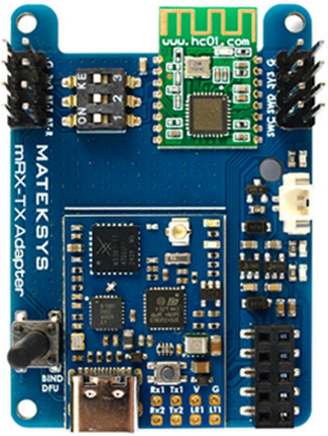
mR24-30-TX

Matek Systems – mLRS 2.4 GHz transmitter module (kit)
User manual



Read the safety instructions before first use. Never power on the module without an antenna connected and set the transmit power according to the regulations of the country of operation.

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

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1. Safety instructions

1.1 Before you start

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

- The mR24-30-TX transmitter module is intended for **adult and experienced users** of RC models. It is not a toy and must be kept away from children.
- The module is supplied as a **kit** without a case. The bare board is sensitive to mechanical damage, static electricity and short circuits – fit it into a suitable case before use (see chapter 4).
- Incorrect settings (protocol, binding, failsafe) may lead to loss of control of the model. Always test every change on the ground first, with the propellers removed. Do not modify the product in any way other than described in this manual.

1.2 Antenna and radio-frequency emission

- **Never power on the module without an antenna connected.** Transmitting without an antenna, especially at high power, may permanently damage the module's amplifier.
- Use only a 2.4 GHz antenna with the correct connector. **SMA and RP-SMA** connectors can be screwed onto each other, but the signal is not connected – this may damage the module. That is why both versions of the extension cable are included (see chapter 4.3).
- Do not touch the antenna during operation and keep it away from your body, especially at high power.
- The transmit power setting must comply with the regulations of the country in which you operate the module (chapter 3).

1.3 Power supply and heat

- The module is powered from the radio via the JR bay connector at **5–13 V DC**. Do not apply a higher voltage or reverse polarity.
- The module heats up at high output power. The built-in controller switches the fan on at **500 mW and above**. Therefore always connect the fan and do not cover the ventilation openings of the case.
- Connect connectors, set the DIP switch and insert the module into the bay only with the radio switched off.

1.4 Operating environment

- Protect the module from moisture, rain, dust, direct sunlight and impacts.
- Do not operate it near flammable materials, in explosive atmospheres or where radio equipment is prohibited (hospitals, aircraft, etc.).

2. Product description

2.1 Intended use

The Matek mR24-30-TX is an external transmitter module for the **mLRS** system in the 2.4 GHz band. mLRS (MAVLink Long Range System) is an open-source project that carries RC channels and bidirectional MAVLink telemetry over a single radio link. It is particularly suitable for long-range flights with model aircraft and drones running ArduPilot or INAV firmware.

The kit contains the mR24-30 module mounted on the **mRx-TX Adapter**. The adapter adds an HC-04 Bluetooth module for a wireless ground station connection (PC, tablet, phone), a fan controller, status LEDs and the connection to the radio's JR bay. The module communicates with the radio using the CRSF protocol. To establish a link you need a compatible 2.4 GHz mLRS receiver.

2.2 Package contents

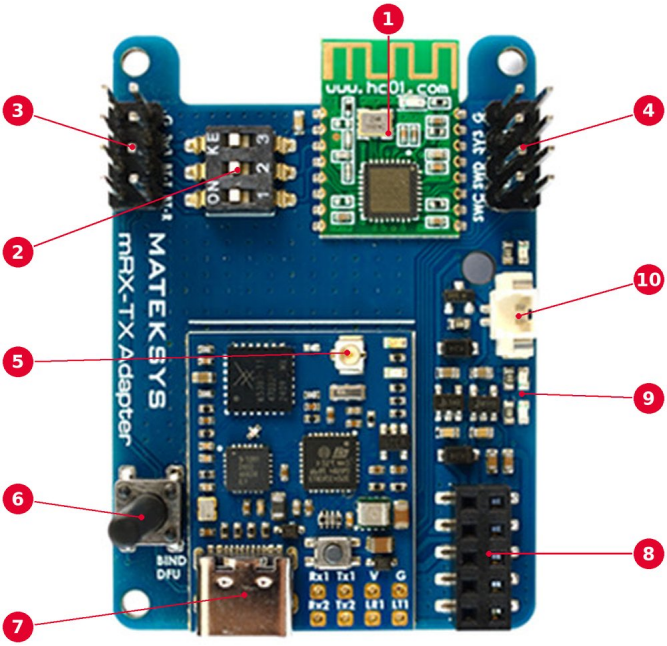
Qty	Item
1	mR24-30-TX transmitter module (mR24-30 module on the mRx-TX adapter)
1	IPEX MHF-1 → SMA extension cable, length 5 cm
1	IPEX MHF-1 → RP-SMA extension cable, length 5 cm
1	5 V fan, 25 × 25 × 10 mm
–	set of screws (shown in the manufacturer's photo as 5× M3.3 × 8 and 10× M2.2 × 6)

