



REPLACEMENT BOARD  
SERIES2  
De Agostini  
Millennium Falcon  
assembly instructions

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## Replacement Board for deAgostini Millennium Falcon

### Overview

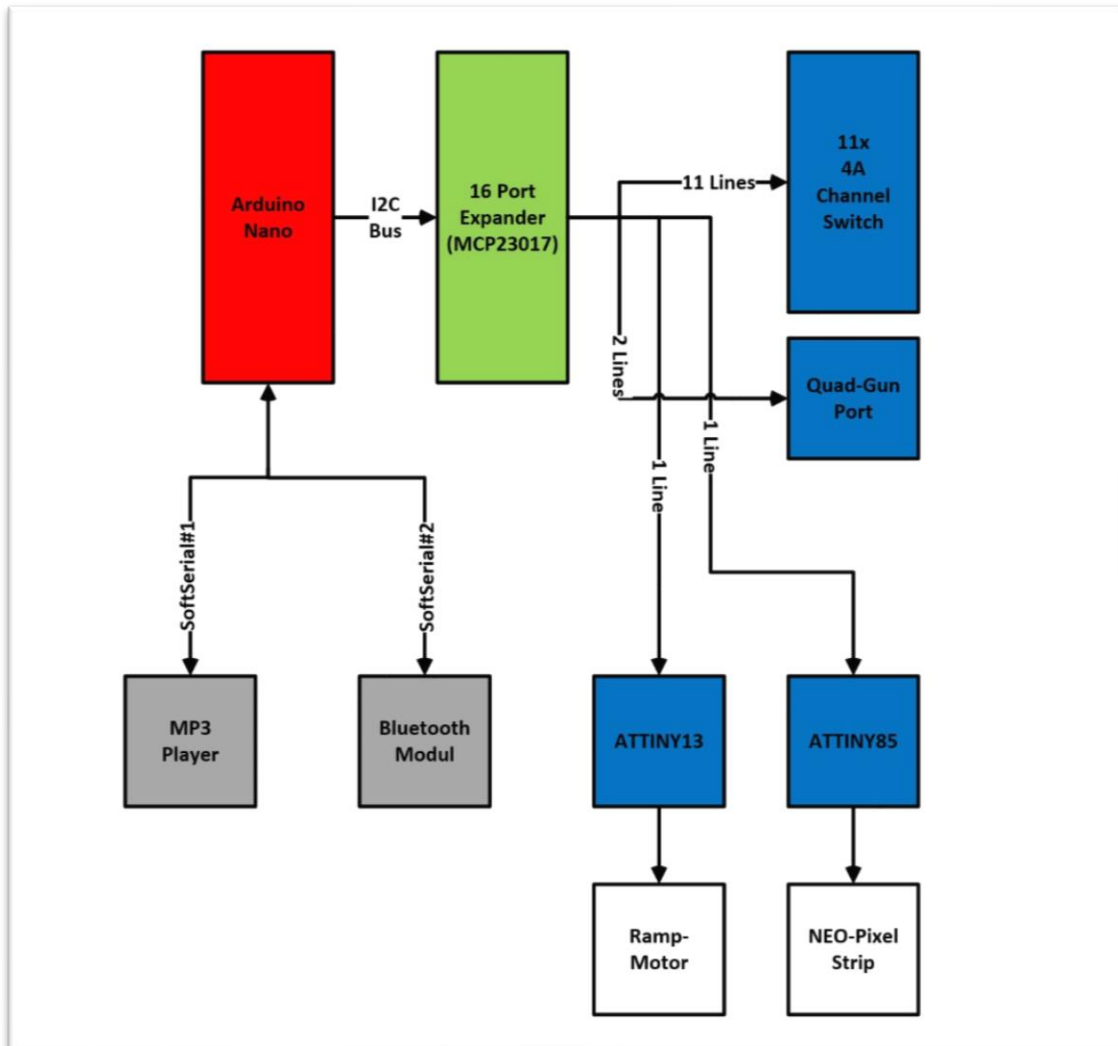


Figure 1 Board Diagram

The board uses an Arduino Nano as a control computer.

16 channels are provided via the I2C bus, 10 of which are for free use, 2 channels control the ramp and the spotlight, 1 channel controls the driving light and 1 channel serves as a "heartbeat" indicator.

Serial channels control the Bluetooth and Sound modules.

For the ramp control an ATTINY13 is used, so that in case of a failure of the Nanos the ramp does not run over the end stops.

The Neopixel module is controlled by an ATTINY85 - so that the Nano is not burdened with the elaborate NEO pixel LED protocol.

Each of the 10 freely available channels can be used with max. 4A burdened. The desired voltage for the channel can be set by means of a jumper. Either 5V from the board's own step-down regulator or with the used power supply voltage.

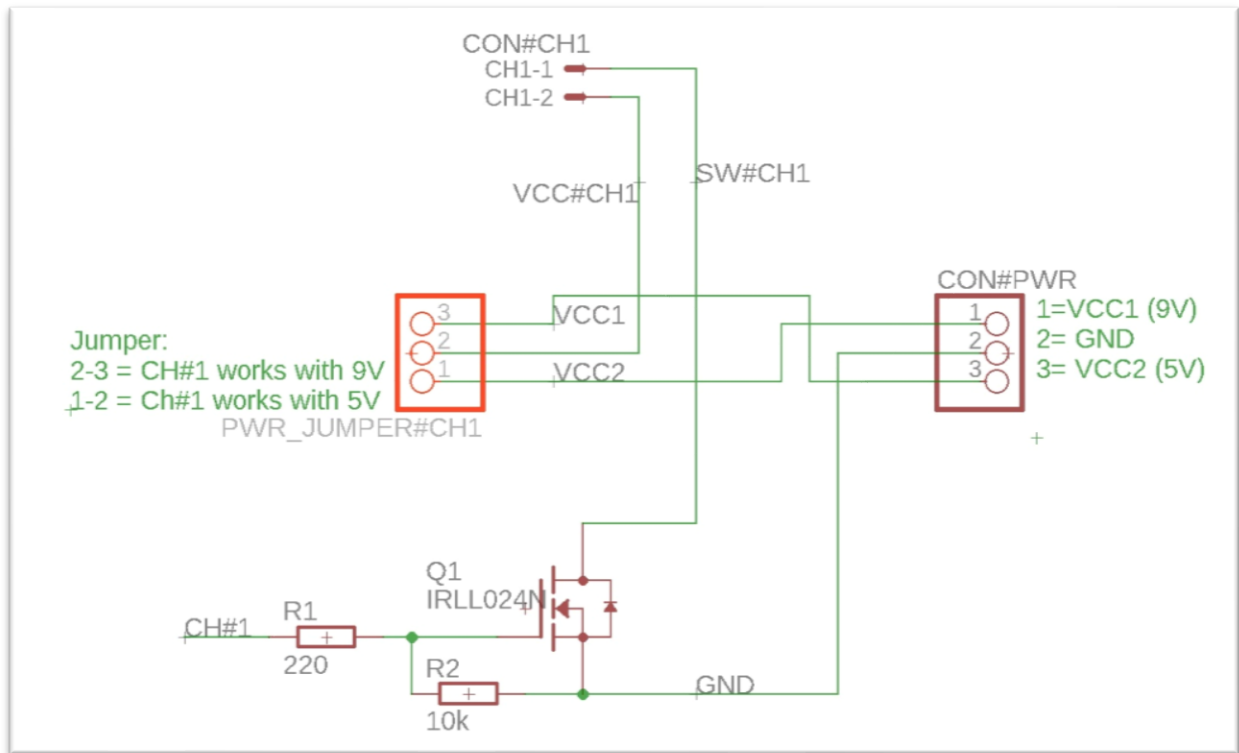


Figure 2 4A channel switch schematics

Figure 2 shows the circuit of a channel from the board.

Name	Description	Notes
CH#1	Connection to the port expander	can be set per app, whether static, flashing or flickering
Q1	4A MOSFET	electronic switch
CON#PWR	3Pin connector	Connection of power supply / step down control
PWR_JUMPER#CH1	jumper connector	Selects the voltage of the channel
CON#CH1	JST-XH2	connector for LEDs, etc.
VCC#CH1	Voltage +	Selected voltage
SW#CH1	GND	GND - switched by Q1

If the channel is activated via app, the mosfet Q1 switches the connection CH1-1 to GND.

This means that the voltage set on PWR\_JUMPER#CH1 is routed from CON#PWR via VCC#CH1 to CH1-2 through the connected load.

The pin assignments for channels 1-10 are identical to those on the deAgostini board.

