Circuitron
Electronics for Model Railroads
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DT-3

GRADE CROSSING DETECTOR
SINGLE DIRECTION

GENERAL DESCRIPTION: The CIRCUITRON **DT-3** is an advanced, integrated circuit design detection circuit which utilizes CIRCUITRON'S proven Opto-Electronic system. This circuit will provide true-prototype grade crossing action for all *single direction* applications. The **DT-3** is entirely independent of the track power and may be used for all scales and methods of power including AC track power or command control systems. There are absolutely no modifications to any piece of rolling stock necessary. The output from the **DT-3** provides a connection to common (ground) that can be used to control DC powered devices such as flashers, bells, relays, etc. The output has a current capacity of 250 ma. The **DT-3** requires a 10 - 18 volt AC or DC input.

CIRCUIT DESIGN: The **DT-3** uses a quad operational amplifier to provide all the functions of detection and logic necessary. A small current flows through the two Opto-Sensors and is applied to one side of a current comparator circuit. When the Sensor is shaded by a passing train, the current decreases, and the output of the comparator turns on. These signals then trigger a bi-stable latch whose output is used to drive the output transistor connected open collector.

INSTRUCTIONS: The **DT-3** can be connected with .110" x .032" solderless connectors (available from CIRCUITRON) 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 from 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. A section of CIRCUITRON'S **PCMT** can be used for simple, snap-in mounting of the circuit board or you may drill holes in the mounting pads in the corners of the board and mount the **DT-3** with screws and standoffs.

1) Mount the **DT-3** in a convenient location under the layout in the vicinity of the grade crossing. A section of CIRCUITRON'S Printed Circuit Mounting Track (**PCMT**) makes this a simple task .

2) Mount the two Opto-Sensors following the instructions included with them. One Opto-Sensor should be located where you want the approaching train to start the signals flashing. The other should be located a short distance beyond the crossing so that the signals will remain on until the last car of the train has passed.

3) Connect one lead from each Opto-Sensor together with light gauge wire, and then run that wire to the Sensor Drive Terminal **[SD]** on the circuit board.

4) Individual wires are then run from the remaining leads on each of the Opto-Sensors to the Sensor Terminals **[S1]** and **[S2]** on the circuit board. Be sure that the wire from the Opto-Sensor just beyond the crossing connects to **[S2]**.

