the Betaflight configurator interface. The left sidebar has '动力 & 电池' (Power & Battery) highlighted. The main area is titled '动力 & 电池'. A modal window '校准管理器' (Calibration Manager) is open, displaying instructions for voltage and current calibration. A red arrow points from the '校准' (Calibrate) button in the modal to the '校准' button in the bottom right corner. Another red arrow points from the '校准' button in the bottom right corner to the '保存' (Save) button. The bottom status bar shows system information.

2. Enter the voltage measured with a multimeter and click Calibrate;
the controller adjusts the scale to match the multimeter

1. Click Calibrate

3. Save after calibration



3 - Initial setup and calibration (Betaflight configurator)

Step 6: Receiver

Configure receiver protocol, channel mapping and signal processing here.

应用版本: 2025.12.2 (a2d0f50)
固件: 4.6.0 BTFLL

2025-04-16 @09:35:16 -- 禁止解锁

设置

端口

配置

动力 & 电池

失控保护

预设

PID 调试

接收机

模式

调整

舵机

GPS

电机

OSD

视频发送

LED 灯带

传感器

线传日志

黑盒子

CLI

接收机

• Always check that your Failsafe is working properly! The settings are in the Failsafe tab, which requires Expert Mode.

• Use the latest Tx firmware!

• Disable the hardware ADC filter in the Transmitter if using OpenTx or EdgeTx.

Basic Setup: Configure the 'Receiver' settings correctly. Choose the correct 'Channel Map' for your radio. Check that the Roll, Pitch and other bar graphs move correctly. Adjust the channel endpoint or range values in the transmitter to ~1000 to ~2000, and set the midpoint to 1500. For more information, read the [documentation](#).

预览

横滚 [A]	1500
俯仰 [E]	1500
方向 [R]	1500
油门 [T]	885
AUX 1	1675
AUX 2	1500
AUX 3	1500
AUX 4	1500
AUX 5	1500
AUX 6	1500
AUX 7	1500
AUX 8	1500
AUX 9	1500
AUX 10	1500
AUX 11	1500
AUX 12	1500

接收机

串行 (通过 UART)

接收机模式

CRSF

Serial Receiver Provider

Some Receiver Providers are not supported by current Build Configuration.

遥测

TELEMETRY

遥测输出

RSSI (接收机信号强度)

RSSI_ADC

模拟 RSSI 输入

RSSI 通道

已禁用

通道映射

AETR1234

摇杆低位 阈值

1050

摇杆中点

1500

摇杆高位 阈值

1900

RC 死区区间

0

Yaw 死区区间

0

3D 油门死区

50

RC 平滑

RC 平滑

自动

设定点截止类型

30

Setpoint Auto Factor

自动

Throttle Cutoff Type

接收机校准

刷新

保存

端口利用率: 下:24%-上:2% 连接: 28.02 数据包错误: 0 I2C 错误: 1 循环时间: 125 CPU 负载: 25%

应用版本: 2025.12.2 (a2d0f50), 固件: 4.6.0 BTFLL

1. Pair the receiver and transmitter, then verify the channel monitor.

- Move each stick and verify its channel bar
- Verify Roll/Pitch/Yaw directions
- Verify minimum throttle
- Operate each switch and verify AUX channels

2. Save



3 - Initial setup and calibration | Use ACRO before lock

ANGLE/HORIZON modes are not supported

Step 7: Modes

Assign flight modes to transmitter channels on this page.

Beginners should start in ANGLE mode, then use ACRO after gaining control. ANGLE limits tilt and self-levels when sticks are released.

