

# rESCue

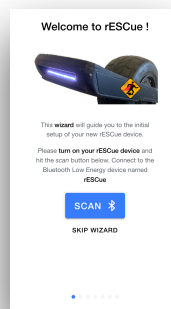
USER MANUAL, VERSION 3.1  
RESCUE-S3—PCB, REV 1.1



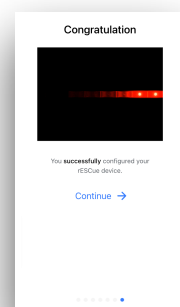
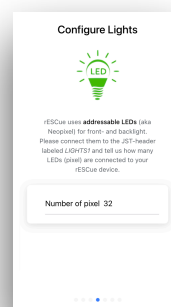
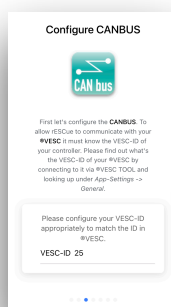
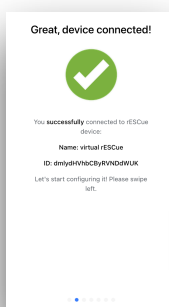
## QUICK START:

Your rESCue-PCB comes with the latest version of the rESCue firmware pre installed. Please follow this steps:

1. Download our rESCue-App for iOS or Android  
**or** point you Chrome browser to the URL <https://rescue.thank-the-maker.org>  
You could also scan the QR code on the back of the rESCue-PCB.
2. The rESCueApp should welcome you with the setup wizard.



3. Scan for your device by pressing the „Scan“ button and connect to the „rESCue“ device.
4. After connecting to your rESCue device, the wizard will guide you through the initial setup of your device.



Your rESCue device should now be configured and is ready for use.  
After restarting your device, you should hear a melody and if addressable LED are connected, the LEDs should show a start-light pattern.

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## Recommended:

For the front and back led light we recommend a high quality piece of WS28... like the Adafruit neopixel.

For the lightbar led strip we also recommend a high quality WS28... led strip like the Adafruit neopixel.

Chinese cheap led strips may do there job but are prone to random flickering due to interference.

Keep your cable management clean and tidy to prevent interference on the data lines from other cables like your power supply etc.

If you solder your own ESP32 please make sure you soldered all the legs without any cold joints.

Prevent the input power on the PCB from shorting. A piece of tape (kapton) will do the trick.

Make sure your *rESCue-S3 PCB* and your VESC share GND.

**Please be careful when using high voltage input!!**  
**MAX CURRENT CONSUMPTION OF 2A!!!** (depending of version, see DC/DC converter spec)

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## Specs:

- 10V TO 100V INPUT
- 5V OUTPUT
- 2A MAX OUTPUT (DEPENDING OF VERSION, SEE DC/DC CONVERTER SPEC)
- WS28... DIGITAL STRIP OUTPUT FOR FRONT AND BACK LIGHT
- WS28... DIGITAL STRIP OUTPUT FOR BATTERY MONITORING
- BLUETOOTH (WORKS WITH @VESC TOOL AND RESCUE-APP)
- CANBUS COMMUNICATION
- BUZZER INTEGRATED
- ESP32-S3 (FLASHED ESP32 WITH LATEST RESCUE FIRMWARE)
- RUNS OPEN SOURCE RESCUE FIRMWARE - SEE [HERE](#)
- FREE FIRMWARE UPDATES
- WIRING DIAGRAM CAN BE FOUND AT THE BOTTOM

### DC/DC CONVERTER SPECS:

- INPUT VOLTAGE 10V-100V
- OUTPUT VOLTAGE 5V
- DIMENSION 44X16MM
- MAX OUTPUT CURRENT
  - **2A**

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## Installation:

Depending on the product you bought from our store either a *Lolin WEMOS S3 mini* is already included or you have to add it yourself. If you bought your *rESCue-PCB* with a ESP32-S3 already included, it's already ready to use and you can directly read the chapter on wiring.