❖ The package does NOT include an antenna or a JR bay case. A 3D-printable case model can be downloaded from the manufacturer's website.



Package contents except the module itself (photo: Matek Systems)

2.3 Parts description



mRx-TX adapter with the mR24-30 module, front view

① HC-04 Bluetooth module
② DIP switch (Bluetooth module connection, chapter 2.5)
③ Left pin header: G, 3V3, Rx1, Tx1 (UART1)
④ Right pin header: G, 3V3, LP-Rx1, LP-Tx1
⑤ IPEX MHF-1 antenna connector
⑥ BIND / DFU button
⑦ USB-C connector
⑧ Connector for the radio's JR bay
⑨ Status LEDs – green and red
⑩ 5 V fan connector (FAN); above it the blue Bluetooth status LED

2.4 Technical data

Parameter	Value
Manufacturer	Matek Systems (www.mateksys.com)
Designation	mR24-30-TX (mLRS 2.4GHz TX Module KIT)
Processor	STM32G431KB
Firmware	mLRS, target **tx-matek-mr24-30-g431kb-default**
Radio chip	LoRa SX1281 with TCXO
PA/LNA amplifier	SKY65383-11
Frequency band	2.4 GHz ISM (2400–2483.5 MHz)
Transmit power (levels)	13 dBm (min.) / 20 dBm / 24 dBm / 27 dBm / 30 dBm (1000 mW)
Antenna connector	IPEX MHF-1, via cable to SMA or RP-SMA
Bluetooth	built-in HC-04 module
Fan	5 V controller, switches on at power ≥ 500 mW
RC input	TX2 – RC IN (CRSF) on the JR connector
Controls	1 button (DFU and Bind)
Indication	red and green LED (mLRS status), blue LED (Bluetooth status)
Power supply	5–13 V DC on pin 3 of the JR connector (VIN)

※ The manufacturer does not state the weight, board dimensions or operating temperature.

2.5 Pinout and DIP switch

Pin	Function
③ Rx1, Tx1	UART1 – depending on the DIP switch connected to the HC-04 module, or available for an external Bluetooth or Wi-Fi module
③ BT-T, BT-R	HC-04 module pins (rear row of the header, labelled on the back of the board) – for configuring the HC-04 with AT commands
④ LP-Rx1, LP-Tx1	additional serial port (labelled LPR1 / LPT1 on the back of the board)
④ SWD, SWC	programming interface (rear row of the header)
⑧ JR: NC, NC	not connected
⑧ JR: VIN	5–13 V power supply from the radio
⑧ JR: G	ground
⑧ JR: TX2	RC channel input (CRSF) from the radio

The pins on headers ③ and ④ use TTL logic levels. Do not connect a classic PC serial port (RS-232) – use a USB-TTL converter.

▶ **DIP switch ②**

Switch	Function
1	Tx1 → BT Rx on / off
2	Rx1 → BT Tx on / off
3	Bluetooth module power on / off

- **1, 2, 3 all ON** (left, antenna pointing up): the HC-04 module is connected to the processor's UART1 – default setting for Bluetooth.
- **3 ON, 1 and 2 OFF**: a USB-TTL converter can be connected to G / 3V3 / BT-T / BT-R to configure the HC-04 with AT commands.
- **1, 2, 3 all OFF** (right): another Bluetooth or Wi-Fi module can be connected to G / 3V3 / Rx1 / Tx1.

