

## Application Note #1

# Diamond Scale® Rotary Switch Conversion

## Converting the Diamond Scale® Dual-Stack Rotary Track Selector Switch For Use With The PTC Model III Indexing System



### OVERVIEW

This application note describes the conversion of the Diamond Scale® Rotary Track Selector Switch (or any similar multi-deck “break-before-make” rotary switch) for use with the PTC Model III Turntable Indexing System.

The Diamond Scale rotary switch utilizes a 24 position “dual stack” switch configuration where one deck (i.e., one set of rotary contacts) is used to select a track for indexing, and one deck is used for routing locomotive power to the stall selected.

With this configuration, the user selects a track to index to, and in doing so, also routes power to the selected track at the same time. This Application Note describes how to convert the track selection function of the rotary switch for use with the PTC, such that the dual action of track selection and track power routing can be preserved.

### PREPARATION

To do the conversion, it is necessary to use a PTC Model III configured for use with either a *Pushbutton Track Selector Module* (also known as the “PTS”) or *Chubb/Universal Track Selector Module* (abbreviated “CTS”). Confirm that this is the configuration you ordered. Additionally, if you are intending to index up to 24 tracks (the maximum supported by the Diamond

Scale rotary switch), it will be necessary to make sure that the PTC configuration you have purchased supports that number of tracks (the base PTC Model III supports indexing of only 12 tracks). Lastly, this conversion also requires an additional pushbutton switch, which will be termed a *Track Select Enable Switch*. This switch is a momentary switch, normally “open”. You can supply this switch to match others you may have on your control panel, or it can be optionally purchased from New York Railway Supply.

After you have confirmed that you have the required equipment on hand, review the installation documentation that is supplied with the *Pushbutton Track Selector Module* or *Chubb/Universal Track Selector Module* so that you are familiar with the general theory of operation of your system. The essence of the conversion will be to wire the rotary switch to the track selector such that from a functional point of view the PTC Controller will “think” that it has a conventionally wired *Pushbutton Track Selector* or *Chubb/Universal Track Selector* attached to it.

Lastly, prepare your control panel for installation of your track selector module and *Track Select Enable Switch*: refer to the *Pushbutton Track Selector Installation and User's Manual* for mounting details of the track selector. To install the *Track Select Enable Switch*, select a location convenient to the track selector or rotary switch (your preference) and drill an appropriate mounting hole. ♦**Tip:** Do not permanently install the track selector and *Track Select Enable Switch* at this time; simply test fit them for now (it is much more convenient to test fit now, prior to completing the wiring details).

### THEORY OF OPERATION

♦**Important:** There are two styles of the *Pushbutton Track Selector Module* available, which are basically the original and updated versions of the same thing. The original version is identified with the part number “ASSY 07-220” on it; the newer version has part number “ASSY 07-295” on it. If you have the original version, refer to Figure 1A, “Wiring Diagram: Rotary Switch Connections to Pushbutton Track Selector”. If you have the newer version, or are using the *Chubb/Universal Track Selector*, refer to Figure 1B, “Wiring Diagram: Rotary Switch Connections to Chubb/Universal Track Selector”.

When using the *Pushbutton Track Selector (PTS)* or the *Chubb/Universal Track Selector (CTS)*, an array of several pushbuttons is installed in your control panel. Each switch is wired individually to the track selector module. When one of the switches is pushed, the PTC Controller acknowledges the track selection and moves the turntable. In summary, this conversion will make the rotary switch function like an array of pushbuttons.

Normally if using the PTS, each switch has a pair of wires connected to one of the terminal block terminal pairs “A” through “L”. Refer to your *Pushbutton User's Manual* for complete details and normal wiring, and compare to wiring as shown in Figure 1A.

Normally if using the CTS, each switch has one wire connected in common with the other switches, with each of the other switch wires connected to one of the track selector terminals numbered “1” through “12” (or “1” through “24”, if your selector is so equipped). The common switch wire is connected to any one of the terminals labeled “G1” through “G4”. Refer to your *Chubb/Universal User’s Manual* for complete details and normal wiring, and compare to wiring as shown in Figure 1B.