BETAFLIGHT

应用版本: 2025.12.2 (a2d0f50)

固件: 4.6.0 BTFL

2025-04-16 @09:29:22 - 禁止解锁

设置

端口

配置

动力 & 电池

失控保护

预设

PID 调校

接收机

模式

调整

舵机

GPS

电机

OSD

视频发送

LED 灯带

传感器

线传日志

黑盒子

CLI

陀螺仪

加速度计

磁力计

气压计

GPS

声响

Dataflash: free 0B

更新固件

断开连接

启用专家模式

显示日志

模式

在此处通过设置范围和/或链接到其他模式的组合配置飞行模式(BF4.0及更高版本支持链接)。使用 范围 来定义遥控器上的开关和分配相应的模式。当接收机给出的通道值在最小/最大范围内将激活该模式。当一个模式被激活时,使用链接来激活另一个模式。例外: 解锁不能链接或者被链接到其他的模式, 当一个模式已被链接则无法被再次链接(多重链接)。多个范围/链接可以用于激活任何模式。如果为一个模式定义了多个范围/链接, 则可以将每个范围/链接设置为和 或 是 或 是 或 是。模式将在以下情况下被激活:
- 全部的和 范围/链接都被激活; 或者是
- 至少有一个 是 范围/链接被激活。
记得使用保存按钮来保存你的设置。

隐藏未使用的模式

ARM

添加范围

AUX 1

最小: 1700

最大: 2100

ANGLE

添加链接

添加范围

AUX 2

最小: 1300

最大: 1700

HORIZON

添加链接

添加范围

AUX 2

最小: 1700

最大: 2100

ALTHOLD

添加链接

添加范围

HEADFREE

添加链接

添加范围

FAILSAFE

添加链接

添加范围

POS HOLD

添加链接

添加范围

Mode switch assignment example

Mode	Channel	Function	Switch position
ARM	AUX1	Arm motors	High
ACRO	AUX2	Manual control, no self-level	Low (900-1300)
ANGLE	AUX2	Angle limit, self-level	Mid (1300-1700) Save
HORIZON	AUX2	Self-level at small angles	High (1700-2100)
BEEPER	AUX3	As needed	Activate the beeper to find the aircraft

保存

https://app.betaflight.com/#/ 04:05 数据包错误: 0 I2C 错误: 1 循环时间: 124 CPU 负载: 25%

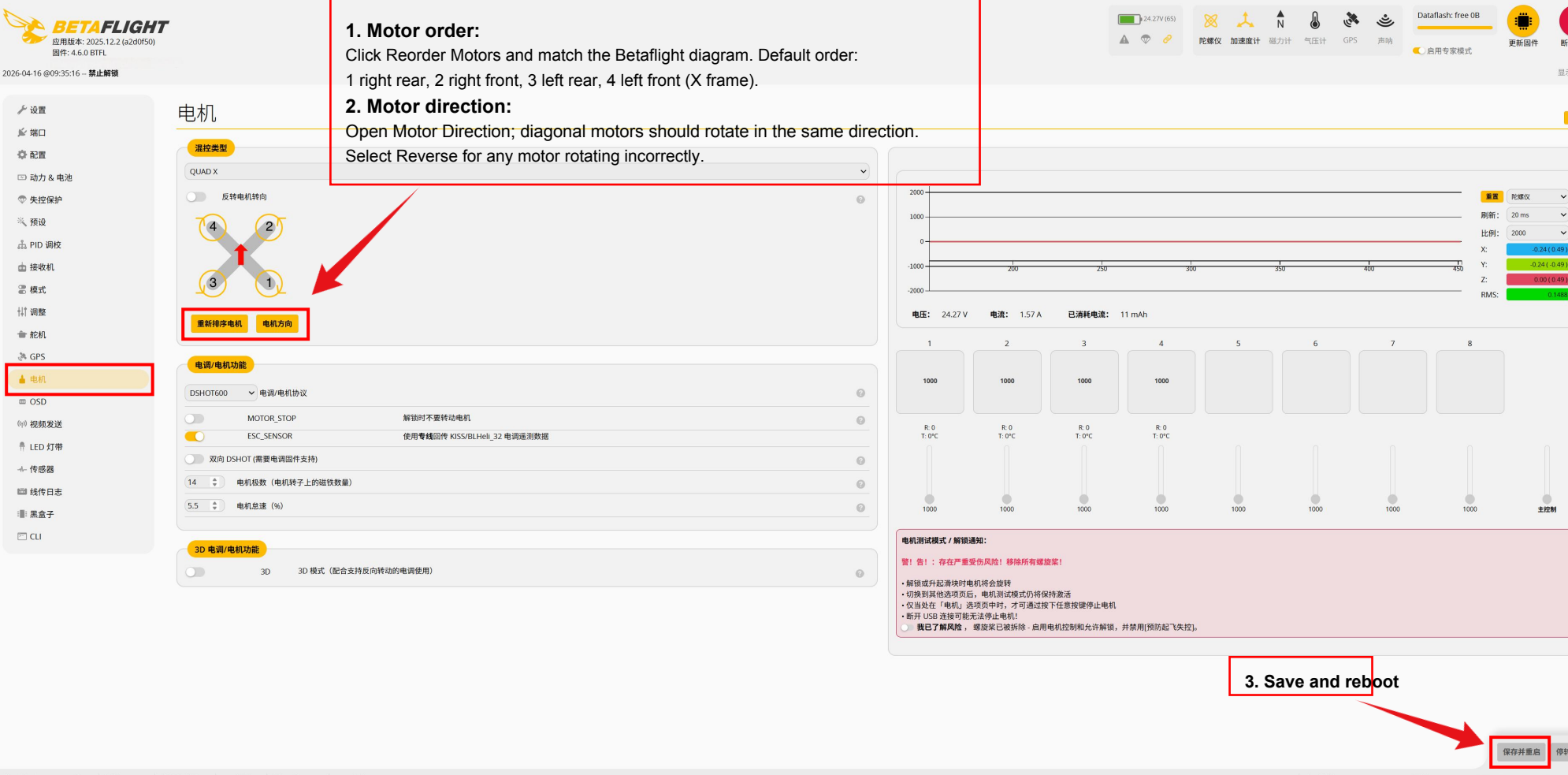
应用版本: 2025.12.2 (a2d0f50), 固件: 4.6.0 BTFL



