Tip: 37654 BR 261 001-2 Diesel LED Light Upgrade

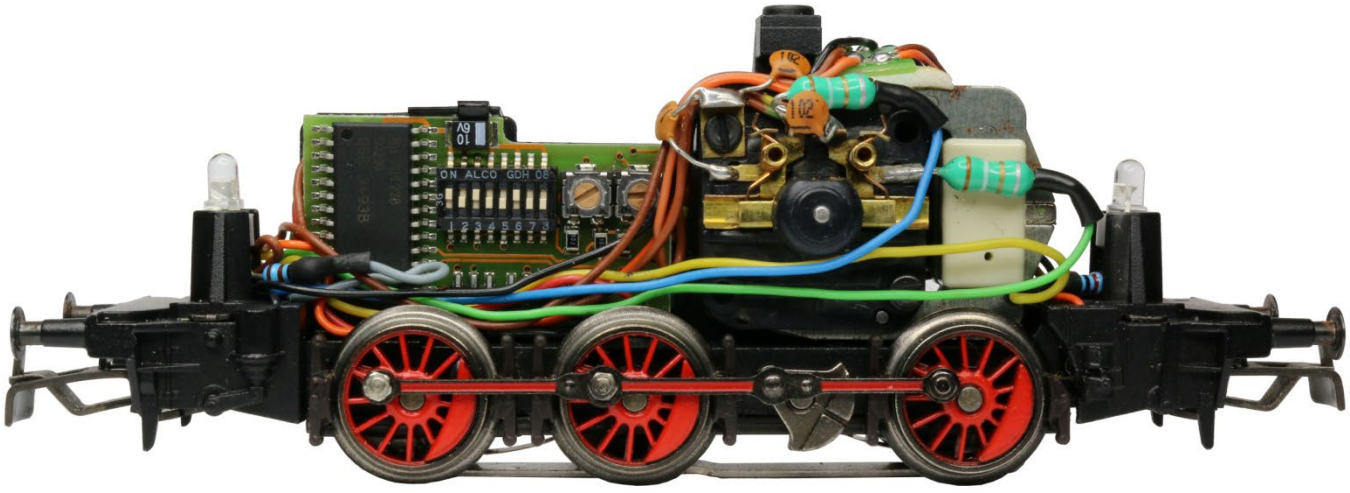
Date: 07-04-2020, Fix 15-06-2025

Hi All,

I've had this loco for some time and decided to start running it on my layout and thought it would be nice to have red and white LED lights that change over with a direction change, this is the result of that idea.

A little History

I upgraded the bulbs to LED lights on 31-08-2016.



The front and rear bulbs were replaced with 3mm warm white LEDs and the 1k current limiting resistors were wired in series with the respective grey and yellow **F0** function wires. The resistors where soldered direct to the LED socket cathode pin, this was a simple and easy upgrade.

With the addition of the red LEDs the resistors and wiring would have to be changed to allow for extra components and wiring.

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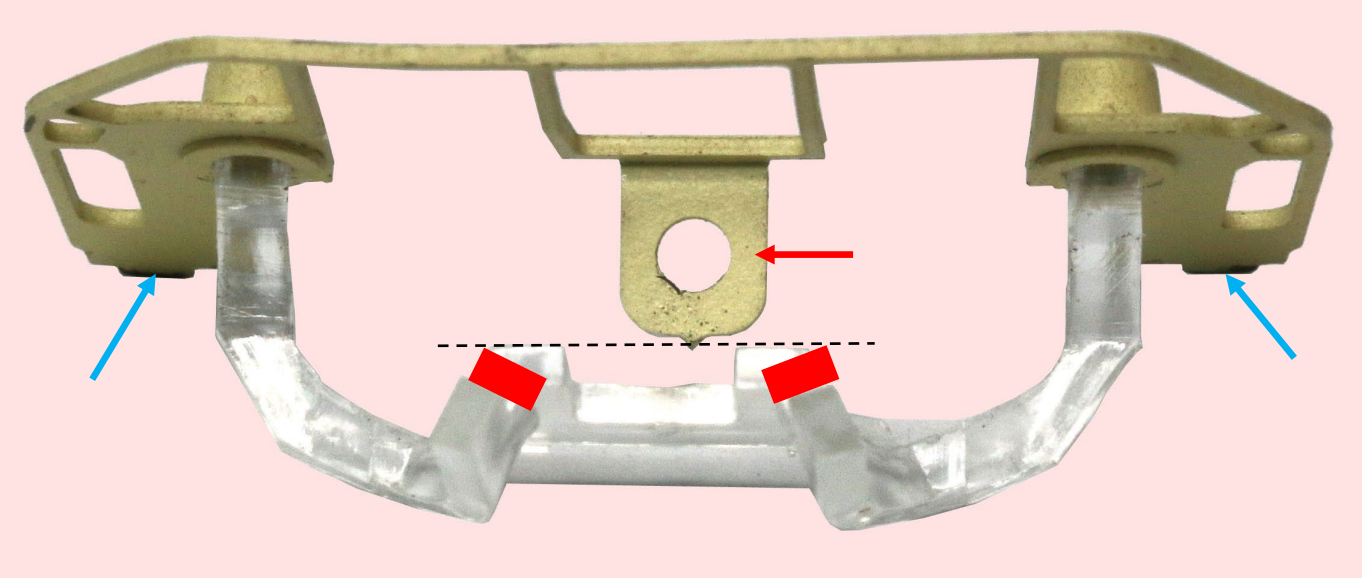
Planning and Feasibility Study

