

BUILD AN IC LIGHT MODULATOR

CONTROL UP TO 1 KW OF LAMPS WITH A MINIMUM OF PARTS

BY EDWARD M. YANDEK

LIGHT modulators are becoming increasingly popular with college students, hi-fi buffs, electric guitarists, and other musicians. Such devices expand the auditory sensations of music into a pleasing visual experience as well. Usually, however, to buy a good commercial light modulator is fairly expensive; less costly models are generally low on sensitivity and must be used at high listening levels. The single-channel modulator described here is inexpensive, simple to construct, and very sensitive. It should be possible to buy the parts for this modulator (with a 1000-watt controlling capability) for about five dollars.

Theory of Operation. The input impedance of the primary of *T1* is in series with *R1* to insure that there is no adverse loading on the audio amplifier. The stepped-up secondary voltage is controlled by sensitivity potentiometer *R2* and applied to the IC input. The key to the sensitivity and simplicity of this circuit is the use of operational amplifier *IC1*, a 741. The gain of this stage is determined by the setting of feedback control *R6*, with respect to *R4*; while the input is protected against overvoltage by diodes *D1* and *D2*. The output of the op amp drives the gate of the triac through *D3*, which prevents the triac input from going negative.

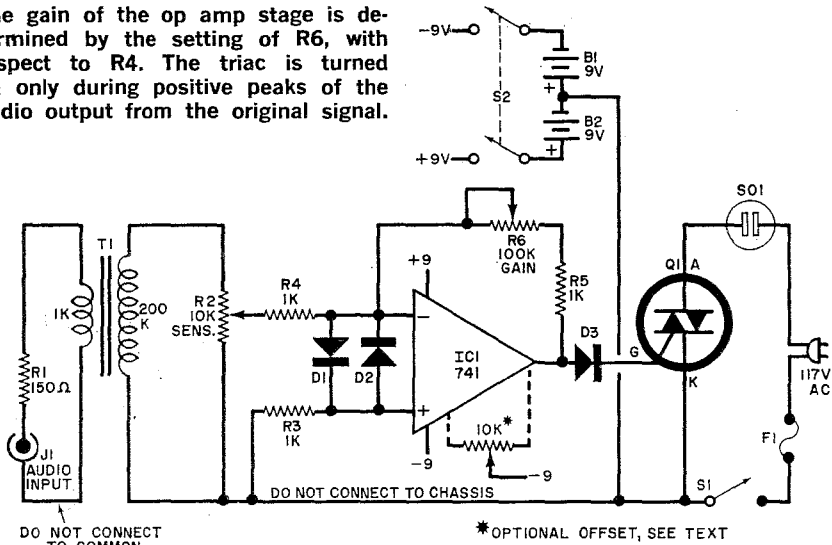
The triac, which operates on both halves of the line power cycles, is connected in series with the lamp load across the power line. Protection is provided by *F1*. Each time the gate of the triac goes positive, the triac fires and remains conducting until the voltage crosses through zero. Then the triac cuts off. The triac, therefore, is turned on only during the positive peaks of the audio.

Construction. Parts layout is not critical, and either a PC or perf board can be used. A socket can be used for the IC, and a heat sink is needed for the triac. Select a triac and fuse whose ratings are compatible with the lamp load being used. Keep in mind that the "common" circuit may be at power line voltage level, so *do not* use a chassis ground for this circuit. Terminal strips are used to make power connections. Also be sure that switch *S1* will carry the required current. For low-power operation, a line-isolation transformer is suggested. Both the op amp and the triac are available at low prices from advertisers in this magazine.

Mount the completed assembly in a plastic container with only the audio input jack, the shafts of *R2* and *R6*, and the two switches on the front panel. (*S1* can be part of *R2* or *R6*.) *Do not* connect the shield of *J1* to the common ground in the circuit.

Adjustment. Connect a short circuit across input jack *J1* and set gain control *R6* to the center of its travel. Connect a suitable lamp load to *SOL*, and turn on the modulator. The lamp should not glow. If it does, check the wiring of the circuit. If it is OK, then the op amp may require a slight offset to bring its positive-going output below that required to fire the triac. This is accomplished by the use of the optional offset circuit shown in dotted lines in the schematic. With the potentiometer connected between the offset terminals of the op amp and with its rotor connected to -9 volts, the potentiometer can be adjusted until the light goes out. You can also use a low-voltage dc voltmeter (positive connected to the op amp output and negative to the common) to measure

The gain of the op amp stage is determined by the setting of R6, with respect to R4. The triac is turned on only during positive peaks of the audio output from the original signal.



PARTS LIST

B1,B2—9-volt battery
 D1-D3—Silicon rectifier diode
 F1—Fuse and holder
 IC1—741 op amp
 J1—Phono jack
 Q1—Suitable triac
 R1—150-ohm, 1/2-watt resistor
 R2—10,000-ohm potentiometer
 R3-R5—1000-ohm, 1/2-watt resistor

R6—100,000-ohm potentiometer
 S01—Power socket
 S1—Spst switch (may be part of R2 or R6)
 S2—Dpdt or dpst switch
 T1—Audio transformer; primary: 1000 ohms; secondary: 200,000 ohms (Lafayette AR-100 or similar)
 Misc.—Battery holders, terminal strips, mounting hardware, heat sink for Q1, line cord.

the op amp output voltage. It should be less than that required to fire the triac.

Using the Modulator. Connect the audio input to J1. (Use two modulators for a stereo system if desired.) Set R2 to minimum and adjust the speaker volume as desired. Turn on the ac power to the modulator; then turn on the op amp battery power. With R6 set at mid-position, slowly

turn up R2 until the lamp begins to pulsate with the audio level.

For increased sensitivity, rotate R6 toward its maximum resistance. If you make the circuit too sensitive, it will be "touchy" so use less feedback and more R2.

Due to the high gain of the op amp, interaction may result if there is an SCR light dimmer on the same ac circuit. Turn such devices off before using light modulator. ♦

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