Step 8: Motors

Configure motor mixing, ESC protocol, motor order and direction here.

REMOVE ALL PROPELLERS before testing motor or
High-speed propellers can cause serious injury!



2. Motor direction:
Open Motor Direction; diagonal motors should rotate in the same direction.
Select Reverse for any motor rotating incorrectly.

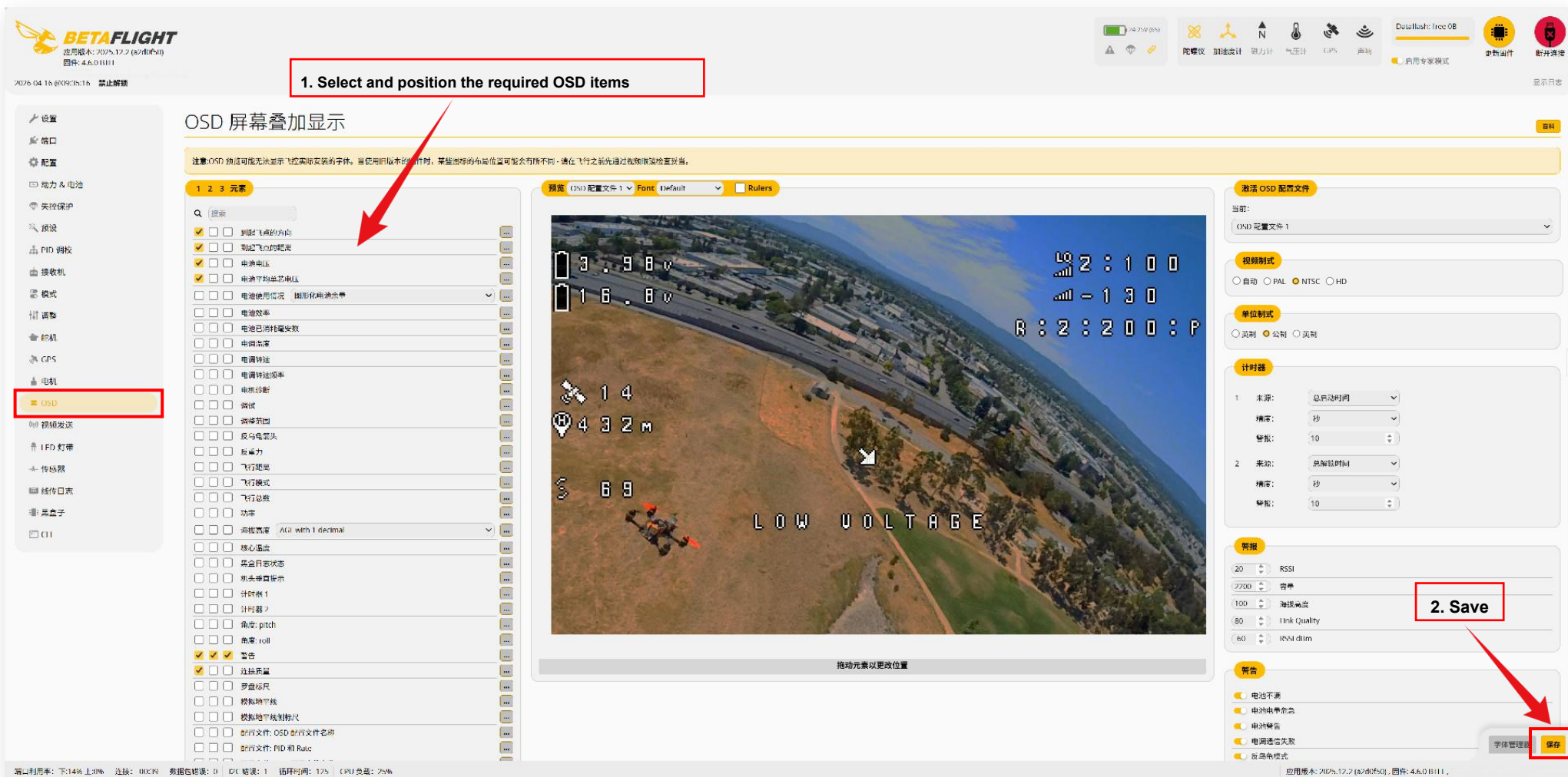
3. Save and reboot



3 - Initial setup and calibration (Betaflight configurator)

Step 9: OSD

Use OSD to place essential flight information on the FPV image.





3 - Initial setup and calibration (Betaflight configurator)

Step 10: Video transmitter

Configure VTX band, channel, frequency and power level on this page.

BETAFLIGHT

应用版本: 2025.12.2 (a2d0f50)

固件: 4.6.0 BTFL

2026-04-17 @17:50:56 - 禁止解锁

设置

端口

配置

动力 & 电池

失控保护

预设

PID 调校

接收机

模式

调整

舵机

GPS

电机

OSD

LED 灯带

传感器

线传日志

黑名单

CLI

视频发送

Here you can configure the values for your Video Transmitter (VTX). You can view and change the transmission values, including the VTX Tables, if the flight controller and the VTX support it.
To set up your VTX use the following steps:
1. Go to [this](#) page;
