Techniques for Lighting HO Passenger Cars

By Ken Harstine

Trains we did and did not ride kindle our desire to recreate them. Whether we observed the trains from the inside, the outside or simply in print we want to see them again in miniature. We go to great lengths to replicate even the small details of a particular passenger train. Often lighting them is often overlooked because of the difficulty of adding power contacts and the relative quality of the resulting lighting. Passenger cars had lights and the interiors were visible in the evening and at night. Our models should also have lights. This article will explain how to add realistic lighting to any passenger car.

The obstacles to good lighting are:

1. Power to the lights.
2. Lighting that does not fade or flicker.
3. Sufficiently uniform lighting through the entire car.

The lights of prototype passenger cars are of constant brightness and do not flicker (with the exception of certain electrified lines and then only when passing from one substation to the next). Except for Rapido Trains, and Centralia Car Shops products, all of the factory supplied lighting kits will flicker and vary in intensity. This flickering is caused by the low weight of the passenger cars and even more often by poor electrical pickup. Kato, Walthers and some others provide the best possible pickup by collecting power from all wheels but flickering will still likely occur. The old Rivarrosi cars are much worse with pickups only on one side of each wheel set. In non-DCC systems the brightness of factory lighting will also change with the throttle setting. Most products use a single LED at one end and a clear plastic light guide in an attempt to provide uniform lighting throughout the car. Invariably the lighting is stronger on one end of the car and darker on the other end. Even if multiple LEDs are provided there are often not enough to provide uniform lighting.

Easy Peasy lighting kit from Rapido Trains Inc. is perhaps the easiest to install. It is installed just below the roof of the car and involves no wiring. The lights are powered by batteries and turned on by means of a magnetic wand. Easy Peasy lights provide light from two LEDs and a light guide that disperses the light through the length of the car. This lighting system is very good but is not completely uniform from end to end of the car and of course the batteries will eventually need to be replaced.

A recent addition to the available sources is ESU (http://www.esu.eu). Their light boards are adjustable and provide the super-capacitor as an extra cost option for N and HO and are standard on their large scale product. They provide the ESU 5070X series of lighting kits. The come in 7 x 255mm and 15 x 380mm sizes. Height is not mentioned but is probably very low unless the super-capacitor is used. Several different colors of light are provided as well. The ESU 50706 is used to add a super-capacitor to any of their models. The ESU 50707 can be used with their instructions to provide wheel pickups for all scales.

I have created another third option. My light board is also installed between the cabin and the roof of the passenger car and has a maximum thickness of 0.1" (2.5mm) with the exception of the end that contains the super capacitors where the maximum height it 0.59" (15 mm). My Constant Lighting Kit, includes three 1 Farad super-capacitors, is DCC friendly (current draw as well as capacitive load is limited). It is also compatible with analog control. Under analog control the lights will not start working until the track voltage reaches 4.5 Volts. The resistance the flicker will be fully engaged at or above 7 Volts on the track. The Voltscooter lighting system is regulated for constant brightness and the level of brightness can be adjusted with a small screwdriver. The lighting board can be wired to existing pickups and can also be wired to pickups made from supplied phosphor bronze wire (metal wheels must be added if not already present). The circuit board uses 16 soft white LEDs to provide a more uniform brightness than can be achieved with LEDs and plastic light guides. This light board can provide constant light at realistic levels for at least 30 seconds after power is removed, much longer if gradual dimming is acceptable. The ultimate duration after removal of power is dependant on the actual brightness level that has been set and if on a non-DCC system by the maximum track voltage. By having such a large storage capacity it is possible for steady lighting to be maintained even with poor pickups and track that is not as clean as it could be. While contact exists the super

capacitors are charged at a controlled rate of no more than 200mA until fully charged after charging is complete the current draw is dependent on brightness and is typically about 50 mA. The following section describes the technique for installation.

