YEAR OF THE MMR
PART 8

Model Railroad Engineer — Electrical Certificate

article and photos by Larry Wolohon, MMR #295, and Paul Richardson, MMR #345

Author Biographies:

Brief Bio of Larry Wolohon

Larry is a retired Ford Motor Company design engineer with a B.S.M.E. degree from Colorado State University. He was born and raised in the Denver, Colorado, area. Larry began model railroading like many others with wind-up trains, Lionel, American Flyer and then moving on to scale railroading (in his case, HO). Larry stopped model railroading when he became interested in automobiles and girls during high school.

Larry currently serves as the NCR AP Chair, for approximately the last six years.

For his MMR, which he earned in 2000, Larry holds the following AP Certificates:

Golden Spike Award
Master Builder — Cars
Master Builder — Scenery
Model RR Engineer — Electrical
Chief Dispatcher
Association Official
Association Volunteer
Model RR Author

Brief Bio of Paul Richardson

Paul worked as a brakeman/switchman for nearly 14 years before entering the computer industry. He currently owns and operates R Squared Technologies, LLC, a Texas-based computer consulting company.

Paul is currently the NMRA AP Chair, and he was the former National Tenure Chairman for approximately ten years. Paul held various offices at the Divisional and Regional levels in the Lone Star and Mid-Continent Regions.

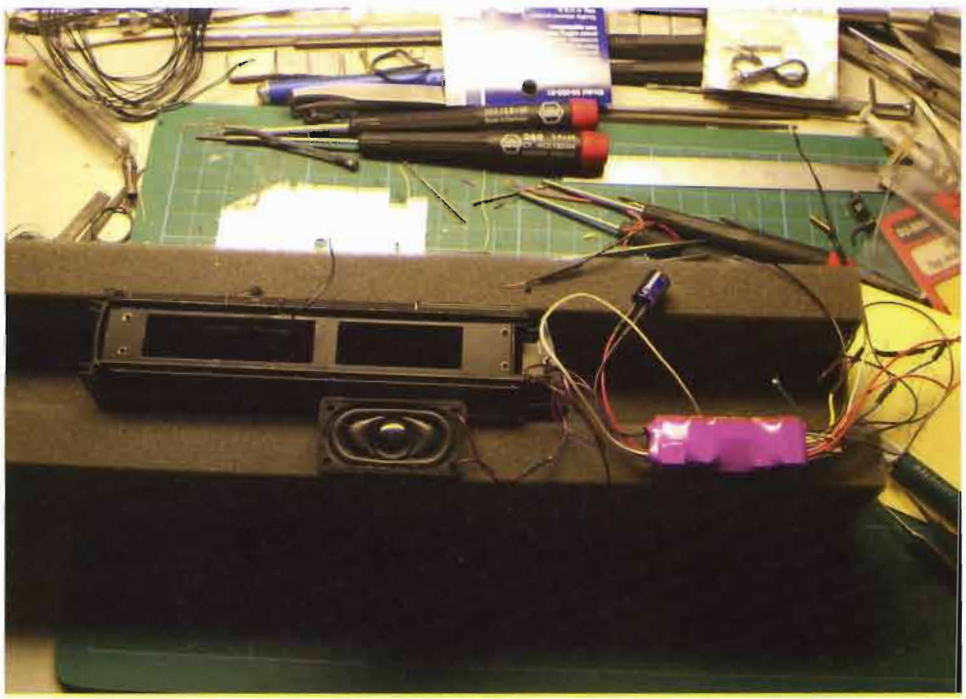
For his MMR, which he earned in 2005, Paul holds the following AP Certificates:

Golden Spike Award
Master Builder — Cars
Master Builder — Scenery
Model RR Engineer — Electrical
Chief Dispatcher
Association Official
Association Volunteer
Model RR Author

