Figure 1

Control Panels for an N-Trak Junction

Introduction to the Junction

In preparation for the first No Bull un-convention in Richmond, VA in 1999, and at the urging of layout designer Matt Schaefer from NVNTRAK, we at North Raleigh Model Railroad Club (NRMRC), www.trainweb.org/nrmrc, built two junction modules with Mountain Division tracks to connect the layout spine to the NTRAK loop we were in. Although there was little switching performed on the junctions in this layout, the NTRAK junction concept has evolved to become a regular feature of NTRAK setups by NRMRC and by many other N-Scale clubs.

The problem

A common layout configuration for my junction, known as Red Rock Junction, is to extend a typical NTRAK mountain division loop out to a peninsula with a turn-around loop. This configuration requires extensive turnout switching to permit traffic to remain either on the loop or to use the multiple routes available in the peninsula. An engineer following trains often has to stretch across the junction to manually change the turnout routing. As the junction is comprised of a four-foot corner and a four-foot by two-foot junction extension, it is a challenge to reach the turnouts on the opposite side of the junction.

A Mechanical Solution

As I am an electro-mechanical oriented person my first idea for controlling the distant turnouts was to use mechanical linkages from each side of the layout to the turnouts on the opposite sides. This would eliminate the stretch across the junction but posed problems because the junction, as described earlier, is in two pieces. Another drawback to the mechanical solution was a lack of visual feedback to the engineer. To provide a better indication of a turnout's status I installed dwarf signals at most turnouts but still each turnout in a route would need to be examined to determine the route settings. Dwarf signal information is available from the web site of David Harris http://www.dpharris.ca/index.pl/signals.

Stationary decoder

Since the NRMRC and many other eastern NTRAK clubs use the Digitrax DCC system, I then considered using DCC Stationary decoders such as the Digitrax DS-54. These stationary decoders, now replaced by the newer DS-64, offer capability to control four turnouts if switch machines are also provided. They can be operated by way of switch messages on the DCC Track and by use of local pushbuttons. I liked this idea so much that I acquired two DS-54 units. These would operate the eight turnouts on the junction but I still did not have visual route feedback to the engineers.

**Realization that I needed three panels**

At about this time I realized that I needed to operate the turnouts from three locations; inside the loop, and on both front and rear sides of the junction. To tie the DS-54 inputs and outputs to the three panels, it seemed, would require extensive wiring with suitable multiple wire connectors between modules and between control panels. Maybe I need to think some more.

The SRC-8

On the long ride to the Capitol Limited NTRAK convention in Chantilly, VA, my friend and I discussed the junction control panel situation. He mentioned the Team Digital SRC-8 as a possible base for creating control panels as these devices are intended for multiple panel applications. So after the convention I hit the web and found Team Digital at: http://www.teamdigital1.com/ The SRC-8 (Switch and Route Controller, eight circuits) boards looked very interesting for handling both inputs, outputs and visual route feedback, across multiple panels.

