



Electronics for Model Railroads

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FL-3

HD ALTERNATING FLASHER

GENERAL DESCRIPTION: The Circuitron **FL-3** is a complete solid state flasher with three independent outputs that can be used to alternately flash sets of lamps or LEDs at three separate locations. Three control terminals are provided for use with CIRCUITRON Detection Units to allow individual control of each of the locations. Alternately, the three control terminals may be connected together for increased current capability to provide a heavy duty flasher with a maximum capacity of 750 ma. on each side. This is sufficient to alternately flash a total of 30 grain of wheat lamps. The **FL-3** contains on-board regulation to allow the unit to be powered by 10-18 volts AC or DC. Best performance will be achieved, however, when a DC power supply is used to power the **FL-3**. A CIRCUITRON **PS-1** or **PS-2** is ideal. Mounting pads are provided on all four corners of the circuit board, or for the greatest ease of mounting, a section of CIRCUITRON's Printed Circuit Mounting Track (**PCMT**) may be used.

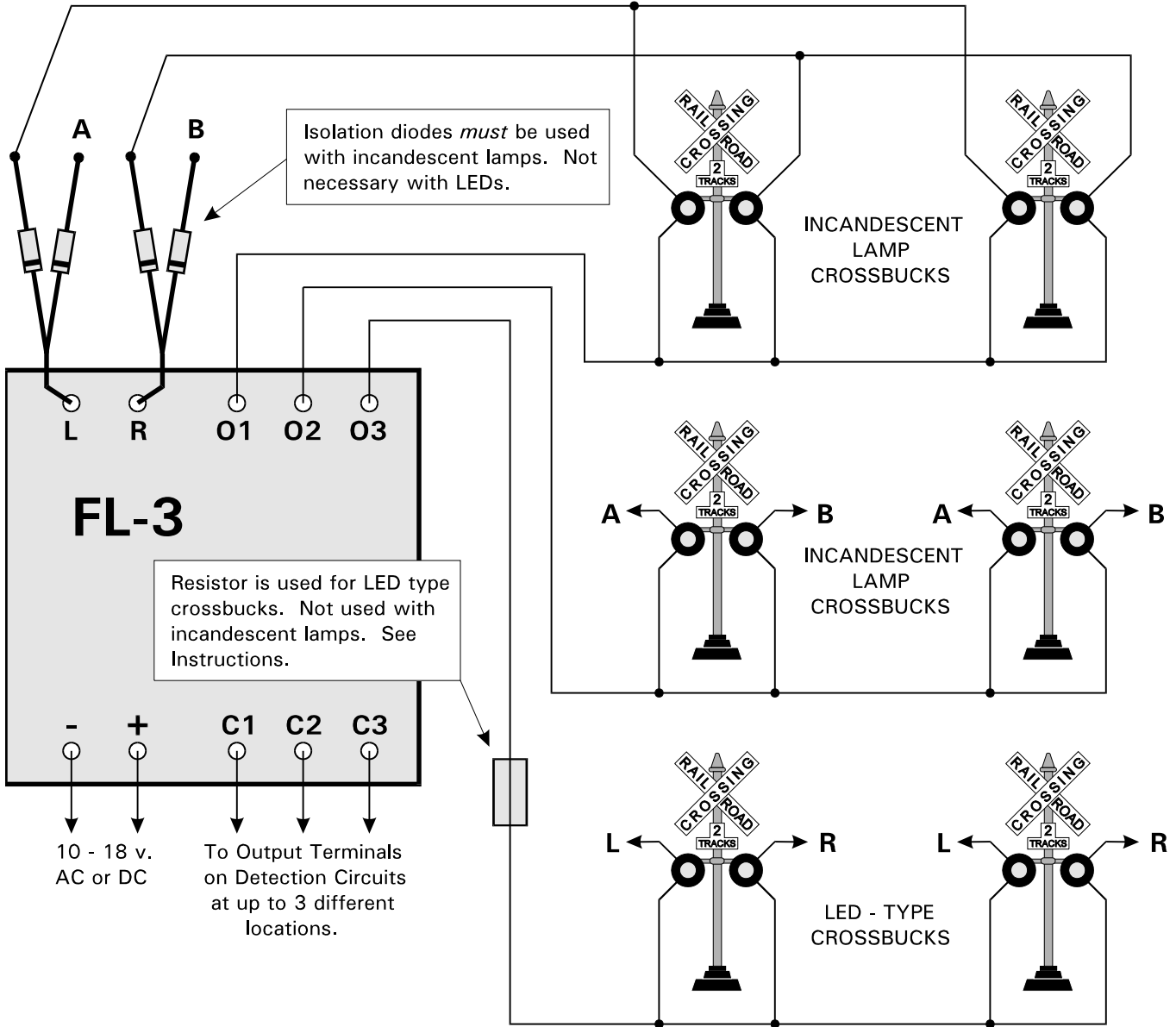
CIRCUIT DESIGN: The CIRCUITRON **FL-3** utilizes a low-power CMOS integrated circuit connected as a free-running astable multivibrator. A diode in conjunction with a zener and a filter capacitor provide a regulated source of filtered DC for the IC. The complimentary outputs from the integrated circuit drive two darlington power transistors which are connected common emitter. Positive output to the loads is gated by three transistors. A ground connection on the respective Control Terminal [**C1**, **C2**, or **C3**] turns the transistor on and allows current to flow from the Output Terminal [**O1**, **O2**, or **O3**] to the load.

