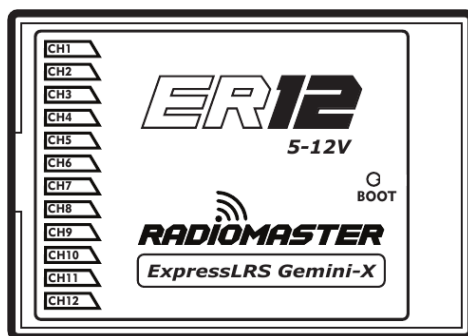




RadioMaster ER12

12-channel PWM ExpressLRS receiver
Dual-Band Gemini / Gemini-X · 2.4 GHz + Sub-GHz



Read the entire manual before first use, especially Chapters 1, 3 and 4. In the Czech Republic and the EU, use only the EU868 regulatory domain in the Sub-GHz band - the 902-928 MHz band (FCC915) is prohibited for these devices in the Czech Republic.

Based on the manufacturer's original manual · Rotorama, s.r.o. · www.rotorama.cz

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1. Safety instructions

Before you start

- Read the entire manual before first use and keep it for future reference. If you pass the product on to another person, include this manual.
- The product is intended for persons aged 14 and over. It is not a toy.
- The receiver is designed for installation in RC model aircraft, in particular larger fixed-wing aircraft. Do not use it for any other purpose.
- Installation, wiring and set-up require basic knowledge of electronics and RC modelling. If in doubt, ask an experienced modeller or your dealer.
- Do not use a receiver that is mechanically damaged, wet or shows signs of overheating.

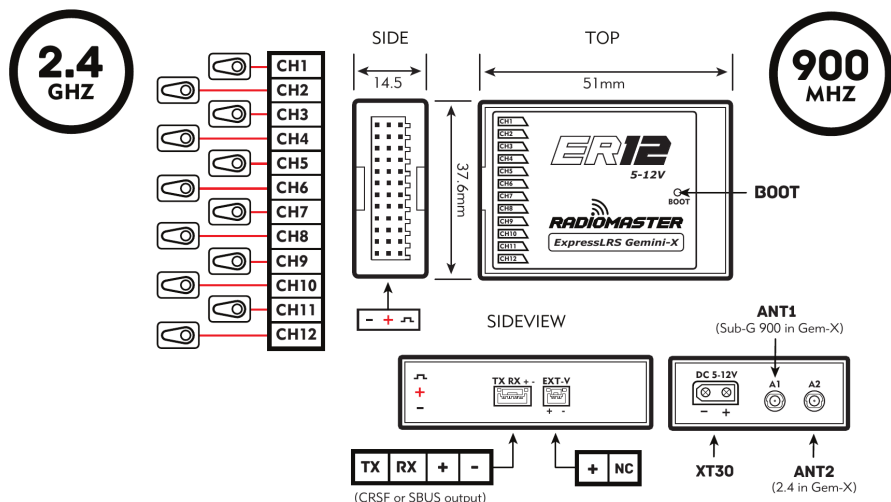
Power supply and wiring

- The receiver supply voltage is **DC 5.0–12.0 V**. Do not exceed this range.
- The XT30 input provides direct battery voltage to the PWM rail – output matches input voltage. Connect only servos rated for this voltage (Chapter 4.2).
- When powering via the XT30 input, the ESC's 5V/BEC wire must be **disconnected**.
- Observe correct polarity. Change the wiring only with the power disconnected and always check it before connecting the battery.
- When handling LiPo and Li-ion batteries, follow the instructions of their manufacturer. Never charge batteries unattended.

Radio link

- Never power on the receiver without antennas connected. Use only the antennas supplied by the manufacturer, do not connect power amplifiers and do not modify the receiver electrically or mechanically.
- Check the link and the correct response of all servos before every flight.
- Before the first flight, set up and test the **failsafe** – the behaviour of the model on loss of signal (Chapter 6.2).
- Set the frequency band and transmit power in accordance with the regulations of the country in which you operate the model (Chapter 3).

2. Receiver description



Dimensions, connectors and wiring of the ER12 receiver (labels from the manufacturer's original)

The RadioMaster ER12 is designed for larger fixed-wing aircraft that require a higher channel count and robust power handling without unnecessary complexity. Its full-size layout and straight-forward integration make it well suited to multi-servo, higher-current installations.