The Switch Controller

Each Switch Controller circuit, shown in figure 2, has two states, closed and thrown, like a turnout. A switch controller can be operated by physical inputs from panel-mounted switches or from DCC switch control messages received by LocoNet, the proprietary communications bus used by Digitrax. Similarly the output of each Switch Controller can be physical by illuminating LEDs as well as by issuing DCC Switch Control messages to the LocoNet.
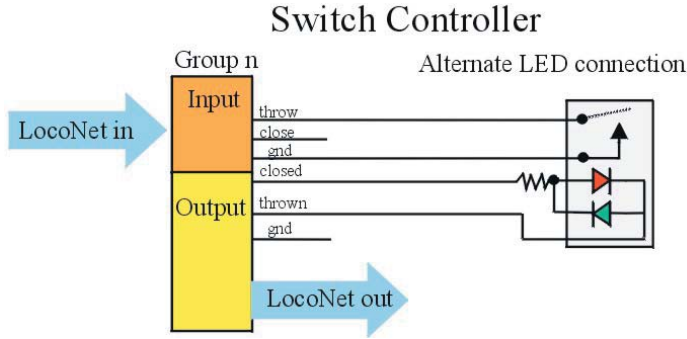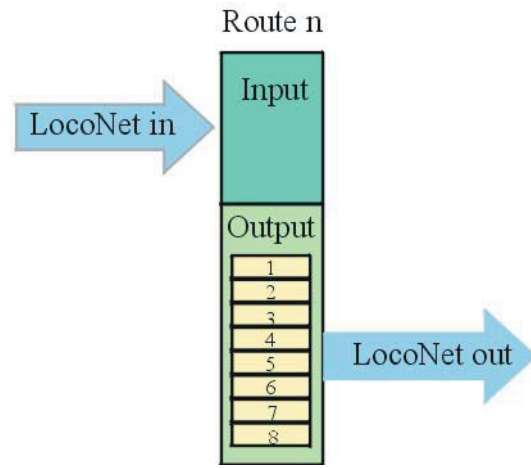

Switch Controller

Figure 2.

As an example of operation, when a physical input is given, say the thrown input is grounded, the Switch Controller will respond by energizing the thrown indicator lead and by issuing a switch control message over LocoNet such as 49T. When a LocoNet message is received that corresponds to the Switch Controller address, say 49C, the Switch Controller will respond by changing the output leads so that the closed lead is energized. Note that no LocoNet message is issued as a result of a change made in response to a LocoNet message.

The Route Controller

The Route Controller circuits, shown in figure 3, are independent of the Switch Controllers. Each Route Controller is assigned an address in the first of eight cells for each controller. When a LocoNet message that matches this address is received, the Route Controller issues up to seven switch commands over LocoNet.
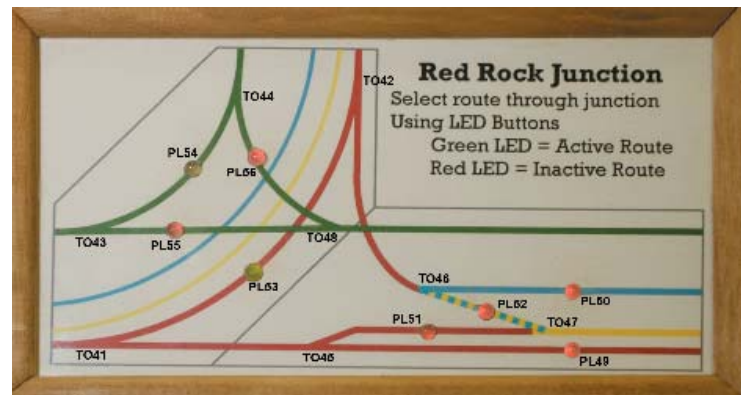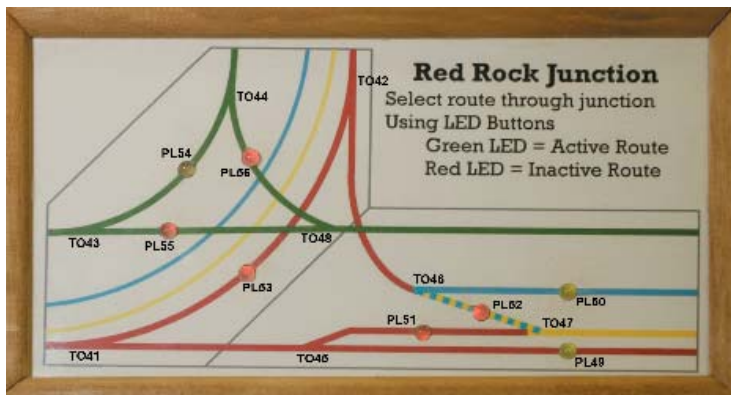

Route n

Figure 3

As an example, assuming 49T was programmed into the first cell of a Route Controller, when 49C is received there is no action taken but when 49T is received, a pre-defined list of switch commands is issued over LocoNet. Note that I used the convention that thrown means the route is active and closed means that the route is not active. Your conventions may vary.