## Delivery

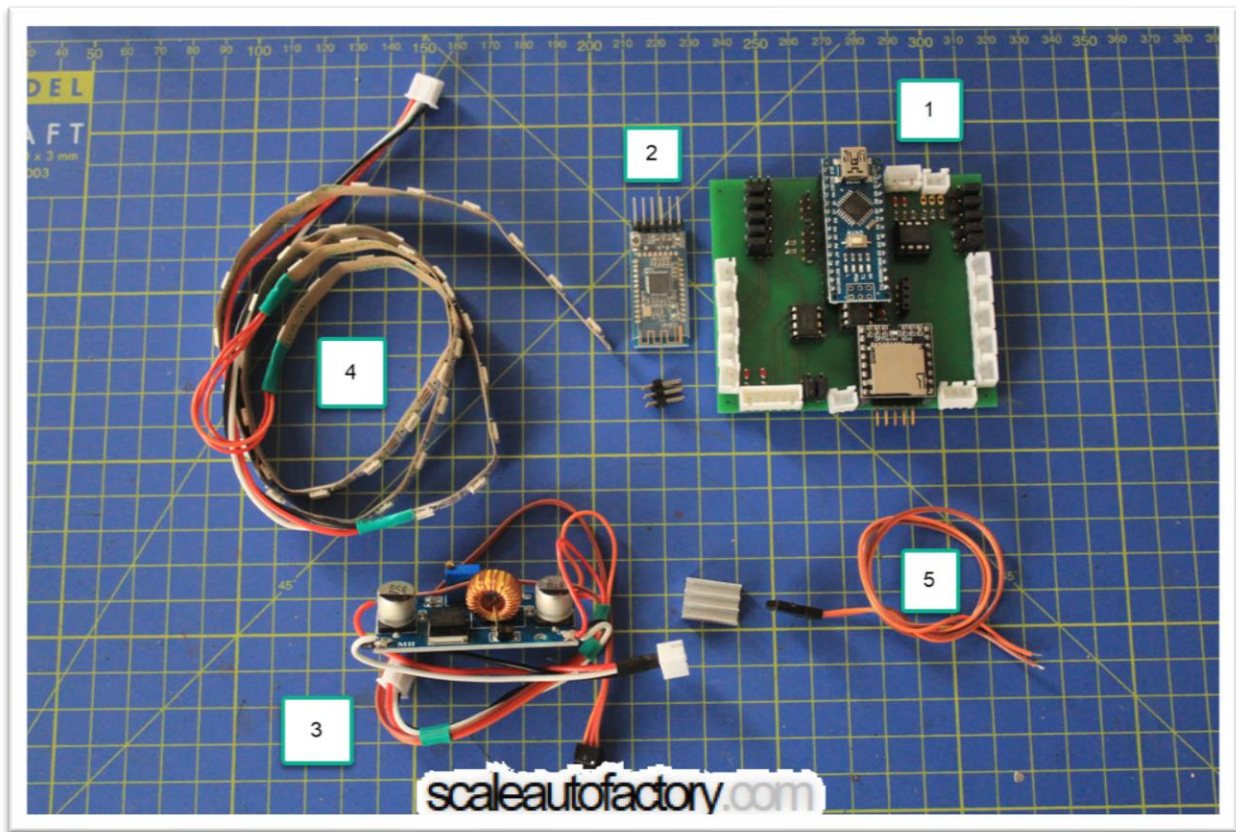
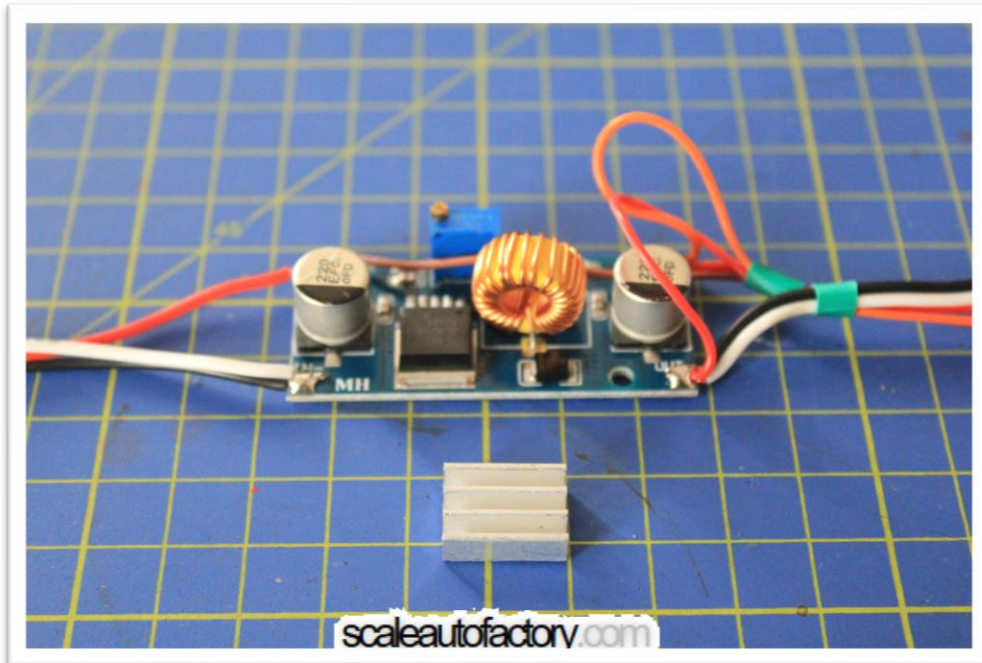


Figure 3 Delivery of Replacement Board with Neopixel

Number	Description
1	Board
2	Bluetooth module
3	5V step-down module
4	Neopixel strip
5	speaker cables 2x

## Hints

- All channel power connections jumper set to power supply voltage
- The 5V step-down module comes with a heat sink, which should be mounted when 3A power is required - during normal operation without additional loads, the heat sink is not needed.



*Figure 4 Step-Down-Modul*

- The 6 pin connector is for the Nano and is not normally needed.
  - The mounting holes in the board must be drilled out with a 2.5mm drill bit
  - When connecting non-original deAgostini lighting, pay attention to the values of the lighting set - voltage, current, pin assignment.
- The board is pin-compatible with the deAgostini board.

## Montage

### Board pinout

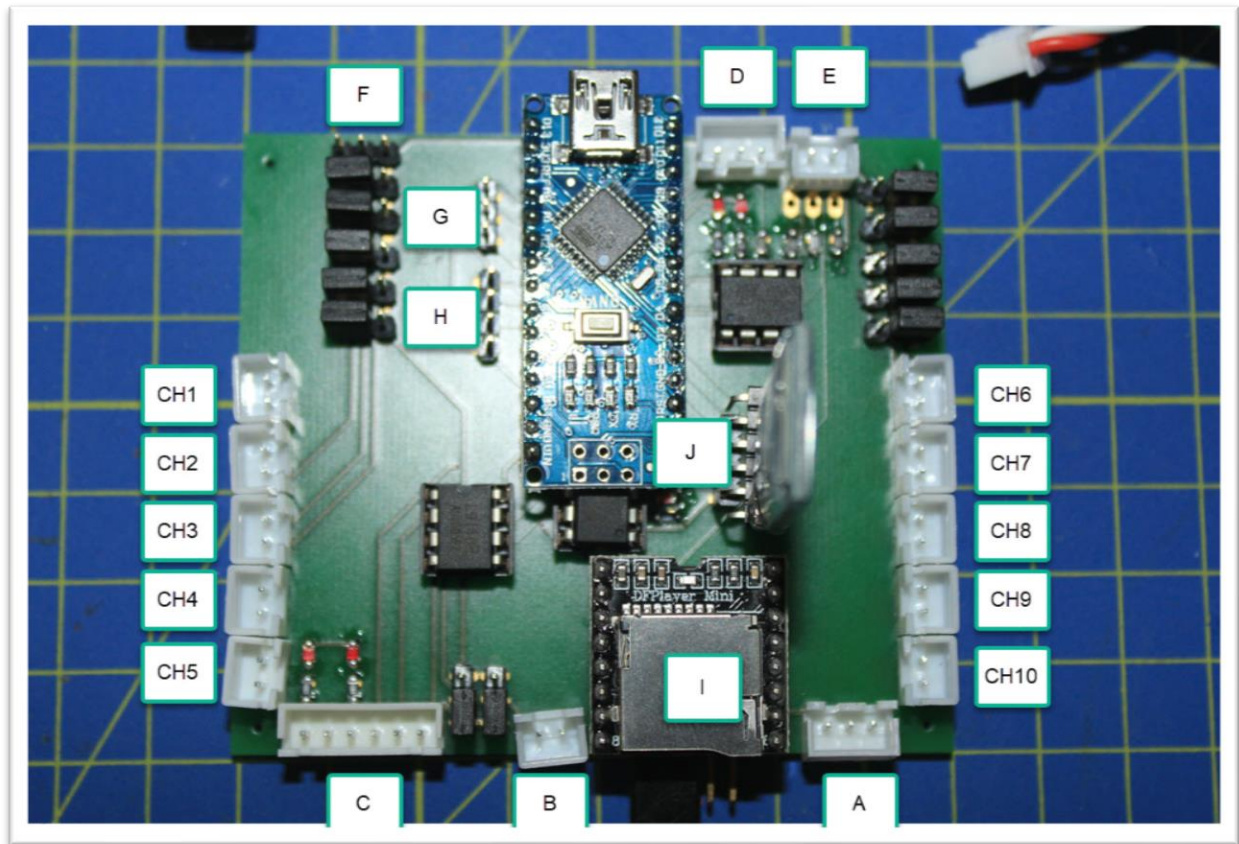


Figure 5 Replacement Board pinout

Number / Letter	Description
<b>CH1-10</b>	channel
<b>A</b>	5V step down module
<b>B</b>	spotlight
<b>C</b>	ramp engine
<b>D</b>	Neopixel Strip
<b>E</b>	support board (if available)
<b>F</b>	channel power supply terminal
<b>G</b>	quad-gun (if available)
<b>H</b>	I2C expansion port
<b>I</b>	sound module
<b>J</b>	Bluetooth module





*Figure 6 Mounting Area*

It is recommended to insulate the frame under the board with thin textile adhesive tape. The board must be installed with the USB connector facing the drive box.

