NWV Layout Electrical Wiring

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Overview

- This talk addresses:
  - DCC system and wiring
  - DC system and wiring
  - AC connection
- Purpose: to familiarize people who will maintain the system and add changes as technology changes
- Disclaimer: most of this presentation can be found from the NCE DCC Power Pro manual and the PSX manual from Tony's Trains. The DC portion is home designed and built.

DCC System

- NCE Power Pro system
  - AC step down transformer
  - CS02 command station
  - Power Pro 10A DCC booster
- DCC Specialties PSXX circuit breakers (4 districts) and PSX-AR (1 district)
- DCC distribution bus to each peninsula that follows the mainline tracks
- NCE Cab Bus distribution with UTPs and DC boosters.

House Analogy

- The NWV DCC system wiring is analogous to house wiring.
  - For a house, power comes into the main breaker panel from the outside power source and is distributed to various branches of the house from each circuit breaker.
  - For the layout, power comes into the main PSXX breaker panel from the DCC power source and is distributed to various branches of the layout from each PSXX circuit breaker.
- The DCC Cab Bus runs separately from the track wiring and has no analogy in a house (unless your house electrical outlets, appliances and lights are controlled from your cell phone via the internet).

DC System

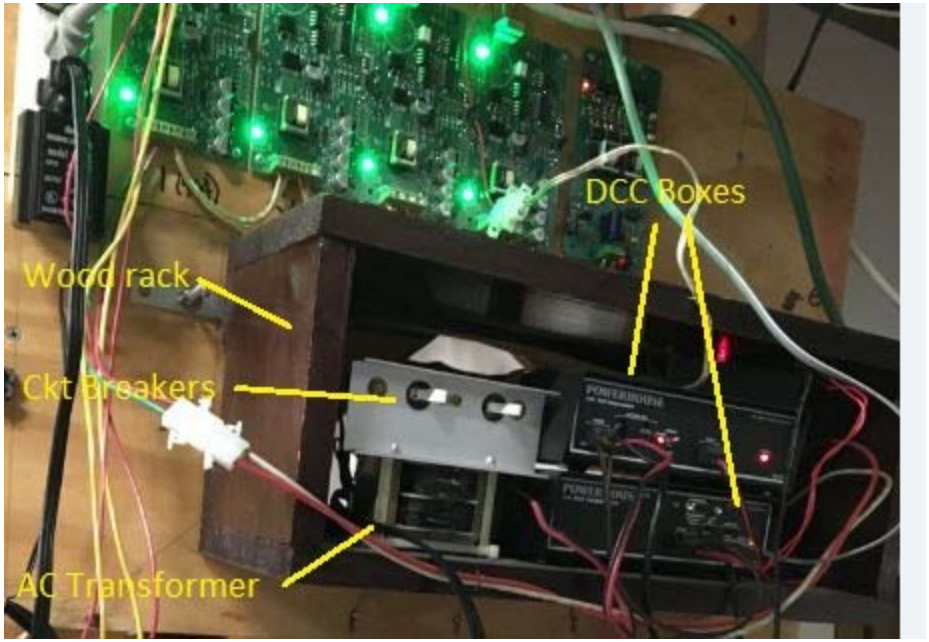
- 12 volt DC, 33 amp switching regulator
- Distribution panel with 5 power districts containing cut out switches and circuit breakers
- Distribution bus to each peninsula and end point of the layout.

