ELRS 2.4G True Diversity

iFlight · ExpressLRS 2.4 GHz receiver
User manual



Read the entire manual carefully before installation and first use, especially the safety instructions and Chapter 3. Keep this manual.

Importer: Rotorama, s.r.o. · www.rotorama.com

Contents

1. Safety instructions

1.1 General principles

1.2 Wiring and power supply

1.3 Radio transmission

2. Product description

2.1 What the receiver is for

2.2 Package contents

2.3 Parts description

2.4 Technical data

2.5 True Diversity and Gemini mode

3. Legal conditions of use in the Czech Republic and the EU

3.1 The law of the country of use applies

3.2 Frequencies and transmit power

3.3 Operating drones and models

4. Installation

4.1 What else you need

4.2 Connecting to the flight controller (FC)

4.3 Antennas and their placement

4.4 Flight controller setup

5. Getting started

5.1 Firmware and the correct target

5.2 Binding

5.3 Settings in the Lua script

5.4 WiFi mode and firmware update

5.5 Further guides

6. Pre-flight check

6.1 Bench test

6.2 Failsafe

7. Maintenance and troubleshooting

7.1 Status LED

7.2 Troubleshooting

7.3 Maintenance and storage

8. Information for the EU and Czech market

9. Warranty and rights arising from defective performance

1. Safety instructions

1.1 General principles

The receiver is part of the control chain of a drone or RC model. Incorrect installation or setup may result in loss of control of the aircraft, personal injury and damage to property.

- The product is intended for users with basic knowledge of building and setting up FPV drones and RC models. It is not a toy and must be kept away from children.
- Always carry out installation and all settings **with the propellers removed**.
- Before every flight, check that the link between the radio and the receiver works and that failsafe is set correctly (Chapter 6).
- Do not use a receiver that is mechanically damaged, has a damaged antenna cable or shows abnormal LED behaviour.

1.2 Wiring and power supply

- Power the receiver **only with 5 V** from the flight controller (FC). Connecting a higher voltage, for example directly from the flight battery, will destroy the receiver.
- Before powering up for the first time, check the wiring and make sure there is no short circuit between the pins. Remove any flux residue after soldering.
- Keep the battery disconnected when soldering on the flight controller. Work on a non-flammable surface and follow the instructions of the flight controller manufacturer.
- Prevent the receiver from shorting against a carbon frame or other conductive parts — insulate and mount it appropriately.

1.3 Radio transmission

- The receiver does not only receive, it also **transmits** telemetry and, in WiFi mode, a WiFi signal. Use it only with the supplied antennas or antennas specified by the manufacturer; additional RF amplifiers are prohibited.
- Set the transmit power in accordance with the regulations of the country in which you use the product (Chapter 3.2).
- Do not power up the receiver without the antennas connected.

2. Product description

2.1 What the receiver is for

The iFlight ELRS 2.4G True Diversity is a receiver for the open-source **ExpressLRS** RC system in the 2.4 GHz band. It receives control commands from a radio with an ExpressLRS module and passes them to the flight controller (FC) via the CRSF protocol; in the opposite direction it sends telemetry back to the radio (e.g. battery voltage or link quality).

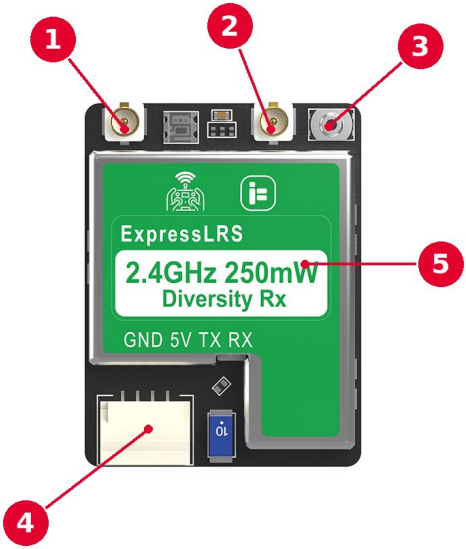
The receiver features **True Diversity**: two antennas and two radio chips, each receiving independently. It also supports **Gemini** mode. It is equipped with a temperature-compensated crystal oscillator (TCXO), a low-noise amplifier (LNA) and a shielding cover. The manufacturer recommends it especially for drones of 5 inches and larger and for long-range flights.

2.2 Package contents

Qty	Item
1	iFlight ELRS 2.4GHz 250mW Diversity Rx receiver
2	T antenna (dipole) 70 mm with IPEX1 connector

※ The radio, the ExpressLRS transmitter module and the flight controller are not included.

2.3 Parts description



Receiver — top view

① and ② IPEX1 antenna connectors — one for each of the two antennas (one for each radio chip).