In referring to Figures 1A and 1B, you will note that for the rotary switch conversion, only one pushbutton is used. This individual pushbutton switch is the *Track Select Enable Switch*.

The *Track Select Enable Switch* is normally “open”, meaning no contact is normally being made at its terminals. By connecting the *Track Select Enable Switch* to the common terminal of the rotary switch, when the *Track Select Enable Switch* is depressed a temporary circuit is made through one terminal of the rotary switch and it *appears* to the track selector (and the PTC Controller) that an individual “pushbutton” of a standard pushbutton array has been pushed.

The controller then interprets the track selection and performs it’s functions normally, transparent to the nature of the rotary switch.

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## CONVERSION STEPS

The conversion can be implemented by executing the following steps:

1. Cut the wires from the terminals of the Diamond Scale indexing system sensors, *not* from the rotary switch itself. The idea is to re-use these wires, if possible.
2. Similarly, cut the wire from the rotary switch common terminal at it’s destination at the Diamond Scale indexing system electronics. ♦**Tip:** All the Diamond Scale indexing electronics (sensors, motor, etc.) may be discarded at this point, if desired. They are not needed by the *PTC Model III*.
3. Group the wires in a bundle, noting which one is the common terminal wire, and re-route the wires to the location of the *Pushbutton Track Selector Module*. Trim the wires, if necessary, to an appropriate length.
4. Strip the ends of the wires of the rotary switch terminals approximately 1/8". Strip the end of the common wire of the rotary switch terminal approximately 1/4". ♦**Tip:** If possible, "tin" the ends of the wires with solder to aid in reducing stray wire strands during subsequent handling.
5. Install the *Track Select Enable Switch*:
  - Install 1/2" piece of heat shrink tubing (supplied, if you ordered the optional switch from NYRS) over the end of the rotary switch common wire.
  - Solder the common wire to one terminal of the *Track Select Enable Switch*
  - Select a piece of scrap wire of appropriate length; strip one end 1/4", tin it, and solder to the other terminal of the *Track Select Enable Switch*. This wire will be

referred to as the *Enable Switch Wire*. Strip the other end of the *Enable Switch Wire* 1/8" and tin it.

