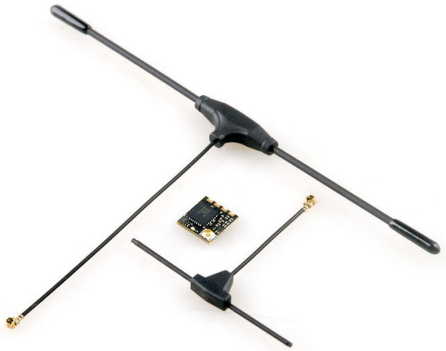
ES900RX

Happymodel · ExpressLRS 868/915 MHz receiver
User Manual



In the Czech Republic and the EU use the EU868 regulatory domain only. The 915 MHz mode (FCC915) must not be operated in the Czech Republic.

www.rotorama.com

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1. Safety instructions

1.1 Before you start

Read this entire manual before connecting the receiver. The ES900RX receiver is part of an RC system that controls a model – a drone, aeroplane, car or boat. Incorrect installation or setup may result in loss of control of the model, a crash, personal injury or property damage.

- This product is not a toy and is not intended for children. A model with this receiver may only be operated by a person familiar with its operation.
- The receiver is a small electronic component without a housing. Protect it from moisture, dust, metal objects and mechanical damage.
- Before handling the board, discharge static electricity by touching a grounded object; avoid touching the components unnecessarily.

1.2 Installation and electrical connection

- Solder and connect the receiver **only with the power disconnected** – unplug both the model's battery and the USB cable.
- Soldering should be done by a person with the necessary skills. Before powering up for the first time, check that there is no short circuit or solder residue between the pads, and clean off flux residue.
- Connect the **VCC pad to the 5 V output only** of the flight controller (FC). Never connect the receiver directly to battery voltage.
- Do not operate the receiver without an antenna attached. Use only the antennas supplied with the receiver or antennas specified by the manufacturer.
- Do not cover the receiver with heat-shrink tubing or otherwise enclose it until you have verified that it works correctly (Chapter 5.1).

1.3 Operating the model

- When setting up the receiver, binding and bench testing, **always remove the propellers** (on car and boat models, disconnect the drive).
- Before every flight, check the link between the radio and the receiver and the failsafe function (Chapter 5.6).
- Observe the regulations for the operation of unmanned aircraft and radio equipment in the country where you operate the model (Chapter 3).
- Charge and store the Li-Po and LiHV batteries that power the model according to their manufacturer's instructions; never leave them charging unattended.

2. Product description

2.1 Intended use

The Happymodel ES900RX is a miniature RC receiver for the open **ExpressLRS** (ELRS) system in the 900 MHz band. ExpressLRS is an open source RC system with long range, low latency and a high update rate. The 868/915 MHz band is selected by firmware – the product is sold as the 868 MHz version for Europe.

The receiver connects to the model's flight controller (FC) via a serial link (UART) using the **CRSF** protocol: it passes the commands from the radio to the FC and sends telemetry (e.g. battery voltage) back to the radio. The manufacturer intends it for FPV racing drones, RC aeroplanes, cars and boats. To bind it you need a radio with an ExpressLRS transmitter module for the 900 MHz band.

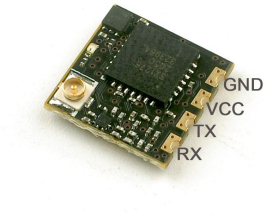
2.2 Package contents

1×	Happymodel ES900RX receiver
1×	T antenna (Immortal T) – larger, for long range and freestyle
1×	Mini T antenna – smaller, for racing drones and whoops

Not included: radio or ExpressLRS transmitter module, connecting wires, heat-shrink tubing, flight controller and battery.

2.3 Pad description

There are four solder pads on one side of the board and an IPEX (u.FL) antenna connector on the other side. The board also carries a red status LED.



