Hills Rail Time

September 2021

PO Box 555 Castle Hill NSW 1765

My Pennsylvania Railroad

By Bruce Roberts

The creation of a model railroad….

AN EXTRACT FROM THE CHRONOLOGICAL RECORD DURING CONSTRUCTION.

See the video our HMRS website at hmrs.org.au – via menus to Gallery & Member Layouts

Background

From early childhood with a grandfather eager to share and pass on his technical skills to his grandson, I watched and 'assisted' the creation of a large train board, initially spending most of its development phase on my grandparent's lounge room floor. When I say large it was what could be built in the early nineteen fifty post war years with Australia coming out of a depression. A single board six by three foot (182cm x 91cm) was constructed using a pine timber frame, 3-ply wooden baseboard and landscaping using bird-wire mesh and Papier Mache.

Grandfather (Albert) Taylor built one large oval and an inner circle interconnected by manual points using single rail extrusion for a 00-scale three-rail network. To my grandfather's credit, which I realised many years later, this consumed many hours of tedious work, as each of the discrete three rails was placed straight or curved as required, spaced and pin-tacked using a hand template. There were no track sleepers and ballast was river sand painted grey.

Although Australia was expanding its rail network and rolling stock, with an increase in locally engineered and constructed locomotives, at this time the British Railway was most prominent with manufacturers of replica toys. This led to grandfather's choice of the London and North Eastern Railway model train purchases in the Hornby-Dublo (00) gauge. An LNER steam locomotive named Sir Nigel Gresley (4-6-2) with tender.

Figure 1 Sir Nigel Gresley at the North Yorkshire Moors Railway on 5th August 2001 - shortly before she was withdrawn from service for overhaul ~ photo by Hamish McNaughton. In 1937 the 100th Gresley Pacific was built by the London and North Eastern Rail

Later to emulate the freight era an (0-6-2) tank locomotive from Hornby®, who was then owned by Meccano Ltd an English based model manufacturer and supplier.

Figure 2 The 0-6-2 Goods Tank Engine from Beyer Peacock & Company 1854-1966, which became the LNER Class N5 was supplied to the MS&LR in 1893, 1894 and 1896 and to the GCR in 1898, 1900 & 1901 - 79 engines.

Model locomotives were mostly diecast metal, whereas passenger carriages and rolling stock at that time were machine pressed and painted tinplate. Engine speed control was via a rheostat using 12 volts DC, with 15 volts AC for lighting and signals. A slow progression from diecast metal to plastic occurred as manufacturing technology improved. In the early 'Hornby Dublo" (00) scale, one rarely if ever saw separately applied handrails, loose air hoses and replica detail as in today's plastic moulded or brass rolling stock.

When moving the train board from Burwood, to new family home at Fairfield then to Ryde in the state of New South Wales (Australia), the original tracks succumbed to twists and misalignment, so while apprenticed as an electrical fitter and mechanic in the early 1960's, I re-laid all tracks with the 'new' three-rail track, factory mounted on a pressed tin-plate base with 'painted' sleepers. At the time a DC (Direct Current) rheostat (variable resistor) speed control was used for all tracks, but electric points and signals also needed a rewire. In my late teens this board was to see its demise as other interests came my way – namely a certain young lady named Marilyn who is now my wife. This original board was 'pensioned off' and all rolling stock was given to deserving friends.

However, as our children came along I repeated my grandfather's efforts and built up a slightly larger train board using two old doors as a base. We purchased a LIMA® train set and I set about laying the new two track option, namely short fixed length steel track sections with moulded plastic sleepers. This turned out to be a not-to-be-repeated disaster with long term reliability being plagued by continual poor contact between track joiners. Later working in the medical electronics field and with computers as a long-term hobby, I set about re-wiring the entire board while building a new 3-channel direct current speed controller, offering variable pulse width output for better torque, speed control and simulated inertia.

Post graduate education and employment during the 1970-80 decades as a biomedical engineer and later years led to overseas travel for business and further training to several European countries. One highlight being north by rail from Hamburg in Germany, onto the rail-boat ferry to Denmark then through to Copenhagen. Later to Palm Springs and Monterey in California then further job changes saw moves to the Great Lakes area of the USA, south west from Duluth in Minnesota. Apart from the variety of rail locomotives and rolling stock across the world, I was impressed with each country's look and character during the northern autumn. Landscape geography, forest trees and ground cover during this period came alive with colours not traditionally seen or native to Australia.

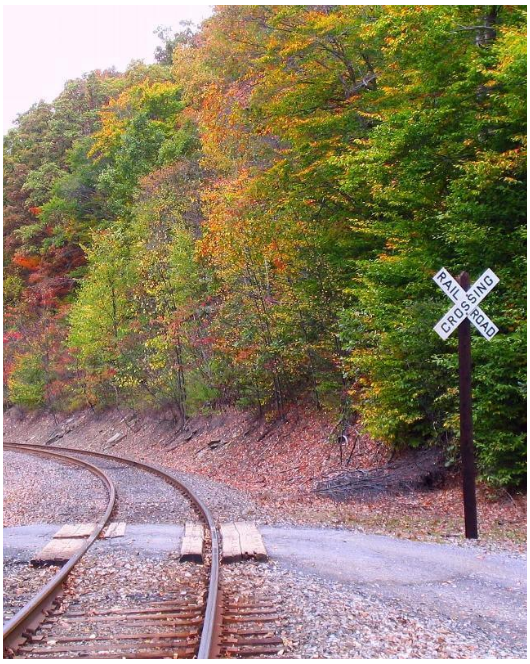

Figure 3 Pennsylvania in autumn

Later work-related visits to America through Minnesota; Wisconsin, Brookings in South Dakota down to Hartford in Connecticut was to remain in my mind, when I finally decided what I should do now and into my retirement.

Figure 4 Pennsylvania in summer

March 2008

During a visit to the local model railway shop (*Model Railroad Craftsman* in Blacktown NSW) and in response to my interest, Gary Spencer-Salt suggested I consider moving to computer controlled trains, I thought great, just my field of expertise! In a flash he pulled out an ALCO RS-27 Diesel Locomotive with Digital Command Control (DCC), with sound and livery for the Pennsylvania Railroad. So, this is how it all began…….

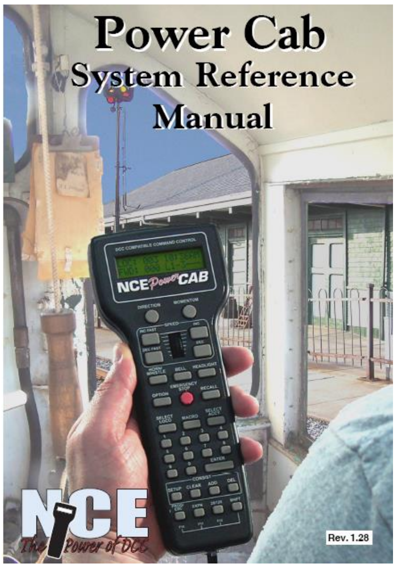

Figure 3 ALCO RS-27 Diesel Locomotive and hand throttle

With locomotive and an NCE® Power Cab™ controller kit under my arm, I headed home wondering how to test run my recent purchase. So, while running this locomotive on my computer desk using a loose piece of flex track, I started learning all about program control variables (CVs) associated with Digital Command Control.

Now came the hours of research for a suitable track layout within the available space and financial resources.

While searching internet sites and using the expertise from the many and great web site contributors, I initially settled on a contributor's concept of the Vandalia Railway.

My original grand idea led to an L-shape of four large train boards (each 1500 x 750mm) which would neither fit in my car garage, nor allow space to move around and landscape once constructed.

Figure 4 The Vandalia Short Line is a 1.5 x 10 feet rectangular switching layout. The layout is influenced by the Gum Stump & Snowshoe layout by Chuck Yungkurth (Model Railroader, April 1966 p.32).

Work begins

With our three children now in their own homes, I convinced my wife to handover an unused bedroom, to end up with an assembled, straight layout with a large, dog-bone at one end. Later ideas for a complete circuit of track led to the seven boards shown below. Each board is bolted together and aligned with metal dowel locators. Originally, the regional boards interconnecting tracks used the standard National Railroad Modellers Association (USA) track insert concept. These inter-board track joiners were down sized to 100 mm in length however, frustration with the fitting and alignment of the rail joiners was replaced by butting rails between each board.

Each board was to have folding legs with all DCC, low voltage DC, track blocks and power interconnects linked by plug/socket cable looms. Later the legs were removed and the boards loose mounted on a skeletal timber framework. My goal was to allow multiple users with hand held throttles for family and visiting enthusiasts. Also, paramount was the physical protection of the layout during the early years of my grandchildren.