Before committing to the project, I needed to determine if I could position the red LEDs to get good light transmission through the light pipes then find space for the extra resistors and wires required.

Masking would also have to be considered to stop the red lower lights bleeding into the top light at each end of the locomotive. I had already noted there was light leakage between the body shell and the chassis of the locomotive which I was sure I could reduce or fix entirely.

The first task was to remove the light pipe from the body shell without breaking it.



I found by lifting the centre part (red arrow) first to release it from the body shell then carefully flexed the stairs on each side to release the tabs (blue arrow) the light pipe and hand rail assembly was released.

Using a 0603 red LED with long wires wired to a 1k current limiting resistor I found the sweet spot where I had good light transmission and mounting the LED was possible without touching the body shell shown by the black dashed line. The two red rectangles show the best location for the 0603 red LEDs.

I glued the red LED in place with hot melt glue and re fitted the assembly into the body shell then mounted the body shell onto the locomotive chassis. With the LED turned on I noted the red was too bright and there was red light bleeding into the top light. By changing the current limiting resistor to **10k** the light level was reduced to a good level that could still be seen in a room with lights on and the light bleed was also reduced to a very low level that I could live with as it could only be seen in a very dark room.

With the red LED lighting possible it was time to plan the mounting of the resistors and routing the extra wiring required.

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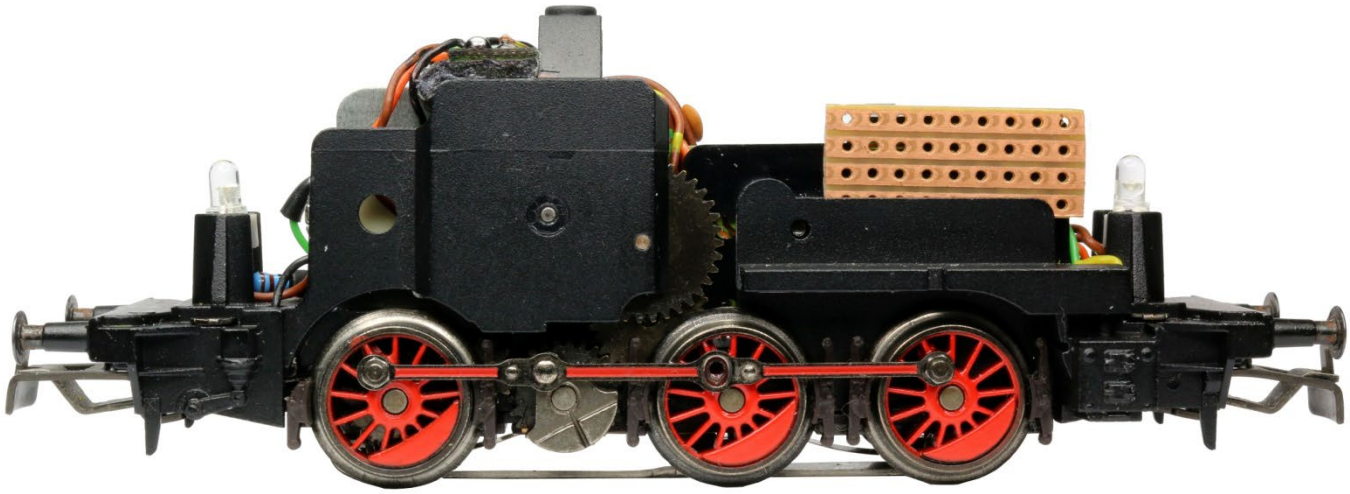
Planning and Feasibility Study continued

I decided I would use 1206 size resistors (SMD) for their low profile and small size to allow fitting into a small space. I sketched up a circuit diagram and small layout design on Vero board to allow mounting the resistors and allow the correct connecting wires to be soldered with ease.