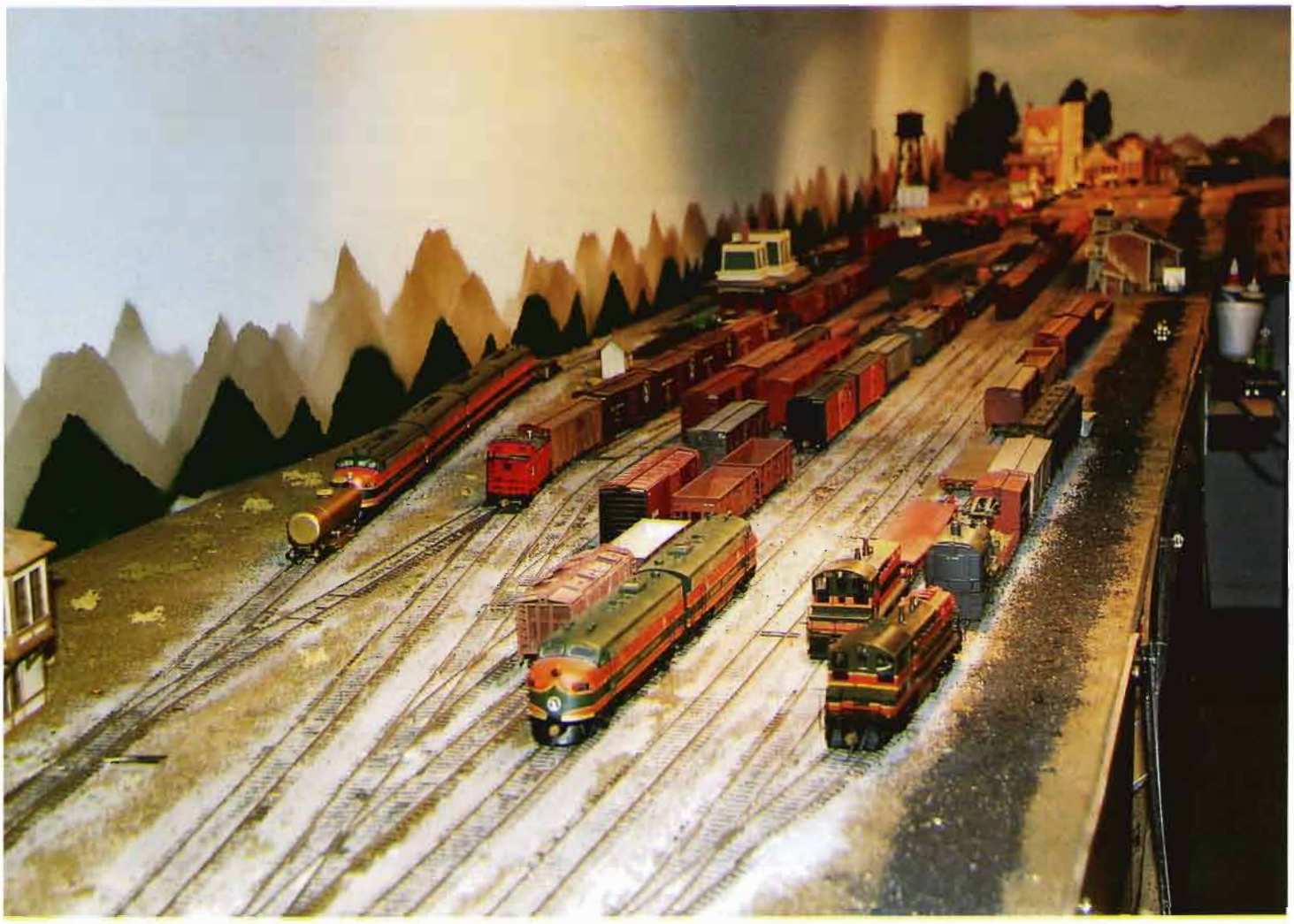
Interestingly, Larry and Paul currently hold the same AP certificates.

