

# Calgary N-Scale Traksters Society Recommended Practice for DCC

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# Calgary N-Scale Traksters Society

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### 1. Introduction

Calgary N-Scale Traksters Society, commonly referred to as Cantrak, is an “N” scale modular model railroad club based in Calgary, Alberta, Canada. The club meets regularly to discuss and operate a selection of club owned, club provided but member scenic'd, and member owned modules.

The standard module is 2' x 4' mounted 39" from railhead to ground, with the front track 4.5" from the front, and the rear track 6" from the front. Tracks end 2.5" from the module ends so a 5" piece of Atlas sectional track can be used to join the rails together. These minimum standards, like any standard, allow for interoperability between modules, but do not preclude longer modules or additional tracks. Passing tracks and spurs may be extended to one or both ends of a module to allow longer passing tracks for more interesting operation, in which case a 1.5" on centre arrangement will rule.

Cantrak at one time supported both analog DC and DCC operation on it's layout but with the introduction of reverse loop dog-bones in the summer of 2012 the club became a DCC-only operation. Some of our members still use analog DC on their home layouts.

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### 2. DCC

The DCC members of the club, and hence the club, have standardized on the MRC Prodigy Advance<sup>2</sup> system for control, decoders are left to the members choice. The following is a list of the part numbers and what is included in each.

Prodigy Advance <sup>2</sup>	MRC 0001414	Handheld (Cab/Throttle), Base unit (DCC Command Station and Booster) input power supply.
Prodigy Express	MRC 0001408	handheld cab/throttle command station/booster input power supply
Prodigy Advance Wireless	MRC 0001410	Prodigy Advance Wireless cab/throttle “Base Station” called a “receiver unit” (All in one wireless receiver/DCC Command Station and Booster) input power supply.
Prodigy Advance <sup>2</sup> Cab	MRC 0001415	handheld only
Prodigy Express Cab	MRC 0001409	Discontinued as a separate handheld
Prodigy Advance Wireless Walk around	MRC 0001411	handheld only
Prodigy Advance Wireless Upgrade	MRC 0001412	handheld and dongle only
Prodigy Advance Extension Plate	MRC 001501	Cab bus extensions for layout fascia panel.
Prodigy Advance Extension Plate	MRC 001502	Cab bus extensions for layout fascia panels, with power supply. (use when five or more walk-a-rounds are needed with Prodigy Advance [2]or Express)
Prodigy District Power Booster	MRC 0001505	Provides an additional 3.5 Amps wherever needed. Includes 120-240 VAC universal power supply.
MRC 8 Amp Power Booster	MRC 0001521	Includes 15vDC/10Amp power supply with internal cooling fan

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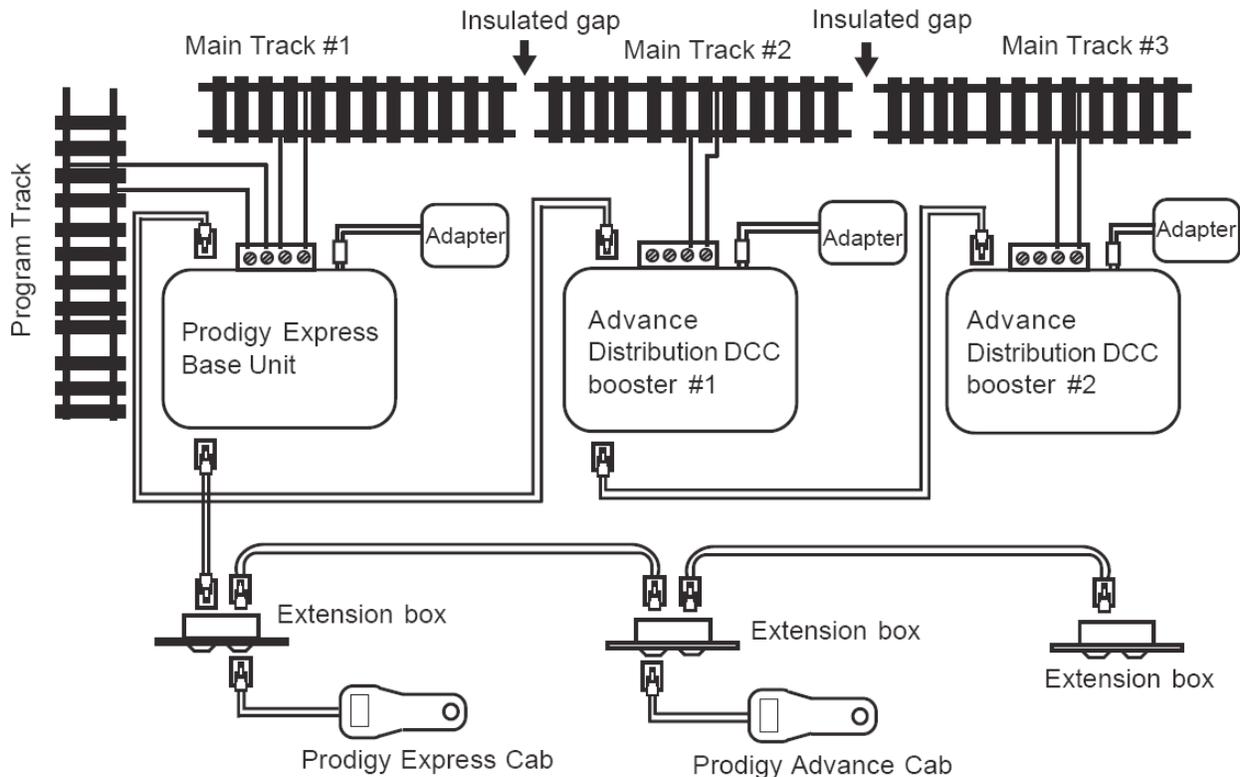
In light of the descriptions above, there should be few issues to cause confusion, but to re-emphasize, to run a decoder equipped locomotive, you need:

1. a handheld cab or throttle, wireless, advance<sup>2</sup>, or express
2. a command station and booster
3. either a command station and booster with built in wireless, or a wireless dongle plugged into the throttle bus IF you are using a wireless handheld throttle
4. one or more of the boosters IF you have a large number of locomotives, many sound-equipped locomotives or lighted passenger equipment

Manufacturers use the following radio spectrum:

- MRC 433 MHz
- Digitrax, NCE, EASYDCC, TrainCam, LGB (USA) 900MHz to 922MHz
- Lionel TMCC: 26.75MHz
- Arsitocraft: 27MHz
- LocoLink: 75.4MHz.

On the back page of the Prodigy Express Users Manual is a diagram that shows how to connect the base unit to multiple cabs and multiple boosters using cables and extension boxes. (reproduced below)



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The wireless dongle could be plugged into any extension box including the one on the right, but would be best situated above head height to reduce the effect of beer attenuation. The wireless system can support up to 32 cabs and use a frequency of 433 MHz. Interestingly the Prodigy Advance<sup>2</sup> supports 20 cabs. Also the wireless cab numbers must be sequenced before the wired ones, this seems to be because the command station built into the MRC 0001410 is slightly different than the one in the MRC 0001414.

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## 3. Electrical Bus

Although the following refers to new modules, nothing here precludes upgrading existing modules to meet this standard.

Each track shall have a separate bus; this will enable the option of DCC or DC on a per track basis. The bus wire, #12 AWG, will run continuously from the Anderson PP30 30 Amp Powerpole connectors at one end to the other. There should be about 12" of extra cable at each end of each module, for connecting between modules. The Powerpole housings are to be stacked vertically using the built-in dovetails, hood up, tongue down, black over red on the left end of the module and hood up, tongue down red over black on the right end. When connected together, red goes to red, black to black. See the photos of the left and right ends below the diagram. Clearly the RED connector will be the front rail of the track. If connected to a terminal strip or other distribution point, the insulation will be removed to enable the connection; the bus wire will not be cut.

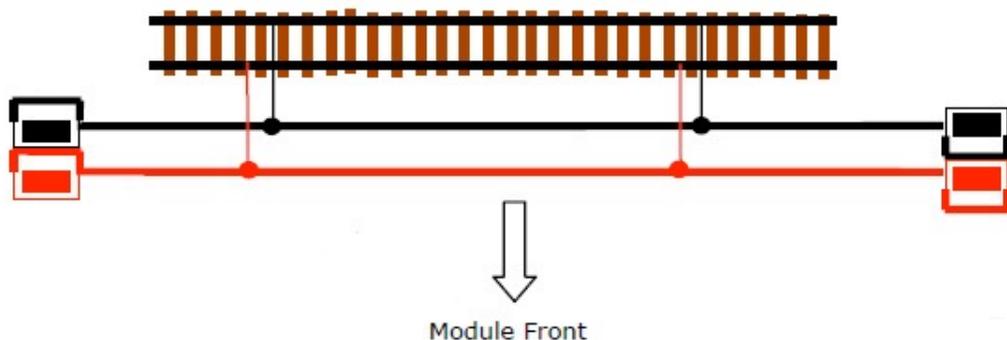
The club will arrange to have adapter cables, in sufficient quantity to interconnect existing modules with the older Cinch Jones 6 pin connectors, to modules wired to this newer standard (there are no longer any club modules with the CJ connector, though some personal modules may still be using them.)