So finally, I had my design conceived; modular, easily transportable and DCC controlled to emulate a segment of The Pennsylvania Railroad. To aid construction in the available garage space a modular approach was taken, initially with three then expanded to seven regions.

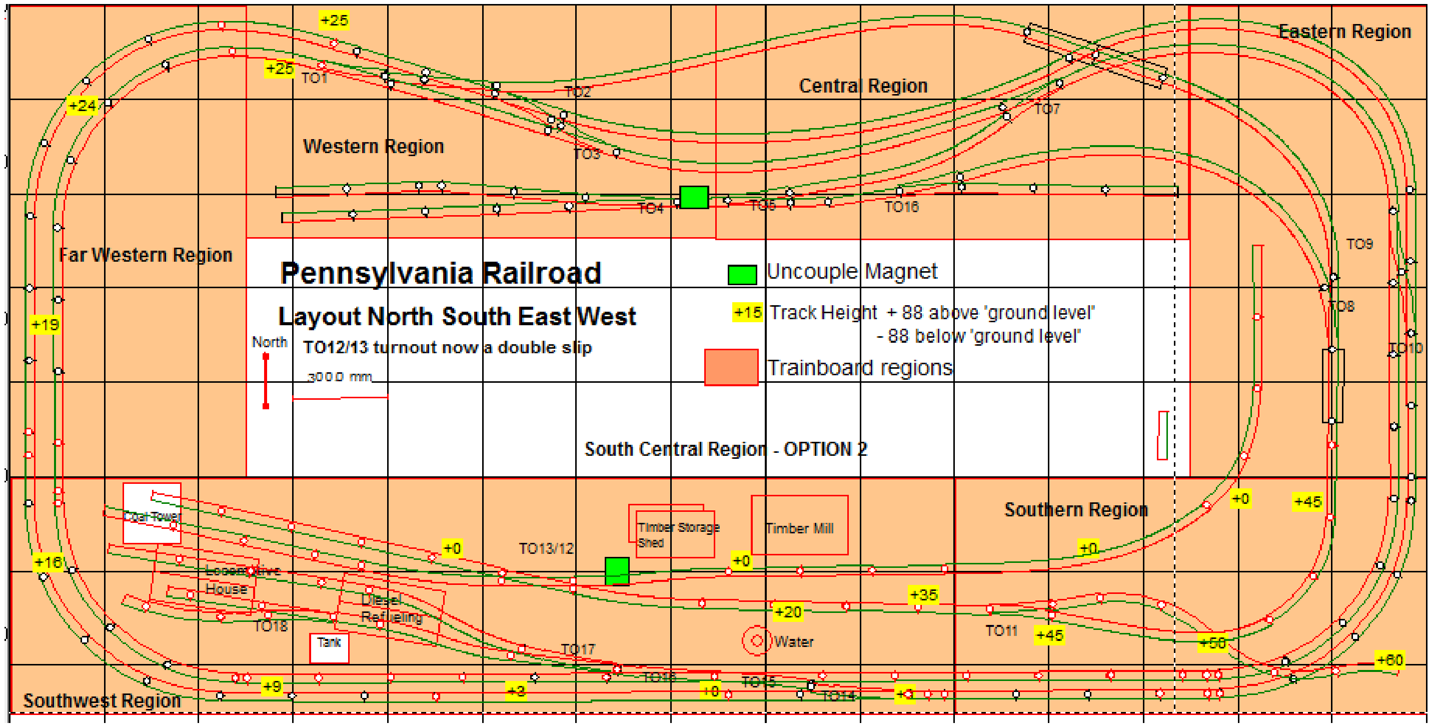

Figure 5 Modified layout - June 2014

From 1900’s to the early 1970’s era chosen was as diesel electric locomotives gradually overtook steam, with changes in corporate ownership and the ultimately progressive demise of the PRR railroad. Later the automobile and road freight became railroads greatest competitors.

The mighty **Pennsylvania Railroad** in the United States of America earned the distinction of being the largest railroad in the world for much of its 122-year history. The first region of my PRR layout, stemmed from a yet to be assembled, laser cut timber model of the **New Freedom** railroad station along with the **ALCO RS-27 Diesel** locomotive.

The town of New Freedom (Lat/Lon: **39.7° N 76.7° W** from Google Map) is just north of the historic Mason Dickson line in Pennsylvania. New Freedom was the high point on the Northern Central Railway between Baltimore and York. At one time, this was a major railroad town on the Northern Central's route, with helper engines stationed here.

Figure 6 New Freedom Station now a museum

There is also an interchange here with the Stewartstown railroad, which runs east from New Freedom to its namesake town of Stewartstown. New Freedom is now the home base of the Northern Central Railway, which operates dinner and excursion trains over the line from New Freedom to just outside of York. The restoration of the station improved the area, with railcars and locomotives adding to the atmosphere.

From this beginning I’ve endeavoured to create my interpretation of this Pennsylvania region and surrounding countryside.

Late 2008 through 2009

My prior experience of mounting model rail track on old doors had one major failing, how does one place or disguise the many wires and cable within the landscape or on the door surface! So as many enthusiasts have suggested I constructed rectangular timber frames (1500 x 750 x 90mm) with a plywood top. This meant approximating a basic track layout using masking tape, ultimately onto which the foam base was to be laid.

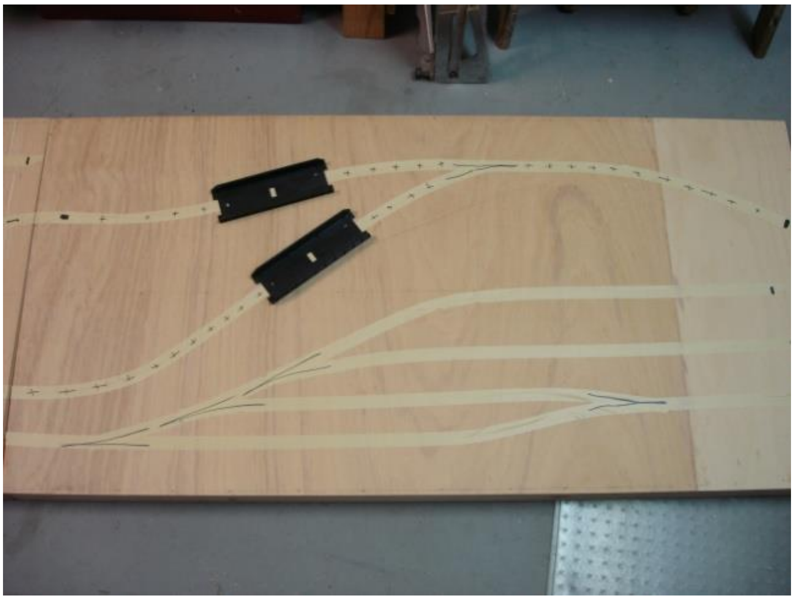

Figure 7 One of the preliminary track layout

Initially each board was coated with adhesive then covered with a 50mm thick sheet of high density polystyrene 'aircraft modellers' foam. The key aspect of this task is to choose an adhesive without a strong thinner base that would dissolve the polystyrene foam. Selleys® Aquadhere™ was the preferred PVA adhesive resulting in minimal effect on foam. But for strength Selleys® Hard-as-Nails™ was used to glue the perimeter of the foam sheets onto the plywood baseboard as the wood base quickly absorbed this glue's thinner. Centre line and cross timber struts underneath were added later after the track layout was determined. More importantly this delay of strut fixation allowed turnouts to be positioned with their associated slow-motion actuator. Once these items were mounted; struts were cut to size, clearance holes drilled to allow passage of board wiring; then glued and screwed under each board.

