

NTRAK Wiring and Connectors

Powerpole FAQs

1 WHAT ARE POWERPOLES?

1.1 What are 'Powerpoles', and what are their advantages? - Anderson 'Powerpole' connectors are compact, genderless connectors designed for high current power applications. They were developed over 30 years ago for use on Bay Area Rapid Transit trains, and continue to be used there today. More recently, they have become the de-facto standard for 12v DC power distribution in the ham radio emergency services community nationwide. In addition, due their low resistance, high current capacity and light weight, they see considerable use in the electric model airplane hobby, where they are sometimes known as 'Sermos' connectors. Their genderless design eliminates the need for separate male and female versions, although they may be interlocked via molded on dovetails to create unique 'keyed' configurations as may be required.

1.2 What are some key features of Powerpoles that favor them over Cinch-Jones plugs and would make it worth the hassle of changing? - The 'worth' of changing has to be decided by each individual. Powerpoles do have several advantages. First, they can handle the 12 AWG wire suggested in the NTRAK DCC RP (see <http://trainweb.org/nrmrc/pubs/modwiring.pdf>) without modification. The contacts are self-cleaning, with a design life of 10,000 connect-disconnect cycles. Powerpoles' 'genderless' construction means that you don't have to buy both male and female connectors. Molded-in dovetails allow the connectors to be 'stacked' in various configurations, making them ideal for anything from running a single ground wire to multiple pair gangs for yards. They can be used on reversible modules (like inside/outside corners) without the need for male and female plugs on each end, and will maintain correct polarity when the module is reversed. The same connectors can be mounted in panels or let hang free. You can use red/black pairs color-coded with electrical tape, or you can use various color shells matching the NTRAK line coding ... yellow/black, blue/black, green/black, orange/black, white/black... whatever works for your specific application, and when connected correctly the colors will be continuous across the mated connectors. On top of all this, they are less than half the cost of Cinch-Jones connectors, even in small quantities.

1.3 I've never heard of Powerpoles. How can I be sure they will still be around in 10 years? - Powerpoles and their derivatives have stood the test of time in industrial and prototype railway applications for over 30 years. In fact, Anderson Power Products, which specializes in high current capacity connectors, has been in business for over 100 years, the Anderson brothers having invented the trolley pole! See <http://www.electronicstalk.com/news/ars/ars107.html> .

1.4 I notice that the Powerpoles are rated for 30 amps. Do we need 30 amps for NTRAK? - No. The 30 amp Powerpole (PP30) was chosen because it can accommodate the recommended 12 gauge wire (it is rated for #12 - #16). The 15/30/45 amp Powerpoles all use the same housings with contacts that differ only in the wire size accommodated, are all interchangeable and will mate with each other. See http://www.andersonpower.com/products/pp/stdpp_specs.html .

2 WHY ARE POWERPOLES BEING RECOMMENDED AND HOW WILL THIS AFFECT NTRAK AT LARGE?

2.1 What is the reason for this new recommendation? - The intent of the recommendation is to provide a common alternative that addresses various issues with Cinch-Jones plugs that have risen over the years, and to enable improved performance, both for DC and DCC operation.

2.2 Will N-Trak stop supporting the Cinch-Jones standard that has worked so well for the last 30 years? - No! The Powerpole is an “alternate” connector, NOT a “replacement”. N-TRAK will continue to support the Cinch Jones standard as long as Cinch Jones Connectors remain available.

2.3 What will Powerpoles do for me in or on my module? - On an individual module basis, use of the alternate standard is likely to have little impact, particularly if DCC use need not be supported, however, in larger set ups, especially where DCC is used, the lower resistance achieved through the use of heavier bus wire and low-loss connectors will minimize performance issues at the extremes of DC blocks or DCC power districts, allowing larger districts to be configured, thus reducing the number of boosters required.

2.4 What happens if I stay with Cinch-Jones plugs? - Nothing. Cinch-Jones plugs will remain the primary standard for N-Trak. You will still be able to participate in all NTRAK setups. Layout planners must assume performance characteristics of the existing specs for the foreseeable future. If the alternate RPs are implemented widely, design specs will be able to take advantage of the improved performance.

2.5 Our group has converted to (xyz) connectors internally and are quite happy with them. Were xyz's considered, and how does the Powerpole recommendation affect us? - It's up to you. In recent years, a number of groups and individuals have investigated alternatives to the Cinch-Jones connector (Molex, RCA, AMP, etc.) for various reasons, many adopting one or the other for internal use. While each of these meets the particular needs of the adopting group (ease of assembly, multi-track capability, low resistance, etc.), none has emerged as a common solution across the board, resulting in a cacophony of connectors at some large setups. For your group, the 'xyz' connectors may be just what the doctor ordered, and local alternatives will continue to be permitted, however the Anderson Powerpoles'

performance and unique flexibility can provide a common, simple and inexpensive solution to the variety of limitations ascribed to CJs. Having a common standard alternative can help minimize the number of conversions required and maximize overall performance.