Organizing your tasks

When in pursuit of an AP Certificate, it's a good idea to carefully read the requirements — twice — so you understand them thoroughly. Reading aloud helps because you not only read and say the words, you also hear them — a great learning tool. Although the program advises you to not make the requirements more difficult than they are by reading more into them than is there, everyone still does. Frequently we see modelers making the program way more difficult than is necessary. To help you stay on target, open a spreadsheet and type (not cut and paste) the requirements. There is something about reading and then typing the requirements that helps cement them into your mind. Have you noticed the recurring theme of understanding what is required? For sections of requirements where we have multiple items to choose from, pick the ones you plan to do and type only those items into the spreadsheet. Once you have populated the spreadsheet with everything you plan to do to meet the requirements for a certificate, turn the cells of the spreadsheet where these items are listed to the color red. Approaching a large task as several smaller sub-tasks makes the entire project seem easier to accomplish and more manageable. Once work has begun on a particular item, turn the cells for that item yellow. This provides a quick visual indicator of your project's status. When an item has been completed, turn the cells green. At any given point in the project, it is possible to see cells that are red, yellow, and green. As more and more cells turn yellow and then to green, your spreadsheet becomes a visual motivator to complete the project. Everyone who has tried this idea has commented that they were surprised at how much it helped



Left: **The installation of a Soundtrax Tsunami sound decoder in a GN S-2 tender would meet requirements C-6 and C-14.**



to keep them focused to completion. There is something exciting about turning those cells green that really cranks up the desire to finish the requirements.

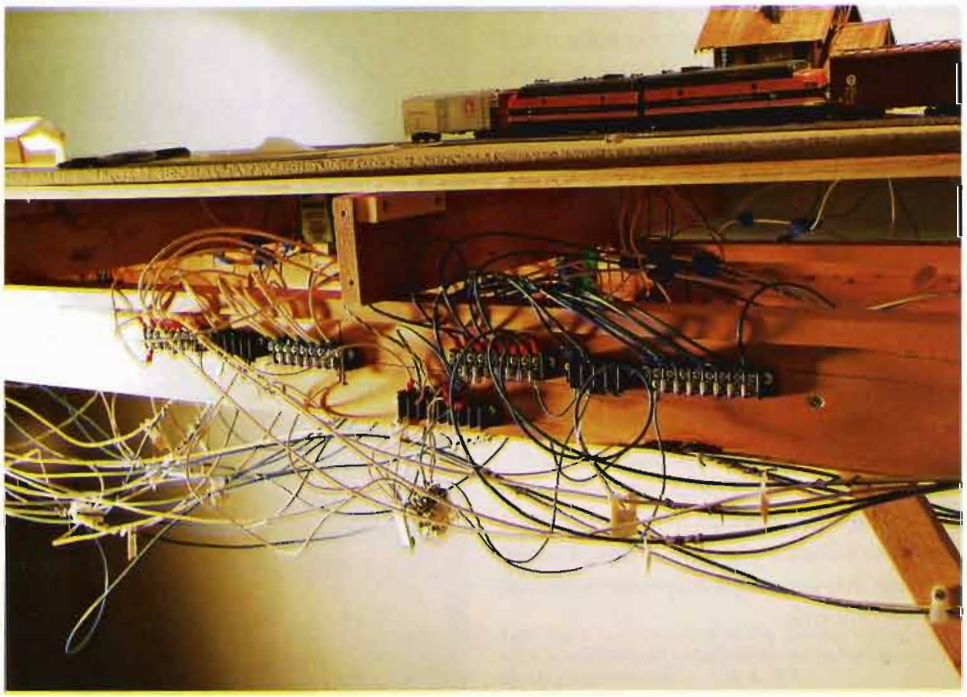
Electrical certificate requirements

There are five sections of requirements for the Electrical Certificate: A, B, C, D, and E. Let's take a look at the individual sections. Paul and Larry will share their thought processes as they worked to attain the Electrical Engineering Certificate.

