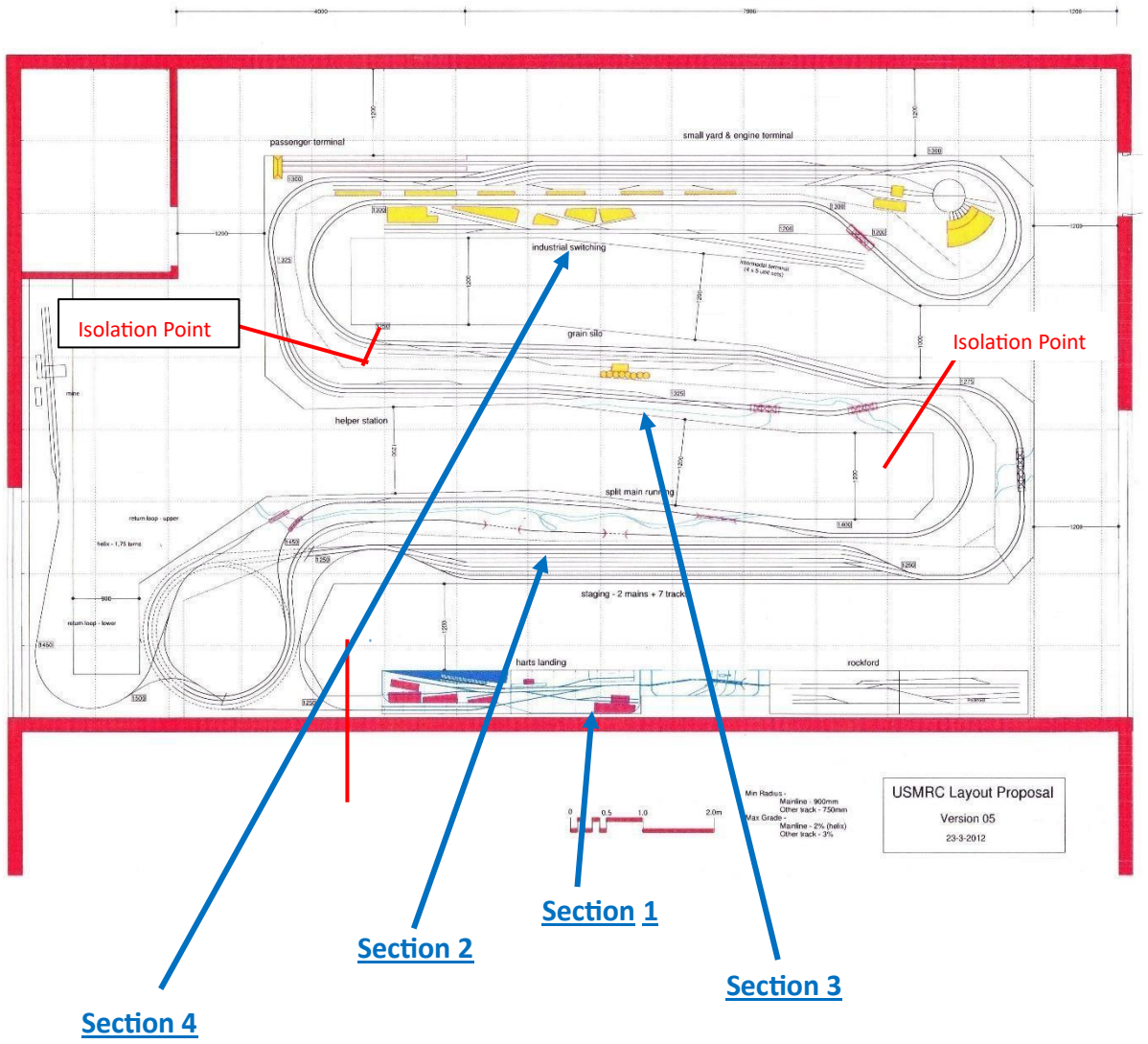
US Model Railroad Club of WA

Wiring Rules and Wiring Structure of US Model Railroad Club of WA.

NOTE: It is important that **all sections remain Isolated** from each section has a Short Circuit device protecting each section. Cross Connections will cause issues with the Short Circuit Devices.

The layout is divided into 4 x "Power" Sections



Each section has a power supply cable from the control Panel to the centre of each section.

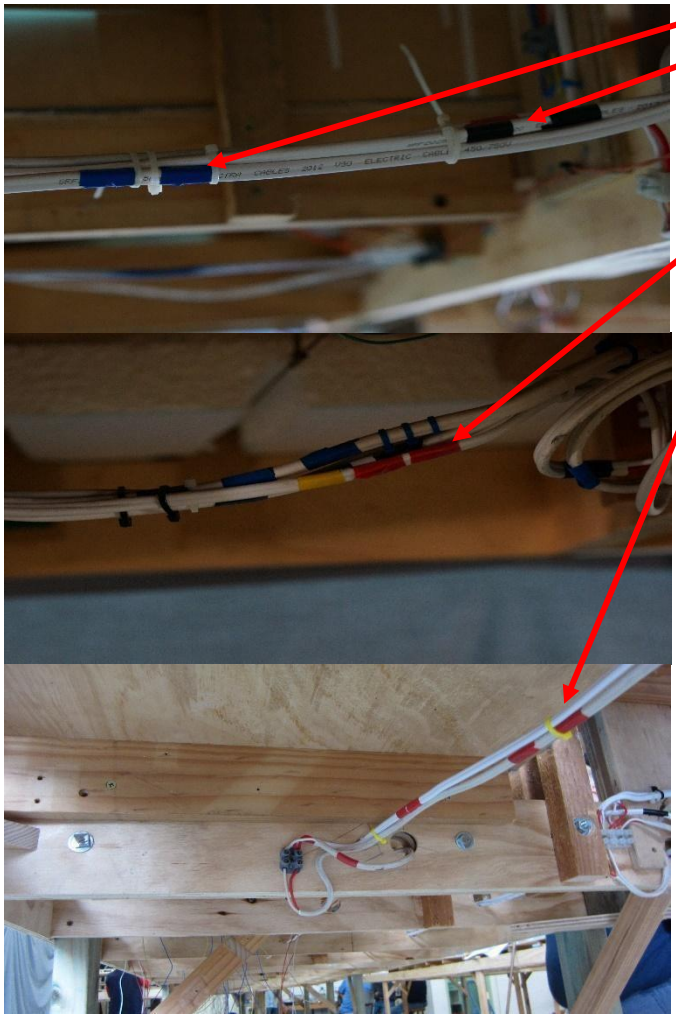
- Supply power cable is 2.5mm square.
- Sub-divides out in each direction with 1.5mm square
- And finally, with 1mm square to the ends of each section
- Each "Table joint" has connections each side with jumper leads so each "Table Section" can be dis assembled without having to cut the main power supply cables. The layout was designed so it can be dismantled to 1.8 m sections.

Each Section is isolated from all other Sections, by insolation “fish plates” on the Mainlines – approximately where the “Red” lines are on the Drawing.
Each section had “short circuit protection” devices at convenient locations at the Control End of the layouts.

Each section has 2 x feeders (from the Short Circuit devices) to each section

- A Main Line Feed – these cables have a “Black” tape around these cables and have
- “Hart Landing/Rockford” now “Franklin” – a single Black Band
- “Staging Yard & Silver Rock Mountain & the Spiral” – have 2 x Black Bands
- “Twin Rivers” & the “Grain Silos” – have 3 x Black Bands
- “Passenger Terminal & Small Yard & Engine Terminal & the Main Line on the other side” – have 4 x Black Bands
- Back Track Feed – these have “Red” tape around this cable as above
- NOTE: - It is important these cables are isolated from the Main Line Feed.
- “Light Industrial Yard” is different, this Feed still has 3 x tape around the cable, but this one is alternate “Red” and “Yellow”
- Note the spiral – it has some different colour coding and is treated elsewhere.