This choice of connector has been standardized by Calgary Free-Mo, and is the (April 2011) standard for new modules, and DCC clubs, in NTRAK. <http://www.ntrak.org/>

Left End Track Bus Connector



Right End Track Bus Connector



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It would be helpful to colour code the individual bus connectors, possibly using coloured electrical tape.

Several modules have the tracks identified using the standard TELCO colour scheme, where the front track (4.5" from the front) has a blue identifier, and the rear track (6" from the front) has an orange one, no standard has been adopted for other tracks.

The NTRAK® colour code would be another solution. The front track at the 4.5" mark would then be marked **RED**, the rear track at the 6" mark would be **YELLOW**.

We have been discussing the options of passing tracks being connected between modules, if a front passing track were provided, its bus connection would be **ORANGE**; if a rear passing track were provided, its bus connector would be **BLUE**.

Instead of using coloured electrical tape, there are Powerpole Housings available in other colours. In which the Red Housing would be replaced by the appropriate colour.

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Anderson Powerpole Part Numbers (<http://www.powerwerx.com/anderson-powerpoles/>)

Housing Colour		Complete PP30 Connector (Housing & Contact)	15-45A Housing Only	30A Contact Only
Red		1330	1327	1331
Black		1330G4	1327G6	1331
Yellow		1330G11	1327G16	1331
Blue		1330G12	1327G8	1331
Green		1330G2	1327G5	1331
Orange		1330G13	1327G17	1331
White		1330G5	1327G7	1331
Purple		1330G17	1327G23	1331

From this chart it is clear, Housings, and Contacts are available separately. Small numbers of coloured housings may be best ordered directly from NTRAK [http://www.ntrak.org/paypal\\_order\\_form.htm](http://www.ntrak.org/paypal_order_form.htm) (scroll down to Mountain division module) (or possibly Calgary Free-Mo) to avoid the minimum quantity requirements of various wholesalers.

Module wiring is essentially identical for each of the tracks, and is totally independent from one track to another, common rail wiring is prohibited. Where there is a crossover from one track to another, both rails must be gapped to preserve the electrical independence (this makes wiring a double crossing or a double slip quite exciting) Connecting DCC and DC equipment together can let some or all of the smoke out, and then everything stops.

Module wiring consists of the following components:

- the track on the module,
- the connecting tracks to the adjoining modules and their rail joiners,
- the electrical bus underneath the module and its connectors that join to other modules,
- the feeder wire that runs between the track and the electrical bus.

Private tracks on modules can be powered in different ways. A simple on/off DPST switch between the private track and the connecting main track, both rails shall be fed through this switch; no common rail wiring shall be used. For independent operation with a separate throttle use a DPDT, center-off switch. This is, in effect, two-cab wiring with the connecting main track as one cab and the separate throttle as the other.

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If the module has a separate control panel the same color codes should be used for the track diagram as for the connectors. Since others may need to operate the tracks on the module the controls should be easy to use and clearly marked so turnouts can be worked and tracks powered with a minimum of confusion.

The track and its electrical bus must be interconnected by pairs of feeder wires. Solid core 18–22-gauge insulated wire must be soldered to the outside or bottom of the rails and connected to the electrical bus. Feeder wires should be kept as short as possible.

Alternatively, the track feeder may be soldered to the rails as described in the paragraph above and connected to a terminal strip. The unbroken electrical bus must connect to the terminal strip by wrapping the electrical bus around one screw or by a drop wire soldered to the bus which is then terminated on the terminal strip for distribution. This will permit correcting any wiring errors easily. Screw terminals must be securely tightened and checked for tightness before each operating session or train show.

There has been some discussion about the use of suitcase connectors, Scotchlok™ 567 Tap Connectors for example (which are Tan in colour and have a run connector for 12 gauge wire and the tap connector can range between 18 and 14 gauge); the other option is the use of single blade connectors automotive type connectors. The concern with this second choice is you need the Yellow connector for 12 – 10 gauge, but the Red connector for 22 – 16 gauge, no single connector can manage the required range in the wire gauge.