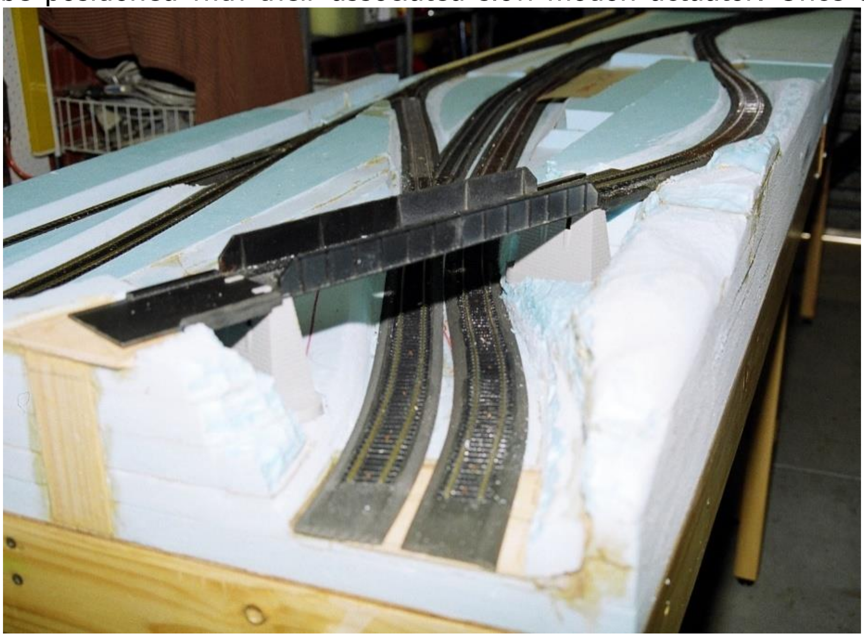

Figure 8 Central Region viewed from the 'North East'

I intended to create a realistic landscape by adjusting the height of the foam for track, houses, shops and roads, plus later ideas for a water course and wetlands. Once the layers of additional foam were added the task of shaping foam began. Enthusiasts recommend a rise or fall for track not to exceed 1.5% over a given length of track, to an absolute maximum of three percent. Less if tracks are curved or at turnout location or interchange.

A hot-wire cutter, scalpel, rasp file, coarse abrasive paper and manual labour were the key ingredients during the many hours contouring the foam. Once the basic track path was achieved, **Trackrite™** flexible foam underlay strips (P/No. H505A) to support the rail and sleepers were glued to the polystyrene base. This underlay is shaped to slightly raise and centralise the flex-track above the surrounding ground and also provide a tapered edge on which to lay track ballast.

Where the interface of each board's track occurred, the rail heads were strengthened and supported by additional timber inserts. Track and underlay placement on the base foam became a 'bit-of-an-art', with dressmaking pins or any heavy item in reach used to anchor the track until the glue hardened.

While keeping in mind the final landscape appearance, during layout contouring it became very easy to remove too much foam. Very much later after many hours of contouring, along with road construction came the brush painting of the foam surface in preparation for placement of roads, buildings, grass vegetation and trees.

Figure 9 Adding foam to contour the hillside and track way of the West and Central regions

Trees and shrubs were created using plastic, bendable armatures covered with coloured flock or where realism became important, various kits were purchased to enhance the overall landscape.

Figure 10 A selection of landscaping products

As the road base was contoured I paused to decide; how was one to replicate a U.S. country road surface devoid of today's bitumen or concrete? I had retained some fine grade gap-sand, combining a moisture activated adhesive, used to in-fill gaps when paving our home's entertainment area.

Figure 11 Central region's mainlines on the left to/from southern regions and branch lines to the right

To achieve some realism a straw-grey colour was painted on to the road base and then allowed to dry. Next a liberal coating of Selly's® Aquadhere™ was applied followed by the gap-sand sprinkled from a teaspoon onto the road. The combined effect was a fine, white sandy coloured road base. Finally, the New Freedom station house was positioned trackside in the 'Central Region', then began the 'real landscaping' with shrubs, trees and grass.

June 2009

With the landscaping of the Central and West region boards the goal now was to create desired routes or a combination of turnout signals to govern operation of multiple consists (locomotive and rolling stock). Plus, creation of train routes using DCC macros programmed into the NCE Power Cab™ hand control. *(A macro is a set of pre-programmed commands that when activated can perform several tasks in a pre-set order at the push of a button).*

PRR unique railroad signals were world renown for design, operational rules and ease of comprehension by railroad staff. This further complicated my electronic controller's design to achieve a selection of displays from the aspects shown below.

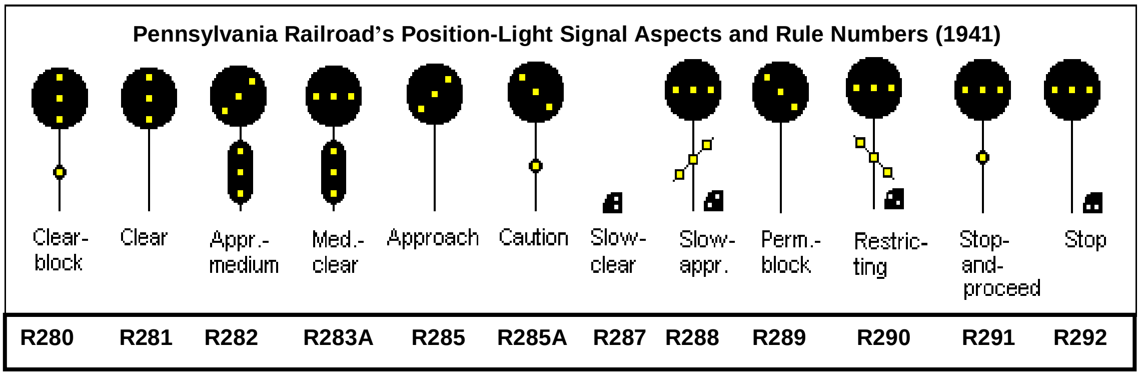

Figure 12 PRR Mast and Dwarf Signal Aspects

Purchasing off-the-shelf signals and controllers was cost prohibitive, so ingenuity became the mother of invention. Mast and dwarf signals designed were constructed in my home workshop using brass sheet and tubing with light emitting diodes (LED) wired to the home-made electronic logic controllers. Hours of detailed work was necessary to achieve the signals and operational logic required for each turnout as in many cases with secondary signal interlocks.

To appreciate the steps involved in creating my home-made PRR signals, here are some of the stages in construction along with the finished product. Brass and or copper were cut and shaped to replicate a 1/87 scale model of these signals. The scale model height for the mast, less the below ground base is 95mm, the dwarf when positioned at ground level is approximately 12mm. The actual full-size heights are 8.1 metres and 475mm respectively.

Figure 13 Single head Mast signal

Both used yellow 1.8mm diameter light emitting diodes (LED) except for red stop (L5) lamps on westbound masts. Several Teflon™ insulated flexible wires are threaded down the mast post or folded at the rear of the dwarf. These were connected underneath the board to their respective signal controllers all powered by 12 volts DC. As is the norm in the USA these signals are placed on the right side of the track relative to train direction. In dual track sections where placement could be deemed confusing, or where track space allows safe placement, dwarf signals are permitted on the left.

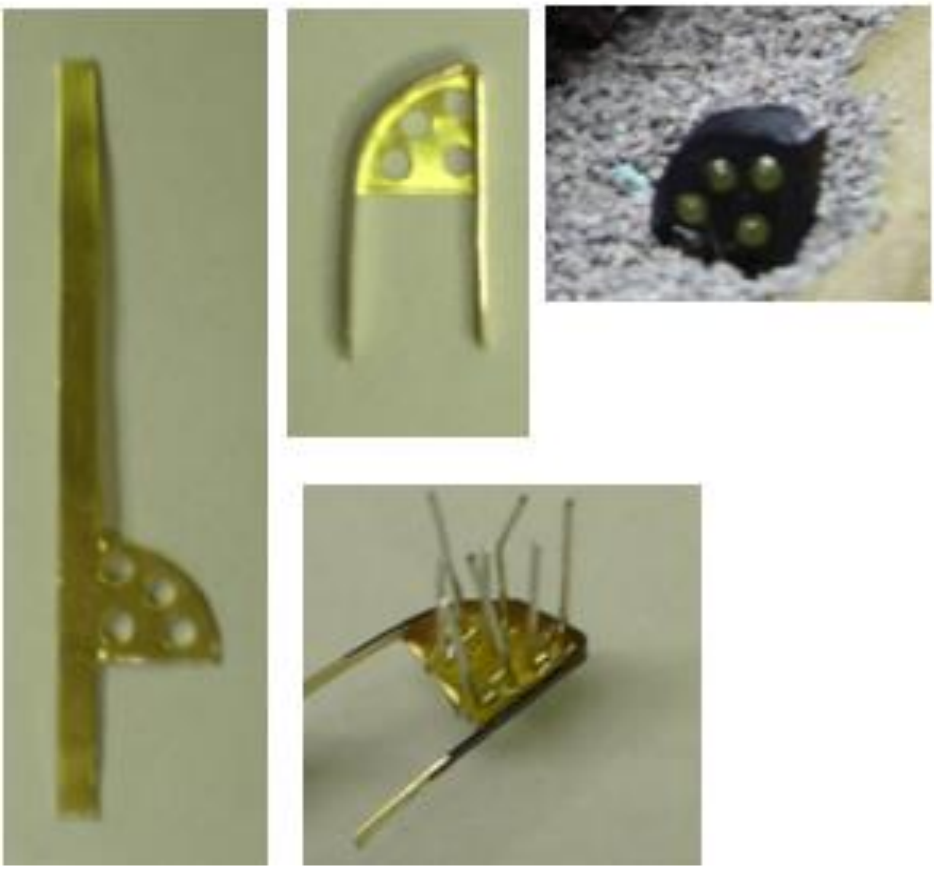

Figure 14 Dwarf signal components and as viewed from an approaching train

December 2009

Through my holidays during December 2009 to January 2010 additional under board wiring took place to the originally conceived central and western regions. Wiring for DCC has its own unique requirement compared to the traditional direct current (DC) for track and alternating current (AC) for trackside accessories.