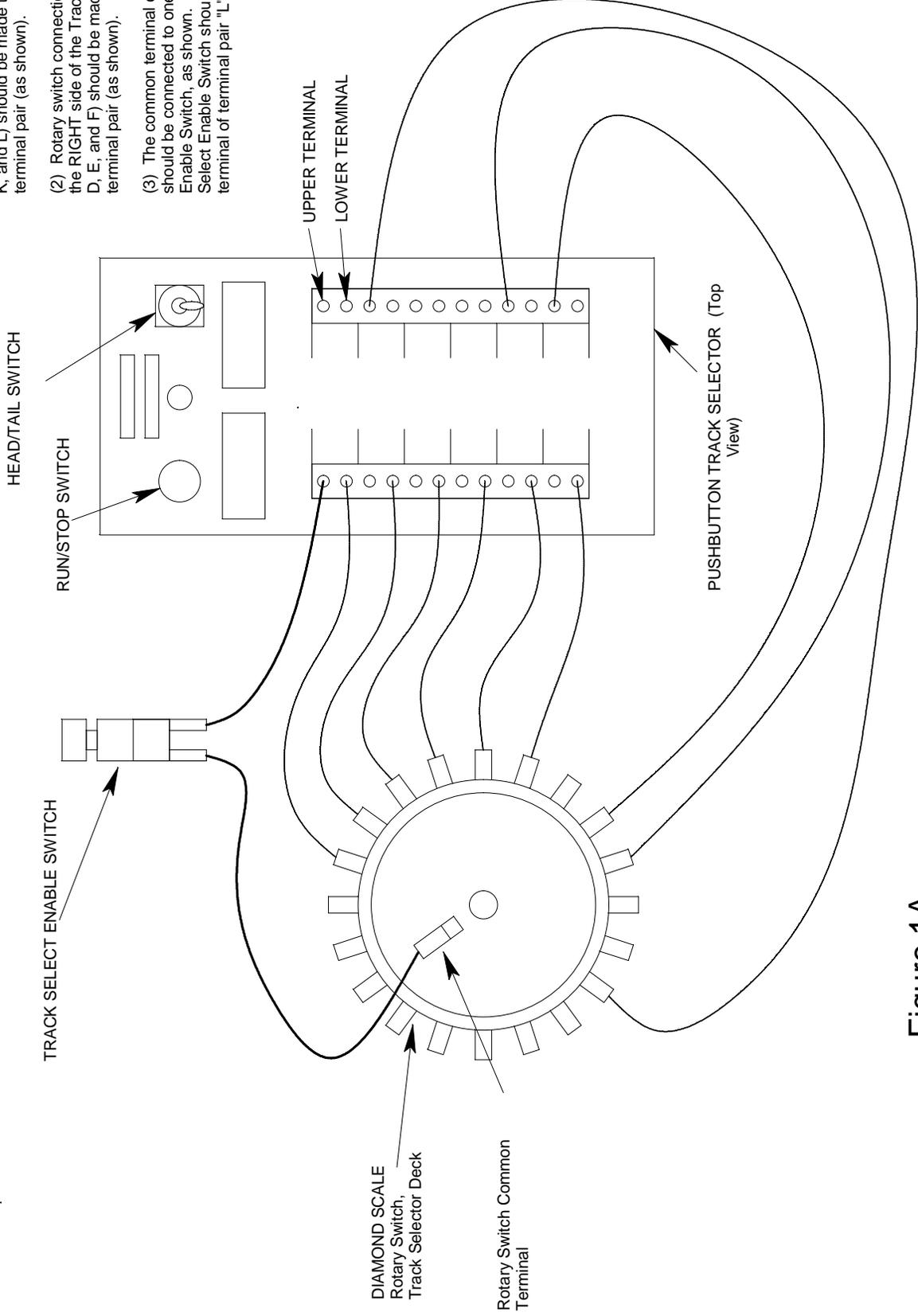
- Slip the another piece of 1/2" piece of heat shrink tubing (again, optionally supplied) onto the other end of the *Enable Switch Wire*, and work it up onto the switch terminals. Work the other piece of heat shrink onto the *Enable Switch* terminal as well.
  - Using a heat gun, match, or butane flame, *CAREFULLY* shrink the heat shrink tubing onto the *Track Select Enable Switch* terminals. Heat just enough to shrink the tubing.
- 6) Depending on the selector, connect the *Enable Switch Wire*:
    - (A) If using a PTS, connect the wire to the UPPER terminal of Terminal Pair "L" on the *Track Selector Module* (refer to Figure 1A).
    - (B) If using a CTS, connect the wire to any one of the terminals labeled “G1” through “G4”.
  - 7) Depending on the selector, connect the individual rotary switch terminal wires. Begin with any convenient rotary switch terminal wire. Although it does not matter which wire you choose, you may wish to make a note of which wire you’ve chosen and what terminal you are routing it to, if debugging or maintenance of the system wiring ever becomes needed:
    - (A) If using a PTS, connect the first rotary switch wire it to the LOWER terminal of Terminal Pair "L". Continue with the next convenient rotary switch terminal wire, connecting it to the LOWER terminal of Terminal Pair "K". Continue with the rest of the wires, using the remainder of the left side terminal blocks, "J" through "G". When completed with the left hand terminal block pairs, begin using the right hand terminal block pairs "F" through "A". Note: When wiring to the right hand terminal block pairs, use the UPPER terminal of the terminal block pair. Refer to Figure 1A. *Note:* If using a *Pushbutton Track Selector Expansion Module*, continue wiring its terminal blocks while observing the same left hand/right hand, lower/upper terminal block pair wiring convention.
    - (B) If using a CTS, connect the rotary switch wire to any terminal numbered “1” through “12” (or “1” through “24”, if your selector is so equipped). Continue with the next convenient rotary switch terminal wire, connecting it to any of the remaining numbered terminals. Refer to Figure 1B.
  - 8) After wiring is completed, double check connections, and install the *Track Selector Module* in your control panel (refer to your respective *Pushbutton* or *Chubb/Universal Track Selector Installation and User’s Manual*).