2. Find the appropriate VTX configuration file for your country and your VTX model and download it;
3. Click '从文件加载' below, select the VTX configuration file, load it;
4. Verify that the settings are correct;
5. Click '保存' to store the VTX settings on the flight controller.
6. Optionally click '保存 Lua 脚本' to save a lua configuration file you can use with the betafight lua scripts (See [more](#) here.)

选择模式

直接输入频率

RACEBAND

频道 3

1W6

维修站模式(Pit Mode)

0

关闭

图传表

8

8

名称	字母	1	2	3	4	5	6	7	8	
BOSCAM	A	5865	5845	5825	5805	5785	5765	5745	5725	频段 1
BOSCAM	B	5733	5752	5771	5790	5809	5828	5847	5866	频段 2
BOSCAM	E	5705	5685	5665	5645	5885	5905	5925	5945	频段 3
FATSHARK	F	5740	5760	5780	5800	5820	5840	5860	5880	频段 4
RACEBAND	R	5658	5695	5732	5769	5806	5843	5880	5917	频段 5
BAND_L	L	5362	5399	5436	5473	5510	5547	5584	5621	频段 6
BAND_U	U	5325	5348	5366	5384	5402	5420	5436	5456	频段 7
BAND_O	O	5474	5492	5510	5528	5546	5564	5582	5600	频段 8

4

当前值

设备准备就绪

图传类型

频段

频道

频率

功率

维修站模式(Pit Mode)

维修站模式频率

低功率上锁

True

Tramp

RACEBAND

3

5732

1W6

否

0

关闭

保存

从剪贴板加载

从文件加载

保存到文件

保存 Lua 脚本

Device ready: True confirms communication between the controller and VTX.

