USA Trains SD70 en

Here we would like to show the retrofit of an American SD70 of USA Trains.

Alternatively you can also use a XLS for XXL + S, which depends on how much you want to charge your locomotive.
For locomotives which have little load or driving in traction it is enough to use a XLS decoder!
However, you then give up the special effect of the delayed startup of the locomotive at fast high speed motor.

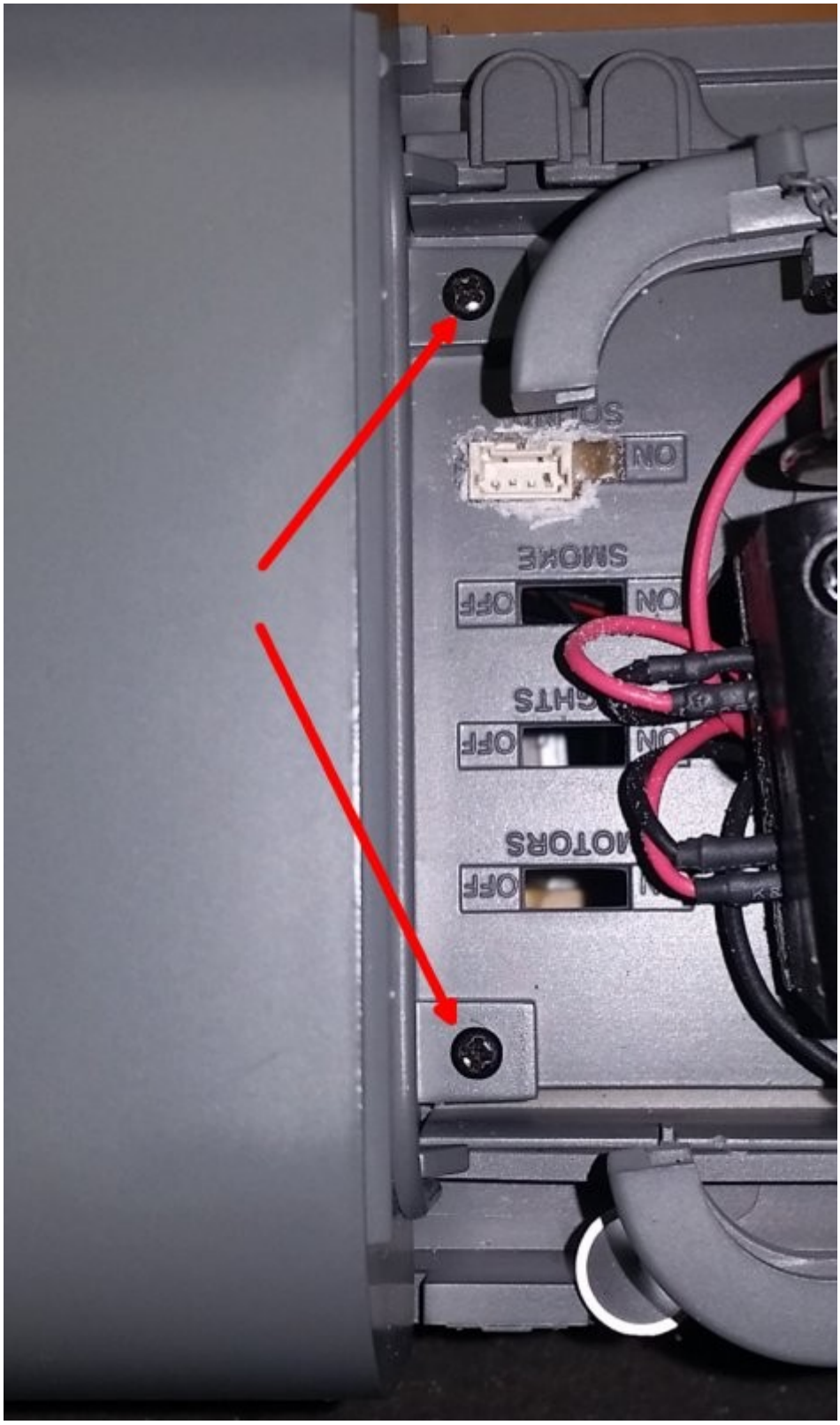
Easy retrofit, only sound and driving Decoder

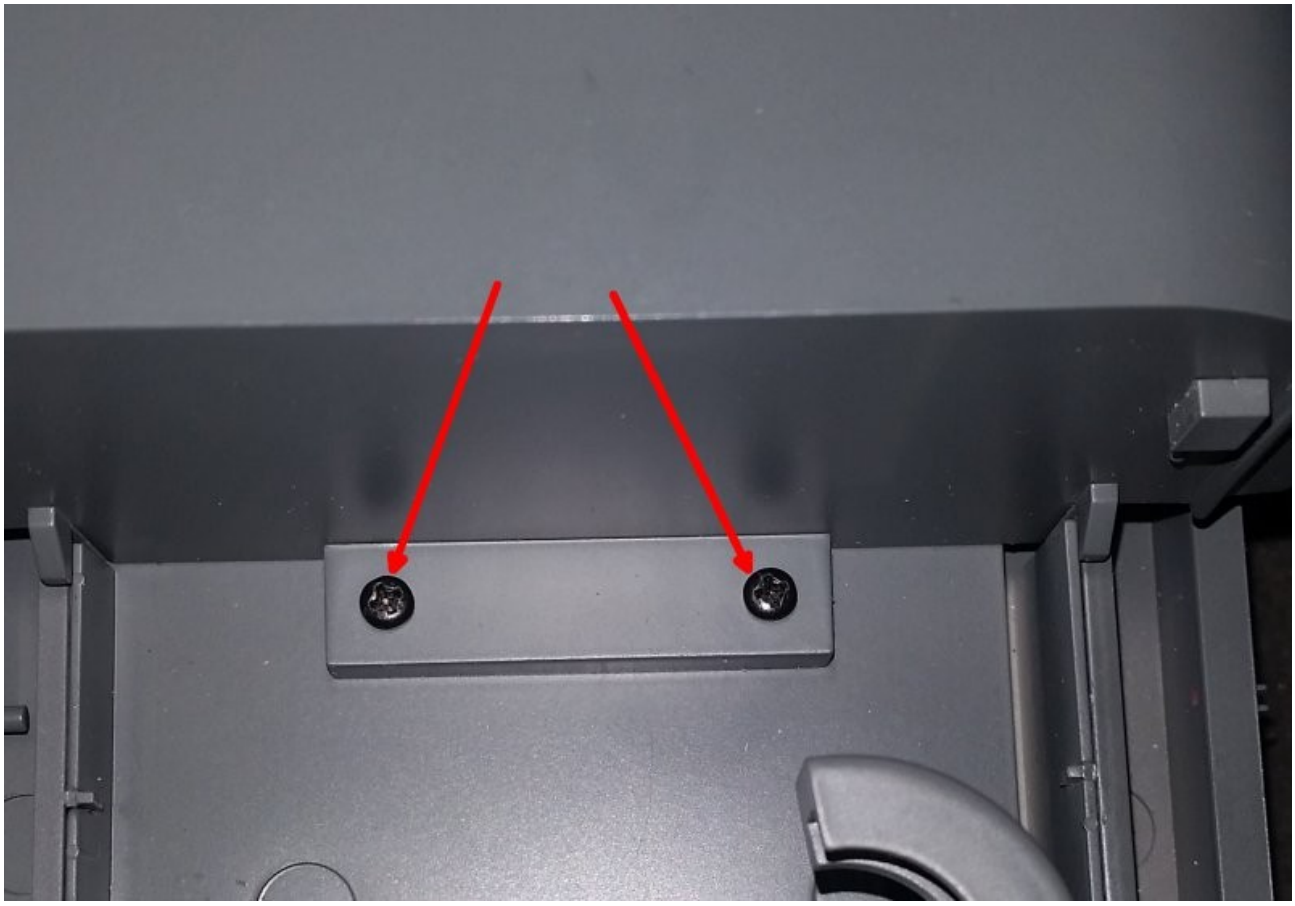
In the first part we describe the simple conversion with XXL and S Decoder
Following parts will be needed:

- 1 x Massoth XXL Decoder
- 1 x Massoth S Decoder (for the time being with Genesis sound, the SD 70 sound still follows)
- 1 x Speaker Visaton FRS 7
- 2 x Resistors 2,2KOhm
- braided wire

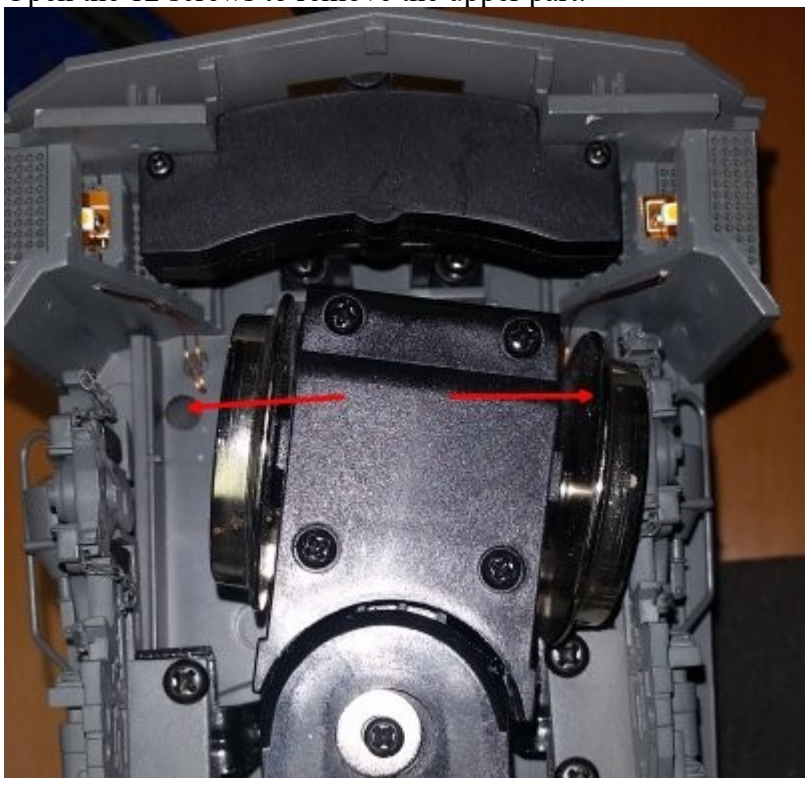
First you have to open the locomotive, thereto it is necessary to turn this on a foam pad on the head.

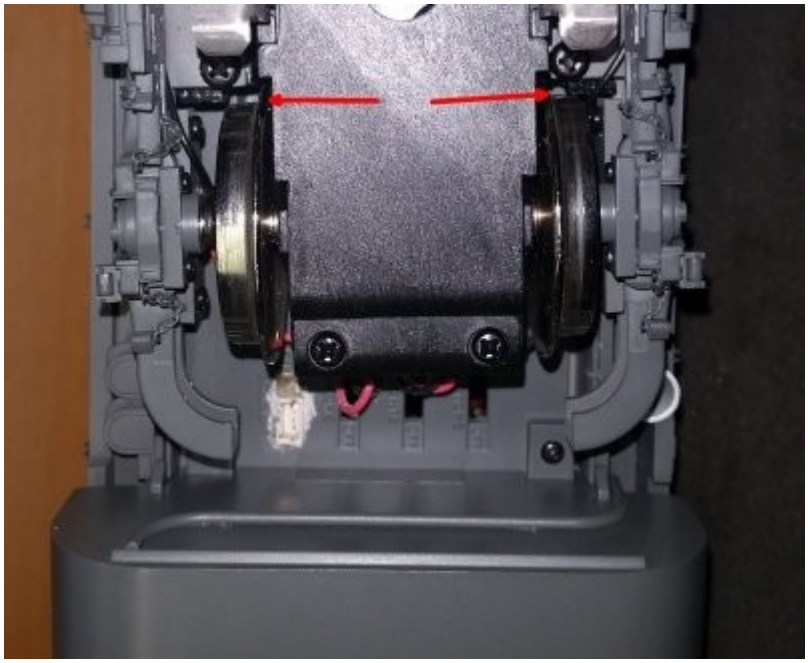
Now remove the tank with the 4 screws.

