



Micro RC Transmitter

Operating Manual for SW Version 1.6x



open source
hardware



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Safety regulations



This system is not suitable for the control of large and dangerous models.

The product must not be used until this manual has been fully read and understood. Likewise, you must agree with all the restrictions mentioned in this chapter.

This is a prototype system and is left to the user's own responsibility for use, free development and customization. TheDIYGuy999 assumes no liability whatsoever for any damage or consequential damage resulting from the use of this system.

To increase security against interferences, you should define your own "pipe" addresses. Please refer to the chapter "Software upload with Arduino IDE".

The radio antenna must not be covered with metallic objects.

The IR transmitter requires visual contact with the vehicle.

The remote control may only be used in dry locations.



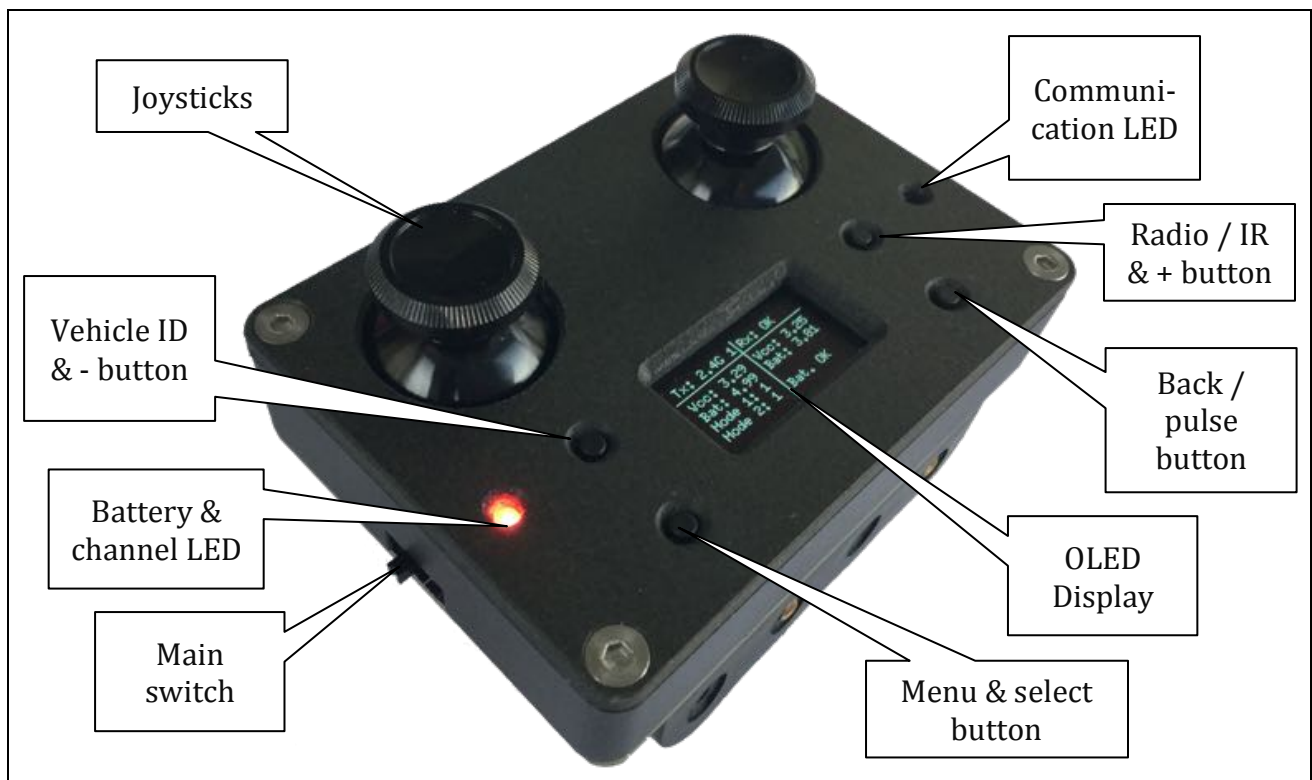
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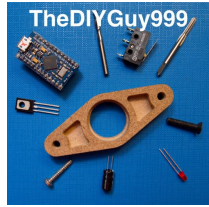
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Technical specifications

Radio:	2.4GHz, 2 channels, 10 vehicle ID's (Range depends on antenna type)
Infrared:	LEGO „Power Functions“ („Red“ & „Blue“ x 4 addresses) MECCANO (channel „A“, „B“, „C“ and „D“)
Analogue channels:	4 (Joysticks) 1 (Potentiometer-connector on the right side)
Digital channels:	2 (Mode 1 & 2 push buttons, integrated in joysticks) 1 (pulse button, together with „Back“ button)
Back channel:	Yes (to report vehicle battery charge status, etc.)
Batteries:	4xAA (alcalines or NiMh rechargeables)
Display:	0.96“ OLED, 128 x 64 pixels
Auto calibrating:	Yes, after power-on, automatic zero-point calibration of all joysticks is performed
Configuration menu:	Yes, direction reversal and travel limit for all 4 joystick channels, stored in the EEPROM
Open Source:	Yes (Software & Hardware): https://github.com/TheDIYGuy999/RC_Transmitter