Multiple panels

For the Red Rock Junction project I had decided to use three panels, one inside the loop as well as one each for the front and rear sides of the junction. With an SRC-8 in each panel, only LocoNet and 9 Volt power needs to be connected to each panel – a huge simplification of wiring. For each panel the Switch Controller functions are used to detect inputs from panel mounted switches, to provide a graphic indication of the status of each route (selected or not-selected) by use of bi-colored LEDs, and by issuing LocoNet messages so that all the panels are kept in synchronization. The Route Controller of only one panel is used because only eight routes are required for Red Rock Junction. Figure 4 shows a typical operation example

Figure 4A - Before

Figure 4B - After

As shown in Figure 4A, Push-button/LED (PL) 50 and 49 are green indicating a clear route for both the Blue Spine and Red Spine tracks to and from the main Red Line while PL 53 is red indicating the Corner route is blocked. Pressing PL 53 on any of the three panels will result in the following: throw lead of Group 53 is grounded, Group 53 state changed to thrown, PL53 turns green, LocoNet message 53T is issued, Group 53 PLs in the other panels turn green, Route controller with 53T in first cell issues the commands 41C closing Turn Out 41 (TO), 42C closing TO42, 49C turning PL 49 red, 50C turning PL50 red, 51C turning PL51 red, 52C turning PL52 red resulting in all three panels showing the Corner route selected and the Spine routes blocked as shown in Figure 4B. Of course all turnouts are changed to the appropriate position although they are not detailed in the figures above.

Panel Construction

I drew the track plan for the control panels using Corel Draw though any drawing package can be used and manually drawn panels are also feasible. The paper the panel is drawn on is sandwiched between a clear plastic sheet on the front and a piece of 1/8" luan plywood on the back. I used white craft paint to coat the luan so the track plan would show up better.

Push-button LEDs

The key element of the panels that allows easy operation and clear representation of the state of each route is the push-button LED assembly as shown in figure 5. These are comprised of bi-color LEDs and lever switches. The lever switches are mounted on an angle bracket made of 2 pieces of 1/8" luan plywood glued at right angles and drilled for mounting screws to suit the lever switches. Holes that are just large enough to provide bind-free clearance for the bi-color LEDs are drilled in the panel sandwich where required. The LED is placed in the hole, the lever switch's operating arm is placed in position to hold the LED in place then the lever switch bracket is glued to the back of the panel.
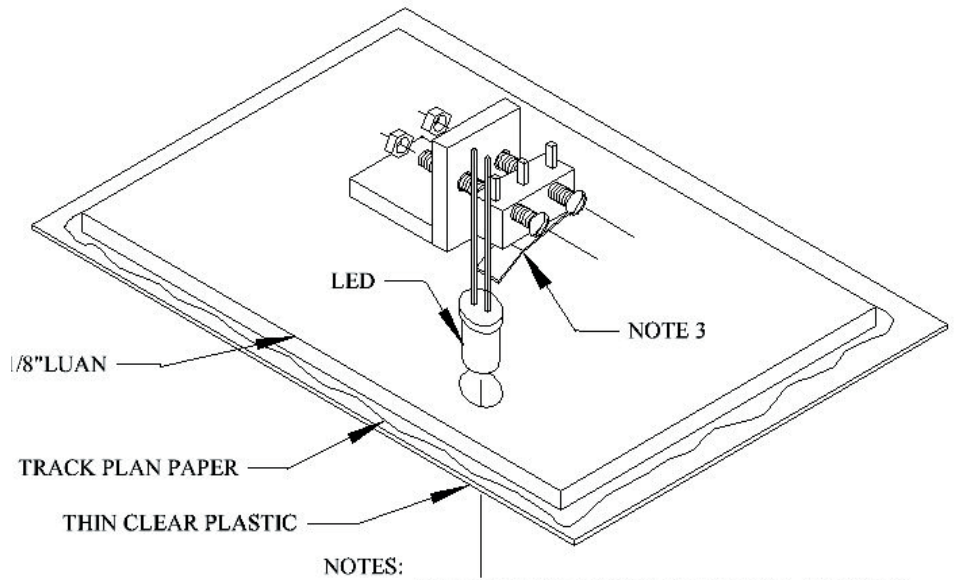

