North American T-TRAK™ Organization

Standards and Recommended Practices

July 28, 2018

Questions, comments, corrections and suggestions should be addressed to the T-TRAK Standards Committee at Info@T-TRAK.org

1. Introduction

This document will be permanently maintained and downloadable on the T-TRAK.org web site. In this document, standards are printed in black, while *recommended practices are printed in blue italics*. It should be noted that this document is for North American clubs as Australia and Europe standards differ slightly. There are links to their web sites on both the T-TRAK web site and the Wikidot site. This document covers N scale only. T-TRAK standards have been suggested for other scales, but at the time of writing this document, there were not enough clubs using the other scales to provide the experience needed to define those standards completely.

The standards contained herein should be the basis for operating practices for all clubs and should be used as a mandatory minimum set of standards for all T-TRAK layouts at public train shows or conventions. The intent of these standards is to provide uniform construction techniques ensuring compatibility between all modules used at public events. Any additional requirements imposed by a club should be compatible with the practices defined by these national standards.

2. Terminology Used in This Document

2.1. The following terminology is used in this document:

2.2. Front, rear, left and right refer to the T-TRAK module when looking at the module from the audience side — typically the two main tracks run side to side across the front of the module.

- Width or length is the dimension the mainline tracks follow along the top of the module — width is used in this 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 (i.e., bottom of Unitrack pieces), not counting the vertical scenery. This is 2¾" in N scale.

2.3. The front main track is referred to as the "Red" track.

2.4. The rear main track is referred to as the "Yellow" track.

2.5. Outside rail refers to the front rail on the Red track and the rear rail on the Yellow track.

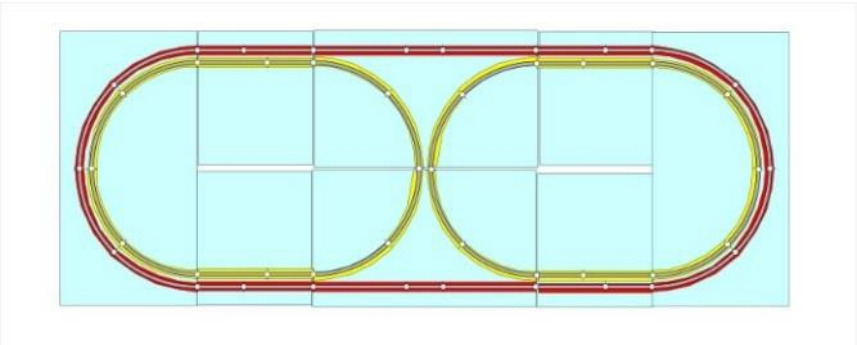
2.6. Kato wire colors are used to establish connections to the main tracks following the pattern with blue to the outside (i.e. blue — white — white — blue) from front to rear or vice-versa.

2.7. Track Bus refers to the external cable used to carry track current from the control unit or power pack to the various modules.

2.8. Accessory Bus refers to the optional external cable used to carry power for lighting, animation, or other non-track options. It can be either 12VDC (white & black) or 15/16VAC (brown & black) cable.

2.9. Leveling Bolts refer to the required bolts which allow the module height to be adjusted from 2¾" to 4". These should be ¼"x20 bolts or set screws with hex nuts on at the bottom end.

2.10. Inner Loops are isolated loops of the Yellow track when Junction modules are used, as shown in the diagram at the top of the next page.