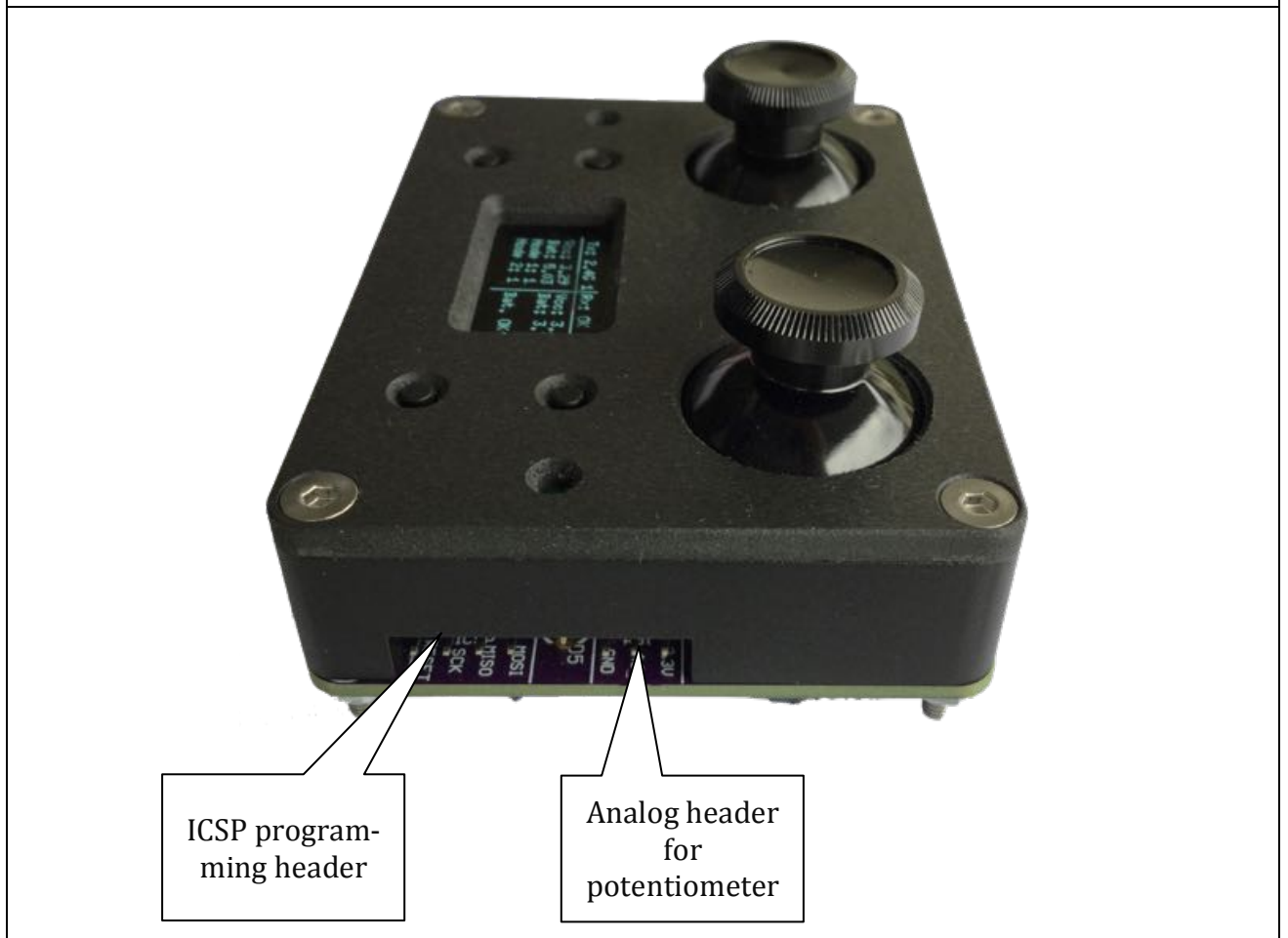
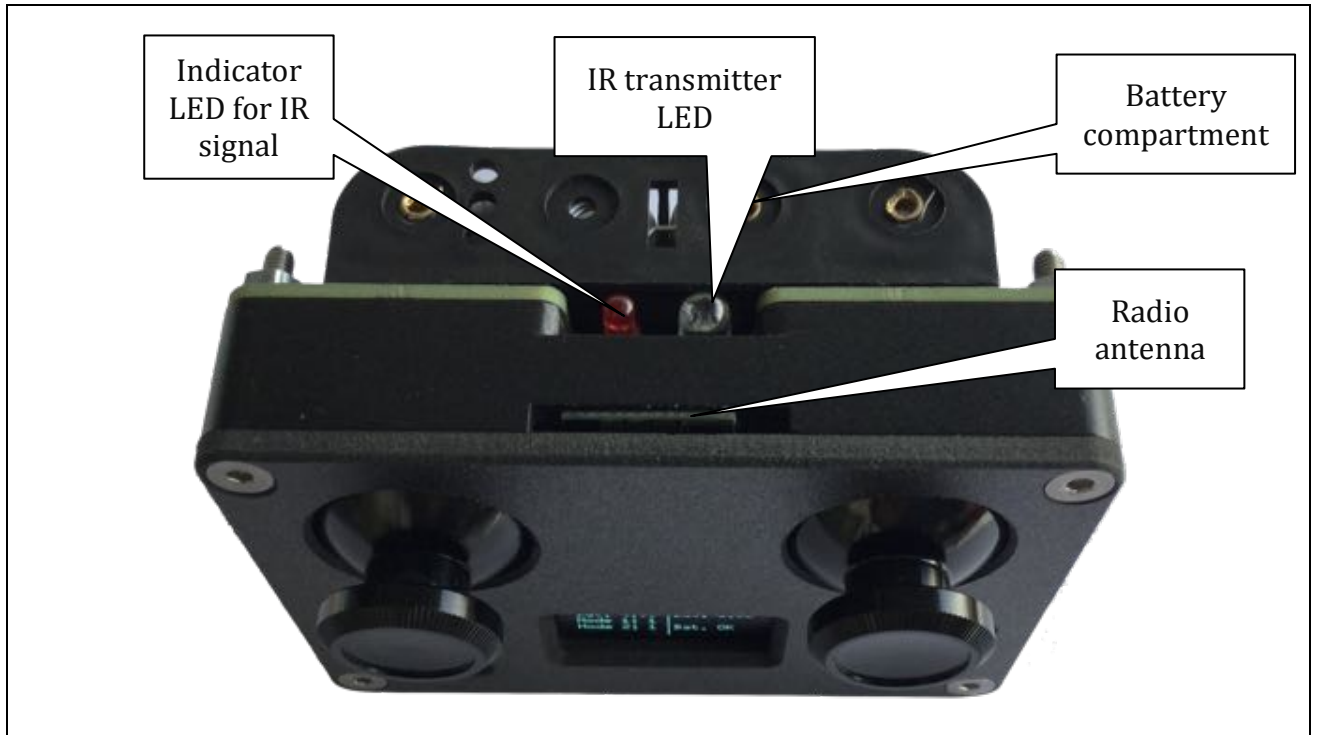
System overview





