



# North Raleigh Model Railroad Club

## Application Note

### What You Need to Know About Kato Unitrack Turnouts

May 14, 2019

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

Kato produces several types of Unitrack turnouts — #2 wye turnout, #4 left and right, #6 left and right, and #6 crossovers (double, left and right). These are power-routing turnouts (the #4 can be optionally set for non-power routing), and the machines to operate the turnouts are pre-wired and built-in. Unlike most turnout machines that have three wires, Unitrack turnouts use a bi-polar solenoid drive that has only two wires, and are operated by reversing the polarity. The #4 turnout comes with a two-wire control cable with plugs at each end, while the #6 turnouts and the double crossover do not have a plug at the turnout end.

Note: If for any reason you remove the bottom from any of these turnouts be very careful. Leave the turnout on a table upside down the entire time you are working on it. The internal parts can easily fall out; something will almost certainly fall out of place. As soon as you remove the bottom plate check to see if anything looks out of place, and put it back.

The #6 turnouts are reliable and work well, and allow any N scale locomotives and rolling stock to run through them, whereas the #4 turnouts require “tuning” (see below) for reliable and derailment free operation. **Note that only #6 turnouts and/or the #6 crossovers can be used on the T-TRAK mainlines, with wye and #4 turnouts used on secondary and yard tracks where #6 turnouts may not fit.**

### Turnout Terminology & Technology

**Turnout:** The collection of fixed rails, moving points and switch mechanism that allows a train to be moved to a desired route.

**Points:** The moving rails that actually select the route.

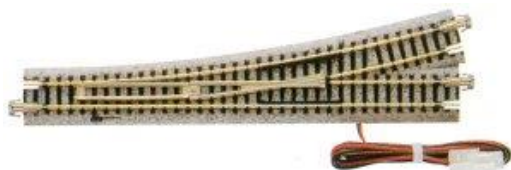
**Switch:** The mechanism that moves the points. Usually called a switch machine to distinguish from the electrical switch that may be part of controlling the switch. As mentioned above Unitrack turnouts are single-coil turnouts. There are also twin-coil switch machines (e.g. Atlas) and stall motor machines (e.g. Tortoise).

### Types of Unitrack Turnouts

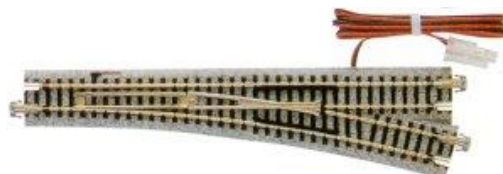
The standard center-to-center spacing of Unitrack is 33mm. The #4 turnouts and the #6 double crossover are designed to work with this 33mm spacing. The #6 turnouts are not designed to 33mm spacing, but instead to 49.5mm spacing.

#### Kato 20-202 #6 Left-Hand Turnout (EP718-15L)

#### Kato 20-203 #6 Right-Hand Turnout (EP718-15R)



Left-Hand Turnout



Right-Hand Turnout

These are power routing turnouts (similar to a Peco Electrofrog turnout), and are not DCC-friendly. The turnout power routes the frog rail. The point-to-stock rail gap is very large, so any rolling stock that stays on the track should have no trouble clearing the points.

This publication and its contents are Copyright © 2014 – 2019 by the North Raleigh Model Railroad Club.  
(The NRMRC is a Not-For-Profit Corporation incorporated in North Carolina.)  
The various logos and heralds shown here are the property of their respective organizations.

Since T-TRAK modules can be configured in any order, in order to ensure problem free operation and configuration insulated UniJoiners should be placed in all four rails at the frog end of the turnout, and track power feeders installed beyond the insulated UniJoiners.

Two #6 turnouts connected back-to-back as a crossover between two tracks creates a center-to-center spacing of 49.5mm, not the Kato standard 33mm; insulated UniJoiners are required in the diverging route between the two turnouts. The turnout itself can be physically hacked to make the spacing 33mm, but this is a project only for the advanced modeler.

### Kato-20-210 Double Crossover (310mm)



The #6 double crossover consists of four (4) #6 turnouts and one 15° crossing, and provides the standard 33mm center-to-center track spacing. The four turnout machines are wired to a single cable coming out of the turnout, so all four turnouts will switch at the same time.

Except for the two outside stock rails, nothing else is wired through on this crossover, i.e. it is isolated in the center of the crossover. Power feeds are required to the stock rails at the four stock rail legs of the crossover. Insulated UniJoiners are not needed anywhere on this crossover.

