



SuperG Nano 高频头

使用说明书



Welcome to ExpressLRS!

第 1 版 2023-09-04



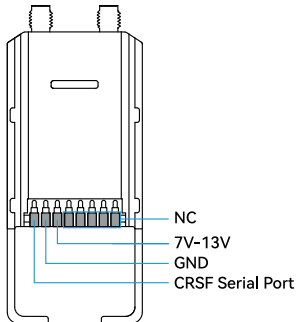
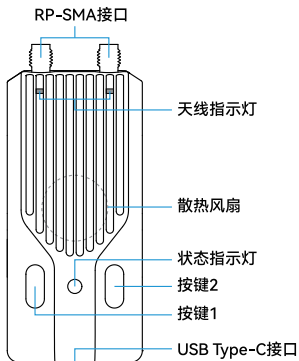
ExpressLRS | BETAFPV

ExpressLRS是新一代开源无线遥控系统，致力于为FPV遥控提供最好的无线链路连接。它是基于性能优越的Semtech SX127x/SX1280 LoRa通信协议射频芯片结合Espressif或STM32处理器开发的，具有遥控距离长，连接稳定，延迟低，刷新率高，配置灵活等特点。BETAFPV SuperG Nano高频头是基于ExpressLRS V3.3开发的高性能无线遥控产品，采用了最新的双天线双发射的射频链路架构，提高了遥控信号的可靠性，支持先进的双子座模式。相比传统的单天线单发射射频架构，SuperG Nano高频头具有抗干扰性能更强，信号链路更加稳定的优点，适合竞赛、远航、摄影等对信号稳定性和延时具有极高需求的应用场景。

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

基本参数:

- 刷新率: 50Hz/100Hz/150Hz/250Hz/333Hz/500Hz/D250/D500/F500/F1000
- 输出功率: 25mW/50mW/100mW/250mW/500mW/1000mW
- 频段: 2.4GHz ISM
- 输入电压: 7V~13V
- 功耗: 8V,1A@1000mW, 1:128, Gemini mode
- 天线接头: RP-SMA
- USB接口: Type-C
- USB供电范围: 7-13V(2-3S)
- 内置风扇供电: 5V



注意：必须先安装好接头匹配的天线才能给高频头上电，否则会导致高频头PA芯片损坏。

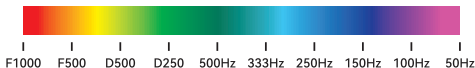
SuperG Nano高频头能够匹配市面上所有使用Nano接口（也叫作Lite接口）的遥控器。使用该接口的遥控器有BETA FPV LiteRadio 3/3 Pro、Radiomaster Zorro、Frsky Taranis X-Lite、Frsky Taranis X9D Lite、TBS Tango 2等。

状态指示

接收器状态指示灯含义：

| 指示灯颜色 | 状态 | 含义 |
|-------|----|------------------|
| 彩虹 | 渐变 | 开机启动 |
| 绿色 | 慢闪 | WiFi升级模式 |
| 红色 | 快闪 | 未检测到射频芯片 |
| 橙色 | 双闪 | 对频模式 |
| | 三闪 | 已连接，但与模型匹配中的设置不符 |
| | 慢闪 | 等待连接 |
| | 常亮 | 已连接，颜色表示刷新率 |

刷新率对应的RGB灯颜色如下图所示：



F1000和F500是FLRC模式下的刷新率，仅ELRS 2.4G支持该模式，该模式提供更快的调制和更低的延时，但遥控距离比普通的LoRa模式要短，适用于竞赛；

D500和D250是DVDA (Déjà Vu Diversity Aid) 模式下的刷新率，该模式工作在FLRC模式的F1000刷新率下，通过多次发送相同的数据包在有复杂干扰的情况下提供更可靠的链路连接，D500和D250分别表示将相同的数据包重复发送两次和四次。

遥控器配置

SuperG Nano高频头默认只接收Crossfire串行数据协议（以下简称CRSF）的信号，因此遥控器的高频头接口需要支持CRSF信号输出。下面以EdgeTX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脚本控制高频头。

