Ranger Nano

RadioMaster – ExpressLRS 2.4 GHz transmitter module
User Manual



Read the safety instructions before first use. Never power on the module without an antenna connected.

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1. Safety Instructions

Read this entire manual before first use and keep it for future reference. If you pass the product on to another person, include this manual.

1.1 Radio transmission

- The module is a radio transmitter. **Never power it on without an antenna connected** – transmitting without an antenna may damage the transmitter circuitry.
- Connect and disconnect the antenna only with the module and the radio switched off. Tighten the RP-SMA coupling nut by hand only.
- Use only the antenna supplied by the manufacturer or an antenna the manufacturer offers for the module (e.g. the MOXON directional antenna). Additional amplifiers and modifications of the equipment are prohibited in the Czech Republic.
- In its FCC certification documents the manufacturer states that the antenna must be installed to provide a separation distance of **at least 20 cm from all persons**.
- Set the transmitter power in accordance with the regulations of the country in which you operate the module (Chapter 3). The user is responsible for the power setting.

1.2 Controlling a model

- **Do not change link parameters** (packet rate, power, telemetry ratio) **while the model is armed** (motors enabled).
- **Never change the packet rate in flight** – the change forces a disconnect between the transmitter and the receiver.
- Before every flight, check that the model responds correctly to the controls and that failsafe is configured in the flight controller (FC).
- Spinning propellers can cause serious injury. Remove the propellers or secure the model while setting up and binding.

1.3 Power supply and operating conditions

- Connect only a power source within **6–16.8 V DC** to the XT30 connector and observe the polarity (+ / −) marked on the housing.
- The module is equipped with a fan and air vents. **Do not cover them** and do not insert any objects into them.
- Protect the module from moisture, dust, drops and direct radiant heat. Do not use a wet or damaged module.
- Do not disassemble the module beyond the procedures published by the manufacturer. The product is not a toy – keep it out of the reach of children.

2. Product Description

2.1 Introduction

Featuring F-1000Hz refresh rates and a high-efficiency cooling system, the Ranger Nano 2.4GHz ELRS Module represents the cutting edge in ExpressLRS (ELRS) technology. Attach the module to a compatible radio (Zorro, Pocket or MT12) to enjoy all that ELRS has to offer.

The included T-shape antenna is designed for general purpose flying. An optional MOXON antenna is available separately for directional applications.

※ The Ranger Nano 2.4GHz ELRS Module fits Nano style module bays (connectors). For JR style and Micro (Lite) module bays, please consider the Ranger and the Ranger Micro module.

2.2 Features

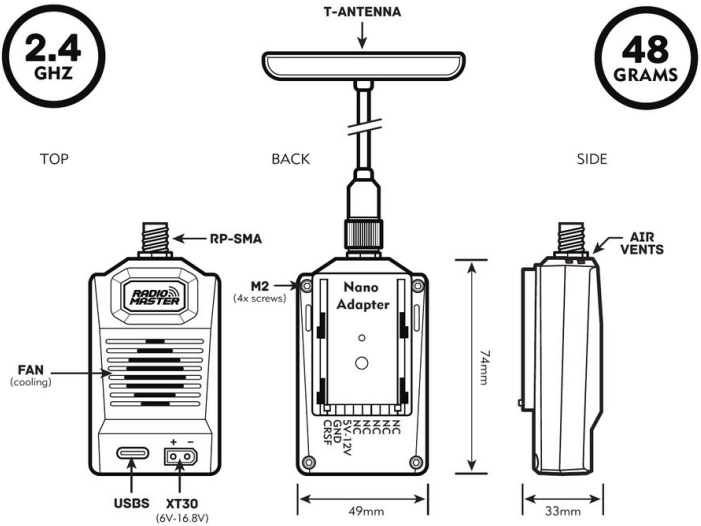
- Built-in ExpressLRS Backpack
- High-efficiency cooling system
- Wifi and Bluetooth support
- Packet rates up to F-1000Hz
- T-antenna included
- Supports Zorro radio

2.3 Package contents

1×	Ranger Nano Module
1×	2.4GHz T-Antenna
1×	Manual

Not included: radio, receiver, battery for external power supply, USB cable and MOXON directional antenna.