If you bought just the *rESCue PCB*, please follow this instructions to prepare your *WEMOS S3 mini*.

### SOLDERING THE FEMALE HEADERS

Normally the *WEMOS S3 mini* is delivered containing some female headers. To be able to attach the ESP32-S3 to the *rESCue PCB* solder the included female header to the bottom of your *WEMOS S3 mini*.

### INSTALLING THE FIRMWARE

- Download the latest release of our *rESCue* firmware. You can find it on this GitHub page: <https://github.com/thankthemaker/rESCue/releases>  
You'll need to download the *firmware.bin* file as well as the *partitions.bin* file.
- Install the esp-tool. Please follow the instruction on this GitHub page <https://github.com/espressif/esptool>
- Flash the partition scheme to your ESP32  
**TBD**
- Flash the *rESCue* firmware to your ESP32  
**TBD**

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## LED-Strips:

One more word about the LED-strips. Please make yourself familiar with addressable LEDs aka. Neopixel. There is a great tutorial about Neopixel from Adafruit, the [Neopixel Uber Guide](#).

We only use high quality DC/DC converter that guarantee a maximum of current according to their specification. Nevertheless, you should calculate the power consumption of your LEDs carefully to avoid damage. Here are some information that should to be taken into consideration:

- ESP32's current flow is between **50mA - 200mA** (with BLE & WiFi)
- each pixel usually takes around **20mA**, but might take up to **60mA** (full brightness, white color)
- *rESCue*'s default settings are brightness of 100 (max 255) and an odd/even light pattern, which means only half of the pixels for front- and backlight are used most of the time

Some example calculation:

Given:

- *rESCue* with 2A DC/DC converter,
- 5 pixel for lightbar, 32 pixel for front- and backlight

Example 1:

All pixel on, full brightness, white and ESP32 BLE + WiFi:  $37 \times 0.06A + 0.2mA = \mathbf{2.42 A}$

Example 2:

Odd/Even pattern, brightness 100, white and ESP32 BLE:  $21 \times 0.02A + 0.1mA = \mathbf{0.52 A}$