AC Connection

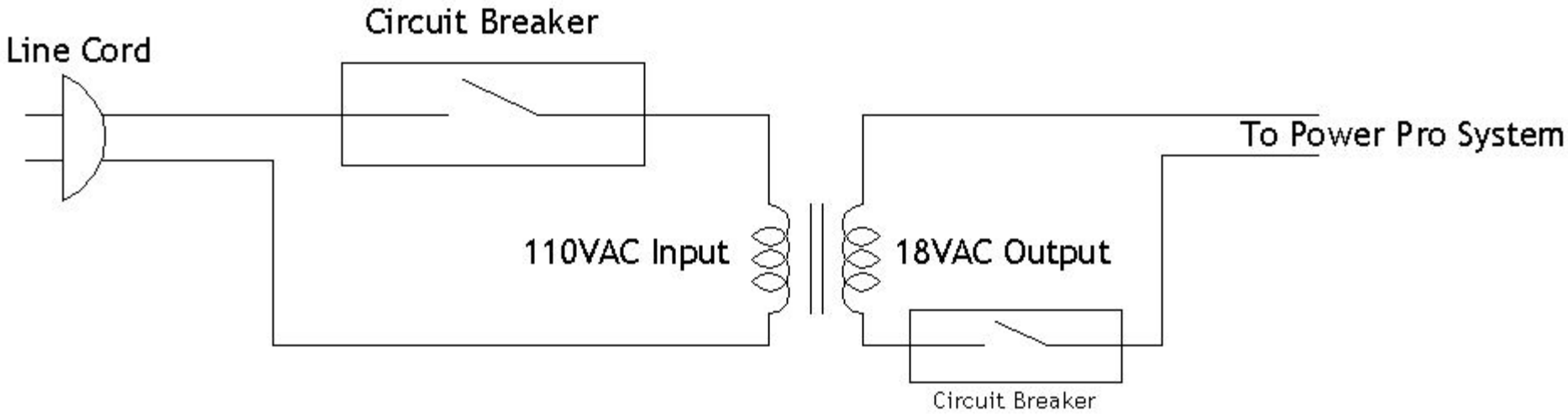
- Terminal strip on cord to wall outlet
  - On/Off switch on terminal strip controls all AC to layout
- 4 terminal strip plugs used:
  - DCC system input transformer
  - DC system regulator
  - DCC system cooling fan
  - 15V DC wall wart for PowerPax programming track amplifier

DCC System Transformer

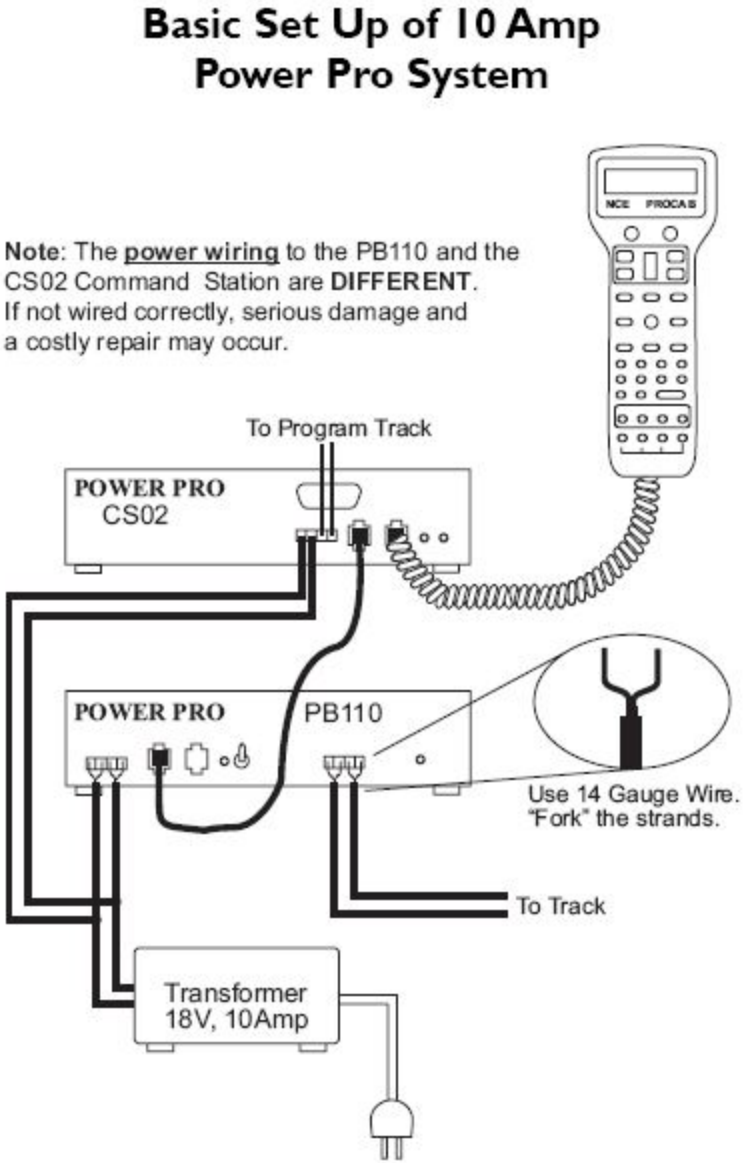
- NCE requires 18V AC input at least 10 amps from the transformer.
  - A box with a transformer is mounted to the power panel:



DCC System Transformer (cont)



DCC Box Hookup



Notes:

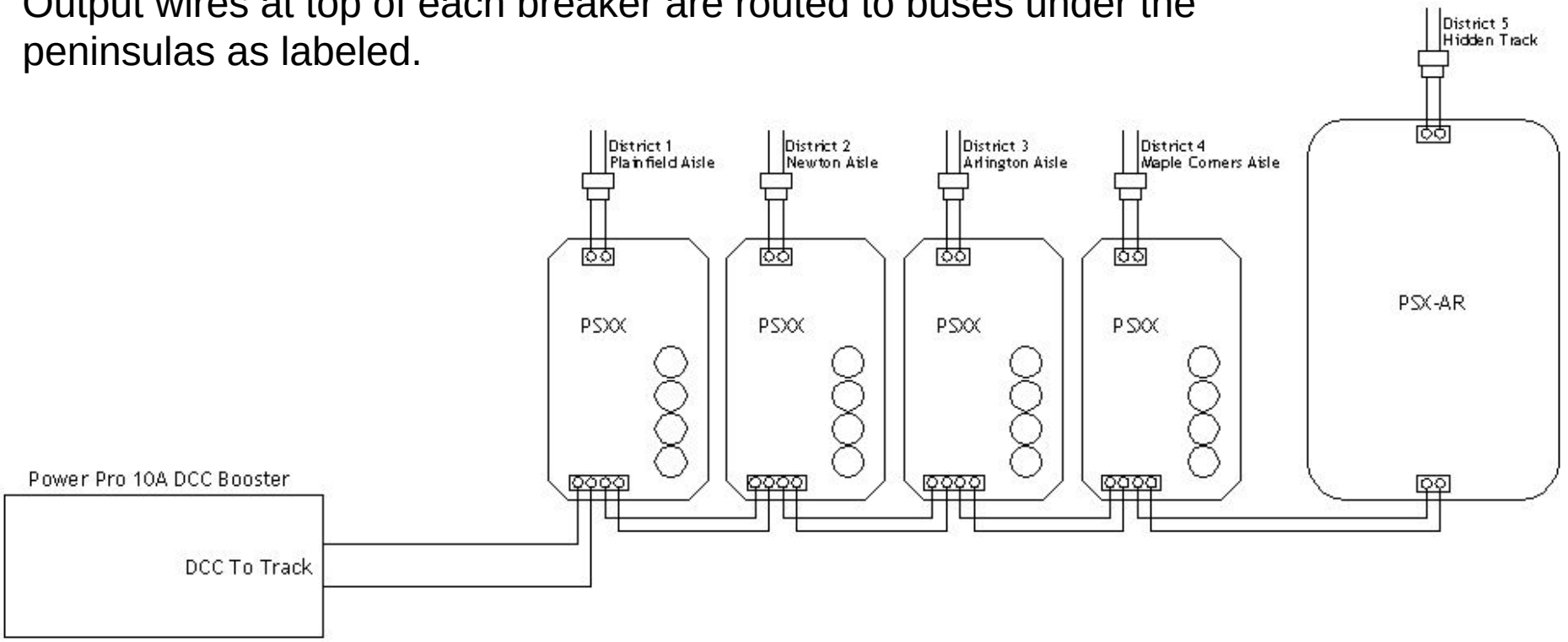
- Track connection goes to DCC Specialties PSXX breakers instead of track
- Power Pro throttle is not plugged into CS02. NCE Cab Bus cable is plugged instead
- Power Pro PB110 overheats and becomes intermittent. Cooling fan is mounted externally to cool the back of the box.
- Program Track connection goes to DCC Specialties PowerPax programming amplifier instead of programming track.