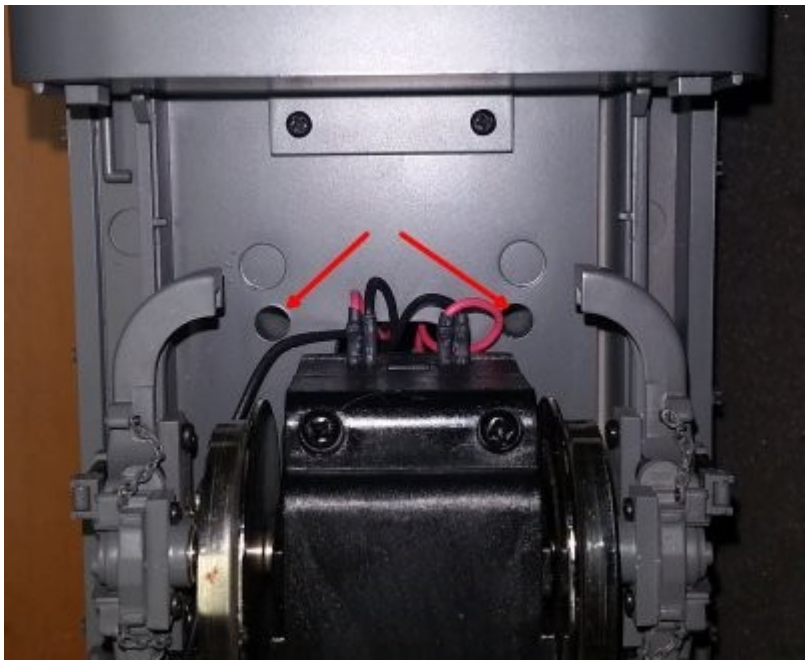

NO
SMOKE
OFF
NO
OFF
NO
OFF

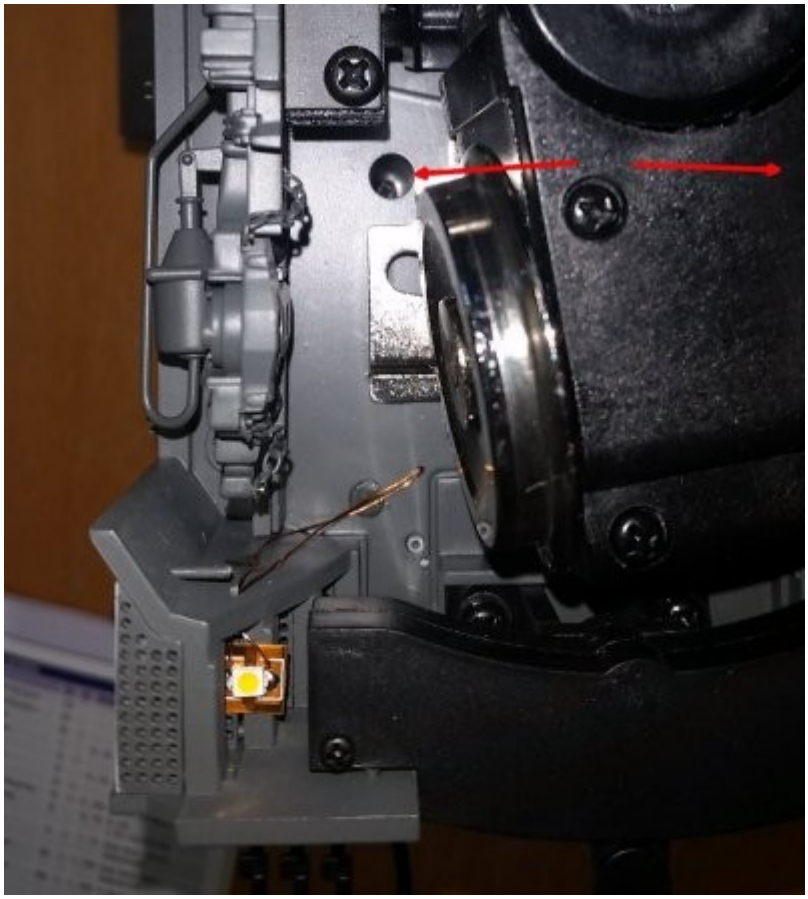


Open the 12 screws to remove the upper part.





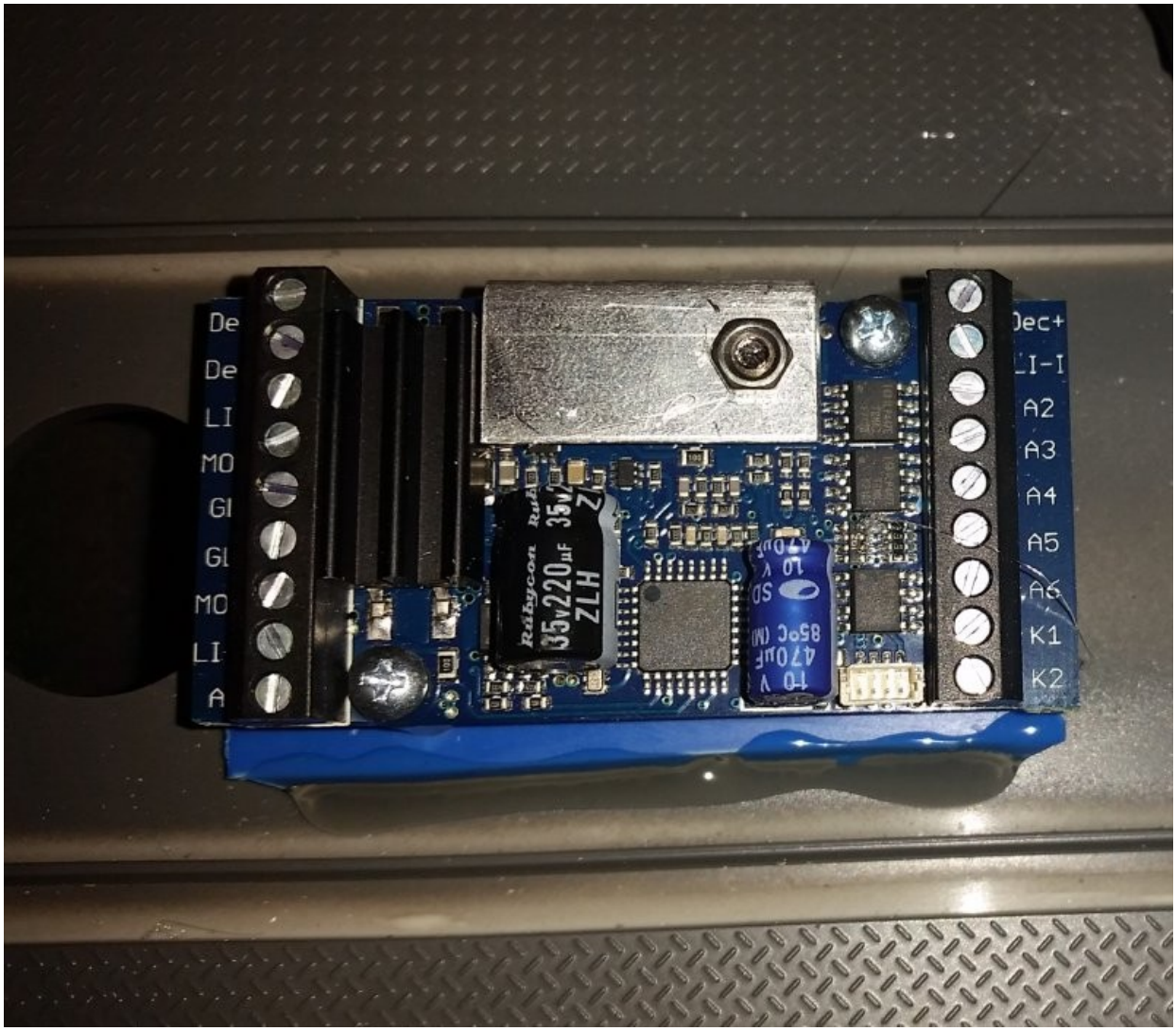




You can find the screws in the round indentations.
Four Depending on the bogies.
Two in the middle of the loco.
VERY IMPORTANT! The cab is once more fixed with 2 tiny screws.
These are located on the ground at about the end of the cab.
Now turn over the loco and carefully lift the upper part.
IMPORTANT!! At the front is a very short connector for front lighting, first pull it off.
Then you can remove all the cables from the central board of the locomotive.
The original vaporizer can not be controlled by the decoder, therefore I don't decribe the connection for it.
The central board may be removed. It is conceivable, not to remove the board only for the evaporator, which we did not tested.
In detailed report the installation of the pulsed smoker of Massoth is shown.

The entire lighting in the locomotive is designed for 5V, therefore absolutely dimming the function outputs Prior to initial switch!!
The lower front LEDS have NO RESISTORS! These must be strictly soldered before!

Screw the XXL decoder as shown in the picture an the bottom of the loco.
Who don't want to holes in the bottom, can screw the decoder on a plastic carrier plate, and then secure it with hot glue.



The S decoder is glued using the enclosed adhesive foil onto the underside of the locomotive (inside the tank).

Now it is time the wiring of the locomotive.
Cut off the plug of the cable coming from the gearbox.
Who does not want to sell the old central board, can cut off the mating connector with cable track / motor terminal on the old board and continue to use!
It should be noted the need cross-connect the gearboxes!
The track connections are the double cable from gearbox.
Here the following assignments apply in direction of travel:
Right double Track Connection Cable to Track -
Right Motor Cable to Motor -
Left Motor Cable to Motor +
Left double Track Connection Cable to Track +

Connect additionally the track connecting cables of S-decoder with the track connection of XXL decoder.

A first short test should now show the correct direction of travel.

Now for the modification of the lamps.
The plug of the cable from the top of the lighting and lighting of the front board will be cut off.
As already mentioned, the front lower LEDs do not have a resistor. Therefore, you have to solder a 2.2 Ohm resistor on each LED.
The assignment of the 6-pin cable from the front board is as follows:

- red = LED + right **SERIES RESISTOR**
- black = LED - right
- black = LED - left
- sw = LED + links **SERIES RESISTOR**
- black = LED - top
- black = LED + top

We suggest to solder the resistors in the + circuit.
Solder a resistor with 2,2KOhm each on the cable LED + right and left. These protect with heat shrink tubing.
Generally, you have to now consider to make the connection upper/lower part with a plug. That remains up to you. We advise you to do so.

NOTE: In some series the PCB layout varies from the way we described! Please proof the PCB before!

Now the cables are connected as follows to the XXL:

- red = LED + right **SERIES RESISTOR** --> +22V
- black = LED - right --> LI-F
- black = LED - left --> LI-F
- black = LED + left **SERIES RESISTOR** --> +22V
- black = LED - top --> LI-F
- black = LED + top --> +22V

The cable from the cab:

- red = Nicht belegt
- black = Nicht belegt
- black = LEDs + --> +22V
- black = LEDs - --> LI-I

The cable from the rear light:

- black = LEDs + --> +22V
- red = LEDs - --> LI-R

Mount the speaker on the speaker opening.
We recommend an installation with good hot glue. Whether by cutting off with a hand drill, the receptacle for the round speakers is up to you.
Plug the speaker cable into the S-decoder.

Programming:

In all new variant of XXL a programming lock is available!

Per factory default this is not been set.
The value of CV 15 is 132.
The XXL will be programmed as follows:
CV 3 = 75 (Strong acceleration delay)
CV 53 = 6 (Dimming to approximately 5 volts)
CV 15 = 0 (Set programming lock)

No further settings are necessary for the S decoder.
In the programming shown here you have the real effect of a diesel-electric locomotive. Motor is turning once fast high, but the loco moves very delayed.