LED

1/8"LUAN

NOTE 3

TRACK PLAN PAPER

THIN CLEAR PLASTIC

NOTES:
1) SIZE LUAN L-BRACKET, SCREWS AND NUTS TO SWITCH USED.
2) LED SHOULD EXTEND THROUGH PLASTIC APPROX 3/32"
3) BEND SWITCH LEVER SO IT HOLDS LIP OF LED AGAINST 1/8"LUAN AND DOES NOT TOUCH LED LEADS. ADJUST SWITCH HEIGHT AND BEND LEVER TO OBTAIN CORRECT ACTUATION WHEN LED IS PUSHED.

Figure 5

Frame

Frames for the panels are built much like picture frames with the added consideration that space behind the panels must be allowed for mounting the SRC-8 and for wiring. Figure 6 shows a panel with the back removed. The SRC-8s inputs (lower two ribbon cables) are connected to the lever switches and the outputs (two upper ribbon cables) are connected through resistors to the LEDs. The back of the panel also serves as a convenient place to mount the RJ-45 jacks as shown in figure 7. Use of ¼" threaded inserts on each end allow us to mount the frames to a bracket using threaded knobs as shown in figure 8. The brackets are clamped to the side of the module using a spring clamp so that the panels can be pivoted to achieve the best viewing angle. An 8 conductor cable then plugs into the RJ-45 jack to connect the panel to the distribution hub.
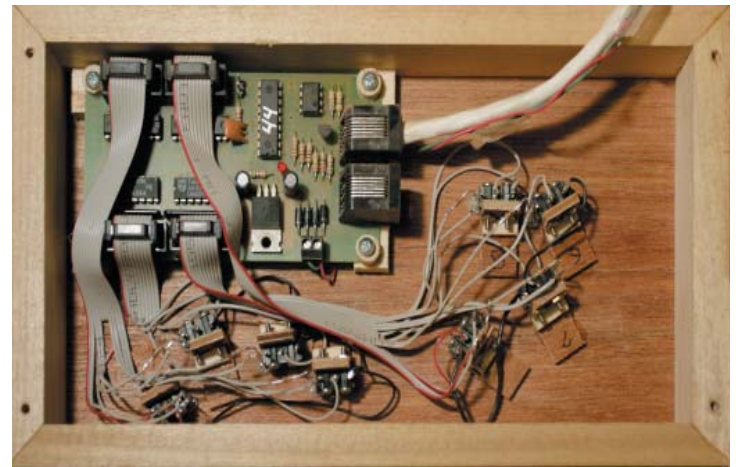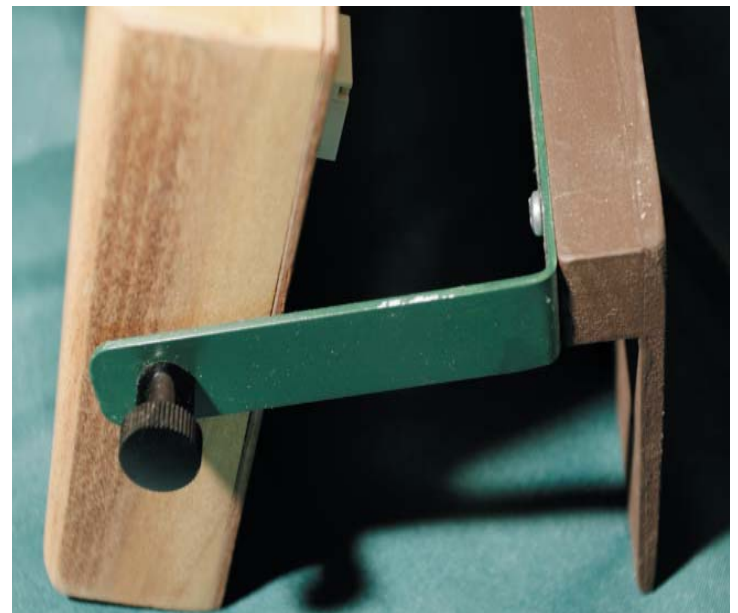