Each Section has a “Utilities” Supply – currently, nothing is on this bus. It is fed from one of the DCC controller. ---- We are looking at feeding the Utilities buzz from an alternative supply – Same Number of Bands but are Blue



Section 2 – Utilities Feed (Blue)
Section 2 – Main Line Feed (Black)

Section 3 – Back Track feed to “” (Red/
Yellow/Yellow)
Section 2 – Back Track Feed to “” (Red)

Wiring Rules

Main Line

- Each separate piece of rail has its own dropper – White/Red (Mainline)
- Colours are **White** (always to the front) and **Red** (always to the back) – Bunnings Sprinkler wire is the best, it is flexible, multi-core and retains its shape when bent/twisted.
- Note – in the spiral – **Red** is to the middle of the spiral.
- Frog droppers are always **Green**

Back Track/s

- Each separate piece of rail has its own dropper – Yellow/Blue (Backtracks)
- Colours are **Yellow** (always to front) and **Blue** (always to the back) – Bunnings Sprinkler wire is the best, it is flexible, multi-core and retains its shape when bent/twisted –
  Note – in the return loops around the spiral – **Blue** faces the middle of the loop.
- Frog Droppers are always **Green**

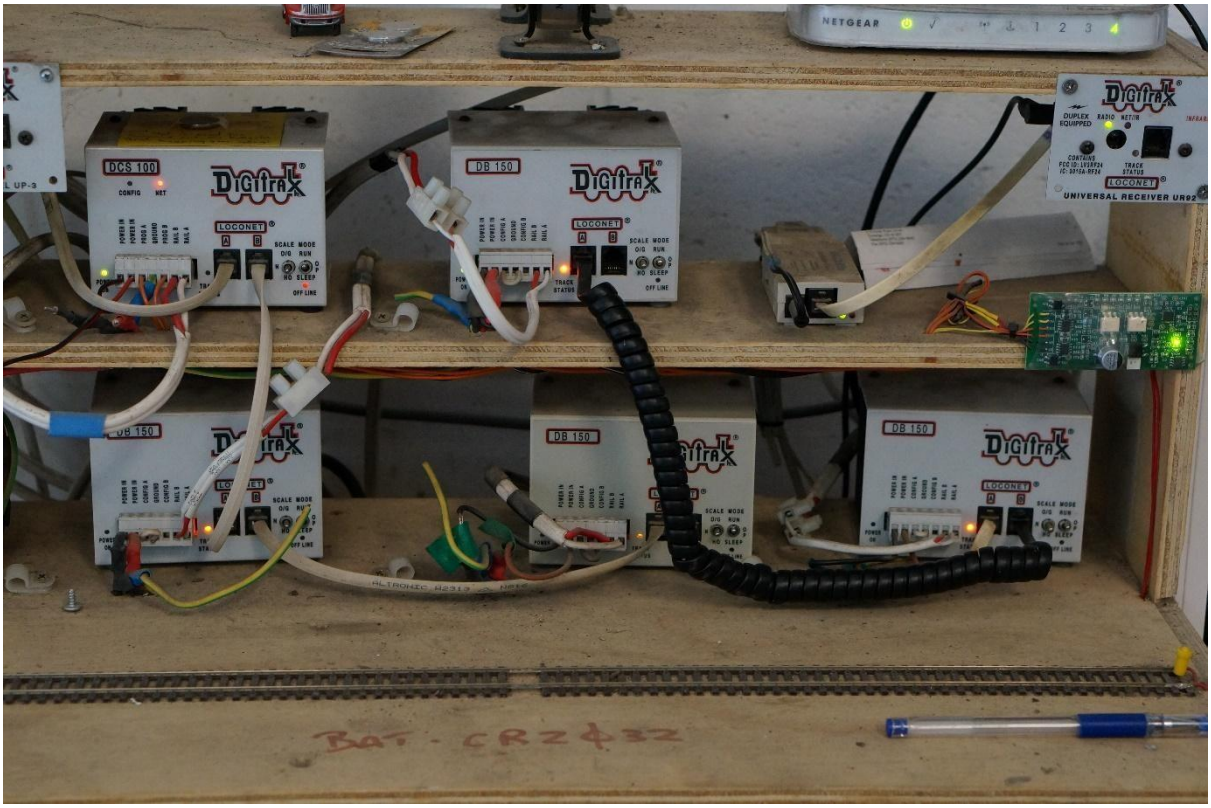
The Reverse Loops

- There are 2 x Reverse Loops
- Both Loops are controlled by a Frogducer
- The power cable to the Frogducer is banded with **Black/Yellow/Yellow**
- The Top Loop bus cable is banded with **Black/Red/Blue**
- The Bottom Loop bus cable is banded with **Black/Yellow/Red**
- The "Y" at the entrance to Franklin, the bus cable is banded with Black/Yellow/Red and the Red/White cable crosses over (i.e. the White bus wire is routed to Red in a connection block under the loop) between at Franklin side of Turnout #"" and the Turnout at the entrance to Franklin Yard
- The back part of the "Y" up against the wall, is connected to the Back of the Bottom Reverse Loop and is the same polarity as the Turnout #"" at the back of the Bottom Reverse Loop.

Dropper Cable/Bus Cable

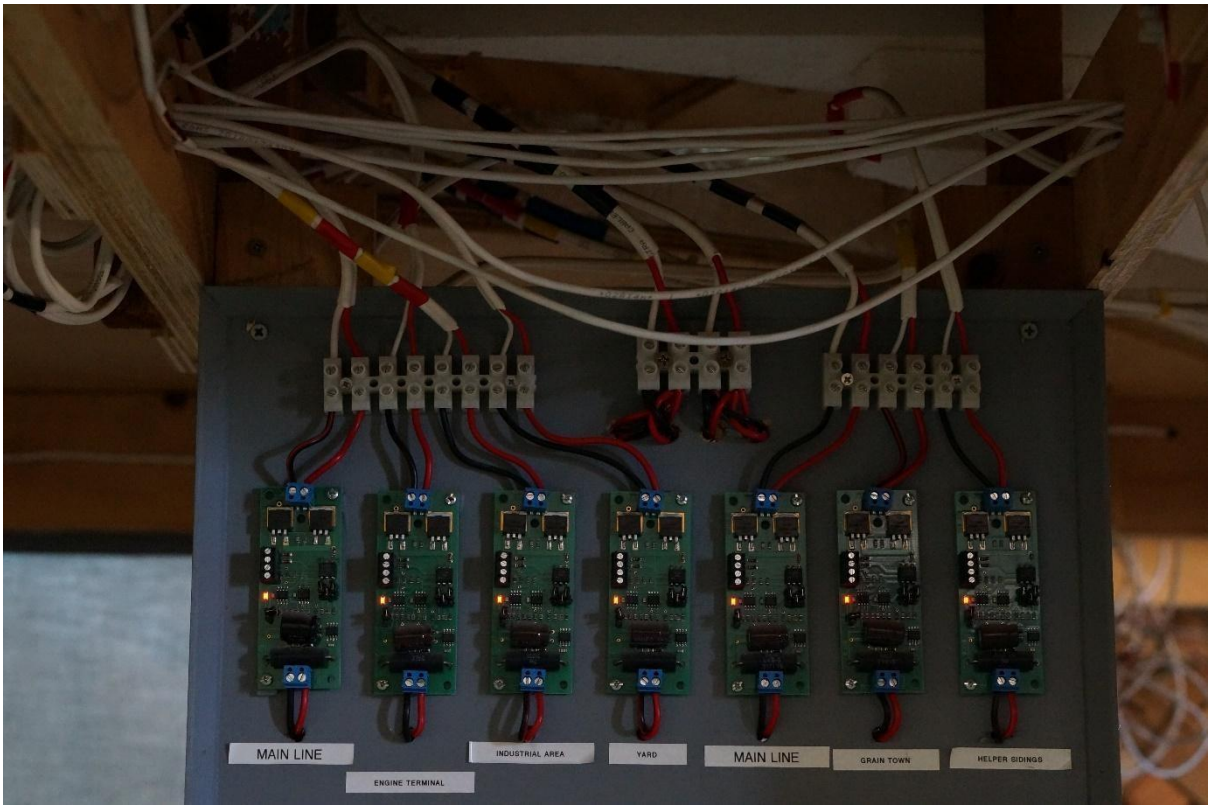
- Each piece of Rail has a Dropper Cable/Wire (found Bunnings Sprinkler Cable the best)
- All Dropper Cables and Bus Cables are routed under the layout boards.
- All Dropper are soldered to the rail on the outside of the Rail no Soldered connections to rail are to be made on the inside of the Rail.
- Bus Cable is either routed through hole in the Cross Braces and/or secured to the sides/base of the layout by Wire Ties secured to the sides/base timber (the preferred method is using Staples)
- All Dropper wires are secured to the sides/base of the layout by Wire Ties secured to the sides/base timber (the preferred method is using Staples).
- In places Dropper wires may go through sub-board braces to connect to a connection block.
- All Connections of both Bus Cable and Dropper Wires are to Connection Blocks. Where multi-strand Wire/Cable are used, the end connected to Connection Blocks are soldered.
- In Franklin, each module has Quick Release connections for quick assembly/dis-assembly at a "show".