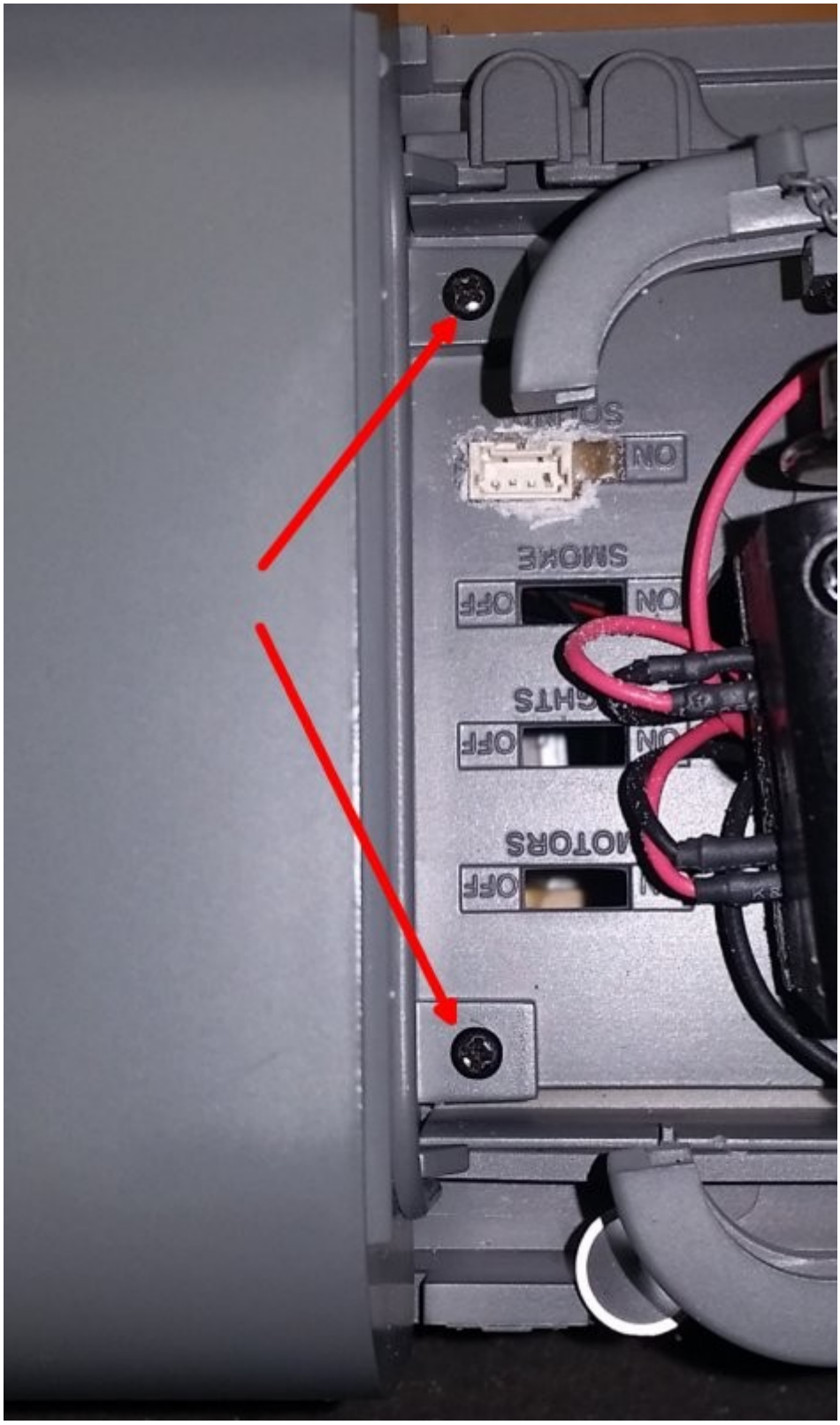
Complete retrofit like above + 8FL and pulsed smoker

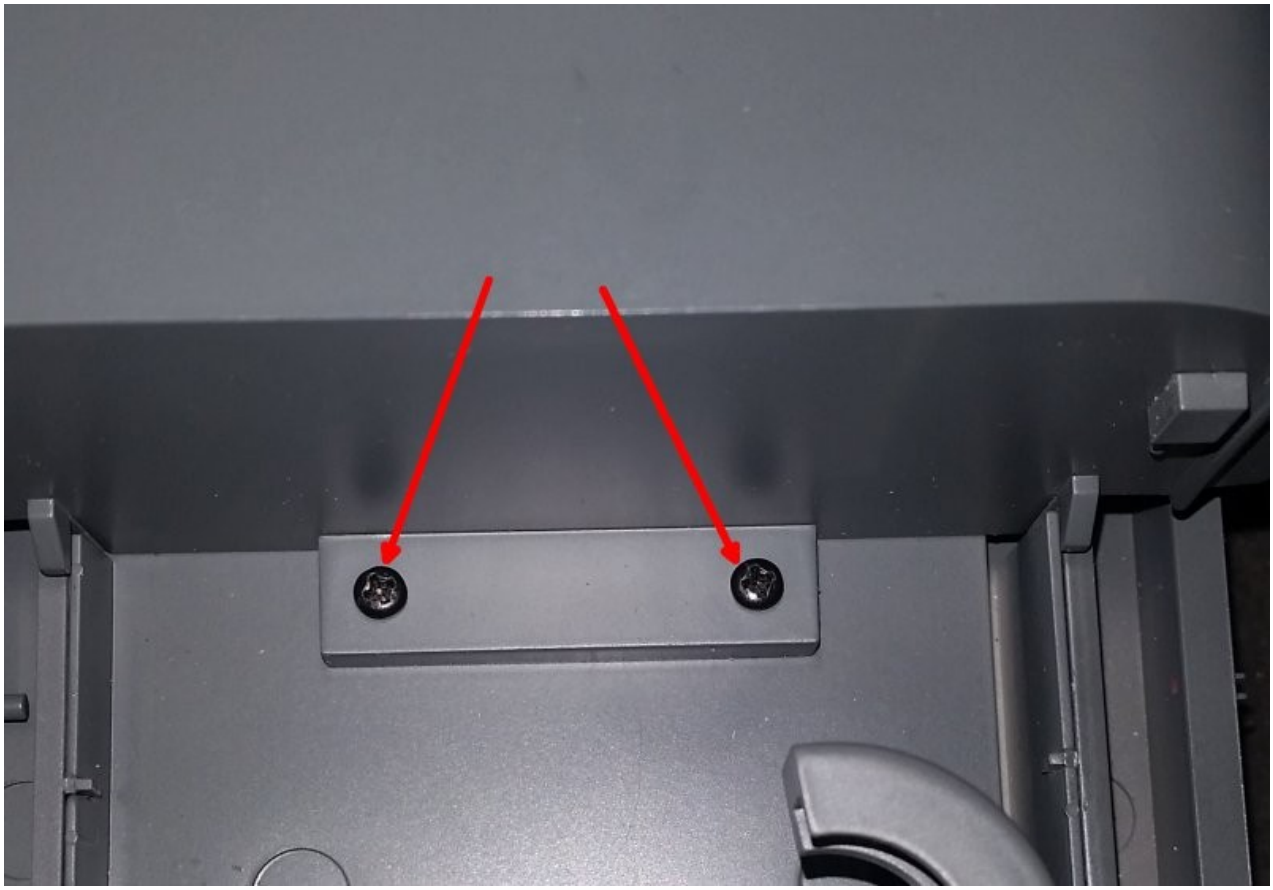
This retrofit is only for really experienced model railroader.
We describe here the reconstruction of the locomotive with Ditchlights, installing a stair and step lighting as the original and a pulsed smoker.

Following parts will be needed:
1 x Massoth XXL Decoder
1 x Massoth S Decoder (for the time being with Genesis sound, the SD 70 sound still follows)
1 x Massoth 8FL Decoder
1 x Massoth Pulsed Smoker
1 x Mini CT - SUSI Adapter PCB 4-pin 200mm
1 x Mini CT socket 4 pin
4 x Pairs High current plugs
1 x Speaker Visaton FRS 7
2 x Leaded Resistor 10 KOhm
2 x Leaded Resistor 2,2KOhm
11 x Leaded Resistor 22 KOhm
7 x SMD-Resistor 0805 2,2KOhm
2 x Diode 1N4150
2 x LED warmwhite 3mm
5 x LED warmwhite 5mm
5 x SMD LEDs from a LED stripe
4 x Lampholders round from plastic for 5mm LEDs
2 x Fan 24 Volt Dimensions 40 x 40mm
Threaded rod 3 or 4mm with 4 nuts
Enamelled copper wire
Braided wire
Breadboard
Two component adhesive
Lead weights if necessary

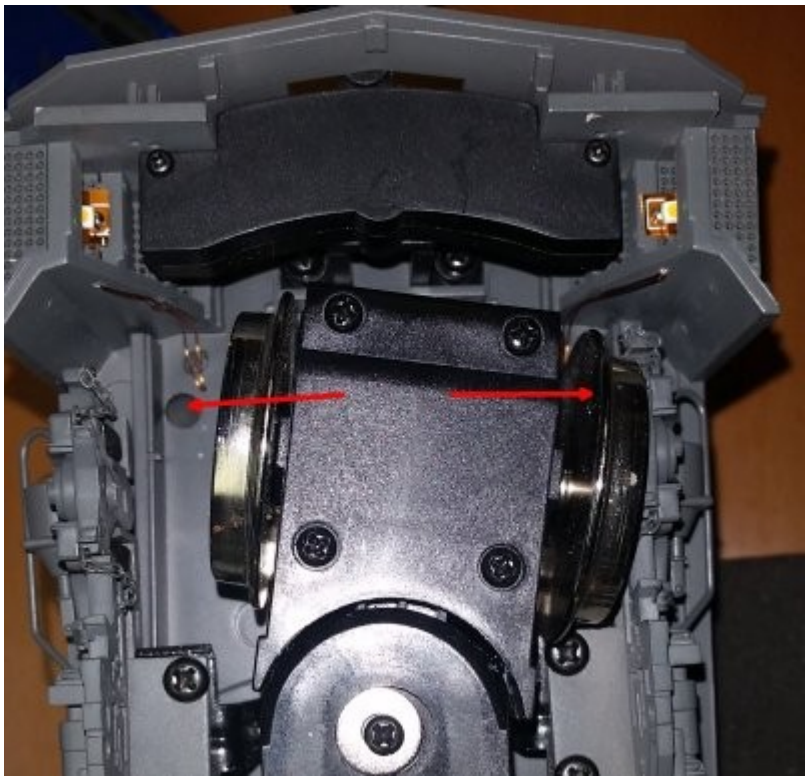
First you have to open the locomotive, thereto it is necessary to turn this on a foam pad on the head.

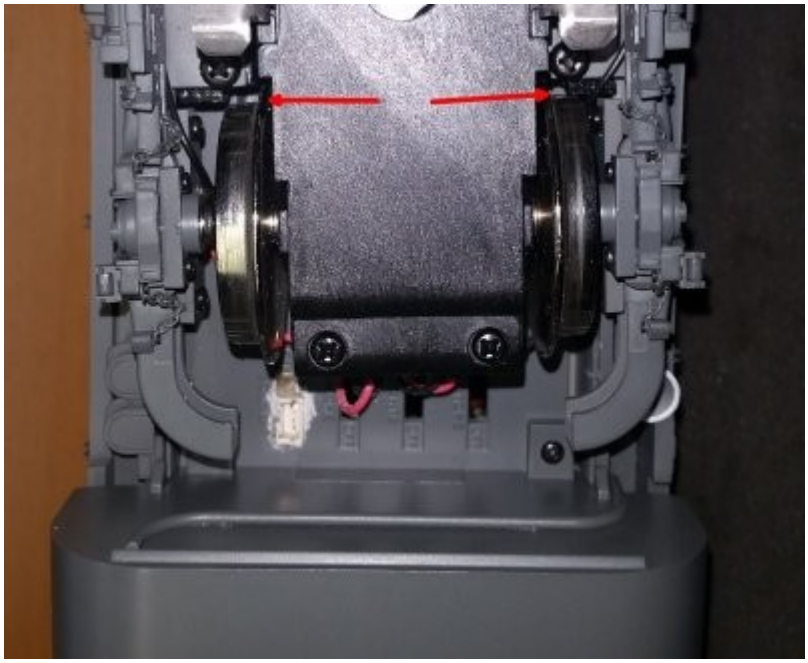
Now remove the tank with the 4 screws.