The decoder mounting holder is offset from the chassis and the Vero board PCB could just fit between the holder and the chassis and is the reason to have low profile resistors to avoid touching the body shell. I could also glue the PCB to the back of the holder.

Using ESU wire, I would be able to route the extra wires required between the front and rear lights. Because the red LEDs are mounted on the light pipe in the body shell, I would also require a plug and socket connection to allow removal of the shell for servicing.

Red Led Wiring Assembly

The two LEDs are wired in series with the white wire as the positive and the black wire as the negative.

I tested each assembly with a current limiting resistor, once that was complete, I glued the LEDs in place with hot melt glue looping the wire down in the middle of the light pipe then gluing the wires on the side of the light pipe for wire stress relief to protect the wires flexing on the LEDs as the assembly is very fragile.

Once again, I tested the LEDs still worked.

With the light pipe assemblies complete both were place back it the body shell to avoid breaking them.

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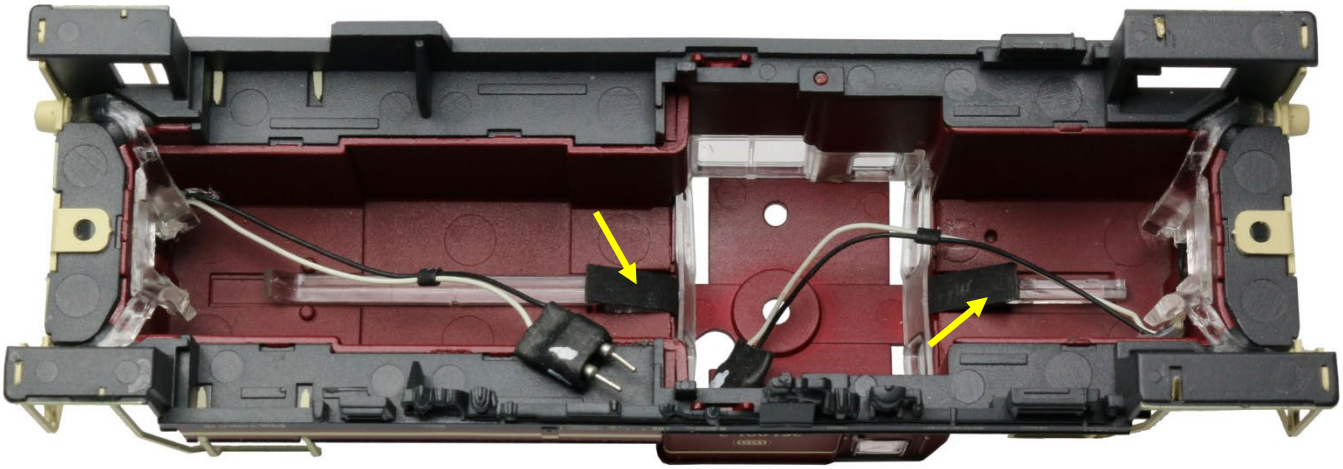
Red LED Plugs and Light Pipe Masking



On the ends of the wires, I soldered IC rolled pins to form a plug and used heat shrink for protection. The positive (white wire) is marked with white paint on each plug.

The yellow arrows show 4mm wide strips of thin black card inserted between the light pipe and the window inserts to stop the cabin windows glowing when the white lights are on.