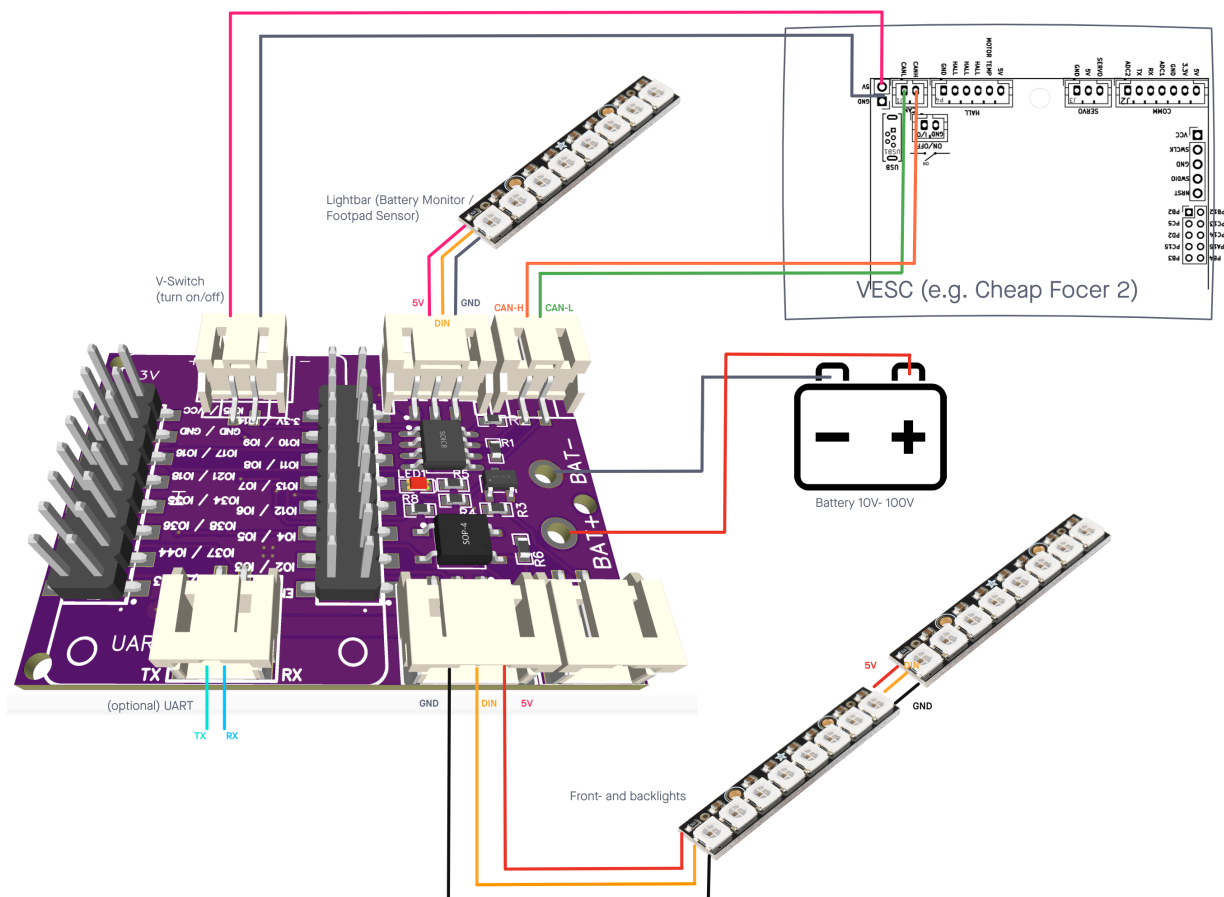
As the examples show, in normal operating conditions the DC/DC converter is able to drive 32 pixel for front- and backlight and additional 5 pixel for the lightbar and still has plenty reserve.

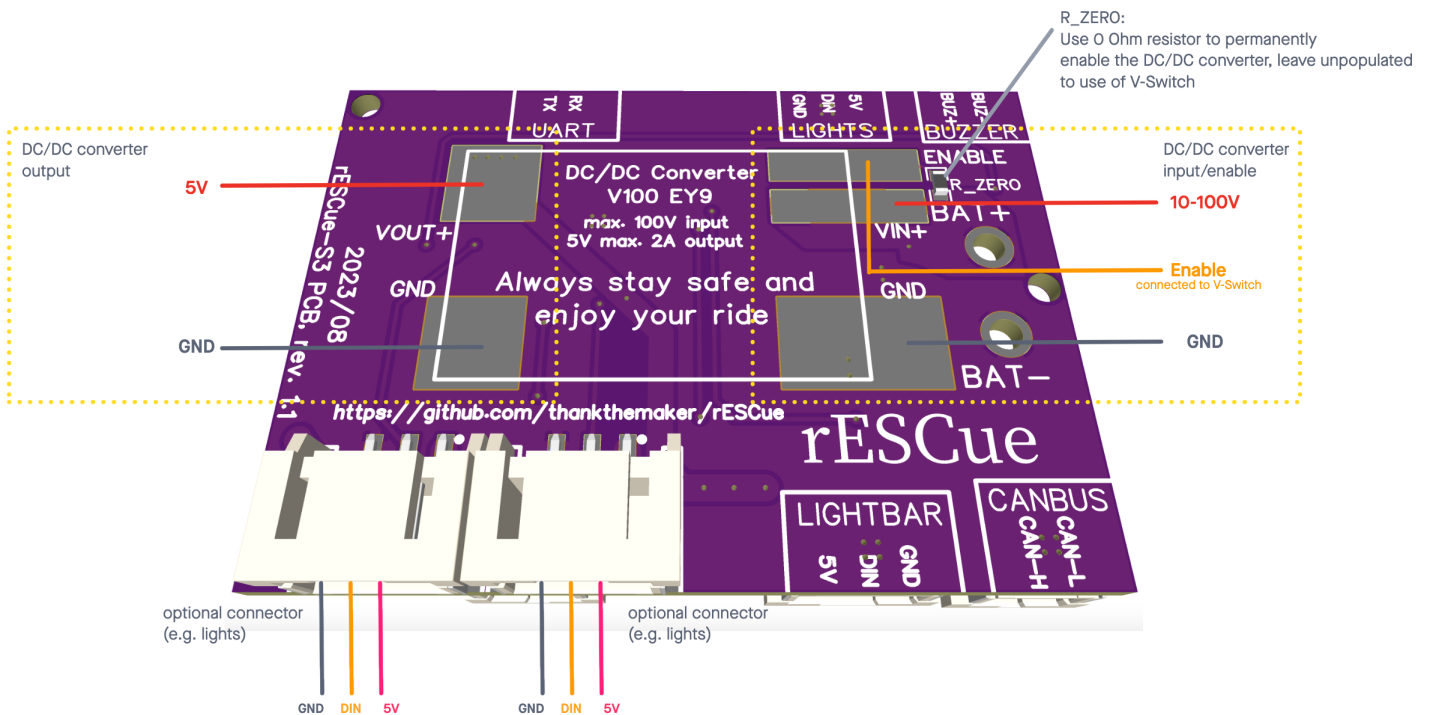
Driving the LEDs at full brightness and with a light pattern that makes usage of all pixel, the current flow *might* increase significantly. **Please carefully measure the real current flow / power consumption of your setup.**

