**Track Power Control**

**General:**

Track power is supplied by the transformers thru the TIUs mounted on five wiring panels located along the aisles and suspended from the layout facia. The power is then routed thru custom made track power control (TPC) boards located beneath the layout near the track sections to be controlled. The actual power switching is done by a 20 amp relay on the TPC board which is activated by power from inside the control panel or a local small power supply.

Spurs and sidings use the TPCs to select whether power is needed on that segment at any given time. These TPC can be turned on or off using either the associated toggle switch on the control panel, a DCS handheld (using the Accessory function), or thru computer control. An LED beside the toggle switch and another alongside the track indicates the power condition of that track segment. Green indicates there is power going to the track, red that power is available but NOT turned on, and dark indicating that power is not available to that track because the transformer is not turned on, selected, or has tripped a safety device. These LEDs are powered by the track power itself and will only light if the transformer is working properly.

TPC boards are used to activate the Public trains on loops 1 and 2 as well as both the upper and lower mountain. In addition, the bridge safeties for the Old Man Bridge incorporate the TPC boards.

TPC boards are classified as Red or Green to indicate the condition of track power when the board relay is *unpowered*. All TPC boards are identical and whether the board is Red or Green is determined by a jumper on the board. Typically the color of the jumper wire on a board indicates, to the casual observer, the type configuration for the board. A board is designate Green if a green jumper wire is soldered between the normally closed NC solder pad and the center pad. A board is Red if a red wire is soldered between the normally open NO solder pad and the center pad. Jumper wires are soldered in place to prepare the board for installation.

A Green board will provide track power even if no other electrical connections are made to the board, essentially emulating a piece of wire. These Green boards are located wherever power enters a block on the main lines and often have no connection to the control panel. They were provided to allow individual track quadrants to be turned on and off if control cables are installed in the future.

A Red board will block track power unless its relay is activated. All sidings, spurs, bridge safeties, and public activated track sections are Red boards. The public activated loops have a Picaxe Hand board configured to provide the power to close the relay on the Red TPC board associated with that local track segment. The bridge safeties use a microswitch at the base of the bridge roadbed to switch a locally supplied power source when the bridge is lowered. These Red TPC boards assure that in
the event of any failures in the bridge sensing system will result in the trains being stopped.

Sidings and spurs are activated by either toggle switches on the control panel or by action of an AIU segment. Control panel LEDs will indicate the condition of these boards. The control of the TPC relay is provided by a “3-way switch” circuit that contains a toggle switch on the console and an accessory port on and AIU as seen in this diagram.

The indicator LED (which is not electrically connected to the TPC controls) has its common (center pin) connected to the white-of-orange wire and the other two terminals connected to the blue and green of a CAT 5 cable as detailed below.
Wiring:

Track power wires to the track are red and black in keeping with the color code used on the transformers and the TIUs.

Track power control cables are CAT 6 with a Yellow jacket. These yellow cables are terminated in industry standard 110 punch-down blocks located on the back of each panel and within the control panel.

http://www.pandprr.com/pandprr/Need_to_Know_files/Track%20Control%20110%20wiring.pdf

All of the above can be considered part of the layout infrastructure and normally don’t require further consideration.
Termination:

Each TPC requires its own wiring harness. A standard Ethernet cable is cut in half and the two pieces are used to connect to the two 110 blocks. Within the control panel, a short wiring harness is made up to connect the 110 block to the toggle switch, LED and power to activate the TPC. Power for the TPC is supplied by a power source separate from the track power and terminations for that power are located within the control panel.

The terminations of the **control panel** Ethernet cable are:

(the order of the wires below is as wired on an Ethernet cable)

- White of Orange       LED center pin (cathode)
- Orange                Power supply high connection
- White of Green        One side of the DPST switch
- Blue                  One LED outer pin (anode)
- White of Blue         Other side of the DPST switch
- Green                 Other LED outer pin (anode)
- White of Brown        Unused
- Brown                 Unused (This will be used on the Panel end)


At the **wiring board** 110 block, the installer has jumped two of the RJ-45 connectors to allow two connections to be made to the same infrastructure cable. The first connection is made using a standard Ethernet cable to connect the TPC to the 110 block.

At the wiring panel another short wiring harness is made up to connect that 110 block to the AIU which acts as the second switch in the “3-way” control configuration. The Control Panel switch is the other switch of the pair. The brown wire is connected to the center pin of an AIU Accessory segment. The white of blue and white of green wires are connected to the other two pins of that segment.