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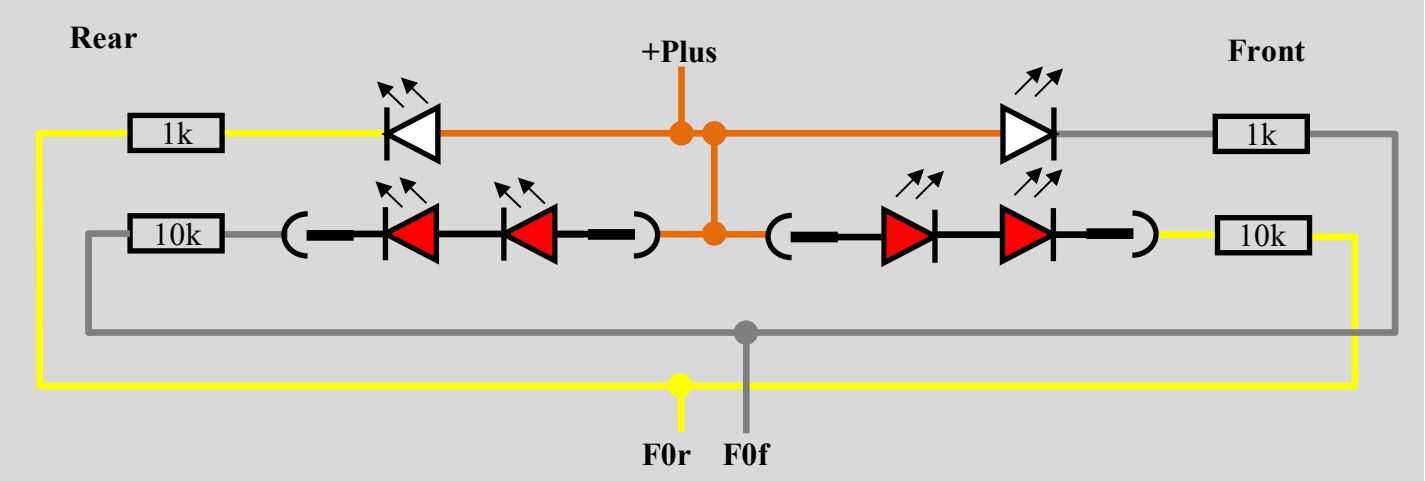
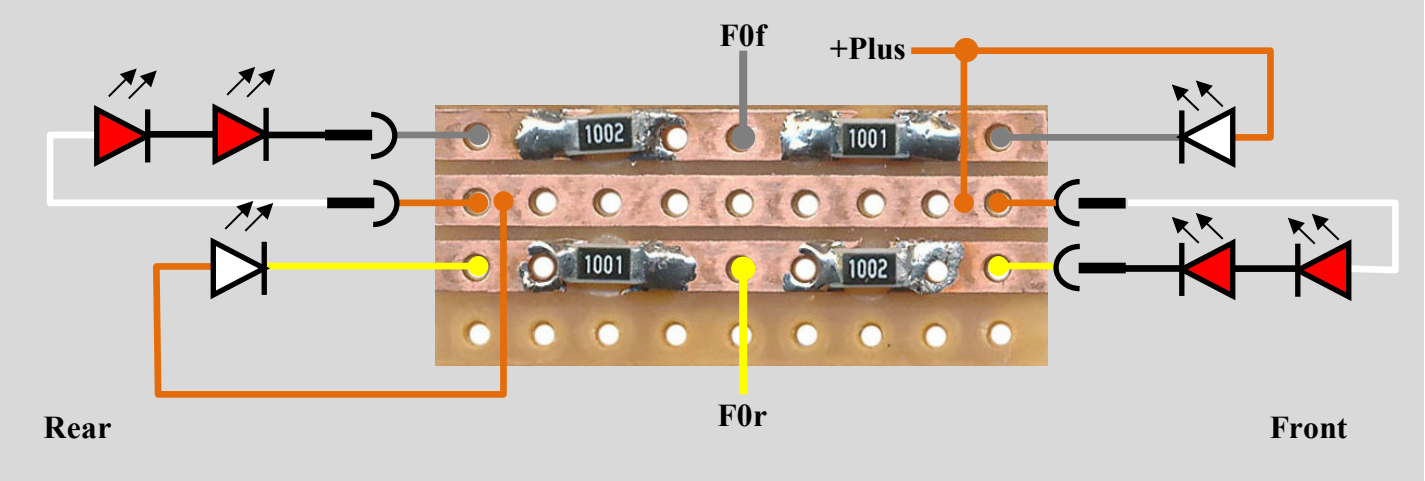
Wiring Diagram 37654 LED Lighting



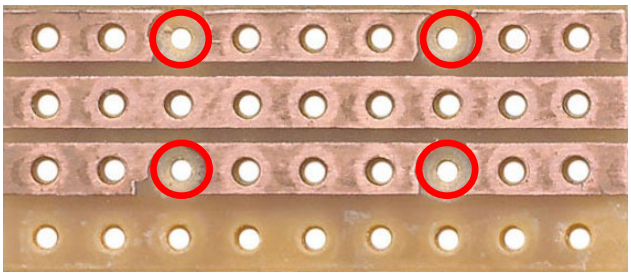
PCB Layout and Wiring Interconnections



The connectors shown are made of IC rolled sockets. The socket for the front red LEDs is soldered direct to the PCB mounted from the other side. The socket for the rear red LEDs is soldered to wires to reach the rear of the locomotive. Please note I removed the thick grey and yellow F0 wires from the decoder and replaced them with thin ESU wires to make routing the wires easier.