**Conclusion:** In most setups the DC/DC converter is already powerful enough. If for some reason, your setup needs more current, there are options to equip your rESCue-device with a DC/DC converter up to **3.5A**.

## Wiring:

Wire your rESCue-S3 PCB as follow:





### INPUT 10V - 100V:

rESCue PCB	Battery
BAT+	positive terminal
BAT-	negative terminal

### FRONT-/BACKLIGHT-STRIP OUTPUT:

Almost all WS2812 based RGB or SK6812 RGBW addressable LED strips should work. Configure your LEDs accordingly in the rESCue-App.

rESCue PCB	LED-strip
5V	+
DIN	Data
GND	-

### LIGHTBAR-STRIP OUTPUT:

Almost all WS2812 based RGB or SK6812 RGBW addressable LED strips should work. Configure your LEDs accordingly in the rESCue-App.

rESCue PCB	LED-strip
5V	+
DIN	Data
GND	-

#### CANBUS:

rESCue PCB	VESC
CAN-H	CAN-H
CAN-L	CAN-L

#### BUZZER OUT:

Almost all passive piezo buzzer should work. Please make sure your buzzer is a passive piezo buzzer and not an active one. Active buzzer won't work.

#### 5V OUT:

**Attention:** please make sure the external component is eligible for 5V and the maximum current of all connected components (LEDs + external components) do not exceed the maximum overall current of your rESCue-PCB.

rESCue PCB	external component
5V	5V
GND	GND

#### UART:

**Attention:** please make sure rESCue and VESC do use a common ground (GND).

rESCue PCB	VESC
TX	RX
RX	TX

#### VSWITCH:

The VSWITCH connector allows your rESCue-S3 to turn on/off in sync with you VESC. Normally it is connected to the 5V output connector of your VESC based controller.

When the VESC gets powered it will provide a 5V signal which makes the integrated High-Side-Switch of the rESCue-S3 turning on the DC/DC converter of the rESCue-mini

rESCue PCB	VESC
5V	5V
GND	GND

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## Connect VESC tool or Yours Truly via BLE:

The *rESCue* firmware includes a CANBUS-BLE bridge which allows 3rd-party apps like the *VESC tool* app (Android) or *Yours Truly* (iOS) to connect to your *rESCue* board. Other Apps might also work as long as they are compatible with the VESC Bluetooth software, but the mentioned are well tested.