Built on the ExpressLRS platform and equipped with dual Semtech LR1121 transceivers, the ER12 utilizes a dual-band Gemini X RF architecture operating on both 2.4 GHz and Sub-G 900 MHz. The result is a stable, consistent control link across a wide range of operating environments, with an architecture that prioritizes dependable operation.

The ER12 uses amplified PWM outputs to help maintain reliable servo signals over long leads and extension cables commonly used in larger aircraft. The amplified outputs also help ensure clean and consistent signals when operating larger, high-torque servos that place greater demands on the control system. Serial connectivity is available via a dedicated 4-pin JST-GH locking UART/CRSF port for telemetry devices and other serial peripherals.

From installation to operation, the ER12 focuses on practicality, with a clean PCB layout to reduce interference, MMCX antenna connectors for easy serviceability, and a durable injection-molded housing built for long-term use.

※ In the Czech Republic and the EU, use the EU868 regulatory domain (863-870 MHz) in the Sub-GHz band – see Chapter 3.2.

2.1 Connectors

Label	Description
CH1-CH12	PWM servo outputs. Pins of each output: signal, +, – (orientation as shown in the side view).
BOOT	Button on the top. Hold for 10 seconds to reset the receiver (Chapter 5.4).
XT30 DC 5-12V	Power input from the battery. The voltage is also supplied to the PWM rail (Chapter 4.2).
TX RX + –	4-pin JST-GH locking UART/CRSF port – CRSF or SBUS output for telemetry devices and other serial peripherals.
EXT-V + NC	2-pin JST-GH voltage detection input (NC = not connected), Chapter 4.3.
A1 (ANT1)	MMCX antenna connector. Sub-GHz band in Gemini X mode.
A2 (ANT2)	MMCX antenna connector. 2.4 GHz band in Gemini X mode.

2.2 Specifications

Item	ER12 PWM - Dual-Band GEMINI and GEMINI-X Receiver
Variant	LBT (for the EU)
Size	51 × 37.6 × 14.5 mm
Weight	22.5 g (without antenna)
Power Supply	DC 5.0–12.0 V (power to the receiver)
Wireless Protocol	ExpressLRS
RF chips	2× Semtech LR1121
Frequency bands	2.4 GHz and Sub-G 900 MHz (in the CZ and EU: EU868 domain, 863–870 MHz – Chapter 3.2)
Output Channels	12-channel PWM
Serial Output	CRSF / SBUS
Telemetry Power	Up to 100 mW (LUA adjustable)
Voltage Detection	DC 4.0–70 V (monitor main flight battery)
Bus Interface	CRSF
Antenna Connector	MMCX
Antenna Type	2× 2.4 GHz & 2× Dual-Band (25 cm)
Firmware	ExpressLRS

3. Legal requirements in the CZ and EU

3.1 The law of the country of operation applies

Radio equipment and model aircraft operation are governed by EU law (Directive 2014/53/EU, Regulation (EU) 2019/947), but national rules differ – bands and power limits, registration, pilot age, zones and insurance. This chapter describes the situation in the Czech Republic. **When flying in another country, follow its regulations.**

3.2 Radio frequencies and transmit power

The ER12 operates in the 2.4 GHz and Sub-GHz bands and transmits telemetry at up to **100 mW** (manufacturer's data, adjustable in the ExpressLRS LUA script). Limits in the Czech Republic:

Band	Limit in the CZ	Regulation
2400–2483.5 MHz	100 mW e.i.r.p. (FHSS)	VO-R/12/11.2021-11
863–870 MHz	25 mW e.r.p., limited duty cycle	VO-R/10/05.2025-5
FCC915, AU915 (902–928 MHz)	operation not permitted	mobile networks and GSM-R railway network

- Set the Sub-GHz regulatory domain to **EU868** on the receiver and the transmitter module (in the WebUI); never use FCC915 or AU915 in the CZ.
- The receiver is supplied in the EU **LBT** (Listen Before Talk) variant – it checks that the 2.4 GHz channel is free before transmitting.
- The limits apply to radiated power including antenna gain. **The user is responsible for the power setting** – set the telemetry power so that the limit is not exceeded.