CRSF协议

在EdgeTX系统中，选择MODEL SEL，进入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。

```
SETUP 2/12
Internal RF
Mode OFF
External RF
Mode CRSF
Baudrate 921k
Status 500Hz 0Err
Ch. Range CH1-16
```

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

Lua脚本

Lua是一种轻量小巧的脚本语言，它可以嵌入到遥控器中使用，能够便捷地读取和修改高频头的配置参数。Lua使用方法如下所示。

- 在BETA FPV官网或ExpressLRS客户端下载elrsV3.lua脚本；

⚙️ **Target**

Device category
 BETA FPV 2.4 GHz ▼

Device
 BETA FPV SuperG Nano 2.4GHz TX ▼

Flashing Method
 UART ? WIFI ?

DOWNLOAD LUA SCRIPT

⚙️ **Device options** RESET

Standard mode Manual mode

- 将官方的Lua脚本eIrsV3.lua拷贝到遥控器的SD卡中，路径为Scripts/Tools;
- 在EdgeTX系统上，长按SYS按键或者MENU按键，进入SD-HC CARD界面，在该界面下，选择eIrsV3.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。

```

BFPV NanoG 2G4           0/250 C
Packet Rate    250Hz(-108dbm)
Telem Ratio    Std(1:64)
Switch Mode    Wide
Antenna Mode   Gemimi
Model Match    Off(ID: 0)
> TX Power(50mW)
> VTX Administrator
> WiFi Connectivity
> Backpack
  [BLE Joystick]
  [Bind]
3.3.0 ISM2G4 b08b82
> Other Device
  
```

- 使用Lua脚本，可以选择配置Packet Rate（刷新率），Telem Ratio（回传包率），TX 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 |
|-------------------------------|---|
| BFPV NanoG 2G4 (产品名称) | 产品名称，最多15个字符 |
| 0/250 (丢包比) | 表示高频头和遥控器之间通信的丢包比 |
| C/- (连接标志) | C: 表示已连接 -: 表示未连接 |
| Packet Rate (数据包频率) | 高频头与接收机的通信数据包频率。频率越高，高频头发送遥控数据包的间隔越短，控制越精准 |
| Telem Ratio (回传比例) | 设置接收机回传数据的比例，例如，1:64表示接收机每接收到64个遥控数据包，就回传一个遥感数据包 |
| Switch Mode (数据包格式) | Wide: 4x10bit+1x1bit+7x6或7bit Hybrid: 4x10bit+1x1bit+6x3bit+1x4bit 可前往 https://www.expresslrs.org/software/switch-config/ 了解 |
| Antenna Mode (天线模式) | Gemini: 双子座模式，两个天线以40MHz的频率差同时发送或者接收回传 Ant1: 仅Ant1发送，两个天线同时接收回传 Ant2: 仅Ant2发送，两个天线同时接收回传 Switch: Ant1和Ant2交替发送，两个天线同时接收回传 |
| Model Match (模型匹配) | 设置模型ID，可关闭 |
| TX Power (功率) | 设置高频头发射功率、动态功率和散热风扇启动阈值 |
| VTX Administrator (图传管理) | 设置图传频点，功率，PIT模式等 |
| WiFi Connectivity (WiFi互联) | 可启用高频头/接收机/背包/VRX的WiFi |

| 参数名 | 参数说明 |
|----------------------------------|--|
| Backpack (背包) | 设置DVR开启通道以及开始和结束录制的延时时间 DVR必须有backpack功能或模块 |
| BLE Joystick (BLE操纵杆模式) | 该模式允许高频头通过计算机的蓝牙连接到模拟器 |
| Bind (对频模式) | 进入对频模式 |
| 3.3.0 ISM2G4 b08b82 (固件版本和编号) | 固件版本，频段和编号 |
| Other Device (其他设备) | 设置与高频头连接的接收机的参数 |

注意：关于Express LRS Lua更详细的说明可前往：<https://www.expresslrs.org/quick-start/transmitters/lua-howto/>了解。