Circuit Breakers

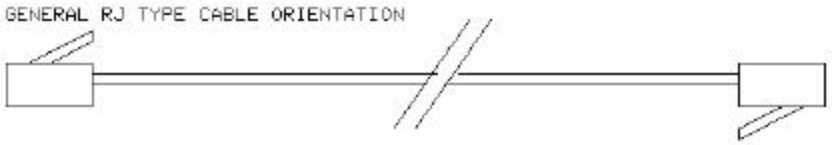
PSXX Breakers set to 4A. PSX-AR set to 3.86A

Breakers can be turned on/off with Accessory Commands from throttle

Output wires at top of each breaker are routed to buses under the peninsulas as labeled.



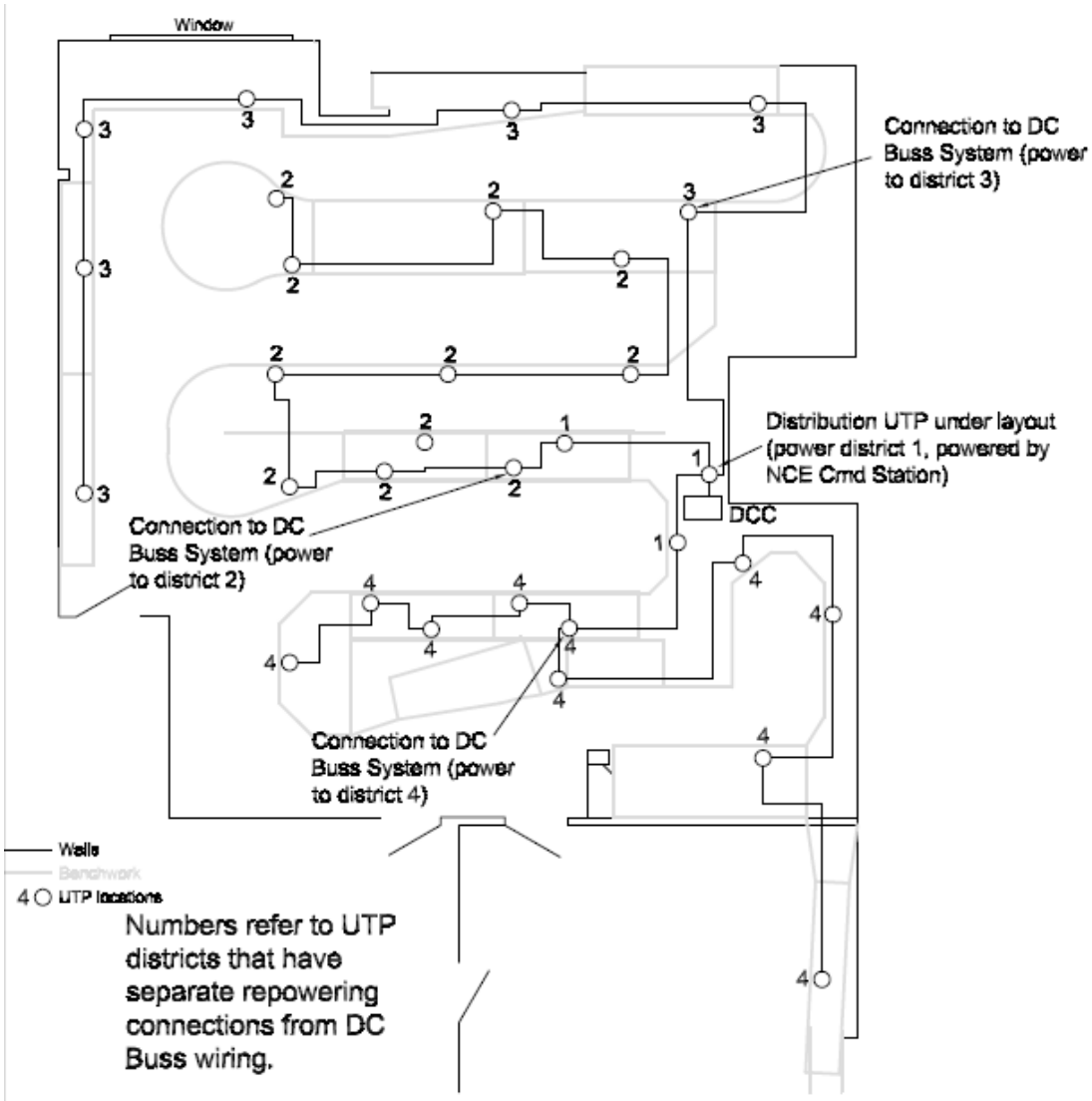
NCE CAB BUS CABLE



Pin #	Color	Description
Pin 1	White	No Connection, reserved
Pin 2	Black	Ground
Pin 3	Red	- RS-485
Pin 4	Green	+ RS-485
Pin 5	Yellow	+12 volts
Pin 6	Blue	No Connection, reserved

- Coiled cables have only 4 conductors. Pins 1 and 6 are missing.
- Cables with 6 conductors will work fine. The flat cables from Tony's Trains are typically 6 conductor cables.
- If replacing connectors on these cables, if a 4 wire cable is connected with a 6 position connector, be sure to center the 4 cables in positions 2 through 5.
- Pins 2 and 5 are used to power throttles when they are plugged into the bus. If too many throttles are plugged in, the voltage will drop and poor operation will result. UTPs are used to repower the bus periodically.