Separation is required for regional areas of local track, most importantly where track cross-overs occur or when one region interconnects another. Likewise, many track block sensors within the overall track and turnout layout, were located to sense the passage or presence of locomotives and or rolling stock.

At right is the original track schematic drawn to guide the wiring process prior to the deletion of the southern region's dog bone. Now the additional four boards allow a complete circuit route back to the western region.

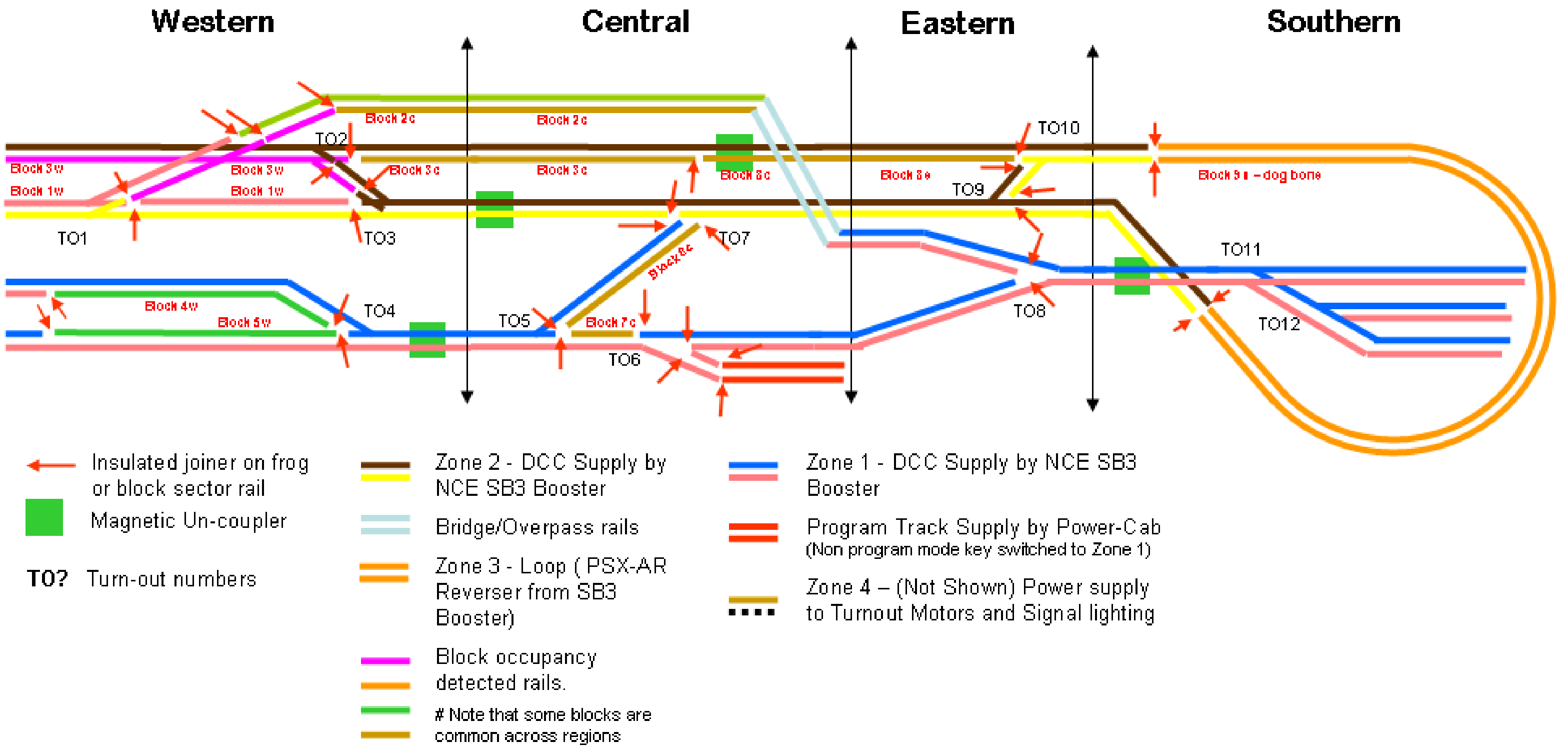

Figure 15 Regional track layout with turnout and track blocks. The 'dog bone' in the southern region as shown no longer exists

While landscaping I searched the internet and obtained photographs of the Pennsylvania State and right-of-way for the many PRR branch lines. These were used to create and guide the resulting placement of shrubs, trees and grass vegetation. Local rail hobby shops were searched for replica plastic and timber building kits to depict shops, signal boxes and homes of the era.

Hours of trial and error using various colour paint mixtures, coloured flock and foliage achieved an acceptable presentation of the Pennsylvania countryside. A variation in colour flock applied to tree foliage and shrubs replicated the approach of autumn on the landscape across the northern hemisphere.

Figure 16 Town centre, dual mainlines, Northwest branch line and West yards viewed east across the West region

Figure 19 View east from the town centre along the northwest branch line

January 2010

Now with the completion of the Western and Central regions, the question arose as to how should I manage the operation of multiple consists (locomotive and rolling stock) controlled by more than one user. An electro-mechanical Centralised Traffic Control (CTC) panel was an initial and quickly forgotten option with its overall complexity being unnecessary for this layout. Likewise, should the locomotive movement control the desired route, or as decided a combination of turnout and signals govern operation of multiple consists on what could be shared rail lines.

With testing in the Central and West regions using locomotives and rolling stock, automation of each turnout and signal was the next task. Just to give some indication of the complexity now undertaken, here is the central regions under board signal wiring schematic.