Main Control Centre

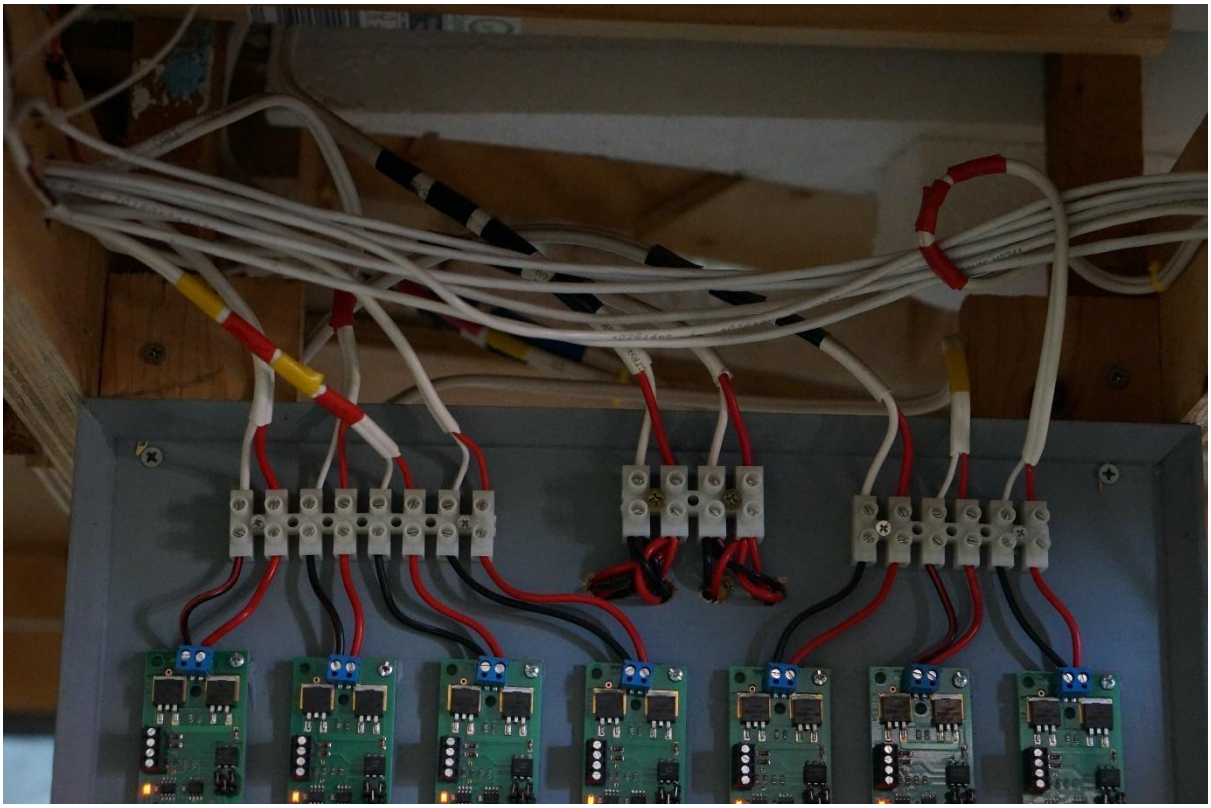


Master Control Panel – Top Left is circuit #1

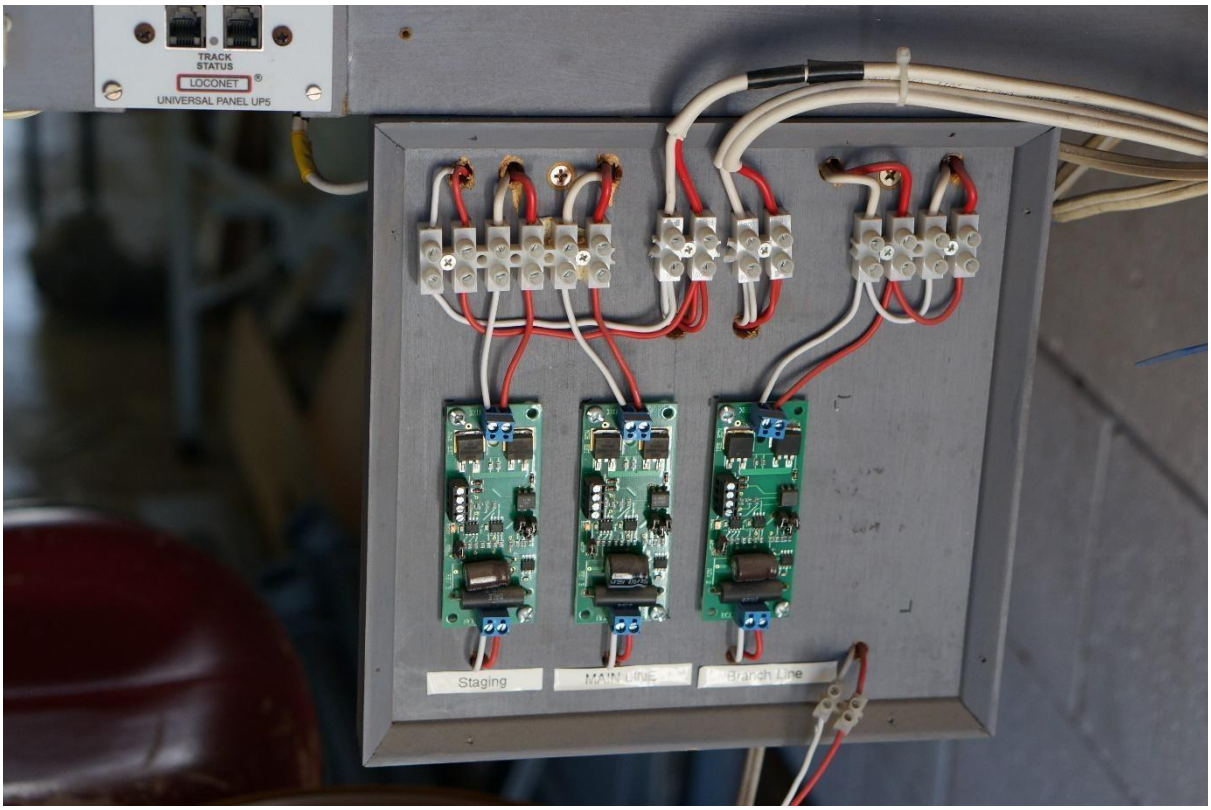
Short Circuit Protection



Short Circuit Protections for Sections #3 & #4 (all cables from here either have 3 or 4 bands)

