

Chapter Three

Track Layout and Wiring

Once you have your train board completed, you are ready to start playing with some track, switches, locomotives, and rolling stock. Before you settle on any particular track plan, try several different configurations. While your options are somewhat limited because of the size of the train board and the size of O gauge trains, you can pack a lot onto a 4 x 8 layout. Sketch a layout or just lay some track and switches on the board. Move them around until you come up with a combination you like. Keep this first layout simple with only two or three switches.

When you've arrived at what you believe to be the THE plan, drill small holes through the plywood for the switch wires and run some wire to them. Position the lock-on near the transformer, power up the track, and check the switches. Since the switches draw their power from the track, all you have to do is hook up three wires for each switch and you are ready to play.

Once you get a feel for the transformer and the locomotive's response to a variety of power settings, practice throwing the switches as a train approaches. When you and your children are comfortable with the process, you are ready to

advance to a more complicated layout with more switches.

After you have experienced several different track configurations, you will naturally gravitate to a favorite one. When you've gotten to that point, lay out the track and switch, flip the switch motors where necessary, drill any switch-wiring holes that are needed, and plug in your trusty lock-on. Manually test the switches, fix any fluttering or consistent throw problems (page 48), and then test the trains on the track.

Once you are satisfied that the layout works, decide where you want accessories and infrared sensors. The sensors need to be plugged into the same side of the track as the lock-on. What I mean by this is that if the lock-on is connected to the outer part of the track, the outside and middle rails will be electrically wired. Conversely, if the lock-on is connected

to the inside of the track, the inside and middle rails will be electrically wired. For the sensor to work properly, it must be plugged into the lock-on-powered rails so that it can draw power to run the sensor and the accessory.

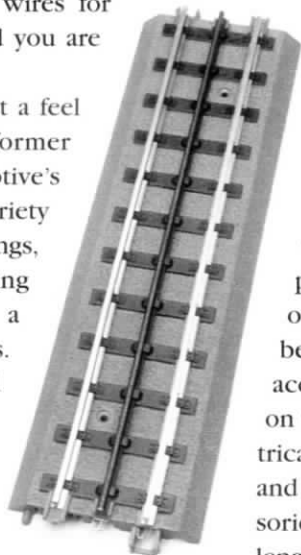
Before we go on, let's take a moment to discuss why O and O27 gauge trains have three rails. The three-rail standard was set by the Lionel Corporation when they introduced electric trains almost 100 years ago. Having three rails simplified the electrical wiring for all the working accessories that Lionel planned to make. By powering only the inner rail and one other rail, the dead rail became the switch for all the accessories. Because the wheels on trains are metal, they make electrical contact between the inner and outer rail. Locations for accessories required that you isolate a length of rail so that it did not have electrical contact with the rest of the track. As the train passed over this length of rail, the wheels provided electrical power to that isolated length, thereby turning on any accessories connected to it.

The wiring required to do all this is perhaps not as simple as this explanation, which is why MTH designed their plug-and-play accessories and track. The plug-and-play concept takes advantage of the three-rail design for activating accessories, but without the headaches of wiring, thanks to their infrared sensor and accessories designed to draw low voltage from the track.

I settled on a modified large oval with two curves at one end, a reversing loop, two sidings for storage of additional rolling stock, one uncoupler, and six switches—three left and three right. A reversing loop allows you to literally reverse the

direction of the train by stopping the last car of the train just past the switch, throwing the switch and then backing the train completely through the section of track, and then throwing the switch at the other end of the track. When the train goes forward again, it will be running in the opposite direction. Reversing loops help your children practice running and stopping trains as well as throwing switches. An uncoupler allows you to remotely uncouple rolling stock from each other or the locomotive. Here you and your children get practice positioning the trucks directly over the uncoupler to disconnect them.

For accessories I chose two crossing gate signals, one block signal, three different types of street lamps, and four lighted buildings—two houses, a switch tower, and a station. Once the track was positioned on the train board, I placed all the accessories in their approximate locations both to check the fit and to see how they would look on the layout. I also marked the locations of any infrared sensors and popped out the tabs on the track for these locations. I did not secure any of the accessories at this time.



That's part of the next chapter. For now, let's concentrate on getting the track laid out, adjusted, wired, and secured to the train board.

Once you are satisfied with the layout, it's time to screw down the track. Track and switches have recessed holes in them for screws. Use a wood punch to set a starter hole in the plywood, and then set

the screws in place. The best screws are no. 4, 3/8-inch panhead zinc-plated, available in just about any hardware store. It's not necessary to place a screw in every hole; one per section is plenty. Once the track is in place, drill holes for the switch and lock-on wiring.

Next, decide where on the control panel you want the switch controllers, line them up, mark holes for the wiring, and then drill the holes. Be sure you leave enough room between the controllers and the edge of the control panel so you can label the controllers and still have room for a diagram of the layout, complete with corresponding numbers for the switches. Secure the switch controllers with screws, and run the wire from each controller through the corresponding holes in the control panel. The holes for the screws on the switch controllers are very small; Atlas sells bags of O gauge track screws that fit perfectly.

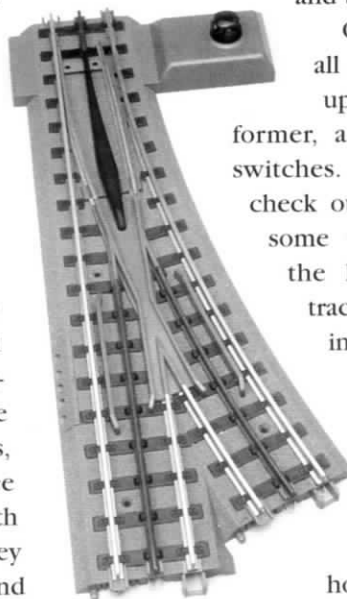
Since the wires attached to the controllers are not going to be long enough to reach all the switches, you will need to lengthen them. The easiest way to do this is to add electrical screw terminal strips under the train board and make longer wire lengths to reach the turnouts. These terminal screw strips, which come in various lengths, can be found in any electronics supply store, such as Radio Shack. To keep things neat and organized, screw the terminal strips into the inside of the train board frame just behind the control panel where the switch controllers are located.

The next step is to cut individual lengths of wire that will reach from the switch to the terminal strip. To ensure that you do not mix up the wiring, use the same colors for these new lengths as those supplied with the switch controllers: black, red, and green. You can use either solid



wire or stranded wire, but I like to use stranded because it is more flexible and easier to work with. Atlas sells spools of stranded 20 gauge wire and solderless wire clips, both of which are designed specifically for model railroading. For this particular layout you will need two spools of red, two of black, two of green, and several bags of solderless clips. To make the wire lengths and use the solderless clips, you will also need a wire stripper/crimper. Here again, this handy tool can be found in Radio Shack stores. One more item you will need is small plastic tie strips, which can be found at just about any hardware store.

Work with one switch at a time and measure each group of wire lengths separately, strip the ends, and then add the solderless connectors. Next, take several tie strips, secure the three wires together with the tie strips so they are bundled, and then cut the excess tie strip end. Usually three or four strips are all that is needed for each wire bundle. Run the wire bundle through the plywood to the switch,



hook the wires to the switch's screw posts, and then run the wires back to a terminal strip. When running the wires under the train board, be sure to run them through the holes that you drilled into the framing.