3. Module Standards

Item	T-TRAK Standard	Recommended Practice
Single Straight Module	308mm W x 210-330mm D x 70mm H (12-1/8" W x 8¼ -13" D x 2¾" H)	*Depth can be from 5" - 14 3/8" (125mm-365mm) (including skyboard)*
Double Straight Module	618mm W x 210-330mm D x 70mm H (24-5/16" W x 8¼ -13" D x 2¾" H)	*Depth can be from 5" - 14 3/8" (125mm-365mm) (including skyboard)*
Triple Straight Module	928mm W x 210-330mm D x 70mm H (36½"W x 8¼ -13" D x 2¾"H)	*Depth can be from 5" - 14 3/8" (125mm-365mm) (including skyboard)*
Quad Straight Module	1238mm W x 210-330mm D x 70mm H (48¾" W x 8¼ -13" D x 2¾" H)	*Depth can be from 5" – 14 3/8" (125mm-365mm) (including skyboard)*
Note – straight modules width is a multiple of 310mm less 2mm		
Outside Corner Module	365mm W x 365mm D x 70mm H (14-3/8" x 14-3/8" x 2¾")	
End Cap (double Outside Corner)	732mm W x 365mm D x 70mm H (28-13/16" W x14-3/8" D x 2¾" H")	
Inside Corner Module	559mm W x 559mm D x 70mm H (22" W x 22"D x 2¾"H)	*The front and back corners can be truncated to form a 6-sided module for ease of transport and storage*
Junction Module (see note)	596mm W x 365mm D x 70mm H (23-7/16" W x 14-3/8" D x 2¾" H)	*The outside track requires use of a Kato 20-050 expansion track or cutting a standard piece of track*
Leveling Bolts	¼-20 x 2" bolt and ¼-20 threaded T-Nuts installed near corners of module.	*¼-20x2" socket set screws with holes in top of module can be used to allow height adjustment from above with a hex wrench.*

3.1. Skyboard

Skyboards are optional backdrops mounted to the rear of the module to provide a visual block behind the module. Skyboards vary in height between 6" to 15" above the surface of the module. *Each club should adopt a specific standard to provide continuity throughout the layout.* The width of the skyboard should be approximately the width of the module on which it is mounted. *There should be no more than a 1/8" gap between modules to provide visual continuity between adjacent modules.*

4. Non-Standard Modules

These standards allow T-TRAK modules to be located on a standard 30" folding table. Any module that goes outside the

dimensions of the standard modules defined above is considered a non-standard module, even if it still matches up and interfaces with the standard T-TRAK base modules. While non-standard modules are allowed, special consideration is required when using them and it is the responsibility of the module owner to deal with these considerations. Non-standard modules include, but are not limited, to the following:

4.1. Larger Corner and Junction Modules - Corner modules using larger radius Unitrack can be created as long as such modules interface with standard T-TRAK modules at each mating end. The use of such modules requires special table considerations to accommodate the two parallel sides of the layout and must be paired with matching corner modules at the opposite end of the layout. The use of non-standard radius curves also prevents the use of standard Junction modules in a cross-table configuration in the layout. Junction modules will still work side-by-side to allow a side loop to branch off of the table, or in a cross-table configuration if a "bridge" module is used to join the two Junctions.

4.2. 25mm Track Spacing – While the standard track spacing is 33mm between centerlines, some situations can benefit from closer track placement. In urban or street running track that is designed for streetcar or other small format trains, track may be run with 25mm spacing between centerlines. This provides more realistic appearance in streetcar operations, but will be problematic for normal modern sized trains, and thus should only be used in specialized settings.

4.3. Balloon Modules - These modules connect the Red and Yellow tracks so that trains that are traveling on the one track will change direction and re-transit the same modules on the other track. A pair of these modules permits a single row of T-TRAK modules, such as along a wall. Care must be taken to ensure that both tracks are the same polarity (see section on Connecting the Control Unit to the Track Bus in Electrical).

4.4. Long Modules - Modules longer than Quads are problematic because of transportation and storage issues. All modules should be 2mm short of a multiple of 310mm for compatibility with standard modules.

4.5. Modules that Extend out the Front of a Base Module - modules must be constructed so they can overhang the table front without requiring special bracing and must have complete stability on the table. The front legs on these modules should be placed consistent with the table edge rather than in the front corners.

4.6. Deep Modules - Modules deeper than 14-3/8" must have complementary modules of smaller depth on the other side of the table so that both modules fit on a 30" deep table. Modules can be made to extend across the entire table depth to accommodate the tracks on both sides of the table. These modules must be 732mm (28 7/16") deep.

4.7. Transition Modules - A module where the tracks swing away from the standard front offset must have complementary modules that bring the tracks back to the normal position at the front of the module.