INSTRUCTIONS: The CIRCUITRON **FL-3** 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) Connect a wire from one of the Output Terminals [**O1**, **O2**, or **O3**] to one side of all the lamps or LEDs to be flashed at one crossing or location. *NOTE: If LEDs are to be used, a proper value current limiting resistor must be included in this connection. See the drawing and Table 1 for proper values and location of this resistor. In addition, LEDs must be connected with the proper polarity for correct operation. The Output Terminals on the **FL-3** are positive and must connect to the anode of the LEDs. The cathode is the other terminal on the LEDs and is usually marked by a flat spot or notch in the case.*
- 2) Connect the remaining leads of the left side lamps together and run a wire from them to the terminal labeled [**L**]. *NOTE: If incandescent lamps are being used, and you intend to control more than one set individually with the **FL-3**, a blocking diode must be included at the connection to the [**L**] terminal to prevent interaction between the locations. Six (6) diodes are provided. Connect the cathode (banded end) of the diode to the terminal on the circuit board and then your wire lead to the remaining lead of the diode. These diodes are not needed if all LEDs are to be flashed.*
- 3) Follow instruction 2 with the right side lamps.
- 4) Connect a wire to the Control Terminal [**C1**, **C2**, or **C3**] which has the same number as the output terminal which you used in Step 1 above. Run this wire to the output of a CIRCUITRON Detection Unit such as the **DT-1**, **DT-2**, **DT-3** or **DF-1**. For manual operation, connect a switch between the Control Terminal and [-] on the circuit board input.
- 5) Connect the input terminals [+] and [-] to a 10-18 volt power source. Use the same source as your CIRCUITRON Detection Units and observe proper polarity.
- 6) To use the **FL-3** as a Heavy-Duty Flasher for a single location, connect all three Control Terminals together, and connect up to 250 ma. of lamps to each output as above. *DO NOT EXCEED 250ma. PER OUTPUT, A TOTAL LOAD OF 750ma.*

Table 1: LED Limiting Resistor Values in Ohms

SUPPLY VOLTAGE	Number of LEDs on Each Side		If you wish to connect more than two LEDs to each side, wire them singly or in pairs with separate resistors to each.
	1	2	
10 volts	820, 1/2 watt	470, 1/2 watt	
12 volts	1.0K, 1/2 watt	560, 1/2 watt	
15 volts	1.2K, 1/2 watt	680, 1/2 watt	
18 volts	1.5K, 1/2 watt	820, 1/2 watt	



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.