Section A – Construct and demonstrate on own or club layout, the satisfactory operation of an electrical control system on a model railroad capable of simultaneous and independent control of two mainline trains in either direction, and containing at least: (You must do each item defined in this section).

The simultaneous and independent control of two mainline trains is well-defined in Section A of the requirements, so more detail is unnecessary here. The remaining items will be discussed one at a time.

Above: **Here is a view of Whitefish Yard on Larry's Great Northern Whitefish Division. Here we can see a siding, seven yard tracks, a crossover, and a few turnouts, most thrown by Tortoise switch machines and controlled by Digitrax DS-54 stationary decoders. This would satisfy Parts A 1, 2 and 4, B 1 and 3.**



Right: **Here is a town in progress, showing how to isolate sections of a layout for trouble shooting. Terminal strips, which can be used to isolate sections, were installed here. This meets requirement A 1. Also shown are Tortoise switch machines and Digitrax DS 54 stationary decoders that control the Tortoise Switch machines. Also visible are suitcase connectors that Larry uses now rather than soldering to the bus.**

1. For conventional DC wiring (non-command-control), five electrical blocks that can be controlled independently.

Paul: These do not have to be large sections of track. The key here is independent control, five small areas where you can cut power or control from more than one throttle will qualify.

Larry: It means that you must, for a block control layout, be able to run two trains with five blocks.

1. (Continued) For DCC TMCC and others, provide sufficient gaps, and switches to maintain polarity, phase if needed and troubleshooting.

Paul: This does not mean you have to electrically carve the entire layout into tiny sections. Just partition it so if there is a short in one section, it does not shut down the entire layout. I have DCC, so I divided the layout into three power districts that were electrically independent of each other.

Larry: For DCC, the layout must be blocked so that you can troubleshoot it. I would think that you would want to wire a layout this way just for operation and/or troubleshooting.

2. One mainline passing siding.

Larry: Only one mainline siding is required.

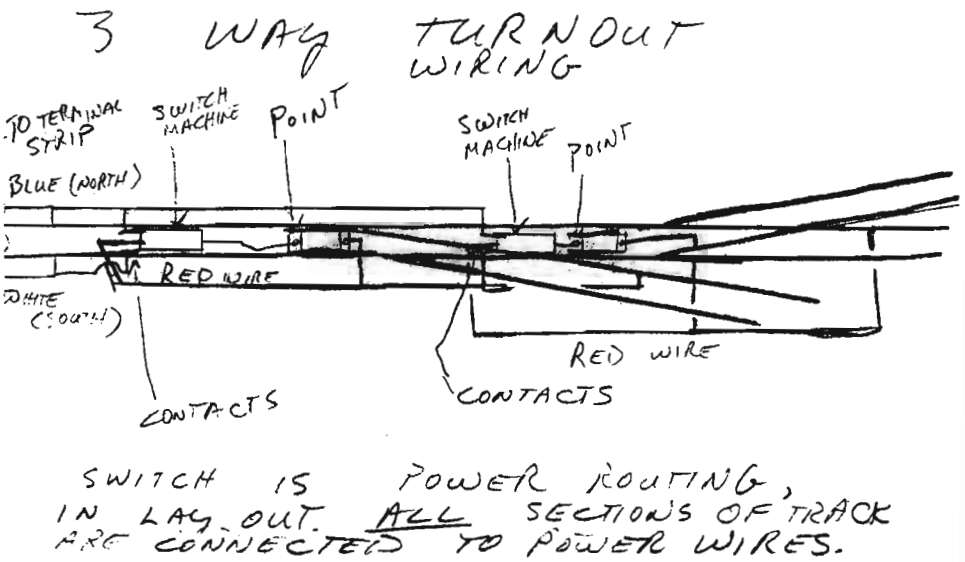
Paul: Pretty simple. No additional detail required.