### Kato 20-220 #4 Left-Hand Turnout (EP481-15L) Kato 20-221 #4 Right-Hand Turnout (EP481-15R)



Left-Hand Turnout



Right-Hand Turnout

These turnouts can be set to be either power-routing or non-power routing, and are thus DCC friendly. They can be operated electrically, manually or as a spring switch. The frog can be powered or not as desired.

The **Power Routing** feature switches power in the direction the turnout is thrown, with the track in the other direction dead (just like a Peco Electrofrog turnout). The **Non-Power Routing** feature supplies power to both lines of track without interruption (just like a Peco Insulfrog turnout). **Frog Power ON** prevents the stalling of small locomotives while passing over the turnout, and is the recommended setting; the frog power is always power-routing to prevent short circuits. The factory settings for the #4 turnout are Power Routing and Frog Power ON.

When used as a Spring Switch set the turnout to Non-Power Routing and Frog Power OFF.

**Note: The power routing screws on the bottom of some #4 turnouts are mislabeled, as are the directions that are included with those turnouts.** If your #4 turnout is one of the mislabeled ones, please see the correct explanation below.



The frog itself can be set to either fully insulated or power-routing; for our T-TRAK purposes it should be set to power-routing using the screw on the bottom of the turnout — set to the ON position.

There are two additional screws for power routing, which do not do what you think. See the tables below; note the terminology may seem wrong, but it is correct in view of the mislabeling of the screws mentioned above.

### 1. Power Routing Functionality — When “Non-Power Routing” is Selected

	Straight Frog Rail	Divergent Frog Rail
Straight Route Selected	Powered w/appropriate polarity for that route.	Dead
Divergent Route Selected	Dead	Powered w/appropriate polarity for that route.

### 2. Power Routing Functionality — When “Power Routing” is Selected

	Straight Frog Rail	Divergent Frog Rail
Straight Route Selected	Powered w/appropriate polarity for that route.	Powered w/appropriate polarity for that route.
Divergent Route Selected	Powered w/appropriate polarity for that route.	Powered w/appropriate polarity for that route.

For most T-TRAK applications set the Frog power to ON and follow the settings in Table 2. This sets the turnout to be non-power routing, i.e. the same as a Peco Insulfrog turnout.

**If for any reason power routing is selected, i.e. Frog power on and the setting in Table 1, be sure to put insulated UniJoiners in all 4 rails at the frog end of the turnouts, and track power feeders installed beyond the insulated UniJoiners. This is good practice even if the turnout is set to non-power routing, and is mandatory in layouts where individual DCC track buses are used.**

### Special Care Must be Taken with #4 Turnouts on T-TRAK Modules

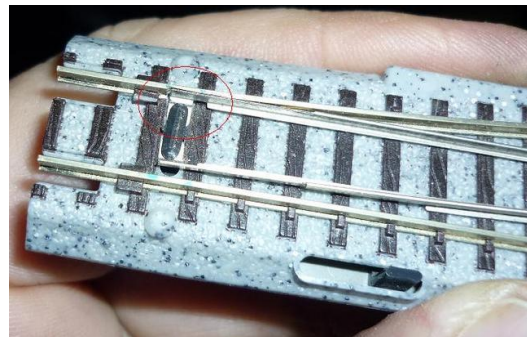
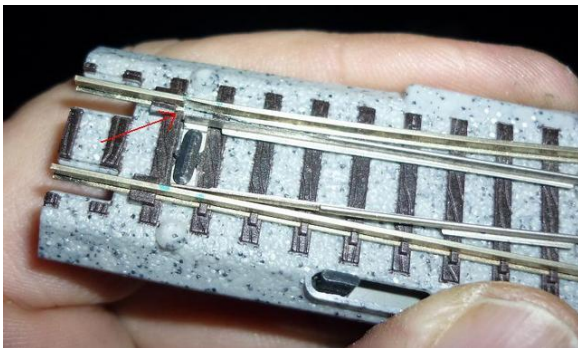
Special 62mm contoured sections of Unitrack are provided in the package for use at the frog ends of the turnouts, connected to either the straight or diverging route. The special tracks are S60L for a left-hand turnout and S60R for a right-hand turnout. This enables use of a standard section of Unitrack in the other route. Use of this special 60mm section in the straight route may mean that the overall track for the module could be 4mm short, depending on the configuration of the rest of the track. It may be necessary to modify the shape of a 64mm section to match the contour of the special 60mm section. Note the UniJoiner is also modified to fit properly.

