



Electronics for Model Railroads

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SD-2

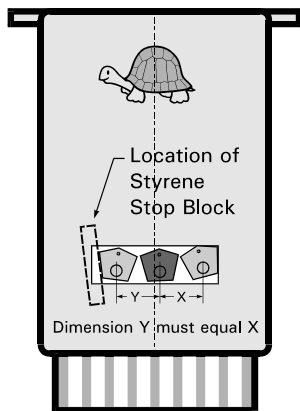
SEMAPHORE DRIVER- 3 POSITION

GENERAL DESCRIPTION: The CIRCUITRON **SD-2** is designed to drive a CIRCUITRON Tortoise Switch Machine to all three signaling positions when used in conjunction with a Semaphore signal. Linkage and mounting hardware will need to be fabricated for each particular application and brand/scale of signal. The **SD-2** requires a 10-18 volt DC power source for proper operation. With no connection to the [Y] or [R] pins on the circuit board, the **SD-2** will move the Tortoise to the "Green (Clear)" position. Connecting either [Y] or [R] to GROUND or [-] will move the Tortoise to the "Yellow (Approach)" or "Red (Stop)" positions. These connections can be made through a multi-pole switch or automatically with CIRCUITRON Block Detection Circuits.

MODIFYING THE TORTOISE: Refer to Figure 1. When the Tortoise is connected to the **SD-2**, you will note that the center stopping position (for the "yellow" approach signal) is slightly off of center. This is due to the internal switch configuration of the Tortoise and is unavoidable. The **SD-2** will, however, consistently stop the Tortoise in approximately the same center position going in either direction. It is recommended that a styrene "stop" be glued to the Tortoise case across the arm opening to equalize the throw on either side of "center". You will need to connect the **SD-2** and Tortoise on the bench following the wiring instructions below. With

power applied to the **SD-2**, connect a temporary jumper wire from the [-] power supply terminal to the terminal marked [Y]. The Tortoise should move to the center position and stop. Mark the centerline stopping position of the moving arm on the case with a marker. Move the jumper wire to the [R] terminal. The Tortoise should move to the "Stop" (Red) position. Again mark the centerline position on the case. Quickly move the jumper wire from the [R] terminal to the [Y] terminal. The Tortoise should again stop in the center position. If this position is slightly different than the previously marked one, mark a new 'center' in between the two positions noted. Measure the distance between the center stop mark and the "Red" stop mark (X distance). Measure the same distance on the other side of the center mark (Y distance) and mark the case for the "Green (Clear)" stopping position. Remove power from the **SD-2** and carefully apply pressure to the arm to slowly move it to align with the "Green (Clear)" stopping position. This will be a short distance in from the normal stop in the case opening. Glue a block of styrene square tube or angle across the opening in the case to provide a new stop for the arm in the "Green (Clear)" position. Make sure the glue is dry before proceeding.