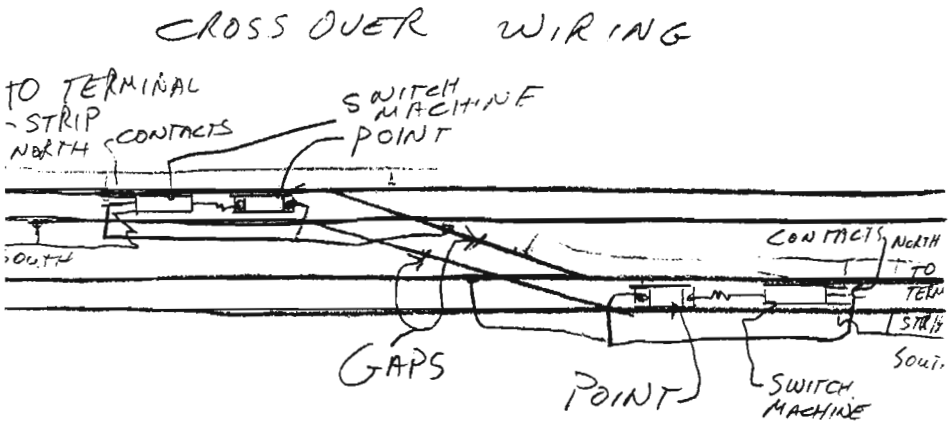
3. One reversing loop, wye, turntable, or transfer table.

Paul: Only one of these items is required, and if you are using DC, a reversing loop can be established with a pair of insulated rail joiners, a turnout, and a double pole/double throw electrical switch (DPDT). When using DCC, there are several products commercially available to automatically sense a potential short and change the polarity before the DCC sys-

Above: **Here is Whitefish Yard showing the turntable, two storage tracks in the engine facility, crossover, turnouts, three-way turnout and a passing, which would meet requirements A.1, 2, 3, 4 (partial in this photo) and 5, B1, 3, 8 and C 4. All these turnouts are controlled by Digitrax DS 54s that throw the Tortoise switch machines.**

Below: **Here is sketch that shows how Larry wired a three-way turnout to partially meet requirement D.**





Left: **This sketch shows how Larry wired a crossover to partially meet requirement D. Note that a hand-drawn sketch properly meets the requirement. Computer drawings aren't necessary.**

tem detects it. There are also products that will detect when the points of a turnout are thrown against the train's direction of travel, throwing the turnout so the train can remain in motion without manual intervention. Commercial turntables are available from variety of sources. I suggest you visit my web site (http://www.purgatoryandevilriver.com/clinics_turntable_p.htm) for a clinic that will teach you to build a turntable and pit using an Atlas table to do the polarity switching and indexing, yet still allow you to have a pit and bridge for your turntable. *None* of these items must be scratchbuilt, and you could use the Atlas turntable without modification to meet this item requirement.

Larry: There must be a way to reverse the direction of at least one locomotive or a provision of a transfer table.

4. One yard with a minimum of three tracks and a switching lead independent of the mainline.

Larry: A three-track yard with a lead independent of the mainline would satisfy this requirement.

Paul: Pay close attention to the definition of "independent" in the requirements.

My Purgatory Yard was considerably larger than three tracks and easily met this requirement.

5. Facilities for the storing of at least two unused power units.

Larry: Provisions to store at least two units of motive power. An engine facility with a roundhouse and turntable will meet the requirements of items three and five.

Paul: These can just be tracks where you can cut the power to store locomotives. I had tracks coming from the turntable where I stored extra locomotives and could cut the power to these tracks.

6. One power supply with protective devices.

Larry: A power supply with a circuit breaker or a fuse to eliminate a possible major short. This should be done even if you aren't interested in earning Model Railroad Engineer — Electrical.

Paul: Many commercial power supplies come with this feature included. For my railroad, I built and installed a short indicator using an automotive tail light bulb. The instructions are on Alan Gartner's web site, http://www.wiringfordcc.com.