Receiver pads (photo: Happymodel)

Pad	Function	Connect to FC
GND	ground (−)	any GND pad
VCC	5 V power supply	5 V pad
TX	commands from the radio to the FC	**RX** pad of the chosen UART
RX	telemetry from the FC to the radio	**TX** pad of the same UART

2.4 Technical data

Parameter	Value
System	ExpressLRS (ELRS), 900 MHz band
Frequency	868 MHz (EU) or 915 MHz – selected by firmware
Processor (MCU)	ESP8285
Protocol to flight controller	CRSF (UART serial link)
Supply voltage	5 V
Operating current	approx. 100 mA
Telemetry output power	< 17 dBm
Antenna connector	IPEX1 (u.FL)
Dimensions	12 × 12 × 3 mm
Weight	0.60 g (without antenna)
Status LED	red

Data according to the manufacturer Happymodel.

3. Radio frequencies and operating conditions

3.1 The law of the country of operation applies

Radio equipment and unmanned aircraft are governed by European Union regulations that apply in all Member States, but national implementing rules differ from country to country – permitted frequency bands, maximum transmit power, operator registration, geographical zones or compulsory insurance. The information in this chapter describes the situation in the Czech Republic. If you operate the model in another country, **you must follow the regulations of the country in which you operate it**.

3.2 Frequency bands and transmitted power

The receiver does not only receive but also transmits – it sends telemetry back to the radio and, in WiFi mode, creates an access point for configuration.

Function	Frequency band	Max. transmitted power
RC link and telemetry, EU868 domain	863.275–869.575 MHz	< 17 dBm (manufacturer's data)
WiFi – configuration and updates only	2.4 GHz	not stated by the manufacturer

In the Czech Republic, short range devices are operated under the CTU general authorisation **VO-R/10**. In the 863–870 MHz band it sets, among other things, a maximum radiated power of **25 mW e.r.p.** (500 mW e.r.p. in the 869.4–869.65 MHz sub-band) and duty cycle conditions. The device may only be operated with the antenna specified by the manufacturer, without additional amplifiers and without modifications. WiFi in the 2.4 GHz band is governed by the general authorisation **VO-R/12**.

The operator is responsible for setting up the RC system and for complying with the operating conditions in the country where the model is operated.

3.3 EU868 regulatory domain

The frequencies on which an ExpressLRS system operates are determined by the **regulatory domain** selected when flashing the firmware (Chapter 5.5). The transmitter module and the receiver must use the same domain.

- In the Czech Republic and other EU countries, use the **EU868** domain.
- The **FCC915** domain operates in the 903.5–926.9 MHz band, which is not permitted for this purpose in the Czech Republic. Do not use it on Czech territory.
- Check the domain again every time you flash firmware – it is a mandatory option in the ExpressLRS Configurator.

4. Installation

4.1 What else you need

- a radio with an **ExpressLRS 900 MHz** transmitter module (EU868 domain) and the ExpressLRS Lua script,
- a flight controller (FC) with a free full UART (RX and TX pads) and a 5 V output,
- a soldering iron, solder and thin wires,
- a computer with FC configuration software (Betaflight, INAV, etc.) and the **ExpressLRS Configurator**,
- heat-shrink tubing to protect the receiver once its function has been verified.

4.2 Connecting to the flight controller (FC)

Connect the receiver to any free UART of the flight controller. The link is crossed: the transmit pin of one device goes to the receive pin of the other.

① Receiver **GND** → any GND pad on the FC.

② Receiver **VCC** → 5 V pad on the FC.

③ Receiver **TX** → **RX** pad of the chosen UART (e.g. R2 or RX2).

④ Receiver **RX** → **TX** pad of the same UART (e.g. T2 or TX2).

※ UART pads that the FC manufacturer labels as "for the receiver" (SBUS) often have a pull-down resistor. This can put the ES900RX into bootloader mode at power-up (the LED stays solid even with the radio switched off). In that case, move the receiver to a different UART.

The exact UART and pad labels can be found in the manual of your flight controller. After soldering, check that there is no short circuit between the pads.