VTX setup:
1. Find the VTX control wire marked RX/DATA/IRC;
connect it to the UART1 TX pin on the controller.
2. Select the VTX protocol on the Ports page.
3. Import the manufacturer's VTX table.
4. Save

端口利用率: 下:14%-上:0% 连接: 00:54 数据包错误: 0 I2C 错误: 1 循环时间: 124 CPU 负载: 25% 应用版本: 2025.12.2 (a2d0f50), 固件: 4.6.0 BTFL

PART 4

INTELLIGENT ASSISTED LOCK (CH10)

* Assign a transmitter switch to CH10



Use ACRO mode before target lock;
ANGLE/HORIZON modes are not supported

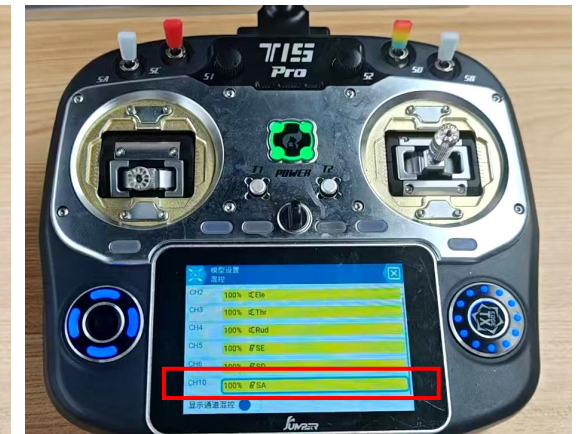


4 - Assign a transmitter switch to CH10 assisted lock

* Jumper T15Pro example; use equivalent settings on other radios.



1. Menu 2. Model Settings 3. Mixing 4. Press + to add a channel

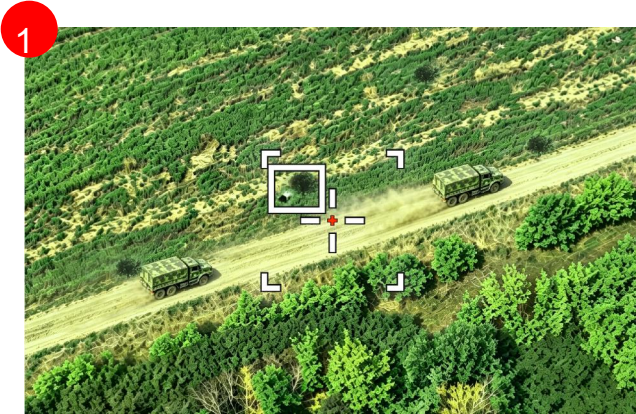


5. Select CH10 6. Assign switch SA 7. Confirm and return 8. Verify SA in the list



4 - Intelligent assisted lock (CH10)

Use ACRO mode before target lock
ANGLE/HORIZON modes are not supported



Place the recognition box over the target
The system searches near the crosshair and snaps to a target



When the correct target is selected, move CH10 down to enter assisted lock



White recognition box -> purple tracking box | Release sticks | Target reached



PART 5

AI FORCED LOCK (CH11)

*** Assign a transmitter switch to CH11**



**Use ACRO mode before target lock;
ANGLE/HORIZON modes are not supported**



5 - Assign a transmitter switch to CH11 forced lock

* Jumper T15Pro example; use equivalent settings on other radios.