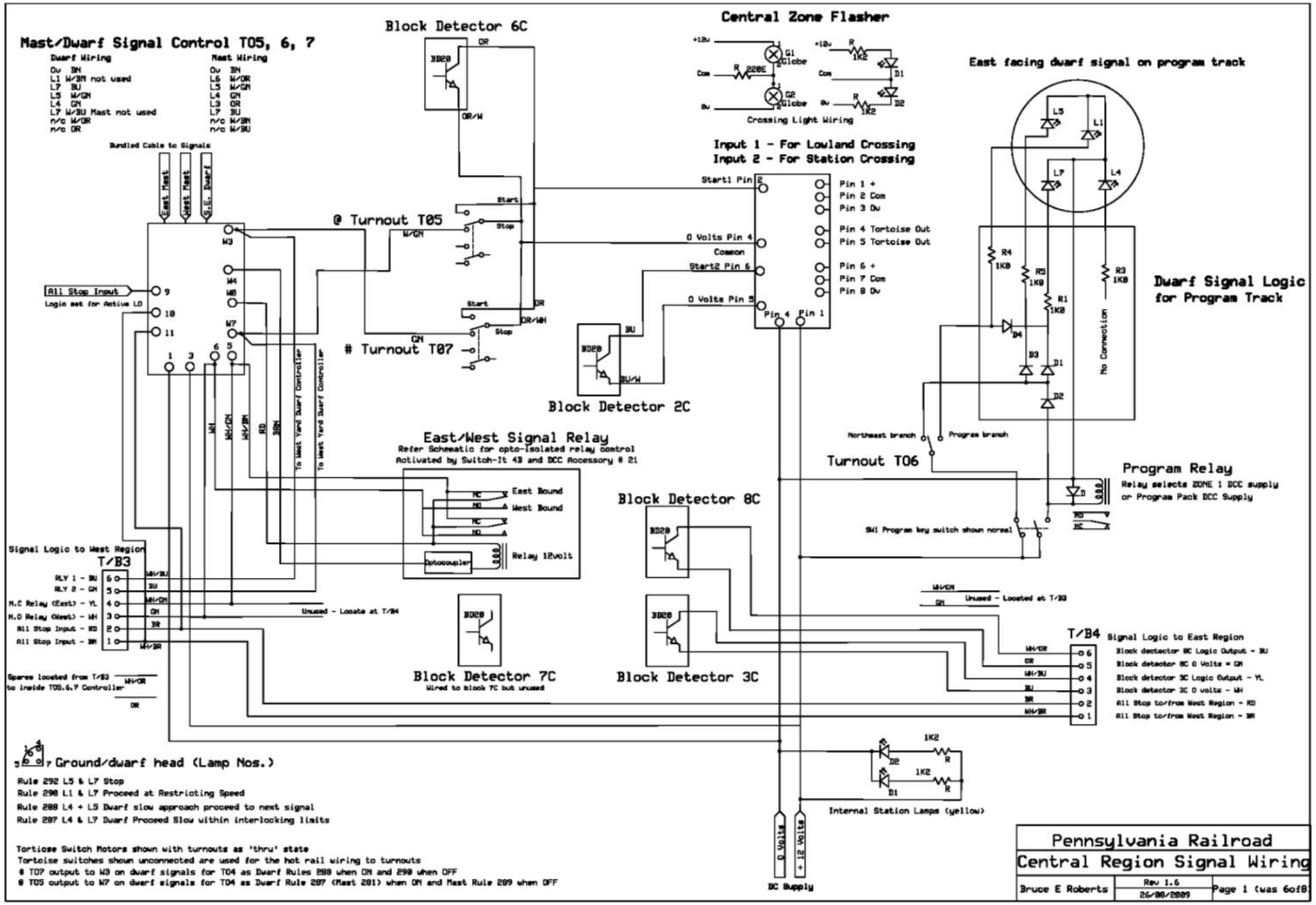

Figure 20 Central region's signal control and track block sensor wiring

Having accumulated a multitude of electronic components in past years, I decided to create non-computer-based signal controllers. Each of the region's boards will eventually have a similar amount of interconnectivity, both within and to the neighbouring regions. Additional to and not shown above is the under-board wiring for track and turnouts.

Solid state signal controllers were designed and built to change track turnouts and power the PRR position light signal displays. Combined with the Tortoise® (at right) or Cobalt® slow motion turnout actuator's switches, DCC macros allowed control of consist direction and interlocking of signals between opposed turnout signals on programmed routes.

Figure 23. Tortoise slow motion turnout actuator

Homemade push button switch assemblies for all turnouts allow manual control of DCC accessory control for turnouts. The push button operation controls many NCE Switch-It modules to retain the user's operational link to each turnout with the associated signal being interlocked for safety. Signal controllers for multiple turnouts, consist direction and rail located block sensor inputs generally follow the functional flow schematic below.

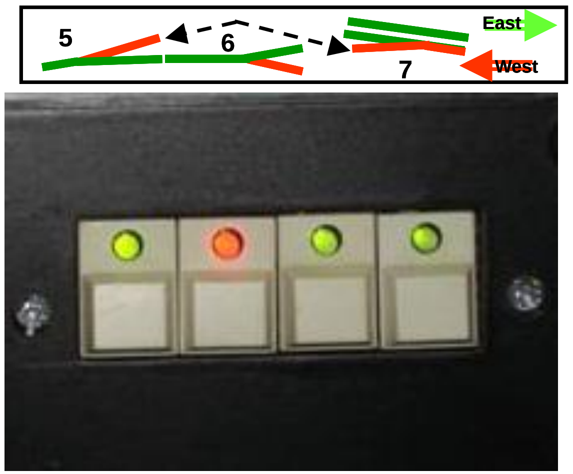

Figure 21 Central region's turnout controls

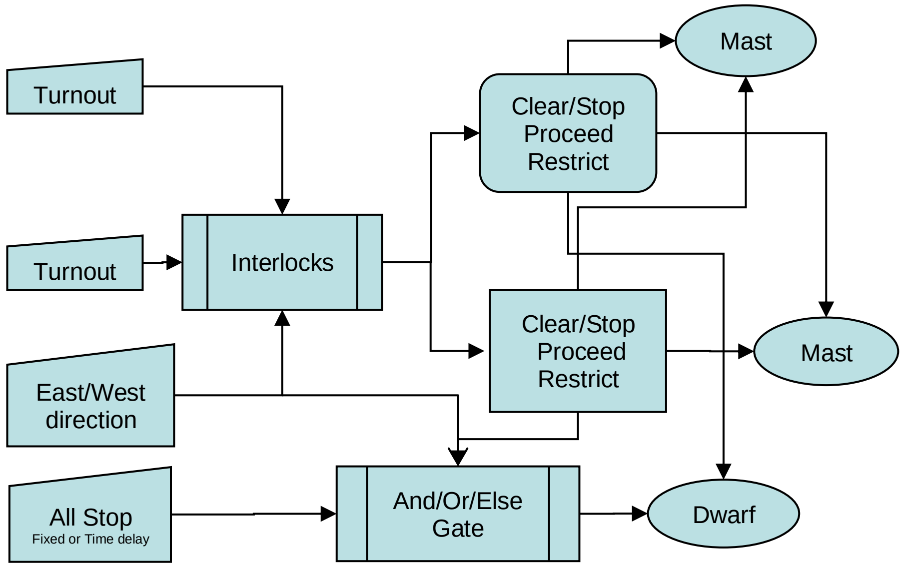

Figure 22 Basic flow schematic for signal controllers

Using a similar flow schematic above for each turnout and signal complex this worksheet is an example of that created for each combination. The Central region's signalling worksheet below describes how the movement of trains would be controlled for each turnout and signal.

W3 Relay 1		W7 Relay 2		East (Logic swapped W5/6)	West	W9 RL3 All stop Not Used	Mast 1 East Facing	Mast 2 West Facing	TO5 Eastbound Dwarf	TO4 Dwarfs	Usage	Notes
Controlled by TO7		Controlled by TO5		W6 +12v	W5 +12v							
On	Thru	On	Thru	On		n/a	Stop	Clear	Stop	Slow Clear	OK	East/west main thru. Marshalling yard eastbound to program track or timber town
On	Thru	Off	Branch	On		n/a	Stop	Clear	Stop	Proceed Restrict	OK	East/west main thru. East bound loco from yard stopped at branch dwarf
Off	Branch	Off	Branch	On		n/a	Stop	Permissive Block	Slow Clear	Slow Clear	OK	Westbound main through. Branch now eastbound. East main restricted
Off	Branch	On	Thru	On		n/a	Stop	Approach	Stop	Slow Approach	OK	Westbound main thru. East main set to approach but blocked by TO7. Marshalling yard east to timber town or via TO6 to program track
On	Thru	On	Thru		On	n/a	Clear	Stop	Stop	Stop	OK	East main may travel west to TO2/3 interchange. West main may be east bound but controlled by TO2/3 interchange signals
On	Thru	Off	Branch		On	n/a	Clear	Stop	Stop	Stop	OK	East main may travel west to TO2/3 interchange. No yard option from timber town or program track
Off	Branch	Off	Branch		On	n/a	Take Siding	Stop	Stop	Stop	OK	East main main may return to west marshalling yard
Off	Branch	On	Thru		On	n/a	Approach	Stop	Stop	Stop	OK	East main may travel west on approach to marshalling yard but blocked by TO5. Timber town or program track may return to marshaling yard
Don't Care	Don't Care	Don't Care	Don't Care	East or West		All Stop	Stop	Stop	Proceed Restrict	Stop	OK	**All stop active but unused.** Circuit board configured as active high

Figure 24 Central Region Signal Logic

This was the most complex of controllers with East/West operation on the inner (clockwise) mainline, with an option of branching through turnout TO7 via TO5 then TO4 to the marshalling yards, including an interlock for the railroad crossing lights between TO5 and TO7. The original circuit on the next page is controlled by the manual switches or DCC macros for the TO5/7 turnouts and activates two Mast and one Dwarf signals.

