



Electronics for Model Railroads

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TC-1, TC-2 TURNOUT CONTROLS

GENERAL DESCRIPTION: The CIRCUITRON **TC-1** and **TC-2** Turnout Controls provide automatic activation of any dual-coil type switch machine when used in conjunction with any CIRCUITRON Detection Circuit. Both units provide short, high-current pulses to the switch machine, protecting the coils from burnout. The **TC-1** has two control terminals and may be used to control both directions of a turnout. In this way, the output from one Detection Circuit may be used to throw a turnout one way, and the output of another Detection Circuit may be used to throw the turnout back. The **TC-2** is CIRCUITRON's Turnout Direction Alternator and it has only a single control terminal. When the control terminal is connected to a Detection Circuit, the switch machine will be thrown one way the first time a train is detected, and then the switch machine will be thrown the opposite way the next time a train is detected. In this way, trains can be made to travel alternate routes around a layout, automatically. Both the **TC-1** and **TC-2** require a 12 - 18 volt AC or DC input for proper operation. The outputs on the **TC-1** and **TC-2** can activate one or two switch machine coils at the same time depending upon the style of switch machine and the input voltage of the circuits.

CIRCUIT DESIGN: Both the **TC-1** and **TC-2** have capacitor discharge type outputs for high-current snap-action of switch machines controlled by them. The capacitor is charged by a 200 ohm resistor which will limit current to the switch machine should a circuit failure occur. The **TC-1** contains two identical one-shot multivibrator circuits that produce an output pulse of fixed length when the corresponding control terminal is grounded. This output pulse drives a power darlington transistor connected common emitter which connects the coil of the switch machine(s) to ground for the duration of the pulse. The capacitor discharges rapidly through the switch machine coil and then recharges in 2-3 seconds to await the next cycle. The **TC-2** outputs are the same as the **TC-1**'s, but the **TC-2** also contains a toggle flip-flop circuit that changes states each time the input is activated. There is additional conditioning incorporated in the circuit in the input section that is used to clean up any oscillations that might be present from the output of the Detection Circuit that might create false triggering of the circuit.

INSTRUCTIONS: Please refer to the diagrams for labeling and Opto-Sensor locations. The **TC-1** or **TC-2** can be connected with .110" solderless connectors or by soldering leads directly to the terminals on the printed circuit board. If soldering, use a small pencil-type iron and electronics-grade rosin core 60/40 solder (available at Radio Shack). Use only as much heat as necessary to obtain a good joint and do not wiggle the terminal until the solder has cooled completely.

- 1) Mount the circuit board in a convenient location near the switch machine to be controlled. A section of CIRCUITRON's **PCMT** makes this a simple task, or the mounting pads may be drilled out at the corners of the board and the circuit mounted with screws.
- 2) Connect a 20 gauge or heavier wire to the common terminal on the switch machine (see specific instructions packed with your switch machine) and run it to the terminal on the circuit board labeled **[OUT]**.
- 3) Connect a 20 gauge or heavier wire to one of the remaining terminals on the switch machine and run it to the terminal labeled **[1]** on the circuit board.
- 4) Connect a 20 gauge or heavier wire to the remaining terminal on the switch machine and run it to the terminal labeled **[2]** on the circuit board.
- 5) Connect the Control Terminals (**[C1]** & **[C2]** on the **TC-1**, **[C]** on the **TC-2**) to the output(s) of any CIRCUITRON Detection Circuit using light gauge wire. The **DT-4** is ideal for this application. The Opto-Sensor supplied with the Detection Unit should be located at the point where it is desired to have the switch machine activated. In this way, the switchpoints will be thrown when the first piece of rolling stock passes over the Opto-Sensor.
- 6) Connect a source of 12-18 volts AC or DC to the INPUT Terminals. *CAUTION: See Notes Below*
- 7) Manual pushbuttons may be connected as shown in the diagrams below.

NOTES: 1) Input *must* be DC if the Turnout Control and the **DT-4** are to be powered by the same supply. 2) Maximum power will be attained in the Turnout Control Circuit when it is powered by an AC or *unfiltered* DC supply. Use of a filtered or regulated supply is not recommended since inadequate power may be stored in the capacitor with this type of supply. Separate supplies for the Turnout Control and the **DT-4** may be used if they share a common ground connection as shown in *Figure 2*. 3) Pushbuttons for manual operation may be added to the Turnout Controls by connecting them between the *Negative* power supply connection and the Control Terminal(s) [**C1**, **C2** or **C**] as shown in *Figure 1*. If an AC supply is being used, the Negative connection is obtained by hooking the wire to the Negative lead on the large capacitor near the Control terminals on the board (see *Figure 2*.) 4) The **TC-1** and **TC-2** circuits may be triggered by reed switches mounted in the roadbed and activated by a magnet mounted below the locomotive. Connect the reed switch between (-) and the Control Terminal as in the Manual Pushbutton example above. The Detection Unit such as the **DT-4** is *not* needed in this case. 5) Please note the direction of train traffic necessary with the **TC-2**. Traveling in the opposite direction may cause derailments when the train crosses the Opto-Sensor. This is not a factor with the **TC-1** and bi-directional traffic is possible. 6) If the switch machine throws in the wrong direction in the **TC-1** hookup, reverse the [1] and [2] leads.