2.4 Parts description



Top (TOP), back (BACK) and side (SIDE) view – manufacturer's drawing

Label in drawing	Meaning
T-ANTENNA	2.4 GHz T-antenna
RP-SMA	RP-SMA antenna connector
FAN (cooling)	cooling fan
AIR VENTS	air vents
USBS	USB-C connector (firmware update)
XT30 (6V-16.8V)	XT30 connector for external power supply 6–16.8 V
Nano Adapter	connector for the Nano module bay of the radio
M2 (4x screws)	4 M2 screws of the adapter

▶ Nano Adapter pinout

Pin	Function
CRSF	CRSF data line to the radio
GND	ground
5V-12V	power supply from the radio 5–12 V
NC (5×)	not connected

2.5 Specifications

Regulatory Domain	ISM2400
MCU	ESP32 (main) ESP8285 (aux, as ESP backpack)
RF Chip	SX1281IMLTRT
Frequency Range	2400–2480 MHz
Maximum Packet Rate	500Hz / F-1000Hz (F-1000Hz mode requires EdgeTX 2.7.1 or later)
Control distance	max. 2 km
Min. Receiver Refresh Rate	25 Hz
RF Output Power	default 100 mW
Wifi Support	yes
Bluetooth Support	yes
XT30 Power Supply Voltage	6–16.8 V DC
Weight	48 g (with antenna) 39 g (without antenna)
Dimension	136 × 42 × 26 mm (with T-antenna) 74 × 42 × 26 mm (without antenna)
Default firmware	RadioMaster Ranger Nano 2.4GHz TX

The control distance is a manufacturer's figure; the actual range depends on settings, antennas, receiver and environment. The dimension lines in the drawing in Chapter 2.4 (49 mm and 33 mm) differ from the dimensions in the table; the manufacturer does not explain the discrepancy.

2.6 Frequency bands and maximum transmitted power

Data according to the test report for the CE (RED) certificate published by the manufacturer:

Radio section	Frequency band	Max. power
2.4 GHz (ELRS)	2402.4–2479.4 MHz	19.25 dBm
WiFi 2.4 GHz	2412–2472 MHz	16.04 dBm
Bluetooth	2402–2480 MHz	2.06 dBm

Maximum antenna gain according to the same report: 1.35 dBi.

The product is offered in **FCC** and **LBT** versions. The values above relate to the CE certification. When operating in the Czech Republic and the EU, observe the limits given in Chapter 3.2 regardless of the version.

3. Legal Conditions of Operation

3.1 The law of the country of operation applies

European Union regulations apply in all member states, but national implementing rules differ from country to country – permitted frequency bands, maximum transmitting power and rules for operating unmanned aircraft. The information in this chapter describes the situation in the Czech Republic. If you use the product in another country, you must follow the regulations of the country in which you use it.

3.2 Frequencies and transmitting power in the Czech Republic

- In the Czech Republic, the 2400–2483.5 MHz band is used under general authorisations of the Czech Telecommunication Office (ČTÚ). For FHSS spread-spectrum equipment according to ETSI EN 300 328 the limit is **100 mW e.i.r.p.** (general authorisation VO-R/12). The limit includes the antenna gain.
- For non-specific short-range devices in this band, the limit is 25 mW e.i.r.p. (general authorisation VO-R/10).
- The frequencies are shared and the equipment has no protection against interference. Additional amplifiers and modifications of the equipment are prohibited.
- In the ExpressLRS Lua script and firmware, select the regulatory domain and power setting appropriate for the country of operation. The user is responsible for complying with the limit.