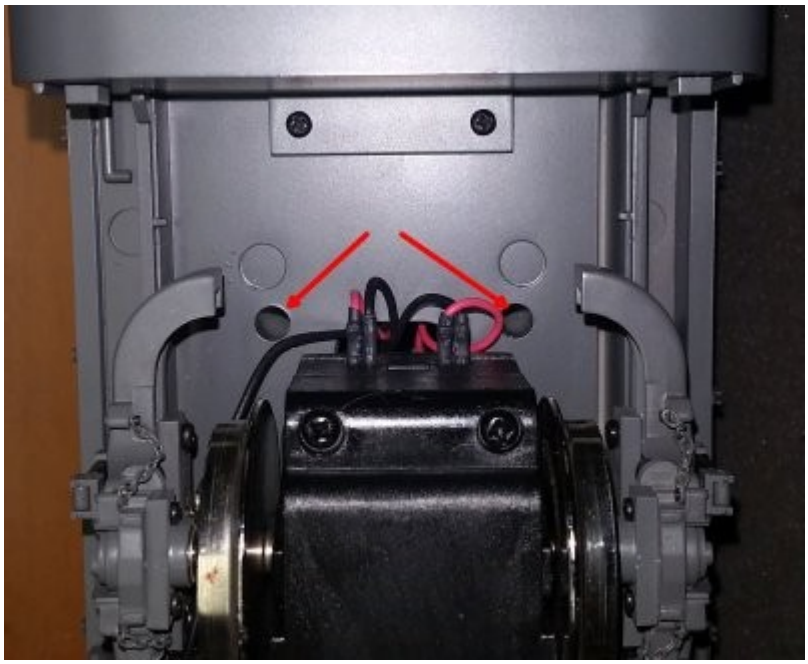

NO
SMOKE
OFF
NO
OFF
NO
MOTORS
OFF

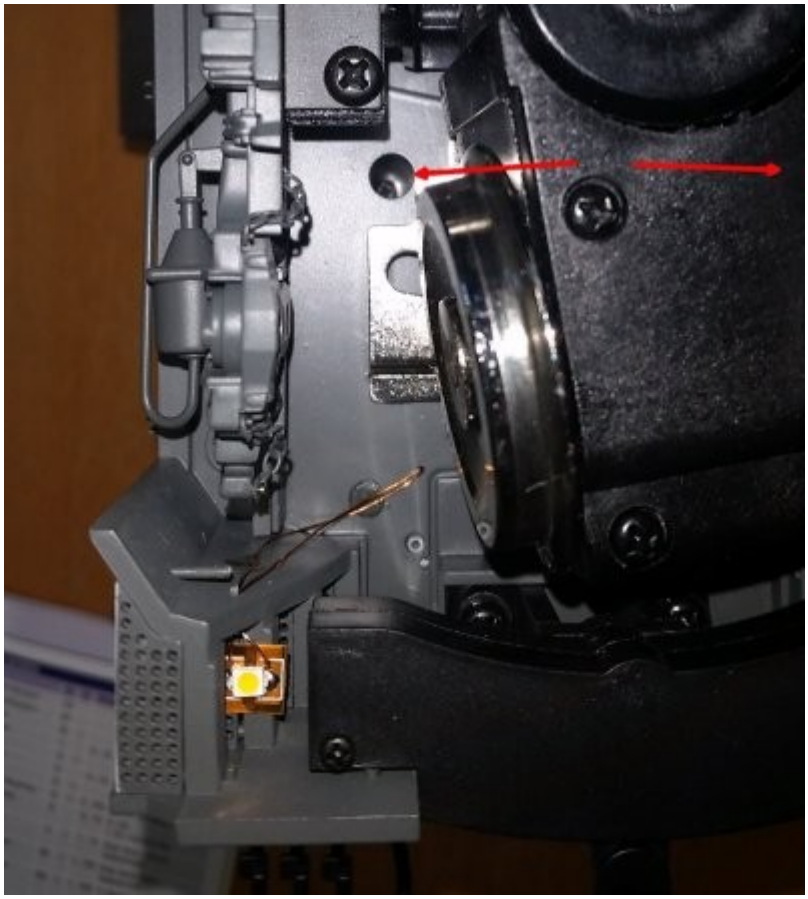


Open the 12 screws to remove the upper part.
You can find the screws in the round indentations.





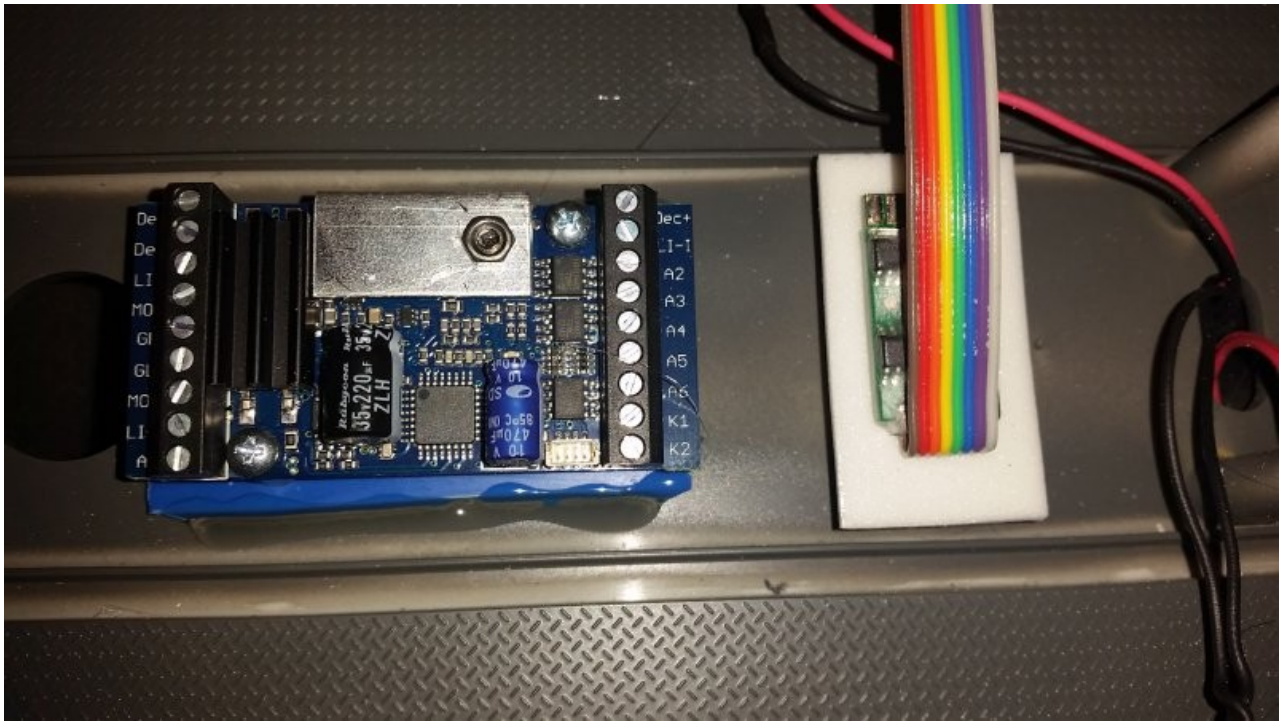




4 Depending on the bogies.
2 in the middle of the loco.
VERY IMPORTANT! The cab is once more fixed with 2 tiny screws.
These are located on the ground at about the end of the cab.
Now turn over the loco and carefully lift the upper part.
IMPORTANT!! At the front is a very short connector for front lighting, first pull it off.
Then you can remove all the cables from the central board of the locomotive.
The original vaporizer can not be controlled by the decoder, therefore I don't decribe the connection for it.
The central board may be removed. It is conceivable, not to remove the board only for the evaporator, which we did not tested.
In detailed report the installation of the pulsed smoker of Massoth is shown.

The entire lighting in the locomotive is designed for 5V. However, we recommend the lighting at 22 volts rebuild. By dimming of LEDs has an unwanted "flickering" effect of the LEDs when shooting video..
Therefore, all resistors are exchanged.
The lower front LEDS have NO RESISTORS! These must be strictly soldered before!

Screw the XXL decoder as shown in the picture an the bottom of the loco.
Who don't want to holes in the bottom, can screw the decoder on a plastic carrier plate, and then secure it with hot glue.
In addition, stick to the 2 elevations the double-sided tape of 8FL decoder.
Now fix both decoder as shown in the picture.



The S decoder is glued using the enclosed adhesive foil onto the underside of the locomotive (inside the tank).

Connection of the gearbox

Cut off the plug of the cable coming from the gearbox.
Solder the High Current plugs. We recommend for the track siding, the jack and use the pins for the engine.

It should be noted the need cross-connect the gearboxes!
The track connections are the double cable from gearbox.
Here the following assignments apply in direction of travel:

- Right double Track Connection Cable to Track -
- Right Motor Cable to Motor -
- Left Motor Cable to Motor +
- Left double Track Connection Cable to Track +

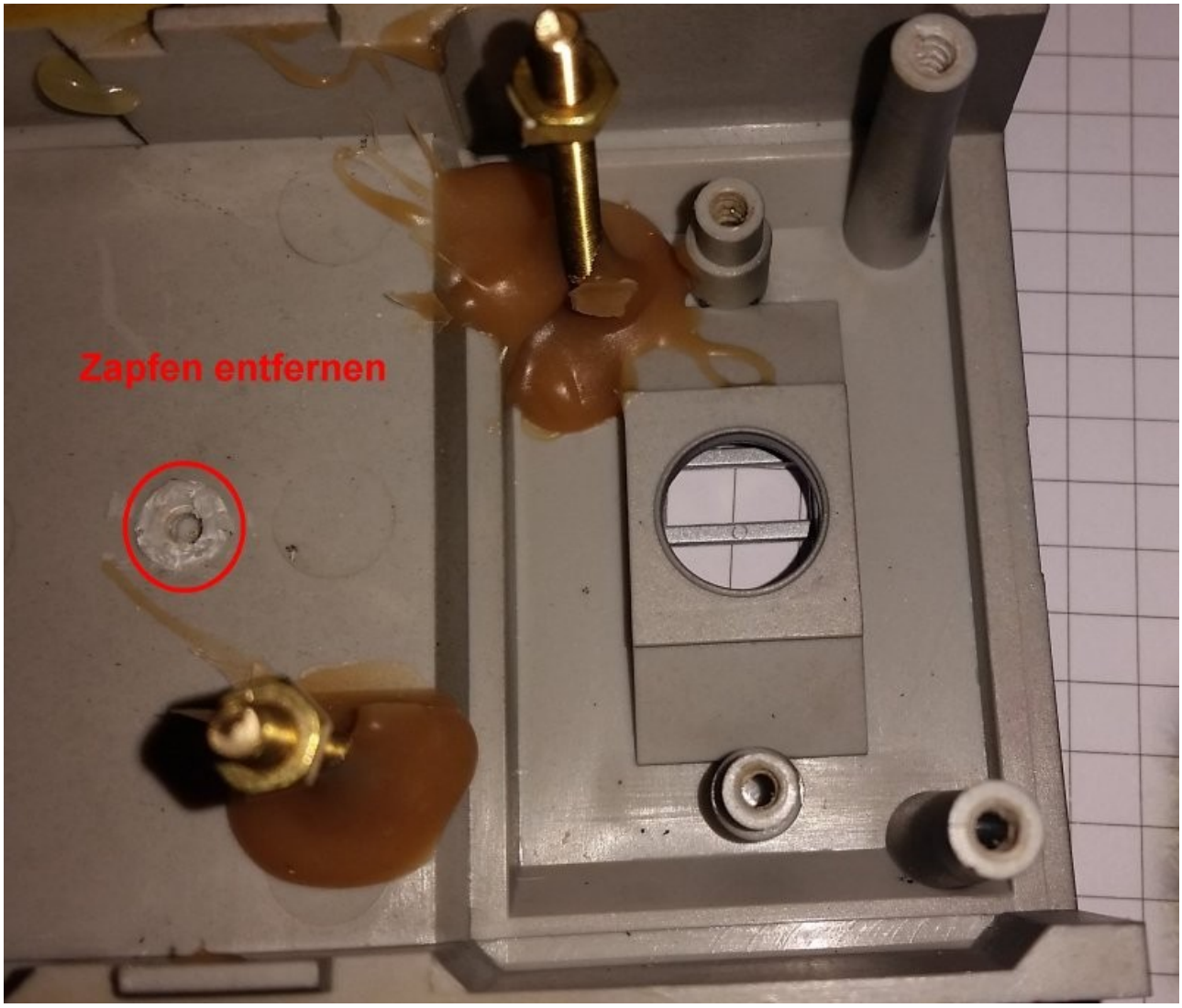
Generally, you have to now consider to make the connection upper/lower part with a plug. That remains up to you. We advise you to do so.