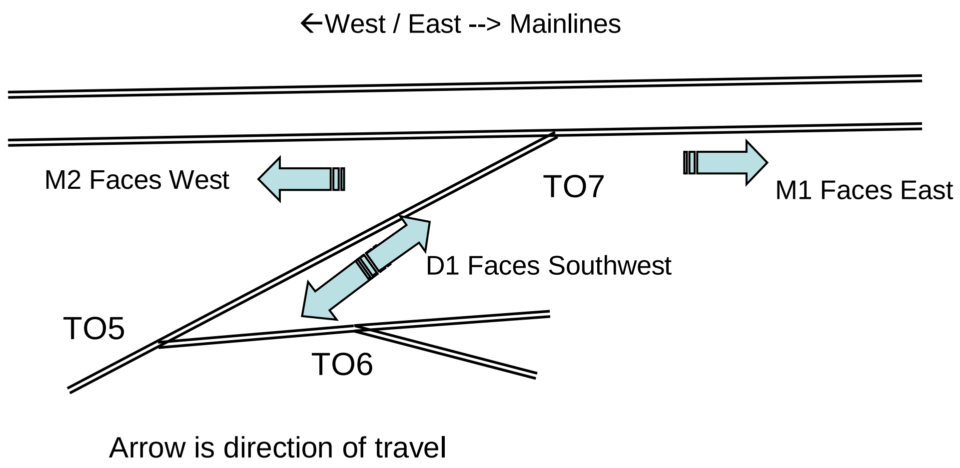

Figure 25 Turnouts within the Central region

Options were incorporated to this circuit for inter-region signal control to interlock distant signals and or turnouts Note the included ‘All Stop’ option and East/West direction change inputs against another consist.

User control by a Power Cab DCC macro or push button on the regional base board, achieves manual control for yard shunting or consist interchange on mainlines.

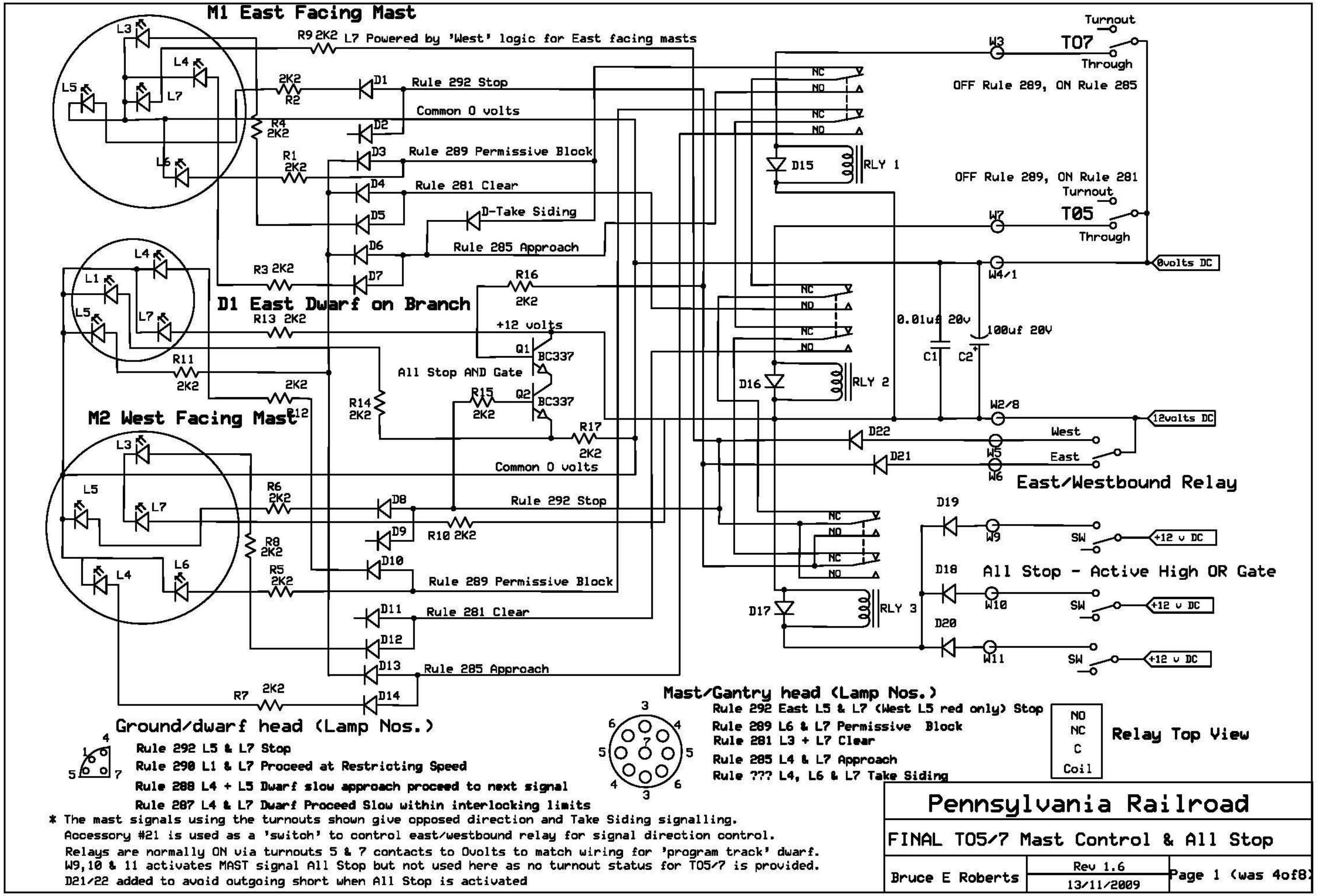

Figure 26 Turnouts 5/7 Signal controller

Then using computer aided design software this Veroboard layout was drawn for component positioning of the above circuit.

Rather than going to the expense of a printed circuit board (PCB) each layout was wired onto Veroboard®. This lower cost option allowed modification if errors were located.

As it turned out the idea of a common PCB was impossible to realise as each controller's logic was in some way different, based on the turnout function, direction of consist and desired signal aspect. After assembly and testing, here is the finished board for turnouts 5 and 7 located in the central region.

A future option is to replace these relay and diode gate logic controllers with microcomputers with software programmed for differences in signal logic onto a common board. Dependant on cost this future option may be better served by replacement of these analogue controllers with a digital PIC-based microcomputer or programmable NCE MiniPanel®.

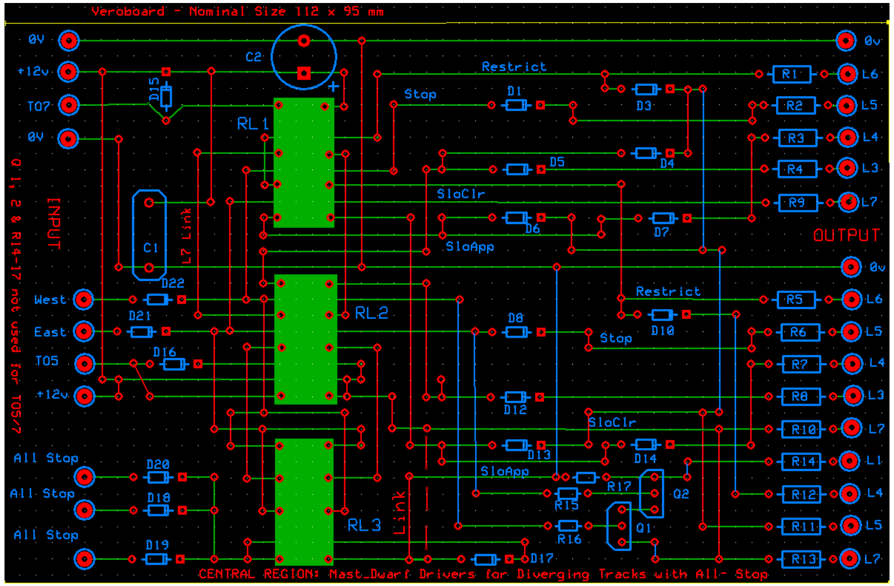

Figure 27. Circuit board artwork for the TO5/7 Signal controller

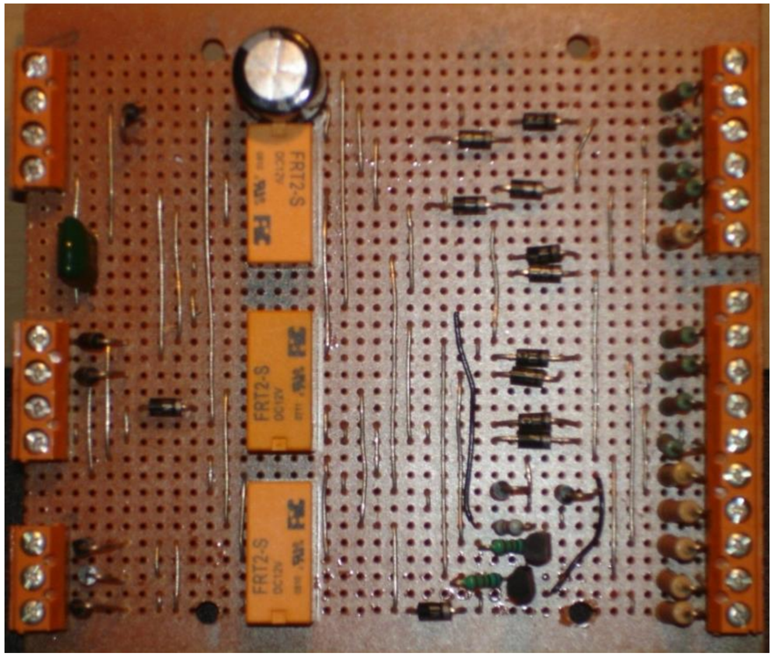

Figure 28 Completed analogue TO5/7 Signal controller

January 2011

Now began the task of laying track on the East Region's base board with the added difficulty of aligning the bi-level northwest and west bound branch lines. The previously constructed base board now required matching track levels with an increase of height of foam from the central region's over the plate-and-girder bridge from the northwest line. This required some road modification to achieve a realistic rise and fall to allow the eastern road to pass under the rail bridge to Timber Town.

