North Raleigh Model Railroad Club

Standards and Recommended Practices

T-TRAK Standards & Recommended Practices

Xxx xx, 201x

Questions, comments, corrections and suggestions should be addressed to the NRMRC Standards Committee at wallisjm@att.net

Introduction

This publication was authorized by the Standards Committee on xxxx xx, 201x, and proposed to the general membership. The Club ratified it on xxxx xx, 201x. It is updated from time-to-time.

It is established that the current official standards for T-TRAK modules (http://www.t-trak.org) be the adopted base guideline for standards and materials. This document will be unique to the NRMRC, but will ensure full compatibility with T-TRAK standards so NRMRC T-TRAK modules will be fully connectable and interoperable in T-TRAK layouts.

The standards contained herein are mandatory for member-owned and club-owned modules, except as modified and stated below. The intent of these standards is to ensure compliance during construction, and to enable ongoing maintenance with minimal effort.

Newly constructed modules must be certified as being in compliance with these standards before they can be incorporated into a show layout. Recertification will be required if a major problem develops, or modifications made to the module. Also, re-certification is required every five (5) years. The Standards Committee and/or the Show Coordinator/Superintendent (see "Show Operating Procedures") will certify new modules and designate modules for re-certification where necessary.

Existing modules are to be brought into compliance with these standards prior to the next 5-year recertification of the modules.

Any corrections or suggestions for changes or improvements should be directed to the Chairman, Standards Committee, North Raleigh Model Railroad Club.

Terminology Used in This Document

The following terminology is used in this document:

- Front, rear, left and right refer to the T-TRAK module when looking at the module from its front — the two main tracks are nearest the front.
  - Width or length is the dimension the mainline tracks follow along the top of the module — width is used in thus document.
  - Depth is the dimension from the front-edge to the back-edge of the module.
  - Height is the dimension from the bottom edge to the top edge of the module base, not counting the adjusting bolts. This is normally 2¾".
  - Running Height is the dimension from the table top to the bottom of the Kato Unitrack.
- The front main track is referred to as the "Red" track; some clubs refer to this as "Track 1".
- The rear main track is referred to as the "Yellow" track; some clubs refer to this as "Track 2".
- Outside rail refers to the front rail on the Red track and the rear rail on the Yellow track.
- Normal T-TRAK color coding is used for the main tracks — Blue to the Outside, i.e. blue — white — white — blue, from front to rear or vice-versa.

Module Standards & Recommended Practices

Item	T-TRAK Standard	NRMRC Standard
Standard Straight Module	308mm W x 210mm D x 70mm H (12-1/8" W x 8¼" D x 2¾" H) Height adjustable to 4"	Same as T-TRAK at left. D can be 14-3/8" (365mm) maximum Recommended: 8¼" (210mm), 12¼" (310mm), or 14" (365mm) Max depth modules [14-3/8" (356mm)] with skyboard must have depth reduced by thickness of skyboard. Full-Depth Module: 28-13/16"
Multiple Length Modules, 2x, 3x, 4x	2x Dimensions 618mm W x 210mm D x 70mm H (24-5/16" W x 8¼" D x 2¾" H) 3x Dimensions 928mm W x 210mm D x 70mm H (36½"W x 8¼"D x 2¾"H) 4x Dimensions 1238mm W x 210mm D x 70mm H 48-11/16" W x 8¼"D x 2¾" H	Same as T-TRAK at left. D can be 14-3/8" (365mm) maximum Recommended: 8¼" (210mm), 12¼" (310mm), or 14-3/8" (365mm) Max depth modules [14-3/8" (365mm)] with skyboard must have depth reduced by thickness of skyboard. Full-Depth Module: 28-13/16"
	General Rule: (310mm x N)–4mm (leaves about 1/16" overhang at each end)	
Outside Corner Module	Single Outside Corner 310mm W x 310mm D x 70mm H (12¼" W x 12¼" D x 2¾" H) Alternate Single Outside Corner 365mm W x 365mm D x 70mm H (14-3/8" x 14-3/8" x 2¾")	Alternate Single Outside Corner 365mm W x 365mm D x 70mm H (14-3/8" W x 14-3/8" W x 2¾" D) Double outside corner permitted 732mm W x 365mm D x 70mm H (28-13/16" W x14-3/8" D x 2¾" H")
Inside Corner Module	Single Inside Corner (25mm) 518mm W x 518mm D x 70mm H (20-3/8" W x 20-3/8" D x 2¾" H) Alternate Single Inside Corner 559mm W x 559mm D x 70mm H (22" W x 22"D x 2¾"H)	Alternate Single Inside Corner 559mm W x 559mm D x 70mm H (22" W x 22"D x 2¾"H)
Junction Module (See note below)	No standard	596mm W x 365mm D x 70mm H (23-7/16" W x 14-3/8" D x 2¾" H) (NVNTRAK Design)
Module Front/Sides Color	Modeler's Choice	NRMRC Standard color. See below
Leveling Bolts	¼-20 x 2" Full thread carriage bolt and ¼-20 threaded T-Nuts installed in all 4 corners of base, ¾" inset from front and rear of module.	Nylon Flat Point Socket Set Screw, ¼"–20 Thread, 2-1/2" Length, with ¼"-20 threaded insert nuts (in place of T-Nuts) installed in all 4 corners of base, ¾" inset from front and rear of module, with hole drilled through top of module. (Note)

