

Make Your Passenger Cars Light

NMRA Fourth Division Clinic by Tom Barrett, April 13,

This is “A” way of lighting passenger cars, not the only way. It is the process I used to reach the final configuration

The cars modified were Walthers heavyweight 80’ and Athearn heavyweight cars

First I tried the Rapido “Easy-Peasy” passenger car lighting system that uses a watch battery and has a switch that allows turning lights on and off with a magnet. These units are sweet, except removal of the roof or car body is required to replace the battery. When tried on the Walthers cars with the stock interior, the clerestory roof interfered with the light system and could not be attached. They could not be modified to fit as circuitry runs near the outside of the light bar and restricts any cutting. The Rapido Easy-Peasy lighting system run about \$16 each.

With Walthers cars having built in pickup from the wheels, installation of the Walthers lighting kits was considered. Contact with Walthers and questioning which version, DC or DCC, to use resulted in the answer of “neither”. The Kitsap Western operates on either DC or DCC and Walthers said the DC units would burn out on DCC and the DCC units would burn out on DC. I did not try either one. They run between \$8 and \$13. I concluded I would “save” some money and make my own.

Since it was around Christmas time, I thought of the thousands of spare bulbs I had. These bulbs are actually low voltage bulbs that should work on about 2.4 volts each. I made clear plastic panels to place below the roof and connect to the car’s track power source. On some of the cars the plastic sagged over the length. I tried several reinforcement systems, and settled on solid 14 gage copper wire attached with double sided tape. Using two such wires as buss wires, I could solder the bulbs directly to them. Sitting still, on DCC, the lights glowed nicely. However, when moving, I noticed them dim. I also noticed the train speed was reduced. I had to reduce train length to get the speed back. Admittedly, this could be the result of Kitsap Western’s built in “yard speed restriction”, but it was not desirable.

My next trial involved LED lights. With the help of the thick Mouser Electronics catalog, I chose amber LED’s because I thought they would give off a nice warm yellow glow and were inexpensive. Also, because LED’s are directional, I added a bridge rectifier to the circuit so the lights would always be on when the train is moving and no matter which way the car was facing. On DCC, the square wave would be rectified to near DC. Since the LED’s use low voltage, I placed several in series, selecting the number based on the desired brightness. These worked reasonably well except I wished I tried yellow LED’s. Also, the lights had an undesirable flicker as the train rolled. And, yes, I did burn out a few LED’s during the initial trials.

Next, back to incandescent lights. I decided to add AAA size batteries to each car as under floor tanks. From the mouser catalog I determined the AAA battery to have about 850 mah. To get acceptable battery life, I chose to use 1 ½ volt 15 ma lights. Using six bulbs in parallel, should give me about 10 hours of light for each car. Unfortunately, the 15 ma bulbs didn’t give enough light in the car. If you’ll

notice, I didn't mention switches. I figured they weren't necessary because I would remove the batteries after each operation. Fat chance!

To increase battery life and improve convenience I epoxied switches to the underbody. It helped, but the lights were still dim. The best switches came from tearing apart various battery boxes and electronic toys. Most of the switches I used were from Radio Shack, however.

To distribute the light, I taped silver ribbon to the car roof. Later I determined that the ribbon could be a problem as it could cause a low level short across the bulbs or LED's. I have since settled on either white paint or white tape to reflect the light. I prefer to have the lights pointing up toward this reflective surface to more evenly distribute the light.

Next, I bit the bullet. I replaced the bulbs with Yeloglow LED's from Minatronics and, because of different voltage requirements, replaced the AAA cell with three hearing aid cells to provide about 4.2 volts. All the LED's were in parallel and the resulting battery life dropped accordingly. Also, since I had made the battery box, the batteries kept coming out and it was hard to install and retain the stack of three cells. A package of 7 LED's run about \$26.

The final try was to use a battery size A23. This is a 12 volt battery and can power four Yeloglow LED's in series. I found that a resistor in series with the LED's is really necessary, not so much to drop the voltage, but to reduce the current draw. By installing a 470 ohm resistor, the current dropped from over 100 ma to less than 0.1 ma. I experimented with several different resistor values and only the last couple of cars have just that resistor. I remember one of the cars ended up with enough resistance to draw only 0.03 ma from the battery. According to Mouser catalog, an A23 battery has 55 mah. The 0.1 ma draw should give a battery life of 550 hours. I operated the lights for three days of operation, about ten hours, at the Science Center show and haven't noticed any drop in brilliance.

When I installed the A23 battery, I chose a commercial battery box. The A23 battery is close to the same size as a 1 ½ volt "N" size battery. Using the battery box from Radio Shack or Mouser required some car surgery. I cut the floor of each car to accept the box and reduce the amount the box and battery hung below the car. To cut the plastic floor, I used a Dremel Moto-Tool and a dentist's cutter. Making light, easy cuts, I was able to follow the outline of the battery box and keep the cutter from overheating, melting the plastic. I epoxied the box to the car's interior floor.

The Observation car has a unique problem. I needed 12 volts for interior lights and 1 ½ volts for the drumhead and marker lights. I installed a second commercial battery box for a AAA battery to power the two 30 ma marker lights and the 15 ma drumhead. For this installation, I used a small DPDT slide switch from Radio Shack.

When these lights are used, it sometimes can be hard to tell that they are on. The car interior can be seen, but the lights aren't too bright. However, turn them off and the car interior is dark.