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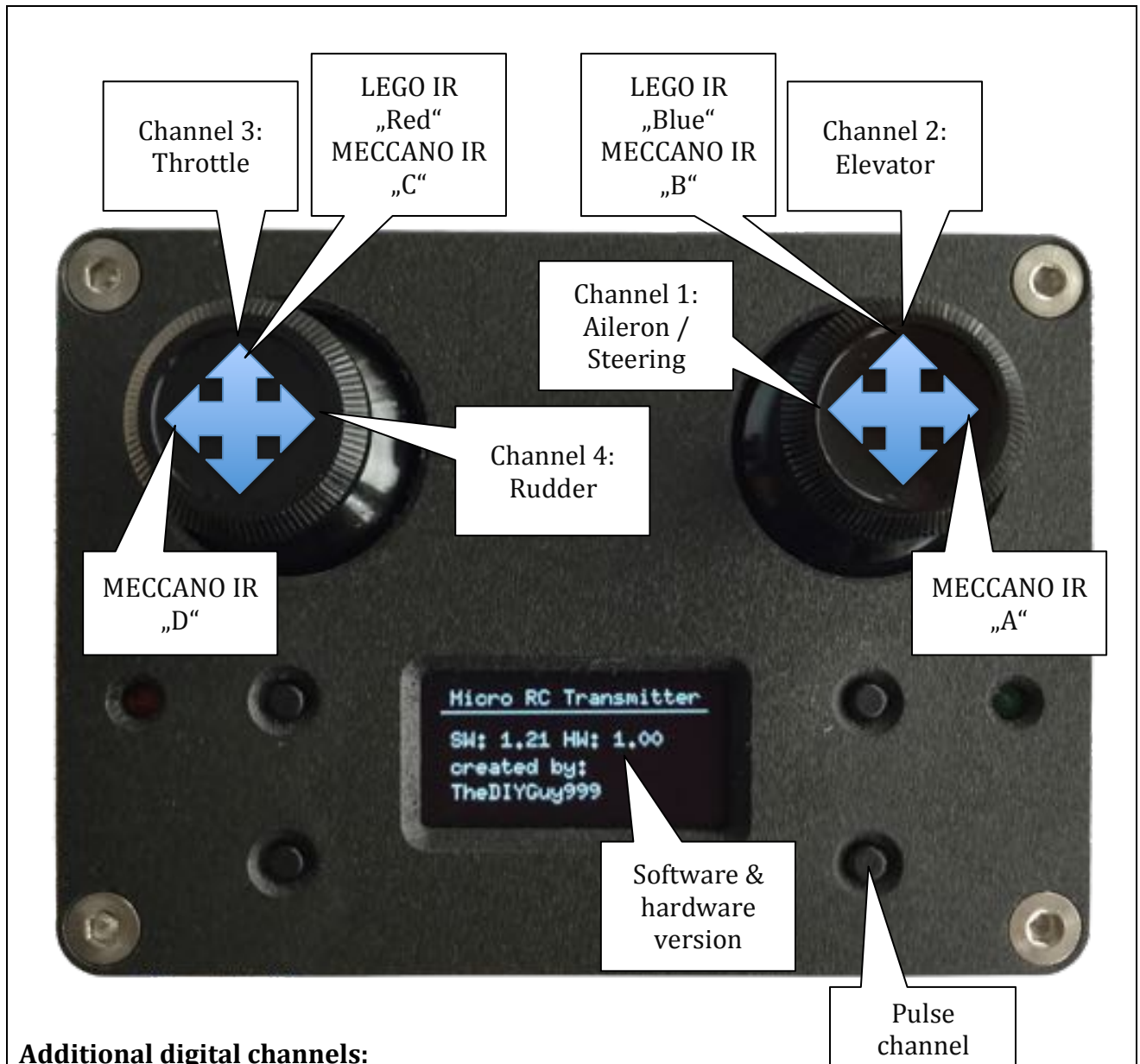




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Channel assignment



Additional digital channels:

- „Mode 1“ on / off: clicking with left joystick
- „Mode 2“ on / off: clicking with right joystick

„Pulse“, E.g. For horn etc. On, as long as the button is pressed (when the menu is closed)

The two "mode" channels are - depending on the programming of the receiver - used to limit maximum speed and acceleration.



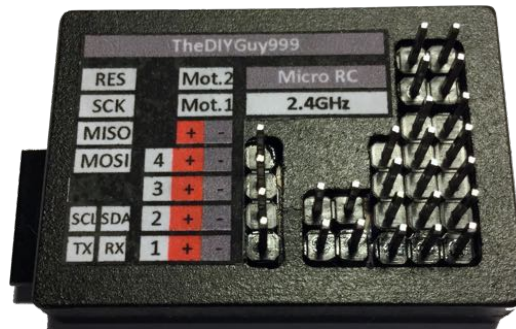
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Commissioning

Receiver compatibility

This remote control works only in combination with the Micro RC 2.4GHz receiver from TheDIYGuy999. For details, see separate operating instructions.



Also compatible are "**Power Functions**" infrared receivers from **LEGO**



and **MECCANO** infrared receivers.