3.3 Operating a model aircraft

Under Regulation (EU) 2019/947 a model aircraft is an unmanned aircraft; the Czech authority is the Civil Aviation Authority (ÚCL), www.caa.gov.cz. Basic open category rules:

- Operators of models of 250 g or more, or with a camera, must register (in the CZ at dron.caa.gov.cz) and mark the number on the model.
- Keep the model in visual line of sight, no higher than 120 m above the ground, and never fly over assemblies of people.
- Larger models are usually operated in subcategory A3 – at least 150 m from residential, commercial, industrial and recreational areas.
- The minimum pilot age is 16; exceptions are set out in Article 9 of Regulation (EU) 2019/947, e.g. direct supervision by a qualified pilot.
- Clubs and associations may fly under an ÚCL authorisation (Article 16) on its terms. Liability insurance is recommended.

4. Installation and power supply

4.1 Mounting the receiver and antennas

- Mount the receiver so that it is protected against vibration, moisture and mechanical damage and is not close to heat sources.
- Connect the servo plugs with the correct pin orientation (signal, +, –) as shown in the figure in Chapter 2.
- In Gemini X mode, connector A1 operates in the Sub-GHz band and connector A2 in the 2.4 GHz band – therefore connect a dual-band antenna to A1.
- Route the antennas as far as possible from metal and carbon parts, power cables and ESCs, preferably perpendicular to each other. Do not bend the antenna cables at sharp angles and protect them from damage.
- Connect and disconnect the antennas only with the receiver switched off.

4.2 XT30 power input and servo power

IMPORTANT: XT30 provides direct battery voltage to the receiver and PWM rail. Output matches input voltage.

USE only servos rated for the applied voltage. High-voltage systems (2S LiPo/Li-ion) require HV servos. Standard 5V servos must be powered via a regulated 5V supply or through the standard servo power input pins. When using the XT30 input to power the receiver and servos, the ESC's 5V/BEC wire must be **DISCONNECTED** to avoid back-feeding and possible damage.

※ A fully charged 2S LiPo battery has 8.4 V (2×4.20 V/cell), 2S LiHV 8.7 V (2×4.35 V/cell). A fully charged 3S LiPo battery has 12.6 V (3×4.20 V/cell) and therefore exceeds the receiver's maximum supply voltage of 12.0 V.

4.3 EXT-V power input and voltage detection

The EXT-V input on the ER12 is accessed through the 2-pin JST-GH connector. Solder the red wire to the positive (+) terminal of the battery or ESC. The ER12 features multiple independent ADC channels and can monitor voltage from V-EXT and V-XT30, allowing it to accurately detect and report the appropriate input voltage for your installation. The detection range is DC 4.0–70 V.

Solder only with the battery disconnected and always insulate the joint.

5. Set-up and binding

5.1 Firmware and Wi-Fi

The receiver is configured with the ExpressLRS LUA script on the radio or in the ExpressLRS web interface (WebUI), accessed via Wi-Fi from a phone, tablet or PC:

Device	Wi-Fi network	Password	URL (open in browser)
transmitter module	ExpressLRS TX	expresslrs	http://10.0.0.1/
receiver	ExpressLRS RX	expresslrs	http://10.0.0.1/

When updating the firmware, select this device:

Device Category	RadioMaster Dual 2.4GHz/900MHz Receiver
Device	ER12 Dual Band True Diversity + 12xPWM RX

Transmitter module and receiver firmware must be compatible (same ExpressLRS major version).

5.2 Recommended LUA settings

IMPORTANT: The recommended ELRS LUA settings on the remote-control end are:

Parameter	Standard servos	Performance servos
Packet Rate	100Hz Full	333Hz Full
Telem Ratio	Std (1:32) – default	Std (1:128)
Switch Mode	16ch / Full	16ch / Full

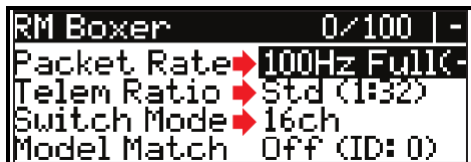


Fig. 1 – Packet Rate, Telem Ratio and Switch Mode in the ExpressLRS LUA script

5.3 CRSF / SBUS output

The ER12 supports CRSF or SBUS output on the UART port. To switch protocols:

- ① BIND the receiver to the transmitter.
- ② OPEN the ExpressLRS WebUI using a browser.
- ③ On the *MODEL* page, select the desired serial protocol.