Figure 6

Figure 7

Figure 8

Interconnection

As mentioned previously each panel needs only to be connected to LocoNet and provided 9 Volt DC power to operate. I chose to combine input power and LocoNet into a single, 8 conductor flat cable with RJ-45 plugs. Pins 1 and 8 carry the 9 Volts DC while pins 2 through 7 are equivalent to pins 1 through 6 of LocoNet. Interconnections are made using a hub that provides three RJ-45 jacks, a coaxial power plug and a LocoNet jack. Figures 10 & 11 show a photo and a schematic view of the distribution hub.

In a basic set-up the DS-54s are connected to track power of the layout and the panels are connected to the layout LocoNet by way of the distribution hub as shown in Figure 9A. I have arranged the track power and LocoNet connections so that a DCC Command Station can provide track power to the DS-54 stationary decoders. In this configuration, shown in figure 9B, both track power and the private LocoNet are isolated from the main LocoNet. This would be useful in a large setup to minimize LocoNet traffic as well as to eliminate the potential for switch address overlap.
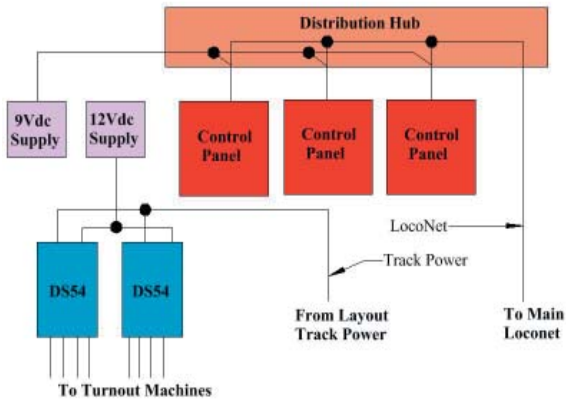

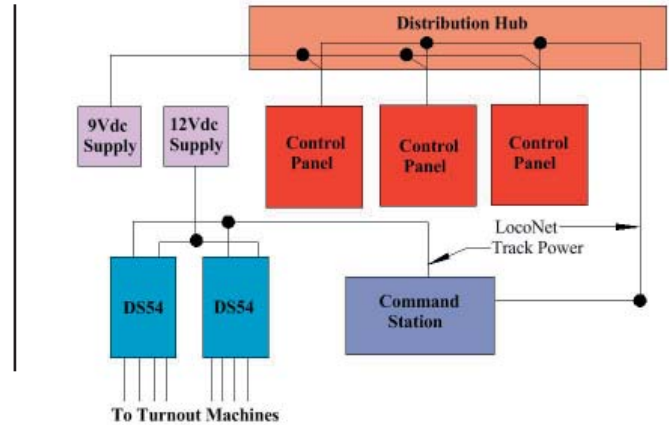
Figure 9A Common Track Power and LocoNet
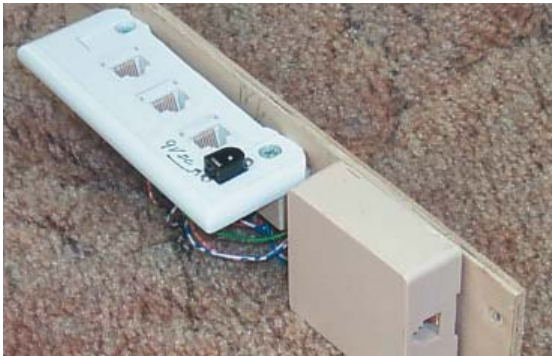