Section B – Wire and demonstrate the electrical operation of at least *three* of the following items. Don't make the requirements in B or C any harder than they have to be. You do not have to scratchbuild any of these; you just have to show that you can make them work electrically. Of course, if you want to go to the effort of building them yourself, you may learn many new skills in the process! The whole point of these requirements is for you to demonstrate a variety of skills. Out of a possible 11 items to pick from, you need to only demonstrate that you wired and made three choices functional.

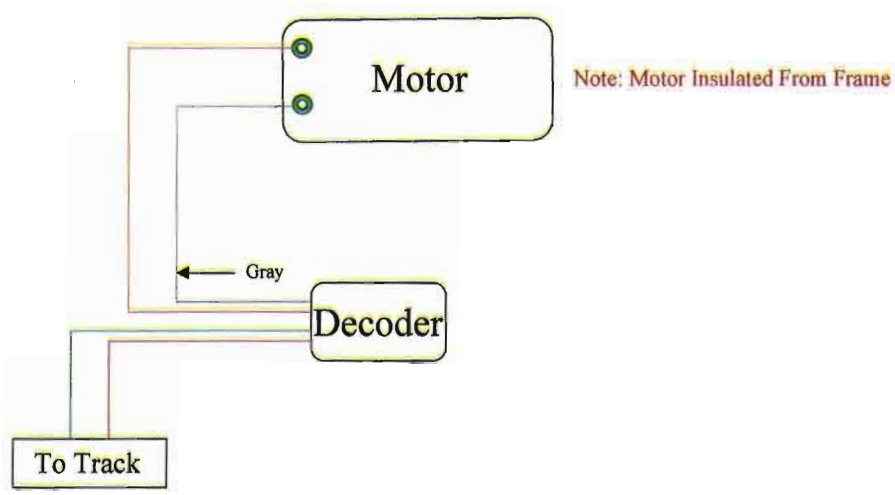
Turnouts–Something as simple as an Atlas electrical powered switch machine will meet this requirement.

Crossing–Most commercially available crossings come already wired just install and demonstrate that it works.

Crossover–This is as simple as a pair of turnouts facing each other with enough track on the diverging rails to join them together and enough track to make a pair of parallel tracks with the crossover, allowing

Left: **Here is a crossover to the passing siding along with a switch lead independent of the main, which meets requirements A. 2, 4 & B 3.**

DCC Decoder Installation



Left: **Paul prepared this computer drawing using MS PowerPoint, but a hand-drawn diagram is fine. Try to keep it smudge-free and neat. It is important to insulate the motor from the frame – check by using an Ohm meter and touch one probe to the frame and one to motor wiring tab. If the needle jumps all the way to the right, the motor is grounded to the frame. If it doesn't move, continue touching the frame with the probe and move the other probe to the other wiring tab on the motor. The same test applies, if it moves all the way to the right, then the motor is grounded. Follow the installation instructions provided by the manufacturer.**

you to cross from one track to the other. A pair of turnouts with switch machines and some flex track will help you meet this requirement.

Items 4 through 11 - Double crossover, Slip Switch, Gauge Separation Turnout, Double Junction Turnout, Three Way Turnout, Gauntlet Turnout, Spring Switch, and Operating Switch in Overhead Wire.

The same this applies as for the regular turnout: Commercial components are acceptable. These items do not have to be scratchbuilt to qualify for Electrical Engineer. Just demonstrate that you know how to make them work electrically.

NOTE: If you choose to scratchbuild these items, they may be judged for the Model Railroad Civil Engineering certificate.

Section C – Wire and demonstrate the electrical operation of at least three of the following items.

1. Electrical turnout position indication on a control panel or at trackside for a minimum of four turnouts. (Remember that many commercial switch machines have electrical terminals to allow you to do this easily.)