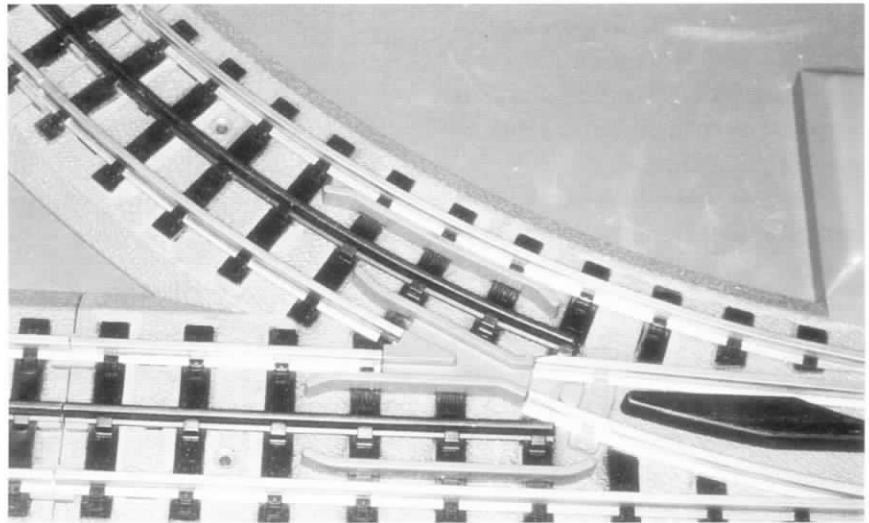
Connect the wires from the switch to the terminal strip, and then connect the wires from the controller to the same terminal strip screws, being sure to match wire colors. The switch controllers should be grouped together so you can control the switches as a locomotive approaches them. Wire one switch at a time and wire switches that are close together, working from the locations farthest away from the control panel to the nearest.

The excess wire from the switch controllers should also be bundled using tie strips so that the underside of the train board does not start to look like spaghetti. Neatness and organization count in wiring a train board, because if you have an electrical problem it will be easy to trace the wires if they are individually bundled, tie-stripped together, and tagged.

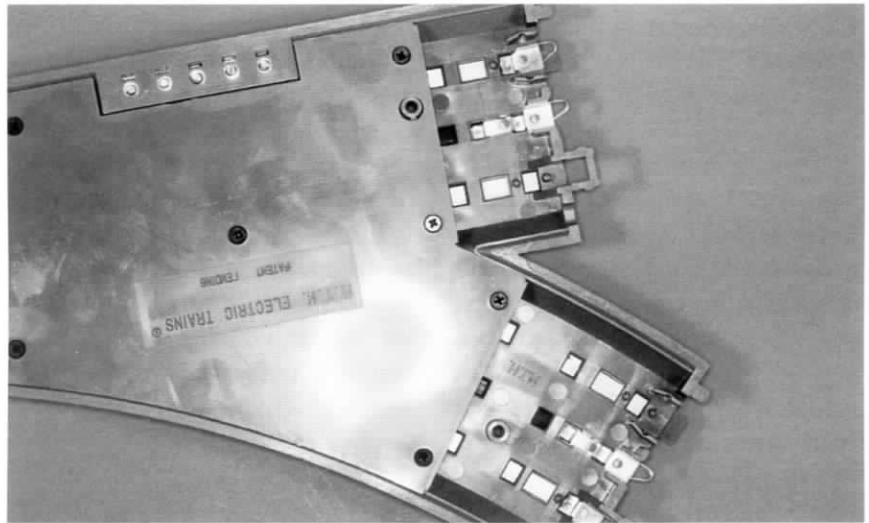
Once you have completed all the switch wiring, hook up the wires for the transformer, and test the track and switches. Once all the turnouts check out, you are ready to run some trains. Practice working the locomotive around the track, especially the reversing loop, and also practice throwing the switches as the locomotive approaches. One last thing you can do is to paint the shiny heads on the screws holding down the track. I recommend Testors primer, which is a gray color and comes in either a water-based or enamel mixture. Testors paints can be found in any hobby store.

Adding Switches

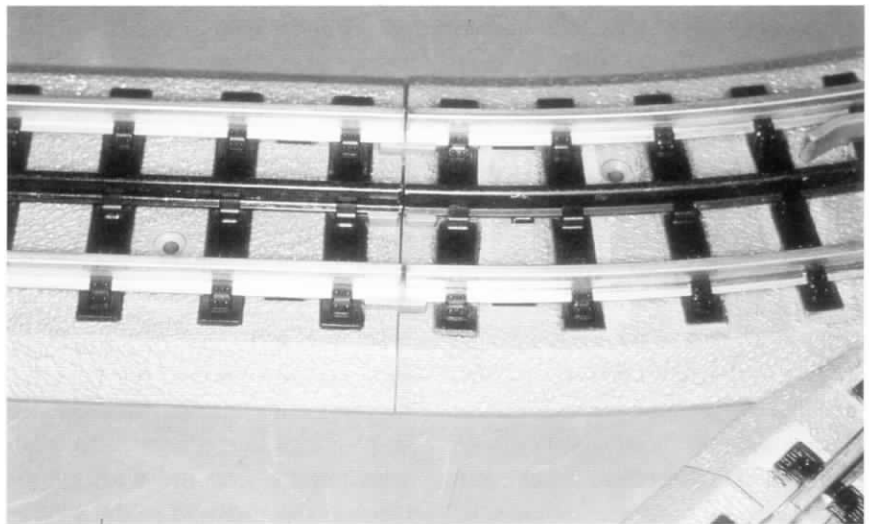
After temporarily placing track on the table and running trains for a while, it's time to add some switches to your layout. Switches are easy to install and wire. It's helpful to remember that the interior curved rails are not electrically connected to anything. This is because these inner rails are the sensors for the nonderailing feature on the switches.



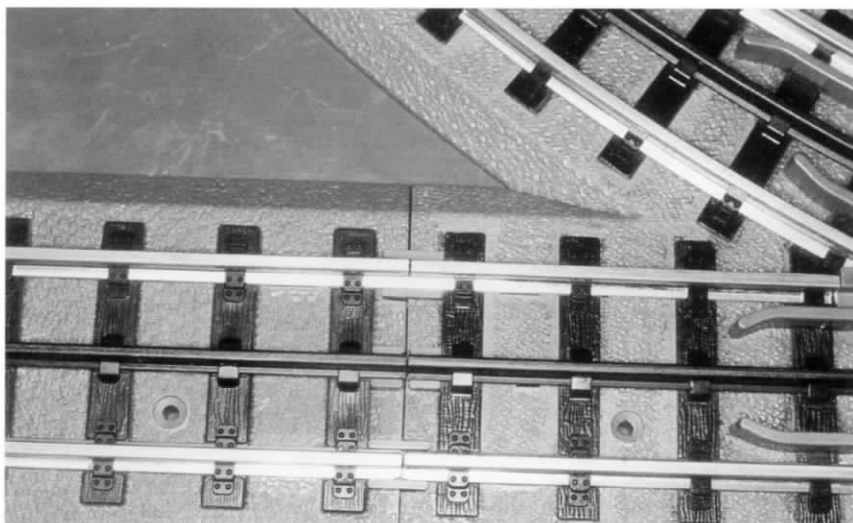
A look at the underside of this switch reveals there are no electrical connectors for the inner rails.