- Make sure you connected you *rESCue PCB* with the CANBUS port of your VESC.
- Make sure your *rESCue PCB* is powered and the power LEDs of the PCB is shining
- Start you App and “Scan” for BLE devices
- A device with the name “rESCue” should be found, select this device.
- The BLE connection should be established successful
- Start using your app as usual

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## Updating the firmware:

### WIRELESS VIA BLUETOOTH LOW ENERGY

To update the firmware you could either use the *rESCueApp* or our Website.

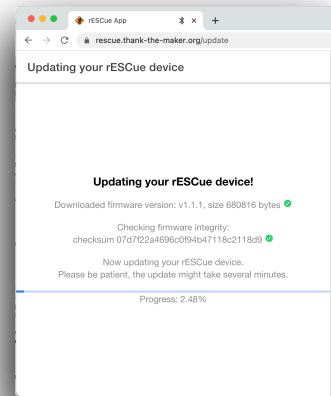
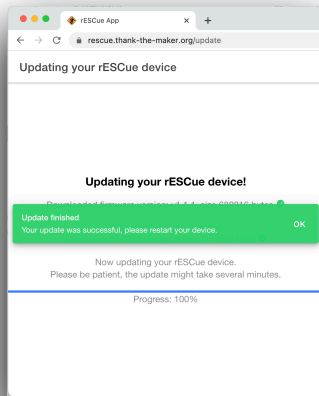
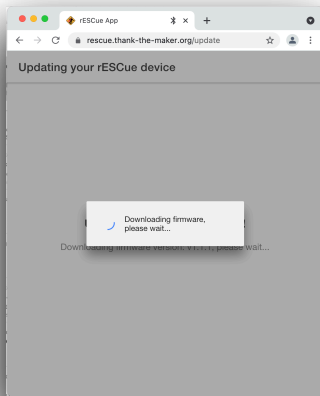


If using our Website, make sure to use a *Google Chrome* browser on your desktop PC, unfortunately other browser don't work at the moment.

- Either start our *rESCueApp* or point your browser to the update page:

<https://rescue.thank-the-maker.org/>

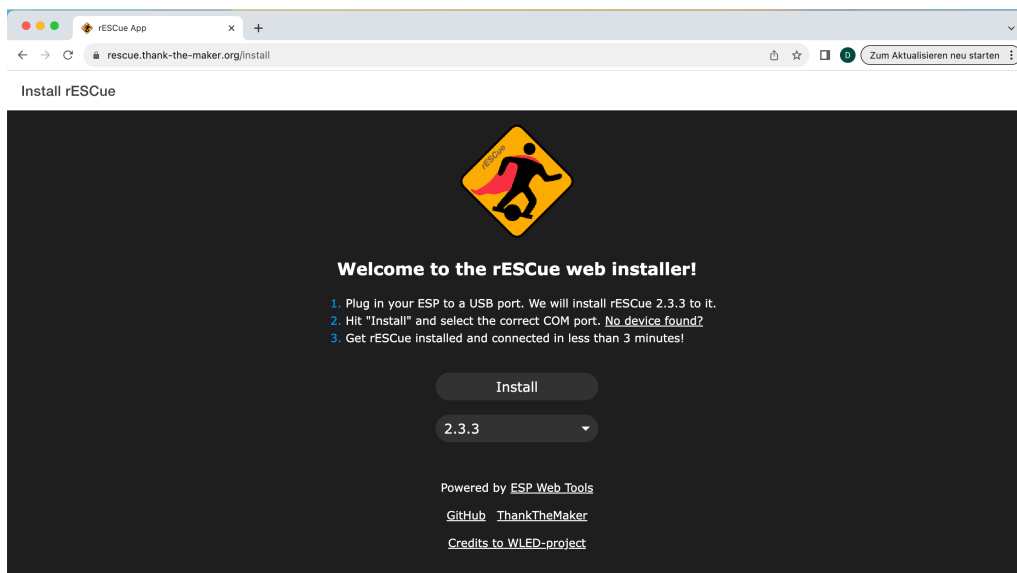
- Hit the “Scan” button to start “scanning”
- Select the device with the name “rESCue”
- If a newer firmware version for your hardware revision is available, a window will appear and ask you to update. Hit the “YES” button to download the latest firmware and to start the update.
- Be patient and watch the progress, the update might take several minutes to complete.
- When finished, a message will be shown.