Paul: You will need a control panel of some type anyway, so just plan to build it with LEDs (Light Emitting Diodes) or lights to display the direction the turnout is thrown. Many switch machines have contact built in to allow you to easily wire these items into your panel. I wired bi-color LEDs following the instructions contained with my Tortoise motors, to meet this requirement.

2. Track occupancy indication on a control panel or at trackside for a minimum of five blocks.

Paul: In the October 2006 issue of *Scale Rails,* there is an easy-to-build detection circuit that will make this a walk in the park. I built a series of these detectors to indicate the position of a train in hidden track, but you could use these to meet this requirement. Fortunately, they are inexpensive to build and the components are available at your local electronics store or from on-line sources.

3. Cab control, making provision for connection of at least two power supplies to a minimum of five blocks as the trains progress. (This means that your layout has at least five blocks, each of which can be controlled by one of two power supplies.)

Paul: The blocks do not have to be in a line; they can be in various places on the layout.

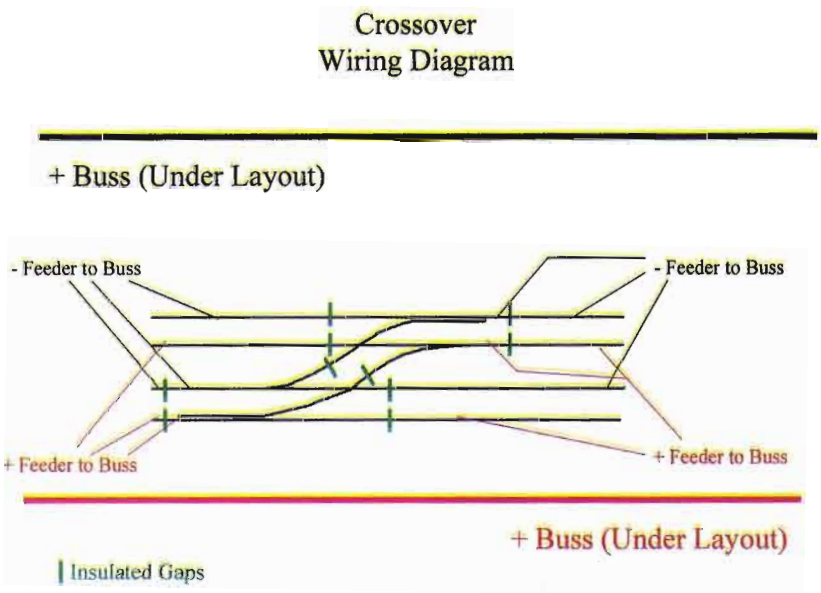
4. Engine terminal, including an electrically powered turntable or transfer table, a minimum of three stall tracks, and at least two blocked storage sections for parking locomotives outside the stall area.

Larry: This means you need to have a total of five tracks (three inside an engine house or roundhouse, and two outside), that you can cut power independently to store motive power.

Paul: My turntable, roundhouse, and service area easily met this requirement.

5. Two turnout junctions with electrical interlocking and protecting trackside signals. (This is simply a turnout with electrical protection to prevent a train from going through a turnout that is set against it. Again, the electrical terminals on a switch machine, combined with a couple of insulated rail joiners, make this a fairly easy project.)

6. High Frequency Lighting (DC controlled layouts)



Above: **Note the position of the insulated joints indicated by the green blocks and the red/black track buss wiring under the layout. Solder feeder/drop wires from the track to the buss wires as indicated in the computer drawing. A hand-drawn sketch is also acceptable.**

Below: Here is the turntable, engine storage tracks, the main, and the passing siding for Whitefish. Again Digitrax DS 54's control Tortoise switch machines. All switches are wired through per Larry's hand-drawn sketches.

Above: This shows a three-way turnout, the siding, and the ladder in the yard. All these are powered by Tortoise switch machines and controlled by Digitrax DS 54 stationary decoders, wired though and match Larry's hand drawn sketches, although they were drawn for his former layout.