③ Button on the receiver board (boot).

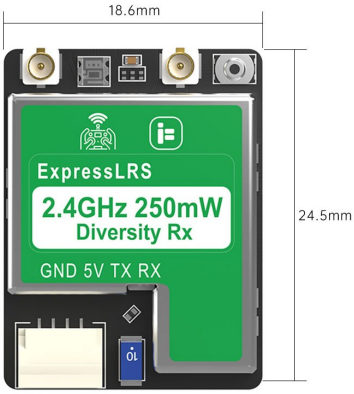
④ Four-pin connector for connection to the flight controller; the GND, 5V, TX and RX pins are marked on the label.

⑤ Shielding cover with the type designation label.

2.4 Technical data

Parameter	Value
System / protocol to FC	ExpressLRS / CRSF
Receiver type	True Diversity, Gemini mode support
Frequency band	2.4 GHz ISM
Telemetry power	50–250 mW (17–24 dBm)
Processor (MCU)	ESP32-Pico D4
LNA / TCXO	yes / yes
Power supply	5 V
Antenna connectors	2× IPEX1
Antennas included	2× T dipole 70 mm
Dimensions	24.5 × 18.6 × 6.3 mm
Weight	3.3 g
Firmware target	iFlight 2.4GHz 250mW Diversity RX
Name in the Lua script	iF 2G4 250mW GRX

Data according to the manufacturer iFlight.



Receiver dimensions (mm)

2.5 True Diversity and Gemini mode

A standard receiver has one antenna. A True Diversity receiver has two radio chips, each with its own antenna, and at any moment uses the one with better reception. This reduces dropouts when one antenna points towards the pilot with its “blind” direction or is shadowed by the carbon frame.

In **Gemini** mode, the transmitter module sends every packet simultaneously on two frequencies (40 MHz apart in the 2.4 GHz band) and the receiver receives them with both chips at the same time. This improves resistance to interference and link quality (LQ), **but does not increase range**.

※ Gemini mode only works with a transmitter module that supports Gemini. With other modules the receiver works in Diversity mode.

3. Legal conditions of use in the Czech Republic and the EU

3.1 The law of the country of use applies

European Union regulations on radio equipment and on the operation of unmanned aircraft apply in all Member States, but national implementing rules differ from country to country — permitted frequency bands, maximum transmit power, registration portals, geographical zones and mandatory insurance. The information in this chapter describes the situation in the Czech Republic. **If you use the product in another country, you must comply with the regulations of the country in which you use it.**

3.2 Frequencies and transmit power

The receiver transmits telemetry in the 2.4 GHz band and, in WiFi mode, also a WiFi signal. The manufacturer specifies a **maximum telemetry power of 250 mW (24 dBm)**, adjustable in the range 50–250 mW (17–24 dBm). In the Czech Republic, the following general authorisations of the Czech Telecommunication Office (ČTÚ) apply to the 2400–2483.5 MHz band:

Band	Limit	Regulation
2400–2483.5 MHz	25 mW e.i.r.p.	VO-R/10 — short range devices
2400–2483.5 MHz	100 mW e.i.r.p.	VO-R/12 — wideband data transmission (equipment according to ČSN ETSI EN 300 328)

- The limits are given as e.i.r.p., i.e. including the antenna gain. The telemetry power specified by the manufacturer, even the lowest level, may exceed these limits.
- Therefore set the lowest possible telemetry power (*Tlm Power*, Chapter 5.3) and, in accordance with the regulations, also the power of the transmitter module in the radio.
- For use in the EU, use firmware with the **EU_CE_2400** regulatory domain, which supports the LBT (listen before talk) function.
- Do not use antennas other than those supplied, additional amplifiers or firmware modifications that increase the power.

The user is responsible for setting the transmit power and complying with the limits in the country of use.

3.3 Operating drones and models

The receiver is installed in drones and RC models. Their operation is governed by Regulations (EU) 2019/947 and 2019/945 and by national rules. In the Czech Republic, consult the Civil Aviation Authority (www.caa.gov.cz) on operator registration, pilot competence, operational limits and geographical zones. In particular, observe:

- flying only within visual line of sight (VLOS); when flying with FPV goggles, with an observer next to the pilot,
- a maximum height of 120 m above ground and the ban on flying over assemblies of people,
- restrictions in geographical zones (airports, protected areas, etc.),
- protection of privacy and personal data when recording.

4. Installation

4.1 What else you need

- a radio with an **ExpressLRS 2.4 GHz** transmitter module (for Gemini mode, a module with Gemini support),
- a flight controller (FC) with a free full UART and a 5 V output,
- a cable with a connector matching connector ④, or soldering equipment,
- a computer with flight controller software (Betaflight, INAV, etc.) and the **ExpressLRS Configurator** application.