2.6 LED indication

LED	Meaning
red flashing (2 Hz)	module is on, no link to the receiver
green flashing (1 Hz)	link to the receiver established
red and green alternating (approx. 2.5 Hz)	binding mode
LEDs not flashing after connecting USB with the button held	DFU mode for firmware upload
blue	Bluetooth module status

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

3.1 The law of the country of operation applies

Radio equipment is subject to Directive 2014/53/EU (RED) throughout the European Union, but the conditions for using frequencies – permitted bands and maximum radiated power – are set by each country individually. The information in this chapter describes the situation in the Czech Republic. If you operate the module in another country, you must follow the regulations of the country in which you use it. The rules for operating the model itself (Regulation (EU) 2019/947, operator registration, zones) apply independently of this module.

3.2 Frequencies and transmit power

Radio	Band and maximum power according to the manufacturer
mLRS (SX1281 + SKY65383-11)	2400–2483.5 MHz; maximum adjustable power 30 dBm (1000 mW)
Bluetooth HC-04	2.4 GHz; transmit power not stated by the manufacturer

In the Czech Republic, the 2400–2483.5 MHz band is governed by the general authorisations of the Czech Telecommunication Office (ČTÚ). For wideband data transmission systems (VO-R/12) the maximum permitted radiated power is **100 mW e.i.r.p.**, for short-range devices (VO-R/10) **25 mW e.i.r.p.** The e.i.r.p. limit includes the gain of the antenna used and must be met for any combination of power setting and antenna.

Power levels 24, 27 and 30 dBm always exceed the 100 mW e.i.r.p. limit. Level 20 dBm (100 mW) complies only if the antenna gain does not exceed the cable losses. The user is responsible for the power setting and the choice of antenna.

The power is set with the *Tx Power* parameter (chapter 5.4). The current wording of the general authorisations is available at ctu.gov.cz/vseobecna-opravneni.

3.3 Privacy and interference

- The module must not cause harmful interference to other equipment and is not protected against interference from other users of the 2.4 GHz band (Wi-Fi, other RC systems, video transmission).
- The use of additional radio-frequency amplifiers is not permitted.
- MAVLink telemetry may contain the position of the model. If you connect a ground station via Bluetooth, protect the pairing with the default or your own PIN.

4. Preparation and assembly

4.1 What else you need

- **A radio with a JR bay** for external modules running EdgeTX or OpenTX firmware (the mLRS configuration script requires a sufficiently recent EdgeTX version – the minimum version is stated in the mLRS documentation).
- **A 2.4 GHz antenna** with an SMA or RP-SMA connector.
- **A JR bay case** – a 3D-printable model (STL file) is available on the manufacturer's website in the *Downloads* section: mateksys.com/?portfolio=mr24-30-tx.
- **An mLRS receiver** for the 2.4 GHz band, e.g. Matek mR24-30 or one of the selected 2.4 GHz ELRS receivers flashed with mLRS firmware (the list is given in the mLRS documentation).
- For updates and configuration: a computer with a USB-C cable.

4.2 Setting the DIP switch

If you are going to connect a ground station via the built-in Bluetooth, set **all three switches of DIP switch ② to ON** (left, looking at the module with the antenna pointing up) before fitting it into the case. Changing it later requires opening the case.

4.3 Antenna cable, fan and case

① Choose the extension cable according to the antenna connector: SMA antenna → SMA cable, RP-SMA antenna → RP-SMA cable.

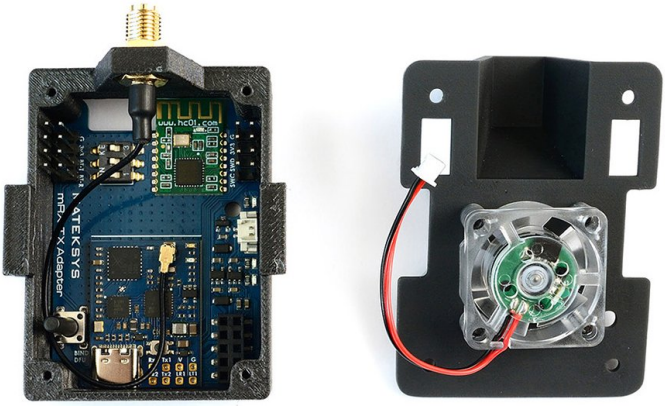
② Press the IPEX MHF-1 connector vertically onto antenna connector ⑤ until it clicks. The connector is fragile – do not pull on the cable or lever it sideways.

③ Fix the SMA / RP-SMA connector in the opening of the case.

④ Screw the fan into the case lid and plug its connector into connector ⑩ (FAN).