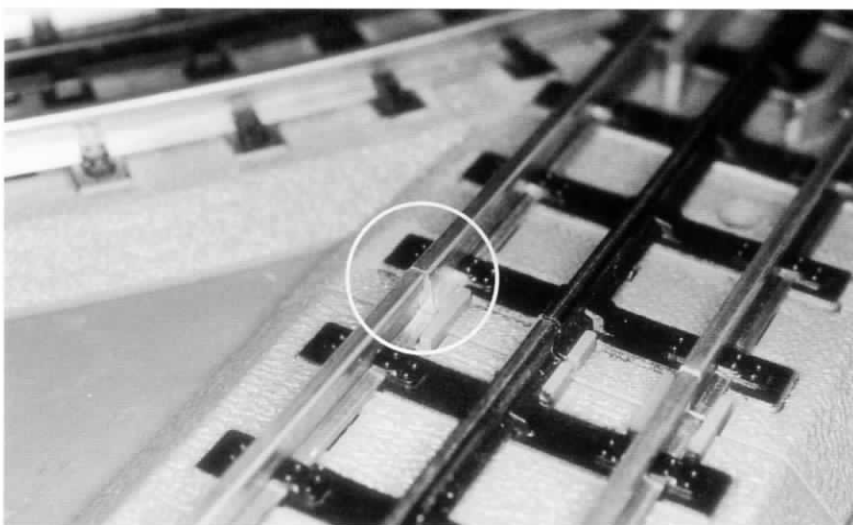
The inner rail on this switch is the correct length, which is slightly shorter so that it will not touch the adjoining rail.



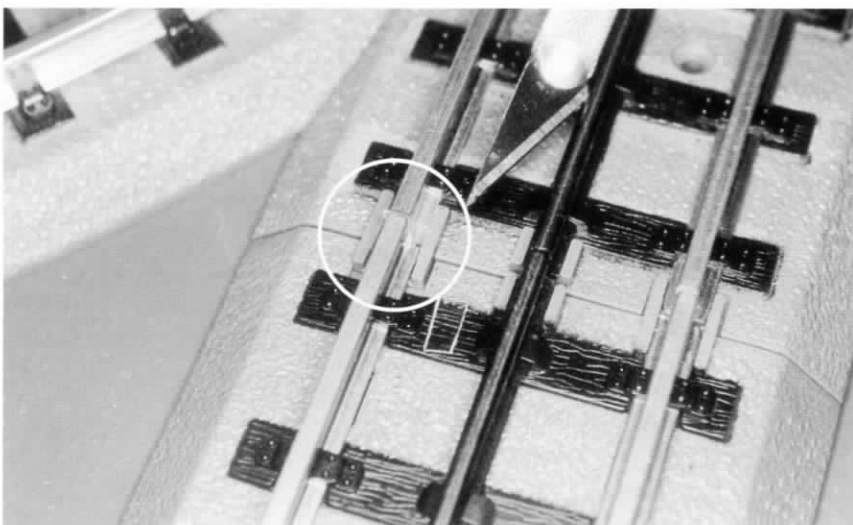
Simple Switch Fixes



The inner rail of this switch is slightly off and is touching the adjoining rail. As a result, the electrical motor for the switch will flutter or constantly be thrown in one direction.

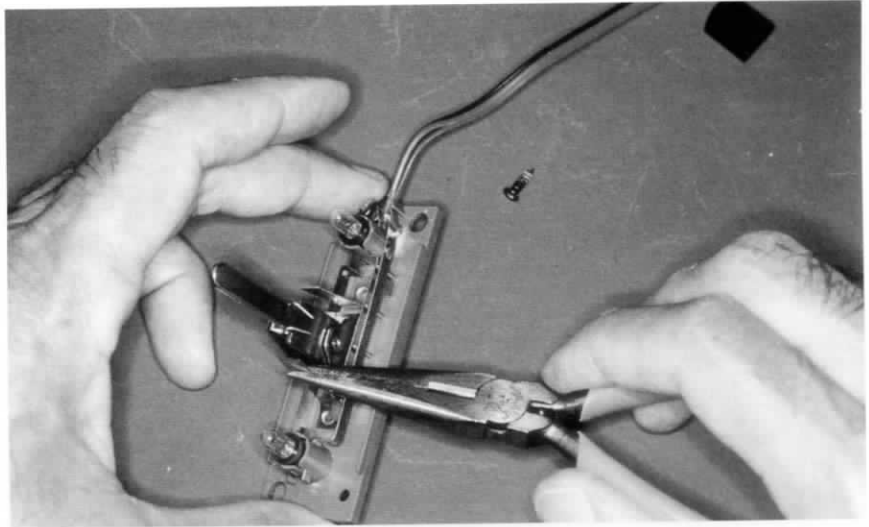


A simple fix for this problem is to insert a small piece of clear plastic from the switch packaging between the two rail ends.



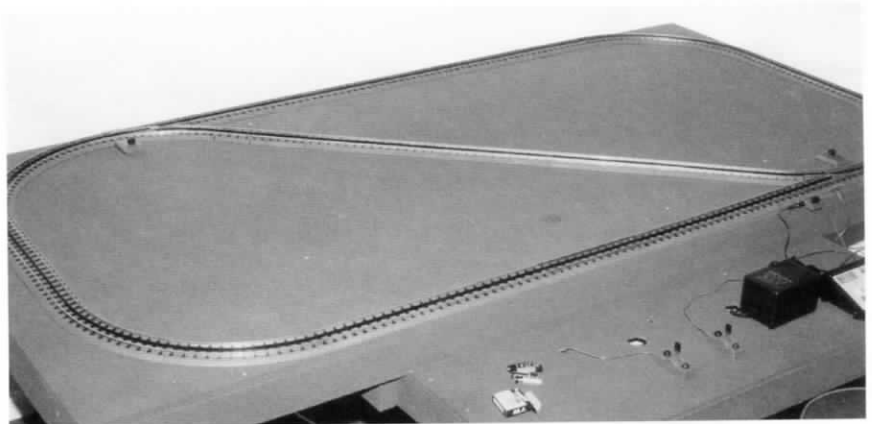
Use a sharp hobby knife to trim plastic from the inside of the rail so that it will not interfere with the wheels of the locomotive or the rolling stock.

Another easy problem to fix is an overly sensitive switch controller. Simply remove the controller cover and bend the electrical contacts away from one another.

