The S-MOD System

CHECKING THE WIRING IN YOUR MODULE

by Don DeWitt

In July 1987 the NASG Board of Trustees voted to accept the S-MOD module system as the official physical, electrical, and operational approach to S module model railroading. The standards for the S-MOD system have been available since that time and have been enthusiastically accepted by most S gaugers. A number of clubs around the nation have built modules using the S-MOD system, and the ultimate S-MOD layout (up to this time) was constructed and operated at the 1988 NASG convention in New Brunswick, New Jersey (see photos). The layout was built with the modules from six S clubs and 52 individuals. A diagram of this layout was published in the October 1988 issue of the DISPATCH.

INTRODUCTION

This article is the first in a series that will describe the details of the S-MOD approach to model railroading. I have decided to write this series in a fashion similar to Steven Spielberg's approach to the Star Wars tales. In other words, I am not going to start at the beginning. I am going to start with a tale from the middle of the story. I need to do this because there are quite a few module builders out there that need some help with electrical matters NOW, rather than sometime six months from now.

This article is written with the assumption that you have built a module, laid the trackwork, and you are dealing with the electrical system. I have observed that the electrical system is the most confusing to many new module builders who may also be diving into the construction phase of model railroading for the first time. Others I have met have come from a club environment where the electrical guru did the wiring for the club. As convenient as that is for the club, it does not educate the other members very well. When the time comes that a person moves away from the club, or the guru moves away from the club, we are in "trouble city."

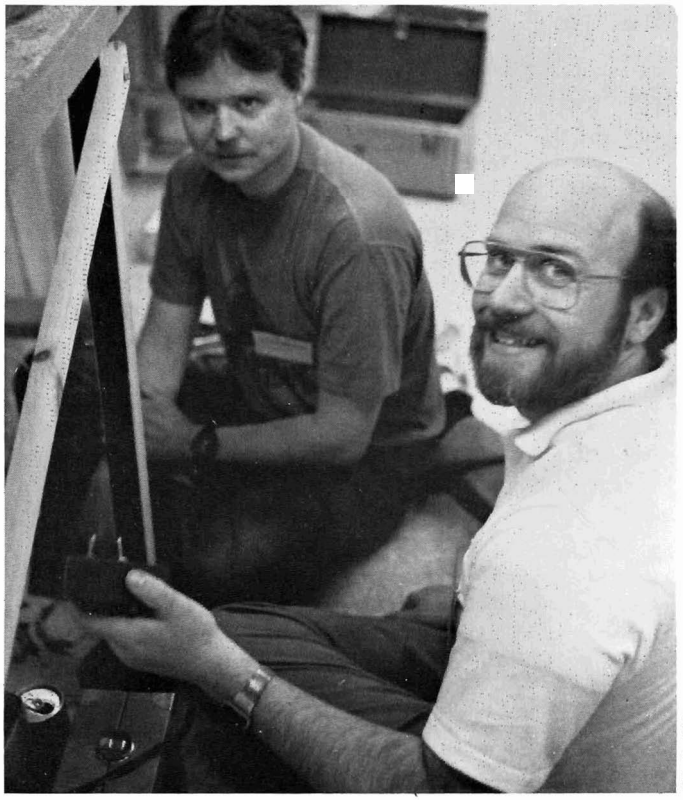
GREMLINS?

The problems first arise after you have installed all the wiring as described in the S-MOD standards. (A standards document is available through the NASG. There are at least four possible conditions that you may encounter.

When you try to run a locomotive on the module:

1) The loco does not run.
2) The electrical system shorts out.
3) The electrical system works ok at home but your module causes the layout at a modular get-together to short out.
4) The module operates fine at home and works great in modular layouts.

Hopefully, your module can be listed under category 4!! Unfortunately, about 95 percent of modules go through categories 1, 2, and 3 before arriving at 4. Category 3 is especially hard on the color and amount of hair on the head of your friendly S-MOD modular layout coordinator.



Bob Werre

Here's our intrepid author (right) with a colleague busily assembling a module at the 1988 NASG National Convention.

Anyone who has met me will now realize that I have dealt with a large number of category 3 modules.