Alternatively, the protocol can be changed using the ExpressLRS LUA script on the transmitter.

5.4 Binding the receiver

► Passphrase binding

※ Note: Bind phrases are not secret and can be read.

- ① OPEN the ExpressLRS LUA and navigate to the *WiFi Connectivity* page. Select the *Enable WiFi* option and connect to your radio's Wi-Fi with a mobile phone, tablet or PC (see Chapter 5.1). OPEN the ExpressLRS web page at <http://10.0.0.1/> and choose a unique bind phrase. *Save and Reboot*.
- ② Power ON the receiver and wait 60 seconds for the LED to blink rapidly to indicate Wi-Fi mode. Connect your phone, tablet or PC to the receiver's Wi-Fi (see Chapter 5.1). OPEN the ExpressLRS web page at <http://10.0.0.1/> and enter the matching bind phrase previously entered on your radio. Save and Reboot. Once both radio and receiver have the same bind phrase set, they will automatically bind.

► Traditional binding

- ① The first time you power on your receiver, the LED is doing a quick double blink, which indicates the receiver is in bind mode. If this is not the case, hold down the BOOT button for 10 seconds to reset the receiver.
- ② Power ON your transmitter/radio and use the *[Bind]* button on the ExpressLRS LUA script, which sends out a binding pulse.
- ③ If the receiver has a solid light, it's bound!



Fig. 2 – *[Bind]* button in the ExpressLRS LUA script

※ Note: To bind the receiver a second time or to another radio, power cycle the receiver 3 times. On the third power cycle, the LED will double blink indicating bind mode. If you cannot successfully enter bind mode with the 3 power cycle method, you can hold down the BOOT button for 10 seconds to reset the receiver to bind mode or use the passphrase method.

WARNING: All previous settings in the receiver will be erased and need to be re-entered when using the reset button.

6. Operation

6.1 LED indication

LED	Meaning
quick double blink	bind mode
rapid blinking (60 s after power-on)	Wi-Fi mode – WebUI access
solid light	receiver is bound

6.2 Pre-flight check

- Check the mounting of the receiver, the antennas and all connectors.
- Make sure the battery voltage matches the receiver and servo supply (Chapter 4.2). Insert a fully charged battery before the flight.
- Check that all servos move in the correct direction and through their full travel.
- Check the link stability and the telemetry values (signal strength, voltage).
- Test the failsafe: with the model secured (with electric power, without propeller), switch off the radio and check that the servos and the ESC behave according to the failsafe setting. Failsafe set-up is described in the ExpressLRS documentation.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- Keep the receiver dry and clean. Do not clean it with solvents.
- Inspect the connectors, servo leads and antenna cables regularly and after every hard landing.
- Store in a dry place at room temperature with the battery disconnected.
- Update the firmware only with the correct device selected (Chapter 5.1) and with the EU868 regulatory domain.

7.2 Troubleshooting

Problem	Possible cause and solution
Receiver does not bind	Different bind phrase or regulatory domain on the transmitter module and the receiver; incompatible firmware; receiver not in bind mode – power cycle it three times or reset it with the BOOT button (Chapter 5.4).
LED does not light after power-on	Check the supply voltage (5.0–12.0 V) and the polarity.
Servos do not respond correctly	Check the orientation of the servo plugs, the voltage on the servo rail (Chapter 4.2) and the Packet Rate setting for the servo type (Chapter 5.2).
No data on the UART port	Check the selected CRSF / SBUS protocol (Chapter 5.3) and the TX and RX wiring.
Cannot connect to the receiver's Wi-Fi	After power-on, wait 60 seconds until the LED blinks rapidly and connect to the ExpressLRS RX network (Chapter 5.1).
Telemetry reports wrong voltage	Check the wiring of the EXT-V input (Chapter 4.3).

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@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.cz

8.2 Product conformity



- 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@rotorاما.cz.
- **Product identification:** the type designation (ER12) is printed on the top cover of the receiver; the firmware version is shown in the ExpressLRS web interface (WebUI).

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

Rights of the buyer under Czech law

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.