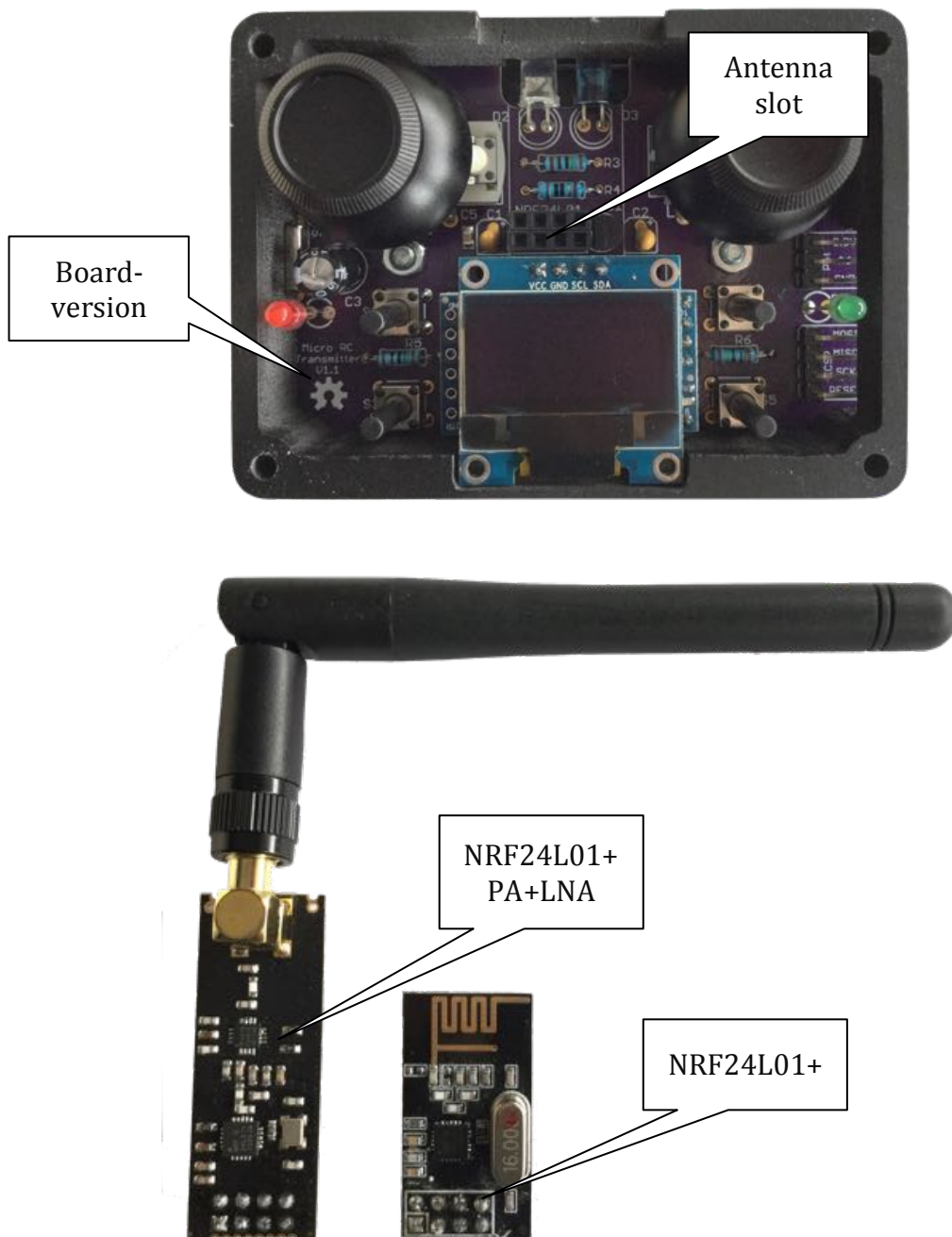
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Antenna installation

Two different types of antennas can be operated in the intended slot.

NOTE: Never insert or remove the antenna module during the transmitter is powered up. Insert the antenna in the correct row of pins! Otherwise, the electronics may be damaged.



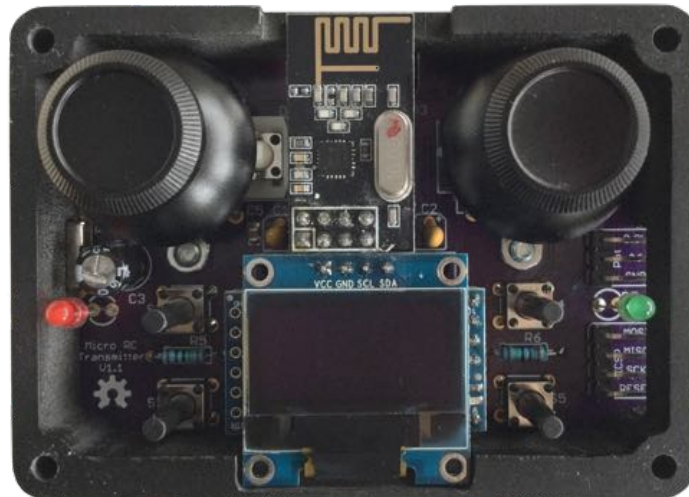


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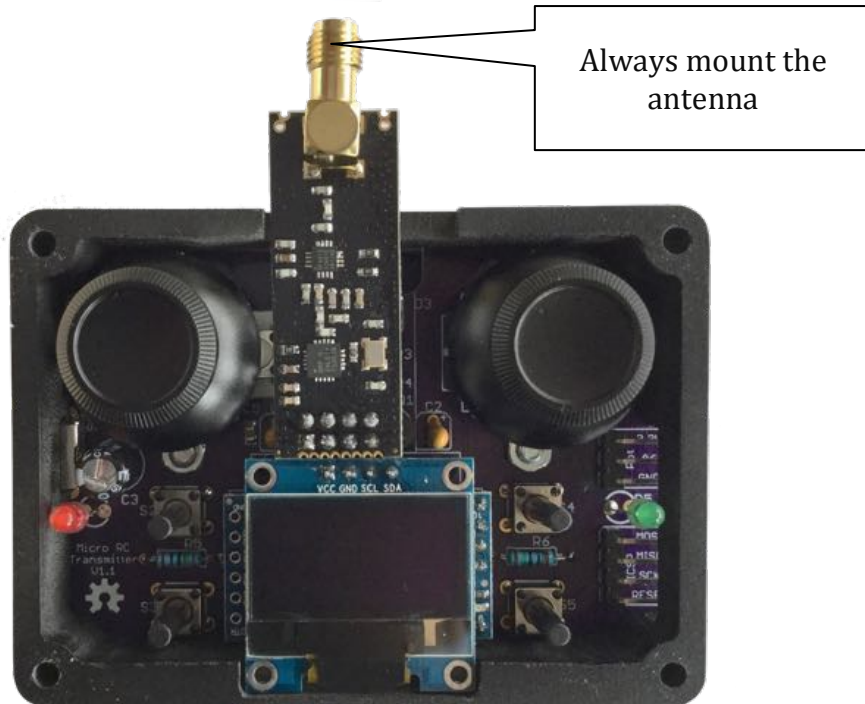
NRF24L01+

This antenna has a range of about 10m and is very compact. It is especially suitable for the control of small indoor models.



NRF24L01+PA+LNA (Only supported from board version 1.1)

This antenna has an additional power amplifier and a range of > 100m. In this case, also use this antenna type in your vehicle. Otherwise, the range improvement is only slight.





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Batteries

Use 4 AA Alkalines or rechargeable NiMh batteries. **Note:** the remote control does not work with incorrect battery polarity, but will not be damaged.