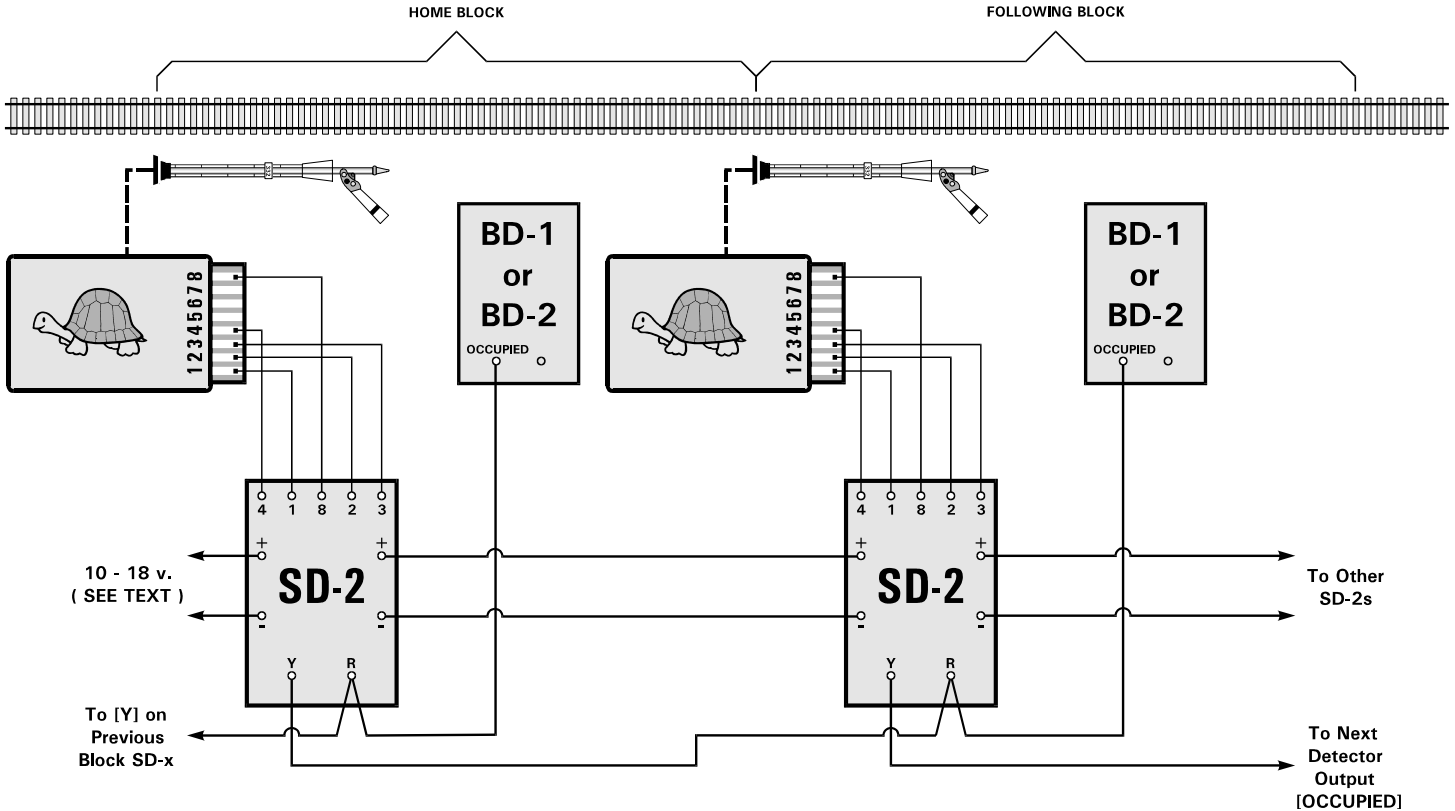
Figure 1



MOUNTING THE TORTOISE: The Tortoise will need to be mounted horizontally under the layout. A wood block or a pair of small steel angles may be used to attach the machine to the underside of the layout. Linkage will have to be fabricated depending on the amount of throw required. The Tomar semaphore only has about 1/8" total throw. Since it is likely that the Tortoise will be mounted some inches away (for clearance), a new fulcrum will likely have to be fabricated also. One system that we have found effective is to use a small steel angle bracket for the fulcrum and temporarily mount it just beyond the control wire for the semaphore. Open up one of the pre-formed holes in the bracket with a 1/4" bit. Flatten a 12" piece of 1/4" brass tube at one end and drill a clearance hole for the retaining screw on the Tortoise arm. Attach the tube to the arm with the screw. Do not over-tighten. Place the end of the tube through the hole in the bracket and keep the assembly just to the side of the semaphore control wire. Holding the Tortoise in place, *gently* move the arm up and down through its complete motion. Note how much the tube moves at the point where it crosses the control wire. Adjust the Tortoise position until you achieve about 1/8" throw at the wire. Mark the wire location on the tube with a marker. Remove the Tortoise and tube and drill a small hole through the tube for the wire to pass through. Mount the Tortoise after passing the wire through the hole in the tube and re-inserting the tube in the bracket. Wire the Tortoise to the **SD-2**, apply power to the board and set the driver to the "approach" aspect by connecting a jumper between [Y] and [-]. Manually adjust your semaphore to the 45 degree approach position. Wedge a tiny sliver of wood or plastic into the hole in the tube so that the control wire is held firmly. Using the **SD-2** to power the Tortoise, run the semaphore to all 3 positions. If it wants to overrun the horizontal and vertical positions, move the fulcrum bracket closer to the Tortoise a bit. You may need to re-adjust the 45 degree position with each move. After you are satisfied with the throw, firmly attach the fulcrum to the layout and glue the wire into the hole with ACC.

WIRING: The **SD-2** 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 SD-2 with screws and standoffs.

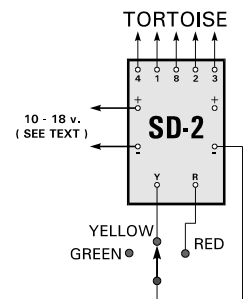


NOTES:

- 1. BD-1/BD-2 power supply and BD-1 Opto-Sensor connections are not shown.
- 2. Block Detectors and SD-2 board(s) must share a common power source.
- 3. Single direction mainline shown. Bi-directional travel requires additional signals & SD-2s for opposite direction.

- 1) Connect 5 light gauge (22-24 ga.) wires from the numbered terminals on the top of the SD-2 to the corresponding connection points on the Tortoise as shown above.
- 2) Connect the [+] and [-] terminals on the SD-2 to a 10 - 18 volt DC source. Leave your power source OFF during these connections. AC may be used to power the SD-2, but if the SD-2 will be connected to Detection Circuits for automatic operation, then DC MUST BE USED! You will notice that the supply terminals, [+] and [-] are bussed across the board so that multiple SD-2 installations are easily wired. Merely connect [+] to [+] and [-] to [-] for daisy-chained installations.
- 3) For automatic operation, connect a wire from the [R] terminal on the SD-2 to the output from a CIRCUITRON detection circuit installed for the SAME block that the signal is supposed to protect. This terminal is labelled [OCCUPIED] in the case of the BD-1 or BD-2. With this connection, the SD-2 will now display 2 aspect signals (red and green). This block is designated the HOME block and will be referred to as such in the diagrams. NOTE: The detection circuits and the SD-2 must have the same power source for proper operation.
- 4) Connect a wire from the [Y] terminal on the SD-2 to the output from a CIRCUITRON detection circuit installed for the block following the HOME block above. This block is designated the FOLLOWING block.
- 5) This completes the installation. Apply power to the board and run a train through the blocks and note that the signal properly displays all three aspects.

Figure 3



MANUAL CONTROL

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.