自定义按键

SuperG Nano高频头预留了两个按键，用户可自定义其按键功能。具体操作步骤如下。

- 通过使能高频头WiFi或上电后等待60秒进入wifi状态；
- 状态指示灯进入绿色慢闪状态，高频头自动打开WiFi（WiFi名称：ExpressLRS TX，WiFi密码：expresslrs）；
- 使用手机或者电脑连接WiFi，浏览器登录<http://10.0.0.1>即可找到自定义按键设置页面；
- 在对应按键的Action栏中选择自定义功能，然后在Press和Count栏中选择按键方式和按键次数或时间；
- 点击SAVE完成设置。

目前支持6种功能可设置快捷按键。按键使用方式有两种：长按和短按，长按可自由设置长按的时间，短按可自由设置短按的次数。以下是6种可设置的功能：

| | |
|------------|----------|
| ● 不使用 | ● 发送图传设置 |
| ● 增加输出功率 | ● 使能WiFi |
| ● 进入图传频段菜单 | ● 进入对频模式 |
| ● 进入图传频点菜单 | |

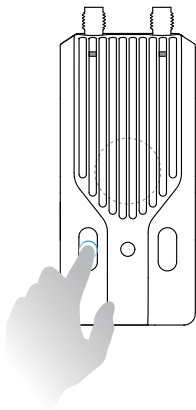
以下是高频头出厂默认设置的功能。

| 按键 | 功能 | 动作 | 次数/持续时间 |
|--------------|----------|----|---------|
| 按键1 (左按键) | 进入对频模式 | 短按 | 三次 |
| | 增加功率 | 长按 | 0.5秒 |
| 按键2 (右按键) | 进入图传通道菜单 | 短按 | 两次 |
| | 发送图传设置 | 长按 | 0.5秒 |

对频

SuperG Nano高频头出厂固件使用的是ExpressLRS V3.3.0正式版协议，而且没有设置对频密码（Binding Phrase）。所以对频的接收机也必须是V3.0.0以上固件，并且没有设置过对频密码。

1. 使接收机进入对频模式，等待连接。
2. 通过点击Lua脚本中的Bind或按设置的快捷按键进入对频状态；如果接收机和高频头的指示灯变为常亮，则表示对频成功。

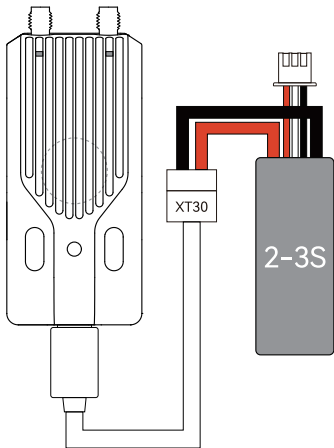


默认连续短按左按键三次
进入对频状态

注意：如果重刷了高频头的固件，并且配置了对频密码（Binding Phrase），则无法通过上面方式进入对频状态。请将接收机也设置相同的对频密码，高频头和接收机则可以自动对频连接。建议将高频头的两个天线尽可能地分开摆放，以获得更好的遥控效果。

■ 外接电源

SuperG Nano高频头在使用500mW及以上发射功率时的功耗较大，会缩短遥控器的使用时间。用户可通过使用XT30-USB转接线外接电池的方式来为高频头提供电源，使用方式如下图。



高频头的功耗不仅和发射功率相关，还和回传比例有关。例如在双子座模式下将回传比例设置为1: 128的功耗是1000mA@8V，而将回传比例设置为1:2的功耗仅为1: 128的一半。因此使用500mW及以上高功率时可将回传比率设置的高一些，以减小功耗、延长使用时间。

注意：当遥控器电池或外接电池电压低于7V(2S)或10.5V(3S)时，请谨慎使用500mW和1W的双子座模式，否则高频头会因供电不足进入重启状态，从而导致断连失控。

■ 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BETAFPV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。



SuperG Nano TX Module User Manual



Welcome to ExpressLRS!