1. Menu 2. Model Settings 3. Mixing 4. Press + to add a channel



5. Select CH11 6. Assign switch SB 7. Confirm and return 8. Verify SB in the list

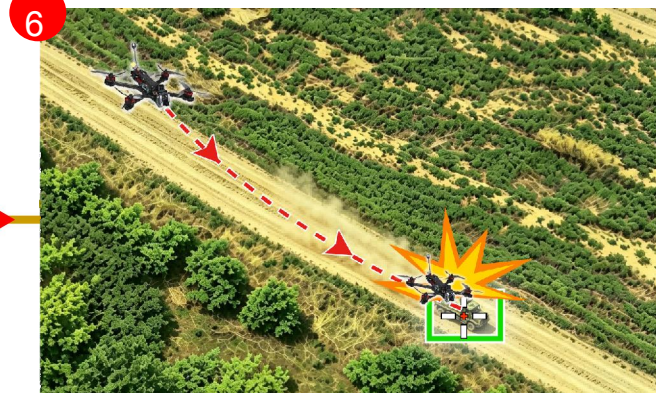


5 - AI forced lock (CH11) - moving or stationary targets

Use ACRO mode before target lock



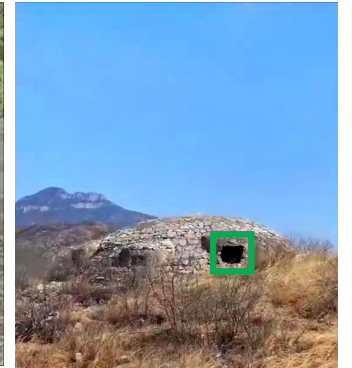
Aim the crosshair | Align with target | Move CH11 down to enter forced lock



Green forced-lock box appears | Release sticks | Target reached



5 - Forced lock - any moving or stationary target





Accelerometer calibration from transmitter



Video image

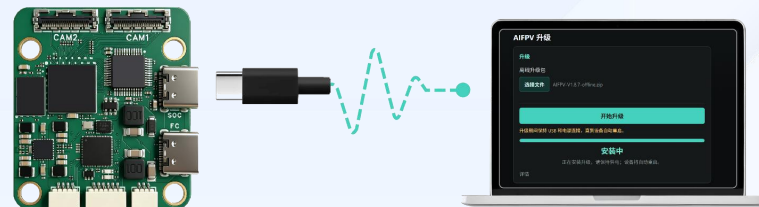
Place the aircraft level. ACC CAL and a countdown indicate calibration.
Activate CH10 and CH11 together. Calibration is complete when the countdown ends.

PART 6

FIRMWARE UPDATE

Address: 192.168.32.1:8080/

Recalibrate Betaflight after updating firmware!