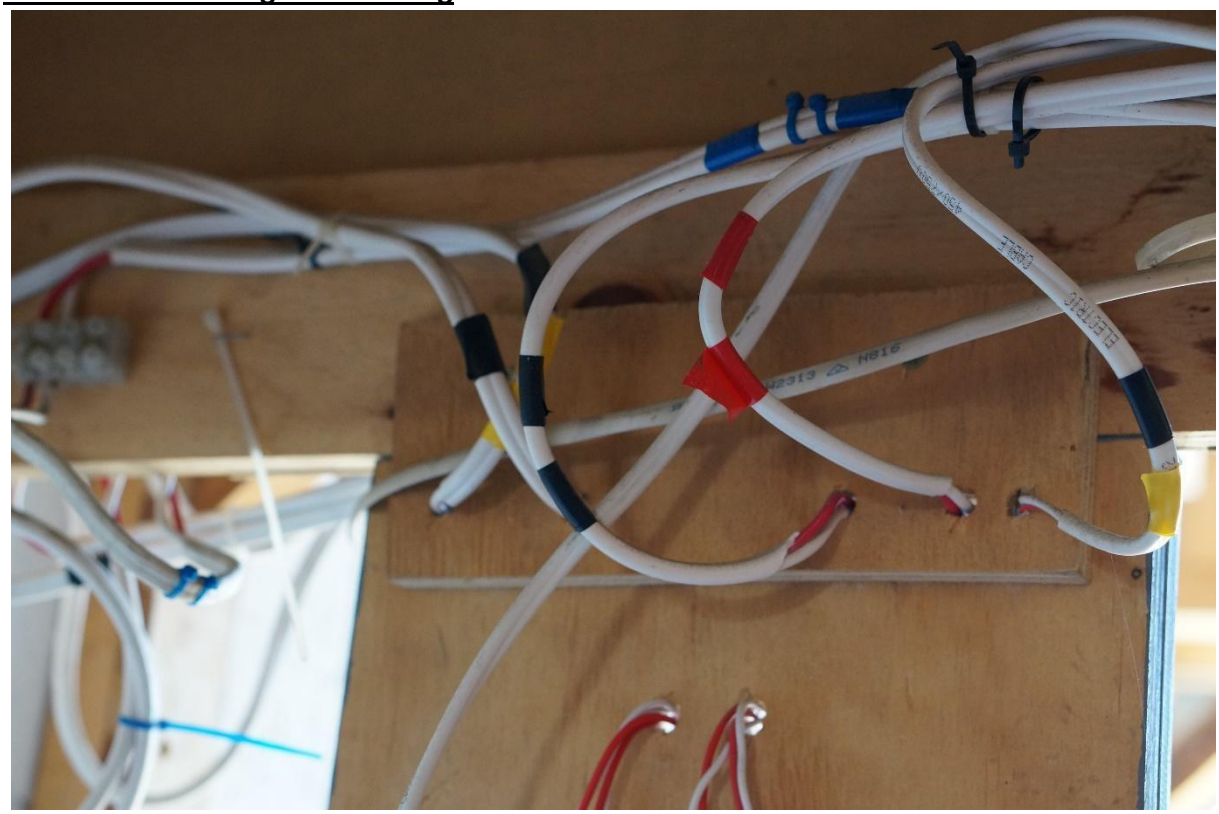


The Left side all go to Section #4, 4 x bands around the cables: to Right all go to Section #3, 3 x bands around all Cables.

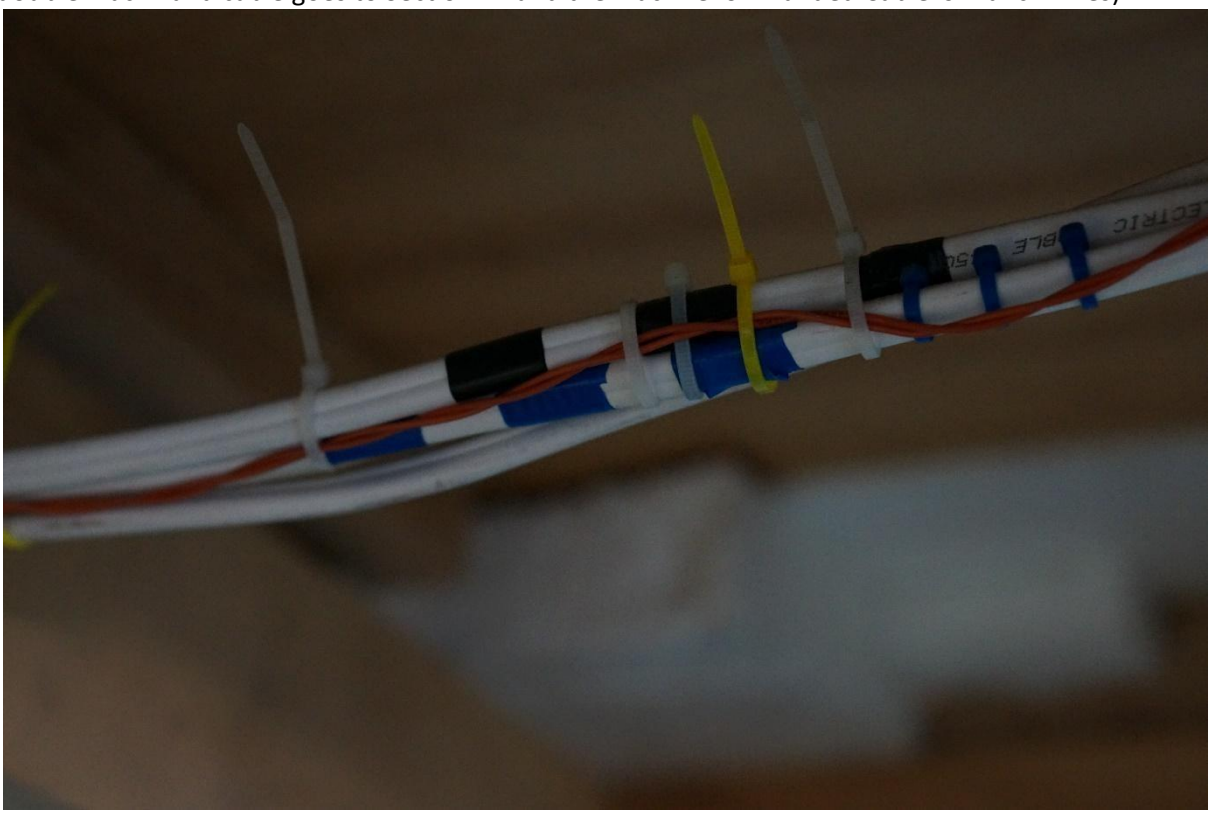


Section #1 & #2 Short Circuit Protections (all cables from here either have 1 or 2 bands)