2.6 OK, there's the "DCC Recommended Practices for NTRAK Layouts" on the NTRAK website, the North Raleigh club's DCC RPs and now this. Which is the real RP??? - Not to be wishy-washy, but they all are. Bob Gatland's "DCC Recommended Practices" is not actually a design RP, but more of an operational guide for using DCC within the original NTRAK standards. The North Raleigh RP addresses wiring (recommending #12 AWG), system configurations and operational procedures. Both assumed (for lack of a better alternative), that Cinch-Jones connectors would be used per the original standard, and are still valid under that assumption. This RP addresses the connector issue and extends those pioneer efforts by providing a comprehensive set of recommendations for both wiring and connectors, maintaining the best features of the existing standards and allowing for whatever transition may suit each individual or club.

2.7 Can Powerpole equipped modules be intermixed with Cinch-Jones equipped modules? - Absolutely! Modules may be intermixed freely using Powerpole to Cinch-Jones adapters which, per the RP and existing NTRAK standards, the Powerpole users must provide. Note that a club that transitions completely to Powerpoles will have the makings for a set of adapters with every module they convert!

3 BUYING AND ASSEMBLING POWERPOLES

3.1 Can I buy Powerpoles locally? How much do they cost? - You likely will not find them at your neighborhood retail electronics store, however you may find them in hobby shops that deal in R/C aircraft (where they might be called 'Sermos connectors'. They're the same thing.). The best source is from one of the many mail/internet outlets that cater to ham radio operators. A list of such sources is available on the Powerpole Proposal and Powerpole Quick Reference guide. Even in small quantities, they are available for less than \$1.00 per pair. NTRAK will be including Powerpoles in their product line so they will be as easy to obtain as Cinch Jones connectors.

3.2 Are special tools needed to assemble them? - No. The contacts may be soldered or crimped on. General purpose crimp tools such as those from Gardner Bender, Klein Tools and Harbor Freight can provide excellent results, although a full ratchet crimper (available from many of the same sources for under \$50) will provide the best results. For a review of some common crimp tools, see http://www.ntrak.org/ntrak_pp_compare.pdf.

An excellent article on Powerpoles and their assembly can be found at http://www.flyrc.com/articles/using_powerpole_1.shtml.

3.3 Do I have to use 12 gauge wire with the Powerpoles? - No, though 12 AWG wire is recommended for new construction as per the NTRAK RP for DCC previously referenced in section 1.1 of this FAQ. Powerpoles are recommended as an alternate connector because they can easily handle larger wire sizes, but there are bushings for the 30 amp contacts and smaller contacts for use with smaller wire, or you can just double 14 or 16 AWG wire over before putting it in the 30 amp contact. Larger wire yields less voltage drop and more efficient use of power resources. While the Powerpoles' resistance is lower than Cinch-Jones plugs, leaving the smaller wire negates one of the primary advantages of Powerpoles.

3.4 What kind of wire should I use? - 12 gauge stranded copper wire should be used for new construction and updating older modules. Red and black zip cord is available from many of the same vendors that supply Powerpoles. Outdoor low voltage cable is available at most large home supply stores as well as electrical supply houses. 12 gauge speaker wire can also be used.

3.5 Crimp or solder, which is better? - Either or both if done properly. For maximum reliability, crimp first, then add a bit of solder to fill in any voids.

3.6 I'm using 12 gauge low voltage lighting cable with Powerpoles. How do I get the wire to fit in the housing? - Low voltage lighting cable has thick insulation which can interfere with contact insertion. After crimping or soldering the contact, taper the insulation at the end. A pair of curved fingernail scissors or a track cutter does the job easily.

3.7 I can't get the contact to go in the housing. What did I do wrong? - The crimped area of the contact can get "out of round" during crimping, particularly if using a standard "U" crimper. Use the round die on the crimp pliers to reshape the barrel, turning it 90 degrees before squeezing. Excess solder can also cause difficulty in inserting the contact. Use a file to remove excess solder. Use a spare new contact as a guide to getting the right shape.

3.8 Occasionally, my Powerpole housings will slip apart. How can I keep this from happening? - Applying the color code tape around the dovetail area of both Powerpoles will usually stop any slipping. Use the roll pins on the white line plugs. A drop of CA or hot melt glue between the two housings will also work. If using tape, be sure not to let it get beyond the roll pin holes in the housing - it can prevent the housings from mating correctly.

4 RECOMMENDED POWERPOLE CONFIGURATIONS

4.1 What are the recommended Powerpole configurations? What connects to what? - Powerpole connectors on the track power busses (red, yellow, blue, green, orange, or any other lines as well as their feeder cables), are to be paired vertically, red over black on the right end of the module, and black over red on the module's left end. The red connector always feeds the front rail, and the black the rear

rail. On the DC power (white) bus, the Powerpoles at both ends of the module are paired horizontally, red on the left, black on the right. Red is DC +, black is DC -. This application is described in more detail at http://www.ntrak.org/ntrak_rp_powerpole.pdf.