4.2 Connecting to the flight controller (FC)

The receiver communicates with the flight controller via a UART serial interface. It uses two separate lines: one carries the control commands to the FC, the other carries telemetry from the FC back. The pins are therefore connected **crosswise**:

Receiver	Flight controller (FC)
GND	any GND pad
5V	5 V pad (or 4.5 V)
TX	RX pad of the selected UART (uninverted)
RX	TX pad of the same UART

- The pin designations are printed on the receiver label (GND 5V TX RX). Check the wire assignment in the cable before connecting.
- Some flight controllers have a resistor on the UART intended for receivers (often because of SBUS) that pulls the RX pad to ground. The receiver then starts in bootloader mode (the LED stays solid even with the radio off). In that case use a different UART.
- After wiring, check that there is no short circuit and **do not heat-shrink or mount the receiver yet** — first verify that it works (LED blinking slowly, see Chapter 7.1).
- For the test it is best to power the flight controller from a battery so that the receiver works as in flight. Make sure the video transmitter (VTX) is cooled, or disconnect it temporarily.

4.3 Antennas and their placement

- Connect the antennas to connectors ① and ② before powering up for the first time. Push the IPEX1 connectors on straight, without levering; repeated disconnection wears them out.
- Route the antennas **away from conductive and magnetic components** (carbon frame, metal parts, motors), as far as possible from the video transmitter and the propellers.

- Route each antenna in a different direction so that the frame cannot shadow both at the same time. The active ends of the antennas must not be covered by carbon or metal.
- Secure the antenna cables (e.g. with a cable tie or heat-shrink tubing) so that they cannot get into the propellers.



Receiver with 70 mm antennas connected

4.4 Flight controller setup

The procedure is described for Betaflight; it is similar in INAV and other software.

① On the *Ports* tab, enable *Serial RX* on the UART the receiver is connected to.

② On the *Receiver* tab, set *Receiver Mode* to *Serial*, *Serial Receiver Provider* to **CRSF** and enable *Telemetry*.

③ With analog video and systems with MSP DisplayPort, disable both *RSSI Channel* and *RSSI ADC*.

④ On the *CLI* tab, use the command *get serialrx* to check that *serialrx_inverted* and *serialrx_halfduplex* are both **OFF**. If necessary, set them (*set serialrx_inverted = off*, *set serialrx_halfduplex = off*) and save with the *save* command.

⑤ Close the configurator and unplug the USB cable to release the port for the next steps.

5. Getting started

5.1 Firmware and the correct target

The receiver runs ExpressLRS firmware. To bind with a transmitter module, both must have the **same major version number** (the first number of the version). When updating or reflashing, always select the correct target:

Device Category	iFlight 2.4 GHz
Device	iFlight 2.4GHz 250mW Diversity RX

Flashing the wrong target results in extremely poor range or a complete failure to connect.

When building the firmware in ExpressLRS Configurator, also set the regulatory domain (for the EU **EU_CE_2400**) and the recommended *Binding Phrase*.

5.2 Binding

Binding phrase (recommended). Enter the same binding phrase when building the firmware of the transmitter module and the receiver (or set it in the receiver's web interface). Devices with the same phrase connect automatically. A unique phrase of at least 8 letters and digits is recommended, e.g. your pilot handle. The phrase is not a password; it only serves to distinguish you from other pilots.

▶ **Binding without a binding phrase**

① Switch off the radio.

② Put the receiver into bind mode in one of these ways: power the receiver on and off within 2 seconds three times in a row; or hold button ③ on the receiver for about 1.5 seconds; or use the *Bind Receiver* button on the *Receiver* tab of Betaflight Configurator (CLI command *bind_rx*).

③ The receiver LED blinks twice and pauses — the receiver is in bind mode.

④ Switch on the radio and select **[Bind]** in the ExpressLRS Lua script.

⑤ When the receiver LED is solid, the receiver is bound.

Bind mode is cancelled by restarting the receiver; the original binding information is then kept. Check the connection in the Lua script: the letter **C** (Connected) appears in the top right corner.

5.3 Settings in the Lua script

The receiver settings are available on the radio under *SYS* → *Tools* → *ExpressLRS* → *Other Devices* (shown when the receiver is connected). The most important items:

- **Tlm Power** — telemetry power of the receiver. The *MatchTX* option matches the power to that of the transmitter module; however, until it receives the information from the module, the receiver transmits at the default (usually maximum) power. To comply with the limits, set the lowest level as a fixed

value.