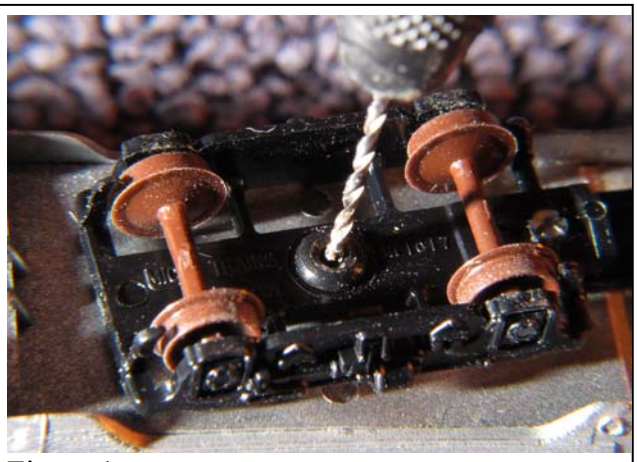

Figure 1

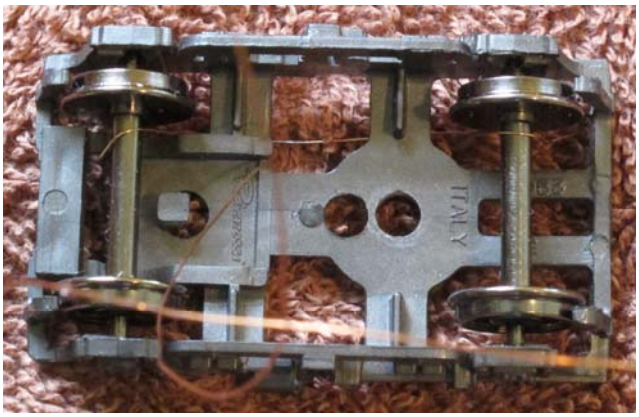

Figure 2

Installation

Figure 3

Installing with the right tools is not too difficult. For tools I recommend a small soldering iron that lets you get close to the solder point, good lighting and magnifications, jewelers tweezers, small needle nose pliers and small wire cutters. The Iso-Tip rechargeable soldering iron with the Micro-Tip is excellent as are the Hakko soldering irons. The Iso-Tip iron with a Micro-Tip is very fine and the iron also has a lamp to let you see what you are doing. You will also need metal wheel sets, and some plastic to make supports for the lighting board. Fine magnet wire (36 AWG or preferably smaller), and 0.008" (0.22mm) phosphor bronze wire is supplied with the kit. The magnet wire will be used to connect the light board to the phosphor bronze pickup wire or to existing contacts on the car. The phosphor bronze wire is used to create the contacts with the metal wheels. Heavier phosphor bronze wire will not allow the wheels to roll freely. The phosphor bronze wire causes a small increase in the rolling resistance of the truck. Shorter trucks will have greater resistance. In all cases the resistance and small and will only be noticed if the ability to pull the train was marginal before the contacts were added. Drill the kingpin all the way through (Figures 1 and 4) or if that is not possible drill through the floor of the car near the kingpin location. One side of the metal wheel has an insulator between the axle and the wheel. You will be placing the phosphor bronze wire next to

the other non-insulated wheel as shown in Figure 2. Do not pre-bend the wire. The wire needs to be sprung (under tension) to make good contact. Bend the end of the wire around the axle to keep it from slipping off (Figure 3). Now install the second wheel set by slipping it under the phosphor bronze wire. Be sure that the non-insulated side of the axle is on the same side as the other wheel set on this truck (Figures 2 and 4). Trim the wire with cutters. Bend the wire as before to secure it.

Figure 4

Figure 5

Another method is courtesy of Brian Bodemann. In this method you make a loop in the middle of the phosphor bronze wire. This loop will fit around the bolster of the chassis that the truck rotates around. This will make it impossible for the phosphor bronze wire to twist and release itself from the truck. See figures 4 and 5. The loop can be made easily with the Kadee coupler forming pliers, with wire bending pliers or a wire bending jig (figure 6).

Figure 6

Tin the magnet wire and the phosphor bronze wire. The magnet wire has insulation on it and the tinning process will need to vaporize that insulation layer. The soldering iron should have a bead of solder on it and the magnet wire tip should be kept in that bead of solder until the insulation is completely gone and the end is nicely tinned. The insulation can also be removed with a butane torch or butane lighter. In any case be sure to tin the wire before the next step. Form a hook on the end of the magnet wire. Hook the magnet wire onto the phosphor bronze wire as shown in Figure 3 and 8. Now solder the magnet wire to the phosphor bronze wire. Insert the other wire into the hole that was drilled through the kingpin as shown in Figure 8. Repeat the above procedure for the other truck. Make certain that the non-insulated sides of each wheel set are on the opposite sides