NCE CAB BUS Daisy Chain to UTPs and Repowering Jacks

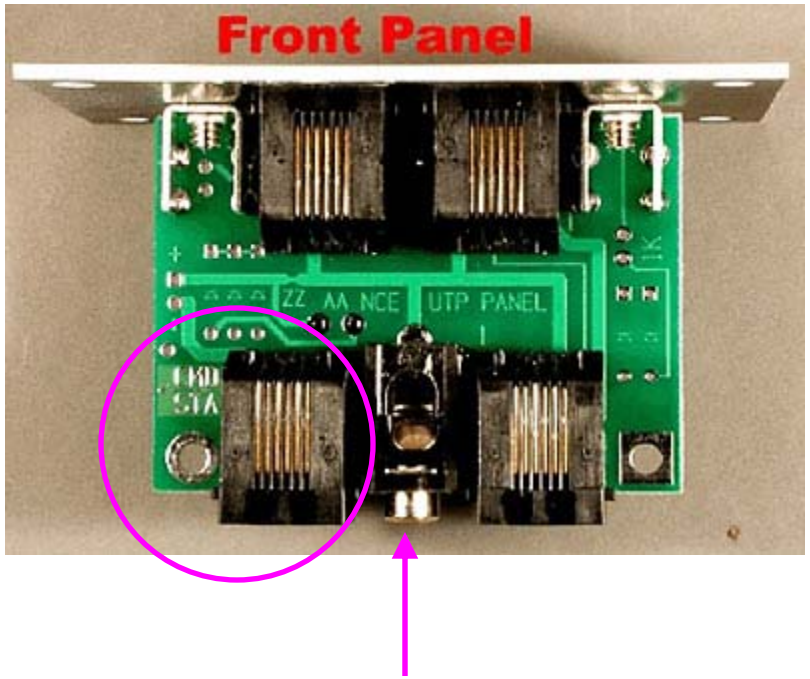


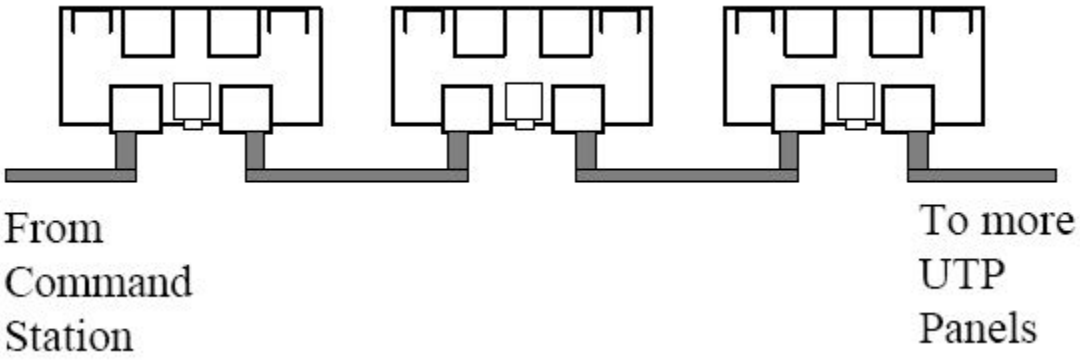
UTP (Universal Throttle Plug)

•The Cab Bus cannot carry enough current to power all UTPs.

•Connect 12V DC power at the earphone connector shown by the