Operation

General

- Always observe the safety regulations mentioned at the beginning of this manual.
- Never drive with exhausted transmitter batteries. Otherwise the vehicle can get out of control.
- Do not touch the joysticks during the start screen is displayed, because their automatic zero point calibration is executed during this time.
- Depending on the vehicle configuration, the battery status is displayed in radio mode on the right-hand side of the screen. Please note, to prevent a deep discharge of the vehicle battery.
- Depending on the receiver version, the drive motor is deactivated after the battery has been exhausted, and "Low battery" is displayed in the lower right corner. To re-enable the vehicle, switch the transmitter off and on. Afterwards, only drive short distances with small speed. Then immediately replace the battery!
- If either the battery of the remote control or of the vehicle is exhausted, the red LED changes from the vehicle ID number blink code to permanent lighting.
- Do not force the joysticks against their end stops.
- If the signal delay is too big, the next radio channel is automatically selected.

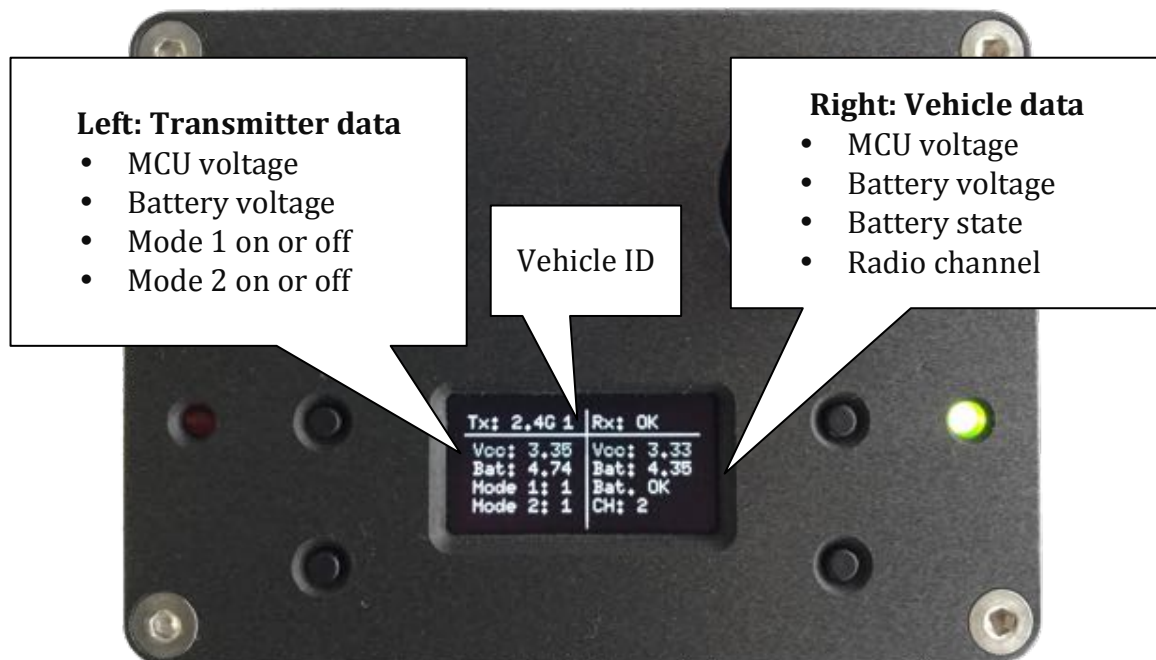


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2.4GHz radio mode

1. Switch on the main switch, wait until the green communication LED is on.
2. Switch vehicle / receiver on according to separate instructions
3. Select the vehicle number according to the pre - programmed number in the receiver to be controlled by means of the "Vehicle ID & -" button. The active ID is also indicated by the left LED by means of flashing code.
4. As soon as the ID is correctly selected and the remote transmitter communicates with the receiver, the green communication LED flickers and the vehicle data are displayed on the right half of the display as far as available.



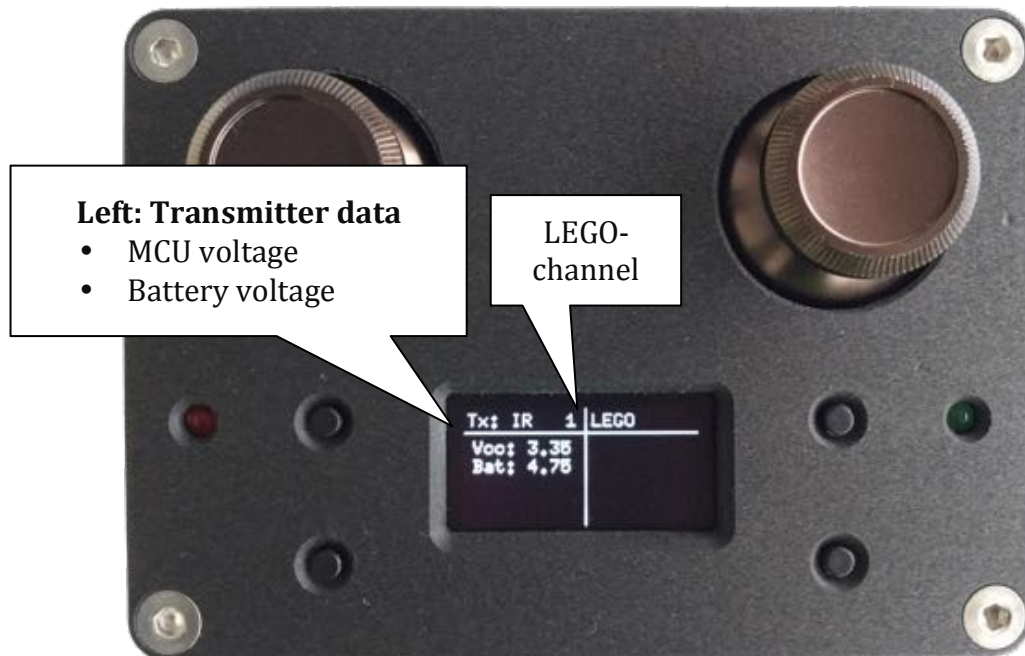


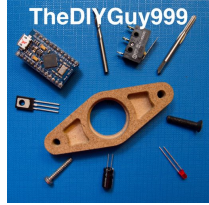
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LEGO „Power Functions“ infrared mode

1. Switch on the main switch, wait until the green communication LED is on.
2. Press the "Radio / IR & +" button several times until the screen below appears. The green communication LED changes to flashing and the LED on the front flashes.
3. Turn on the LEGO receiver
4. Select the LEGO channel according to the position of the orange sliding switch on the IR receiver by means of the "Vehicle ID & - button". The LEGO channel is also indicated by the left LED by means of flashing code.



