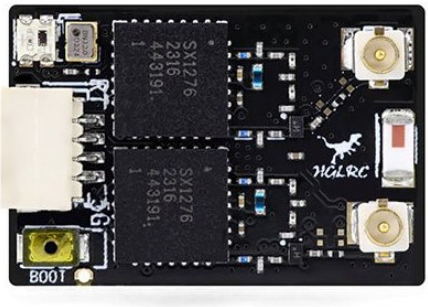
ELRS Gemini RX 868 MHz

ExpressLRS 868 MHz true diversity receiver
User manual



Read this entire manual carefully before installation and first use. In the EU, use only firmware with the EU868 regulatory domain.

Rotorama, s.r.o. · www.rotorama.com · info@rotorama.cz

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1. Safety instructions

1.1 Before you start

The receiver is part of the control chain of a remotely controlled model or unmanned aircraft. Incorrect wiring, incorrect settings or damage may lead to loss of control of the model and to personal injury or property damage.

- This product is not a toy. It is not intended for children without adult supervision.
- The receiver contains small parts that can be swallowed. Keep it out of the reach of small children.
- Always test every change of wiring or settings **without propellers** first.
- Do not modify the product in any way (other than as described in this manual) and do not use a damaged receiver or damaged antennas.

1.2 Installation and electrical safety

- Connect the receiver only with the power disconnected (flight battery and USB cable unplugged).
- Observe the supply voltage range stated in chapter 2.4. Connecting the receiver directly to the flight battery voltage will destroy it.
- Before connecting for the first time, check the polarity and order of the wires – especially 5V and GND. Swapped wires may damage both the receiver and the flight controller.
- When soldering to the pads, use an appropriate temperature and a short soldering time; do not overheat the surrounding components.
- Protect the receiver against short circuits on a carbon frame or other conductive parts – insulate it after installation (e.g. with the supplied heat shrink tube).
- Never power the receiver without the antennas connected. Transmitting telemetry without an antenna may damage the RF section.

1.3 Operating the model

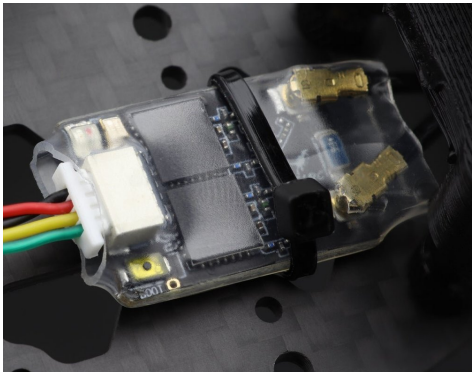
- Check the link and the failsafe function before every flight (chapter 6).
- Do not fly beyond visual line of sight or in places where regulations do not permit it (chapter 3).
- Place the antennas out of reach of the propellers; a cut or torn-off antenna significantly reduces range.
- When the signal is lost, the model behaves according to the failsafe settings in the flight controller. Always verify these settings before you need them.

2. Product description

2.1 What the receiver is for

The **HGLRC ELRS Gemini RX** in the 868/915 MHz version is a radio control receiver for the open-source **ExpressLRS** (ELRS) system. It receives commands from a radio equipped with an ExpressLRS 900 MHz transmitter module and passes them to the model's flight controller (FC) over a serial link (CRSF protocol). It sends telemetry back to the radio.

The receiver is a *true diversity* receiver: it has two antennas and two SX1276 radio chips that receive simultaneously. It supports **Gemini** mode, in which the transmitter sends every packet on two different frequencies at the same time. A temperature-compensated crystal oscillator (TCXO) keeps the frequency accurate even with large temperature changes. The receiver is mainly intended for freestyle and long-range quadcopters and fixed-wing models.