## Replacement Board LEDs

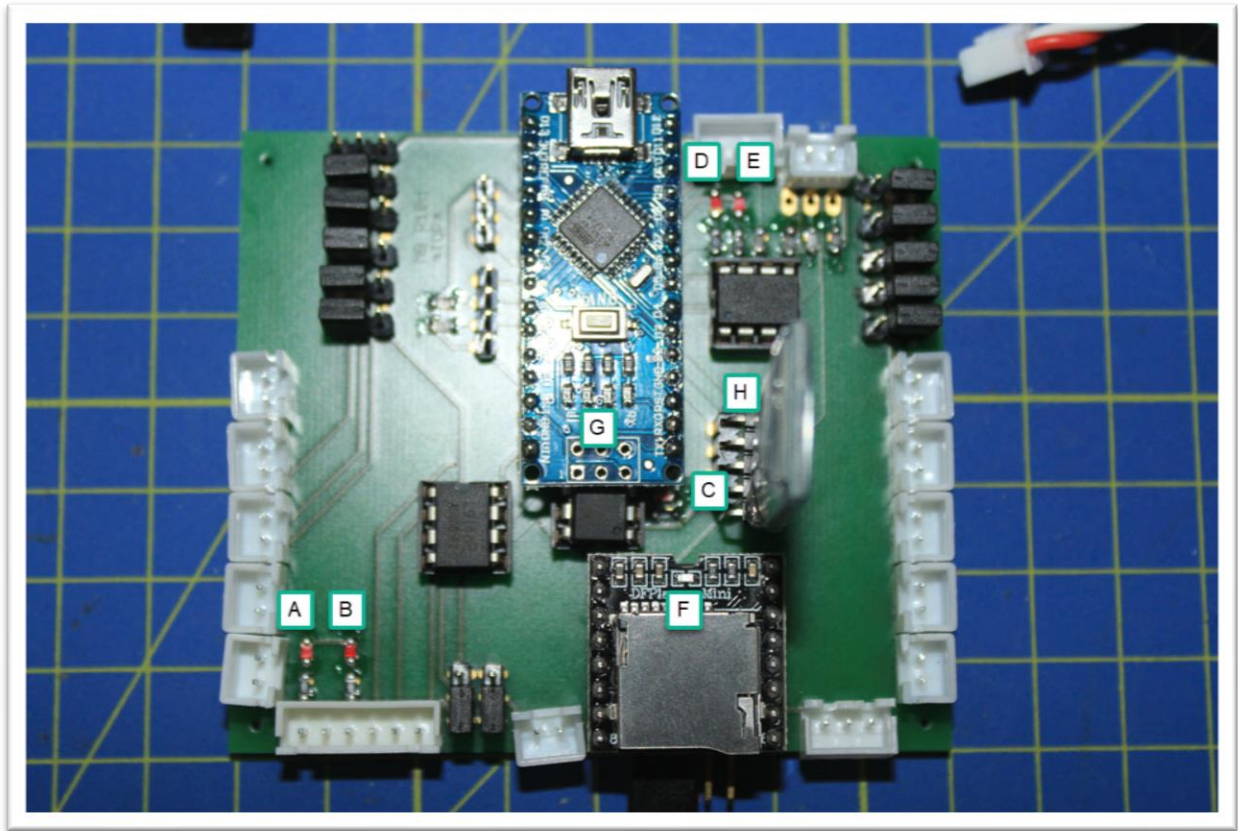


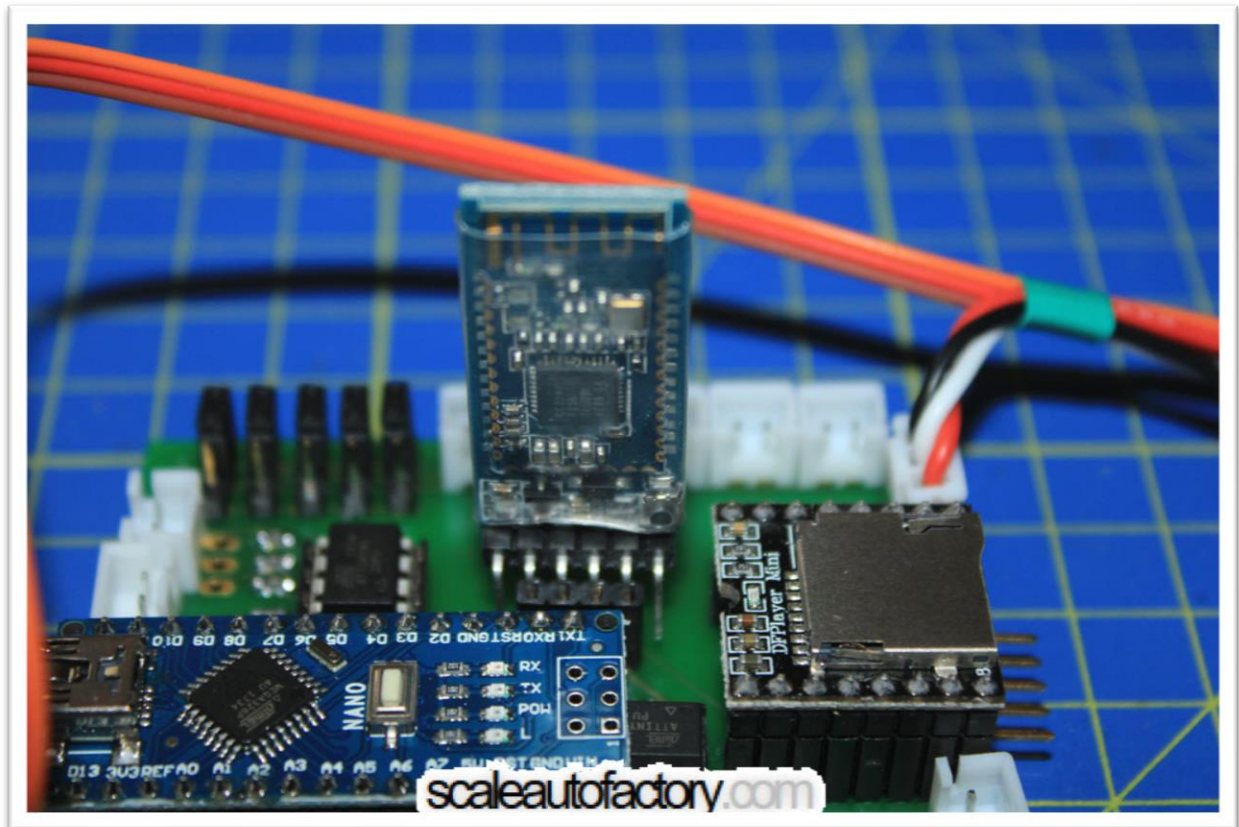
Figure 7 Replacement Board Leds

LED	Description
A	ramp upper end stop
B	ramp lower end stop
C	ramp up
D	heartbeat indicator board
E	heartbeat indicator Neopixel module
F	MP3 module plays a sound file
G	Indicator LEDs Nano
H	indicator LED Bluetooth module, flashing: no connection

The LEDs D and E flash regularly when the board is in operation.

The LED H flashes if there is no Bluetooth connection and lights up permanently when a connection to the Bluetooth application is established.

## Bluetooth Module



*Figure 8 Bluetooth Modul*

The Bluetooth module is plugged into slot J (see picture Figure 5 Replacement Board pinout on page 5).

The outer connections 1 and 6 remain unused.

The component side of the Bluetooth module must point to the Nano.

## Channel power connector

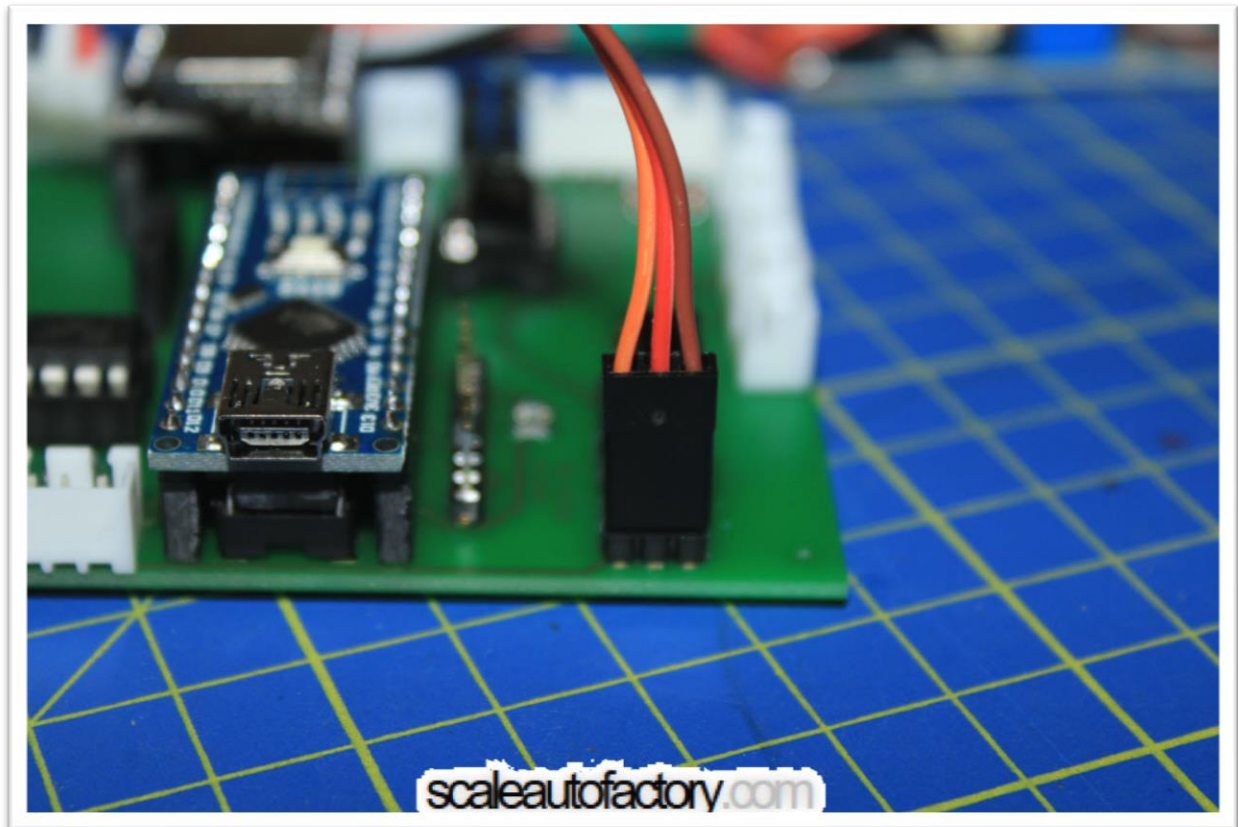


Figure 9 Channel power connector

Plug the 3-pin servo cable from the 5V step-down converter into slot F (see picture Figure 5 Replacement Board pinout on page 5).