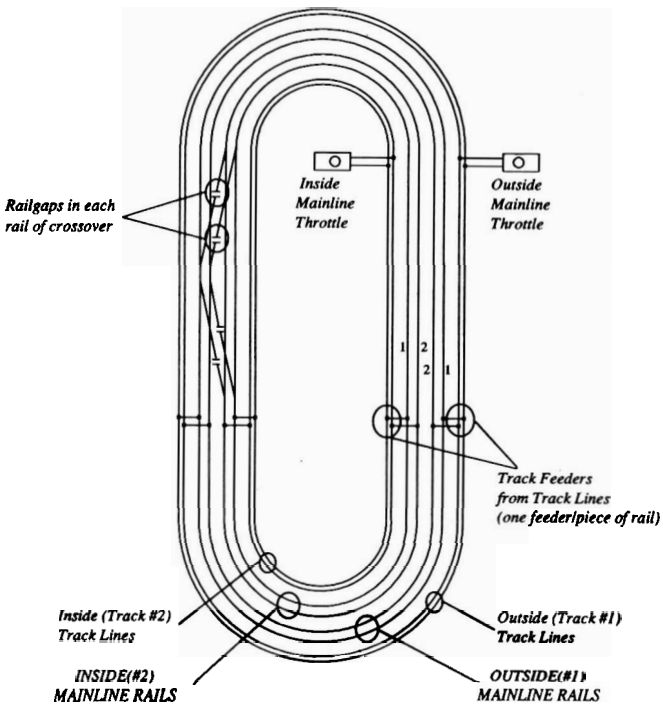
The remainder of this article deals with how you can ensure a jump from category 1 to category 4 and thus save the hairs on the head of your layout coordinator. In fact, with this information you should be able to jump directly to category 4.

BASICS

The S-MOD system allows for two types of modular layout operation. The only difference between these two types relates to the electrical system. The simpler system is called the "Wire-To-Rail" (WTR) system (Figure 1) and the more sophisticated system is called the "RailCAB" (RC) system (Figure 2). The WTR system has one throttle connected to each mainline. It is called "Wire" to "Rail" because each of the four 16 gauge wires running beneath the module (called TRACK Lines) is connected to a single rail. This is similar to the system that N-TRAK uses for its modular layouts. Because the WTR system is fairly easy to understand and implement, and because there is a large amount of N-TRAK material available, you are more likely to jump to category 4 with this type of module than with a RailCAB module. However, the WTR system is not identical to the N-TRAK system, so errors are still likely.

The RailCAB system has eight wires running beneath every module (Figure 2). Of the eight wires, the four center wires still act as TRACK Lines and are thus identical to the WTR system in that rails are still connected to these wires. The outer wires (called CAB Lines) are completely isolated from the center four wires, and therefore from the rails themselves. When these modules are used in a

S-MOD LAYOUT WIRING
Wire-To-Rail Subsystem
(Figure 1)



RailCAB layout, throttles are connected to the CAB lines, not the TRACK Lines as they are in WTR modules. The electrical output of the throttles eventually gets to the rails after it passes through a control panel. The control panel allows the output of one throttle to be connected to either mainline or to both. This is the basic idea of a cab-control system. Each throttle is called a "cab."

In the RailCAB system, there are two types of modules: Run-Through Modules and Control Modules. A Run-Through Module is simply a WTR module with four more wires (CAB Lines) with connectors attached. An RC Run-Through Module thus can be used in either a WTR or RC layout. An RC Run-Through module is not too difficult to build and attain that wonderful category 4 condition. The more challenging type of module is the Control Module with its accompanying control panel.

CHECKING THE ELECTRICAL SYSTEM

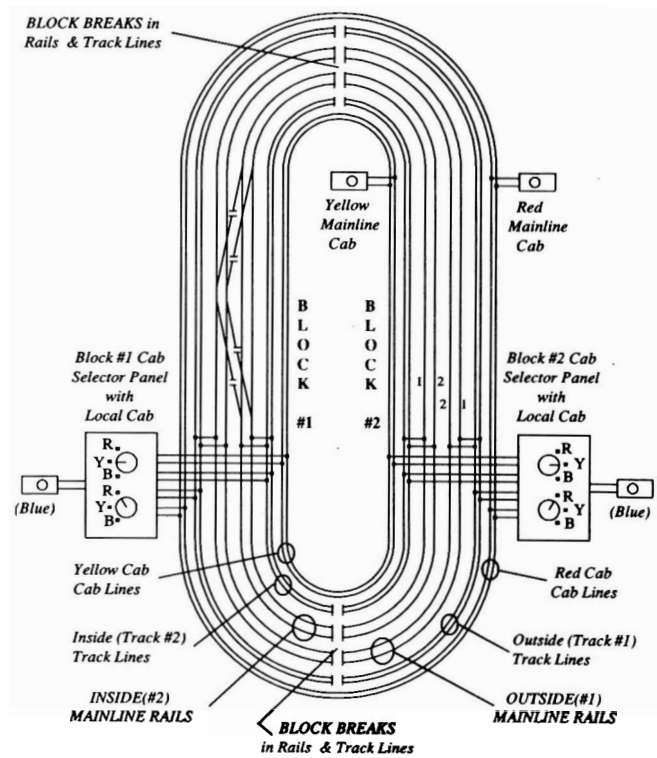
The following procedure will show you how to check your wiring to see if it complies with the S-MOD standards. In this issue we will deal with double-track mainline WTR Modules and RC Run-Through Modules. In the next installment of the "S-MOD story" we will check out single-track modules and Control Modules.