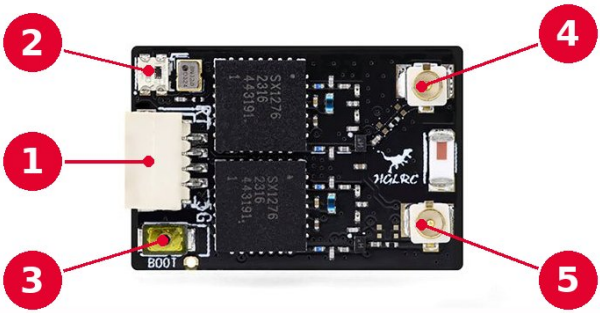
Receiver installed in a model, insulated with heat shrink tube (photo: HGLRC)

2.2 Package contents

Qty	Item
1	HGLRC ELRS Gemini RX 868/915 MHz receiver
1	Short antenna (T, IPEX 1)
1	Long antenna (T, IPEX 1)
1	Heat shrink tube

Not included: radio or ExpressLRS 900 MHz transmitter module, flight controller (FC) and tools. The manufacturer does not list a connection cable for the receiver connector in the package contents – the receiver can always be connected by soldering wires to the solder pads.

2.3 Parts and pinout



Top side of the receiver

① 4-pin connector for connection to the flight controller (RX, TX, 5V, GND)

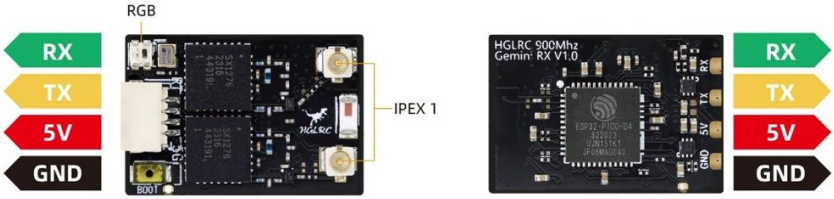
② RGB LED – status indication (chapter 5.3)

③ BOOT button

④ IPEX 1 antenna connector – antenna 1

⑤ IPEX 1 antenna connector – antenna 2

The same signals as on the connector are also available on the RX, TX, 5V and GND solder pads on the bottom side of the board. Use **either the connector or the pads**, never both at the same time.



Pinout – left: connector on the top side, right: solder pads on the bottom side (source: HGLRC)

2.4 Specifications

Parameter	Value
System	ExpressLRS (ELRS), 3.x firmware from the factory
Frequency band (EU)	868 MHz – EU868 domain: 863.275–869.575 MHz
Telemetry power	max. 50 mW (manufacturer's data)
Packet rate	25–200 Hz
Radio chips	2× SX1276 (true diversity), TCXO
Processor	ESP32-PICO-D4 (WiFi for firmware update)
Protocol to FC	CRSF (UART serial link)
Supply voltage	3.6–5.5 V
Antenna connectors	2× IPEX 1
Antennas included	T – 90 mm cable (3.4 g) and 160 mm cable (3.7 g)
Indication	RGB LED
Dimensions (without antennas)	22 × 15.24 mm
Weight (without antennas)	1.5 g
Firmware target	HGLRC Gemini 900M RX

※ The receiver hardware is identical for the 868 and 915 MHz bands; the band is determined by the regulatory domain in the firmware. Only the **EU868** domain may be used in the European Union (chapter 3.2).

3. Legal requirements in the EU and CZ

3.1 The law of the country of operation applies

European Union legislation (Directive 2014/53/EU on radio equipment, Regulations (EU) 2019/945 and 2019/947 on unmanned aircraft) applies 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 operate the receiver in another country, you must comply with the regulations of the country in which you operate it.**

3.2 Frequency band and transmit power

The receiver operates in the 868 MHz band and transmits telemetry back to the radio. The manufacturer states a maximum telemetry power of **50 mW**. For firmware updates, the receiver temporarily switches on WiFi in the 2.4 GHz band.

In the Czech Republic, short range devices in the 863–870 MHz band are governed by the General Authorisation of the Czech Telecommunication Office **VO-R/10** (Art. 3). Selected sub-bands:

Sub-band	Max. power	Duty cycle
863.0–870.0 MHz (FHSS)	25 mW e.r.p.	0.1 % or spectrum access techniques
868.0–868.6 MHz	25 mW e.r.p.	1 % or spectrum access techniques
869.4–869.65 MHz	500 mW e.r.p.	10 % or spectrum access techniques
869.7–870.0 MHz	5 mW e.r.p.	no limit

- In the EU, use only firmware with the **EU868** regulatory domain. The FCC915 (903.5–926.9 MHz), AU915 and IN866 domains are intended for other regions and their use in the Czech Republic and the EU **is not permitted**.
- The user is responsible for configuring the receiver and transmitter in accordance with the regulations of the country of operation (domain, power, duty cycle).
- The product must not be modified electrically or mechanically beyond the scope of this manual.