4.8. 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 staging of trains, especially during a train show. In the design of yard modules consider the following:

4.8.1. Use Kato Unitrack # 6 turnouts (part #20-202 & 20-203) whenever possible. Their use creates track spacing (49.5mm) that allows for easier placing of rolling stock on the track(s).

4.8.2. When Kato #4 turnouts (part #20-210 & 20-220) are used, they should be modified to provide smooth operation. The modifications are described as a T-TRAK Wikidot Tutorial or in a YouTube video.

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

4.10. On all modules, track must extend at least 1mm beyond the ends of the module. This allows the UniJoiners to lock onto the next module and hold the layout together.

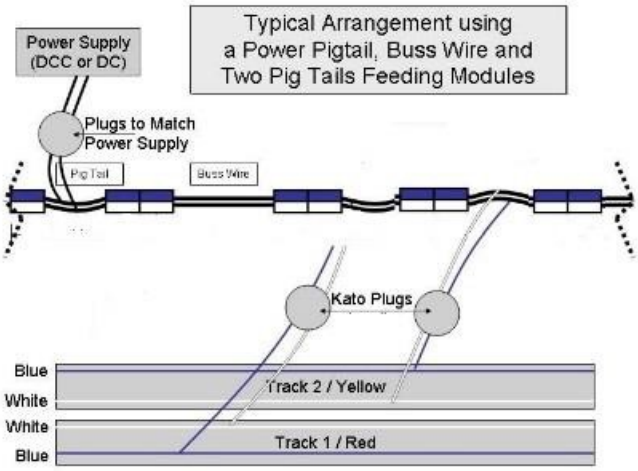
5. Track Standards

Item	T-TRAK Standard	Track Used	Recommended Practice
Track Spacing	33mm centerline-to-centerline (original spacing was 25mm)	*Kato 20-042*	*Use double track pieces on ends when setting spacing*
Track Setback (from front)	38mm / 1½" to front edge of track bed		
Corner Curve Radii	282mm & 315mm	*Kato 20-110* *Kato 20-120*	
Turnout Type	Kato turnouts on mainline tracks	*Kato 20-202/203*	*Use of #6 turnouts on mainline tracks*
Road Crossing Track		*Kato 20-021*	*Aids in train deployment and re-railing*
Single Straight Module	2 mainline tracks - 310mm	*2 – Kato 20- 010* *2 – Kato 20- 020*	*Use of single (wooden tie) track*
Double Module	2 mainline tracks - 620mm	*4 – Kato 20- 000* *2 – Kato 20- 020*	*Use of single (wooden tie) track*
Triple Module	2 mainline tracks - 930mm	*6 – Kato 20-000* *2 – Kato 20- 010*	*Use of single (wooden tie) track*
Quad Module	2 mainline tracks – 1240mm	*10– Kato 20-000*	*Use of single (wooden tie) track*
Outside Corner Module	90-degree curves of 282mm & 315mm	*2 – Kato 20-110* *2 – Kato 20-120*	*Use of single (wooden tie) track*
End Cap (double Outside Corner)	180-degree curves of 282mm & 315mm	*4 – Kato 20-110* *4 – Kato 20- 120*	*Super-elevated track (Kato #20-183 & 20-184) can be used*
Inside Corner Module	90-degree curves on both tracks	*2 - Kato 20-111* *6 - Kato 20-121* *2 - Kato 20-130*	*Front & back corners truncated for ease of transport and storage*
Junction Module	Outside track is straight and Inside track has two 90-degree curves	*2 – Kato 20-000* *1 – Kato 20-050* *4 – Kato 20-110*	*Red track requires use of a Kato 20-050 expansion track or cutting a Kato 20-020 straight track*

Note: Unitrack double track equivalents can be used on modules but note that tie colors will be different.

6. Electrical Standards

Electrical problems are one of the predominant problems encountered in setting up a new layout, and can be the hardest to diagnose and resolve. For this reason, it is important that compliance with a strict set of standards is enforced.



