BETAFPV ELRS Nano RF TX Module High Refresh Rate Long Range Performance Ultra Low Latency User Manual

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

Github Project Link: **https://github.com/ExpressLRS**
Facebook Grau p: **https://fwww.facebook.com/groups/636441730280366**

Specifications

- Packet refresh rate:

  25Hz/50Hz/100Hz/200Hz (915MHz/868M Hz)

  50Hz/150Hz/250Hz/500Hz (2.4GHz)

- RF output power:

  25mW/50mW/100mW/250mW/500mW (2.4GHz)

  100mW/250mW/500mW (915M Hz/868MHz)

- 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: DC 5V~l2V

- USB port: Type-C
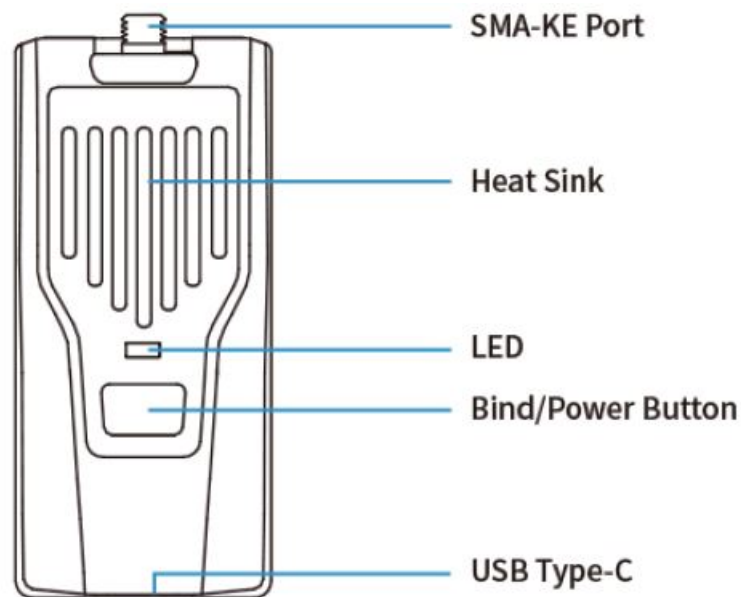
BETAFPV Nano RF module is compatible with radio transmitter which has the nano module bay (AKA lite module bay, e.g. Frsky Taranis X-Lite, Frsky Taran is X9D Lite, TBS Tango 2).

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 Open TX system to show how to setup the CRSF protocol and LUA script.
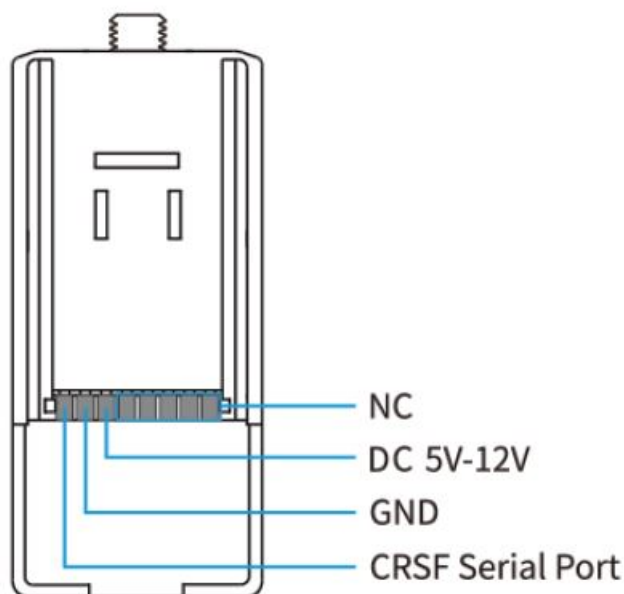
Note: Please assemble the antenna before power on. Otherwise, the PA chip in the Nano TX module will be damaged permanently.