Main Cables Routing and Securing



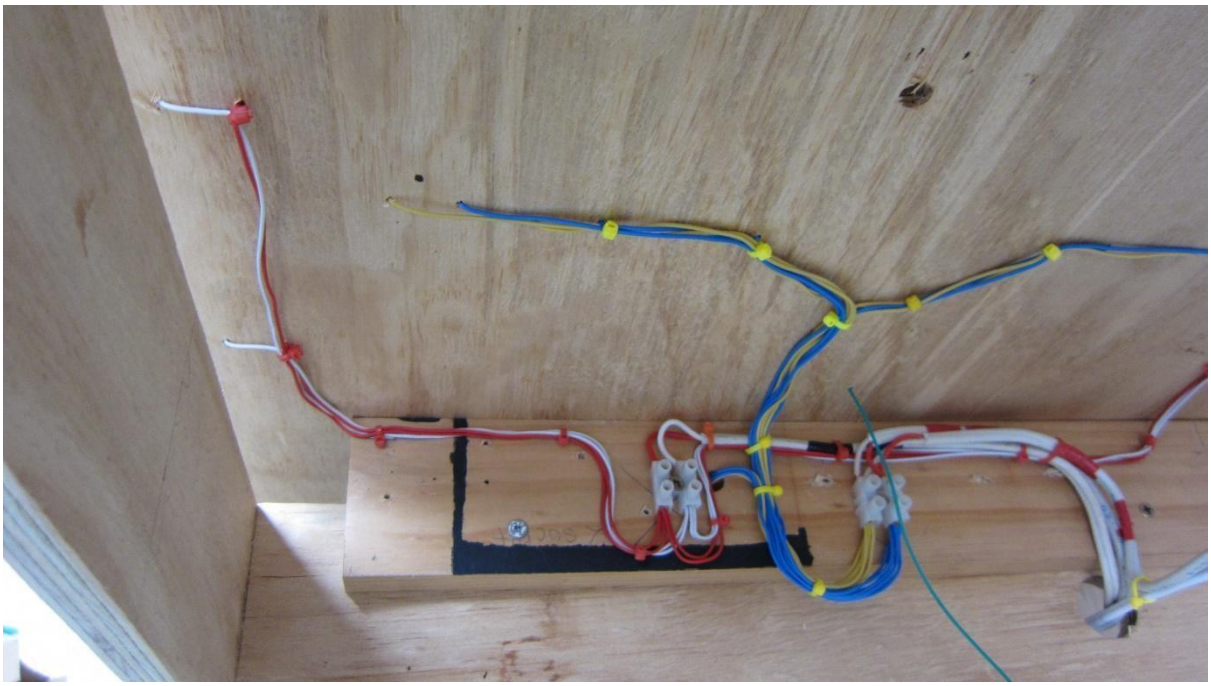
Behind Section #1 & #2 Short Circuit Protections (The single Black Band cable goes to Franklin, the double Black Band cable goes to Section #2 and the Black-Yellow Banded Cable is Branch Lines).



All main Cables are secured together with Wire Ties for cable through holes in cross members or Stapled with Wire Ties sides/tops of the Sub Bases.

Or Stapled with Wire Ties sides/tops of the Sub Bases.
All main Cables are secured together.

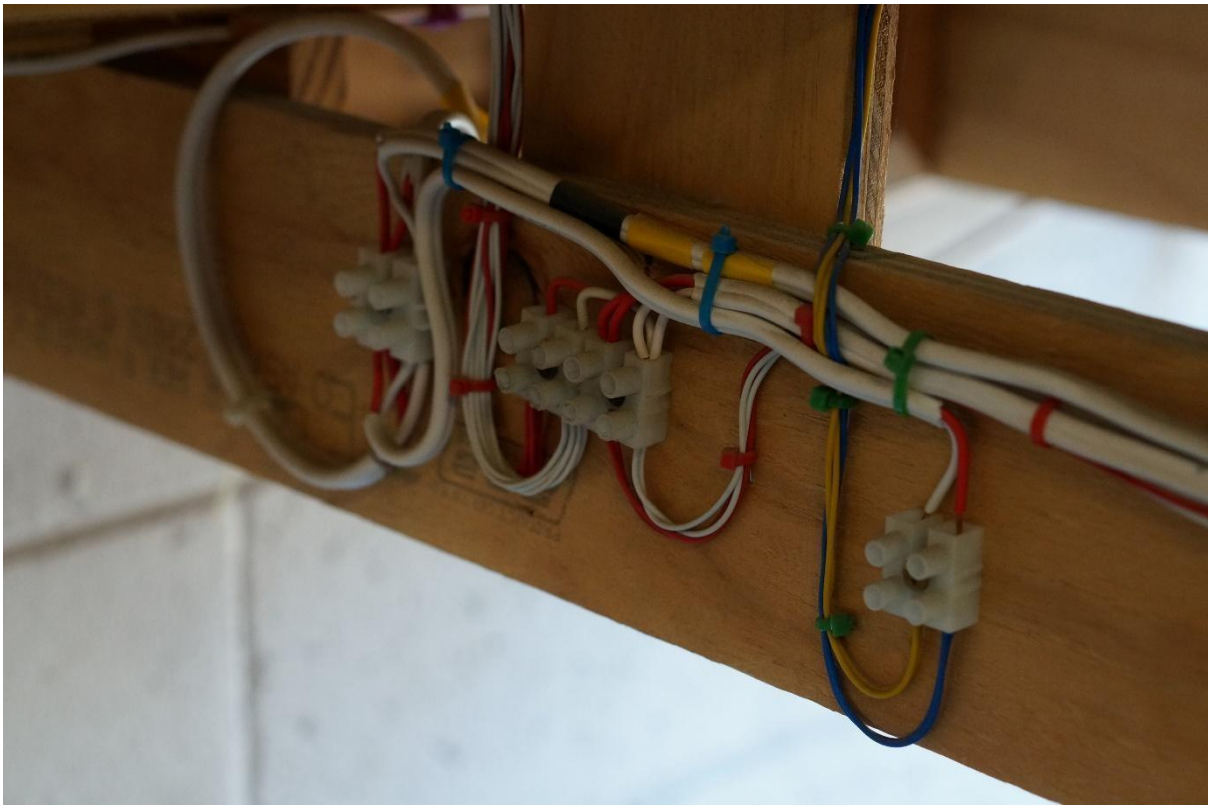
Dropper wire Connection/s to Main Cables



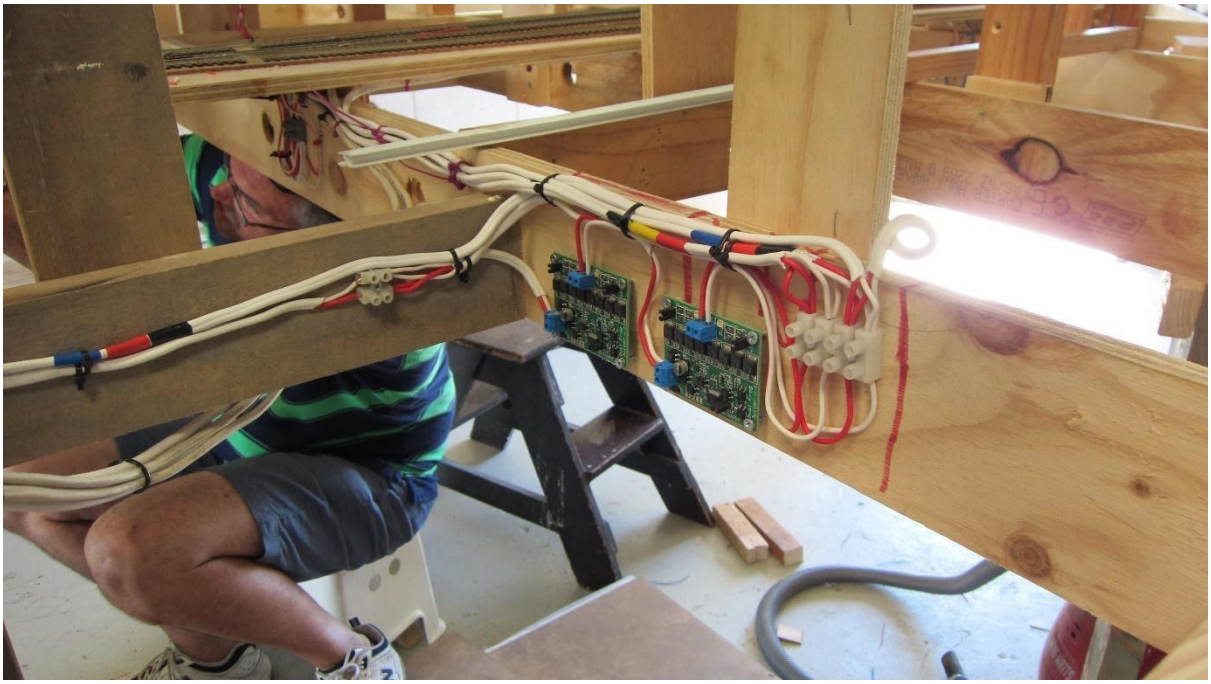
Main Line and Back Track Dropper Connection/s under Fort Hayse – note the light colour is to the front. This is section #2 as main cables have 2 bands around them, (2 x Black – Main Line & 2 x Red – Back Track)

All Terminal Block Dropper wire connections are soldered before securing in the Terminal Block.