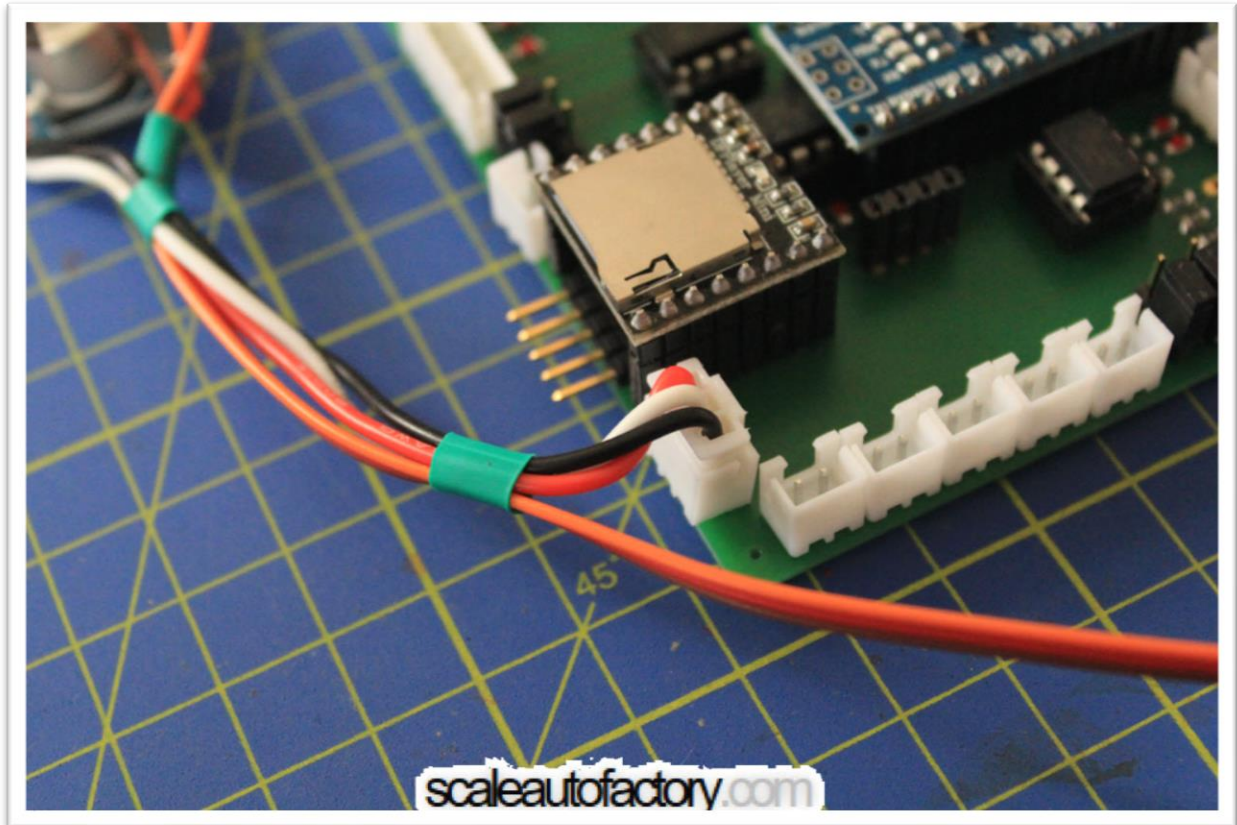
Color	Description
Orange	5V
Red	Ground
Brown	Power Supply Voltage

Orange cable must point to the nano.

Depending on how the jumper is plugged, 5V or the power supply voltage are applied to the channel.

Delivery state: all channels on power supply voltage

## 5V connector



*Figure 10 5V connector*

Plug the 3-pin JST-XH connector from the step-down module into connector A (see picture Figure 5 Replacement Board pinout on page 5).

## Channel connectors

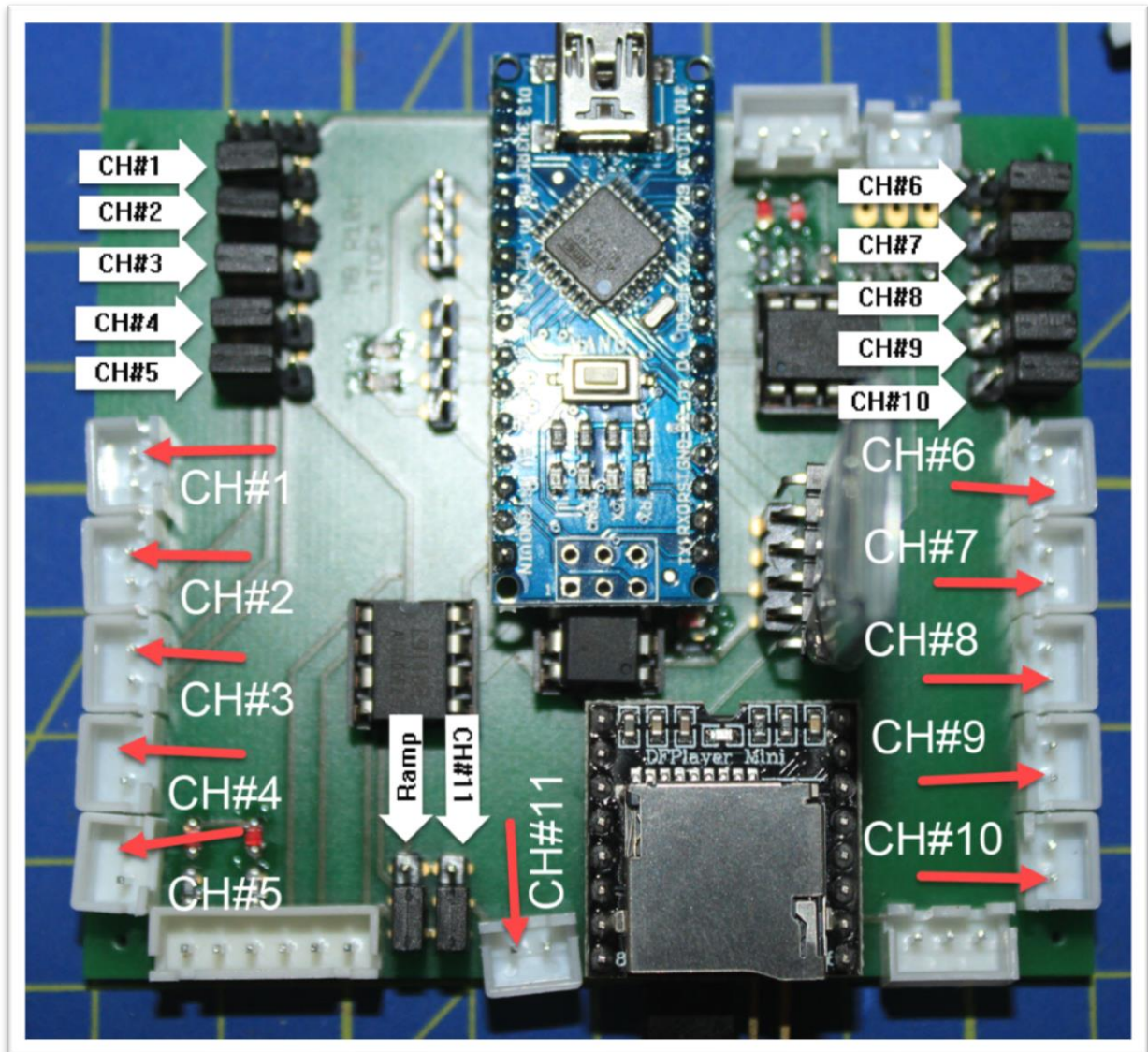


Figure 11 Channel connectors

Figure 11 shows the assignment of the channel connections.

The jumpers select the supply voltage for the respective channel.

If the power supply is connected as shown in Figure 10, then all channels are operated with the power supply voltage with the jumper positions set in Figure 11.

**IMPORTANT: do not connect any voltage instead of the jumpers -> Danger of destruction!**

The red arrows on the channel connections indicate the plus pole of the supply voltage.