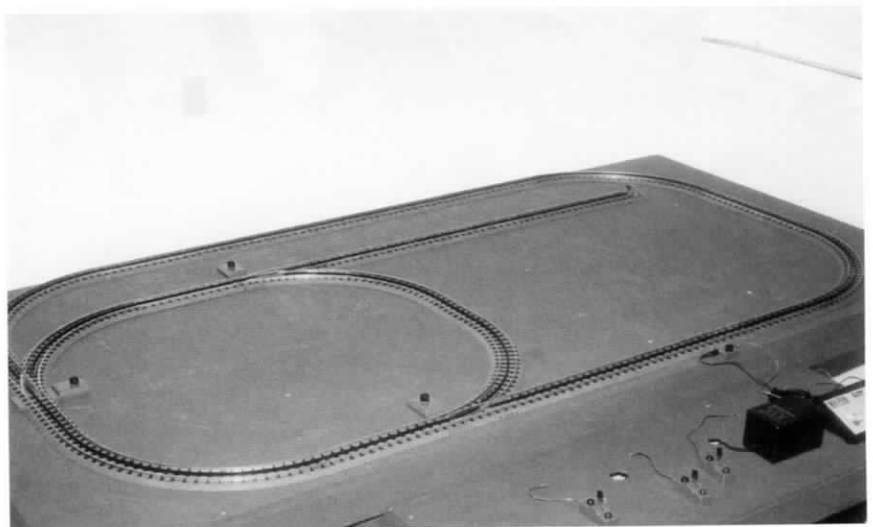


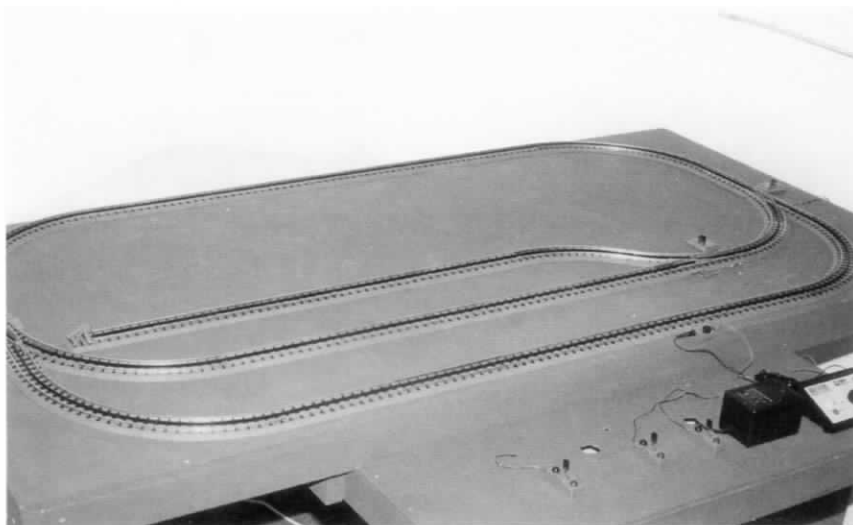
Track Plan Ideas

Once children get a feel for the locomotive, it's time to add some switches. I have modified the oval by adding what is referred to as a reversing loop. This give the kids practice backing up, throwing the switches, and using the locomotive's E-unit.

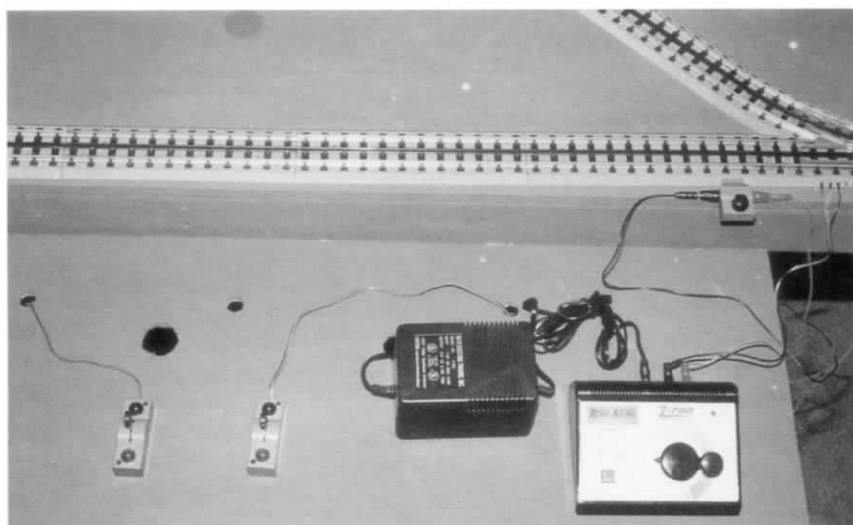


Here is another variation on the oval. This time I removed the reversing loop and added a smaller oval with a siding for storage of rolling stock.



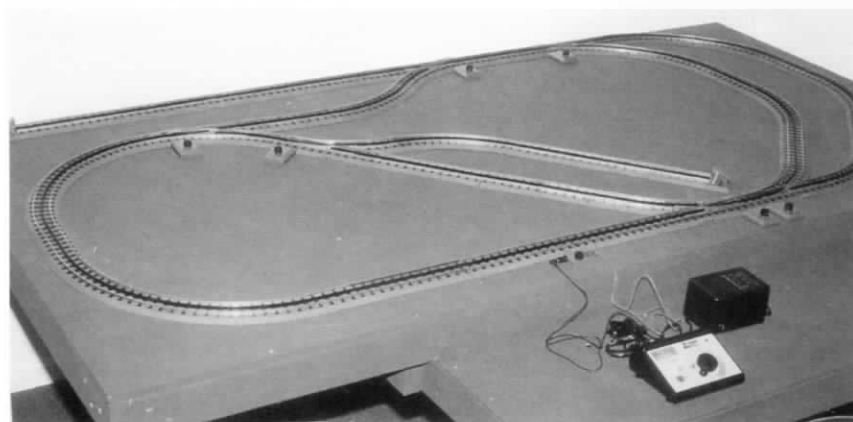


Still another variation on the oval with a long siding. Children seem to master throwing the switches quicker than adults, so now it's time to make a more complicated layout with more switches.



Thanks to M.T.H. Electric Trains' design for the low power draw of the switch motors, you do not need an additional transformer to power them. The switches draw their power directly from the track. Wiring the controllers for the switches is also very easy.

Final Configuration



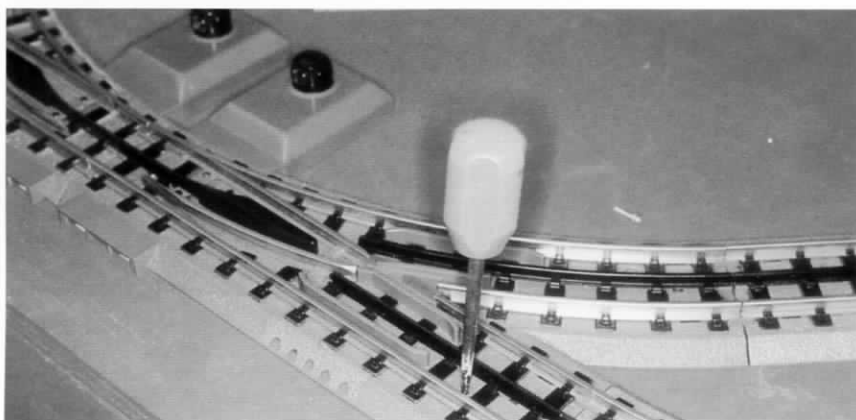
Here's the track design we decided to go with. It will appear throughout the rest of the book. There are three right- and three left-hand switches, 12 lengths of 31-inch curved track, 12 lengths of 10-inch straight track, 2 lengths of $4\frac{1}{2}$ -inch track, 4 lengths of $3\frac{1}{2}$ -inch straight track, 6 lengths of $5\frac{1}{2}$ -inch straight track, two bumpers, one uncoupler, and one lock-on.