Version No.1 2023-09-04



ExpressLRS | BETAFPV

ExpressLRS is a new generation of open-source wireless remote control system dedicated to providing the best wireless link for FPV Racing. It is based on the fantastic Semtech SX127x/SX1280 LoRa hardware combined with an Espressif or STM32 Processor, with characteristics such as long remote control distance, stable connection, low latency, high refresh rate, and flexible configuration.

BETAFPV SuperG Nano TX module is a high-performance wireless remote control product developed based on ExpressLRS V3.3. It adopts the latest dual-antenna dual-transmitter diversity RF link architecture, which improves the reliability of the remote control signal and supports advanced Gemini mode. Compared with the traditional single-antenna and single-transmitter RF architecture, the SuperG Nano TX module has stronger anti-interference performance and a more stable signal link, making it suitable for applications such as racing, long-range flights, and aerial photography, which require high signal stability and low latency.

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

Specifications:

- Packet Rate:

50Hz/100Hz/150Hz/250Hz/333Hz/500Hz/D250/D500/F500/F1000

- RF Power: 25mW/50mW/100mW/250mW/500mW/1000mW

- Frequency band: 2.4GHz ISM

- Input Voltage: 7V~13V

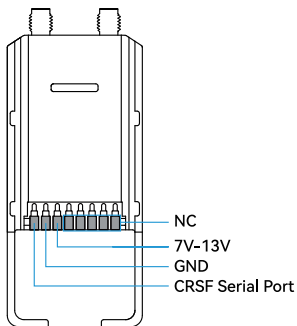
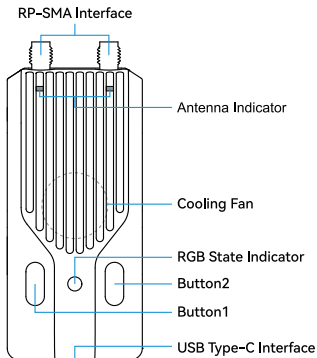
- Power Consumption: 8V,1A@1000mW, 1:128, Gemini mode

- Antenna Port: RP-SMA

- USB Port: Type-C

- USB Power Supply Range: 7-13V(2-3S)

- Built-in Cooling Fan Voltage: 5V



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

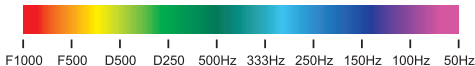
BETA FPV SuperG Nano TX Module is compatible with radio transmitter which has the nano TX module bay (AKA Lite module bay, e.g. BETA FPV LiteRadio 3/3 Pro, Radiomaster Zorro, Frsky Taranis X-Lite, Frsky Taranis X9D Lite, TBS Tango 2).

Indicator Status

Receiver Indicator Status Includes:

| Indicator Color | Status | Indicating |
|-----------------|--------------|---|
| Rainbow | Fade Effect | Power On |
| Green | Slow Flash | WiFi Update Mode |
| Red | Fast Flash | Radio chip not detected |
| Orange | Double Flash | Bind Mode |
| | Triple Flash | Connected to transmitter but mismatched model-match configuration |
| | Slow Flash | Waiting to bind |
| | Solid On | Connected and color indicates packet rate |

The packet rate correspond to the RGB indicator color as shown below:



F1000 and F500 are the only packet rates supported by ELRS 2.4G under FLRC mode. Per mode features a lower latency rate and faster configuration. However, the distance of remote control would be shorter than standard LoRa mode. It's better suited for racing purposes.

D500 and D520 is packet rate under DVDA (Déjà Vu Diversity Aid) mode. Works under F1000 rate of FLRC mode. It repeatedly sends multiple identical packets under a complex environment, ensuring a safer radio link connection. D500 and D250 respectively send the same packet twice and four times repeatedly.

Transmitter Configuration

The SuperG Nano TX module defaults to receiving signals in the Crossfire serial data protocol (CRSF), so the remote control's transmitter module interface needs to support CRSF signal output. Next, we use the radio transmitter with EdgeTX system to show how to setup the CRSF protocol and Lua script.