Note: The Set Screw allows turning from the top of the module with a hex wrench. This does not require the module to be lifted or otherwise disturbed, which could affect adjacent module, and can be easily done with the module in place on the layout. Cover the hole with a movable structure or bush

The ¼-20 insert nuts use a 5/16" hole and screw into the wood using a ¼" or 5/16" screwdriver bit. These are available from Home Depot (#54454) and other retailers. Insert nuts that are nailed in are also available.

The Nylon Flat Point Socket Set Screw is available from McMaster-Carr (www.mcmaster.com) as Catalog. No 94564A115. The hex driver is McMaster-Carr 5497A39 or 7268A56.

To prevent damage during transport and storage the Nylon Flat Point Socket Set Screw should be fully retracted into the module base.

On all modules the track must extend 2mm/1/16" beyond the ends of the module. This allows the UniJoiners to lock onto the next module and hold the layout together.

Special Note for Junction Modules

Two Junction Modules joined by the curved tracks will have the normal spacing of two extended corner modules (28-13/16"). Two Junction Modules placed side-by-side along the straight edge will not have a spacing that is a direct multiple of 310mm, thus opposite side modules will not match. A special module that is 10-1/8" in width or a special module that is 2" wide is required to match the side-by-side Junction Modules length.

Module Base Color

The module wood base, legs and any exposed Styrofoam must be painted. The standard color is available at The Home Depot. The formula is BEHR base 7300, and the rest of the formula is as follows:

CLRNT	BL	IL	KXL	TL
OZ	1	0	0	0
384TH	226	314	191	37

Skyboard

Item	T-TRAK Standard	NRMRC Standard
Skyboard requirement	Optional	Optional
Height (above module)	457mm / 18" maximum Make removable	254mm / 10" maximum from top of base Must be Removable Anchor with T-notch keyhole at 1" from each end and at center of >1x modules
Top Corners	—	Rounded top corners ¾" radius or less for flat top skyboards. Continuous rounded skyboards allowed.
Base Color	Light blue	See below.

The length of the skyboard should be approximately 1/8" less than the width of the module on which it is mounted. This is to prevent any alignment problem with the skyboard on adjacent modules.

The front, top edge and side edges of all skyboards must be kept in good repair. Chips, gouges, dents, etc. must be smoothed and filled, then painted the standard color.

Skyboards must be removable so that modules can be used in layouts with or without skyboards as specified for the layout.