4.3 Antenna

- Attach the antenna to the IPEX (u.FL) connector **before powering up for the first time**. Place the connector straight on and press until it clicks; when disconnecting, do not pull on the cable but carefully lever the connector off.
- Choose the T antenna for long range and freestyle, the Mini T antenna for small racing drones and whoops.
- Place the active elements of the antenna as far as possible from carbon parts, motors, propellers and the video transmitter (VTX), and route them so that they cannot reach the propellers.
- Do not bend the antenna coax at sharp angles and secure it against being pulled out (e.g. with a cable tie or heat-shrink tubing).

4.4 Flight controller setup

In the FC configuration software (Betaflight, INAV) set the following:

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

② On the *Receiver* tab, select *Serial* mode and the **CRSF** protocol; enable *Telemetry* (in INAV on the *Configuration* tab).

③ If you use analogue video or a system with OSD via MSP DisplayPort, set *RSSI Channel* and *RSSI ADC* to *Disabled*.

④ In the *CLI* tab, use the command *get serialrx* to check that *serialrx_inverted* and *serialrx_halfduplex* are switched off (*off*); if necessary, set them with *set serialrx_inverted = off* and *set serialrx_halfduplex = off* and save with *save*.

⑤ Close the configuration software and unplug and replug the USB cable.

5. Getting started

5.1 First power-up and LED check

Check the wiring and for short circuits, remove the propellers and power the model – preferably with a flight battery, so that the receiver runs under the same conditions as in flight. Watch the receiver LED:

LED	Meaning
slow blinking (500 ms)	waiting for connection to the radio – OK
double blink then pause	binding mode
fast blinking (25 ms)	WiFi mode – starts after 60 s without a link
solid (radio switched off)	bootloader mode – see Chapter 7.2
off	disconnect power immediately and check the wiring

5.2 Binding with a Binding Phrase

The recommended way of binding in the ExpressLRS system is the **Binding Phrase** – a short phrase that you enter when flashing firmware to both the transmitter module and the receiver (on the receiver it can also be changed in the web interface, Chapter 5.4). Devices with the same phrase and the same domain connect automatically after power-up, without any further binding.

- Choose a unique phrase, ideally at least 8 characters long (e.g. your pilot handle). It is not a password – the phrase ensures that your system is not confused with the systems of other pilots.
- The first number of the firmware version (major version) must be the same on the transmitter module and the receiver, otherwise the devices will not connect.

5.3 Manual binding

If you do not use a Binding Phrase, bind the receiver manually:

① Switch off the radio.

② Power the receiver on and off three times in a row: apply power, the LED lights up, and disconnect power again within 2 seconds. Repeat twice more.

③ On the third power-up, leave the receiver powered. The LED double-blinks quickly – the receiver is in binding mode.

④ Switch on the radio, start the **ExpressLRS** Lua script (*SYS* → *Tools* → *ExpressLRS*) and select **[Bind]**.

⑤ The receiver LED goes out, starts blinking slowly and finally stays solid – the receiver is bound.

※ Newer versions of the Betaflight Configurator can also put the receiver into binding mode with the *Bind Receiver* button on the *Receiver* tab (CLI command

bind_rx). With older receiver firmware, manual binding cannot be started while a Binding Phrase is set – in that case use binding according to Chapter 5.2.

5.4 WiFi mode and web interface

In the receiver's web interface you can find the firmware version, change the Binding Phrase and upload new firmware. To switch on WiFi mode:

- **automatically** – power up the receiver with the radio switched off and wait at least 60 s, or
- **from the radio** – if the receiver is bound: in the ExpressLRS Lua script select *Wifi Connectivity → Enable RX WiFi*.

The LED starts blinking fast. Connect your phone or computer to the WiFi network **ExpressLRS RX** (password **expresslrs**) and open **http://10.0.0.1** in your browser. If you have previously stored your home WiFi credentials in the receiver and it connects to that network, the access point will not appear – open the interface at **http://elrs_rx.local** instead.

Do not operate the model while WiFi mode is on – in this mode the receiver does not receive commands from the radio.