CRSF Protocol

In the EdgeTX system, select "MODEL SEL" and enter the "SETUP" interface. In this interface, turn off Internal RF (set to "OFF"), turn on External RF, and set the output mode to CRSF. Connect the module correctly and then the module will function properly.

Settings are shown as below:

| | |
|--------------|-------------|
| SETUP | 2/12 |
| Internal RF | |
| Mode | OFF |
| External RF | |
| Mode | CRSF |
| Baudrate | 921k |
| Status | 500Hz 0Err |
| Ch. Range | CH1-16 |

Lua Script

Lua represents a lightweight and compact script language. It can be used by being embedded in radio transmitters and easily reading and modifying the parameter set of modules. The directions of using Lua are as below.

- Download the elrsV3.lua on BETAFPV official website or ExpressLRS configurator.

⚙️ **Target**

Device category ▼
 BETAFPV 2.4 GHz

Device ▼
 BETAFPV SuperG Nano 2.4GHz TX

Flashing Method
 UART ? WIFI ?

DOWNLOAD LUA SCRIPT

⚙️ **Device options** RESET

Standard mode Manual mode

- Save the elrsV3.lua files onto the radio transmitter's SD Card in the Scripts/Tools folder.
- Long press the "SYS" button or the "Menu" button on the EdgeTX system to access the SD-HC CARD interface where you can choose elrsV3.lua script and run it.
- Below images show the Lua script if it runs successfully.

```

BFPV NanoG 2G4      0/250 C
Packet Rate    250Hz(-108dbm)
Telem Ratio    Std(1:64)
Switch Mode    Wide
Antenna Mode   Gemimi
Model Match    Off(ID:0)
> TX Power(50mW)
> VTX Administrator
> WiFi Connectivity
> Backpack
  [BLE Joystick]
  [Bind]
3.3.0 ISM2G4 b08b82
> Other Device
  
```

With the Lua script, users could configure the set of parameters, such as Packet Rate, Telem Ratio, TX Power and the like. All functions of Lua script are shown as below:

| Parameter | Note |
|-------------------|--|
| BFPV NanoG 2G4 | Products Name |
| 0/250 | Drop ratio of the communication between modules and transmitters |
| C/- | C: Connected -: Unconnected |
| Packet Rate | Packet rate of communication between module and receiver, and the shorter the interval between remote control packets sent by the transmitter, the more precise the control is. |
| Telem Ratio | Receiver telemetry ratio. For example, 1:64 means that the receiver will send one telemetry packet back for every 64 remote control packets it receives. |
| Switch Mode | Wide: 4x10bit+1x1bit+7x6 or 7bit Hybrid: 4x10bit+1x1bit+6x3bit+1x4bit Learn more information here: https://www.expresslrs.org/software/switch-config/ |
| Antenna Mode | Gemini Mode: Two antennas simultaneously transmit and receive telemetry with a frequency difference of 40MHz. Ant1 Mode: Only Ant1 transmits, but both antennas simultaneously receive telemetry. Ant2 Mode: Only Ant2 transmits, but both antennas simultaneously receive telemetry. Switch Mode: Ant1 and Ant2 alternate transmissions, and both antennas simultaneously receive telemetry. |
| Model Match | Set the model ID, can be disabled. |
| TX Power | Configure the transmission power of the module, dynamic power, and the threshold for cooling fan. |
| VTX Administrator | Set VTX frequency band, power, PIT mode and the like. |

| Parameter | Note |
|---------------------|--|
| WiFi Connectivity | Enable the WiFi of module/receiver/backpack of VRX |
| Backpack | Set the start channel of DVR or the latency time of start and end of the video recording. Backpack function or module is essential to DVR. |
| BLE Joystick | This mode allows the module to connected with simulators through computer's bluetooth. |
| Bind | Enter the binding mode |
| 3.3.0 ISM2G4 b08b82 | Firmware version, frequency band and version number. |
| Other Device | Set the parameter of the receiver connected with the module |

Note: Learn more details of Express LRS Lua here: <https://www.expresslrs.org/quick-start/transmitters/lua-howto/>.

