G Scale at the National Toy Train Museum
Sex, Lies, and Spade Lugs

Third in a Series of Articles

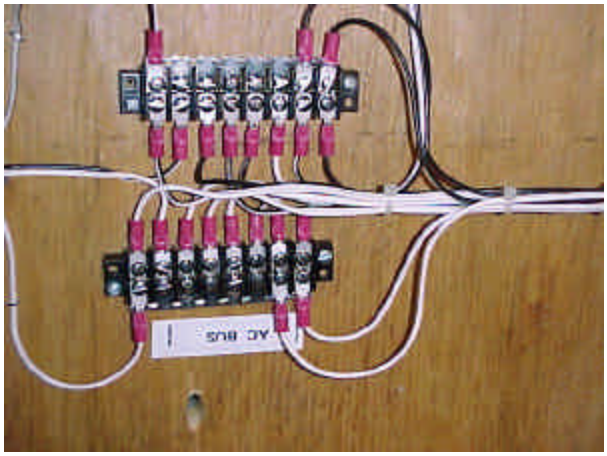
By Mike Frieders

This is the third of a series of articles about the GScale layout at the National Toy Train Museum in Strasburg, Pa.

This article will describe the complete rewiring of the layout that includes both DC track power distribution and control circuits, and an extensive AC accessory and lighting bus. All layout wiring terminates at the control panel, which is beyond the scope of this article. The design and construction of the control panel will be described in the next of this series of articles.

The layout features three operating lines. There is a point to point trolley line with catenary that runs along the entire length and width of the layout at the outer edge.

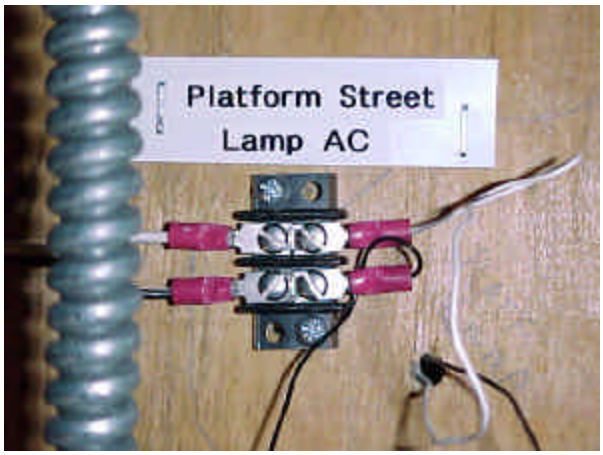
The main line operates at the same level as the trolley line, and has a meandering route that includes two tunnels. The upper line is a small oval on an elevated portion of the layout.



From the time that the layout was built, all three operating lines had been powered by HO power packs that were simply sitting on the floor under the layout near a wood access panel that required the removal of four screws just to get a look at them.

When Twila and I first removed that panel we were truly mystified by what had passed for layout wiring and control. It was nearly impossible to figure out what was going on, so my first thought was to just rip it all out and start over. That's just what we did!

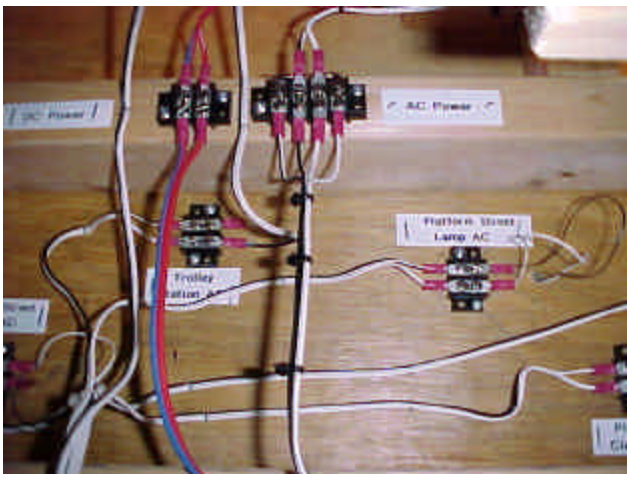
We removed every inch of the existing layout wiring, and all connectors, etc. The HO power packs were put out to pasture. So here we had a large layout without an inch of wire or controls, and it had to be in full operating condition in just over two months. We needed a design concept for the rewiring of the layout. I have always enjoyed electrical wiring. It's logical. It makes things work! It's always been an enjoyable aspect of the hobby for me. Between weekend trips to the museum I scribbled a lot of schematic wiring concepts on paper, finally settling on a modular concept that includes an AC bus.



This new wiring design makes layout maintenance easier, and also provides for easy layout expansion such as adding new AC accessories. Neatness and logic are top wiring priorities with me, so color coding, labeling, and neat wire runs are integral features of the new wiring concept.

So what do I mean by modular wiring? The existing layout wiring had a pair of wires running all the way from an accessory such as a street lamp back to the power pack. That made it real difficult to remove an accessory or to pick up a building in order to change a bulb, etc. That just doesn't work in a museum environment in which layout repairs have to be made quickly on a Saturday night after the museum is closed to visitors.