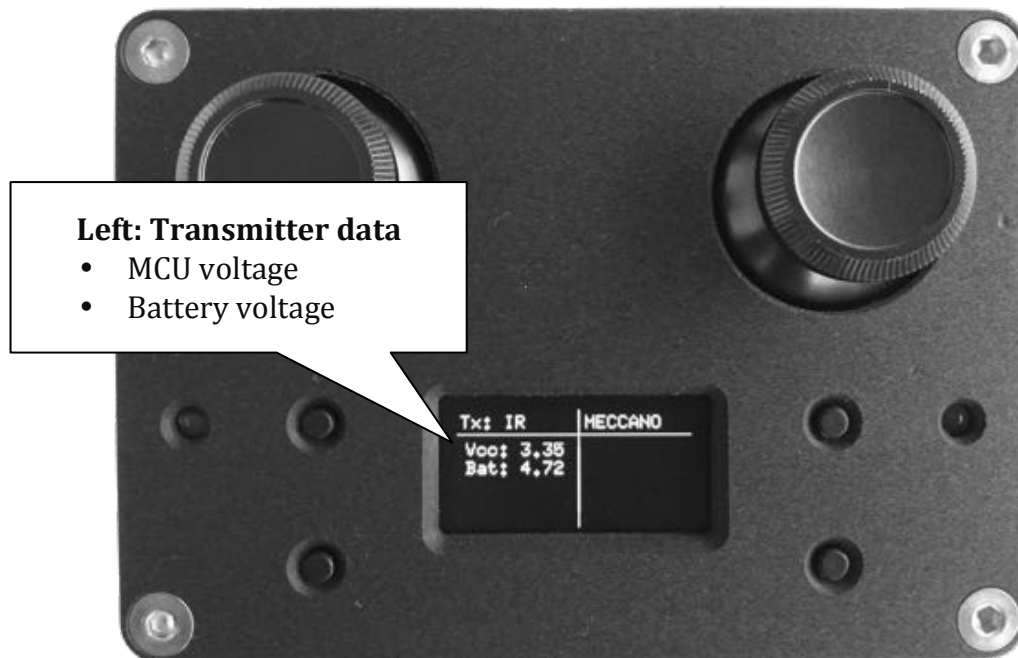


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MECCANO infrared mode

1. Switch on the main switch, wait until the green communication LED is on.
2. Press the "Radio / IR & +" button several times until the screen below appears. The green communication LED changes to flashing.
3. Each MECCANO IR receiver supports only 1 channel from "A" to "D". Select this as desired with the sliding switch. Depending on the setting, the receiver then responds to a different joystick according to the channel assignment.
4. Turn on the MECCANO IR receiver





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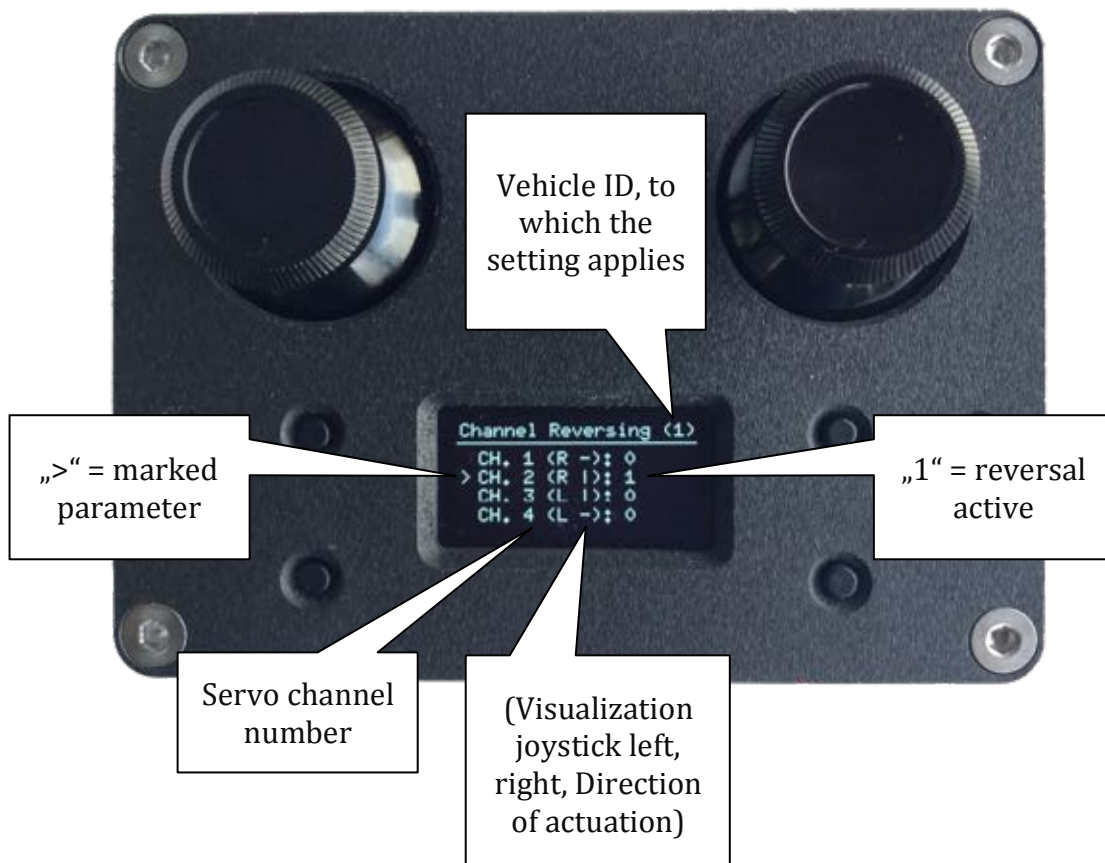
Advanced settings

Note: The following settings are stored separately for each vehicle ID in the EEPROM of the transmitter. Therefore, it is important that the corresponding vehicle ID is selected before opening the settings menu. These settings are active only in the radio mode.