Reverse Loop Cable Routing



Feed from the Short Circuit Protection is Black-Yellow. It divides into 2 x sub sections, Black-Yellow feeds the Branch Line ie Wilfton. Feed to the Frog Juicers from the Short Circuit Protectors (Section #2 – note this cable is Black-Yellow-Yellow).



Feed from the Frog Juicers
Top Reverse Loop is Black-Red-Blue
Bottom Reverse loop is Black-Yellow-Red

Cable Feeds to Reverse Loops – DO NOT interconnect.
Top Reverse Loop is Black-Red-Blue
Bottom Reverse loop is Black-Yellow-Red

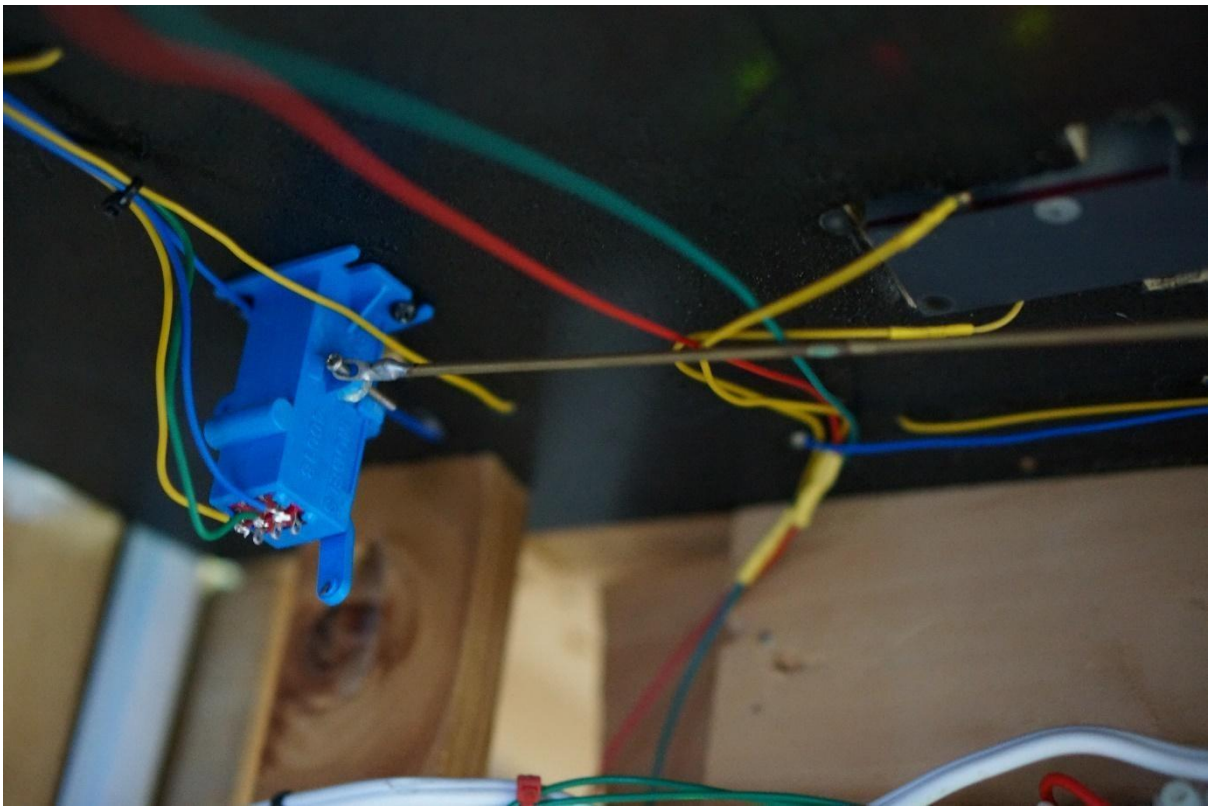
Turnout Control

USMRCWA has 2 types of turnout control

1. Blue Point manual control using push rod.
2. Tortoise Slow Motion electric using pushbuttons.

In both cases, the blue point and tortoise motor both change the turnout and switch the frog i.e. the green wire to the centre of the turnout.

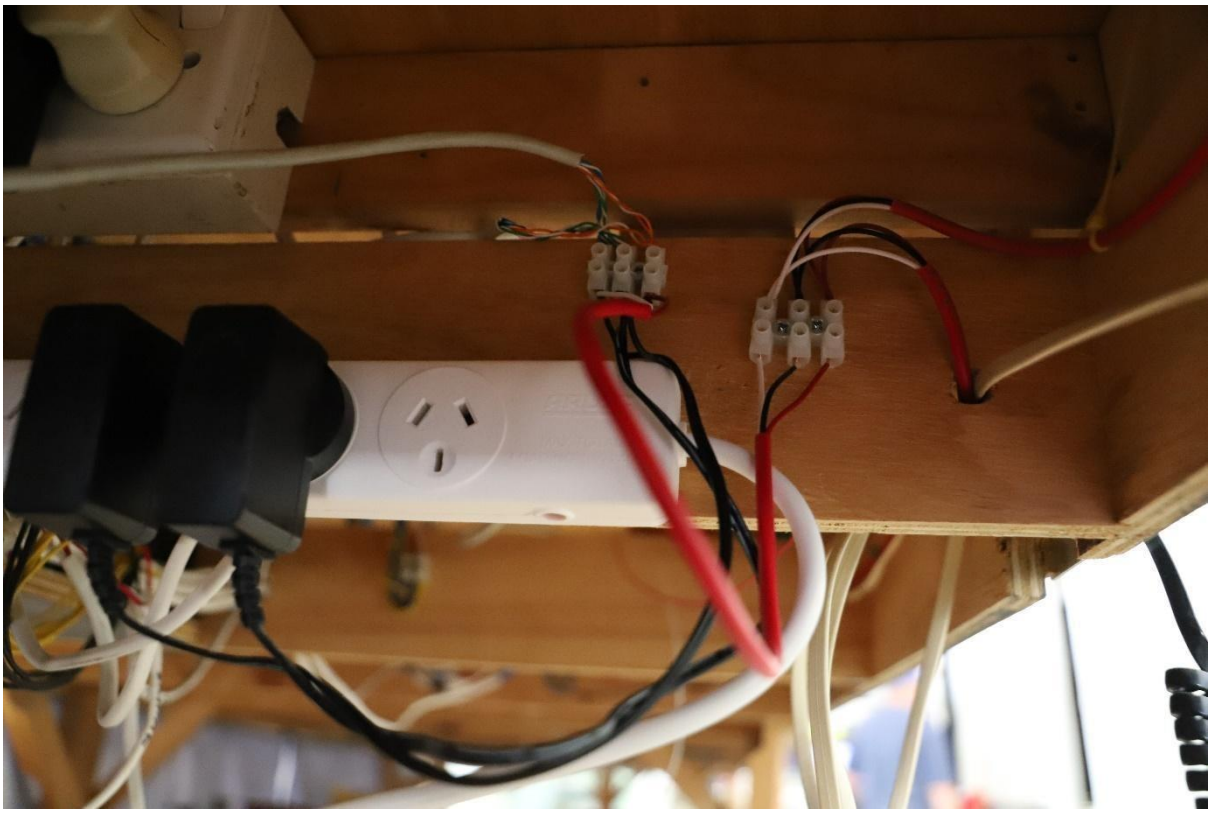
Turnout Control and Wiring – Blue Point



Typical Blue Point Manual Turnout switch – note as this is for Back Track only, the Frog power **feed** is Blue and Yellow. The Frog is always **GREEN**.