Before I screwed down the track, I positioned all the accessories onto the layout to check their locations and to be sure that they would not interfere with one another or the track. I powered up the track and ran a locomotive around the layout. Kids like lots of lights and motion—come to think of it, so do adults!

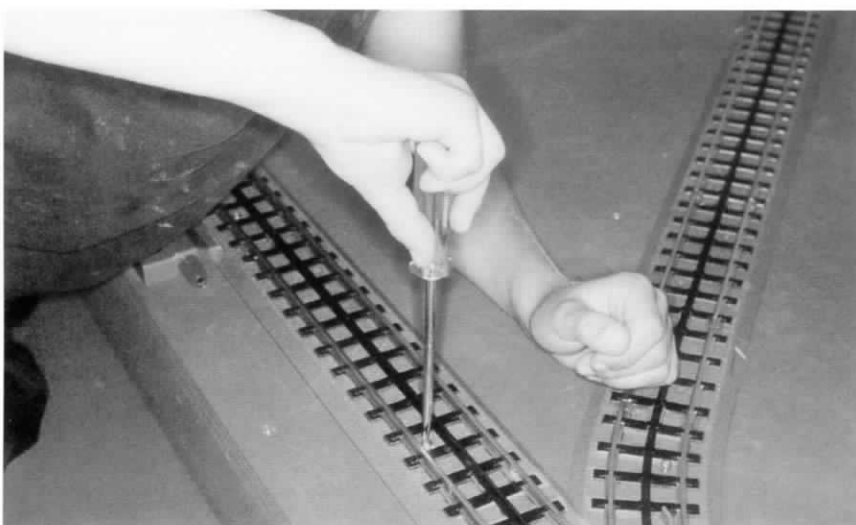


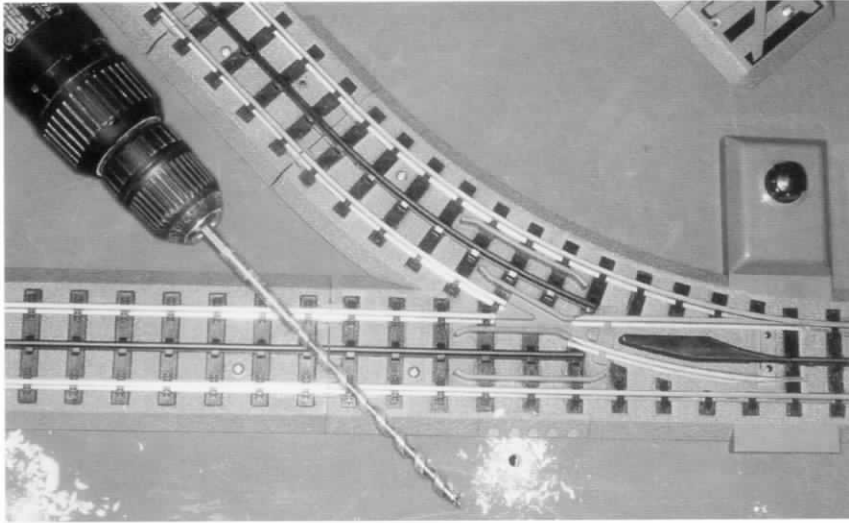
Attach the Track and Switches

To secure the track to the train board, use a punch to start a hole in the plywood.

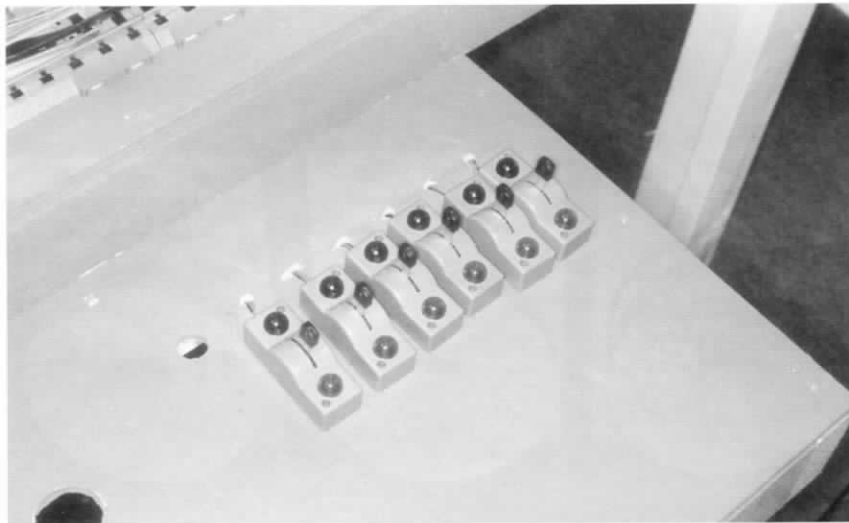


Use no. 4 $\frac{5}{8}$ -inch panhead screws to secure the track to the plywood. You don't need to place a screw into every hole on each length of track; just add enough screws to hold the track in place.



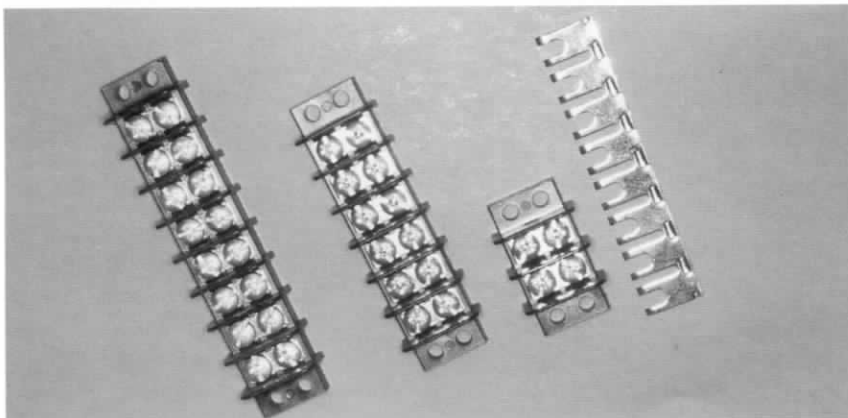


The next step is to drill small holes into the plywood for the switch wiring.