3.3 Operating an unmanned aircraft

If the receiver is installed in a drone, operation is governed by Regulation (EU) 2019/947 and the national regulations of the country of operation – operator registration, pilot competency, operational limits and geographical zones. In the Czech Republic, this information is provided by the Civil Aviation Authority (www.caa.gov.cz). Flying with FPV goggles in the open category is only permitted with an observer who keeps the drone in direct visual line of sight.

4. Installation

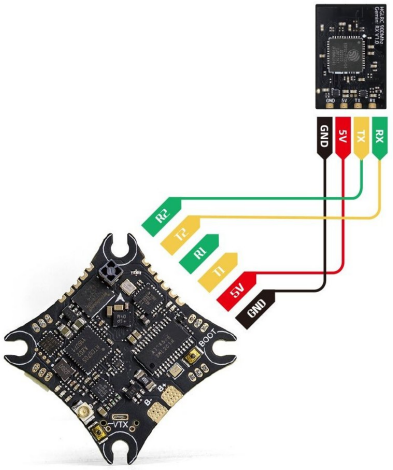
4.1 What else you need

- A radio with an **ExpressLRS 900 MHz** transmitter module (internal or external) running firmware of the same major version (3.x) and the EU868 domain.
- A flight controller (FC) with a free full UART (both RX and TX pins) and a 5 V supply output.
- For configuration: a computer with Betaflight Configurator (or another FC configurator) and ExpressLRS Configurator.
- A soldering iron – if you connect the receiver to the pads or prepare a cable.

4.2 Connecting to the flight controller (FC)

The receiver communicates with the flight controller via the CRSF protocol, which requires a full UART (RX and TX). The signal wires are connected **crosswise**:

Receiver	Flight controller	Note
GND	GND	any GND pad
5V	5V	5 V supply
TX	RX (e.g. R2)	same UART as the RX wire
RX	TX (e.g. T2)	same UART as the TX wire



Example of connection to UART2 of a flight controller (source: HGLRC)

- Use the UART recommended by the FC manufacturer for a receiver. On some FCs, the UART intended for SBUS has an inverter or pull-down resistor on the RX

pin – an ELRS receiver may not work on such a UART (the LED is solid, but no data passes).

- Do **not shrink-wrap or fasten** the receiver yet – first verify the link and function (chapter 5).

4.3 Mounting the antennas

- Press the IPEX 1 connectors on straight and carefully, without levering. Repeated mating wears the connectors.
- Route the active ends of the antennas (T element) as far as possible from the carbon frame, motors, ESCs and video transmitter, and out of reach of the propellers.
- Orient the two antennas **differently from each other** (for example one vertical and one horizontal), so that in any attitude of the model at least one of them is well positioned relative to the transmitter.
- Do not bend the antenna coaxial cables at sharp angles and do not pull them tight over sharp edges.
- Choose the shorter or longer antenna according to the space in the model; 90 mm or 160 mm cable.

4.4 Betaflight setup

① On the *Ports* tab, enable *Serial Rx* for the UART the receiver is connected to. Save.

② On the *Receiver* tab, set *Receiver Mode* to *Serial (via UART)* and *Serial Receiver Provider* to *CRSF*.

③ Enable *Telemetry*. Leave *RSSI Channel* and *RSSI ADC* disabled – ELRS sends RSSI and LQ in the telemetry.

④ The CRSF protocol requires a non-inverted, full-duplex UART: in the CLI, *serialrx_inverted* = *OFF* and *serialrx_halfduplex* = *OFF* must be set. Save the changes with the *save* command.

⑤ As recommended by ExpressLRS, assign the Arm switch to channel **AUX1** (Arm state ≈ 2000).