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.
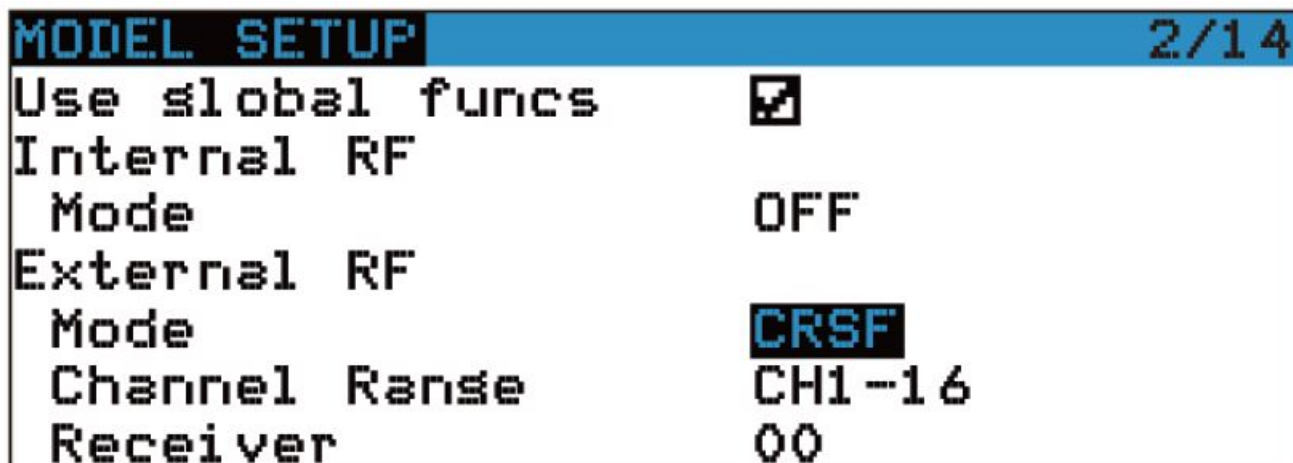
LUA Script

ExpressLRS use the Open TX 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 Tl6 or similar radios) or the "Menu" button (for Frsky Taran is 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 Rate       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 tansmitter 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

The Nano RFTX module comes with offically major release Vl.0.0 protocol and no Binding Phrase inlcuded. So please make sure the receiver works on offically major release Vl.0.0~Vl.1.0 protocol. And no Binding Phrase setted.
Nano RF TX module could enter binding status via ELRS.lua script, as description in "LUA Script" chapter.
Besides, short press the button three times on the module could also enter binding status.