Track and turnout mounting changes were introduced to eliminate the remote 'wire-in-tube' method with a Tortoise turnout actuator. The mainline interchange turnouts (TO9/10) were mounted to 5-ply board with the smaller profile Cobalt slow motion actuators located under the board and turnouts. The base foam was routed out to form a well into which the entire assembly was then positioned. The turnout (TO8) north of the girder bridge on the timber town track was high enough to allow a Tortoise actuator to be mounted within the hill side.

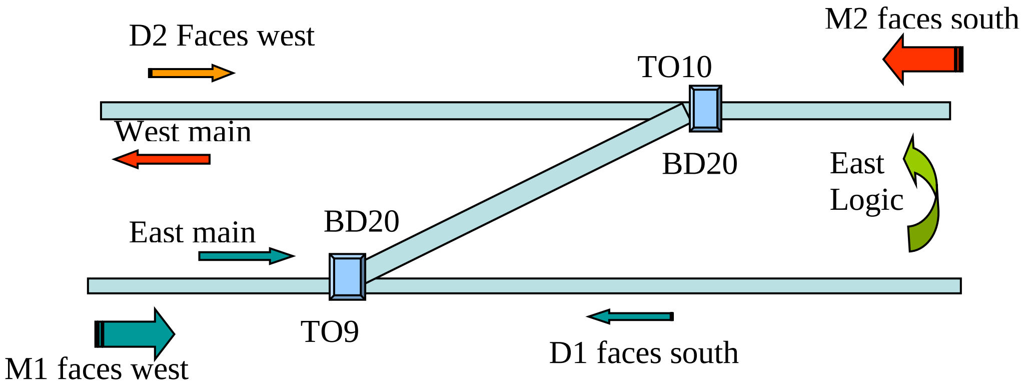

Figure 29 The East regions interchange turnouts

Wiring to and repair or replacement of the three actuators is possible via access ports located under the east region's base board. This board mounting method may be used on the remaining southern regions rather than the Tortoise option of remote method used on the Central and West region boards.

Consideration was now given to the mast signals associated with turnouts TO9/10 for both track interchange and interlock from the central region for west bound trains stopped or passing Freedom Station. Again, the signal controller board underwent change. This time two separate timers providing a 30-second delay and activated by NCE® block detectors (BD20) wired to each turnout's hot-frog. Now as trains pass over either turnout the 'Clear' or 'Approach' display changes to 'Stop' for the delay then returns to the normal state.

Alternately the M2 mast (TO10) set to 'Stop' when interlocked. For west bound trains interchanging to east mainline and onwards to the west region marshalling yards, two dwarf signals were added and linked to this M1/2 signal controller and the West logic state. The dwarfs are normally at Stop except for the track interchange.

The TO8 turnout prior to the girder bridge, where east and northeast branch lines met, has three dwarfs wired to their own signal controller for East or west consist movement. South bound movement into Timber town is interlocked with a block sensor (10E) located south of TO8 onto and over the girder bridge.

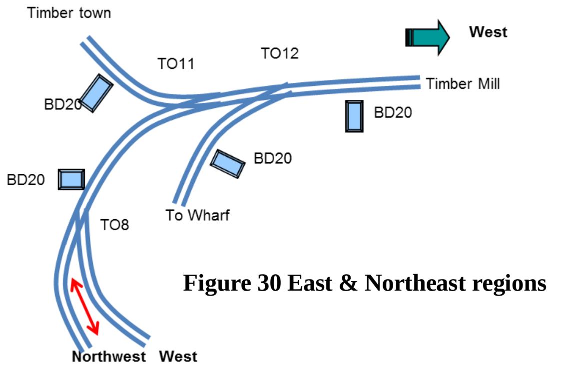

Figure 30 East & Northeast regions

August 2011

One of my desired inclusions was a lake, river and wharf, but on seeing other modellers try to replicate water with a 2-part epoxy fill or using liquid estapol, these methods did not always result in a pleasing finish. Initially the lake was used as a testing area by trying the rippled plastic 'sheet water' available from local model stores. The lake bed was contoured to various depths and painted light blue to bluish green to dark blue to replicate shallow and deep water. The water sheet was cut to size and then contoured foam sheet was added to simulate the water's edge around the lake perimeter.

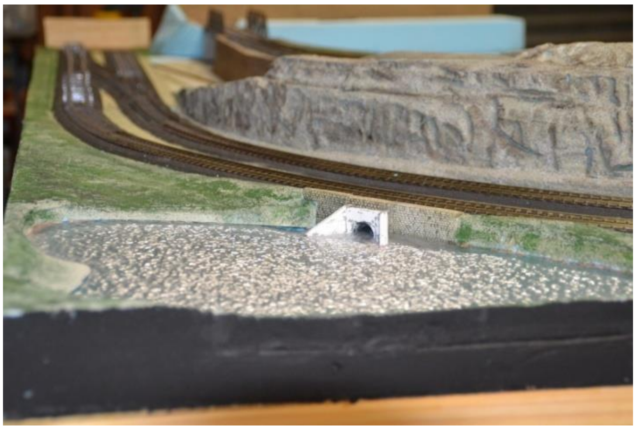

Figure 31 East Lake

The question then came to mind, from where does the water come? So, a compromise was run-off from mountain plus ground water, with a culvert added for outflow though a tunnel to the lake on the other side of the mountain.

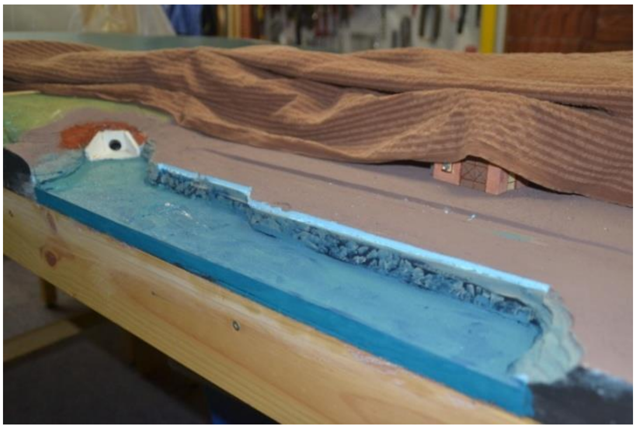

Figure 32 Wharf construction

Using a router, the task began to remove the foam and shape what would become a working river side wharf, plus lake out flow with matching culvert. The concept here was to have a road, rail and barge terminal where supplies and timber could be transported to and from the yet to be built logging area and timber mill.

Figure 33 East region's completed wharf

May 2014

Many ideas were considered as to how the four new regions (South, South Central, South West and Far West) were to complete the circuitous layout. Originally the inclusion of a turntable adjacent to the locomotive sheds was considered but although functional its size limited placement of several buildings. The result was an extension to timber town, logging area with a planning mill, timber storage shed and spur track to the wharf.

The acquisition of locomotives and rolling stock over preceding years necessitated additional sidings for shunting and storage. With rolling stock located in the marshalling yard in the West region I needed a site for locomotives. A coal chute, locomotive shed and diesel fuelling dock were added on the Southwest region.

A turntable was one of the desired inclusions but its omission had an added benefit for the South-Central region by gaining space to include interchange turnouts TO14/15 to match East region's TO9/10. This now allows a 'run-a-round' from the west bound mainline, for an east bound consist, to pass a slow or stationary consist south of TO9 but east of TO15.

Figure 34 Draft track layout, engine house, coal chute and diesel refuelling bay

Track laying for South Central and South West regions required additional turnouts (TO16/17/18) and to reduce the overall length of inline turnouts, a double slip was introduced for TO12/13. The latter inclusion allows consist movement from the northwest/west branch lines to coal hopper, timber mill, wharf and logging areas.