Skyboard Color

Skyboards must be painted front and back. The Club has a light blue paint standard (paint available from Lowe's) for skyboards to ensure that all skyboards are the same color, as defined in the following box:

American Tradition Wall & Trim Interior Latex Flat Base: B 1-94785 Gallon			
Colorant	Ounces:	Shots:	Half Shots:
101	0	0	1
102	0	2	0
103	0	8	1

The front of the skyboard must be a flat finish, while the rear must be a gloss finish. This can be achieved by application of clear gloss over the flat skyboard color,

Non-Standard Modules

The Base Modules defined above are those covered by the T-TRAK standards. These standards allow T-TRAK modules to be located on a standard 30" Banquet table. Any module that goes outside the dimensions of the Base Modules defined above is considered a Non-Standard Module, even if it still matches up and interfaces with the standard T-TRAK base modules. Non-Standard Modules include, but are not limited, to the following:

- Larger Corner and Junction Modules
  The tight track radius that can be accommodated on T-TRAK outside corner, expanded outside corner and junction modules may not permit the reliable operation of some long equipment such as large steam locomotives (4-6-6-4, 4-8-8-4), 85' passenger cars (especially with body-mounted couplers, such as the Micro-Trains heavyweight cars), autoracks and similar length modern box cars, and 89' flat cars.

  The curved tracks could be flex track or larger than standard radius Unitrack. Such modules could interface with standard T-TRAK modules if the track spacing is correct at each mating end. The track at the connecting ends must be Kato Unitrack.

- Balloon Modules
  These modules reverse trains that are traveling on the one track so they re-transit the same module on the other track. A pair of these modules permits a single row of T-TRAK modules, such as along a wall.

- Modules Longer than 4X (Quad)
  Such modules would generally be used for a yard, but for modules longer than quad transportation is usually more of an issue. If strong enough such modules could also span between tables when there is open space between the tables (such as when you are short a table).

  A long module that spans the space between two tables could be used as a bridge or duck-under for operators to get to the center core (pit) of a layout.

- Modules that Extend out the Front of a Base Module
  Effects such as a yard or a station scene, for example, could require a module to extend outwards more than the 1½" of the standard module. Such modules must be constructed so they can overhang the table front without requiring special bracing, and generally should not extend more than 3" or 4" to the front.

- Modules with Special Scenery and/or Tracks
  Special scenic effects and/or special trackwork (e.g. a turntable) may require the use of a non-standard module size.

- Half-Length Standard Module
  When the expanded corner modules are used a space of about 8" is left in the length of a standard 8' table. Use of a half-length module will fill up the table space to the maximum extent. Note that a module length/width of 7¼"/184mm allows the use of a single 186mm/7-5/16" section of Unitrack.

- 45 Degree Corners
  The use of 45 degree corners along with regular corners and junction modules allows a T-TRAK layout to meander or wander rather than be simply square, rectangular, L-shaped, U-shaped, etc.

- Odd Depth Modules
  A module or set of modules that use conforming lengths, but are deeper than 14-3/8" must have complementary modules of smaller depth that will allow for a loop to still be created and used on a 30" deep table.

- Offset Modules
  A module or set of modules where the tracks swing from the front of the module to the rear of the module, thus allowing the placement of scenery in front of the tracks. Such modules must have complementary modules that bring the tracks back to the normal; position at the front of the module.

- Yard Modules
  Yards can be parallel yards or built at an angle to the main module set. They play a very useful role in the setup and tear down of trains, especially during a train show. In the design of yard modules consider the following:

  - Use Kato Unitrack # 6 turnouts where ever possible, but always on the main lines. Their use also creates track spacing (49.5mm) that allows for easier placing of rolling stock on the track(s).

  - Keep all turnouts located on one module at each end (the throat modules). This allows scalability of the yard, simplifies maintenance of the turnouts, and minimizes control issues.

  - Include scenery. Yards are not pretty, but they can be made interesting with the addition of some specialized tracks (e.g. caboose track) where appropriate, maintenance facilities, yard offices, plus some MOW equipment parked in the yard.