Track feeders should be located as shown in the table below:

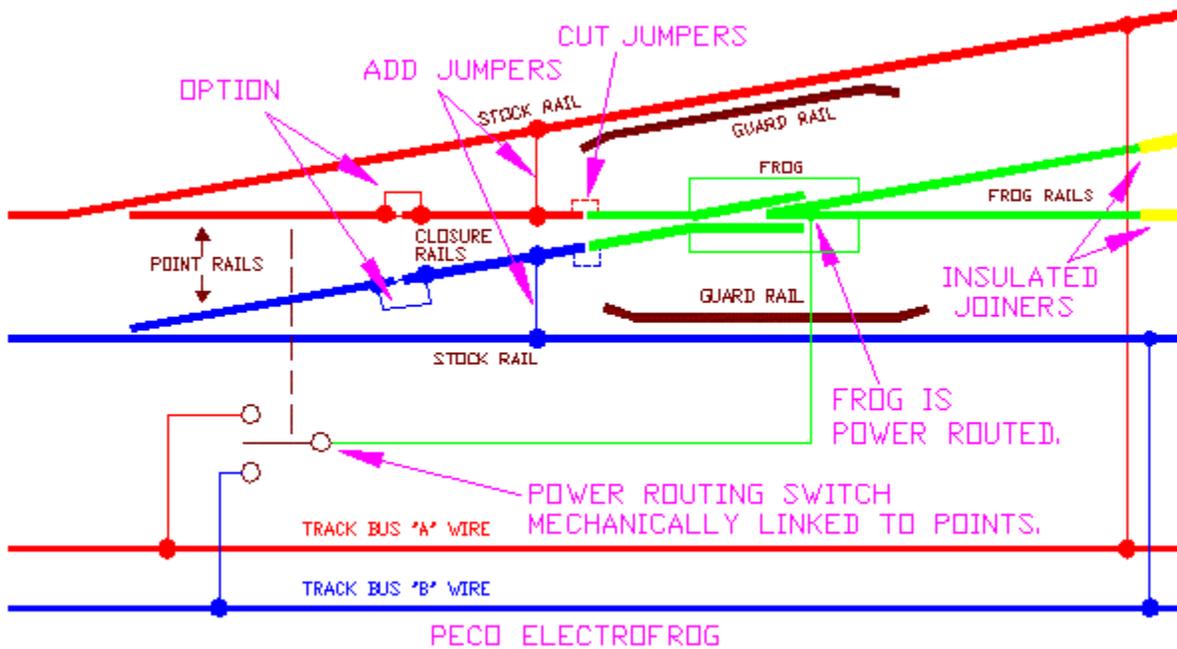
Module Length (Feet)	Number of Feeder Pairs	Location of Track Feeder Pairs
1 or 2	1	Centre of Module
3 or 4	2	12" from each end
5	3	12" from each end and centre of module
6	3	12" from each end and centre of module
8	4	12" from each end and 36" from each end
<ol style="list-style-type: none"><li>1. Turnouts must have feeders installed at both ends for all mainline tracks, with appropriate insulated joiners/gaps at the frog end.</li><li>2. If unsoldered rail joints are used at any location on the mainline tracks a feeder must be present on both sides of the unsoldered joint.</li></ol>		

It is understood that the club standard is a 4' x 2' module; all operating session designs are based on this standard. This does not preclude modules of different lengths; however it is the individual module owner's responsibility to construct appropriate additional modules to make their module conform to a standard length or a multiple thereof.

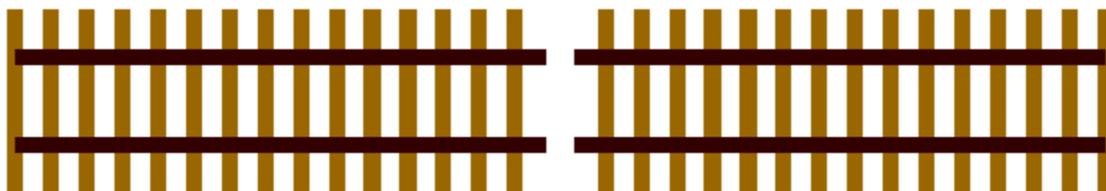
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## 4. Trackwork

There is no finer reference for wiring track (analog or DCC) and the reasons for doing it that way than Allan Gartner's Wiring for DCC web site <http://www.wiringfordcc.com> and the following illustration/s is/are *stolen* from there. There are links for track and turnouts on the main page at the top left. We recommend insulated rail joiners in both rails after the frog (Allan's turnout recommendation #2), which allows the frog to be connected to the correct rail for your 0-4-0 locomotive and your 1-Co+Co-1 diesel to pass through in the direction you have chosen without stalling or shorting anything out. The electrical contact shown in the drawing below can be attached to the electrical switch that operates the point, or even a slider switch in the linkage between a ground throw and the point.