January 2015

By this time my comprehension of DCC operation had increased with an idea of adding a local programmable controller to run a logging consist along the southern region's branch lines. An NCE MiniPanel© was added under the Southern region board to automate specific turnouts and consist movement to and from the Southern region's logging area to South Central timber mill, Southwest yards and the wharf.

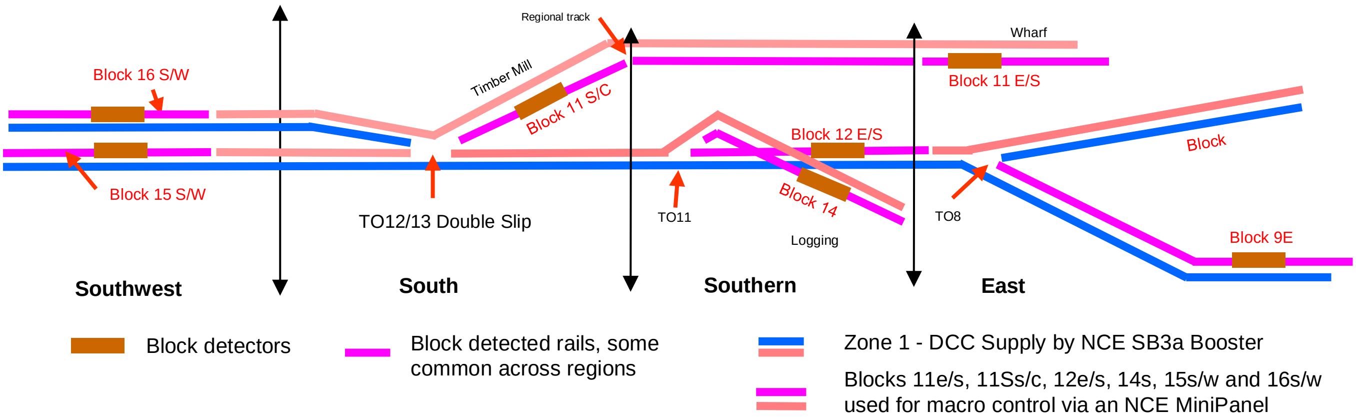

Figure 35 Logging route by region & track block with associated consist detectors

Programming the NCE MiniPanel 'ladder logic' was relatively straight forward to control consist locomotive direction and pre-set speed. Trial and error was required for locomotive speed, run time, number of wagons versus track length and throttle adjustment for hill climbs. The control of consist movement required knowledge of turnout position, location of consist via track block detectors south of TO8 across the Southern to Southwest regions.

Although a user hand throttle can manually perform all these tasks, now at the press of one button the MiniPanel macro automates the process. Movement starts south of TO8 in the East region to the logging area, then to southwest yards and to timber mill and finally output product from mill to wharf. An option is programmed to repeat or stop the process for other traffic.

During this year landscaping for the southern regions was started, including setup of the timber mill and storage areas for logs and finished timber stock. While testing of the logging routes using the 3-truck Shay steam locomotive it was light in weight not having sufficient traction to negotiate the higher than a normal logging track slope. My SW1500 diesel shunter will now move logging trucks to and from the logging area. Although the track slope was known to be excessive it was necessary to run-over the south east tunnel, also the secondary branch line returning to the East region via turnout TO11.

June 2015

DCC Power Supplies

With the number of additional locomotives purchased the existing SB3A DCC power pack was at its 3-ampere limit. A DB5 DCC dumb booster was purchased and wired into place. It had always been the intention to segregate main lines from the secondary tracks, as wiring under each region was initially placed to accommodate this separation.

Figure 36 North Coast Engineering's DB5 Dumb Booster

The original NCE™ SB3A *Smart Booster* and now the DB5 *Dumb* Booster are both synchronised via a control cable. This ensures locomotives can move between main line and secondary tracks without causing short circuits. By suppling an additional 5 amperes of DCC power the DB5 booster improves overall operation on the mainline for multiple locomotives, including those stationary but 'powered-up' on the locomotive yard and shed tracks.

Booster and locomotive safety is provided by three EB1 circuit breakers which have their jumpers set for a trip current of 3.5 amperes, so the layout start up capability was improved for sound equipped locomotive operation. *(Note, the factory supplied EB1 accessory addresses are 2044).*

DCC Accessory Address	Booster ID	Function	Power to
2001	B1	Zone 1	Branch lines and Southwest coaling and shunt yards
2002	B2	Zone 2	Mainlines and locomotive yard and shed
2003	ACCY	Accessories	Tortoise & Cobalt turnout actuators, NCE Switch-Its plus associated pushbuttons and LEDs.

DC Supply

The original low voltage switching power supply used for the 12-volt DC supply was overheating and reaching maximum capacity when used to power signal controllers, signal displays, street and town lighting. Fortunately, an old personal computer had met its demise, so on removing the PC ATX power supply it was duly modified to expand the 12-volt supply capacity for all regions.
All signal controllers and LED signals plus regional supplies to street and building lighting is fed from this ATX Computer power pack + 12 volts 5 amperes maximum. Protection is 3 amperes using a 3AG wire in glass fuse located under the Central region.

Program Track

Short circuit protection is via a 12-volt 12-watt automotive globe located under the Central region. When programming a locomotive's decoder, the current is also limited by the Power Cab used.

CAB Bus

All UTP and PCP CAB bus outlets together with the under board NCE MiniPanel and CTC module are all power via the Accessory EB1.

The remainder of 2015 saw completion of the Far West, South West and South-Central regional board layouts, including all under board wiring and initial steps to adding trees and ground cover. Some operating difficulty was experienced with cross-region signal interlocks, due to not adding blocking diodes for two track block detectors. These had failed due to the short of paralleled outputs. Circuit drawings were revised and wiring amended so by December 2015 locomotives and consists were finally running a complete circuit on main and branch lines.

During this time, I was also assembling seven Central Traffic Control modules for the Hills Model Railway Society Inc., of which I am a member. So, it was an opportune time to add another to the production line for my PRR layout.

Mounted on the external edge of the South-Central region, this CTC module duplicates and centralises all manual turnout push buttons. This now extends total user operation from inside and externally from the layout's front edge. In addition to turnouts operation added switches initiate the logging macro, activate town lights and change east/west signal direction displays.

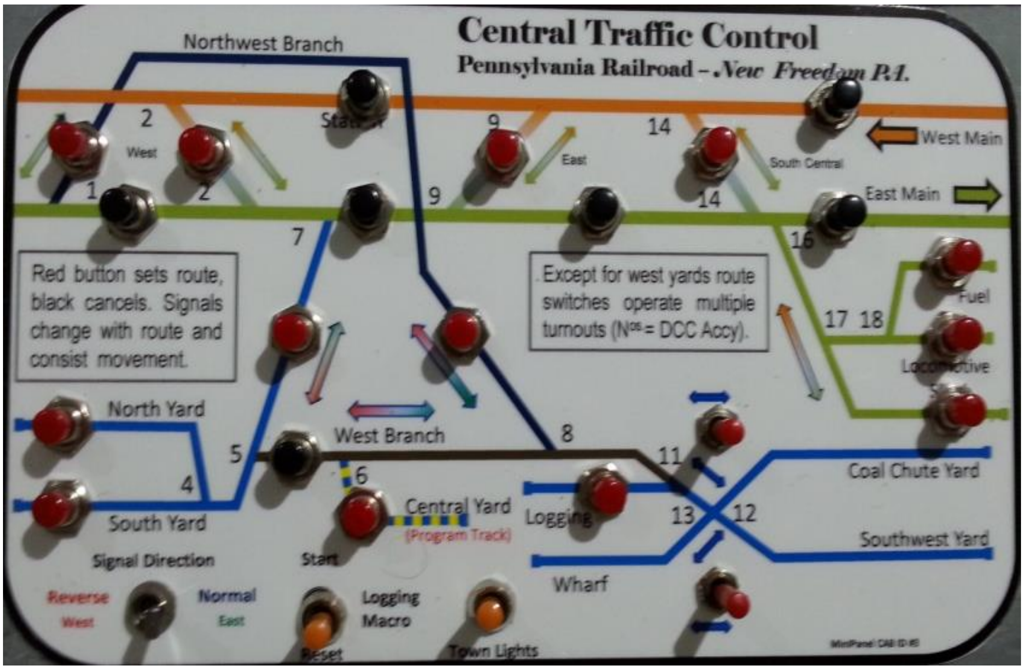

Figure 37 My CTC Module.

Trust this inspires others to venture into model trains