Tortoise Slow Motion Turnout Control

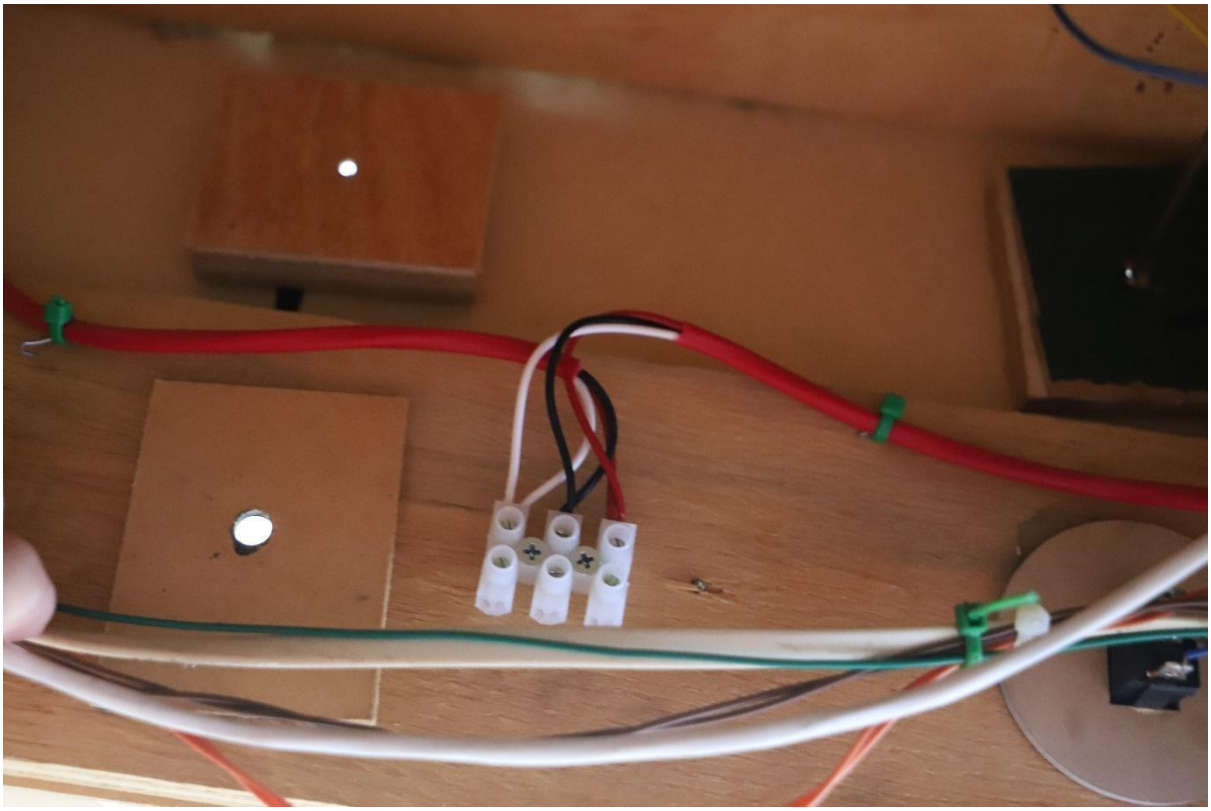
Power to the Tortoise Slow Motion Switch Machine is now on a Separate Power Supply and have a totally separate Buzz. The buzz is stapled to the bottom side Valance and is a Red Cable with 3 x cables Red-Black-White. The power for these cables is from 2 x low Voltage DC power supplies from next to the "Light & Power Switch" in the middle of each section.



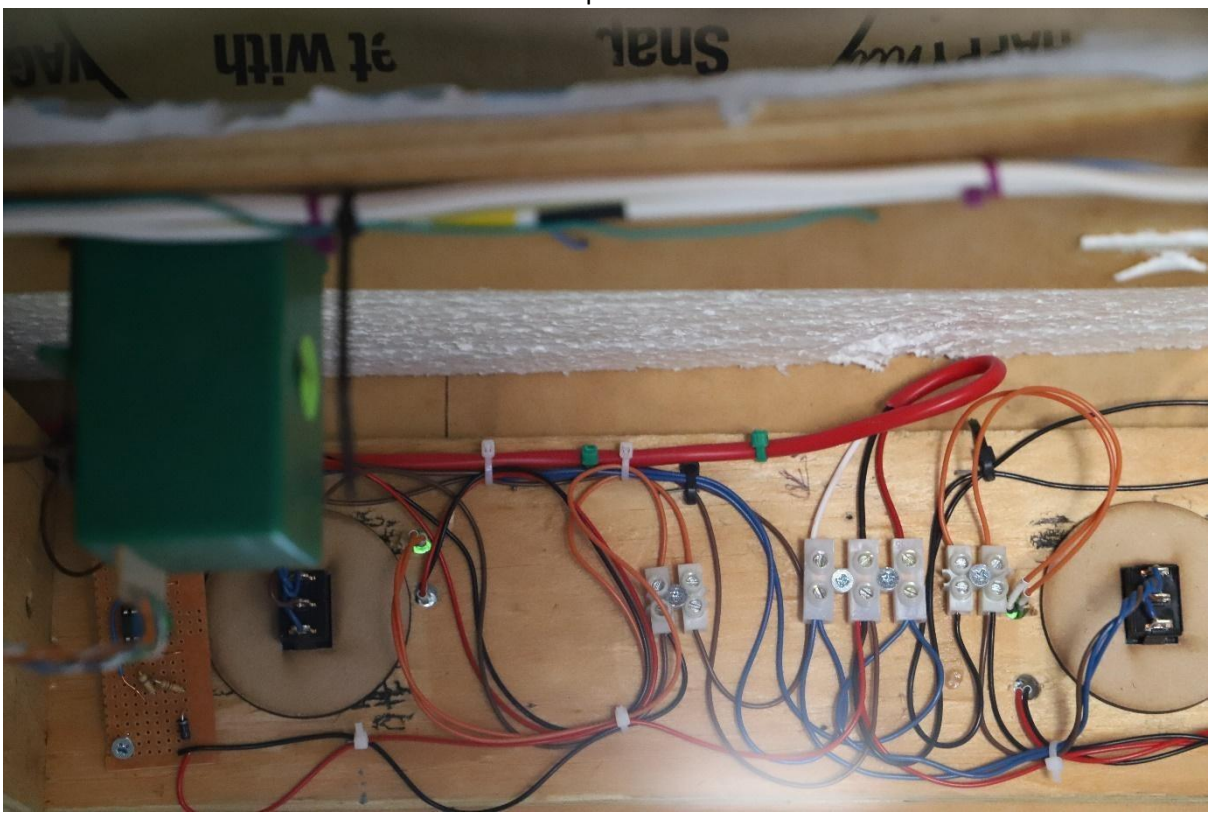
Power Supply for Tortoise Slow Motion Turnout Motors – 3 x wire cable using Total Eden Sprinkler cable.

Black : Common
Red : +12V
White : -12V

This is a 'split potential' system which allows the use of simple single pole switches for switching.



Tortoise Motor connections are set at convenient places behind the front fascia.



Tortoise Slow Motion Turnout Motor and the connection. Note the Total Eden Sprinkler Cable connects to a Terminal Block, power supply to the Tortoise Motor is routed by the Toggle Switch to the Turnout Motor. The Turnout Motor switches the blades and at the same time, switches the Frog Power.