In almost all cases non-standard modules must be provided in pairs so the layout will match at the opposite end. All other applicable T-TRAK standards (e.g. electrical) must be met.

Careful construction of non-standard modules will allow these modules to participate within T-TRAK constraints, and thus participate in ordinary T-TRAK meets.

Kato Unitrack Standards & Recommended Practices

Item	T-TRAK Standard	NRMRC Standard
Track distance from front of module	38mm / 1½" from module edge to ballast edge of front track	Same as T-TRAK at left
Track Spacing	25mm / 1" center-to-center	33mm / 1½" center-to-center. See note
Space between tracks	0mm / 0" (Note 1)	8mm / 5/16"
Mainline tracks	100% Kato Unitrack	100% Kato Unitrack
Other Tracks	All Kato OR Kato for module connectors	All Kato OR Kato for module connectors
Mountain Tracks	No Standard or RP (Note 2)	No Standard or RP (Note 2)
Track Ballast (non-Kato track)	—	User choice
Track Designation	—	Outer main track (front): Red Inner main track (rear): Yellow

Note 1: Owners of modules with 25mm track spacing must provide transition module(s) to 33mm spacing.
Note 2: Discussion underway about using the Kato 216mm/8-9/16" radius track, which maintains the 33mm track spacing, and a height of 60mm.

T-TRAK Electrical Standards & recommended Practices

Item	T-TRAK Standard	NRMRC Standard
Connector	Kato Compatible	Kato and/or Mini-Tamiya (Note)
No. of Modules with Power Feed	DC — every 30 feet	DC and DCC — every 8 feet maximum All corner and junction modules must have track feeders. Modules with DCC accessory decoders powered from the track. Others as necessary.
Power Feed Connectors	Kato / Mini-Tamiya	Kato / Mini-Tamiya for track feeders.
Track Bus Connectors	—	Anderson Powerpole 30A connector
Track Feeder Color Code	Blue–White-White-Blue	Blue–White-White-Blue
Track Bus	No Standard	12-gauge with Powerpole connectors 2', 4' and 8' Long Track Bus 6" Track Bus Feeder sections One or two track buses as required by layout configuration.
Accessory Power	No standard	15 or 16 VAC @ 5A Each module must provide conversion to needed voltage for accessories (diodes for DC, voltage regulators for less than 15V)
Accessory Power Bus	No standard	12-gauge with Powerpole connectors 2', 4' and 8' long Accessory Bus 6" Accessory Bus Feeder sections Single bus per layout
Accessory Power Feed Connectors	Kato / Mini-Tamiya	Kato / Mini-Tamiya for track feeders.
Control	DC	DC and/or DCC
System	User choice	DC: User choice DCC: Digitrax

Note: The Mini-Tamiya connectors are correctly referred to as Tamiya/Kyosho connectors. The Tamiya connector is the female housing with male pins. The Kyosho connector is the male housing with female pins and the clip tab that holds it to the Tamiya connector. Kato uses these connectors with a 22-gauge blue/white wire pair for track power, and a red/black wire pair for turnouts.

Following is ordering information:

- Male/Female set with two housings and pins for one Tamiya and one Kyosho connector: Cat. No. 2913
- Male (Kyosho) connector w/female pins and clip tab: Cat. No. 2914

- Female (Tamiya) connector w/male pins: Cat. No.2917

The pins require a standard Molex type crimp tool capable of crimping .062" diameter pins, such as the GC/Waldorm W-HT-1921.

These connectors can be ordered from Maxx Products at http://www.maxxprod.com/, and other suppliers.