Figure 9B Private Track Power and Loconet

Figure 10

Figure 11

Programming

Team Digital has an EXCEL spreadsheet available for download from their website http://www.teamdigital1.com/suport_tools/support_tools.html. This spreadsheet, along with the instruction booklet provided with each SRC8, make it easy to determine the proper programming values. The values may then be programmed into the SRC8 using a throttle. Still more simple is to use the DecoderPro software by JMRI, version 1.7.5 or later. Simply open DecoderPro, Select "use Programming track", select Team Digital from the pull down list of decoder manufacturers, select SRC8 from the list of Team digital devices and then open the programmer. Once saved, the SRC8 will appear as a member of the roster along with any locomotives you may have stored there. Note that the SRC8 is connected to neither the programming track nor the track. The unit is programmed by LocoNet messages.

Afterthoughts

Written on each panel is the phrase; "Select route through junction using LED Buttons". These instructions are intended for train operators but, based on observations at a couple of train shows, there is apparently a powerful subliminal message to spectators to push the buttons. A way to prevent any passer-by initiated mishaps would be to place a normally open, momentary operation pushbutton, perhap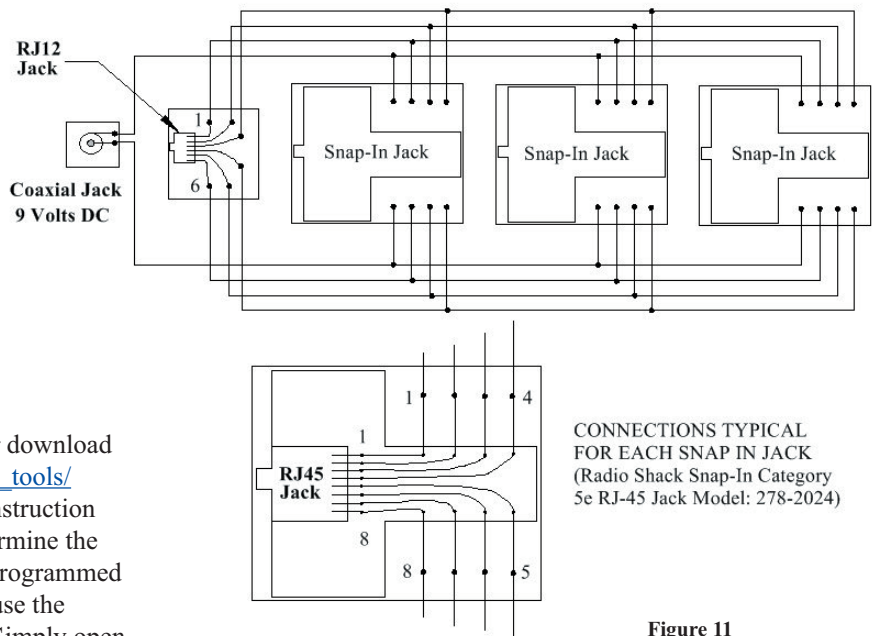s on the back of the panel, in series with the ground connection to the push button/LEDs. This would render the push buttons inoperative until the control button is pressed. Another benefit of using LocoNet as the communications medium is that during an operating session a remote Dispatcher can operate the turnouts using either a Digitrax throttle or the PanelPro component of JMRI.

Finally I can't say enough about the customer support provided by Team Digital. As the SRC8 was new to me I submitted my first attempt at a solution to Team Digital for review and got a very thorough response saying where I was wrong and explaining how it really worked. When I actually tried to program the units I had troubles with two of them and, after an Email to Team Digital, they responded with an offer to replace the troubled units, sent them to me before I returned the originals and all this at no charge. Thanks Team Digital!