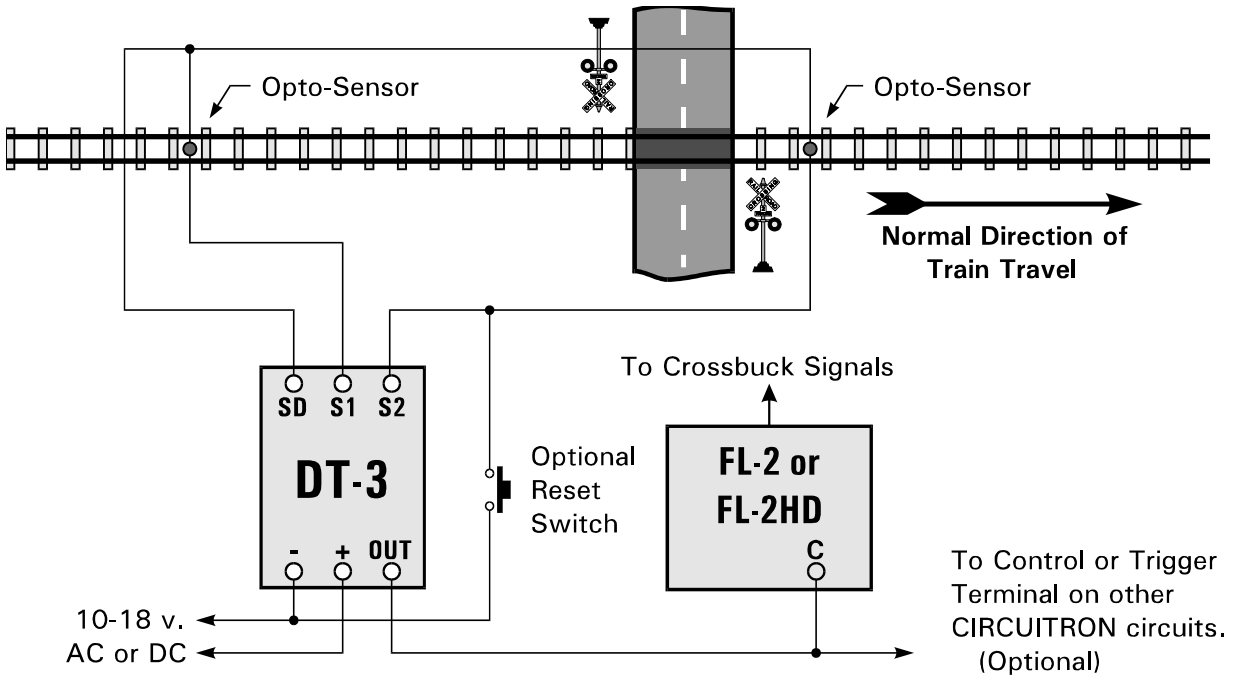
5) Connect a wire to the Output Terminal **[OUT]** and run it to the Control Terminal **[C]** on the CIRCUITRON device that you want the **DT-3** to control (Flasher, Bell Ringer, Relay, Turnout Control, etc.) You may connect the **DT-3** Output to more than one external CIRCUITRON device if you so desire. NOTE: The **DT-3** Output provides a connection to Common (Ground) when a train is detected. The maximum current capability of the Output is 250 ma. This Output may be used to control other manufacturer's products as long as they are DC powered and the current capability is not exceeded.

6) Connect a 10 - 18 volt AC or DC source to the Input Terminals [+] and [-]. Observe proper polarity if a DC source is used. ***NOTE:*** *If an AC source is used to power the* ***DT-3*** *as well as a CIRCUITRON Flasher unit, the inputs must be connected in phase for proper operation.* To avoid problems, connect all the [+] inputs together first, and then connect all the [-] inputs together. Lastly, connect a source of AC to the string of devices. Use of a DC Source eliminates these concerns and is highly recommended.

ADJUSTMENTS: All adjustments should be made with room lighting at the level it will be at during operating sessions of the layout. Changes of room lighting may necessitate readjustment of the Sensitivity Controls.

1) Making certain that no piece of rolling stock is shading either of the Opto-Sensors, adjust Sensitivity Control **P1** completely to its clockwise extreme so that indicator lamp **L1** is off.
2) Rotate Sensitivity Control **P2** fully *counter-clockwise* and then rotate it fully clockwise. The output of the **DT-3** should now be *off* and thus any device connected to the **DT-3** should also be off.
3) Slowly rotate **P2** *counter-clockwise* again until the output turns on. Now, rotate **P2** carefully back clockwise until the output *just goes off.* **P2** is now set.
4) Rotate **P1** *counter-clockwise* until the Indicator Lamp **L1** on the circuit board comes on. Rotate **P1** carefully back clockwise until Lamp **L1** *just goes off.* **P1** is now set. However, the latching action of the circuit will maintain the output on at this time.
5) Run a train past the crossing and the signals should go off after the last car clears Opto-Sensor 2 just beyond the crossing. Check to make sure that the signals start flashing properly as the train approaches the crossing. If not, repeat steps 1 - 4.

NOTE: *When power is first applied to the layout at the beginning of each operating session, the signals may come on, requiring a "dummy" run past the crossing to turn them off. This is normal. In addition, a train passing through the crossing backwards, as when backing up, will leave the signals flashing. A manual pushbutton may be connected between* ***[S2]*** *and [-] as shown in the diagram to reset the circuit.*



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.

CIRCUITRON, INC.