The track connection must be additionally connected to the track connector of the S decoder, the 8FL (brown/grey) and the Pulsed Smoker (only if 8413501).

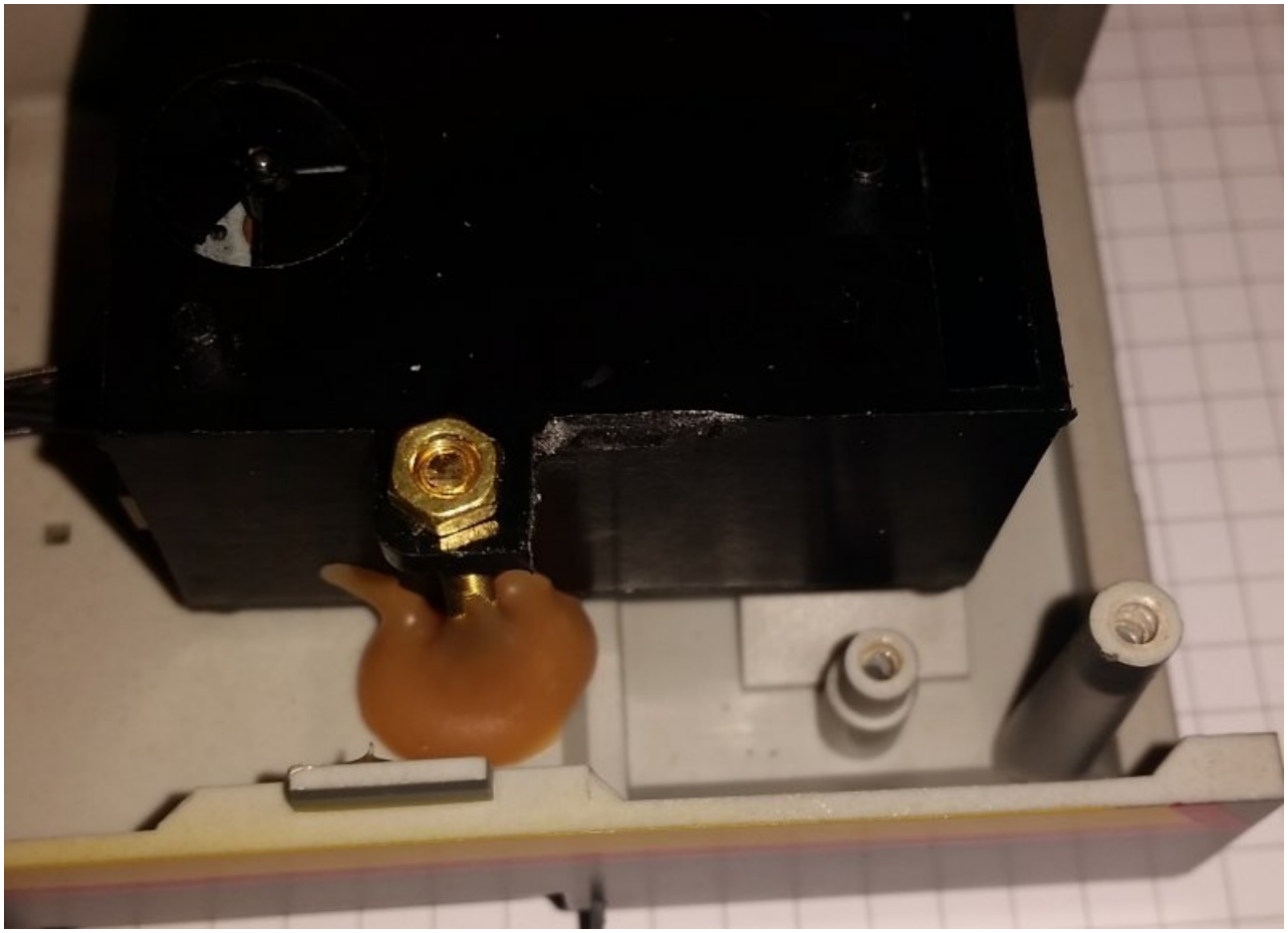
A first short test should now show the correct direction of travel.

Retrofit of the Pulsed Smoker

To mount the Pulsed Smoker first remove the 6 screws of the insert for the Pulsed Smoker.
Now unscrew the USA Trains smoke unit.
Remove as shown in the picture the spigot.



Put the Pulsed Smoker so in that the steam outlet opening is aligned with the steam outlet of the locomotive.
Determine now the position of the 2 threaded rods (also their height).
Cut the threaded rods to the correct length.
Assemble the threaded rods with the 4 nuts so that the lower part of the rod rests on the housing.
Now fix the threaded rods with 2-component adhesive.
Before mounting cut as shown in the picture, a corner of the bracket.



Before securing the insert 2 pins must be shortened as far as the picture until the Pulsed Smoker fits.

This can be done with a side cutter.

The insert is screwed until later!

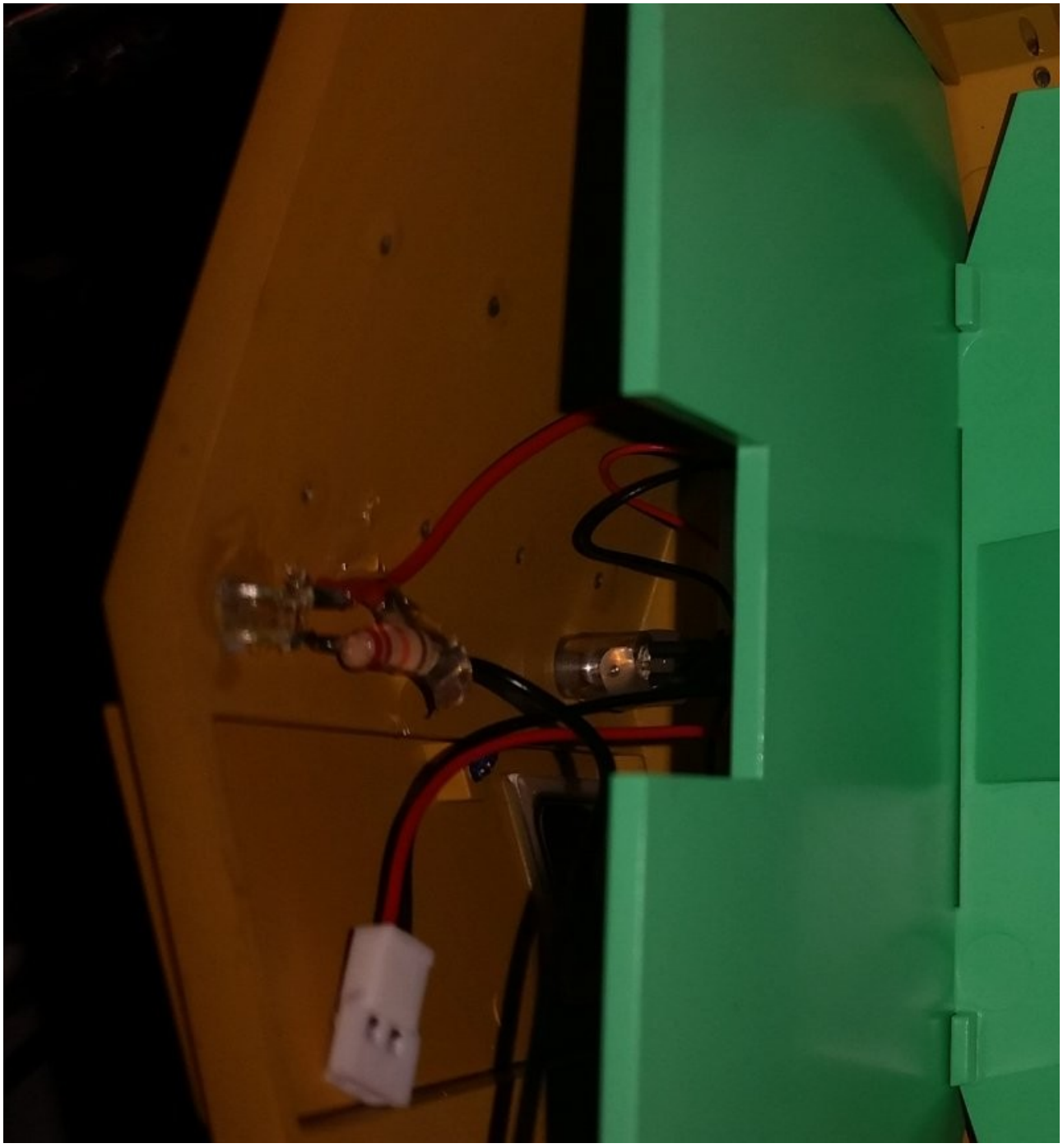
Modification of the lamps of the upper part

The plug on the cable of the upper part of the lighting (4-pole) is cut off.