"Dropcords" are the S-MOD Interface Connectors and 16-gauge wires that hang from the ends of each module. These are used to connect to adjacent modules at an S-MOD Interface. The manner in which the dropcords are attached to the terminal strips is critical. This is therefore a likely place for error.

Another source of error is the realization that when a module is drawn as if you were looking down through the top of the module, as it is in the S-MOD standards booklet, it will look different when you turn it over and try to wire it. If you stand on the viewer's side of a module when the module is being operated, the end of the module on the left is the WEST end (Figure 3). The right end is the EAST end. Remember that when you turn a module over, depending on which way you turn it, either the side closest to you when upright is now on the opposite side, or the east and west ends have been switched. In either case it is easy to get confused, so you should LABEL EVERYTHING ON THE BOTTOM of the module section just to keep the confusion level low. In my experience, I have found it very useful to draw a module schematic as if it has a glass top. Then I turn the drawing over, against a sunny window, and trace the diagram on the back. The traced drawing is now the view from under the module.

At the WEST terminal strip of your module attach the drop cords with plug connectors to terminal strip positions 1-2 and 3-4. In addition, the large pins on the connectors are attached to positions 1 and 3. This attachment is again critical and must be done as described. Drop cords with a receptacle are attached to positions 5-6 and 7-8. The large sockets of the receptacles are attached to positions

S-MOD LAYOUT WIRING
RAIL-CAB Subsystem
(Figure 2)



This layout has two blocks.
A layout with one block has no Block Breaks in the Rails (except in cross-overs between mainlines) and no Block Breaks in the Track Lines.

6 and 8. At the EAST end, receptacle connectors are attached to terminal strip positions 1 through 4 and plug connectors to positions 5 through 8. Again, large pins or sockets are attached to the positions closest to the outside of the module. When you finish, you should find at either S-MOD interface (i.e., either end), if the module is upright and you are looking down at it, that the plugs are always on the right and the receptacles are always on the left. This configuration makes the module reversible and allows for maximum flexibility in layout design.

Now . . . You Must Assume That You Have Made A Mistake Somewhere!!

The following setup should be standard procedure for every group of module owners. The equipment for a simple S-MOD electrical system checker is as follows:

1. An Ohmeter with alligator clips attached to the red and the black test probes.
2. Two lengths of wire equal to the distance between opposite ends of the largest module that you plan to test. The gauge of the wire is not important. Eighteen-gauge zip cord (lamp cord) is convenient, however.
3. Two male S-MOD plug connectors which can be purchased at Radio Shack (274-201) or from electronics stores that sell Cinch-Jones connectors (P302-CCT).

If you examine the plug connector (Figure 3), you will find that it has a large and a small pin. You should solder one plug to one end (A) of the zip cord, and the second plug to the opposite end (B). Make sure that the large pin of connector A is soldered to the same wire that is soldered to the large pin of connector B. Next, solder the small pins to opposite ends of the second wire. The reason for this special cable (the "test cable") is to gain access to wires connected to female connector sockets and also to have a place for the alligator clips to attach.

The configuration for testing the Track and Cab Lines under each module is shown in Figure 3. For a WTR module, you use the same procedure as you use for testing wires 3, 4, 5, and 6 on RC modules.

The goal of the following test procedure is to be sure that every one of the eight wires running beneath the module is completely isolated from its neighbor. In addition, each rail in a double-track mainline module should only be connected to one of the center Track lines 3, 4, 5, or 6. NEVER connect a rail to a CAB line!!