Custom Button

There are two buttons reserved for users to customize its functions. Operation steps are as below:

- Enter the WiFi mode through enable module or powering on for 60 seconds;
- Once the RGB state indicator is in slow green flashing, the receiver's WiFi will be activated (WiFi name: ExpressLRS RX, password: expresslrs);
- Open the website address: <http://10.0.0.1>, you can find the model page for custom button setting interface
- In the "Action" column, select desired custom Function; In the "Press" and "Count" columns, select the button press type and the number of presses or duration of the press.
- Click "Save" to complete the configuration.

There are six settable shortcut buttons and two ways to use the buttons: long press and short press. Long press can be set to a custom time duration, while short press can be set to a custom number of presses.

Six settable functions are shown as below:

| | |
|----------------------------|----------------------|
| ● Unused | ● Send VTX Settings |
| ● Increase Power Output | ● Enable WiFi |
| ● Go to VTX Channel Menu | ● Enter Binding Mode |
| ● Go to VTX Frequency Menu | |

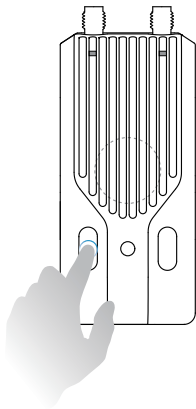
Default functions of the module are shown as below:

| Button | Action | Press | Count |
|---------------------------|------------------------|-------------|-----------------|
| Button1 (Left Button) | Enter Binding Mode | Short Press | 3 Times |
| | Increase Power | Long Press | For 0.5 seconds |
| Button2 (Right Button) | Go to VTX Channel Menu | Short Press | 2 Times |
| | Send VTX Settings | Long Press | For 0.5 seconds |

Bind

The default firmware of SuperG Nano TX module is ExpressLRS version 3.3.0. There is no Binding Phrase pre-set. Hence Binding with transmitters has to ensure that the module is using V3.0.0 above with no binding phrase.

1. Put the receiver in a bound state and wait for connection.
2. Click the "Bind" in the Lua script or the set custom button to enter the binding mode. if the Indicator has turned solid, it indicates that the device has been bound successfully.



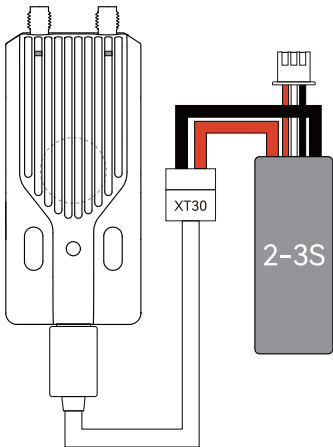
Quick Press the Key for Three Times to Enter the Binding Mode

Note: If the receiver has been flashed with firmware on the configurator and is set with a binding phrase, then using the above binding method will not let the receiver be bound to other devices. Please set the same binding phrase to the transmitter module to perform an auto-bind with the receiver.

It is recommended to separate the two antennas as far as possible to achieve better-receiving performance.

External Power

The power consumption of the SuperG Nano TX module when using a transmission power of 500mW or above is relatively high, which will shorten the usage time of the remote control. Users can provide power to the module by using an XT30-USB adapter cable to connect to an external battery. The usage method is shown in the following figure.



The power consumption of the module is not only related to the transmission power, but also to the telemetry ratio. For example, when the telemetry ratio is set to 1:128 in Gemini mode, the power consumption is 1000mA@8V, while the telemetry ratio is set to 1:2, the power consumption is only half of 1:128. Therefore, when using a high-power module of 500mW or higher, it is recommended to set the telemetry ratio higher in order to reduce power consumption and extend usage time.

Note: When the voltage of the remote control battery or external battery is lower than 7V (2S) or 10.5V (3S), please use the Gemini mode of 500mW and 1W with caution, otherwise the high-frequency head may enter a restart state due to insufficient power supply, leading to disconnection and loss of control.

More Information

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

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

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