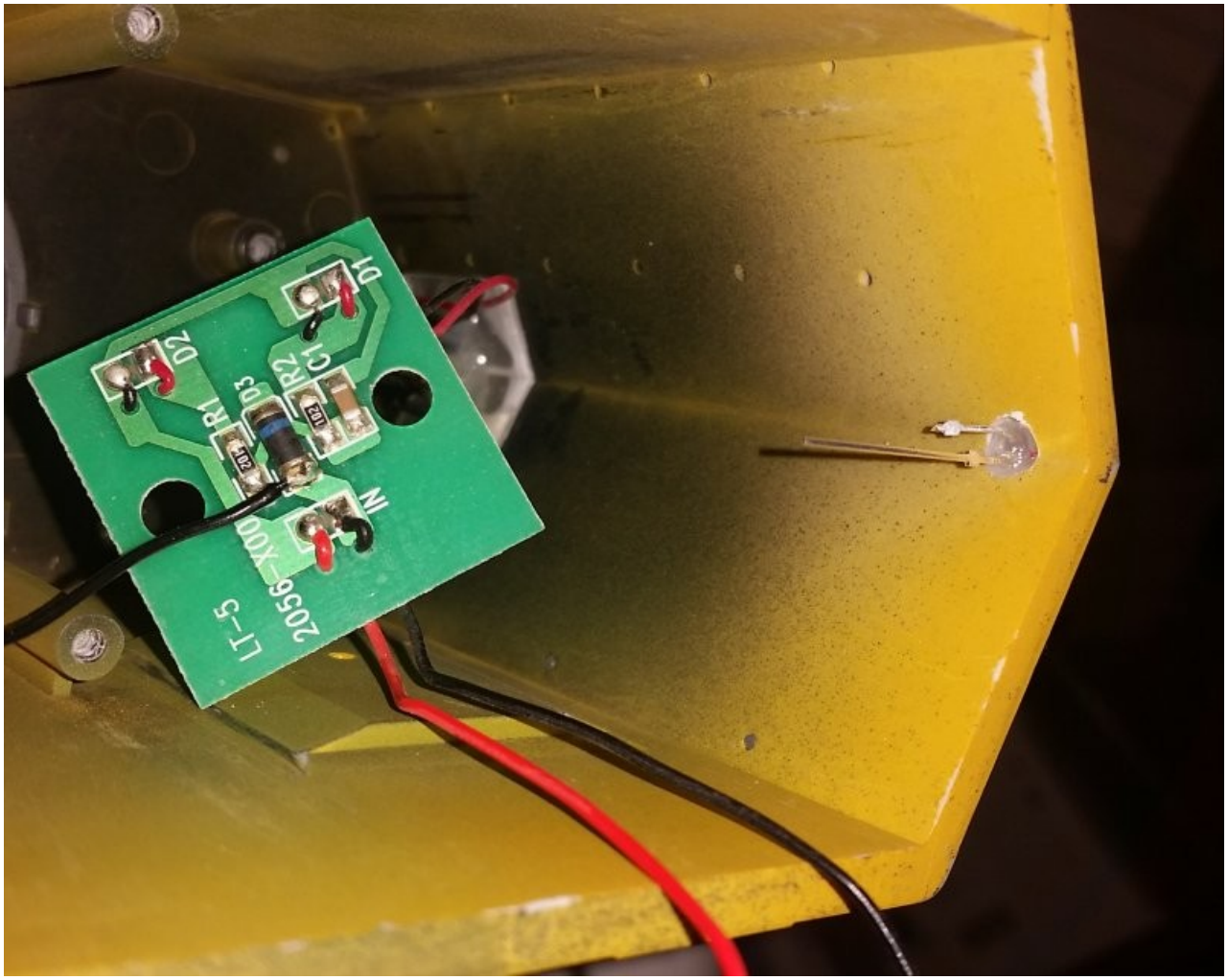
Now remove the cab used by gently pressing apart of the housing top.
Previously pull the 2 pin plug.

First, the assembly of the two 3mm LEDs front and rear.
Drill exactly in the middle of the front in about 5 mm from the housing top bottom a 3mm hole. It is recommended to pre-drill first with a smaller drill.
The hole must be well chamfered from the inside with an approximately 5mm drill. (So that's the 3mm LED flush with the outer edge.)

The long wire of the LED is the anode, here the series resistors with 22 KOhm will be soldered.
Unscrew the front light board.
Replace all SMD resistors here by 2,2KOhm.
Solder a cable from +22 volt (red wire from the 2-pin plug) to the resistance.
Solder a second wire to the cathode (short wire). The cable should reach the center of the housing.
Shorten the wires of the LED before. Fix the whole with hot glue.

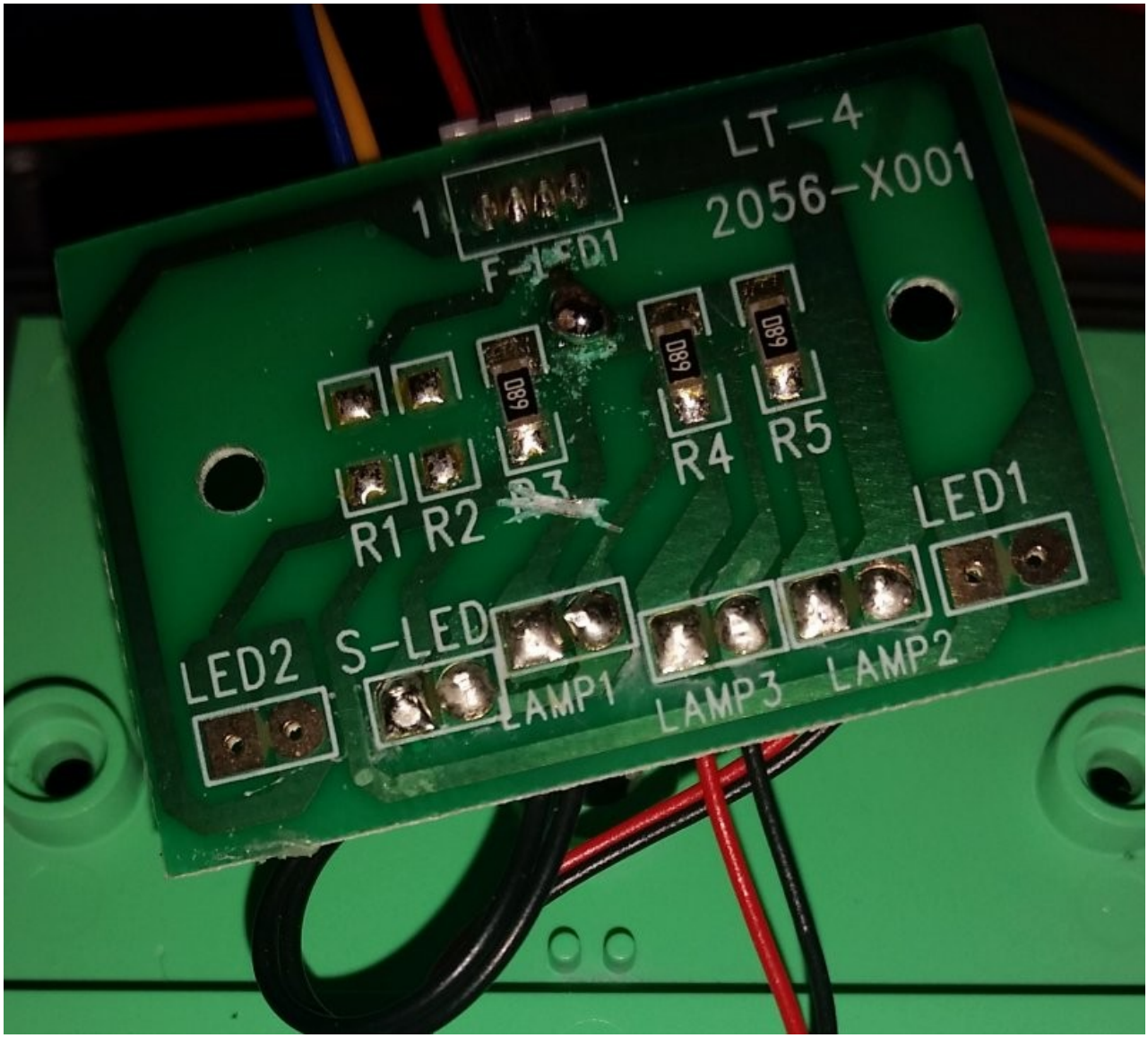


Unscrew the rear light board.
Replace all SMD resistors here by 2,2KOhm.
Solder a cable from +22 volts (be careful here, it is the black cable from the 2-pin plug) to the resistance.

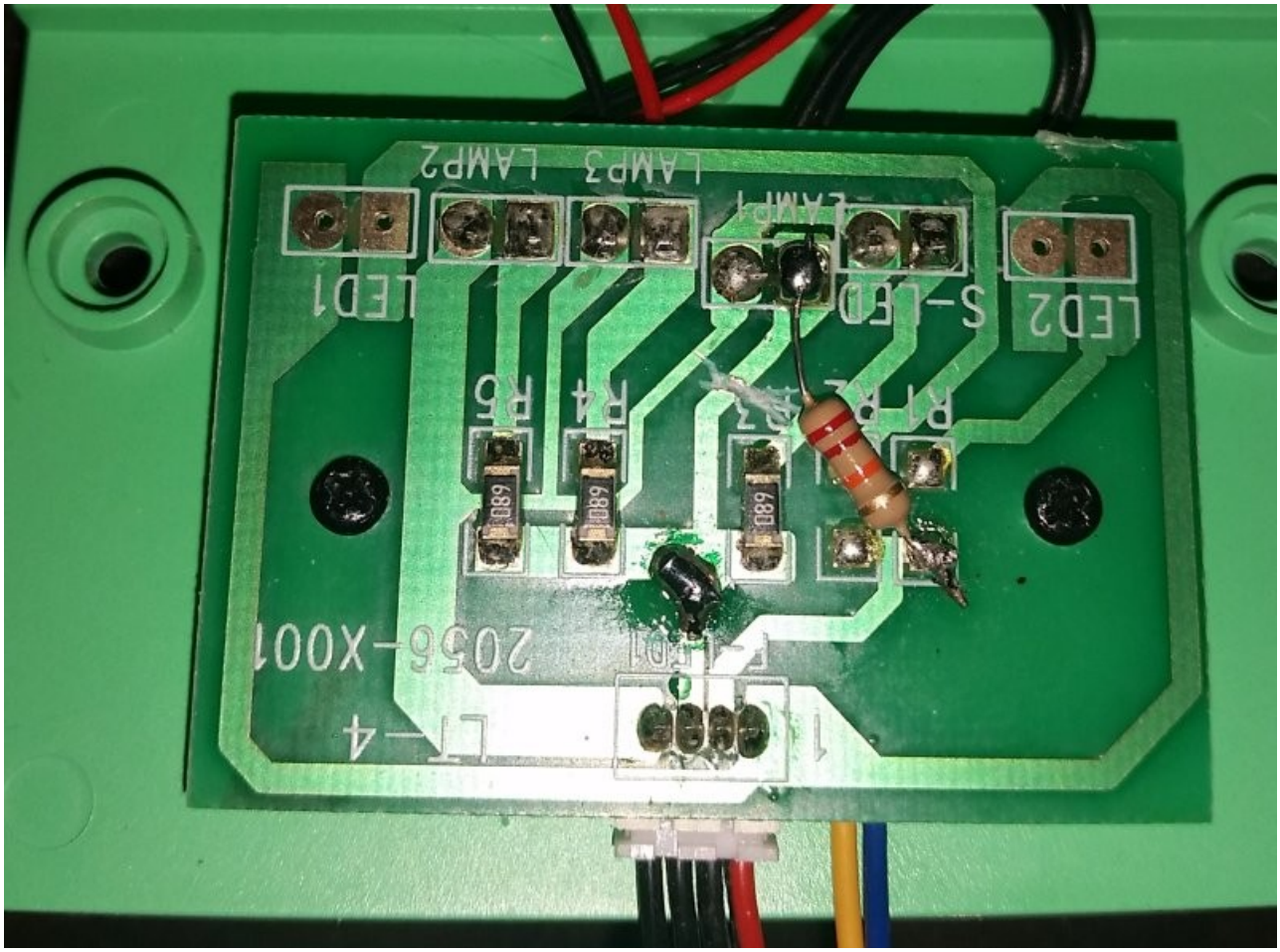


Screw the rear board firmly.
Solder a second wire to the cathode (short wire). The cables should extend to the middle of the housing. Shorten the wires of the LED before. Fix the whole with hot glue.

Now loosen the green shell of the cab with the 2 screws.
The on-board SMD resistors are now being replaced by the 2,2KOhm.
As we replace the 1 bulb for the interior lighting, this circuit has to be modified.
Disconnect as shown in the picture the conductive path.