- **Receiver Mode / Antenna Mode** — selection of Gemini or Diversity. In newer ExpressLRS versions the antenna mode is set automatically according to the transmitter module.
- **WiFi Connectivity → Enable RX WiFi** — switches the receiver to WiFi mode (Chapter 5.4).

5.4 WiFi mode and firmware update

The receiver has a web interface in which you can upload firmware, set the binding phrase and check the firmware version. To put it into WiFi mode:

- automatically — switch off the radio, power up the receiver and wait about 60 seconds (the interval can be changed in the web interface, *Options* tab),
- from the Lua script with *WiFi Connectivity → Enable RX WiFi* (the receiver must be connected),
- by holding button ③ for about 5 seconds.

① The LED starts blinking rapidly — the receiver is in WiFi mode.

② With a phone or computer, connect to the **ExpressLRS RX** network, password **expresslrs**.

③ Open **http://10.0.0.1** in a browser. If the receiver is set up for your home WiFi network, use **http://elrs_rx.local**.

④ To update, build the firmware in ExpressLRS Configurator (correct target, *WiFi* method, *Build* button) and upload the *firmware.bin.gz* file on the *Update* tab without unzipping it.

⑤ After a successful update the receiver restarts and the LED blinks slowly again.

Firmware can also be uploaded via the flight controller (*BetaflightPassthrough* method) or via a USB–UART adapter (*UART* method; the receiver is put into bootloader by holding button ③ while connecting power). The detailed procedure is on the ExpressLRS website.

※ If the WiFi update fails due to lack of space, follow the instructions on the ExpressLRS page for iFlight 2.4 GHz (expresslrs.org).

5.5 Further guides

Detailed documentation for the ExpressLRS system, including the page for this receiver (*Receivers → iFlight 2.4GHz*), is available on the official website www.expresslrs.org.

Documentation for the EdgeTX radio firmware, in which the ExpressLRS Lua script runs, is available at edgetx.org.

6. Pre-flight check

6.1 Bench test

After installation and after every change of settings, check the function **with the propellers removed**:

① Place the radio about 1 m from the receiver; orient the antennas of the module and the receiver the same way.

② Switch on the radio, then the drone. The receiver LED must be solid and the Lua script shows **C**.

③ In the FC configurator (*Receiver* tab), check that all channels respond to stick and switch movements in the correct direction.

④ On the radio, check that telemetry is received (e.g. battery voltage, RSSI, LQ).

6.2 Failsafe

When the signal is lost, the receiver stops passing valid commands and the flight controller enters **failsafe** according to the settings on the *Failsafe* tab (e.g. stopping the motors). Check the function before the first flight:

① Without propellers, **Arm** (start the motors) and let the motors run at low throttle.

② Switch off the radio. The motors must stop according to the failsafe settings.

③ Switch on the radio and check that the link is restored and the aircraft is in the **Disarm** state (motors off).

Never fly if failsafe does not work correctly.

7. Maintenance and troubleshooting

7.1 Status LED

LED behaviour	Meaning
slow blinking (500 ms)	waiting for connection from the transmitter module
double blink and pause	bind mode
triple blink and pause	connected, but Model Match setting does not match
medium-speed blinking (100 ms)	radio chip not detected
very fast blinking (25 ms)	WiFi mode
solid	connected to the transmitter module; if it is solid even with the radio off, the receiver is in bootloader mode

LED states according to the ExpressLRS documentation (single-colour LED).

7.2 Troubleshooting

Problem	Cause and solution
LED does not light at all	Disconnect power immediately and check the GND and 5V wiring.
LED solid even without the radio (bootloader)	Check that button ③ is not pressed (e.g. by heat-shrink tubing). Disconnect the TX and RX wires — if the LED starts blinking slowly, connect the receiver to a different UART.
Receiver does not bind	Different major firmware version, binding phrase or regulatory domain. Align the firmware and settings of the transmitter module and the receiver.
Connected, but the FC does not respond	Swapped TX/RX wires, wrong UART on the Ports tab, CRSF protocol not set, or inversion / half-duplex enabled (Chapter 4.4).
Short range, dropouts	Wrong firmware target, damaged or shielded antenna, antenna near carbon, motors or VTX. Check the antenna placement (Chapter 4.3).
ExpressLRS RX network not visible	The receiver is connected to your home WiFi (use elrs_rx.local), or the device does not support 2.4 GHz WiFi. Move the device closer to the receiver.

7.3 Maintenance and storage

- After a crash, check the antennas, cables, connectors and mounting; replace damaged antennas.
- Protect from moisture, dust and conductive dirt; store dry, at room temperature, away from children.

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 (2.4GHz 250mW Diversity Rx) is given on the label on the shielding cover of the receiver; the firmware version is shown in the receiver's web interface (see Chapter 5.4).

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.