5. Getting started

5.1 Compatibility and regulatory domain

The receiver only links with an ExpressLRS transmitter module **in the 900 MHz band** (it does not work with 2.4 GHz modules). For a link to be established, the transmitter and the receiver must have:

- the same **major firmware version** – the first number of the version (3.x with 3.x). 2.x firmware is not compatible with 3.x; the receiver ships with 3.x firmware, so update the transmitter module to 3.x or newer,
- the same **regulatory domain** (always EU868 in the EU),
- the same **binding phrase**, or be bound using the traditional method (chapter 5.2).

5.2 Binding

▶ Traditional method – power-cycling the receiver three times

① Switch off the radio (transmitter module).

② Power the receiver on and off three times in a row: connect power, wait for the LED to light up and disconnect power within 2 seconds. The third time, leave the power connected.

③ The LED changes from the rainbow fade to an **orange double blink** – the receiver is in binding mode.

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

⑤ When the LED changes from blinking to **solid**, the receiver is bound.

Binding mode is cancelled by restarting the receiver. Without a new bind, the receiver then continues to use the previous binding information.

▶ Binding phrase

The same custom *binding phrase* can be set in both the transmitter module and the receiver – when flashing in ExpressLRS Configurator or in the receiver's web interface (chapter 5.6). Devices with the same phrase link automatically, without binding. We recommend a phrase of at least 8 letters and digits. The phrase does not provide security; it only prevents collisions with other devices.

▶ Binding from Betaflight

The *Receiver* tab in Betaflight Configurator has a *Bind Receiver* button (or the *bind_rx* command in the CLI). It only works with sufficiently recent FC and receiver firmware.

Verify the link in the ExpressLRS Lua script: the letter **C** in the top right corner means that the transmitter and receiver are connected.

5.3 LED indication

LED	Status
rainbow fade	receiver starting up
slow blink	waiting for connection from the transmitter
orange double blink	binding mode
orange triple blink	connected, but Model Match does not match (5.5)
green/orange pulsing	WiFi mode (update)
fast red blink	radio chip not detected
solid	connected; colour indicates packet rate
off	off or in bootloader mode

Solid colours by packet rate in the 900 MHz band according to the ExpressLRS documentation:

Colour	Packet rate
red	200 Hz
yellow-green	100 Hz Full
green	100 Hz
light blue	50 Hz
blue	25 Hz
purple	D50

※ The packet rate is set in the Lua script on the radio. A higher rate means lower latency at the expense of range. Never change it in flight – a change always causes a brief loss of link.

5.4 Gemini mode

In Gemini mode, a transmitter module with two antennas sends every packet simultaneously on two frequencies approximately 10 MHz apart in the 900 MHz band. The true diversity receiver receives both packets at the same time. Gemini does not increase range, but helps maintain a higher link quality (LQ) up to the point of failsafe.

- Gemini requires a 900 MHz transmitter module that supports this mode. In the Lua script, set the antenna mode of both the transmitter and the receiver to *Gemini*.
- With a non-Gemini transmitter, the receiver still listens on both antennas but synchronises on only one.
- If you use a Gemini transmitter with a non-Gemini receiver, set the transmitter to *Switch* mode or to a single antenna.

- The receiver does not support **Gemini Xrossband** (2.4 GHz and 900 MHz simultaneously) – that requires different hardware.

5.5 Model Match and telemetry

Model Match prevents the receiver from controlling the model when a different model is selected on the radio. On a mismatch, the receiver links with the transmitter but sends no data to the flight controller (the LED blinks orange three times).

- Enable Model Match in the ExpressLRS Lua script (*Model Match: On*); the receiver number is set in the model settings of the radio (*Model Setup → Receiver*).
- To clear Model Match, switch it on briefly (*On*) and after a moment off again (*Off*) – the transmitter and receiver must be connected while doing so.
- **Telem Ratio** determines what share of packets is used for telemetry. Do not set it to *Off*; the recommended setting is *Std*.

