

BUILD A SIMPLE DIMMER SWITCH

by J. R. Bates

YOU CAN make a solid-state continuously variable dimmer switch at home for only a fraction of the price normally paid for such items.

The switch is capable of controlling loads up to 1.2 KW at 240 volts but there is virtually no upper limit to the load capability of similar switches provided the correct choice of equipment is made and units are suitably paralleled—that is to say connected so that each part carries an equal fraction of the load current. The main advantages of electronic dimmed switches are compactness, the switch described can easily be put into a box of dimensions $3\frac{1}{2}$ in. \times $3\frac{1}{2}$ in. \times 1 in., and the fact that there is negligible unused power loss.

The circuit diagram is shown in Figure 1. The items necessary for the manufacture of the switch are:

250 K Ω , 1 Watt, midget volume control (linear)	Price about 4/-
0.1 μ F capacitor	Price about 2/-
ST-2 diac	Price about 6/6
SC 40D triac	Price about 38/6
27 K Ω resistor	Price about 2/-

No detailed instructions are necessary. The above items should be connected up according to the diagrams, but please be careful and always be on guard to ensure that you have good insulation. Use a wooden or strong plastic box and put an insulated knob on the spindle of the volume control. Use two sections of a terminal strip to connect external wires as shown in Figure 2. This switch will only operate on alternating current.

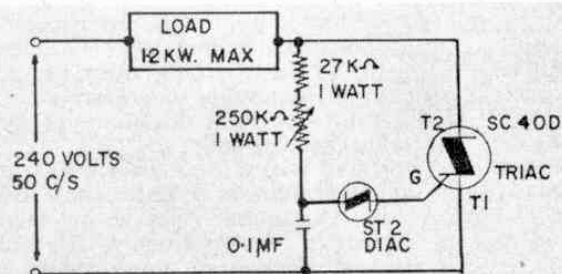


FIG 1 WIRING DIAGRAM

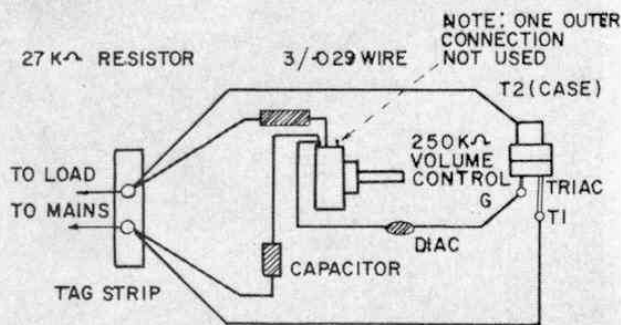
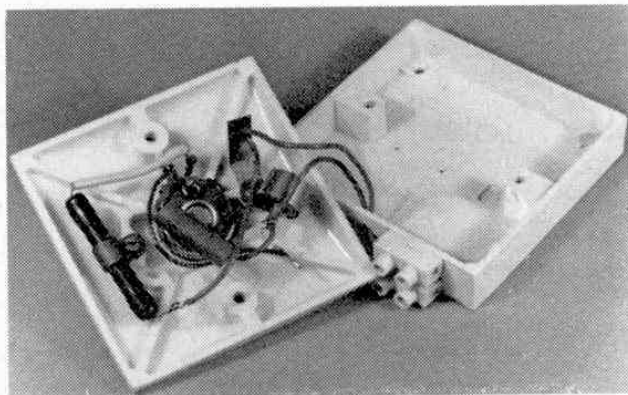


FIG 2 PICTORIAL DIAGRAM



The dimmer switch is shown here with the lid removed to reveal the method of installing the components.

Principle of Operation

For those who are interested in the operation of this dimmer switch, the load is switched on and off twice every cycle or 100 times per second. The filament of an electric light or the element of an electric fire cannot heat up and cool down at this frequency so the result is that the lamp or the heater averages itself out to a steady level which is the R.M.S. or root-mean-square level.

The triac is a bi-directional triode thyristor which can be triggered from a conducting to a non-conducting state by a voltage applied to the "gate".

Referring to Figure 1, the capacitor is charged up at a rate depending on the current allowed to pass through the controlling resistor. If, for example, the resistor is set to the maximum 277K Ω only a small charging current flows into the capacitor but if the resistor is set at 27K ohms there is a large charging current. This means that we have control over the time taken to charge the capacitor to the level of voltage required to make the disc conduct. When this happens the diac passes a current through the triac and so switches it. The capacitor discharges, the diac stops conducting, and the whole cycle repeats itself. We therefore have control over the time duration, or fraction of a cycle of the mains alternating current, in which the load is actually switched on, thus giving the dimming action.

There is no unused power loss since there is no current flowing in the "off" condition.

Applications

The dimmer switch can be used in many applications. Some suggestions are given as follows:

- Lamp intensity control for T.V. viewing.
- Lamp intensity control in photographic studios.
- Heat control.
- Motor speed control on universal motors.

Should you have a requirement to control loads greater than 1.2 KW, this can be done. The correct triac to use may be found from the following table:

Type	Maximum Load (KW)	Mounting
SC40D	1.2	Stud
SC41D	1.2	Press-fit
SC45D	2.0	Stud
SC46D	2.0	Press-fit
SC50D	2.4	Stud
SC51D	2.4	Press-fit