⑤ Place the board in the case and screw it together. Check that the BIND button ⑥ remains accessible and that the cable does not obstruct the airflow.

⑥ Screw on the antenna.



Module in a 3D-printed case and the lid with the fan (case not included; photo: Matek Systems)



Assembled module: rear side, lid and view of the USB-C connector (photo: Matek Systems)

4.4 Inserting into the radio

Switch off the radio and carefully slide the module into the JR bay. Some modules are sensitive to exact pin alignment – do not use excessive force, the bay pins may bend or break. The module is powered from the radio; after switching on the radio and configuring the external module (chapter 5.1) the red LED starts flashing.

5. Setup

5.1 Radio setup

① In EdgeTX / OpenTX open *MDL → MODEL SETUP* and set the external RF module to the **CRSF** protocol.

② Set the baud rate to **400K** – this is supported by all mLRS firmware versions. Higher rates are supported only by newer versions (see the mLRS documentation).

③ The module's *Tx Ch Source* parameter must be set to **crsf**. This is the default value after flashing the firmware; if it has been changed, set it via the CLI (chapter 5.6).

5.2 mLRS Lua configuration script

The most convenient way to change the settings of the module and the receiver is the **mLRS Configurator** script directly in the radio.

① Download the script from github.com/olliw42/mLRS/tree/main/lua or install it via the *Lua Script* page of the mLRS Web Flasher tool (olliw.eu/mlrsflasher).

② For a 480 × 272 colour display (e.g. Radiomaster TX16S) use **mLRS.lua**, for a black-and-white display (e.g. Radiomaster Zorro) **mLRS-bw.lua**.

③ Copy the file to the radio's SD card into the *SCRIPTS/TOOLS* folder.

④ Start the script in *SYS → TOOLS* with the *mLRS Configurator* item. The header shows the module (Tx) and, once the link is established, the receiver (Rx).

To change a parameter, highlight it, confirm, select the value and confirm again. **Changes are stored permanently only after selecting Save**; with the black-and-white script you must save before leaving the page.

5.3 Binding with the receiver

The module and the receiver connect only if their common parameters (*Bind Phrase*, *Mode*, *RF Band*) are identical. Modules with freshly flashed firmware have the default phrase **mlrs.0** and usually connect immediately without binding.

① Put the module into binding mode: hold the **BIND button ⑥ for approx. 4 s**, or select *Bind* in the mLRS Lua script, or enter the *bind;* command in the CLI.

② Put the receiver into binding mode: hold its bind button for approx. 4 s, or power it on and off three times in quick succession – on the fourth power-up it enters binding mode.

③ The order of steps ① and ② does not matter. In binding mode the green and red LEDs light up alternately (approx. 2.5 Hz).

④ Once the link is established, the green LED on the module flashes (1 Hz). Store the settings with *Save* in the script or with the *pstore;* command in the CLI.

5.4 Setting the transmit power and other parameters

- *Tx Power* – transmit power of the module (13, 20, 24, 27 or 30 dBm). Observe the limits according to chapter 3.2.
- *Tx Power Sw Ch* – channel with which the power can be changed by a switch on the radio.
- *Mode* – operating mode of the radio link (for 2.4 GHz: 19 Hz, 31 Hz, 50 Hz and FLRC). Must be identical on the module and the receiver.
- *Bind Phrase* – custom binding phrase; distinguishes your system from other mLRS users.
- *Rx FailSafe Mode* – receiver behaviour on signal loss (chapter 6.1).

A complete description of the parameters is in the mLRS documentation: github.com/olliw42/mLRS-docu.

5.5 Connecting a ground station via Bluetooth

① All DIP switches must be in the ON position (chapter 4.2).

② In the module, set the serial port to the HC-04 module – in the current mLRS documentation this is parameter *Tx Ser Port* = **wbridge** (Lua script or CLI). The firmware configures the HC-04 itself automatically.

③ On your computer, tablet or phone, search for a Bluetooth device with a name containing **mLRS** (the manufacturer states *Matek-mLRS-BT*) and pair it with PIN **1234**.

④ In the ground station (e.g. Mission Planner, QGroundControl) connect to the Bluetooth serial port. The default baud rate is 115200 Bd.

※ In Windows 11 the module may not appear until you select *Advanced* for the device discovery option in *Bluetooth & devices* settings. The Bluetooth module also transmits in the 2.4 GHz band and may slightly interfere with the mLRS link.