5.6 Firmware update

The receiver firmware can be updated via WiFi, via UART or through the flight controller (Betaflight passthrough). The easiest method is updating via WiFi:

① In **ExpressLRS Configurator**, select the device category and the target **HGLRC Gemini 900M RX**, the regulatory domain **EU868** and, optionally, a binding phrase. Click *Build*; a *firmware.bin.gz* file is created (do not unzip it).

② Switch off the radio and power the receiver. If it does not link with a transmitter, it enters WiFi mode after approximately 60 s (the LED pulses green/orange). WiFi mode can also be enabled in the Lua script via *WiFi Connectivity → Enable RX WiFi*.

③ Connect to the **ExpressLRS RX** WiFi network (password **expresslrs**) and open **http://10.0.0.1** in a browser.

④ Upload the firmware file and wait until it finishes. Do **not disconnect** the receiver during the update; wait until the LED starts blinking again.

Upload only the target intended for this receiver. Firmware for another device or another domain may render the receiver inoperable or lead to illegal transmission.

In the receiver's web interface you can also change the binding phrase, the regulatory domain and the time after which WiFi is enabled when there is no link.

5.7 Further documentation

Detailed documentation on the ExpressLRS system and on EdgeTX radio firmware (Lua script, model setup) is available on the official websites.

Official documentation: www.expresslrs.org and edgetx.org.

6. Pre-flight check and failsafe

6.1 Bench test

Before the first flight and after every change of settings, perform a check **without propellers**:

- On the *Receiver* tab in Betaflight Configurator, verify that every stick and switch moves the correct channel in the correct direction.
- Verify that telemetry (e.g. RSSI, LQ) is received on the radio.
- During the test, orient the transmitter and receiver antennas in the same way; do not place them too close to each other.
- Verify the failsafe function (chapter 6.2).
- Only then insulate the receiver with the heat shrink tube and fasten it.

6.2 Failsafe

When the signal is lost, the receiver stops sending valid data and the flight controller enters failsafe. The behaviour of the model (motors stop, landing) is configured in the flight controller – in Betaflight on the *Failsafe* tab.

① Remove the propellers, connect the battery and Arm (start the motors).

② Switch off the radio.

③ The motors must stop or enter the configured mode according to the failsafe settings.

④ Switch the radio back on and verify that the link is restored. Then Disarm (stop the motors).

7. Maintenance and troubleshooting

7.1 Maintenance

- After a crash, check the antennas, their cables and the seating of the IPEX connectors. Replace a damaged antenna.
- Check that the insulation (heat shrink tube) is not damaged and that the receiver does not touch conductive parts.
- Protect the receiver from moisture, dust and high temperatures. Store it in a dry place.
- Remove dirt with a dry brush; do not use solvents.

7.2 Factory reset

According to the manufacturer, the receiver returns to factory settings if you power it without a link to a transmitter and hold the **BOOT** button for more than 6 seconds. Then bind it again.

7.3 Troubleshooting

Problem	Possible cause and solution
LED off	The receiver has no power – check the 5V and GND wires and their polarity. The supply must be within the range given in chapter 2.4.
LED blinks slowly, no link	The transmitter is off, or the major firmware version, domain or binding phrase differ. Align the settings or bind the receiver (5.2). Make sure you are using a 900 MHz module.
LED blinks orange three times	Model Match mismatch – adjust the receiver number or clear Model Match (5.5).
LED solid, but channels do not move in Betaflight	TX/RX wires swapped, wrong UART or protocol selected. Check the crosswise wiring (4.2) and the CRSF settings (4.4); try another UART.
Short range, dropouts	Damaged or poorly placed antenna, antenna shielded by the frame. Check the antennas and their orientation (4.3).
No telemetry	*Telem Ratio* is off, or telemetry is not enabled on the FC. Set *Std* and enable telemetry (4.4).
Fast red blink	Radio chip not detected – contact the seller.
After a WiFi update the LED is solid and the receiver does not work	The update was interrupted. Repeat it and do not disconnect the receiver during the update.

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 (HGLRC 900Mhz Gemini RX V1.0) is printed on the bottom side of the receiver board; the firmware version is shown in the receiver's web interface in WiFi mode.

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.