arrow periodically (approximately every 12th UTP in the chain).

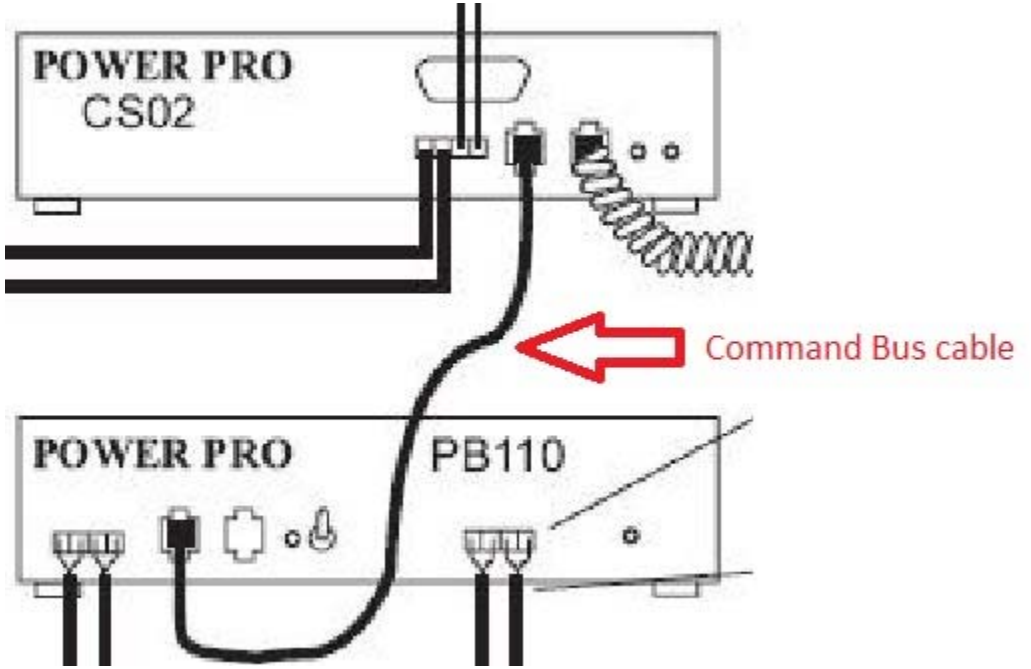
•The Cab Bus cable from the previous UTP (closer to the power source) must be plugged in the circled connector. Otherwise, DC power sources will be shorted together through the Cab Bus.