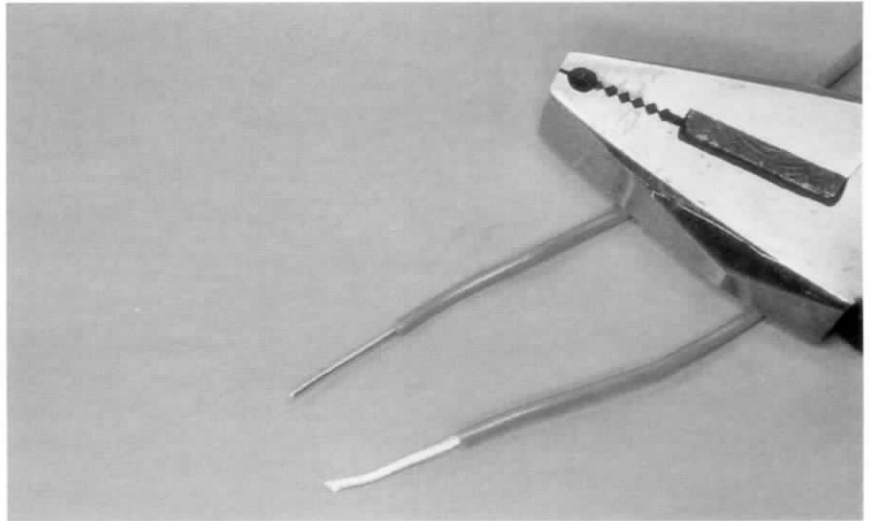
Position the switch controllers on the control panel, mark the locations for the wires, and then drill holes in the panel.

Wiring Supplies



Since some of the switches are farther away from the controllers than the lengths of provided wire, you will need some simple electrical supplies to make extra wire lengths. You will also need terminal screw strips and terminal jumpers similar to the ones shown here.

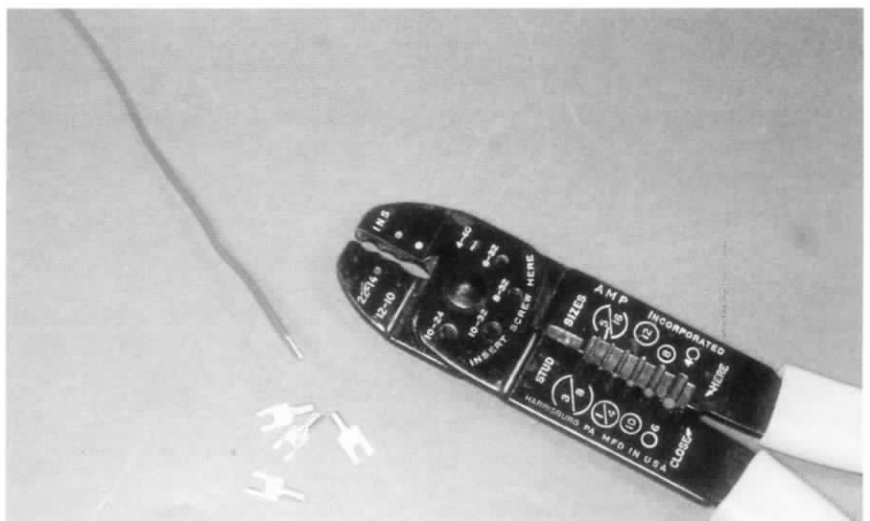
You will need additional wire. Use 20 gauge wire that is either stranded or solid. One advantage of stranded wire is its flexibility. For larger layouts, you'll want to use solid wire of a larger gauge (though smaller number).



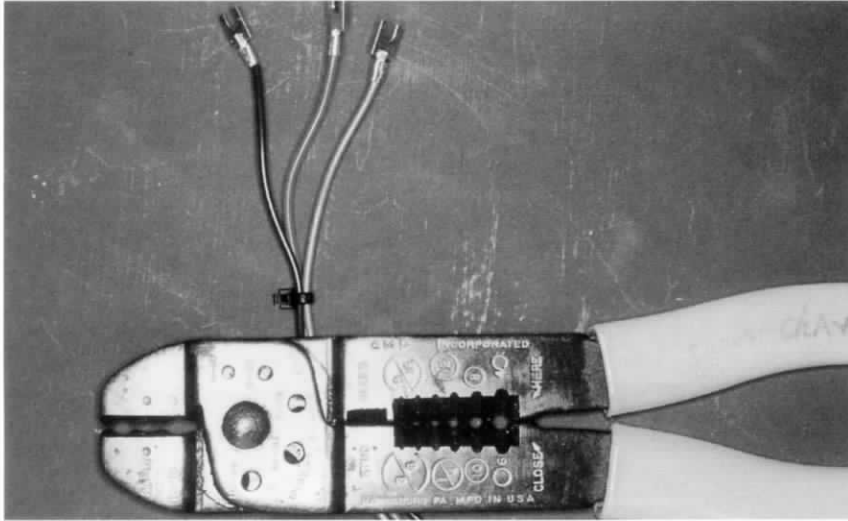
Atlas sells spools of stranded 20 gauge colored wire that is specifically designed for model railroading. Almost every hobby shop carries it.



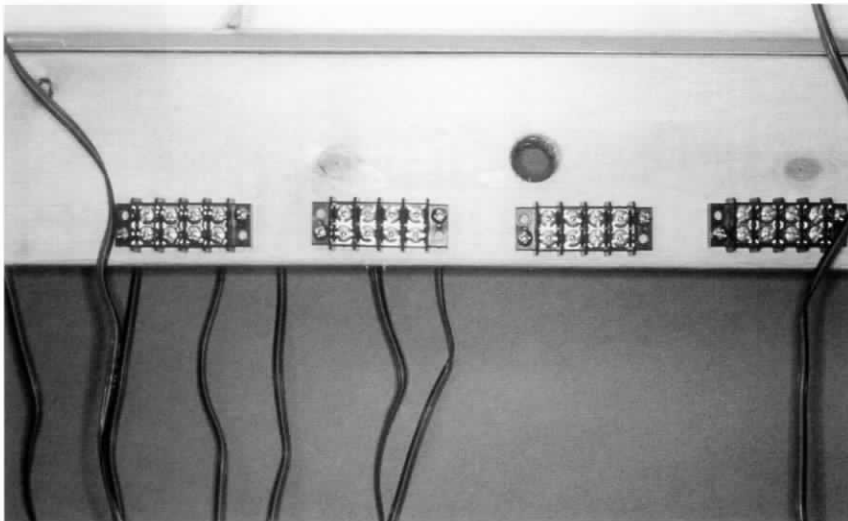
You will also need solderless connectors and a wire stripper. The solderless connectors can be purchased at Radio Shack along with the wire stripper/crimper. Atlas also sells solderless connectors.



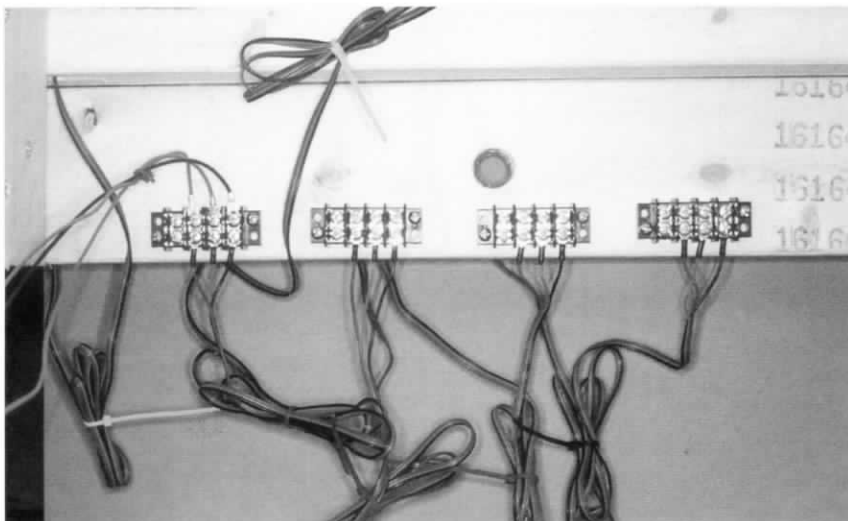
“Lengthening” the Switch Wires



Measure the distance from the switches to where the terminal strips will be located. Make bundles of wire cut to a little more than that length using red, black, and green wire. Bundle them together with plastic tie strips.