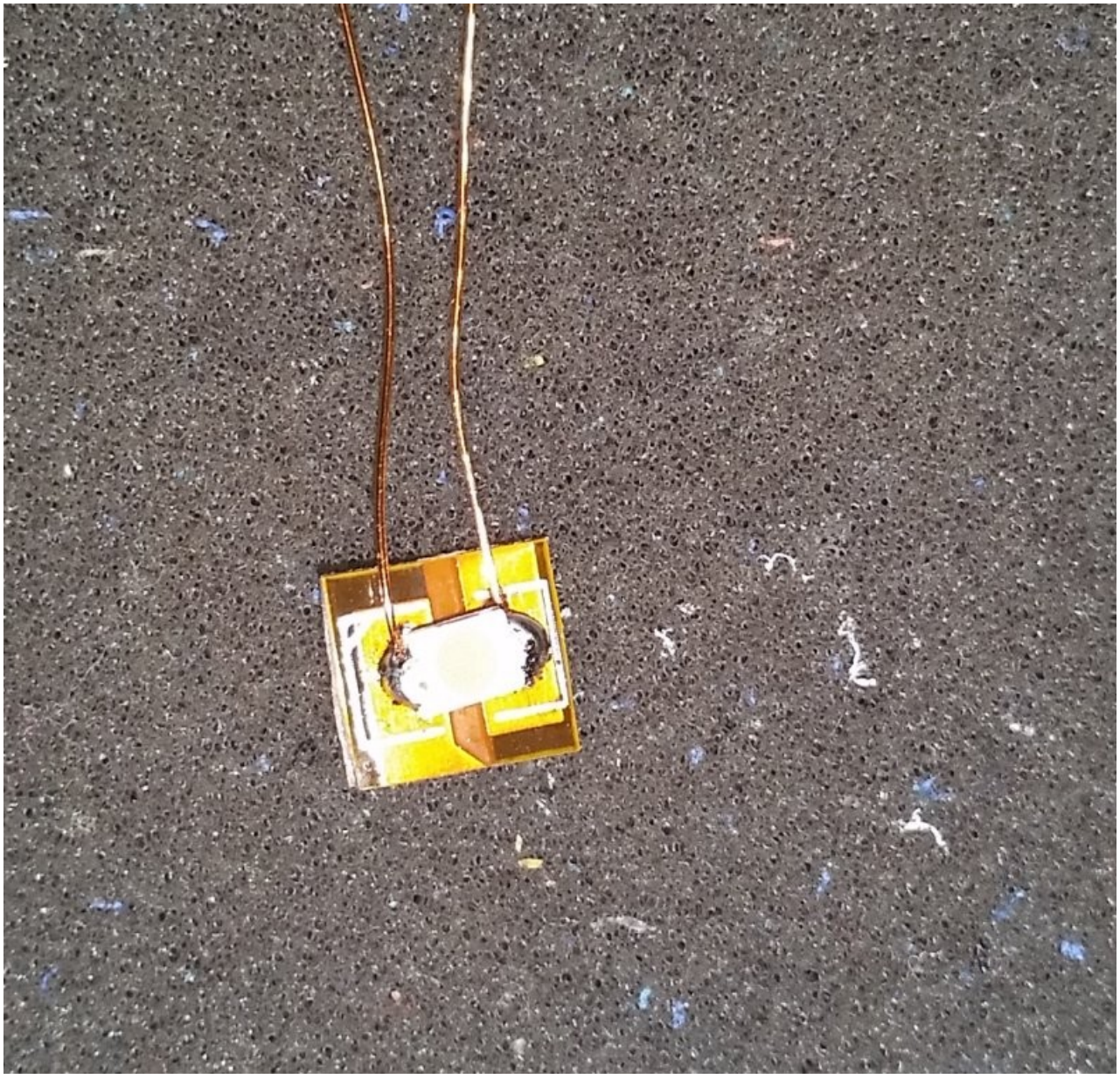
Solder, as shown in the picture, the 22kohm resistor.



Unscrew the PCB with the 2 screws. Remove the light bulb, cut off the cable flush with the lamp.
Take a 5mm LED and grind the flange. Thereafter, the LED should be clamped fit into the opening of the lamp.
Well definitely pay attention to the polarity. The long wire of the LED must be connected to the terminal of the 22KOhm resistor.
Fix the whole with a drop of hot glue.
Screw the PCB again.
Screw the green upper part of the cab again.
The 4-pin cable has now the following allocation:

- red = Not used
- black = LED - Light Cabine --> A7 8FL
- black = LEDs + --> +22V 8FL
- black = LEDs - --> A6 8FL

Now the staircase lighting is mounted on top.
Cut a section of the LED strip and solder to the anode and cathode 1 enamelled copper wire. The length must reach the half of the housing.



The cathode is usually marked on the LED by a small cutout in the housing. In most cases the LED strips are also labeled. Mark with a permanent marker the wire to the cathode.
Drill with a hand drill (1mm drill) directly beneath the lowest step in the corner a hole for the wires.

Peel off the adhesive strip and attach the LED centered under the first step.

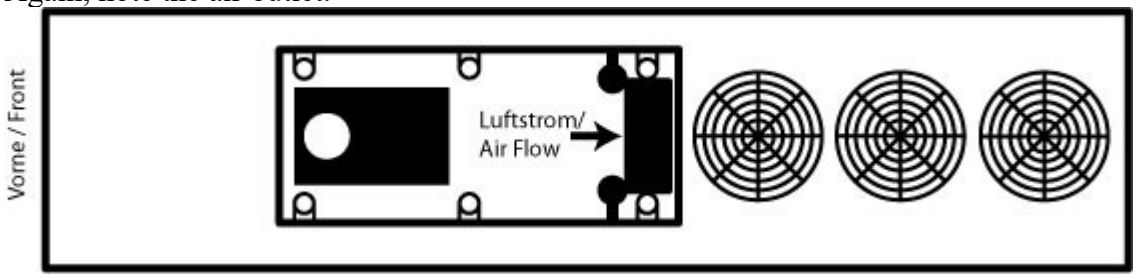
Directly on the output hole solder the 22KOhm resistor to the unmarked wire. Attach the resistor on the inside of the casing with a little hot glue.
This port is connected to + 22V.
The other wire is connected together with the wires of the 3mm LEDs with A5 of 8FL.

Installation of fans

Prepare fan 1 as shown in the picture with distance sticks.
Notice that the air outlet upwards.

Fix the whole centered over the front fan with hot glue.

Fan 2 is glued between the two rear pins as shown in the picture.
Again, note the air outlet.



Both red wire are connected to + 22V. Both black cable to A8 8FL.
You can now install the insert with the Pulsed Smoker again

So that the retrofit of the upper part is finished. For a plug-in contact from top to bottom you need an 8-pin connector.

Now to the bottom of the locomotive.
If desired, you can now add lead weights first.
The plug (6-pin) of the cable from the lower part of the illumination will be cut off.
As already mentioned, the front lower LEDs do not have a resistor. Therefore, you have to solder a 2.2 Ohm resistor on each LED.
The assignment of the 6-pin cable from the front board is as follows:

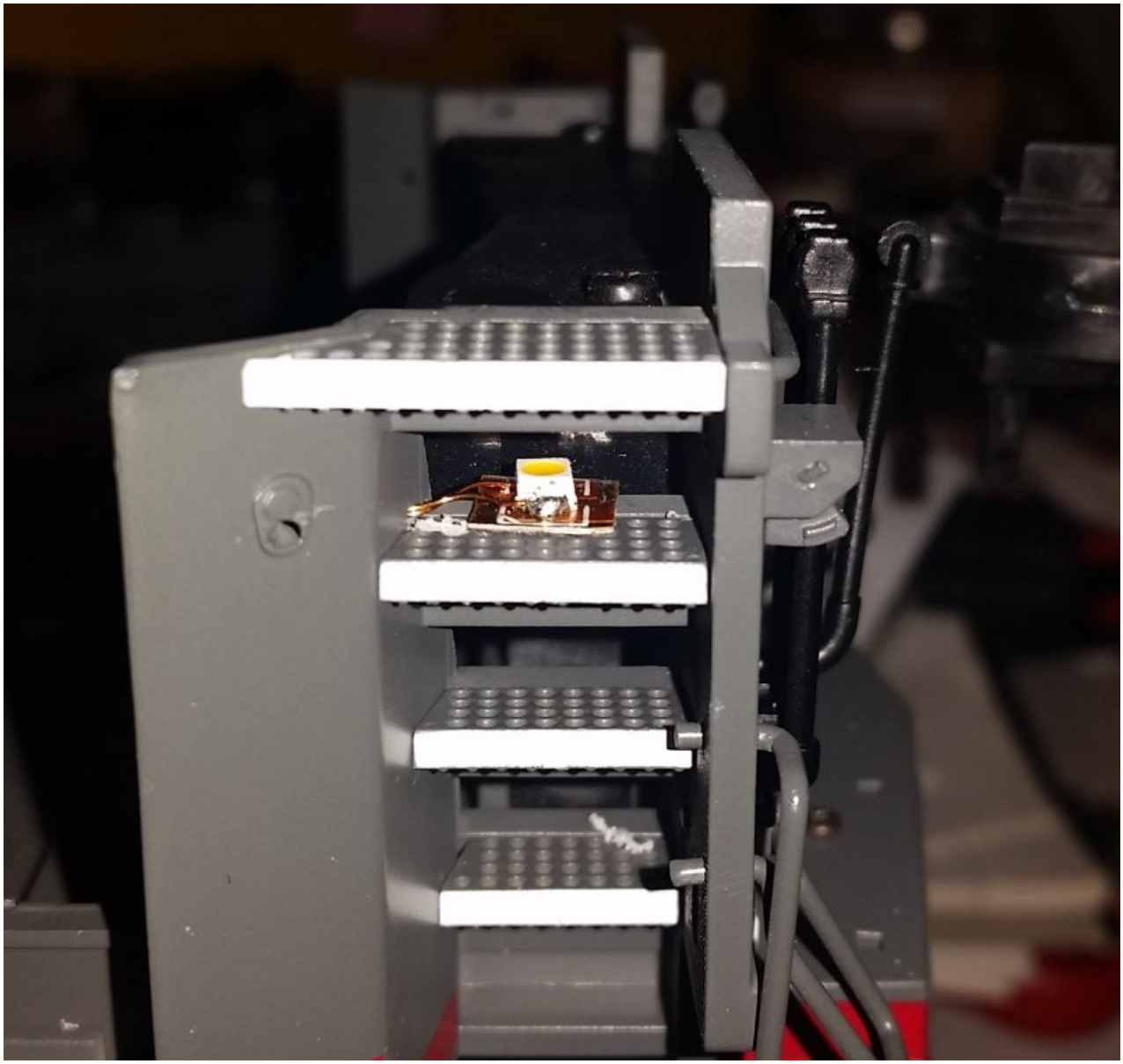
- red = LED + right **SERIES RESISTOR**
- black = LED - right
- black = LED - left
- black = LED + left **SERIES RESISTOR**
- black = LED - top
- black = LED + top

Solder a resistor with 2,2KOhm each on the cable LED + right and left. These protect with heat shrink tubing.