Servo direction reversing (Channel Reversing)

If the direction of rotation of a servo is wrong - e.g. the steering turns in the wrong direction - this can be corrected as follows:

1. Press the "Menu & Select" button
2. Press the key above until the desired parameter is marked with the arrow on the left side. If the above button is pressed after the channel 4 has been reached, the travel limit setting is reached. See the following page
3. With the "Vehicle ID & -" button, the reversal is deactivated (display "0")
4. Pressing the "Radio / IR & +" button activates the reversal (display "1").
5. The "Back button" is used to change the screen back and the settings are stored permanently in the EEPROM.





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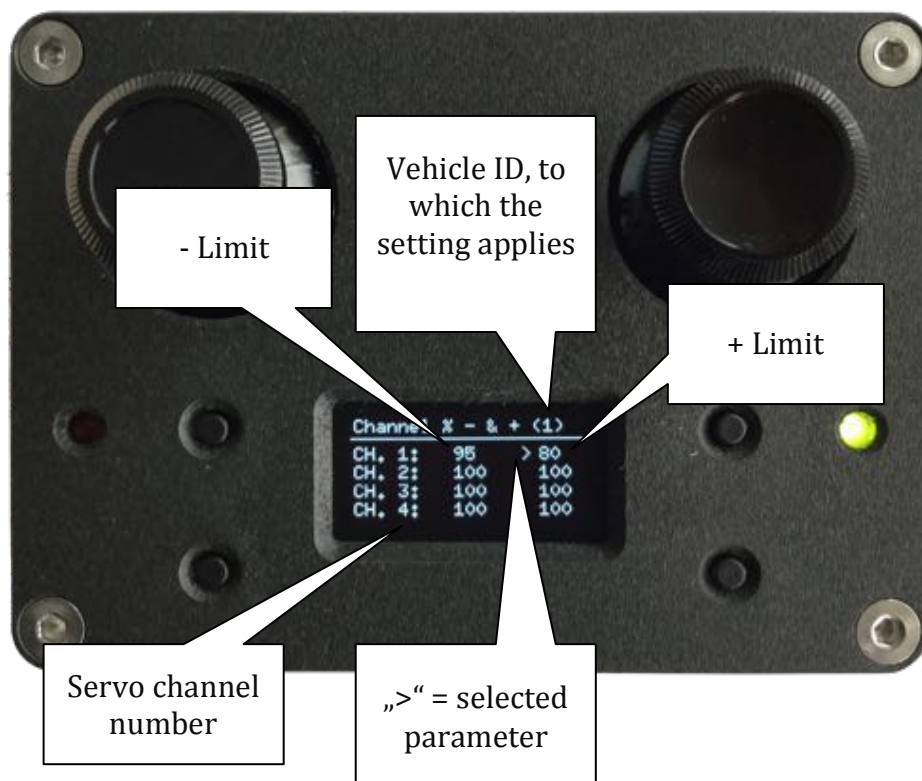
Servo travel limitation (Channel % - & +)

If a standard software is to be used on the receiver, in certain cases the servo travel has to be limited.

For example, a wheel hits in the wheel arch. The function can also be used to trim the straight line (center position).

1. Menu Navigation and saving the settings see previous page
2. The "Vehicle ID & -" button is used to reduce the value
3. Use the "Radio / IR & +" button to increase the value

The travel limit can be adjusted for both end positions from 20% to 100%.
+/- 100% corresponds to +/- 45 ° of the servo, measured from its center position.



Parameter factory reset

If you press and hold the "Menu" and the "Back" button during switching on the main switch, a **factory reset** of all menu parameters is executed.



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Software-updates and documentation

General

Software updates fix bugs and add new features. You can also implement your own ideas by adapting the software.

Documentation

The complete documentation, the software and the Eagle PCB layout files are available on GitHub:

https://github.com/TheDIYGuy999/RC_Transmitter

TheDIYGuy999 auf YouTube:

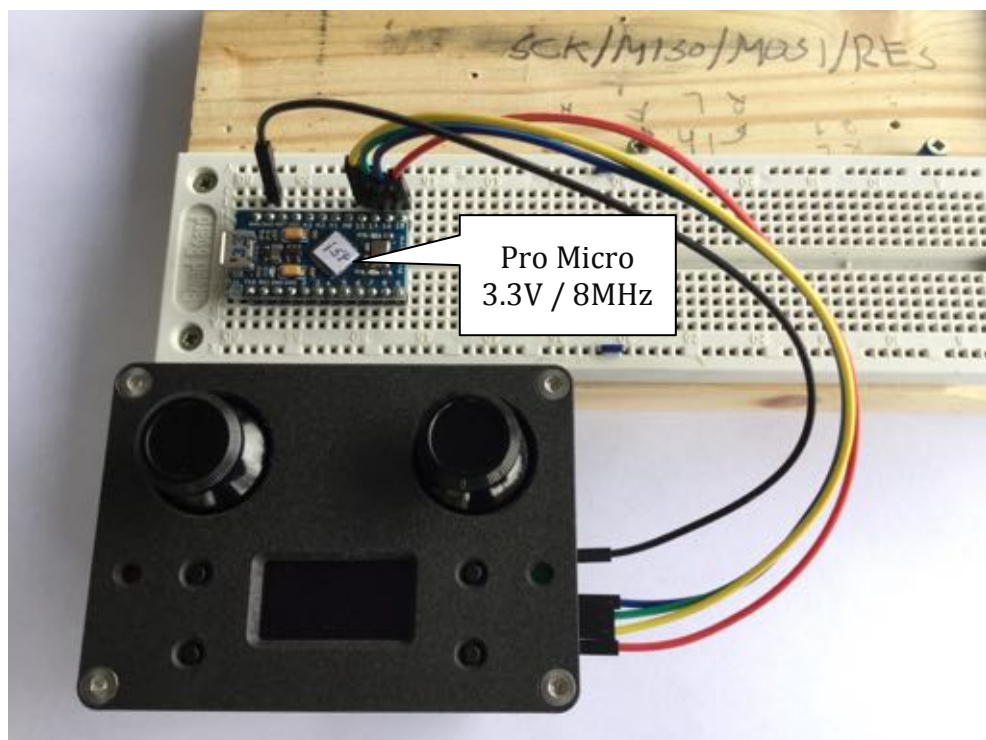
<https://www.youtube.com/user/TheDIYGuy999/videos>