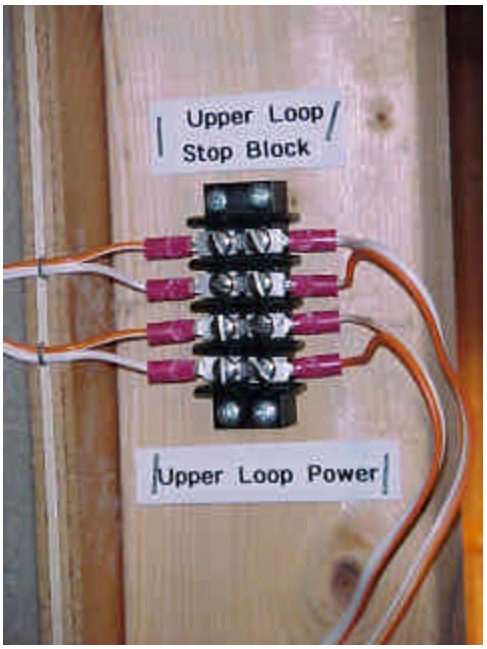
The new modular concept terminates every accessory, every power connection, every wire! that penetrates the layout table, on a barrier strip. In most cases the barrier strip is a 2 position strip allowing connection of 2-wire track or accessory power. The wires coming from the layout are screwed down to one side of the barrier strip. Screwed down to the other side of the barrier strip is a wire that runs to the AC bus or back to the control panel.



To make it easy to do maintenance on the top of the layout we added about 18 inches of wire to all connections coming from items on the layout that can be moved. For instance, if we need to replace light bulbs inside a building, we need to be able to pick up the building so we can reach inside and replace the bulb. The extra 18 inches of wire hanging below the table between the building and the barrier strip makes this easy. No need to disconnect any wires. Just pick up the building, replace the bulb, and put the building back in place. If something does need to be removed from the layout for repair, just cut the wires above the spade lugs at the barrier strip.

There are still over 17 inches of wire left when the item is returned to the layout. In that case just crimp new spade lugs to the wires, and screw them back onto the barrier strip. Easy maintenance!!

The AC bus was designed to minimize the number of wires going back to the control panel, and greatly reduced the amount of wire needed to wire the layout. Several locations were selected under the layout for AC nodes, based on the number of AC accessories located nearby. Each node consists of two widely spaced 8-position barrier strips. The outside positions of each barrier strip are tied together with a single metal jumper designed for that purpose. Looking at the photo you can see that the accessories are wired to the inside positions of the barrier strips, and the AC power runs from the control panel and from node to node at the outside positions of the barrier strips.



In this way, each node can handle up to 14 different connections to accessories. Eight accessories can be connected to the inside screw posts, and six more can be connected on top of the jumper strip to the outside screw posts.

To review then, each AC accessory is wired to a small barrier strip mounted under the layout near the accessory. There is an extra 18 inches of wire between the accessory and the barrier strip to facilitate easy maintenance.

From the small barrier strip, another wire runs to the inside (or the outside if necessary) of the AC node nearest the accessory. Power is passed from the control panel to each AC node in succession by a single two wire run from the panel and from node to node. This bus concept saved literally hundreds of feet of wire and wiring misery.

In 2001, the G scale layout will be expanded by about 10 feet on one end. When that happens, the AC bus will be expanded by simply adding additional nodes as required. Not a single wire will have to be run back to the control panel.

I'm very particular about electrical parts and wire. Getting the quality parts and wire that I selected was a major effort that ate up a lot of lunch hours between trips to the museum.

Selecting the wire was easy!! There is simply nothing better than the various LGB twin-lead wire products. It's color coded, easy to work with, and has more than enough current capacity. Did I mention that it's easy to work with! You don't have to fight with LGB wire. We used the black and white 50140 for all AC wiring. The 50130 orange and white wire was used for all control and EPL wiring, and the blue and red 51230 wire was used for DC track power.

The LGB wire was purchased from Star Hobby, Earlington Trains near Allentown, Watts, and others. The barrier strips and matching jumpers are the Cinch 140 size in many different lengths. They were obtained from Arcade Electronics in Alexandria, various Radio Shacks, and Digi-Key mail order. The solderless spade lugs are True Value Hardware's Master Electrician number 552-706. I wouldn't accept any substitutes for the spade lugs, so getting enough to keep the project moving was a real problem. I found the mother load at the incredible True Value Hardware run by SideTrack Hobbies owner Al Rudman in Leonardtown, MD. Al, along with special orders from Zimmerman's Hardware near the museum kept us in business.

Neatness was maintained through careful wire running, and the use of hundreds of cable ties and staples. We used Tyton 4 inch T18 cable ties purchased at Arcade Electronics. Cable ties were used to bundle wires together, and to secure bundles to staples where necessary. The ties made the AC bus wiring much neater in appearance.

Cable ties must be viewed as a disposable wiring accessory. I'm sure that in the course of wiring the layout we discarded hundreds of ties as we added new wires to AC nodes, etc. If you want neat wiring, you can't worry about wasting cable ties. We also used a special wire stapler with curved staples sized to hold up to two stacked LGB wire pairs. Stapling the wires over your head with limited visibility was a real challenge at times.

Several years ago, Scott McDonald brought a large box of thin plastic sheet material to a WVM meeting. I along with others helped ourselves to a good supply of the plastic, easily cut with a scissors, in the firm knowledge we would need it some day. That day came in the form of signs for all of the connections underneath the layout. We used a Brother P-Touch labeling machine to create tape labels for each barrier strip. The labels were mounted on the plastic, cut out with a scissors, and stapled to the layout framing near the connection. No guessing under the layout!

This year we are adding similar labeling for the holes in the layout that are used for Christmas lighting accessories during the Christmas holiday season. The wiring concept and design has been very successful, and was repeated when Twila and I rewired the Standard Gauge layout last year. In fact, the layout wiring and control panel has been something of an attraction itself, resulting in several under the layout tours.

In the following articles I'll cover several other areas of layout improvement. Future articles will describe the control panel, structure lighting, trolley shuttle control circuit, signal wiring and control, Christmas decorations, and maintenance. Watch this space for more next month!!