Short press the button three times
Enter binding status
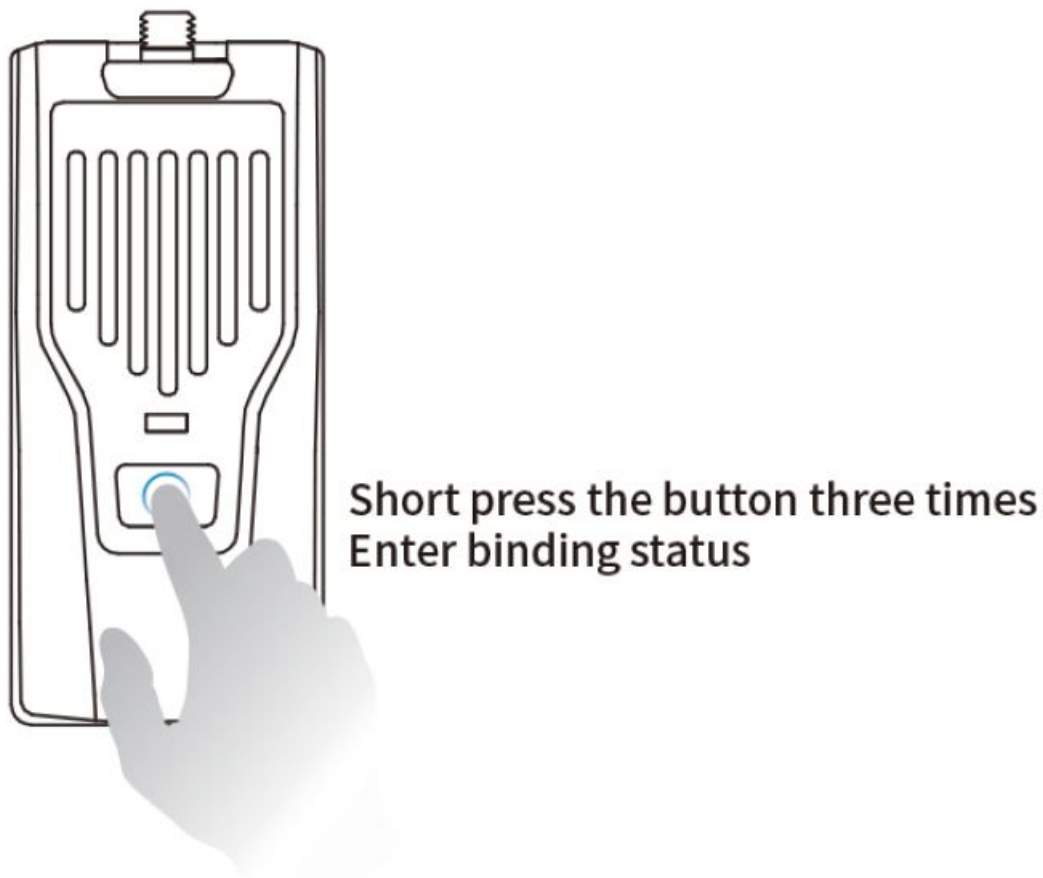
Note: The LED will NOT flash when enter binding status. The module will exit from binding status 5 seconds later auto.
Note: If you reflash firmware of the RF TX module with your own Binding Phrase, please make sure the receiver has the same Binding Phrase. The RFTX module and the receiver will bind automatically in this situation.

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.

Long press the button
Switch output power
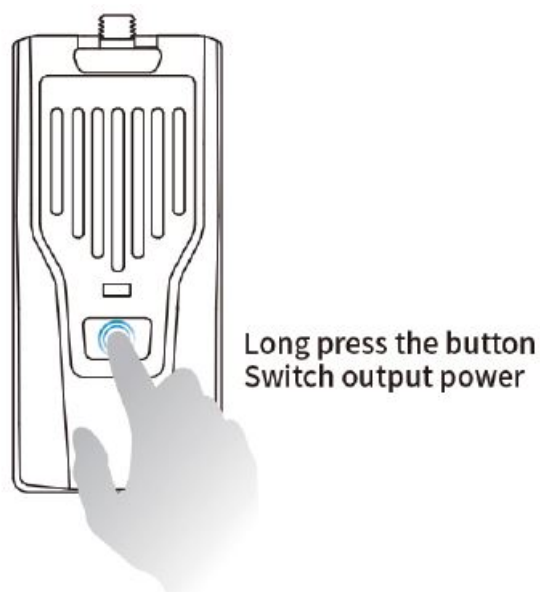
The RF TX module output power and LED indication as show below.

LED Color	RF output power
Blue	l 00m W
Purpl e	250mW
Red	S00mW

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.

FCC statement

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 lo provide reasonable protection against harmful interterence 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 interterence by one or
more of the following measures

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an expelienced radio/TV technician for help

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment
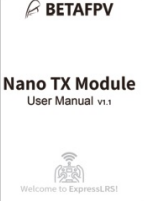This device complies with part 15 of the FCC Rules.
Operation is subtect to the following two conditions:

1. This device may not cause harmful interference, and

2. this device must accept any interference received, including interference that may cause undesired operation

RF Exposure Information
The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restliction

Documents / Resources

BETAFPV ELRS Nano RF TX Module High Refresh Rate Long Range Performance Ultra Low Latency [pdf] User Manual
ELRS Nano RF TX Module High Refresh Rate Long Range Performance Ultra Low Latency for FPV RC Radio Transmitter, B09B275483