A 'Quick Start' guide is also available at http://www.ntrak.org/ntrak_pp_quickref.pdf.

4.2 I don't need any more confusion in my life. Why all the different configurations? - A little confusion now will save a lot of confusion later. The vertical pairing for module track busses ensures that the front rail is always properly connected, even if a module is reversed end for end, as with an inside-outside corner. The white line is paired horizontally to differentiate it from track power, and to ensure that DC + is always +, no matter which way the module is oriented.

4.3 All these configurations with the plugs - 'Red over Black', 'Black over Red', 'Red and Black', 'Black and Red'... how do I know what they mean? - It's easier than it might appear. First, ALL configurations are described with the 'hood' of the connector UP, and the 'tongue' (the 'fat' part where the contact is) DOWN. Also, the 'ribbed' (if using single color zip cord) or 'Red' (if using red and black zip cord) wire ALWAYS goes to the RED connector housing, the WIDE pin (pin #1) of the Cinch-Jones plug, and the FRONT rail. The 'smooth' or 'Black' wire ALWAYS goes to the BLACK Powerpole housing, NARROW Cinch-Jones pin (pin #2), and BACK rail. If you want to use different color housings to color code your wiring, then substitute the appropriate color (yellow, blue, green, orange, white, purple) for the RED housing. NEVER substitute ANY color for BLACK.

4.4 If the white line is used only to power DC throttles, why does it need Powerpoles? - Strictly speaking, it doesn't, however the use of Powerpoles will permit module reversal without adapter cables or double termination. In addition, the low resistance of Powerpoles will minimize voltage drop between the DC supply and DC throttles that take their power from the white line.

4.5 Why do I need purple tape, and where can I get it? - The purple tape (or a purple Powerpole housing) is used to code the power feed ends of 'Y' feeder cables for the rail lines. This is to provide extra assurance that the feeders are plugged in correctly. Either of the two major home improvement chains carries 3M 'Violet' tape in 66 ft. lengths. That ought to be enough.

5 CONVERTING TO POWERPOLES

5.1 What is the target date for conversion? - There is none. Powerpoles and 12 AWG bus wire are alternate standards that are meant to co-exist with the existing standards that have served since the start of Ntrak. Individual clubs may wish to convert as they see fit, but must provide adapters to the C-J standard at external interfaces. Modules using Powerpoles in accordance with the RP will benefit however from the ability to interface directly with similar modules from other organizations without the need for adapters.

5.2 How should a club go about converting to Powerpoles if they wish to? - Every club will come to their own method, but the most obvious way would be to start with module sets, converting the inner connectors first. This way you won't have issues about Cinch-Jones to Powerpole adaptor cables, and can play around with things to start. This will also provide you with available Cinch-Jones plugs for _extra_ adaptor cables as other modules are converted. Multi-track yards with multiple connectors are particularly good candidates for early conversion, and you may find setup time reduced if you use ganged pairs (for example, all red line connectors together in a single group).

5.3 That makes sense...but what about external connections? - Again, it's whatever works best for you. For new construction or major shopping of existing modules, you may want to consider implementing Powerpoles and 12AWG bus wire from the start. Recently completed modules or modules in good repair may be OK for now, particularly if the track busses have been implemented with 12AWG, although connector conversion is then a simple matter. Modules with 18AWG or smaller bus wire should be considered early candidates for upgrade.

5.4 Where am I going to get the adapter cables I need? - You will only need to provide adapter cables (Powerpole to Cinch-Jones) if you are changing your module to Powerpoles. If you are converting an existing module, you are already over half way there! Just save the Cinch-Jones cables you take off and add Powerpoles to the other end - instant conversion cables. Clubs that choose to completely convert to Powerpoles will be able to create large numbers of adapters very easily. If you have modules that are always used in sets, then you will only need adapter cables at the outside ends of the set.

5.5 If I use my old Cinch plugs and wire for adapters, won't this cause extra voltage drop? - The old plugs and smaller wire will add some resistance. Make your adapter cables as short as possible - six inches or less is best. The greatest performance increase will be seen in multiple module conversions using only one set of adapters at each end of the group. Naturally, it's a good practice to discard old Cinch-Jones plugs that are loose or show excessive resistance, and to thoroughly clean the old connectors.

5.6 When I've got the adaptor cables, how do I keep them from getting lost? - First of all, label them. For example, Radio Shack (among others) has a nice bright yellow zip tie with a large space for a label. Put your name and/or your club's name on it and attach it to the cable, or use a color code of ordinary zip ties. If you want to get more elaborate, Anderson also makes a reusable locking device that goes over mated Powerpole pairs to prevent them from coming loose. Then again, you can accomplish the same thing by running a zip tie lengthwise over the mated pair and between the wires, though you can't reuse this. Clubs with large numbers of them will probably want to have a dedicated box for storage, though the more adaptor cables they have, the fewer they will need.