T-TRAK Module Electrical Standard

The b-w-w-b color code for track feeders originated at the first inception of T-TRAK by Lee Monaco-FitzGerald and Jim FitzGerald, as follows:

> "Kato had the 20-041 2-7/16" straight track with an electrical connection. This required no soldering and a variety of wiring extension units were available. Because of the solid ends of the module box/base unit used, there needed to be a way to change of check that the special connector was plugged into the track unit. That meant that a ¾" diameter hole needed to be drilled through the module top, centered under the track and 1¾" in from the end of the base. This was done at the right end of the front track and the left end of the rear track. When done this way, there was easy access to the wiring of each track loop.
>
> Because the #20-041 tracks were facing in the opposite directions, the "b-w-w-b" wiring was the result. At that time (2001) there was no Kato double crossover on the market and very little DCC in use on N Scale layouts."
>
> From Jim FitzGerald, May 6, 2012

DCC on T-TRAK would in general be a lot easier if we had "b-w-b-w", but the standard is "b-w-w-b" and that is followed in this document.

Track Feeders

Many T-TRAK layouts that fill one or two tables can operate satisfactory with a single set of feeders, especially if the control is DC. With DCC, however, more feeders are needed, especially as the layout becomes larger and more complex. For DCC-controlled layouts it is recommended that all corner modules be equipped with track feeder cables. This ensures that no module is ever more than about 8 feet away from a power feed, with most modules within 4 feet.

It is recommended that the following T-TRAK modules be equipped with track feeders:

- All corner and junction modules
- Modules with track sections between two turnouts with insulated UniJoiners at the four frog rails of the turnouts (e.g. a passing siding).
- Modules with DCC stationary decoders to operate turnouts should also have their own track feeders or, as a minimum, be located directly beside a module with track feeders.
- Other modules with specific needs for track power feeders.

For the most flexibility, especially at train shows, it is recommended you equip all modules with track feeders, even though there are times when they will not be used. You can arrange the show layout however you want without worrying about where modules with feeders are located.

It is important to label the feeders so it is known to which track each is connected; use red and yellow colored tape. For Junction Modules mark the straight through track as the Red Track, and, looking at the module from the front (straight) mark the curved track feeders as left and right.

Track Bus

Much effort has been applied to specifying the track bus for the successful design, setup and operation of NTRAK layouts. The NTRAK track bus concept using Powerpole connectors and 12ga bus wire is the basis for the T-TRAK track bus specification. Uniformity with NTRAK allows power supplies/boosters and cables to be easily interchanged between T-TRAK and NTRAK, and allows a Club to use the same parts for both modular formats.

In NTRAK, each track (red / yellow / blue / green, etc.) has its own track bus. This concept can also be applied to the two T-TRAK mainlines (red / yellow). However, since T-TRAK layouts tend to be much smaller and less complex than NTRAK layouts, for many applications a single track bus will meet the layout needs. Following are the rules for the number of track buses needed:

- If both tracks are DCC-only powered, then one track bus may be sufficient.

- If one track is DC powered and the other is DCC powered then each track must have its own track bus.
- If both tracks are DC powered and each track is to be controlled separately from DC power packs then each track must have its own track bus.
- Any track that will be switched from DC to DCC or vice-versa during a show will require its own track bus, i.e. two buses total.

This track bus design for T-TRAK specified in this document provides the flexibility for clubs to use either a single track bus or one track bus per mainline as they deem necessary for their layout configuration. The track bus design can also be used for DC-controlled layouts.

The overall track bus consists of two components:

- The Track Bus — the main bus under the modules, which connects to other track bus sections and track feeder bus sections, and to the DCC Booster or DC powerpack.
- The Track Feeder Bus — a short bus section with blue/white pigtail leads to a Tamiya connector, which connects to the module track feeder.

Bus Wire Fundamentals

Track bus wires should be constructed in 2 foot, 4 foot and 8 to 10 foot lengths of 12 gauge wire with Anderson Powerpole connectors on each end. The intent is to provide sufficient length so that the junction between track bus wires falls under the corner modules in the layout, plus the shorter lengths allow connecting power to any other modules with track feeders.

