



Electronics for Model Railroads

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AR-2 rev. B

Automatic Reverse Circuit with Adjustable Time Delay

GENERAL DESCRIPTION: The CIRCUITRON **AR-2** is a sophisticated, integrated circuit design, automatic polarity reverser for use on point to point layouts in any scale. The **AR-2** provides 5 amp reversing capacity and also incorporates an adjustable time delay circuit that will stop a train at each reversing point for a set period of time before reversing the direction. This time delay is adjustable from 0 to over 1 minute. In addition, a terminal is provided for external activation of the time delay circuitry *without* reversing direction. This terminal can be connected to a panel pushbutton or to the output of one of CIRCUITRON's detection units to permit stop and delays at any point. If a **DT-4** Rolling Stock Detector is used in conjunction with the **AR-2**, up to 4 intermediate stopping points can be established between the reversing points. The **AR-2** utilizes Opto-Sensors mounted in the track to detect the train. There are no modifications to rolling stock necessary, and the **AR-2** will detect un-powered as well as powered rolling stock. The **AR-2** requires a 12-18 volt AC or DC power supply for proper operation.

WARNING

MANY MODERN POWER PACKS HAVE ACCESSORY TERMINAL VOLTAGES THAT EXCEED 18 VOLTS, ESPECIALLY WITHOUT ANY LOAD. IN ADDITION, THE VOLTAGE LISTED ON THE POWER PACK LABEL IS OFTEN-TIMES MISLEADING. WE SUGGEST THAT YOU MEASURE THE POWER PACK OUTPUT WITH A QUALITY VOLTMETER *BEFORE* CONNECTING THE **AR-2**. EXCEEDING 18 VOLTS ON THE SUPPLY TERMINALS TO THE **AR-2** WILL LIKELY CAUSE DAMAGE TO THE CIRCUIT OR RELAYS. THIS WILL VOID YOUR WARRANTY.

INSTRUCTIONS: Please refer to the diagrams for labeling and Opto-Sensor locations. The **AR-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. 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 **AR-2** with screws and standoffs.

- 1) Mount the **AR-2** in a convenient location.
- 2) Install the 2 Opto-Sensors at the points you wish to have the train reverse direction following the instructions packed with them.
- 3) Connect one lead from each of the Opto-Sensors together with light gauge (22-24) wire and run it to the **[SD]** terminal on the circuit board.
- 4) Run individual wires from the remaining leads of Opto-Sensor 1 and 2 to the **[S1]** and **[S2]** terminals on the circuit board.
- 5) If it is desired to have more than one reversing point per side, such as on a siding, additional Opto-Sensors can be connected in series up to a total of three per side. See Figure 2.
- 6) Connect wires from the **[OUT]** terminals to the track as shown.
- 7) Connect the **[IN]** terminals to the variable DC output (TRACK POWER) of a throttle or power pack.
- 8) If manual reversing capability is desired, connect pushbuttons between **[S1]** and [-] and **[S2]** and [-] as shown in Figure 2.
- 9) Connect the [+] and [-] supply terminals to a 12-18 volt AC or DC power source. If you have both available, use DC. **SEE WARNING ABOVE BEFORE MAKING THIS CONNECTION.**

NOTE: If you already have a regulated 12 volt DC power supply (such as the CIRCUITRON **PS-2**) installed, and wish to use it with your Revision B **AR-2**, it will be necessary to bypass the voltage regulation portion of the circuit. This is done by connecting a short jumper wire between the bypass terminal labelled **[BP]** and the Sensor Drive terminal labelled **[SD]**.

CAUTION: Do not make this connection unless you are absolutely certain that your power supply is **REGULATED** at 12 volts DC output. The accessory terminal outputs of most all power packs are **NOT** regulated. Failure to heed this warning will almost certainly result in destruction of components on the **AR-2** which will **VOID** your warranty.

- 10) If manual delay activation is desired, connect a pushbutton or other momentary switch between the **[DELAY]** terminal and the [-] supply terminal. If automatic stop and delay action is desired, connect the **[DELAY]** terminal to the **[OUT]** terminal of a CIRCUITRON detection unit such as the **DT-4**.

ADJUSTMENTS: Be certain that the room lighting is at the level it will be at during the operation of the layout.

- 1) Rotate the Delay Adjustment **[PD]** completely counter-clockwise. This will eliminate the delay section of the circuitry.

- 2) Making certain that no rolling stock is covering either Opto-Sensor, adjust Sensitivity Control [P1] until Indicator [L1] comes on. Turn the control back until [L1] just turns off. Rotate the control about 10-15 degrees further to eliminate unnecessary sensitivity.
- 3) Follow the same procedure with Sensitivity Control [P2] and Indicator [L2].
- 4) Roll a train car across each of the Opto-Sensors and make certain that the corresponding indicator, [L1] or [L2], lights when the Opto-Sensor is covered. If it does not, repeat steps 2 & 3.
- 5) Place a train on the track and adjust the throttle for the desired speed. If the train does not reverse when it covers one of the Opto-Sensors, reverse the throttle direction or interchange the wires going to the track.
- 6) After the train is reversing properly, rotate the Delay Adjustment [PD] clockwise until the desired delay time is achieved. Please note that this control provides a very wide range of adjustment and that a very small change in its position may make a substantial delay difference.