## Quadgun Connector

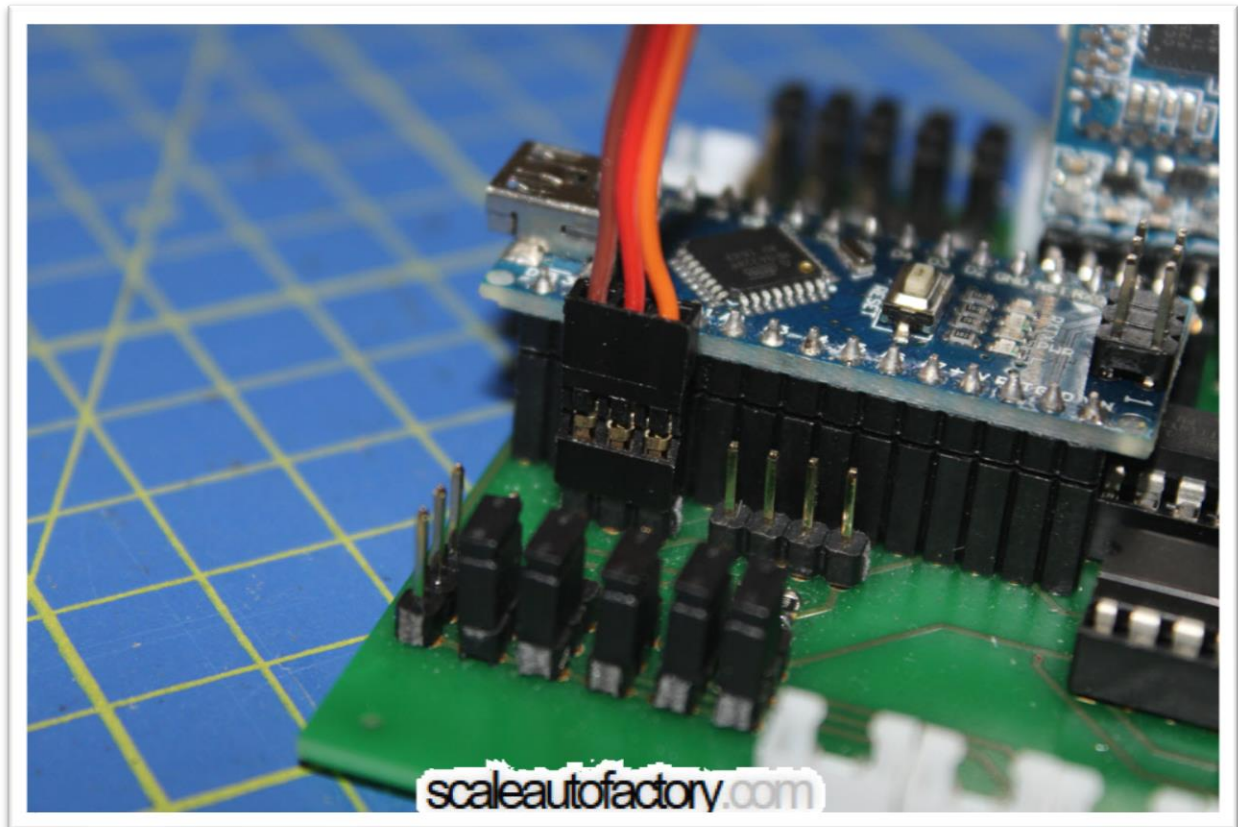


Figure 12 Quadgun Connector

The Quadgun Connector can be used with the optional at shapeways.com available replacement guns.

The connector is ready for plugin of a servo-cable to light on the quad gun.

Figure 12 shows the connector with a plugged servo cable.

Color	Usage
Orange	Quadgun CH#1
Red	GND
Brown	Quadgun CH#2

Each Quadgun Channel can draw a maximal current of 15mA.

The voltage is set to 5V.



*Figure 13 shapeways quadgun equipped with 0401 LEDs*

Figure 13 shows a finished quadgun.

Each barrel has 2 0401 LEDs.

The top two barrel are connected to Quadgun CH # 1 and the other two barrel are connected to Quadgun CH # 2.



Sound-Module (optional)

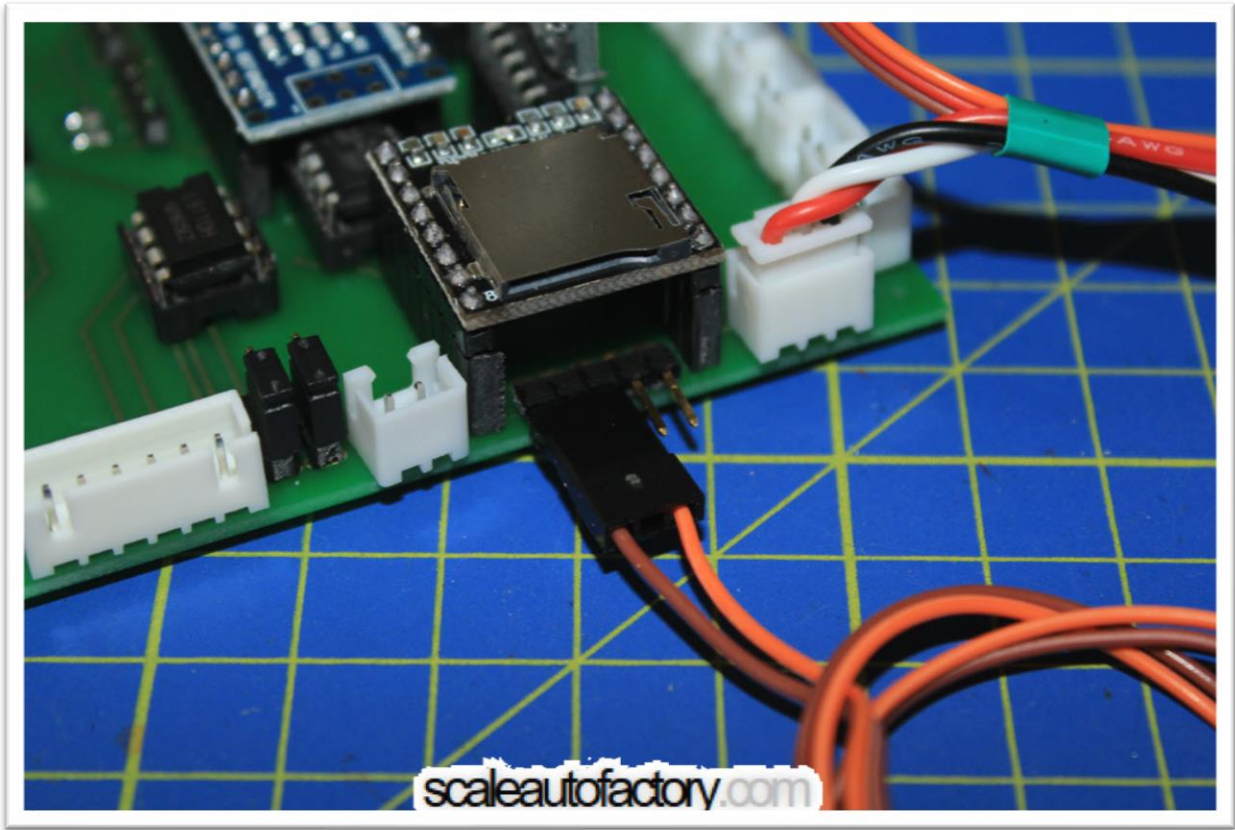
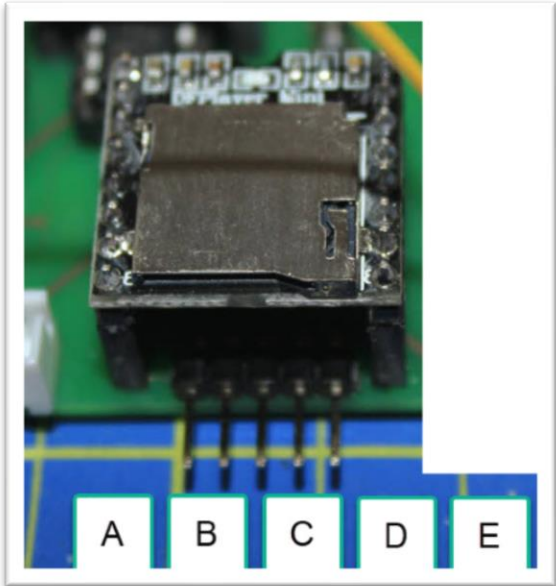
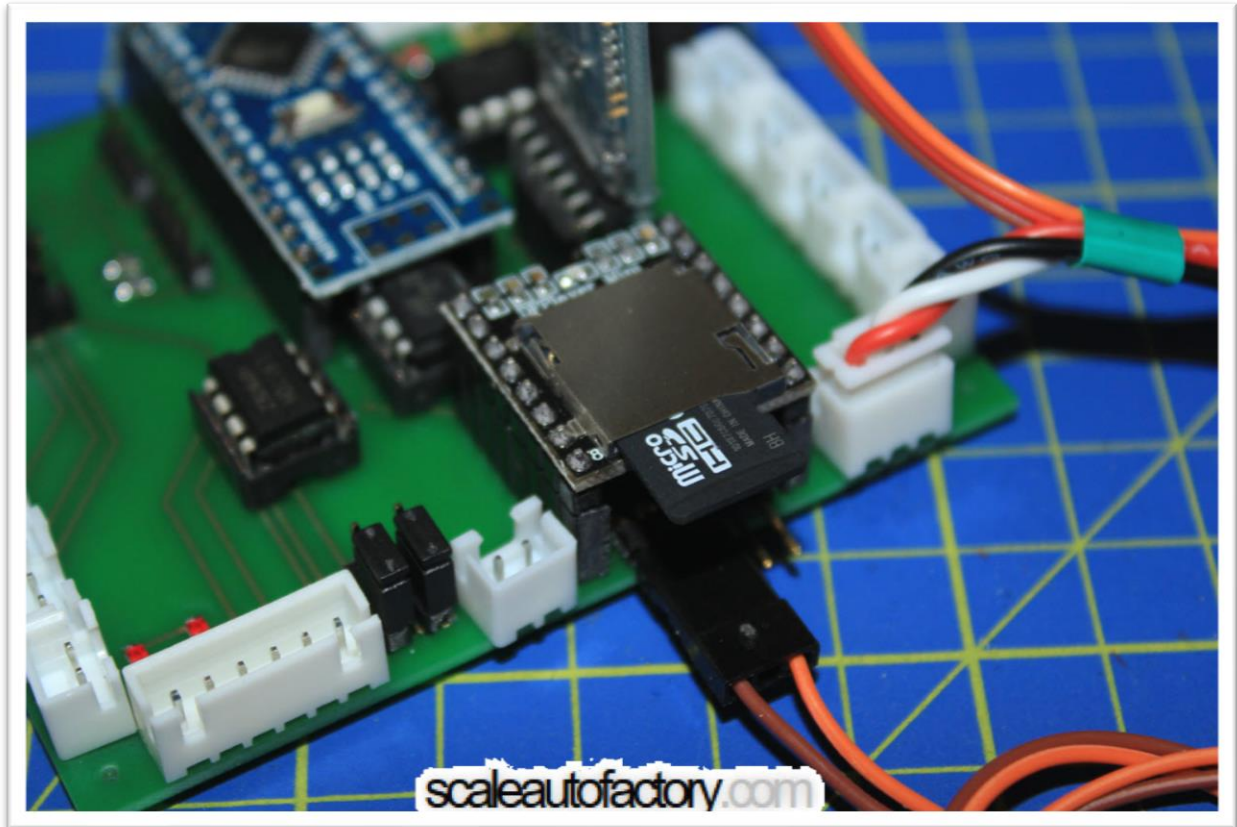