NCE Command Bus

- 4 wire flat cable with smaller 4 position RJ11 connector (same connector used to connect telephone handsets to the base unit)
- Used to connect the command station signals to the booster. The booster amplifies this signal and sends the high power DCC signal to the tracks. (Not used for throttles.)



Throttles

•Each throttle must be assigned a unique ID in the range of 1-63 (see “Set the Procab Address” section of the NCE Power Pro System Reference Manual).

•Wireless throttles have a limited range of 2-17 for Procab throttles and 19-49 for wireless small cabs (page 2 of NCE RB02 Manual).

•Currently the NWV owns 13 throttles (2 Powercabs, 8 Procabs, 2 Wireless Procabs, 1 Wireless Cab06) – Each throttle ID is written on a label on the back of the throttle.

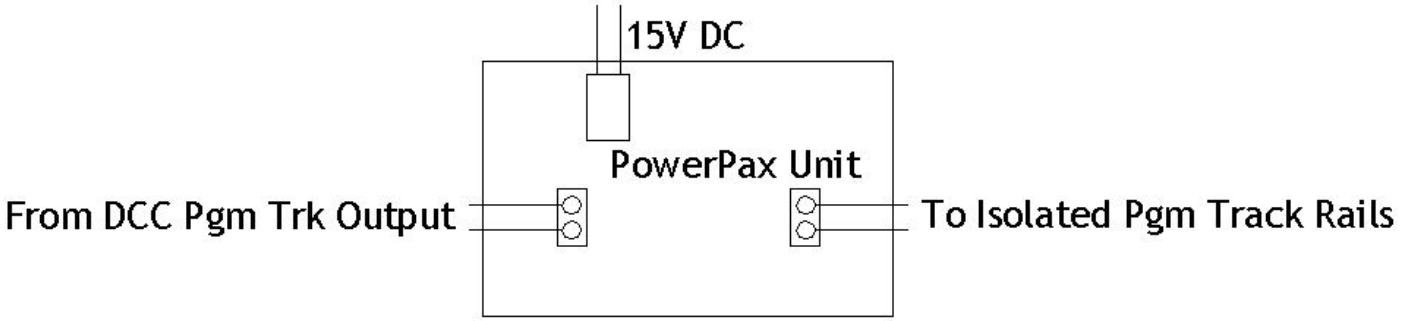
DCC Bus

- Bus wire is 14 gauge stranded wire pair running parallel to main line under each peninsula.
- Track feeders are 22 gauge wires dropping from rails to bus wire every few feet.

DCC Programming Track

- Sound decoders draw more current than the NCE Power Pro system can supply when programming on the programming track. A PowerPax booster is provided in series between the Power Pro and the programming track.
- The programming track is a short section of track across the mainline from Hayward Distillery at Newton. It is electrically disconnected from the rest of the layout.
- Using the programming track has side effects and is rarely used:
  - The rest of the layout is shut down when using the programming track.
  - A computer program, JMRI Decoder Pro, is very effective for programming newer decoders. That program works on a test track with a Power Cab DCC system. This set up is independent of the NWV layout and does not affect layout operations when programming.
    - Decoder settings are recorded and saved in computer files for restoration if the decoder CVs become corrupted.
    - The Power Cab can handle the larger decoder currents much more reliably than the Power Pro system.

DCC Programming Track (cont)



The NWV PowerPax is sitting on top of the CS02 Command Station in the mounting box on the DCC panel.

DC Wiring

- A single DC regulated 12 volt supply is installed to replace all of the independent wall warts plugged into the layout.
  - Note: The DCC Specialties PowerPax for the programming track uses 15 volts DC and still has its own wall wart for power.
- The DC supply and distribution panel are mounted under the layout near the DCC system under the Newton curve at Hayward Distillery.

DC Distribution Panel

- Note that the LED in section 4 is off. That is because the toggle switch has turned off that section while the other sections remain powered.
- Each section is labeled with the layout areas that it controls.

DC System Schematic