Clearly if this turnout leads to private track, it would be helpful to power the rails after the frog for a sufficient distance that a locomotive will not foul the main before cutting gaps in both rails, as below.



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### 5. Assorted MRC DCC specific information

Each cab, up to 20 (32), needs its own ID number, page 2-3/2-4 in the Express, Advance, and Advance<sup>2</sup>, 2-4 Advance Wireless user guides.

Most functions are initiated by pressing their associated keys. However, there are ten functions initiated by pressing the SYS key followed by a numeric key (0-9). The following table summarizes these ten functions and the information about each function is found in the manual.

Keys	Function
SYS + 0	Clear routes
SYS + 1	Set time
SYS + 2	Set time ratio
SYS + 3	Yard on/off
SYS + 4	Set time mode: AM/PM/military
SYS + 5	Set routes
SYS + 6	View your Cab address (Express cab, hold 6 while plugging in)
SYS + 7	Set last Cab allowed to program locos on the Main Track
SYS + 8	Set last Cab allowed to program locos on the Program Track
SYS + 9	Set total number of operational Cabs
SYS + SYS	Shows the cab's internal software version (latest is 3) (wireless is 2)

The 12 volt power supply with the MRC0001502 will feed back this voltage through your DCC System, and into the track rails, if the system is powered off before the powered extension plate[s], trains may still operate, although erratically if there are still throttles with active locos displayed on the screen. This will not damage your DCC system, but if there is enough current draw on the layout, (a lot of decoder equipped locos), this current draw may damage the 1502's power supply over time.

With the Prodigy Advance System, (base unit), if you use more than eight handhelds, flip the handheld switch to the appropriate setting on the base unit. This switch allows the system to operate at its optimum speed.

There are 2 types of addresses;  
2 digit address- from 1-127  
4 digit address- from 128 – 9, 999

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There are two types of Bus' normally referred to:

- A. Track Bus- This is the associated wiring from your base station, or booster to different parts of your track layout. This uses 2 wires.
- B. Throttle Bus- This is the wiring network from your throttle(s), from various parts of your layout back to the DCC system's base unit. This uses 8 wire Ethernet computer cables.

### Reading Loco's Decoder Values on the Program Track

The Prodigy Advance<sup>2</sup> DCC system gives you the ability to read back CV values of a decoder equipped loco on the Program Track. This feature is useful if you do not remember the decoder address or what CV values your decoder has. Not all decoders support this feature. Please read your decoder's manual to check whether it supports this feature.

1. Place the loco on the Program Track.
2. Press PROG to select "rEAd Prog Track" then press ENTER.
3. First, "Adr" will flash, prompting you to read the loco address. Press ENTER to read or press SHIFT to skip to the next item. It may take several seconds to retrieve the address. If the decoder does not support read back feature, you will receive an "Err" (Error message).
4. Next, "SV" will flash, prompting you to read the Start Voltage. Press ENTER to read or SHIFT to skip.
5. Next, "Acc" will flash, prompting you to read the acceleration rate. Press ENTER to read or SHIFT to skip.
6. Next, "dEc" will flash, prompting you to read the deceleration rate. Press ENTER to read or SHIFT to skip.
7. Next, "TV" will flash, prompting you to read the Top Voltage. Press ENTER to read or SHIFT to skip.
8. Finally, "CV#" will flash, prompting you to read a CV. To read a CV, enter a CV number and press ENTER. After reading a CV, press ENTER. "CV#" will flash again, prompting you to read another CV. To end the read process, press ENTER.

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Here is an “if all else fails solution” to a decoder equipped locomotive not responding. If this doesn't work the decoder goes back to the manufacturer for service, or into the garbage.

1. Place the locomotive on a totally isolated piece of track connected to the main track output of the controller.
2. Check NOTHING else is connected to the main output of the controller.
3. Re-check NOTHING else is connected to the main output of the controller.
4. Re-check again that NOTHING else is connected to the main output of the controller.
5. Select “program on main”
6. Select locomotive address 0
7. Change the address to 3
8. Exit programming
9. Try and operate the locomotive with address 3.

Points 2, 3, and 4 are there because if you don't do this, everything, all locomotives, sound decoders, stationary decoders for turnouts, everything will be re addressed to 3, and much wailing and gnashing of teeth will break out.