Figure 14 Sound-Modu



Connection	Usage
A	speaker
B	common
C	speaker
D	amplifier right
E	amplifier links



*Figure 15 Lautsprecheranschluss*

Solder the speaker with the enclosed 2-pin servo cable and connect it to the sound module connector.

Insert SD card into the sound module.

## Neopixel-Strip (optional)

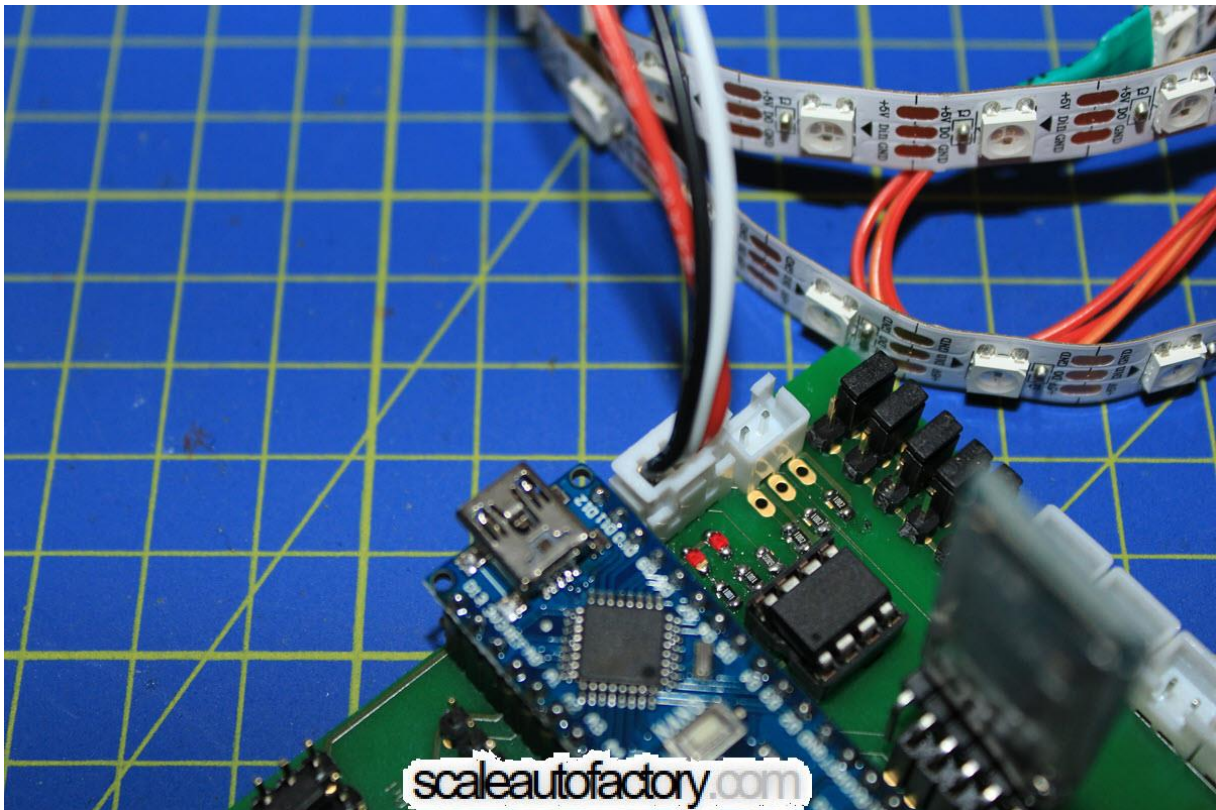


Figure 16 Neopixel-Strip-connector

The 3-pin cable of the Neopixel strip is connected to port D (see picture Figure 5 Replacement Board pinout on page 5).

## Support board (optional)

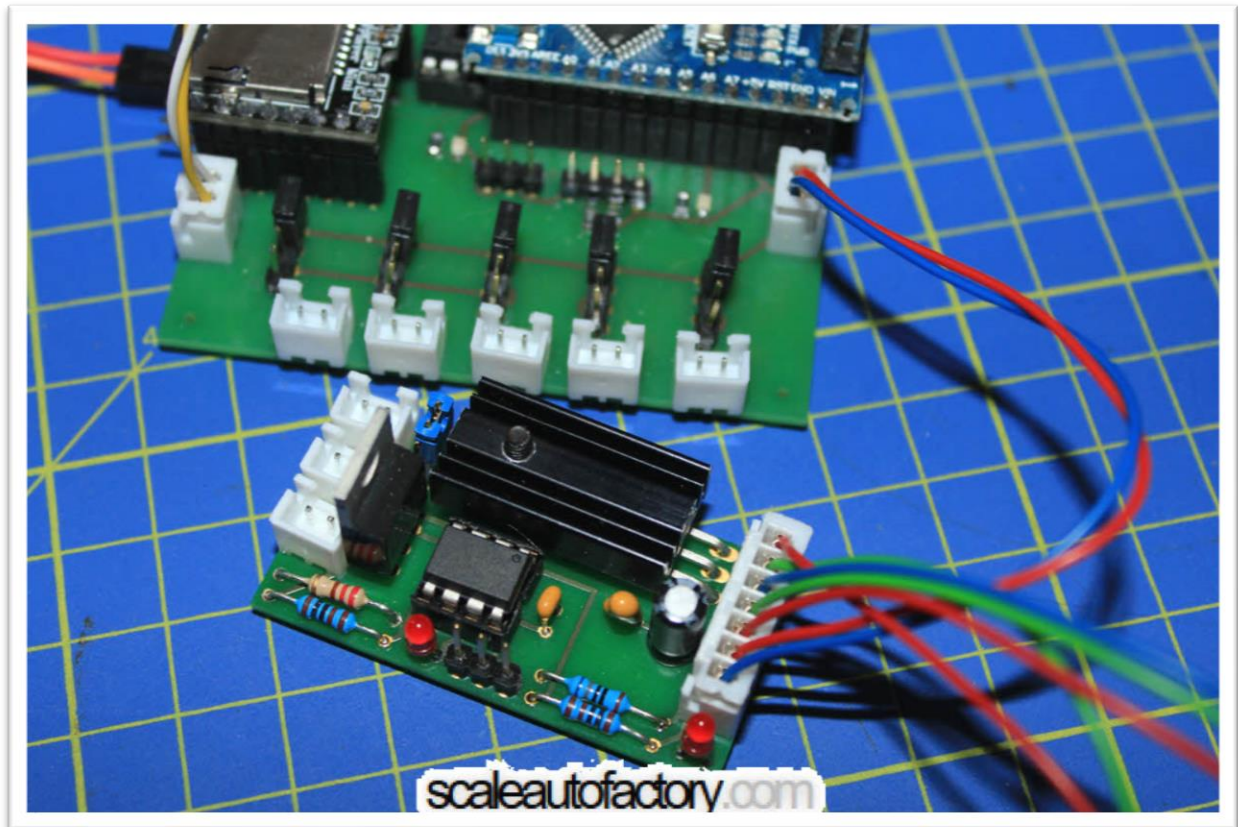
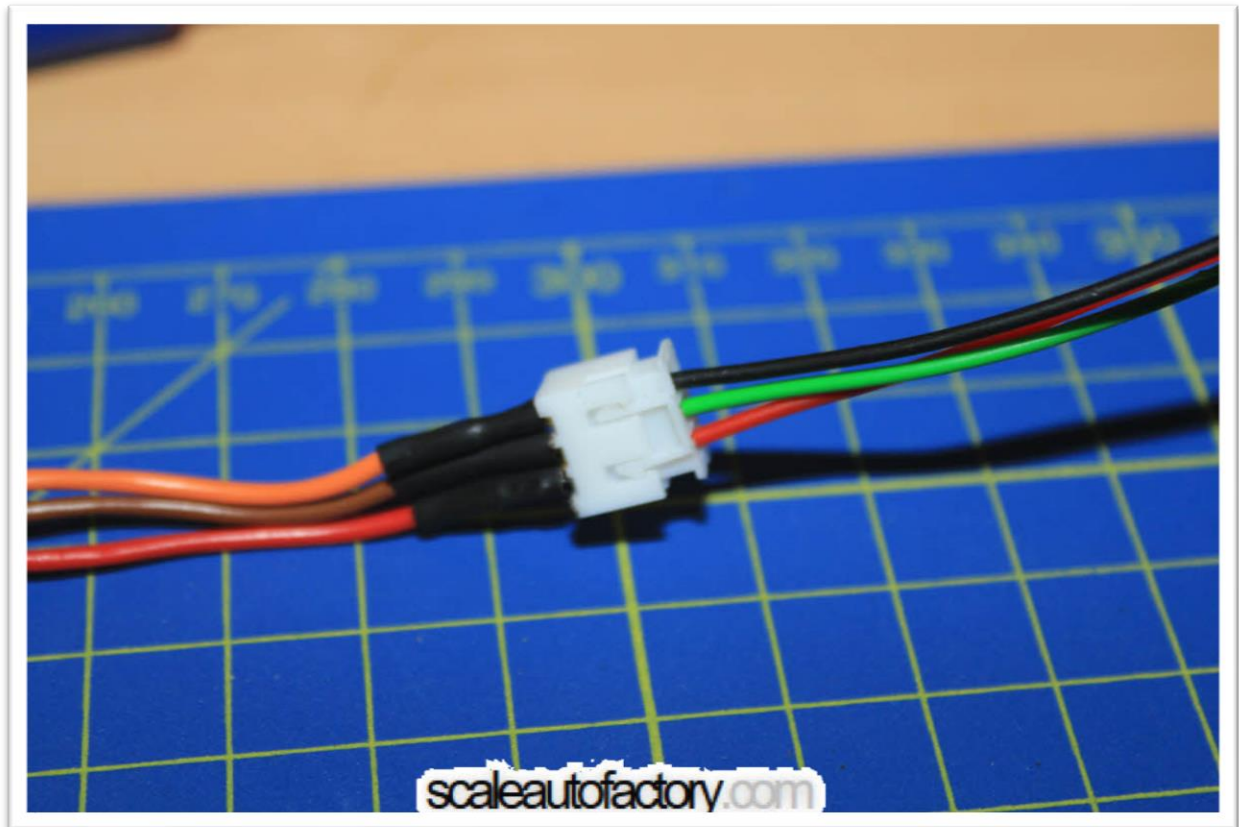