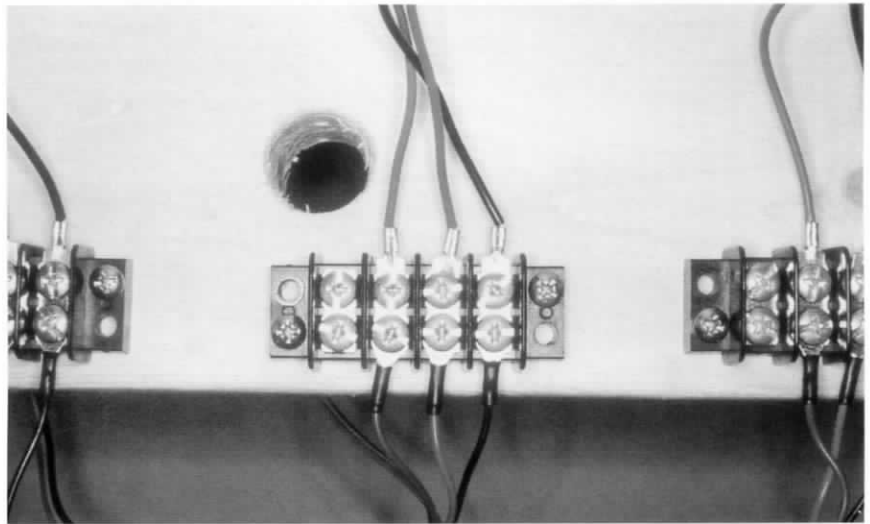


Here, four screw terminal strips have been attached to the back side of the train board framing just behind the control panel and close to the switch controls.



This photo shows that the wires that come with the switch controls have been attached to the terminal screws, and the first wire bundle set for a switch has been added. Connect the other bundles in the same way.

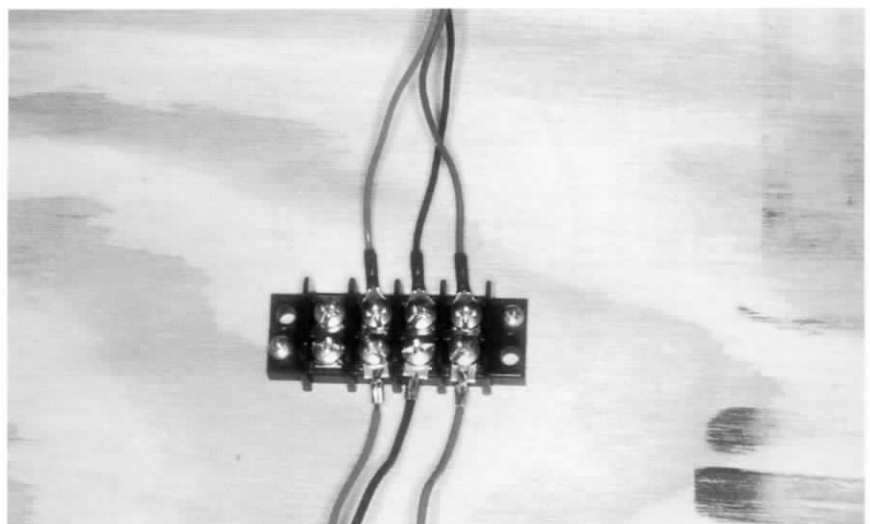
The bundled-wire colors should match the original control-wire colors so that there is no chance of a mix-up. This also makes it easy for children to do the screw terminal hookups.



To help keep the wire bundles tucked under the table, you can buy plastic wire holders and screw them into the underside framing.



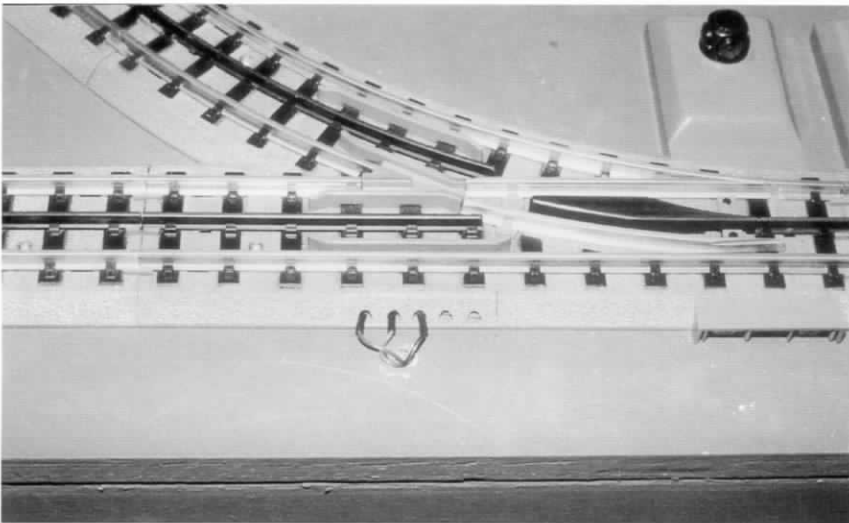
The great thing about terminal strips is that you can use them just about anywhere. I cut one length of wire bundle too short, so I made another short length and simply connected them using a terminal strip.



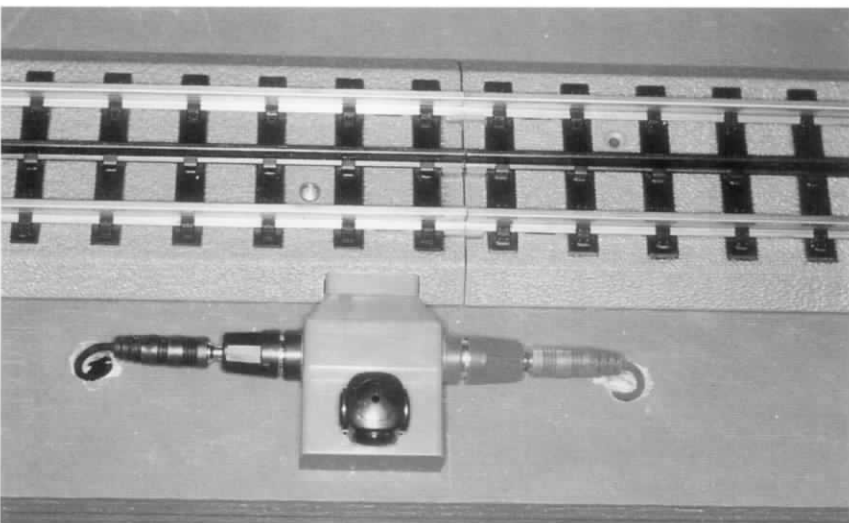
Completing the Wiring



Here the wire bundle ends are attached to the screw posts on the switch. Be sure that the brass jumper (at right) is not removed, as this is the internal jumper that tells the tiny motor inside the turnout to get its power from the track instead of an external source.



