



Nano高频头

使用说明书



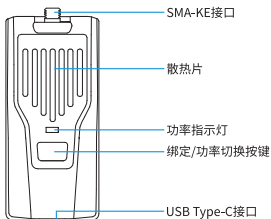
Welcome to ExpressLRS!

BETA FPV Nano接收机, 是基于开源项目ExpressLRS开发的新一代遥控无线系统。ERLS系统具有遥控距离长, 连接稳定, 低延迟, 刷新率高, 配置灵活等特点。

项目Github地址: <https://github.com/ExpressLRS>

基本参数

- 刷新率: 25Hz/100Hz/500Hz
- 输出功率: 100mW/250mW/500mW
- 频段 (Nano高频头2.4GHz版本): 2.4GHz ISM
- 频段 (Nano高频头915MHz/868MHz版本): 915MHz FCC/868MHz EU
- 输入电压: 5V~12V
- USB接口: Type-C

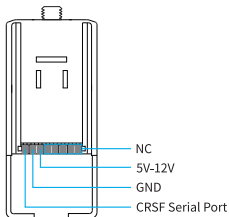


Nano高频头能够匹配市面上所有使用Nano接口(也叫作Lite接口)的遥控器。使用该接口的遥控器有Frsky Taranis X-Lite、Frsky Taranis X9D Lite、TBS Tango 2等。

基本配置

Nano高频头默认只接收Crossfire串行数据协议(简称CRSF)的信号。遥控接高频头接口需要支持CRSF信号输出下面以OpenTX遥控器系

统为例,说明如何配置遥控器输出CRSF信号,并且使用LUA脚本控制Nano高频头。



注意: Nano高频头上电前,请安装好匹配的天线。否则,会导致高频头PA芯片损坏。

CRSF协议

在OpenTX系统中,选择MODEL SELECTION,进入MODEL SETUP界面,在该界面下,将Internal RF关闭(设置为OFF)将External RF开启,并且将输出Mode设置为CRSF。如下图所示。

MODEL SETUP		2/14
Use global funcs	<input checked="" type="checkbox"/>	
Internal RF		
Mode	OFF	
External RF		
Mode	CRSF	
Channel Range	CH1-16	
Receiver	00	

将Nano高频头连接正确,并且按照上面配置遥控器为外部高频头(External RF)的CRSF输出,原则上Nano高频头就可以正常使用。

LUA脚本操控

如果想修改Nano高频头的功率,刷新率等参数,则需要使用OpenTX系统的LUA脚本进行操作。如下所示。

- 将官方的LUA脚本ELRS.lua拷贝到遥控器的SD卡中,路径为Scripts/Tools;
- 在OpenTX系统上,长按SYS按键(例如RadioMaster T8遥控器等)或者MENU按键(例如Frsky Taranis X9D遥控器等),进入SD-HC CARD界面,在该界面下,选择ELRS.lua脚本并且运行该脚本;
- 如果LUA脚本成功运行,则界面如下图所示。

```
ExpressLRS 0bf0d9 0: 250
Pkt Pate    250Hz(-108dbm)
TLM Ratio   1:64 (78bps)
Power       500 mW
RF Freq     2.4G ISM

[Bind]      [Wifi Update]
```

- 使用LUA脚本,可以选择配置Rate(刷新率),Ratio(回传包率),Power(输出功率)等参数;所有LUA脚本功能,说明如下表所示。

	参数名	参数说明
0:250	数据包 及坏包比例	位于界面右上角。表示高频头和遥控器直接每秒发送数据包的数量, 以及坏包的数量
Rkt. Rate	数据包频率	频率越高, 高频头发送数据包间隔越短, 控制越精准
TLM Ratio	回传包率	例如, 1:64表示, 高频头发射出去64个数据包, 接收机回传一个数据包
Power	功率	高频头发射功率
RF Freq	无线电频率	当前高频头使用的无线电所在频率
Bind	绑定	高频头进入绑定状态
Wifi Update	WIFI更新	高频头开启WIFI功能, 用于固件更新

注意: 官方LUA脚本ELRS.lua可以从BETA FPV支持网站(网址见更多信息段落)下载。

CRSF协议

Nano高频头进入对频状态, 有两种方式。第一种方式是使用LUA脚本, 选择Bind, Nano高频头进入对频状态。详见“LUA脚本操控”段落。第二种方式, 短按Nano高频头背部按键, 高频头进入对频状态。



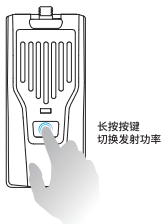
短按按键
进入对频状态

注意: 高频头进入对频状态, 没有灯光闪烁等提示。5秒之后高频头自动退出对频状态。

功率切换

Nano高频头发射功率切换，也有两种方式。第一种方式是使用LUA脚本，选择Power，可在100mW、250mW、500mW直接切换。详见“LUA脚本操控”段落。

第二种方式，指示灯亮时，长按按键等待指示灯变化颜色，然后松开，完成功率切换。输出功率在100mW/250mW/500mW之间循环切换。



功率相应的指示灯颜色如下表所示：

指示灯颜色	发射功率
蓝色	100mW
紫色	250mW
红色	500mW

更多信息

由于ExpressLRS项目还处于更新活跃期，更多详细的信息，如常见问题，最新的说明书等，请到BETA FPV官方支持（技术支持->ExpressLRS遥控系列）下获取。

<https://support.betafpv.com/hc/zh-cn>

- 最新说明书；
- 如何升级固件；
- 常见解答问题。



Nano TX Module

User Manual



Welcome to ExpressLRS!