5.5 Firmware update

Firmware is flashed with the **ExpressLRS Configurator**. Select the category *Happymodel 900 MHz* and the device *HappyModel ES900 RX*, the required official firmware release, and fill in the options:

- **Regulatory Domain** – mandatory; in the EU **EU868** (Chapter 3.3),
- **Binding Phrase** – optional but recommended (Chapter 5.2),
- **home WiFi credentials** – optional; used the next time WiFi mode is switched on.

Then choose the flashing method:

- **WiFi** – use the *Build* button to create the firmware file (for the ES900RX in *firmware.bin.gz* format – do not unpack it), switch the receiver to WiFi mode and upload the file in the web interface on the *Update* tab.
- **BetaflightPassthrough** – via the USB port of the flight controller to which the receiver is connected. The FC configuration software must be closed; unplug and replug the FC before flashing. If the receiver is not powered from USB, connect the battery and make sure the video transmitter (VTX) is cooled, or disconnect it temporarily.
- **UART** – via a USB-to-UART adapter after disconnecting the receiver from the FC; the procedure is described in the ExpressLRS documentation (Chapter 6.2).

After a successful upload the Configurator shows a green *Success* bar and the receiver LED returns to slow blinking after a few seconds. If flashing via WiFi reports a *Not Enough Space* error, flash the firmware using BetaflightPassthrough or UART.

5.6 Failsafe check

When the signal is lost, the receiver stops sending valid data and the flight controller enters **failsafe** mode according to its settings (in Betaflight, the *Failsafe* tab). Check the function before the first flight and after every change of settings:

① Remove the propellers, bind the radio with the receiver and Arm (start the motors).

② Switch off the radio.

③ The flight controller must enter failsafe mode within a moment – the motors stop or the model performs the configured failsafe procedure. If not, correct the FC settings and do not operate the model.

6. LED indication and further guides

6.1 LED indication

LED	Receiver status
solid	connected to the radio, or bootloader mode (with the radio switched off)
double blink then pause	binding mode
slow blinking (500 ms)	waiting for connection to the radio
triple blink then pause	connected, but the *Model Match* setting does not match
medium blinking (100 ms)	radio chip not detected
fast blinking (25 ms)	WiFi mode

Indication according to the ExpressLRS documentation for receivers with a single-colour LED.

6.2 Further guides

Up-to-date procedures and documentation for this receiver can be found on the official website of the ExpressLRS project.

Official ExpressLRS documentation – Happymodel ES900RX

www.expresslrs.org

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After a crash, check the antenna, its connector and the solder joints; replace a damaged antenna.
- Keep the receiver dry and clean. Moisture and dirt between the pads can cause a short circuit.
- Store the model with the receiver in a dry place, with the battery disconnected.

7.2 Troubleshooting

Problem	Possible cause and solution
LED is off	No power – check the GND and VCC pads and the 5 V output on the FC.
LED is solid even with the radio switched off	The receiver is in bootloader mode, often due to a pull-down resistor on the FC UART. Disconnect the RX and TX wires from the FC and power up again; if the LED blinks slowly, move the receiver to a different UART. After a failed firmware update, flash the firmware again (Chapter 5.5).
The receiver does not bind	Different Binding Phrase, regulatory domain or major firmware version on the transmitter module and the receiver. Make them the same, or use manual binding (Chapter 5.3).
LED triple-blinks	The *Model Match* setting in the radio and in the receiver does not match.
Connected, but the FC does not respond to commands	TX and RX wires swapped, or incorrect FC settings (UART, CRSF protocol, inversion) – see Chapters 4.2 and 4.4.
No telemetry in the radio	Check the wire from the receiver RX pad to the FC TX pad and that telemetry is enabled in the FC settings.
Short range	Damaged or poorly positioned antenna, antenna shielded by carbon, different domains. Check the antenna and the settings (Chapters 3.3 and 4.3).
Not Enough Space error when flashing via WiFi	Flash the firmware using BetaflightPassthrough or UART (Chapter 5.5).

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 (ES900RX) is printed on the receiver board; the firmware version is shown by the receiver's web interface in WiFi mode (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.