Electrical systems to run a T-TRAK layout consist of 3 basic components:

Module Connectors – Modules are connected through the use of wires which are attached to the tracks and come out from the module to plug into the connectors on the Track Bus cables. While not all modules in a layout need be connected to the Track Bus, *the recommended practice is to equip all straight modules with feeder cables so that the layout does not have large gaps where no power connection is available.*

Track Bus – The power to the tracks is carried from the control unit to the layout through one or two 12-gauge cables usually in the form of zip cables. The track bus normally lays in the trough created between the backs of the modules placed on either side of the layout table. There should be a Track Bus cable for each track (Red and Yellow) to maintain electrical isolation between the tracks; however, if the layout is all DCC-powered either one or two track buses may be used. Feeder Connectors come off the Track Bus to allow connection to individual modules. Note: On smaller layouts (1-2 tables), the Track Bus may consist of Kato electrical components. *Recommended Practice is for bus cables to have various lengths, from 1', 2', 4' up to 10' maximum in length with 6—12" feeder cables. There should be at least 1 module connected to the bus every 6'-8' on the layout (1/side on an 8' table).*

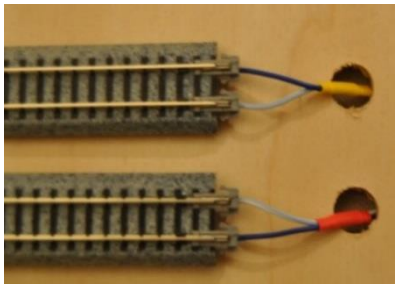
Control Unit – This is some combination of power packs for tracks running in DC mode, and/or a DCC control system for those tracks running in DCC mode. Since the two tracks in a T-TRAK layout are electrically isolated, DC mode will require a power pack for each track, while a single DCC control system can be used for multiple circuits.

Item	T-TRAK Standard	Recommended Practice
Track Feeder Connector	Kato compatible	*Kato 3-way extension cable (#20-827)*
Modules with Power Feed	At least 1 on each side of table	*All straight modules should be equipped with Track Feeders. Modules with lighting, animation, motorized turnouts, or DCC accessory decoders should also have independent Accessory Power Feeds (either 12VDC or 15VAC power).*
Track Bus Connectors	Anderson Powerpole 30A with 12-gauge zip wire	*When using blue/white connectors, cables should be identified as red or yellow circuits with colored tape, paint, or heat shrink.*
Track Feeder Color Code	Blue–White-White-Blue	

6.1. Module Connectors

The recommended connectors are the Kato Terminal UniJoiner (part #24-818), but any connection coming from the track that is terminated with a Kato-style connector will work. Other similar connectors are available, but their reliability has been proven to be lower than the UniJoiner. There can also be problems with polarity if non-Kato equipment is used. The ends of the Module Connectors must be clearly marked to indicate whether they provide a connection to the Red or Yellow line on the module. Do not use Kato Terminal UniJoiners at the module ends.

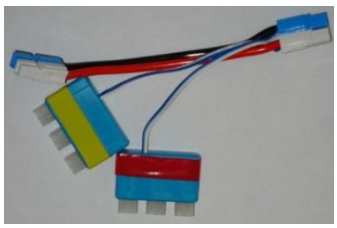
Tracks must be wired blue-white-white-blue



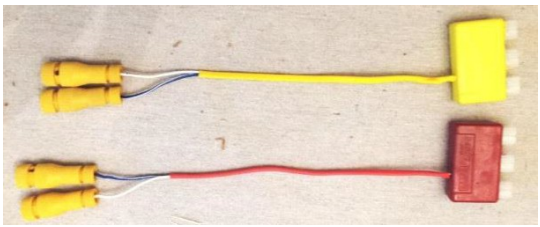
6.1.1. Connecting Modules to the Track Bus

The module connection points on the Track Bus must be compatible with the connectors provided by Kato with their Unitrack line. The most common source for plugs to attach to the Track Bus are the Kato Terminal Adapter Cord (part #24-843) and the Kato 3-way extension cables (part # 24-827) which allows for multiple modules to connect to a single feeder cable.

