

Fig. 4 Component Overlay

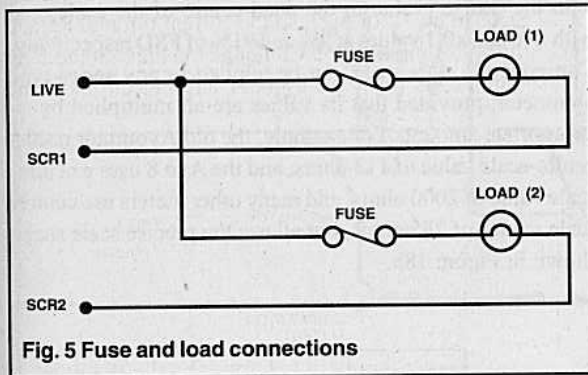


Fig. 5 Fuse and load connections

The triacs used have a rating of five amps which is fine for lighting circuits, however in the excitement of experimenting with the unit it is all too easy to run round the house connecting everything to it, and the simple mistake of connecting a hair drier to the unit could ruin your whole days work (or even your Christmas). It is therefore necessary to place a 3 Amp fuse in series with the triac, as shown in Figure 1, this will also protect the circuit from the usual mains faults.

Setting Of RV1

The variable resistor, RV1, controls the height of the signal (V_{rect}) feeding pin 2 of IC1a. Referring to Figure 3a $V_{trigger}$ should not be greater than the peak value of V_{rect} , otherwise the comparator will not switch during that cycle, the triac will not be triggered and the lamp will remain off. Using an oscilloscope the two signals can easily be displayed one on top of the other and the pot adjusted to make V_{rect} big enough. If an oscilloscope is not available setting up is still possible using a voltmeter as follows: (i) measure the two voltage levels of pin 5 on IC1, which should be approximately 20% and 80% of the supply voltage, as mentioned above; (ii) Measure the voltage at pin 2 of IC1 (using the DC range of the voltmeter), this will be the average value of the waveform V_{rect} . For a rectified sinusoid the peak value is $(\pi/2) \times V_{average}$ and hence the pot can be adjusted until the voltmeter reading

Practical Aspects

The best use for the circuit is in conjunction with a set of fairy lights, or to be more accurate two sets of fairy lights. The reason for specifying a quad op-amp was to allow two copies of the circuit in Figure 1 to be built up easily. Two slightly different values of the combination C1/R3 can be selected so the two 'twinkles' change at different speeds and give quite a soothing Christmassy effect, even if I do say so myself.

Another important practical aspect of any mains control is to make sure the electronics is housed within a good insulating box or case. As this design is solely for Christmas lights, it would be wise to house power supply and control circuits in the one box, leaving just a 'mains in' lead and 'controlled mains' out lead.

PARTS LIST

RESISTORS

R1,2	10k
R3	150k
R4	3k3
R5	100R
R6,7	1k5
RV1	470R

CAPACITORS

C1	33 μ 16V
C2,3	10 μ 16V
C4,5	100n
C6	47n/400V

SEMICONDUCTORS

IC1	LM324
IC2	7805
BR1	1A/50PIV bridge
D1	1N4001
D2	1N4004
THY1	206D

MISCELLANEOUS

T1	9-12V secondary, mains input transformer
FS1	Fuse 3A + holder