Figure 7

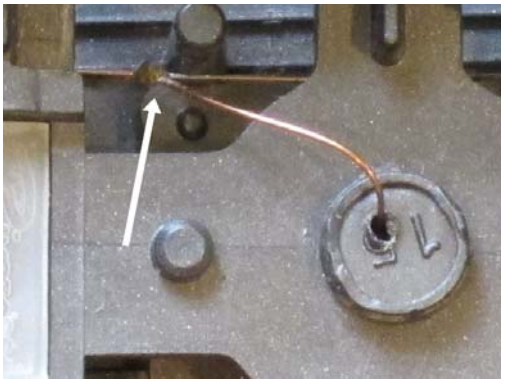

Figure 8

from the first truck. You are trying to pick up power from each of the two rails.

Add some supports for the light board if needed (white styrene blocks in Figure 9).

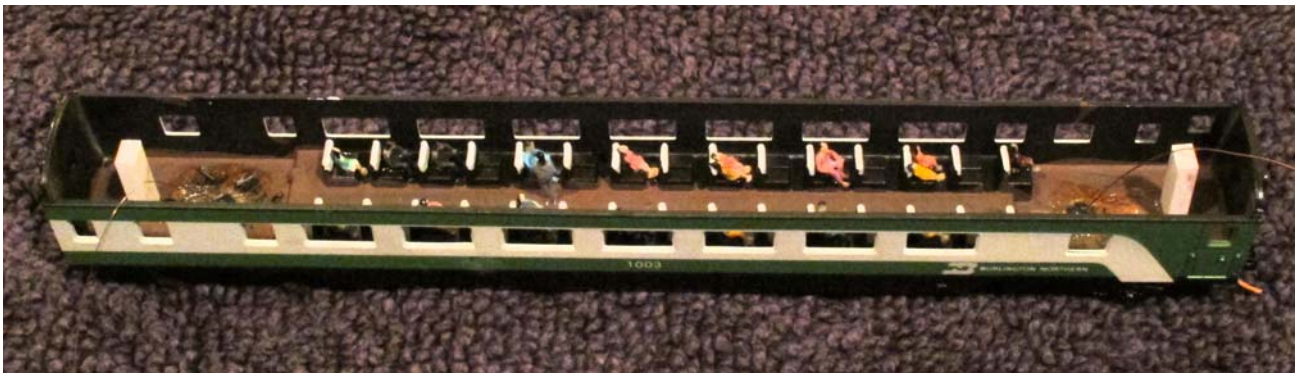

Figure 9

Thread the magnet wire into the T+ and T- holes on the light board. Secure the light board. I prefer to use contact cement such as Walther's Goo for securing the light board. Solder and trim the magnet wire to the light board. Again since the magnet wire is insulated you will need to maintain contact with the soldering iron much longer than normal in order to vaporize the magnet wire's insulation. Place the car onto a powered section of track and adjust the brightness to the desired.

Conclusion and Notes on Detailing

To make the best use of my lighting I have painted and installed passengers in my cars. Non-painted plastic is somewhat transparent and does not look well when lit. Walls and seats should not allow light to pass. As much as I can, I choose colors that are typical of the era of the car. Information on interior colors is not easy to come by. If you actually rode the trains you are modeling, perhaps you have some memory of appropriate colors. Books or articles about the train sometimes have color details. Promotional brochures that show interiors are also great and can be found in books, on-line through Ebay and similar sites, museums, and railroad historical societies. I painted anti macassars onto the seats of my coach cars as I remembered them on the Amtrak cars and on the San Francisco Chief. These were standard equipment from the 19th century until the early days of Amtrak and they are visible through the windows. For the passengers I recommend inexpensive Chinese made 1:100 scale figures from Modelleisenbahn Figuren (http://www.modelleisenbahn-figuren.com/). Because of the un-prototypically thick walls and floors of HO Scale passenger cars the 1:100 scale figures fit much better then actual 1:87 HO scale figures. Flourescent light began being marketed in 1938 by General Electric. Based on some

research I have done it appears that streamliners from at least the mid 40s onward had fluorescent lighting. The supplied LEDs are a warm light that is a reasonable compromise between fluorescent lights and incandescent lights. Tinting with paint is recommended if the color proves unacceptable.

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