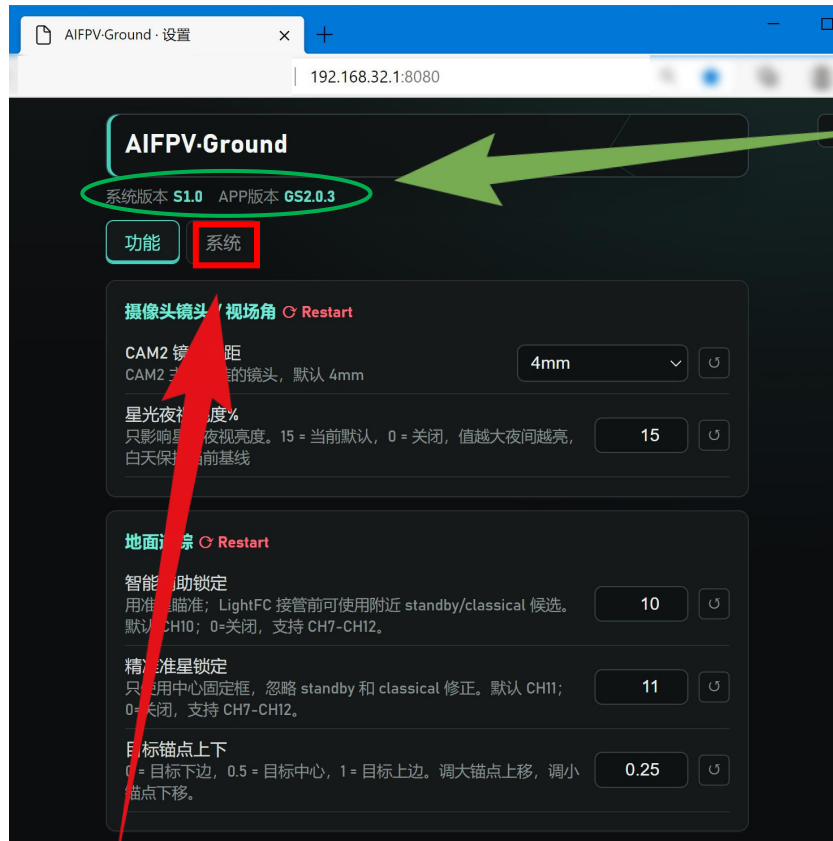




6 - Firmware update procedure

192.168.32.1:8080/

Recalibrate Betaflight after updating firmware!



1. Connect SOC to the computer by USB

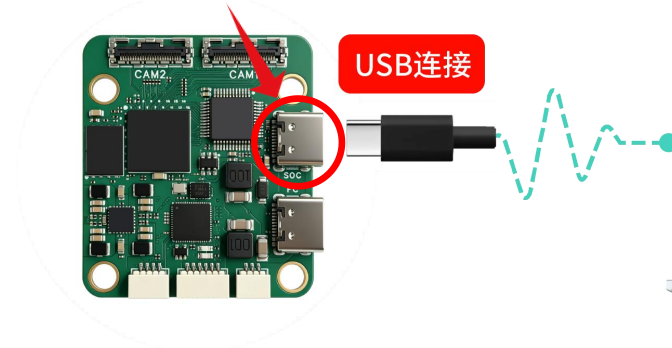
2. Open <http://192.168.32.1:8080/> and select System

3. Select and upload the firmware file

4. Click Start Update

5. Wait for the progress bar to finish

Connect to the SOC port



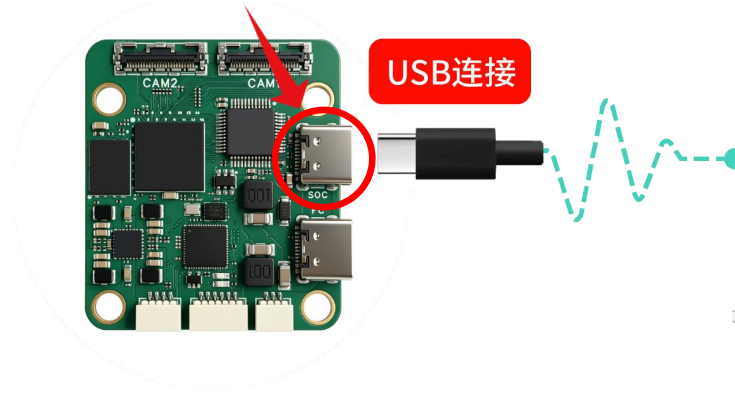
After a successful update, the latest system and app versions are shown





6-1 Additional function

Connect to the SOC port



192.168.32.1:8080/



Select night-vision brightness for night flight

PART 7

TROUBLESHOOTING





7 - Troubleshooting

Common problems and solutions are listed below.

Problem Possible cause Solution	
Cannot connect Wrong USB cable Replace with a USB data cable	
Cannot connect Port in use Close other serial software	
No receiver signal Wrong protocol Select the correct receiver protocol	
No receiver signal Wrong UART setup Check Ports configuration	
Channel reversed Wrong mapping Correct channel mapping	
Motor does not run ESC protocol mismatch Set DSHOT 300/600	
Motor reversed Wiring/direction error Select Reverse	
No OSD Video format mismatch Set Auto or matching format	
No OSD OSD disabled Enable OSD in Configuration	
Cannot control VTX Control wire missing/wrong Connect it to the UART TX pin	
Cannot control VTX UART protocol missing Configure VTX Tramp	
Wrong battery voltage Meter not calibrated Calibrate with a multimeter	
Cannot arm Safety condition not met Check minimum throttle	
ESC keeps self-testing Loose connection Check wiring and plugs	
Aircraft moves sideways after lock Wrong camera angle Install camera at 20-60°	
Aircraft levels when lock starts Switch conflict Check duplicate channel assignment	