Figure 17 Support-Board connector

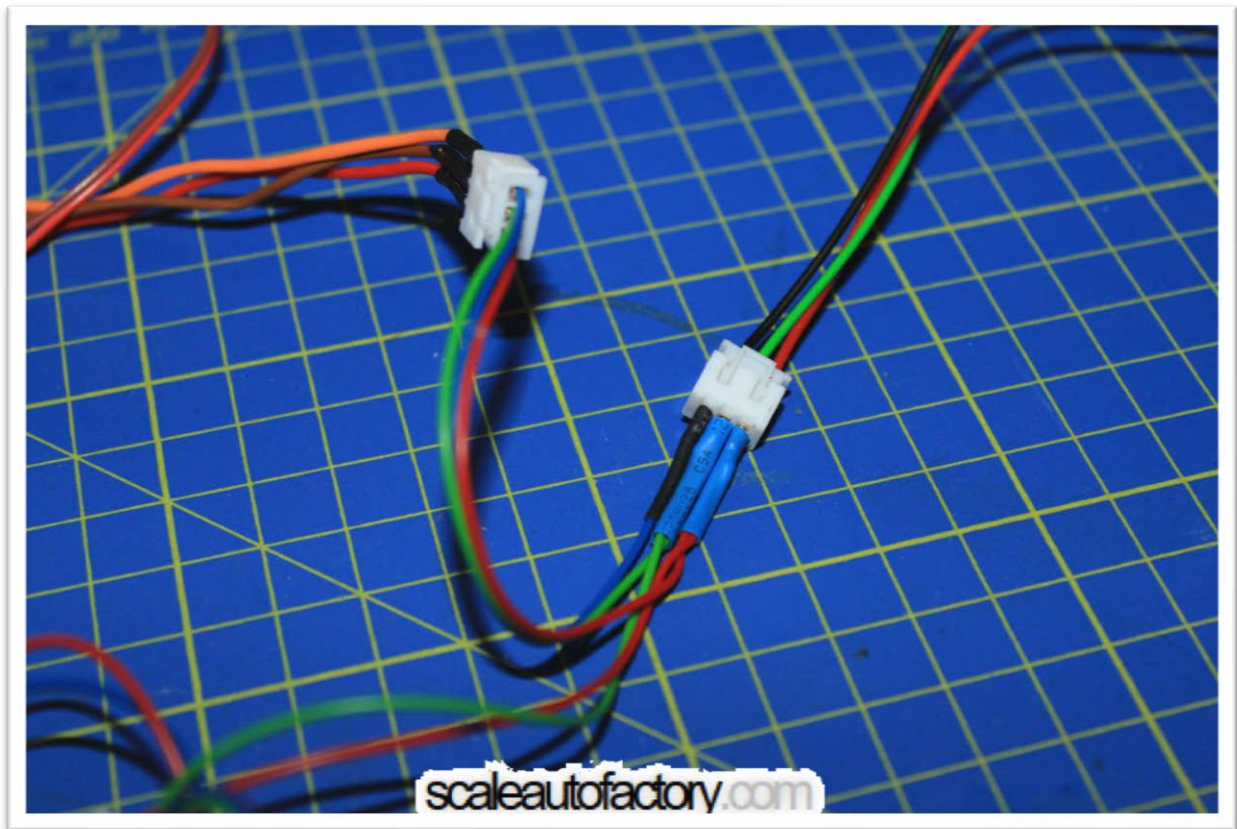
The optional add-on module (support board series 1 to 3) is connected to port E (see picture Figure 5 Replacement Board pinout on page 5).

## Power connector



*Figure 18 power connector (without support-board)*

When operating the Replacement Board without a support board, the power supply cable from output 57 will be connected directly to the 5V step-down module. This allows you to use the switch and power supply socket of deAgostini.



*Figure 19 power connector with support board*

When using the support board, the power supply cable from # 57 is plugged into the corresponding Y-cable connector on the support board.

The 5V step-down module connects to the connector of the Y-wire of the support board.

This allows you to use the switch and power supply socket of deAgostini.

## Sound Module

The module

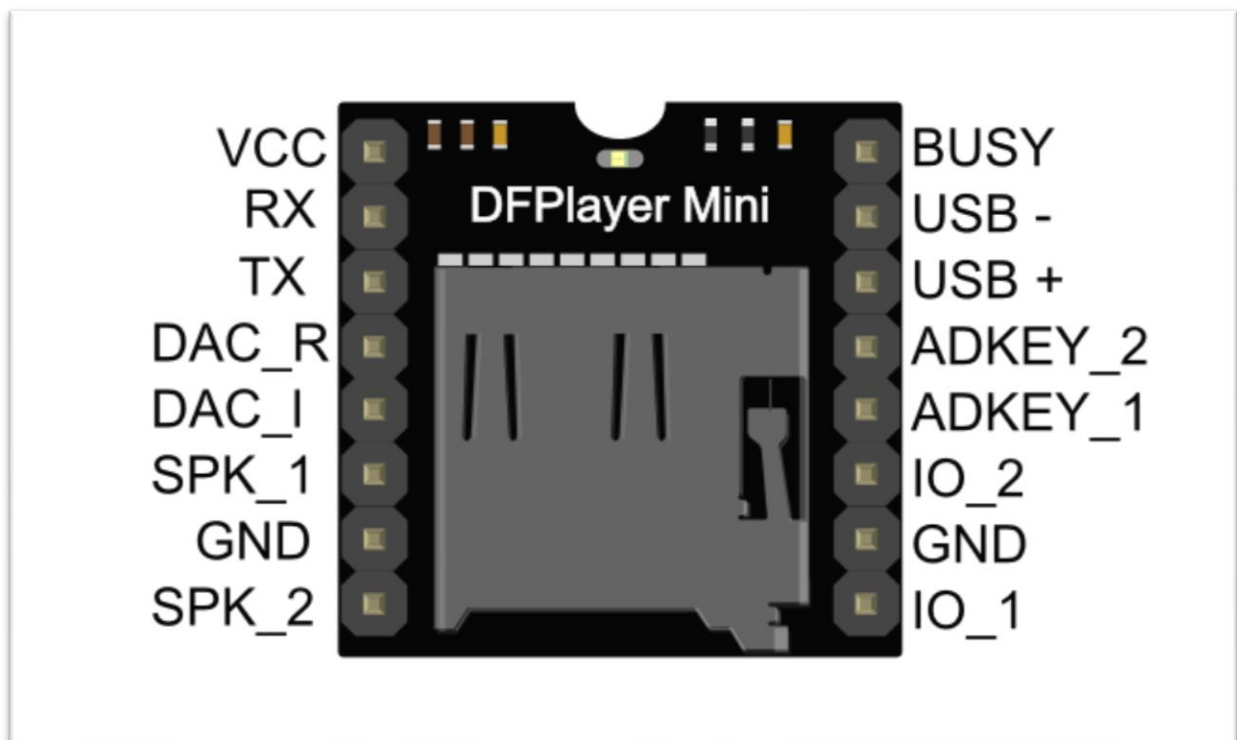
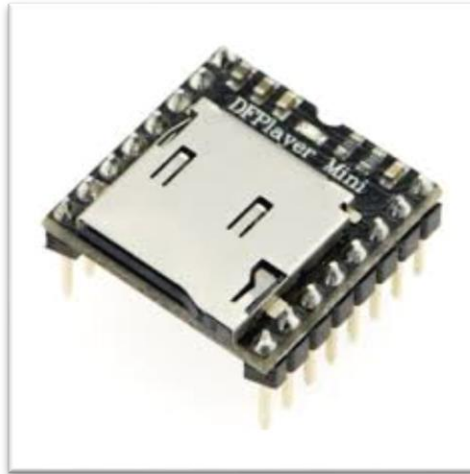


Figure 20 Sound Modul

The sound module is the DFPlayer Mini. This is controlled by the serial interface of the Nano.