### Operational Issues with Unitrack #4 Turnouts on T-TRAK modules

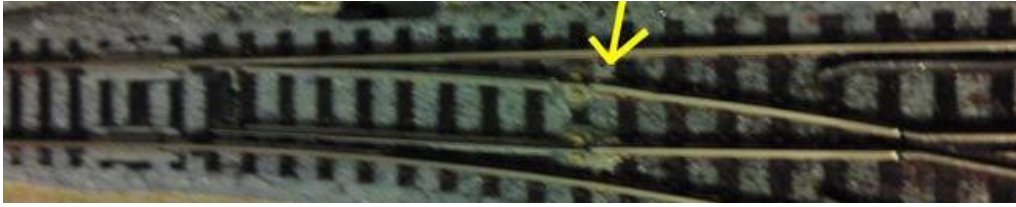
The Kato Unitrack #4 turnouts are sometimes prone to derailments, which can be fixed by tuning the points and the adjacent stock rails. A wheel can hit the end of the point, run up over the point and settle down on the wrong side, derailing the train.

The problem is the points are square, not a point, and there is no notch in the stock rails for the points to fit into. Do the following:

- Sharpen the points. While blocking and supporting the turnout points *carefully* file the points slightly so the points fit completely into the notch in the stock rail.
- File a notch in the adjoining stock rail for the points to sit into. This can be done by placing the points in the position opposite to the stock rail being filed, and *very carefully* carving a notch using a thin flat file. See the photos below for how the resulting notch should look.

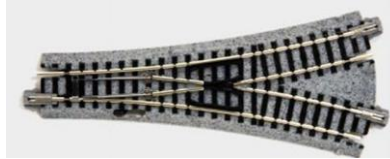


Sometimes derailments happen at the point marked by the arrow in the photo below because the end of the point where it pivots doesn't line up with the stock rail. *Very carefully* bend the stock rail slightly with a pair of long-nose pliers so the rails line up. Take special care not to damage the pivot point while doing this.



As well as tuning the #4 turnouts operation will be more reliable if the wheels on rolling stock are clean and rolling stock is weighted according to NMRA Recommended Practices.

### Kato 20-222 #2 Wye Turnout (EP481-19Y)

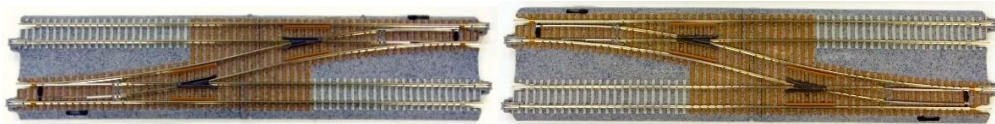


This turnout can be set to be either power-routing or non-power routing, and are thus DCC friendly. They can be operated electrically, manually or as a spring switch. The frog can be powered or not as desired.

The **Power Routing** feature switches power in the direction the turnout is thrown, with the track in the other direction dead (just like a Peco Electrofrog turnout). The **Non-Power Routing** feature supplies power to both lines of track without interruption (just like a Peco Insulfrog turnout). **Frog Power ON** prevents the stalling of small locomotives while passing over the turnout and is the recommended setting; the frog power is always power routing to prevent short circuits. The factory settings are Power Routing and Frog Power ON.

When used as a Spring Switch set the turnout to Non-Power Routing and Frog Power OFF.

### Kato 20-230 #6 Left-Hand Crossover Kato 20-231 #6 Right-Hand Crossover



The #6 left and right crossovers consist of two (2) #6 turnouts and provide the standard 33mm center-to-center track spacing. The two turnout machines are wired to a single cable coming out of the turnout, so both turnouts will switch at the same time.

Except for the two outside stock rails, nothing else is wired through on this crossover, i.e. it is isolated in the center of the crossover. Power feeds are required to the stock rails at the four stock rail legs of the crossover. Insulated UniJoiners are not needed anywhere on this crossover.

## References

- Documentation from T-TRAK official web site at <http://www.t-trak.org> and NTRAK Newsletters.
- Email communications with several people.
- Paul Musselman, "The Unofficial T-TRAK Handbook", at <http://T-TrakHandbook.com>
- Kato Unitrack information from Kato official web site at <http://www.katousa.com>.
- "Power Routing Correction" from Kato USA web site <http://www.katousa.com/consumers/N-4-turnouts.html>
- Wiring for DCC, Alan Gartner at <http://wiringfordcc.com>.
- T-TRAK Email list at Yahoo Groups
- Digitrax Email list at Yahoo Groups
- JMRI Users Email list at Yahoo Groups
- Kato Unitrack Email list at Yahoo Groups