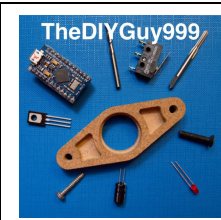
Connecting the ISP

To load the software, the transmitter must be connected to a 3.3V / 8MHz Arduino Pro Micro:

Arduino Pro Micro 3.3V / 8MHz	Transmitter
GND	GND
10	RESET
16	MOSI
14	MISO
15	SCK

During uploading, the transmitter is supplied with power by the battery via the main switch





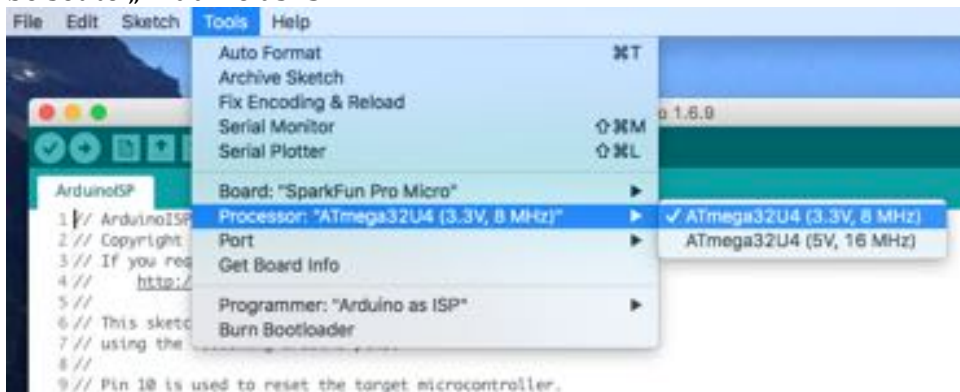
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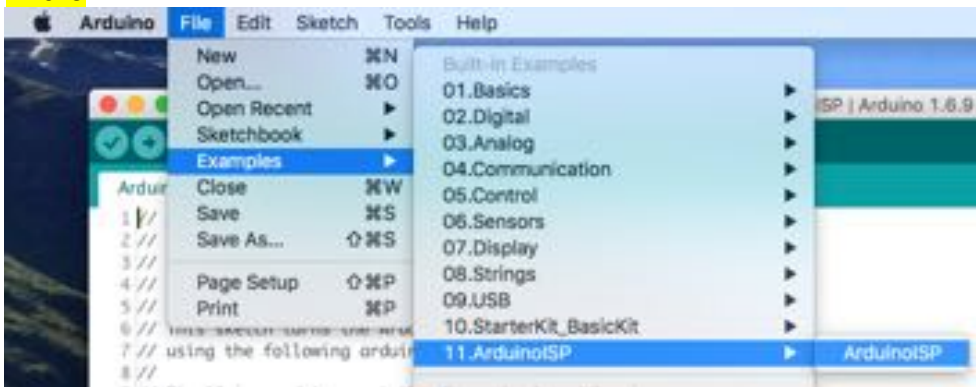
Software upload with Arduino IDE

Note: Uploading the program will destroy the settings stored in the EEPROM. Please note them in advance! Do not confuse the Pro **Mini** and Pro **Micro** boards!

1. Select Pro **Micro** 3.3V / 8MHz as Board (install first, if necessary). „Programmer“ MUST be set to „Arduino as ISP“.



2. Port: select your Pro Micro's USB port
3. Open the following Sketch in Arduino IDE and upload it via USB to the 3.3V / 8MHz Pro **Micro**



4. Download “RC_Transmitter.ino” from GitHub
5. Download and install all the mentioned libraries. Restart Arduino IDE

```
//  
// -----  
// INCLUDE LIBRARIES & TABS  
// -----  
//  
// Libraries  
#include <SPI.h>  
#include <RF24.h> // Installed via Tools > Board > Boards Manager > Type RF24  
#include <printf.h>  
#include <SimpleTimer.h> // https://github.com/ifturcot/SimpleTimer  
#include <EEPROMex.h> // https://github.com/thijse/Arduino-EEPROMex  
#include <LegoIr.h> // https://github.com/TheDIYGuy999/LegoIr  
#include <statusLED.h> // https://github.com/TheDIYGuy999/statusLED  
#include "U8glib.h" // https://github.com/olikraus/u8glib
```

6. Open “RC_Transmitter.ino” in Arduino IDE.



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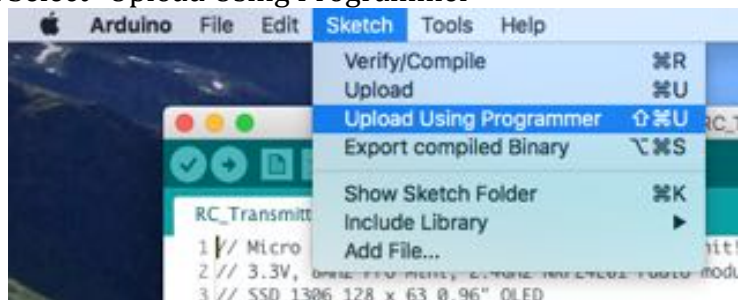
7. Select your board version in the program header

```
RC_Transmitter readVCC.h
1 // Micro RC Project. A tiny little 2.4GHz and LEGO "Power Functions" IR RC transmitter!
2 // 3.3V, 8MHz Pro Mini, 2.4GHz NRF24L01 radio module
3 // SSD 1306 128 x 63 0.96" OLED
4 // Custom PCB from OSH Park
5 // Menu for the following:
6 // -Channel reversing
7 // -Channel travel limitation in steps of 5X
8 // -Value changes are stored in EEPROM, individually per vehicle
9 // NRF24L01+PA+LNA SMA radio modules with power amplifier are supported from board version 1.1
10
11 const float codeVersion = 1.21; // Software revision
12 const float boardVersion = 1.0; // Board revision (MUST MATCH WITH YOUR BOARD REVISION!!)
```

8. Select Pro Mini 3.3V / 8MHz as board



9. Connect all cables as explained above
10. USB Port is still your Pro Micro's port
11. Switch the transmitter on
12. Select "Upload Using Programmer"



13. The software is now compiled and then uploaded
14. If finished, remove all cables
15. Use the new function :-)