3.3 Operation with an unmanned aircraft

If you use the module to control a drone, operation is governed by Regulation (EU) 2019/947 and national rules – in the Czech Republic by the rules of the Civil Aviation Authority (operator registration, categories of operation, operational limits). Up-to-date information is available at www.caa.gov.cz.

4. Getting Started

4.1 Compatibility

The module is designed for Nano style module bays. The manufacturer states compatibility with the **RadioMaster Zorro, Pocket and MT12** radios. The radio must run EdgeTX or OpenTX firmware; F-1000Hz mode requires EdgeTX 2.7.1 or later.

4.2 Fitting the antenna and inserting the module

① Switch off the radio.

② Screw the T-antenna onto the RP-SMA connector and tighten it by hand.

③ Insert the module into the Nano module bay of the radio. Make sure no pins are bent or missing.

④ Switch on the radio. The module is powered from the radio via the Nano connector pins.



Left: back of the module with the Nano connector; right: USB-C and XT30 connectors

4.3 External XT30 power supply

The module can also be powered externally via the XT30 connector (6–16.8 V DC). Observe the polarity marked on the housing (+ / −). External power relieves the radio battery.

4.4 Radio setup (EdgeTX)

① Press the **MDL** key to open the model settings.

② Set *Internal RF* to **Off** – when using an external module, the internal RF module must be switched off.

③ Set the *External RF* mode to **CRSF**.

④ Set the *Baudrate* according to the required packet rate – see the table below.

⑤ Optionally set a unique *Receiver ID*.

⑥ Leave the settings with the **RTN** key.

Baudrate	Use according to ExpressLRS documentation
400K	packet rates of 250Hz and lower
921K	packet rates of 500Hz and lower
1.87M	packet rates of F1000 and lower

According to the ExpressLRS documentation, the Ranger series modules (including the Ranger Nano) support baud rates up to 3.75M. Not every radio offers all rates.

4.5 ExpressLRS Lua script

The module is configured with the ExpressLRS Lua script. Download it from www.expresslrs.org and save it to the radio's SD card in the *SCRIPTS/TOOLS* folder. Start the script with the **SYS** key → *Tools* → *ExpressLRS*.

- If the script remains at *Loading...*, increase the external module *Baudrate* in the model settings.
- The top line of the script shows a dash (−) when the module is not connected to a receiver and the letter **C** when it is bound and connected.

4.6 Binding with a receiver

Using a binding phrase (recommended): set the same binding phrase in the transmitter module (via the web interface, Chapter 6.1) and in the receiver. Devices with the same binding phrase and compatible firmware versions connect automatically on power-up. A unique phrase of at least 8 alphanumeric characters is recommended. The binding phrase is not for security; it is for anti-collision with other users.

Traditional binding: switch off the radio, power-cycle the receiver three times and check that its LED shows a quick double blink. Then switch on the radio and select **[Bind]** in the Lua script. If the receiver LED turns solid, it is bound.

The first number of the firmware version must match between the transmitter module and the receiver.

5. Settings and Functions

5.1 Packet rate and telemetry

The packet rate (link refresh rate) and the telemetry ratio (*Telem Ratio*) are set in the Lua script. A higher packet rate means lower latency, a lower packet rate means longer range. The maximum packet rate of the module is 500Hz / F-1000Hz; the receiver must support a refresh rate of at least 25 Hz. Change the packet rate only on the ground with the model disarmed (motors disabled).

5.2 Transmitter power and Dynamic Power

- **Max Power** – the maximum transmitter power. The default power of the module is 100 mW. Always set it in accordance with the limits of the country of operation (Chapter 3.2).
- **Dynamic** – *Off* means the transmitter transmits at maximum power at all times; *Dyn* lowers the power automatically according to link quality. With AUX9–AUX12, dynamic power can be controlled by a switch.
- Dynamic Power relies on telemetry: *Telem Ratio* must not be *Off* or *Race*. If no telemetry is received while armed, the power is raised to the configured maximum.
- **Fan Thresh** – the power level at which the cooling fan switches on.