The blue LED on the module indicates playing a sound.

When a sound is played (eg channel 1 is turned on) and another sound is activated (eg channel 2 is switched off), the current sound is immediately replaced by the next selected sound - the current sound is ended immediately to start the next sound afterwards.

## Sound-Files

The sound files are stored on a micro SD card, max. 32GB in size.

The mp3 files must be stored in a specific directory structure.

Root

```

01
    001_{songtitle}.mp3
    ...
    255_{songtitle}.mp3
...
12
    001_{songtitle}.mp3
    ...
    255_{songtitle}.mp3
99
    001_{songtitle}.mp3
    ...
    255_{songtitle}.mp3

```

Directory	Description
<b>01 to 10</b>	sound files for the corresponding channel
<b>11</b>	sound files for the ramp.
<b>12</b>	sound files for drive

The directory 99 is the so-called system sound directory, which contains all the sound files used by the board program.

System sound	usage
<b>001</b>	board system launch performed
<b>002</b>	Quad Gun Sound 1
<b>003</b>	Quad-Gun Sound 2
<b>004</b>	Bluetooth connection established

The sound files can be overwritten with own sounds.

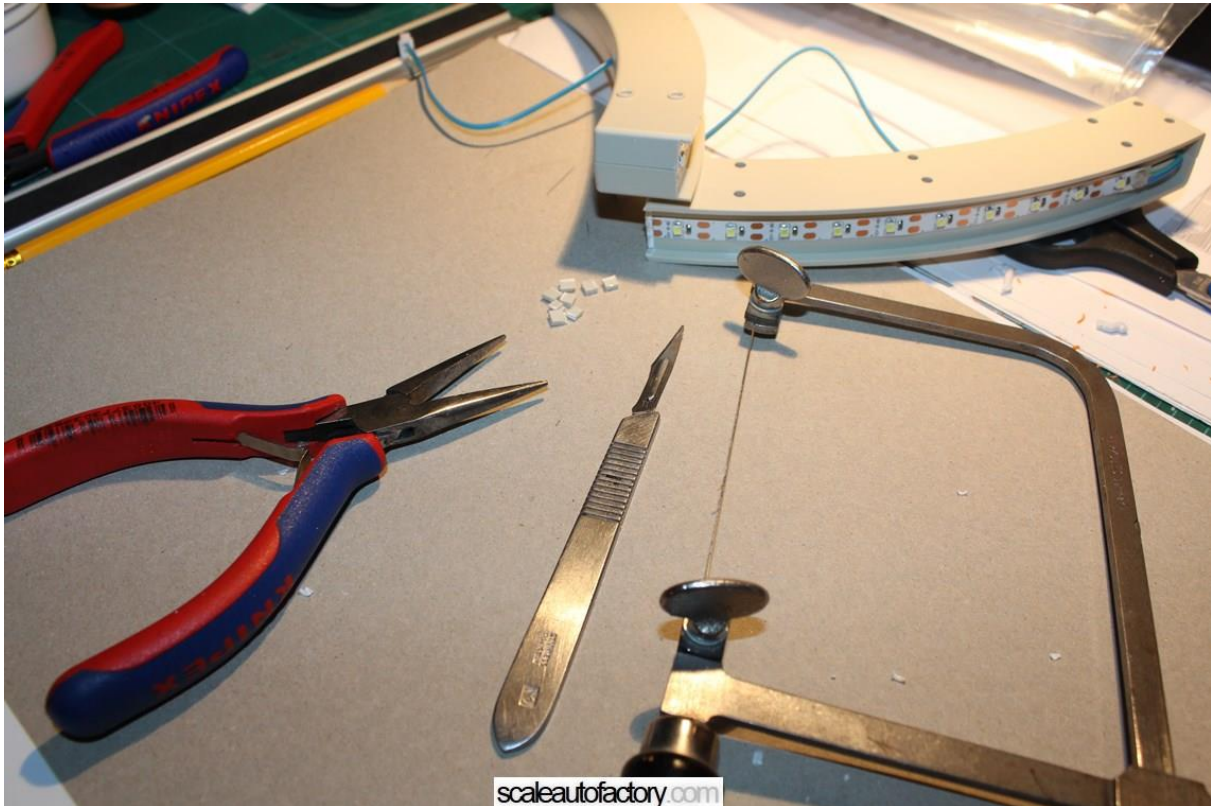
Basically:

- Directories are numbered from 01-99, effectively only the directories 01-12 and 99 are currently used.
- The other directories (13-98) can be used for own sound files, these can be played with the help of the App-Sound-Player then targeted.
- Sound files must begin with a three-digit number: 001 to 255. Then the title name can be added.



## Adjustment of the engine parts for the neopixel strip

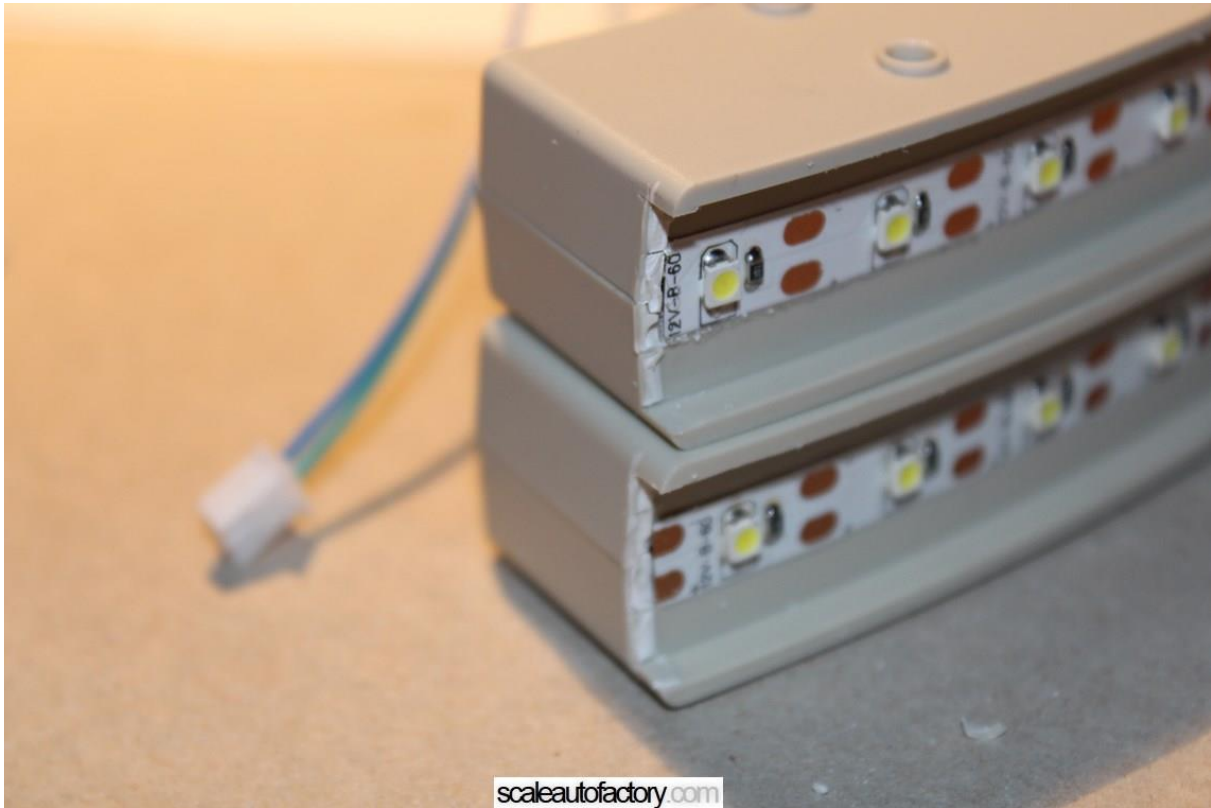
1. Required tools: plier, scalpel or sharp knife, hacksaw or similar



2. Use the hacksaw to make the appropriate cuts on the two edges of the housing



3. Carefully break out the parts between the cuts with the pliers



4. Smooth the breaklines with a scalpel or a sharp knife



*Figure 21 2x22 LED Neopixel strips*