Resistor values **1k = 1001** and **10k = 1002**

PCB Foil Cut Locations



A 3mm drill was used to cut the foils under the resistor locations as shown above. The bottom foil has been removed.

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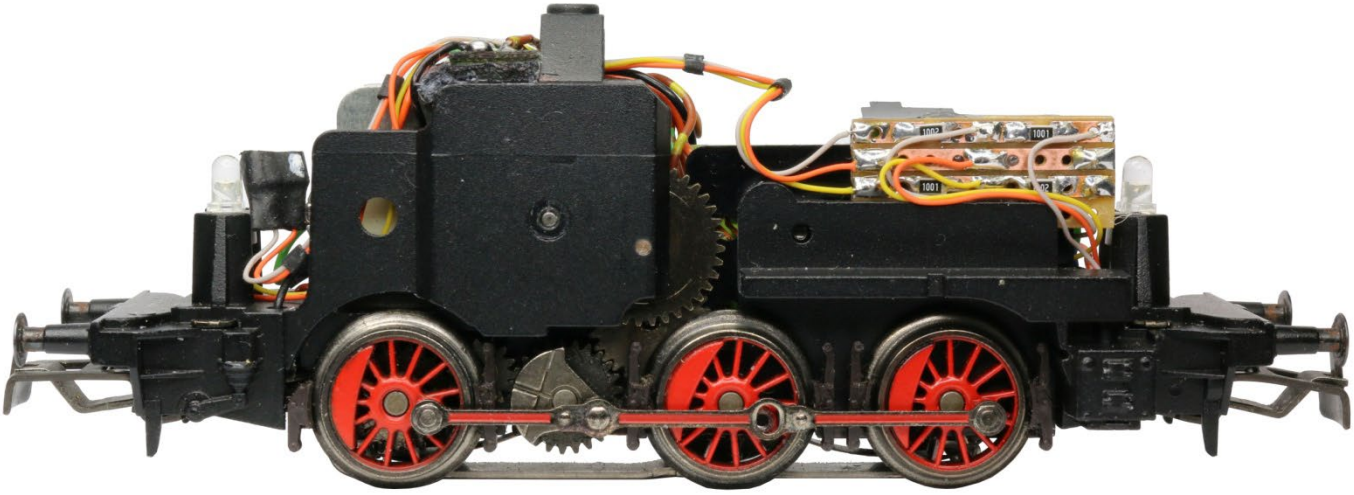
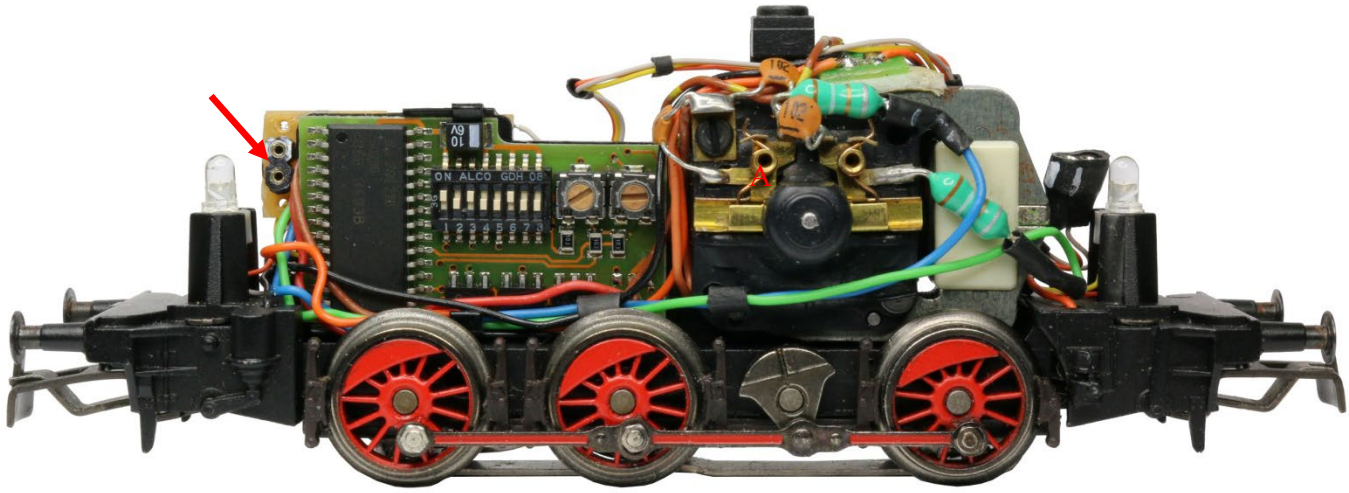
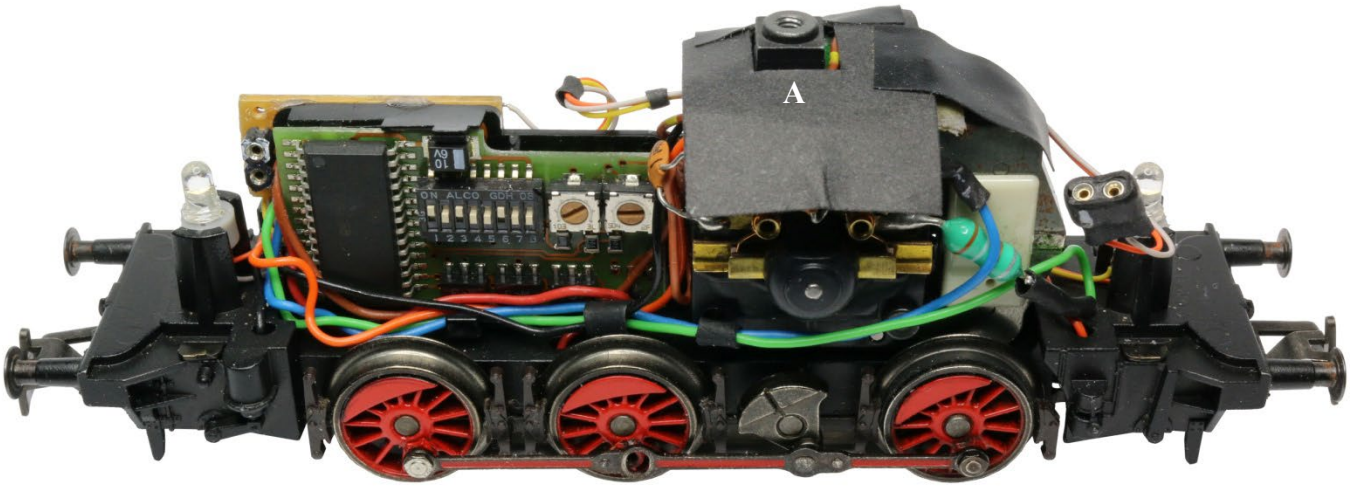
PCB and Wiring Views