Note that when connecting Kato blue/white cable to a red/black bus cable, the blue wire should always connect to the black wire of the bus. When using the Tamiya (female) connector on the Track Bus Feeder pigtail, the blue wire goes to the square opening and the white wire to the round opening on the connector.



Track Bus Feeder Cables (soldered to bus)



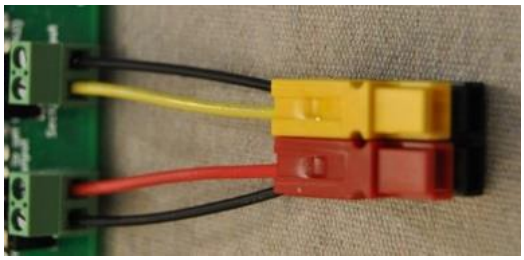
Track Bus Feeder Cables (attached with cable taps)

Connectors in Europe and Australia
Many T-TRAK modelers in Europe and Australia have adopted different plugs instead of Kato and Powerpole connectors. If you plan to use your modules in those areas, refer to the "Australian T-TRAK-N Guidelines".

6.2. Track Bus

6.2.1. Connecting the Control Unit to the Track Bus

An adaptor connector is used to connect the Control Unit to the standard Track Bus Powerpole connectors. The gauge of the cable used in this adaptor should be compatible with the connectors on the Control Unit, and should be as short as possible to avoid voltage loss when using the smaller wire required to connect to most units. It is also critical that both Track Bus cables be connected independently to isolated circuits coming from the control unit. And because the polarity of the two mainline tracks on the layout have opposing polarity (from the B-W-W-B wiring standard), it is recommended that the adaptor from the Yellow track bus cross the wire polarity to prevent cross-over tracks from shorting out the layout. If this is done, care must be taken that it is only done once for each power district, and it only applies to the Yellow track.



6.2.2. Wire for the Track Bus

Track bus cables should be constructed of 12-gauge cable with Anderson Powerpole 30A connectors on each end. *Track bus cables are recommended to be zip cable, from 1' to 10' in length to allow for up to 8' tables.* There must be a cable supplied for each circuit used in the layout. In a simple layout, this would be one cable for the Red track, and one for the Yellow track. When multiple inner circles are created in the layout, each of the inner circuits must be independently cabled. Track Buses should be identified by color as to which track they service to avoid crossing the circuits. A simple piece of colored tape or Velcro strap around each end of the Track Bus will accomplish this. *The following is a suggested set of color/circuit identification pairs:*

Circuit	*Color*
Red Track	*Red*
Yellow Track (Inner Loop 1)	*Yellow*
Inner Loop 2	*Blue*
Inner Loop 3	*Green*
Inner Loop 4	*Yellow & White*
Inner Loop 5	*Blue & White*
Inner Loop 6	*Green & White*

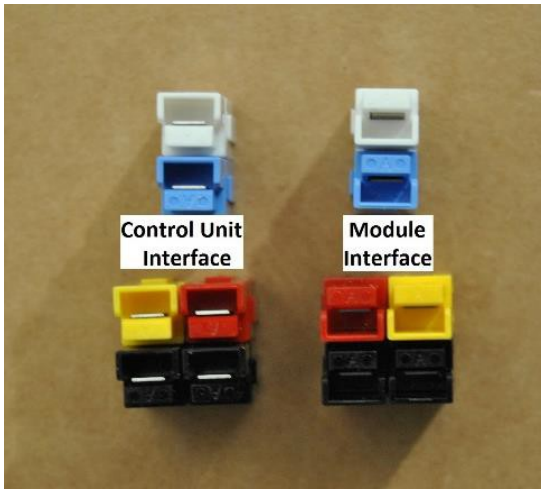
The color coding for the wires of a Track Bus are the following:
Inner Rail = Kato white wire = red wire (when using red/black zip cable)
Outer Rail = Kato blue wire = black wire (when using red/black zip cable)

6.2.3. Connecting Track Buses to Each Other

The Track Bus connectors to be used for T-TRAK layouts are the 30 Amp Anderson Powerpole connectors. The connector shell colors shall be blue and white for single cable bus wire or red/yellow and black if the buses are connected into a single cable. All connectors must be aligned vertically with the end facing the control unit configured with the white (or red/yellow) connector on top and the blue (or black) connector on the bottom. The opposite end of the cable will have the connectors reversed-stacked so that the ends of the Track Bus connect to each other and the colors match. But care must be taken to ensure that the blue or black connectors are always placed on the black or ground wire of the cable on the bus.