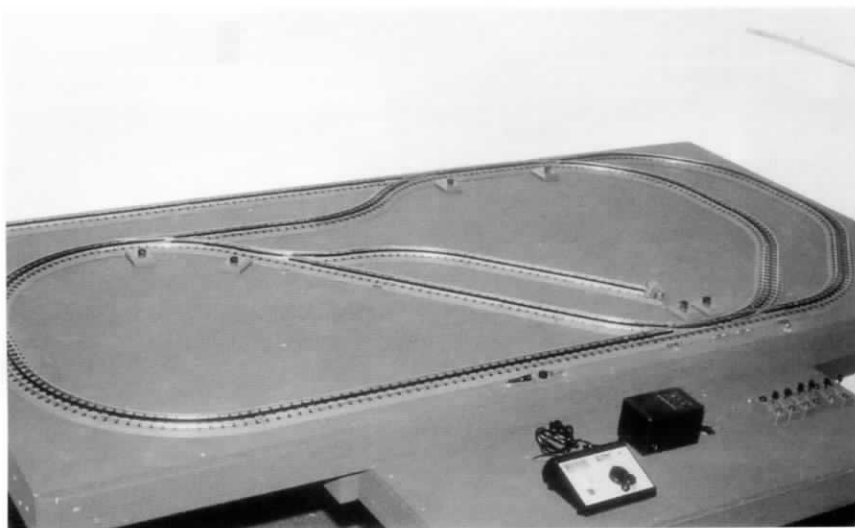
This switch is now wired and ready to go. Neatness counts—especially on top of the layout!



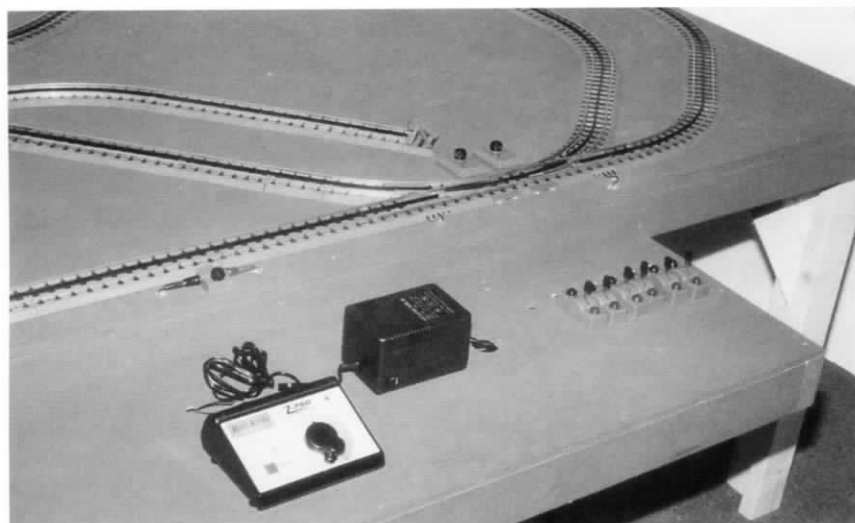
Note how the lock-on wires are connected. There is no excess wire on top of the plywood.

Test the Wiring

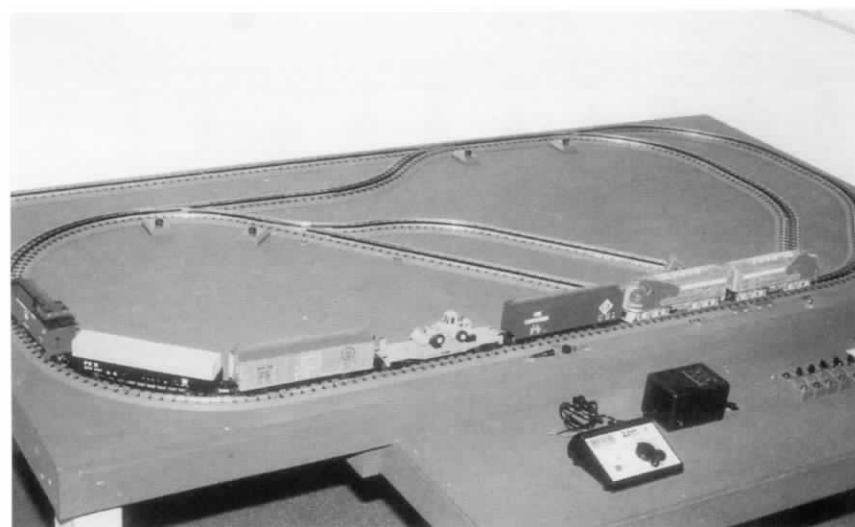
Now that all the turnouts are wired, it's time to test them. The standard Z-750 transformer provides more than enough power to run the switches. Turn on the transformer and start flipping controller handles to check your wiring.

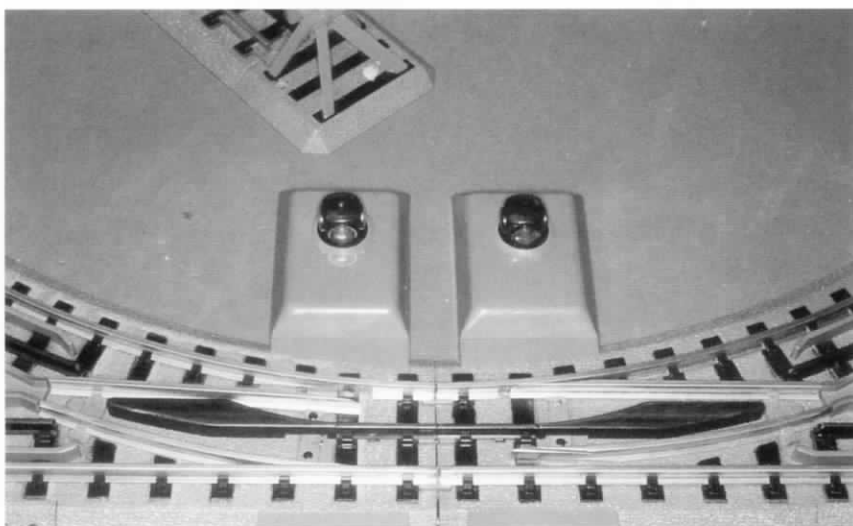


Note how neat the control panel looks. With the controllers all in a row, labeling them will be easy.



Once you're sure all the switches are operational, it's time to run a train.





The switches have green (straight route) and red (diverging or curved route) lights so that you can identify which way the switch is thrown. These lights correspond to the ones on the switch controllers. To change the light color, simply pop out the plastic cover and rotate it.



One simple "dress-up" project is to paint the heads on the screws to camouflage them.



Now that's a smile worth waiting for! After helping Dad build the train board, lay the track, and wire the turnouts, Thomas has his reward.