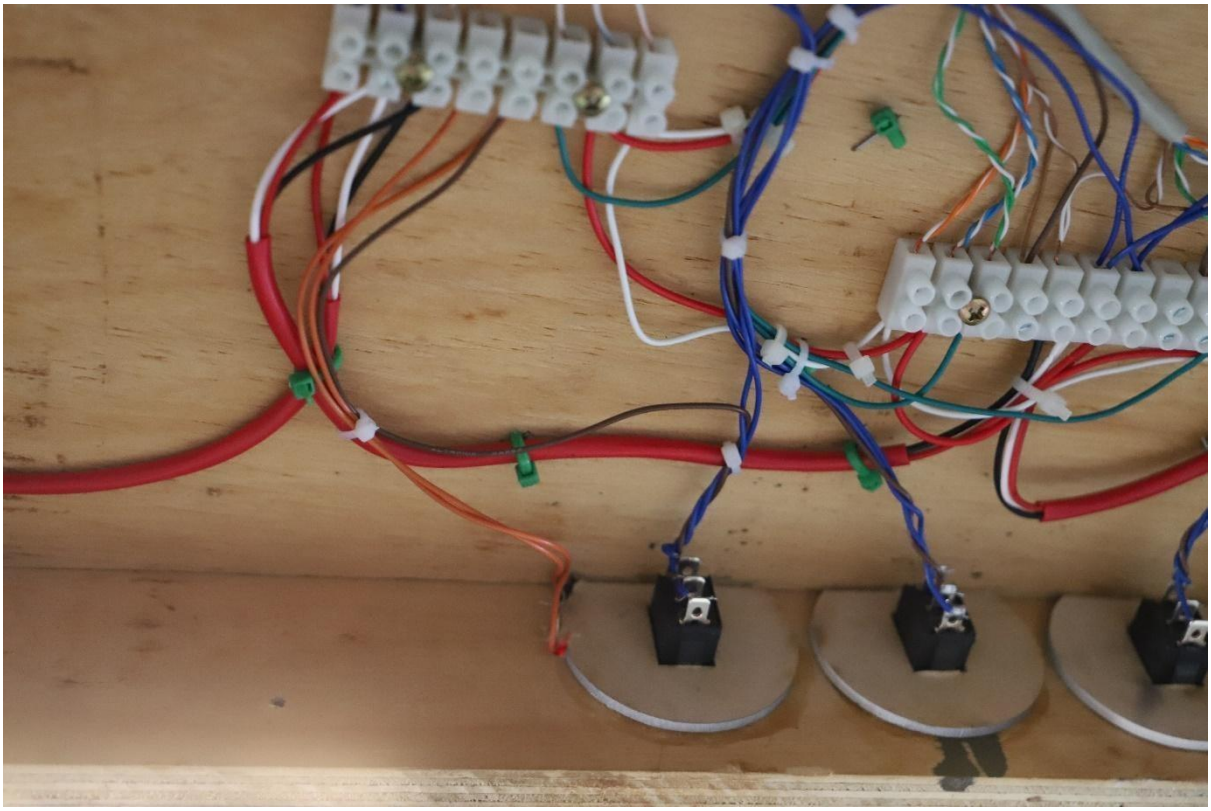
Led indicators are powered inline with the supply to the tortoise motor (*the motor limits the current to approx 10mA so no resistors required for LED's*).

There are 2 switches in each tortoise motor. One is used to switch frog power (supplied from the relevant power bus), the other is free for other purposes such as turnout position detection.

Cabling to each tortoise shall use Cat5 or Cat 6 cable preferably with multi stranded conductors.

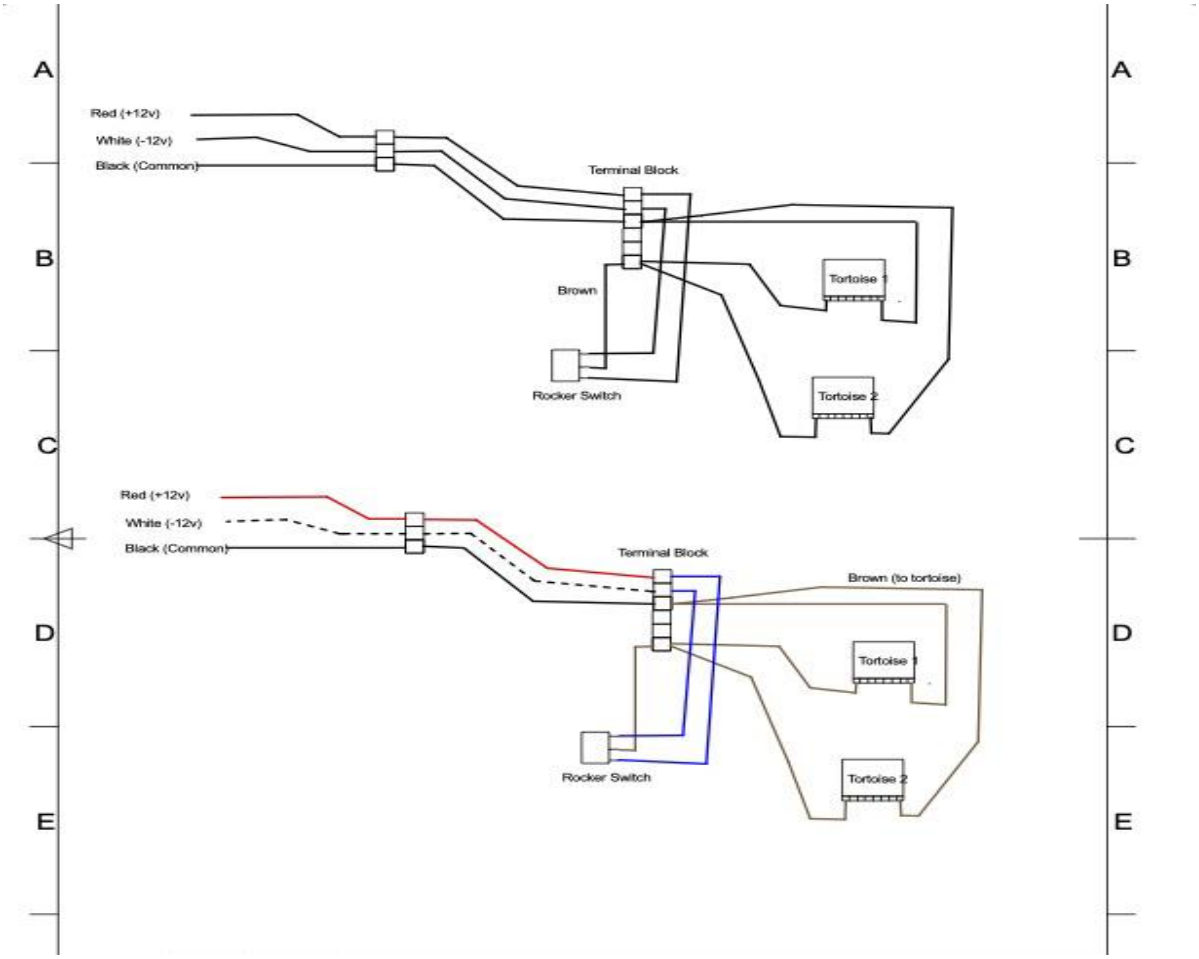
Connections to tortoise motor as follows:

Tortoise Connection	**Wire Colour**	**Purpose**
1	Brown	Tortoise Power A
2	Orange	Frog Power - Rail A
3	Blue	Frog Power - Rail B
4	Green	Frog Power - Frog
5	Green / White	Aux Switch - Switched
6	Orange / White	Aux Switch - A
7	Blue / White	Aux Switch - B
8	Brown / White	Tortoise Power B



Note:- All cables are secured by Wire Ties and are stapled to the Timber Base/Side walls.

Crossover wiring



Note – All Crossover are wired in this process.

The Power Cabling/Dropper/Turnout Switch wiring is simple. After our experience with the previous layout/s, the process/rules for wiring have been established.

There are some simple rules, secure all wiring, use consistent rules, remember the blocks – each block is protected, DO NOT use a feed if you are unsure where and what it is feeding.

If in doubt, ASK.

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