5.3 Model Match

Model Match ensures that the receiver outputs control signals only when the receiver number in the radio model matches the number stored in the receiver. This prevents accidental control of the wrong model. Packet rate, telemetry ratio, switch mode, Model Match, maximum power and Dynamic Power are stored separately for each receiver number.

5.4 WiFi, Bluetooth and Backpack

- The module contains an auxiliary ESP8285 processor that works as the **ExpressLRS Backpack** – wireless communication with other devices (e.g. FPV goggles).
- In the Lua script, the *WiFi Connectivity* menu lets you enable the module WiFi (*Enable WiFi*), receiver WiFi, Backpack WiFi or VRX WiFi.
- The *Backpack* menu switches the Backpack function on or off and sets e.g. DVR recording control, head tracking or telemetry forwarding.
- Bluetooth support allows, among other things, a wireless connection to a simulator.

6. Firmware and Further Guides

The module comes pre-installed with ExpressLRS firmware (target **RadioMaster Ranger Nano 2.4GHz TX**) and does not need to be reflashed before first use. The binding phrase and other firmware options can be changed via the module's web interface.

We wish to thank the ExpressLRS team for their support and testing during development. To learn more and support the ExpressLRS project visit www.expresslrs.org.

6.1 Web interface and WiFi update

① On the radio press **SYS** → *Tools* → *ExpressLRS* → *WiFi Connectivity* → *Enable WiFi*.

② On a computer or phone, connect to the **ExpressLRS TX** network, password **expresslrs**.

③ In a browser, open **http://10.0.0.1**. If the module is connected to your home WiFi, use **http://elrs_tx.local**.

④ Edit the binding phrase and options, or upload the firmware file (*firmware.bin*) created in ExpressLRS Configurator on the *Update* tab and confirm with the *Update* button.

In ExpressLRS Configurator select the category *Radiomaster 2.4 GHz*, the device *RadioMaster Ranger nano 2.4GHz TX* and the regulatory domain appropriate for the country of operation.

6.2 USB update

Remove the module from the radio and connect it to a computer with a USB-C data cable. Install the CP210x drivers, set the flashing method to *UART* in ExpressLRS Configurator and click *Flash*. Then return the module to the radio's module bay. The Backpack of Ranger series modules is updated with the *Passthrough* method via USB.

※ Do not disconnect or switch off the module during the update.

6.3 Further guides

Official documentation: www.expresslrs.org (ExpressLRS) and www.edgetx.org (EdgeTX).

7. Maintenance and Troubleshooting

7.1 Maintenance and storage

- Regularly check the antenna and the RP-SMA connector – a loose or damaged antenna significantly reduces range.
- Keep the air vents and fan clean; remove dust with a dry brush or compressed air.
- Keep the Nano connector pins clean and straight.
- Store the module in a dry place, out of direct sunlight, with the external power supply disconnected.

7.2 Troubleshooting

Problem	Possible cause and solution
Lua script stuck at *Loading...*	External RF is not set to CRSF or the baud rate is too low – check Chapter 4.4.
Module does not respond	The internal RF module is not switched off, the module is not properly seated in the bay or pins are bent.
Cannot bind with the receiver	Different binding phrase, incompatible firmware versions (the first version number differs) or a different regulatory domain.
Short range, link dropouts	Loose or damaged antenna, power too low or packet rate too high.
F-1000Hz packet rate not available	The radio runs EdgeTX older than 2.7.1 or the baud rate is set too low.

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorama.cz
Phone	+420 252 252 098
Website	www.rotorama.com

8.2 Product conformity

CE

- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorama.cz.
- **Product identification:** the type designation (Ranger Nano) is given on the module housing; the version designation is given on the product packaging.
- Shenzhen RadioMaster Co., Ltd. hereby declares that the radio equipment type Ranger Nano is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at www.radiomasterrc.com/pages/certificatiion.

8.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste**.
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.