The following table is a summary of the Powerpole configuration.

Application	End	Stacking	Configuration
Single Bus	Control Unit	Vertical	White over Blue
	Module	Vertical	Blue over White
Red Track Bus	Control Unit	Vertical	Red over Black
	Module	Vertical	Black over Red
Yellow Track Bus	Control Unit	Vertical	Yellow over Black
	Module	Vertical	Black over Yellow



6.3. Control Unit

There are two predominant modes of control in model railroading, Direct Current (DC) and Digital Command Control (DCC). When setting up layouts for use by numerous people and clubs, it is often necessary to accommodate both modes of operation so that either mode can be used on a given track. This is facilitated by the fact that the 2 mainline tracks are independent of each other. Many clubs have built control systems that can handle either mode on each track. At their core, these systems simply have a DPDT toggle switch to change a given track from one power source to another.

In the DCC mode, several options exist to allow the operators to control their train(s). Most popular among these are the wireless throttles that allow the operator to follow their train around the layout. While DCC systems are proprietary for any given brand of system, there are “front end” components which can be used to interface with most major brands. Chief among these is the JMRI software available for most computer platforms and mobile devices. The brand of DCC system is not dictated by these standards, but unless there is a generic front-end component incorporated into the control unit, there should be enough throttles available for the number of trains that will be running on the layout simultaneously.

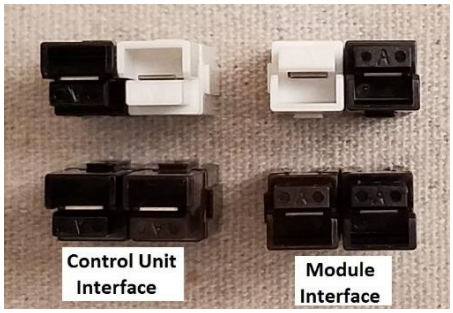
6.4. Accessory Bus

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, an Accessory Bus should be available. It is run in the trough parallel to the Track Bus(es), and color coded and configured as shown in the table. Local option can determine whether this bus will be 12VDC power or 15/16VAC power. If using DC, the cable should be labeled as a White cable. If using AC, the cable should be labeled as Brown.

In layouts with AC accessory power buses, modules that need DC must use a bridge rectifier circuit to convert the power to DC. Voltage regulators should be mounted on the module(s) as required to provide the correct voltage to specific accessories. (e.g., Miller Engineering signs require 4.5V AC/DC.)

Item	T-TRAK Standard	Recommended Practice
Bus Connectors	Anderson Powerpole 30A	*White=positive, black=neutral*
Bus Cable	12-gauge cable	*zip cable*
Supplied Power	12VDC or 15/16 VAC	*Each module must provide conversion to needed voltage for accessories*
Accessory Power Feed Connectors	Anderson Powerpole 30A	

Application	End	Stacking	Configuration
DC Accessory Bus	Control Unit	Horizontal	White on right, hood up
	Module	Horizontal	White on left, hood down
AC Accessory Bus	Control Unit	Horizontal	Brown on right, hood up
	Module	Horizontal	Brown on left, hood down



6.5. 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 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.

7. References

T-TRAK.org web site
T-TRAK Wikidot web site
Australian T-TRAK standards
North Raleigh Model Railroad Club Standards and Recommended Practices
The Unofficial T-TRAK Handbook web site (covering many aspects of layout design)
"T-TRAK PowerPole Bus Wires", Glenn McLain & Steve Jackson, Northern Virginia NTRAK