The Vero board PCB is glued into position with hot melt glue making sure that the bottom foil is just above the metal chassis to avoid any short circuits.



On the decoder side of the locomotive, you can see the socket (red arrow) for the front red lights and at the back you can see the red-light socket is loose.



I masked the components and wires in the cabin area held in position with black tape. The appearance of the cabin is clean without distractions.

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First Results with the New LED Lights

Locomotive End 2

At the rear end (2) the lighting can clearly be seen between the body shell and the chassis, this gap is in the design of the locomotive.

There isn't any light bleed on the top light (left) when the red lights are on because a light mask was used.

The top white light is brighter than the two marker lights below because the top light pipe is close to the top of the LED and the marker lights capture the light from the side of the LED.

Locomotive End 1

At the front end (1) the lighting problems are the same as above.

There isn't any light bleed on the top light (left) and no light mask was used.

The top white light is less bright than the two marker lights below because the light pipe is a longer length.

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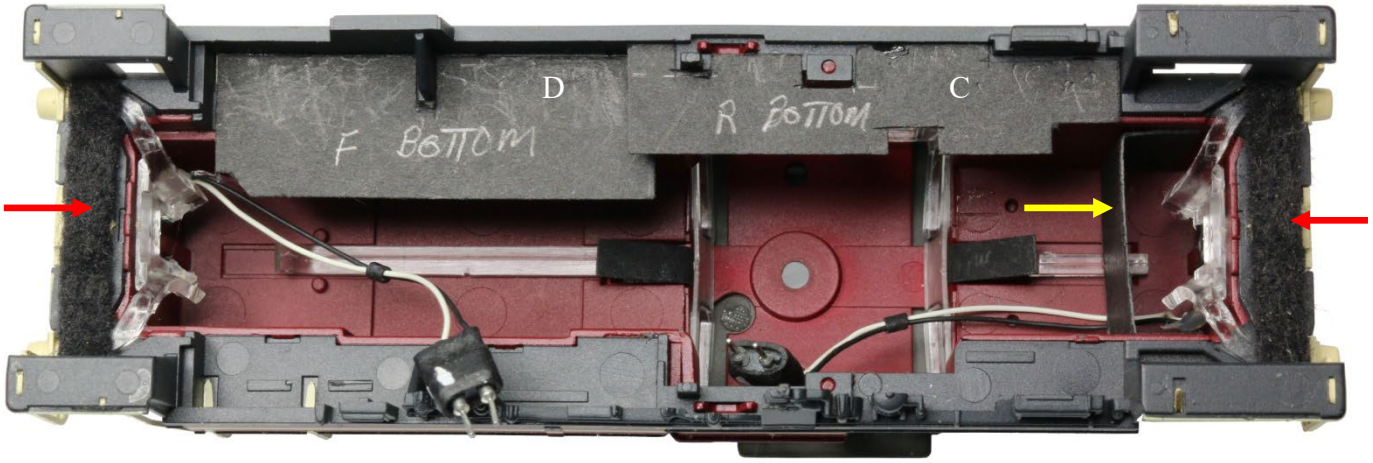
Light Masks

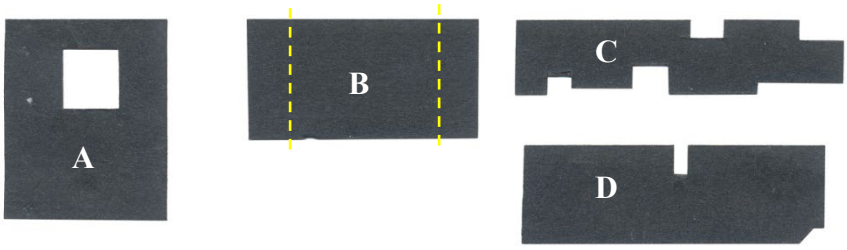


At each end of the body shell, I used black felt **26 x 4 x 1.5mm** thick (red arrows). The felt will take the irregular shape of the light pipes and chassis and compress down to **0.4** mm to fill the gap as required, no glue was used.

The yellow arrow shows the location of mask **B** which helps with reducing the light bleed to the top light and cabin area.

Masks **C** and **D** are located as shown and prevent light leakage on the wheels and track area. These masks have to be inserted when the body shell is on the chassis. I used Woodland Scenics 'Hob-e-Tac' to hold the masks in place and I hope I will be able to remove and replace them when I service the locomotive.

Mask Templates



The mask templates can be used as cutting patterns when printed out with no scaling of the page.

On mask **B** the yellow dashed lines are **6mm** from each end for the fold locations (not to scale)

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Final Results with the New LED Lights

Locomotive End 2

Locomotive End 1

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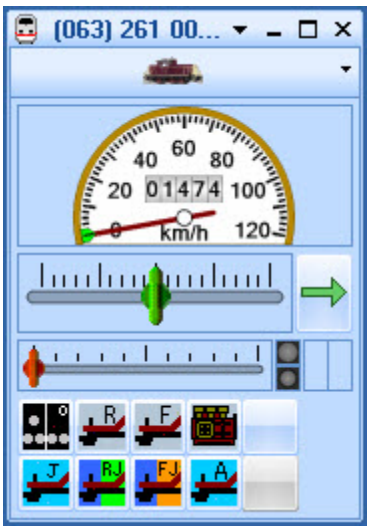
TrainController Use



In TrainController the locomotive is configured for automatic and manual control of the Telex coupler which controls the uncoupling waltz using the original decoder for shunting.

Please refer to my article below to find out how.

[Automatic Shunting with Old or New Telex Couplers]

Overall, I'm pleased I spent the time for the LED light upgrade as the locomotive has increased appeal.

As always enjoy your model trains.