The color coding for the track bus will be the following:

- DCC Rail “A” = Kato white wire = NTRAK red wire (ribbed wire)
- DCC Rail “B” = Kato blue wire = NTRAK black wire

Track Bus Connectors

The track bus connectors to be used for T-TRAK layouts are the 30 Amp Anderson Powerpole connectors, the same connectors specified in the 2011 NTRAK Electrical Standard. The connector shell colors shall be blue and white.

For layouts that normally use one track bus per mainline the Powerpole connector shells could be red/white and yellow/white.

Connectors in Europe and Australia

Many T-TRAK modelers in Europe and Australia have adopted RCA jacks and plugs instead of Kato/Tamiya and Powerpole connectors. RCA twin sockets are mounted on the module backboard or equivalent. The White RCA socket is connected to the Front track and the Red socket is connected to the Back track. For each socket the Inner pin connects to the Inner rail and the Outer skirt connects to the Outer rail. For more information refer to the “Australian T-TRAK-N Guidelines”.

Track Bus Design

Each track bus must be 12-gauge stranded copper zip wire (red/black zip wire, outdoor low-voltage lighting wire or speaker wire), or equivalent. This wire has a thin section between the two wires and can be "zipped" apart. One side of the covering has a rib molded along its length; connect the ribbed wire (or red wire in the case of red/black zip wire) to the white connector at the end of each bus.

The lengths of the bus wire are to be 2 feet, 4 feet and 8 – 10 feet.

Each bus will be connected to the next bus using Anderson PP30 30 Amp Powerpole connectors at each end of the bus.

The following table is a summary of the Powerpole configuration.

Application	End	Stacking	Configuration
Single Bus	Right	Vertical	Blue over White
	Left	Vertical	White over Blue
Red Track Bus	Right	Vertical	Red over White
	Left	Vertical	White over Red

Yellow Track Bus	Right	Vertical	Yellow over White
	Left	Vertical	White over Yellow

The Powerpole housings are to be stacked *vertically* using the built-in dovetails, hood up, tongue down, *white over blue* on one end of the cable and *blue over white* on the *right* end.

An example of a track bus cable is shown in the photograph.

Track Bus Feeder Connectors

The connectors used for track feeders must be compatible with the connectors provided by Kato with their Unitrack line. These connectors are Mini-Tamiya connectors The Mini-Tamiya connectors are correctly referred to as Tamiya/Kyosho connectors. The Tamiya connector is the female housing with male pins. The Kyosho connector is the male housing with female pins and the clip tab that holds it to the Tamiya connector. Kato uses these connectors with a 22-gauge blue/white wire pair for track power, and a red/black wire pair for turnouts.

Following is ordering information:

- Male/Female set with two housings and pins for one Tamiya and one Kyosho connector: Cat. No. 2913
- Male (Kyosho) connector with female pins and clip tab: Cat. No. 2914
- Female (Tamiya) connector with male pins: Cat. No. 2917

The pins require a standard Molex type crimp tool capable of crimping .062" diameter pins, such as the GC/Waldorm W-HT-1921.

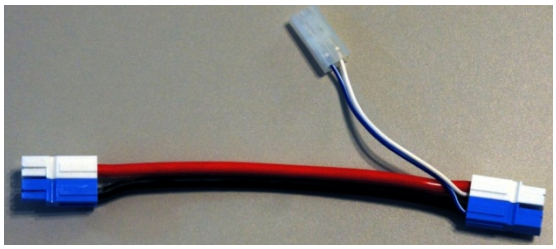
These connectors can be ordered from Maxx Products at http://www.maxxprod.com/, and other suppliers.

