



Electronics for Model Railroads

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FL-2, FL-2HD

ALTERNATING FLASHER

GENERAL DESCRIPTION: The CIRCUITRON **FL-2 / FL-2HD** is a complete solid state flasher that will alternately flash two 250 ma. loads (500 ma. for **FL-2HD**). The **FL-2 / FL-2HD** contains on-board regulation to allow the unit to be powered by 10 - 18 volts AC or DC, and has a control terminal for use with CIRCUITRON detection circuits. Mounting pads are provided on all four corners of the printed circuit board, or the board may be mounted by snapping it into a section of CIRCUITRON'S Printed Circuit Mounting Track (**PCMT**).

CIRCUIT DESIGN: The CIRCUITRON **FL-2 / FL-2HD** 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 source of filtered DC for the IC. The complementary outputs from the integrated circuit drive two transistors (Q1 & Q2). A ground connection on the control terminal (C) enables output from the IC to the transistors. Returns from the loads are alternately grounded by Q1 and Q2 connected common emitter.

INSTRUCTIONS: The **FL-2 / FL-2HD** 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 **FL-2 / FL-2HD** with screws and standoffs.

- 1) Connect a wire from the terminal labeled **[OUT]** to one side of all the lamps or LEDs to be flashed. *Note: If LEDs are to be used, a proper value limiting resistor must be included in this connection. In addition, the proper polarity of the LEDs must be observed. (See Table 1 and the instructions packed with the LEDs or signals.)*
- 2) Connect the remaining leads of the left lamps together and run a wire to the terminal labeled **[L]**.
- 3) Connect the remaining leads of the right lamps together and run a wire to the terminal labeled **[R]**.

*NOTE: If you are using LEDs, the return leads **[R & L]** must be connected to the terminal on the LEDs denoted by a flat spot or notch in the plastic. This is the cathode (-) terminal.*

- 4) Connect a wire to the control terminal **[C]** and run it to the output of a detection circuit such as the CIRCUITRON DT Series that provides a grounded output when a train is detected. For instructions on connecting the CIRCUITRON **FL-2 / FL-2HD** to detection circuits that provide a logic high (positive voltage) output, consult the factory. For manual operation, connect a switch between the **[C]** terminal and the [-] terminal. For continuous flashing, connect a jumper between the **[C]** terminal and the [-] terminal.
- 5) Connect a 10 - 18 volt source, either AC or DC to the terminals labeled [-] and [+]. If DC is used, observe proper polarity.

CAUTION

*Make certain that the total load applied to the left or right return terminals **[L]** and **[R]** does not exceed 250 ma. each (500 ma. for the **FL-2HD**). Exceeding the rated specifications of the **FL-2 / FL-2HD** will result in overheating of the output transistors and probable failure of the device(s). This constitutes abuse and is not covered by warranty.*

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	

Figure 1: Typical Installation

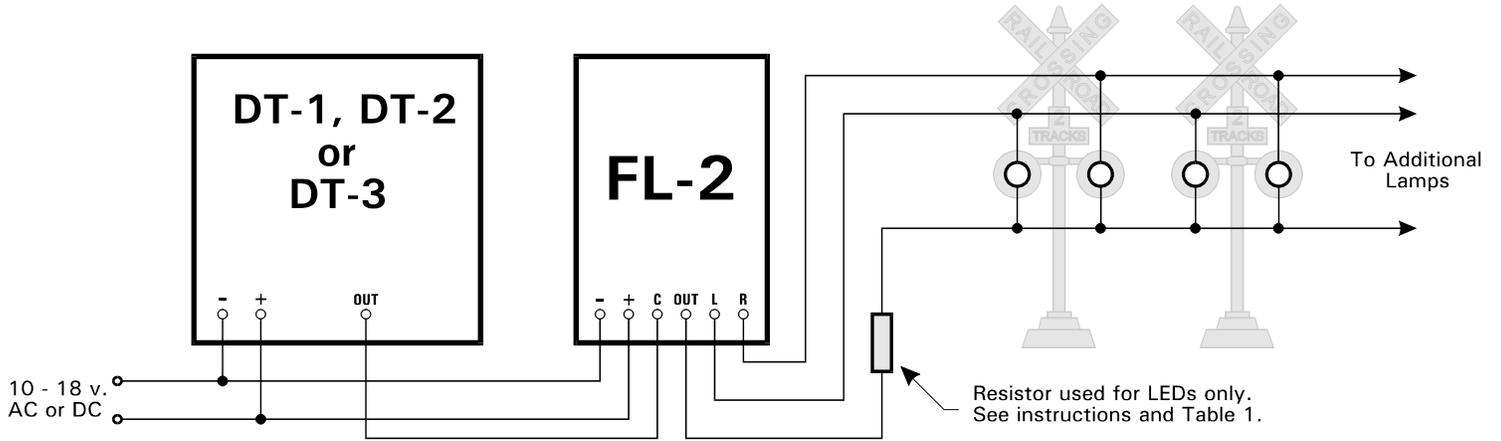
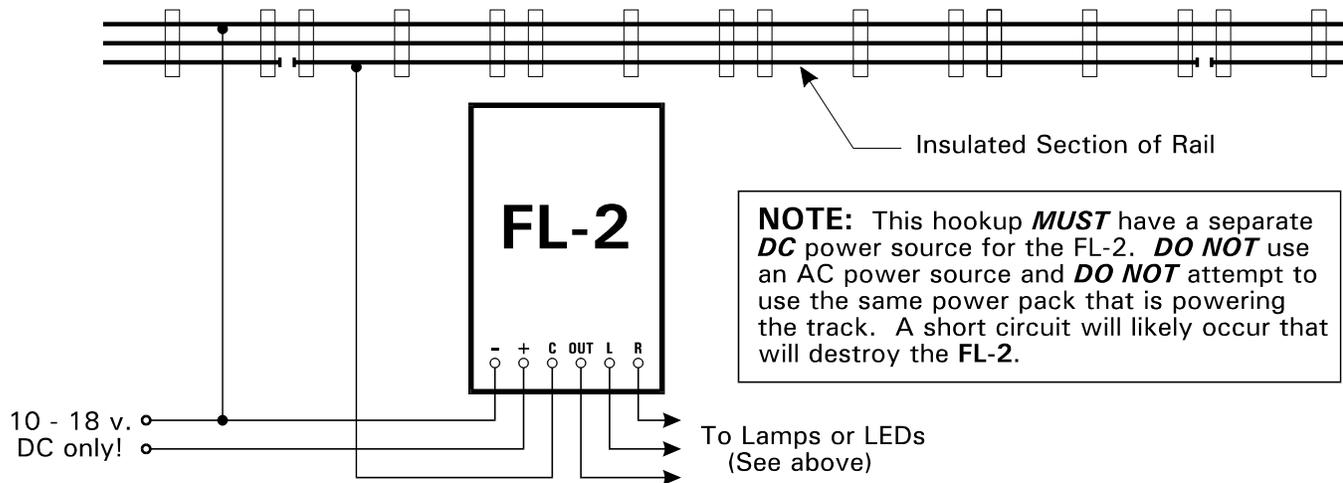


Figure 2: O-27 3 Rail Installation (No Detection Unit Needed)



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.