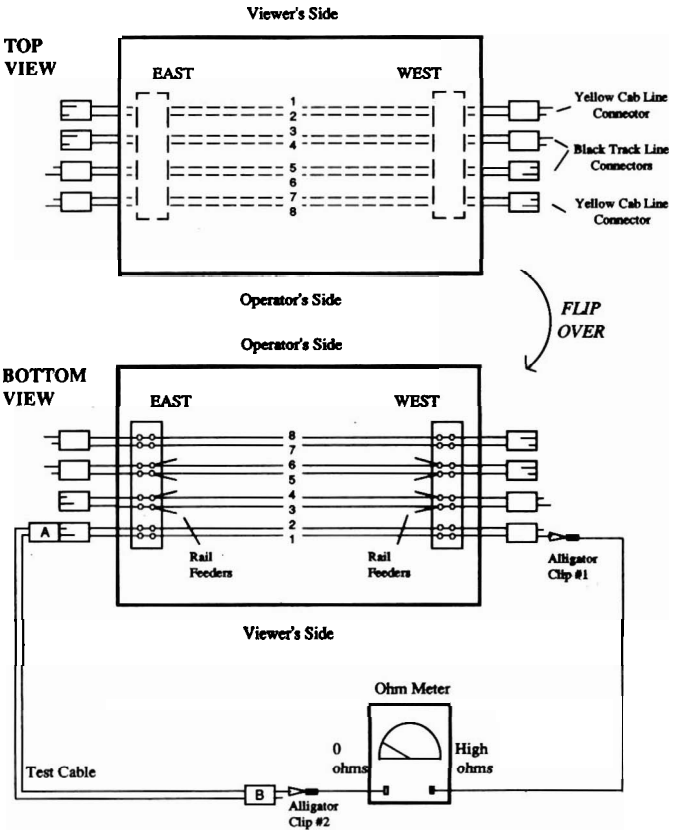
Test for Continuity

To test Cab Line 1, you want to know that you have a continuous connection from the large pin of the plug at the East End to the large socket of the receptacle at the West End.

a. Connect the test cable End A to the East End Receptacle (the one connected to terminal strip positions 1 and 2) and attach one Ohmeter test probe to the large pin on the opposite end of the test cable (End B).

b. Connect the other test probe to the large pin of the plug at the West End Plug (the one connected to terminal strip positions 1 and 2).

S-MOD LAYOUT WIRING
Electrical System Varification
(Figure 3)



c. Turn the Ohmeter to "ohms" and watch the needle. It should move to the zero position. This means that there is no resistance between test points and that you have a good test for continuity for line 1. If the needle remains at a high value, then the two test points are NOT connected and you have detected a problem. Correct it before continuing. Beware: A good test for continuity does not show whether the tested line is connected to any of the other lines. The isolation check is needed; it will follow the continuity check.

d. To check the continuity of Cab Line 2, simply move the probes over to the small pins of the Test Cable (End B, Alligator Clip #2) and the Cab Line Connector (Alligator Clip #1).

e. To test Track Lines 3 and 4, move the test cable to the adjacent black connectors that you believe are connected to terminal strip positions 3 and 4. Repeat the Ohmeter test readings.

f. To test Track Lines 5 and 6 and Cab Lines 7 and 8, the test cable must be switched to the opposite S-MOD Interface end so that you can access the receptacles at that end.

Test for Isolation

Remove the alligator clips from the Ohmeter probes and move to one of the terminal strips. Touch one probe to position 1 and then touch every other position with the second probe. Only when you touch terminal 1 with both

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This view across the huge 1988 modular convention layout shows what can be done in short order by following the NASG module standards.

probes should the Ohmeter show zero ohms. In all other tests, the Ohmeter should show very high ohms. Continue testing by moving to position 2 and touch 3 through 8. Move to position 3 and touch 4 through 8, and THEN touch each rail above. Only rail 1 of the Outside Track should be connected to terminal position 3. Continue testing positions 4 through 8. Positions 4 through 6 should also be connected to one rail each. Positions 7 and 8 should not be connected to any rail.

You have now tested your S-MOD wiring. This testing process is often neglected by beginning module builders and invariably leads to problems at a later time such as when the module is brought to a layout for the first time. A thorough testing is a requirement for participating in the S-MOD way of life. If you feel that this is too much work, then buy some beer and find someone to help you. Do not bring an untested module to a modular get-together. Do not assume that you have made no mistakes. We are all human and we will continue to make mistakes, even after the 20th module you build. If you think you don't have the time to test your module, remember that the layout coordinator has even less time.

Hints

One trick that helps in the wiring process is to use different-colored 16-gauge wire for Cab Lines and Track Lines. In addition, using different color wire for each pair is useful. For instance, the following color scheme will help to reduce errors.

Track/Cab LINES	Wire COLOR	RAIL	TRACK	Connector COLOR
Cab #1	Red			Yellow
Cab #2	Yellow			
Track #3	Blue	#1	Outside	Black
Track #4	Green	#2	Outside	
Track #5	Green	#2	Inside	Black
Track #6	Blue	#1	Inside	
Cab #7	Yellow			Yellow
Cab #8	Red			

Note that to make an S-MOD module reversible so that it can be placed with either side facing the viewer, the wiring scheme is a mirror image of itself as if the mirror is placed between Track Lines 4 and 5.

Another hint for success is to make sure that you paint the Cab Line Interface Connectors yellow as indicated above. This is an S-MOD standard, but many fail to do this and disaster can follow.

In the next installment I will cover the testing of single-track modules and control modules. Until then, may your efforts be rewarded with straight rails and no shorts.