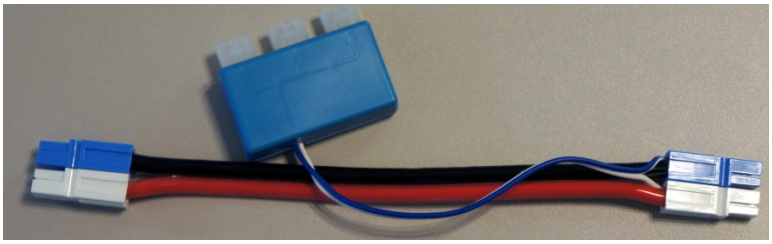
The Tamiya (female) connector (Cat. No 2917) is the connector used on the Track Bus Feeder pigtail. (The Kyosho 2914 male housing with clip connector and female pins attaches to the Track wire coming from the track feeder sections or terminal UniJoiners.) The blue wire goes to the square opening and the white wire to the round opening on the 2917 connector.

Track Bus Feeder Design

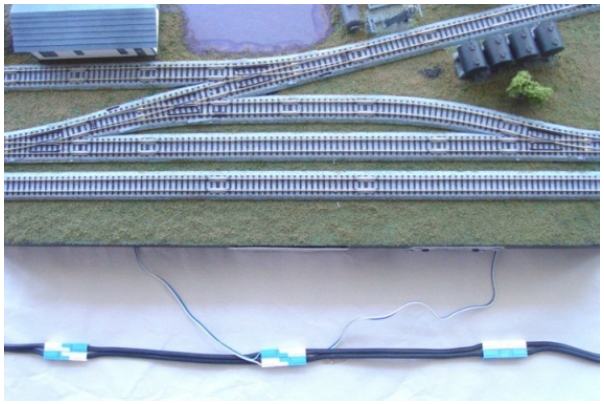
The track bus feeder is a short (6" – 8") pigtail bus constructed just like a normal track bus, but with a feeder cable connected to the Powerpole connectors at the blue over white end. When inserted between two Track Bus cables in correct polarity orientation this cable provides power feed to the Red track. When inserted between two Track Bus cables in the reverse polarity orientation this cable provides power feed to the Yellow track, yet keeps both the Red and Yellow tracks with the same polarity for successful DCC control and operation.

A track bus feeder with pigtail is shown at left below. The photo on the right shows track bus feeder with the Kato 3-way connector to connect to multiple module track feeders.



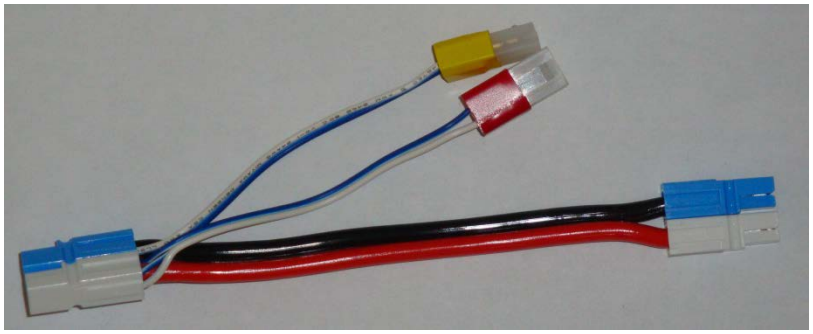


The Track Bus Feeders shown can be used in layout with either a single Track Bus or one Track Bus per track.

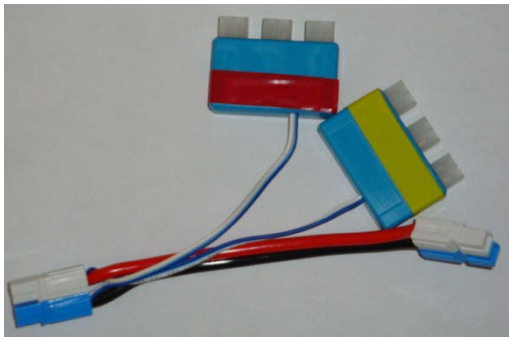


This last photo shows the connection of the track bus feeders reversed to permit changing the blue-white-white-blue to blue-white-blue-white needed for single bus DCC control and operation.

The following track bus feeders can be used with a single Track Bus only.