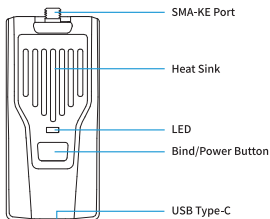
BETA FPV Nano RF TX module is based on ExpressLRS project, open source RC link for RC applications. ExpressLRS aims to achieve the best possible link performance in both speed, latency and range. This makes ExpressLRS one of the fastest RC links available while still offering long-range performance.

Github Project Link: <https://github.com/ExpressLRS>

Facebook Group: <https://www.facebook.com/groups/636441730280366>

Specifications

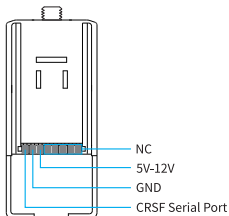
- Packet refresh rate: 25Hz/100Hz/500Hz
- RF output power: 100mW/250mW/500mW
- Frequency bands (Nano RF Module 2.4G version): 2.4GHz ISM
- Frequency bands (Nano RF Module 915MHz/868MHz version): 915MHz FCC/868MHz EU
- Input voltage: 5V~12V
- USB port: Type-C



BETA FPV Nano RF module is compatible with radio transmitter which has the nano module bay (AKA lite module bay, e.g. Frsky Taranis X-Lite, Frsky Taranis X9D Lite, TBS Tango 2).

Basic Configuration

ExpressLRS uses the Crossfire serial protocol (AKA CRSF protocol) to communicate between the radio transmitter and the Nano RF module. So make sure your radio transmitter support the CRSF serial protocol. Next, we use the radio transmitter with OpenTX system to show how to setup the CRSF protocol and LUA script.



Note: Please assemble the antenna before power on. Otherwise, the PA chip in the Nano TX module will be damaged permanently.

CRSF Protocol

ExpressLRS uses the CRSF serial protocol to communicate between the radio transmitter and the RF TX module. To set this up, in OpenTX system, enter into model settings, and on the "MODEL SETUP" tab, turn off the "Internal RF". Next enable "External RF" and select "CRSF" as the protocol.

MODEL SETUP		2/14
Use global funcs	<input checked="" type="checkbox"/>	
Internal RF		
Mode	OFF	
External RF		
Mode	CRSF	
Channel Range	CH1-16	
Receiver	00	

LUA Script

ExpressLRS use the OpenTX LUA script to control the TX module, like bind or setup.

- Save the ELRS.lua script files onto the radio transmitter's SD Card in the Scripts/Tools folder;
- Long press the "SYS" button (for RadioMaster T16 or similar radios) or the "Menu" button (for Frsky Taranis X9D or similar radios) to access the Tools Menu where you can find ELRS script ready to run with only one click;
- Below image show the LUA script run successfully;

```
ExpressLRS 0bf0d9 0:250
Pkt Pate    250Hz(-108dbm)
TLM Ratio   1:64 (78bps)
Power       500 mW
RF Freq     2.4G ISM

[Bind]      [Wifi Update]
```

- With the LUA script, pilot could check and setup some configurations of the Nano RF TX module.

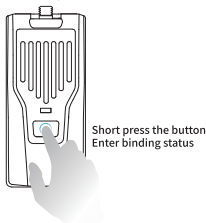
0:250	On the top right. Indicator which tells how many bad UART packets and how many packets it's getting from the radio per second. It can be used to confirm the communication between the radio transmitter and the RF TX module is working properly. e.g. 0:200 means 0 bad packets and 200 good packets per second.
Rkt. Rate	RF transmitter packet rate.
TLM Ratio	Receiver telemetry ratio.
Power	RF TX module output power.
RF Freq	Frequency bands.
Bind	Set the RF TX module into binding status.
Wifi Update	Open the WIFI function for firmware update.

Note: The newest ELRS.lua script file is available in BETAFPV Support website (Link in More Information Chapter).

Bind

Nano RF TX module could enter binding status via ELRS.lua script, as description in "LUA Script" chapter.

Besides, short press the button on the module could also enter binding status.

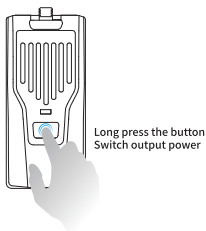


Note: The LED will NOT flash when enter binding status. The module will exit from binding status 5 seconds later auto.

Output Power Switch

Nano RF TX module could switch the output power via ELRS.lua script, as description in "LUA Script" chapter.

Besides, long press the button on the module could switch the output power.



The RF TX module output power and LED indication as show below.

LED Color	RF output power
Blue	100mW
Purple	250mW
Red	500mW

More Information

As ExpressLRS project is still in frequently update, please check BETA FPV Support (Technical Support -> ExpressLRS Radio Link) for more details and newest manual.

<https://support.betafpv.com/hc/en-us>

- Newest user manual;
- How to upgrade the firmware;
- FAQ and troubleshooting.