The conversion is now ready for operation!

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**IMPORTANT:**

- (1) Rotary switch connections made to the terminal blocks on the LEFT side of the Track Selector (terminal pairs G, H, I, J, K, and L) should be made to the LOWER terminal of the terminal pair (as shown).
- (2) Rotary switch connections made to the terminal blocks on the RIGHT side of the Track Selector (terminal pairs A, B, C, D, E, and F) should be made to the UPPER terminal of the terminal pair (as shown).
- (3) The common terminal of the Diamond Scale rotary switch should be connected to one terminal of the Track Select Enable Switch, as shown. The other terminal of the Track Select Enable Switch should be connected to the UPPER terminal of terminal pair "L", as shown.



**Figure 1A**  
 Wiring Diagram: Rotary Switch  
 Connections to Pushbutton Track  
 Selector



◆**IMPORTANT!** If using a PTS, be sure the rotary switch to track selector connections are completed as shown in Figure 1A, using the *upper* and *lower* terminals of the terminal block pairs as shown. If the connections are not made properly, a short circuit will occur and the controller will flash a "R-R-Y-Y-Y-" pattern during Power-On Self Test. See *Pushbutton Track Selector Installation and User's Manual* for additional information on power-on self test checks. While the track selector will not be damaged by the short circuit condition, it is not recommended that the *Track Selector* be operated in such a state for periods longer than 5 minutes.

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#### Wiring Hints:

- ❑ It is not necessary to connect the rotary switch wires in any specific order with respect to the *Track Selector Module*. However, it will aid in trouble-shooting (if the need arises) to keep track of what rotary switch wires are wired to which terminal block pairs.
- ❑ It is not necessary to use all terminals of the rotary switch, or all terminals of the track selector module; rotary terminals and track selector terminals may remain unused.
- ❑ If using a *Pushbutton Track Selector Expansion Module*, it is recommended that all terminal pairs on the primary *Pushbutton Track Selector Module* be used first.

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#### PROGRAMMING THE PTC WITH DIAMOND SCALE ROTARY SWITCH

To operate, follow the standard programming steps as outlined in the *Pushbutton Track Selector Installation and User's Manual*, or *Chubb/Universal Track Selector Installation and User's Manual*, except whenever the instructions indicate to select a track by pressing a track select pushbutton (for example, Steps 2e, 3e, etc.), do so by doing the following:

- Turn the Rotary Switch to point to the track location desired.
- Press and hold the *Track Select Enable Switch*. This will close the rotary switch circuit, resulting in the *Status Indicator* flashing green to acknowledge the track selection. This is as would happen if a track selection pushbutton were pushed in the standard pushbutton configuration.
- After the *Status Indicator* begins flashing red, release *Track Select Enable Switch*, as described for the standard track selection pushbutton.

All other aspects of programming remain unchanged, as outlined in the *Pushbutton* or *Chubb/Universal Track Selector Installation and User's Manual*.

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#### OPERATING THE PTC with DIAMOND SCALE ROTARY SWITCH

To operate, follow the standard steps as outlined in the *Pushbutton* or *Chubb/Universal Track Selector Installation and User's Manual*, except to select a track after setting the *Head/Tail* switch:

- Rotate the Rotary Switch to the track location desired
- Push the *Track Select Enable Switch*. This will result in the *Status Indicator* flashing yellow, as would happen if a track selection pushbutton were pushed in the standard pushbutton configuration. Release the *Track Select Enable Switch*.
- While the *Status Indicator* is flashing yellow, press the *Start/Stop* switch to confirm the track selection. The *Status Indicator* will flash green, and operation will continue normally as outlined in the standard *Pushbutton Track Selector Installation and User's Manual*.

All other aspects of operation remain unchanged, as outlined in the *Pushbutton Track Selector Installation and User's Manual*.

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#### FOR MORE INFORMATION

Your comment and feedback on this document are valuable and are of interest to us. To forward your comments, for answers to your questions, or for more information on the **PTC Model III**, call or write New York Railway Supply, Inc.



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