## VIA USB WITH RESCUE-WEB-INSTALLER

Another option to update the firmware is our rESCue-flasher. You could download it from our Github page:

<https://rescue.thank-the-maker.org/install>



## Configuration parameters

The rESCue firmware has a lot of options that can be configured.

### LIGHTS

Param	Description	Default value	Possible / Allowed values
Number of lights	The total number of LEDs your front- and backlight have.	16	



Type	The type of your LEDs. There are several different types on the market, please read the documentation of you LEDs to find out which type you have	GRB	GRB RGB GRBW RGBW
Frequency	The frequency of your LEDs. There are several different types on the market, please read the documentation of you LEDs to find out which type you have	800 kHz	400 kHz 800 kHz
Start light pattern	The pattern the LEDs should show when the device is booted.		
Idle light pattern	The pattern the LEDs should show when idle mode is detected (ERPM around 0)		
LED maximum brightness	The maximum brightness the LEDs should use. The brighter the LEDs, the more current they'll use.	100	0-255
LED fading duration	The time the fading effect should take when changing the driving direction.		
LED Idle Timeout	The maximum time for the idle mode in milliseconds. When the timeout is reached, the LEDs are turned off. Useful if your VESC stays turned on while charging the battery.	60000	0-60000
Enable Brake Lights	Turns the brake lights on or off. If turned on, the backlight will start flashing at maximum brightness when a negative (regen) current greater than „Brake Lights Amp min“ is detected.	true	true / false
Brake Lights Amp Min.	The minimum negative (regen) current to enable the brake lights. If brake lights are enabled, the backlight LEDs will flash with full brightness for a short period of time.	4A	1 - 10

## SOUNDS

Param	Description	Default value	Possible / Allowed values
Start melody	The melody rESCue should play when the device is started.	Knight Rider	several
Battery warning sound	The melody rESCue should play if the battery level drops below the configured value.		

## BATTERY MONITOR

Param	Description	Default value	Possible / Allowed values
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Min Voltage	The minimum battery voltage. If the battery voltage drops below this value, the lightbar becomes all red and a alarm sound is played.	depends on your battery settings	depends on your battery settings
Low Bat. Warning	The battery voltage for warn tone. If the battery voltage drops below this value, a customisable warning sound is played.	depends on your battery settings	depends on your battery settings
Max. Voltage	The maximum battery voltage. If the battery voltage rises above this value, the lightbar becomes all red and a alarm sound is played.	depends on your battery settings	depends on your battery settings

## CANBUS

Param	Description	Default value	Possible / Allowed values
VESC ID	The ID of your VESC. This value has to be configured accordingly to match the ID of your VESC to make the CANBUS work. You can find the VESC-ID of your VESC in the VESC tool app.	25	numeric
Realtime-Data interval	The interval between two realtime messages rESCue sends to the VESC.	300 ms	200 - 1000
Balance-Data interval	The interval between two balance messages rESCue sends to the VESC.	300 ms	200 - 1000

## NOTIFICATIONS

Param	Description	Default value	Possible / Allowed values
Enable Notifications	Enable notifications If enabled local push notifications will be activated to show warning messages.	true	true / false
Battery Warnings	Notify if battery value is too low or too high, according to the configured values.	true	true / false
Current Warnings	Notify if current value is too high for a amount of time.	true	true / false
DutyCycle Warnings	Notify if DutyCycle value is too high.	true	true / false

**Always stay safe and enjoy your ride!**



**rESCue**

<https://www.rescuestore.net>

<https://github.com/thankthemaker/rESCue>