5.6 Firmware update and CLI

The module is supplied with mLRS firmware installed. The firmware target is **tx-matek-mr24-30-g431kb-default**.

① Remove the module from the radio and open the **mLRS Web Flasher** tool in a Chromium-based browser: olliw.eu/mlrsflasher.

② Hold the **BIND button** ⑥ and connect the USB-C cable at the same time. The module enters DFU mode (LEDs not flashing).

③ Follow the instructions of the tool. The firmware is also available at github.com/olliw42/mLRS/tree/main/firmware; alternatively ST's STM32CubeProgrammer with the STM DFU driver can be used.

④ After flashing, disconnect and reconnect USB. A red LED flashing at 2 Hz means that the module is waiting for a link with the receiver.

With the usual settings the command line interface (CLI) is available via the USB-C port, e.g. in the mLRS Web Flasher tool. Useful commands: *pl;* (list parameters), *p name = value;* (change), *pstore;* (store), *bind;* (binding), *v;* (version).

5.7 Further guides

Official EdgeTX website: edgetx.org
mLRS documentation: github.com/olliw42/mLRS-docu
Manufacturer's page: mateksys.com/?portfolio=mr24-30-tx

6. Operation

6.1 Ground test and failsafe

Before the first flight with a new link, perform a ground test:

① Remove the propellers from the model and switch everything on. Check by the LEDs that the module and the receiver have connected.

② Set *Tx Power* and the receiver power to the lowest level.

③ Check the telemetry (position, voltage, modes) in the ground station and on the radio, and the function of the switches including Arm (motors enabled) and Disarm (motors disabled).

④ **Test the failsafe:** switch off the radio and check that the model reacts according to the flight controller (FC) settings. For *Rx FailSafe Mode* the **no sig** (no signal) option is recommended.

⑤ Perform a walking range test: walk away from the model with the radio and monitor the link quality.

⑥ Return the power to a value suitable for flight and in accordance with chapter 3.2.

6.2 During operation

- Orient the antennas of the module and the receiver vertically where possible, with a clear line of sight.
- There should be no obstacles between the antenna and the model; the body, metal and carbon objects near the antenna reduce the range.
- Estimated maximum ranges apply to free space without obstacles and interference – in reality they are usually shorter.
- Loss of telemetry and loss of control may not occur at the same distance. The ground station may report a link loss earlier or later than the flight controller triggers the failsafe.
- Do not switch off the radio while the model is switched on.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- Regularly check the antenna, the antenna cable and the connectors; replace a damaged antenna.
- Keep the ventilation openings and the fan clean. Replace a faulty fan.
- Keep the JR connector pins straight and clean.
- Store the module in a dry place, out of the reach of children and out of direct sunlight, ideally removed from the radio.

7.2 Troubleshooting

Problem	Possible cause and solution
Red LED keeps flashing at 2 Hz, no link	The receiver is not powered or not bound. Check that the binding phrase, *Mode* and firmware version are identical on both sides and bind again (chapter 5.3).
mLRS Lua script does not communicate with the module	External module not set to CRSF, unsuitable baud rate (try 400K), *Tx Ch Source* not crsf, module not inserted correctly, or unsuitable script or EdgeTX version.
Module does not respond, LEDs off	Check that the external module is enabled in the radio and that the module is seated correctly in the bay (5–13 V supply on VIN).
Bluetooth device not visible	DIP switch not all ON, serial port not set to the HC-04 (*wbridge*). In Windows 11 enable advanced discovery. The PIN is 1234.
Short range	Antenna not connected, SMA and RP-SMA mixed up, loose IPEX connector, unsuitable antenna orientation, metal parts near the antenna, power too low.
Module overheats	Fan not connected or covered. At 500 mW and above the fan must run.
Firmware cannot be uploaded	Module not in DFU mode – hold the BIND button already while connecting USB. Use a Chromium-based browser, or install the STM DFU driver.

A detailed diagnostic procedure is in the mLRS documentation (*Troubleshooting* chapter). Help is also offered by the mLRS community on Discord.

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:** type designation mR24-30-TX (manufacturer Matek Systems); the adapter board is marked *MATEKSYS mRX-TX Adapter*. The firmware version is shown by the mLRS Lua script on its main page (*Main Page*).

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.