FIGURE 1: Point to Point

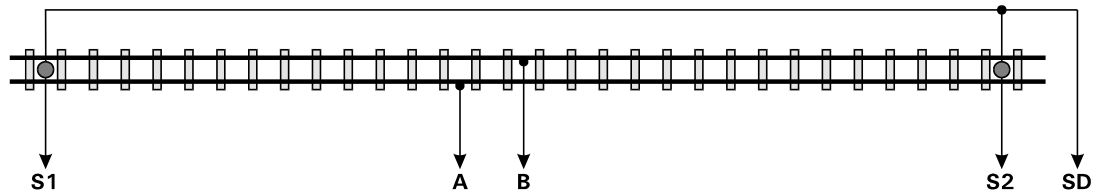
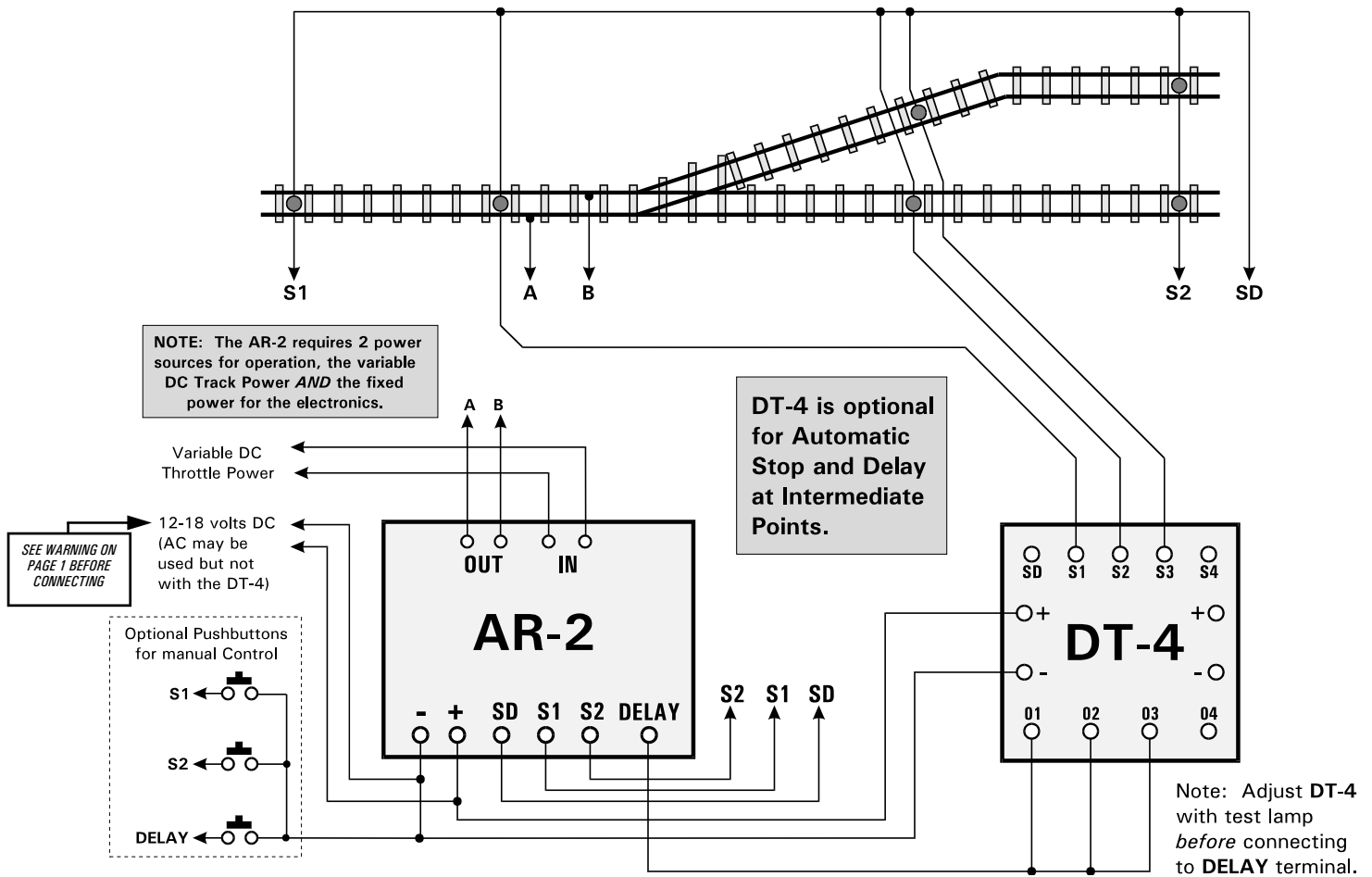


FIGURE 2: Point to Point with Spur (Requires one additional Opto-Sensor connected in series with S2.)



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.