Track Bus Feeder with Color-coded Pigtails for Red and Yellow Tracks



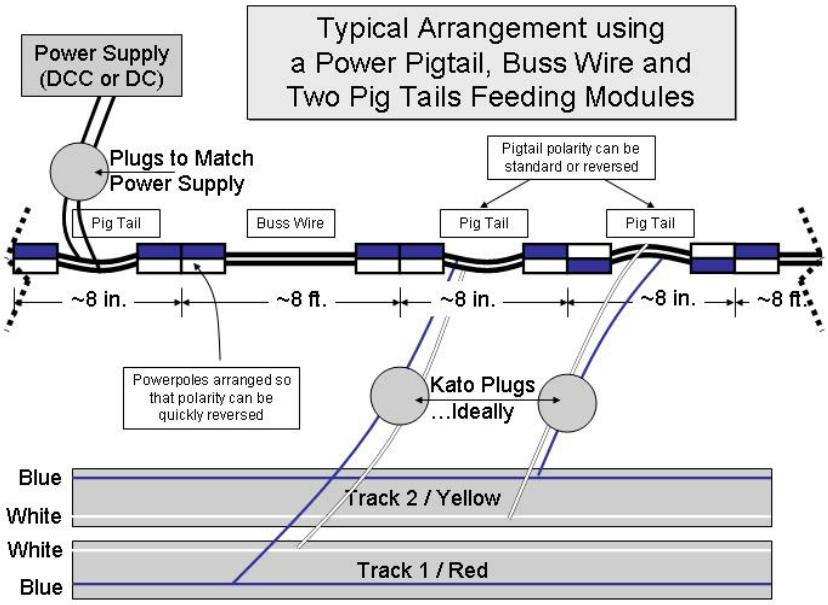
Track Bus Feeder with Kato 3-Way Connectors

Connecting Power Supplies to the Track Bus

A modified version of the Track Bus Feeder is used to connect the track bus(es) to the layout power supplies, whether a DCC Booster or a DC powerpack. The design is identical to the track Bus Feeder except the feeder cable has the appropriate gauge wire and connectors for the power supply.

The Whole Picture

The following diagram shows how everything fits together for a single Track Bus in terms of the power supply, the track bus, the track feeder bus with the connection to the module.



Source: Steve Jackson, NVNTRAK

Note that following the configuration described here means that loops (Balloon modules) and wyes will require reversing sections.

Accessory Bus

Some T-TRAK modules will include operating accessories (such as building and street lights, animated scenes, etc.) that require low voltage power to operate. Rather than having individual power supplies such as wall-warts it is recommended to run an Accessory Bus parallel to the Track Bus(es), color coded and configured as shown in the table.

Application	End	Stacking	Configuration
Accessory Bus	Right	Horizontal	Brown on left, black on right (viewed from contact end)
	Left	Horizontal	

It is recommended that the Accessory Bus be powered from a 15VAC 5 Amp supply, such as a Digitrax PS515 or equivalent. For modules that need DC a bridge rectifier circuit should be placed in the Accessory Bus Feeder. Voltage regulators should be mounted on the module(s) as required to provide the correct voltage to specific accessories.

Accessory Bus Feeder

The Accessory Bus Feeder will follow the design of the Track Bus Feeder, i.e. a short (6" – 8") pigtail bus constructed just like a normal accessory bus, but with a feeder cable connected to the Powerpole connectors at one end. It is the responsibility of the module owner to provide the Accessory Bus Feeders for their module(s) with appropriate connectors, voltage regulators and/or bridge rectifiers mounted to the bottom of the module at the module end of the pigtail cable.

References

- NTRAK Manual, Current edition, NTRAK Publishing, Templeton, CA.
- How to Build a NTRAK Module, Bob Gatland, Long Island NTRAK.
- Building a Winning Module, Bob Gatland, Long Island NTRAK.
- Glenn McLain & Steve Jackson, Northern Virginia NTRAK, "T-TRAK Powerpole Bus Wires"