Installation of bogie lighting

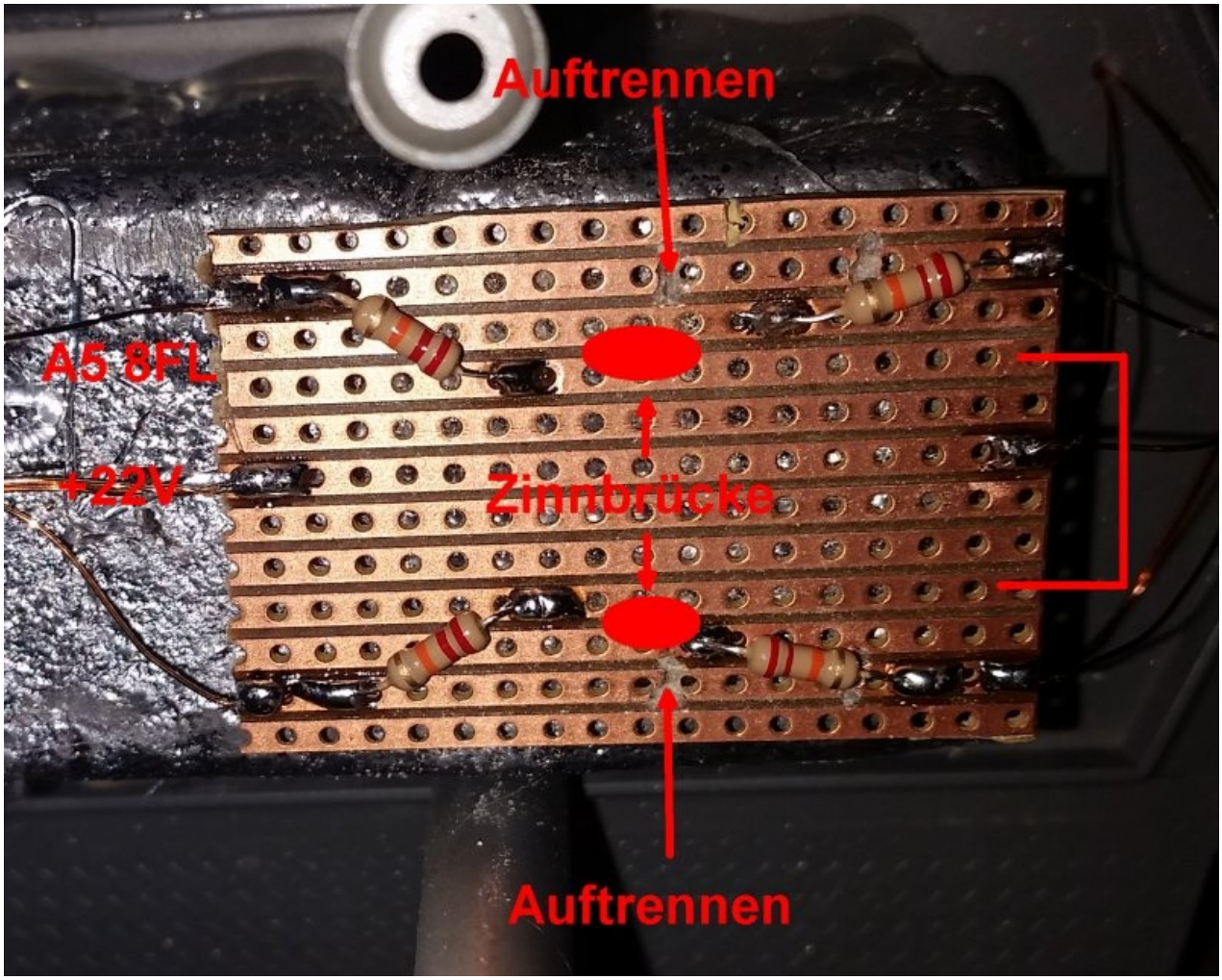
To prepare the lampshades, we have used round plastic LED frames deformed with hot air, as shown in the picture.

The 5mm LED is then plugged the wires bent 90 ° and the whole fixed with glue as shown in the middle of the bogies.
For the wires of the LED 2 holes must be drilled with 1mm.
At the rear bogie you have to drill like shown. Only 2 holes from the outside and then a hole inside. The latter should be drilled from above!
At the front bogie you can drill the two holes directly diagonally upwards.
On the wires braided wire now is soldered (about 15cm). Highlight the cathode (short wire of the LED).
Now the staircase lighting. Cut out 4 individual LEDs from a LED strip. Solder 20cm enamelled copper wire on both sides and mark again the cathode.
Fix the LEDs as shown.

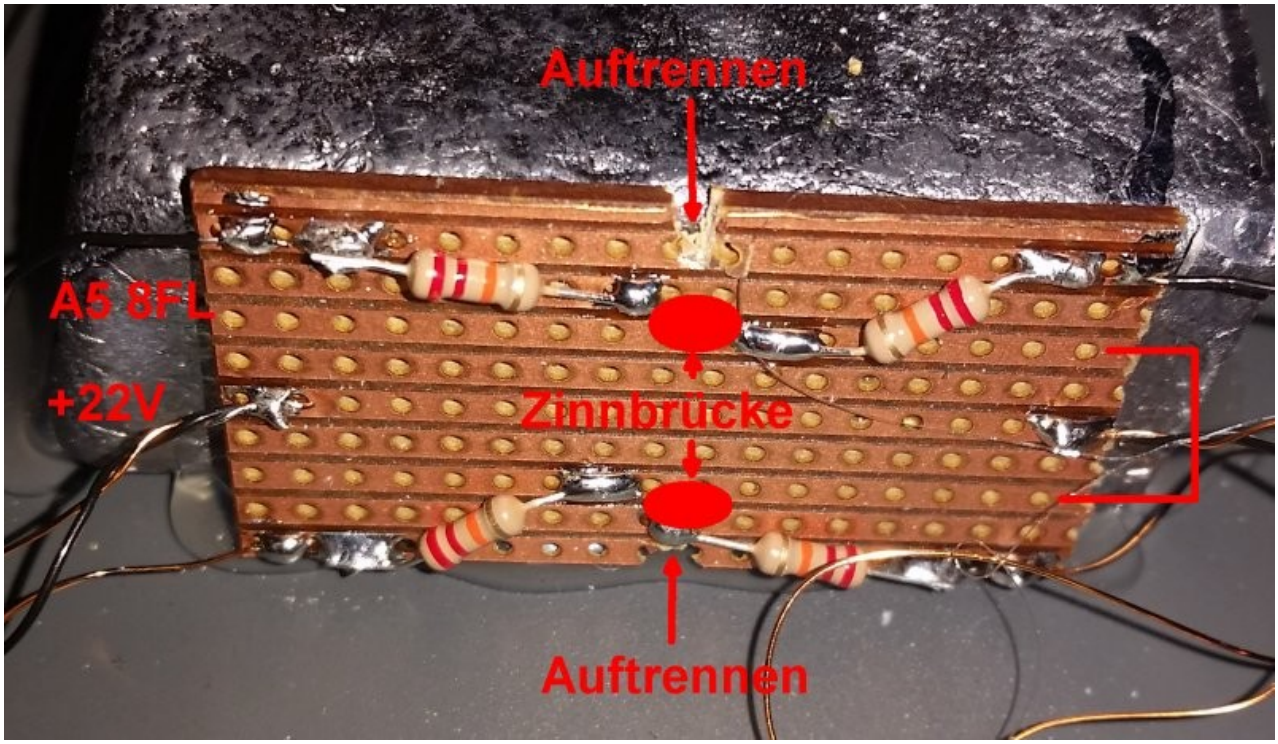


Drill with a 1mm drill exactly on the stair bottom edge a hole for the cable. This only works with unscrewed gear box from the inside!
The 2 enamelled copper wires is carried out along the edge of the housing bottom until you can drill through the bottom upwards.

Now the series resistors are constructed using breadboard. In our example, all 4 LEDs still separated (if you intend Gearbox Illumination and Stair Illumination in single mode), you can combine them however.
Breadboard rear:



Breadboard front:



Lead the SUSI connector outwards (OPTIONAL)

The SUSI connection of the S-decoder and the pulsed evaporator is connected to the outside via a mini-CT connector in order to be able to perform a firmware update via SUSI. For this you need the SUSI adapter board.
File the recess at the position shown. Glue in the socket in such a way that the squeezed cables point backwards when the cable is plugged in!
Then cut off the plug as shown and solder on the cable.
Plug the SUSI cable of the evaporator and S-decoder into the adapter board.

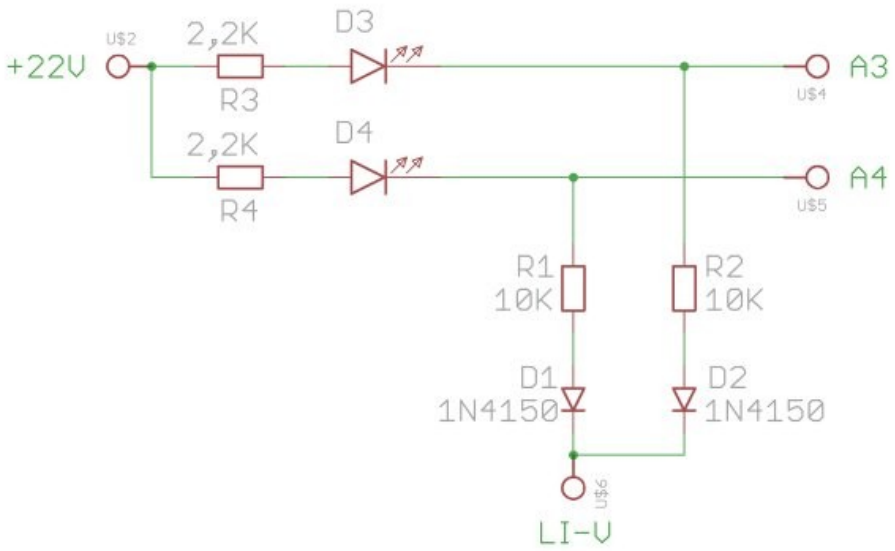
Connection to decoder

Here summarize what cable how and where must be connected:

Connect Dec- from XXL and 8FL
6pole cable from the front

- red = LED + right **SERIES RESISTOR** --> +22V of 8FL
- black = LED - right --> A3 of 8FL and over resistor and diode to LI-V of XXL
- black = LED - left --> A4 of 8FL and over resistor and diode to LI-V of XXL
- black = LED + left **SERIES RESISTOR** --> +22V of 8FL
- black = LED - top --> A1 of 8FL
- black = LED + top --> +22V of 8FL

The connection of the resistor and the diode can be seen here:



These are connected to LI-V XXL.

The cable from the cab:

- red = Not used
- black = LED Light cabin - --> A7 of 8FL
- black = LED + --> +22V of 8FL
- black = LED Display and Loco Number Illumination - --> A6 of 8FL

The cable from the rear light:

- black = LEDs + --> +22V of 8FL
- red = LEDs - --> A2 of 8FL

Fan:

- black = Fan + --> +22V of 8FL
- red = Fan - --> A8 of 8FL

Round lighting:

- black = LEDs + --> +22V of 8FL
- red = LEDs - --> A5 of 8FL

Mount the speaker on the speaker opening.
We recommend an installation with good hot glue. Whether by cutting off with a hand drill, the receptacle for the round speakers is up to you.
Plug the speaker cable into the S-decoder.

Programming:

In all new variant of XXL a programming lock is available!
Per factory default this is not been set.
The value of CV 15 is 132.
The XXL will be programmed as follows:

- CV 3 = 75 (Starke Anfahrverzögerung)
- CV 59 = 0 (Turn off Switching Speed Key)
- CV 61 = 150 (Readjustment Retardation for USA Trains Gearbox)
- CV 64 = 0 (Turn off Load control Key)
- CV 15 = 0 (Set Programming lock)

For 8FL following programming is required (Turn off programming lock is CV 15 = 136):

- CV 110 = 0 (A1 Switch with light button)
- CV 113 = 1 (Only at forward drive)
- CV 120 = 0 (A2 Switch with light button)
- CV 123 = 2 (Only at reversing)
- CV 130 = 1 (A3 Switch with Key 1)
- CV 133 = 1 (Only at forward drive)
- CV 135 = 1 (Flashing symmetrically)
- CV 136 = 10(Value for flash)
- CV 140 = 1 (A4 Switch with Key 1)
- CV 143 = 1 (Only at forward drive)
- CV 145 = 240 (Inverse coupling to A3)
- CV 150 = 8 (A5 Switch with Key 8)
- CV 160 = 0 (A6 Switch with light button)
- CV 170 = 0 (A7 Switch with light button)
- CV 173 = 4 (Only active when stand)
- CV 180 = 16 (A8 Switch with Key 16)
- CV 15 = 0 (Set Programming lock)

No further settings are necessary for the S decoder.
In the programming shown here you have the real effect of a diesel-electric locomotive. Motor is turning once fast high, but the loco moves very delayed.