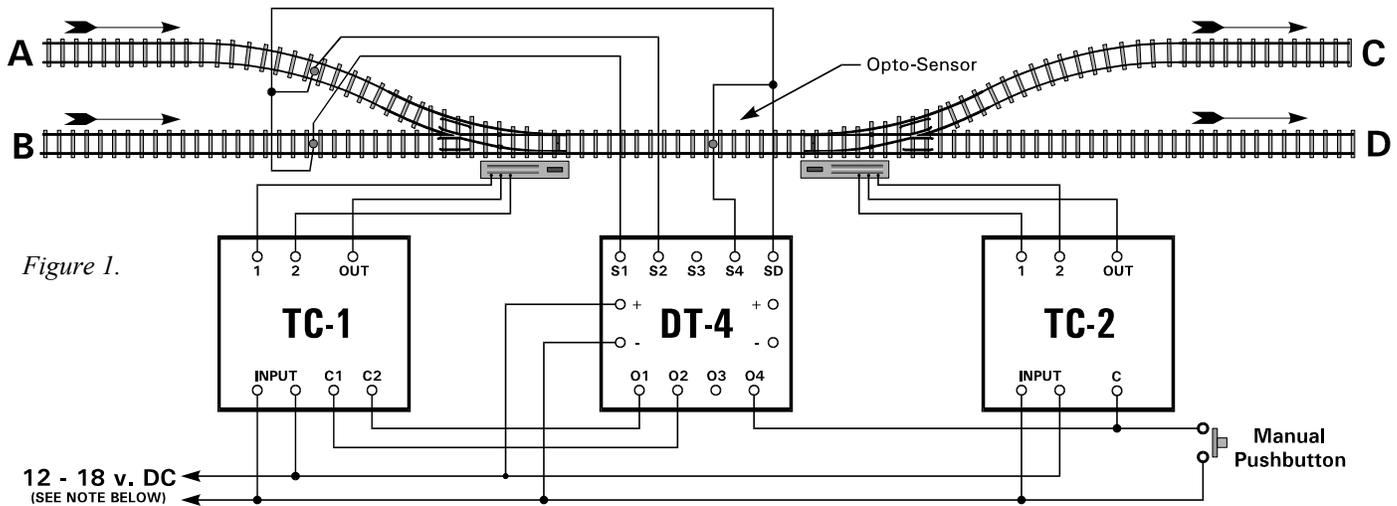
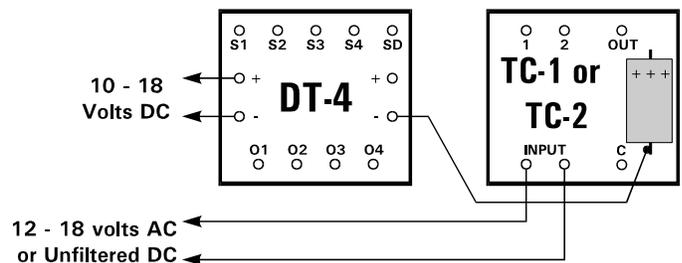


Figure 1.

In the application in *Figure 1*. above, a train approaching the turnout on track A will throw the points automatically so as to prevent derailment. Similar action will occur for trains approaching on track B, but the points will be thrown the opposite way. As the train proceeds and approaches the second turnout, the **TC-2** will throw the points to direct the train onto track C or D. The next train to approach this turnout will activate the **TC-2** which will then throw the points the opposite way. This action will continue with each successive train taking track C and D alternately.

Figure 2. Connecting a common ground between different power supplies.



WARRANTY

CIRCUITRON warrants this device against defects in materials and workmanship for a period of one year from the date of purchase. This warranty covers all defects incurred in normal use of the device and does not apply in the following cases:

- a) damage to the device resulting from abuse, mishandling, accident or failure to follow operating instructions.*
- b) if the device has been serviced or modified by other than the CIRCUITRON factory.*

EXCEPT AS MENTIONED ABOVE, NO OTHER WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED INCLUDING MERCHANTABILITY, ON THE PART OF THE UNDERSIGNED OR ANY OTHER PERSON, FIRM OR CORPORATION, APPLIES TO THIS DEVICE.