

ASK R-E

WRITE TO:

ASK R-E
Radio-Electronics
500-B Bi-County Blvd.
Farmingdale, NY 11735

SUNRISE TO SUNSET SIMULATOR

I need a sunrise/sunset simulator, which is a device that will turn on a lamp slowly to simulate the sun rising and then, after a preset time, slowly dim the light to simulate sunset. Do you have anything in your files?—D.E.R., Notre Dame, IN.

Figure 1 shows a circuit that will fill the bill. The circuit was presented by Jamieson Rowe and Kieth Woodward in the article "An Automatic Lamp Dimmer, Using the Triac AC Switch" in the magazine *Electronics Australia*, De-

cember, 1966, pages 65-75. Because the circuit was designed for 240-volt operation, some circuit values—those marked with an asterisk—will have to be adjusted for operation on 117-volt powerlines.

Current through a lamp or a heater load connected to socket SO1 is controlled by varying the conduction period (angle) through each half-cycle of line voltage applied to the Triac (TR1), which is connected in series with the load across the AC powerline. The conduction period is varied and controlled by the unijunction

transistor (Q3) circuit: a relaxation oscillator that is coupled to Triac TR1's gate through pulse transformer T1. The oscillator's basic frequency depends on R7/C4.

The bridge rectifier develops approximately 165 volts *peak*, which is regulated to approximately 13.5 volts by silicon rectifiers D5 and D6 which are in series with 12-volt Zener diode D8.

Also connected across the 13.5-volt source is Q3's RC timing network, R3/C2. For proper circuit operation, R3 must be adjusted so the voltage across C2 just rises to the conduction point of Q3 at the end of each half-cycle of the line voltage. Under that condition, Q3 delivers a current pulse through T1 to TR1's gate as the instantaneous line voltage drops close to zero. Since the line voltage is near zero, no appreciable current flows through the load (connected to SO1) when the Triac conducts.

The adjustable dimming control R2, is a 10K wirewound potentiometer. The voltage tapped off R2 feeds an RC timing network consisting of R3 and RATE control R4 in series with C3, a 100- μ F, 16-volt electrolytic capacitor. The voltage across C3 is applied to the base of a Darlington amplifier (Q1 and Q2) that uses 2N3565 or similar NPN silicon transistors. The Darlington's emitter output is connected to timing capacitor C4 and to the emitter of Q3.

As C3 charges, its voltage is applied as a "bootstrap" voltage to C4. Since the Triac is normally off, or nearly so, we simply cause it to turn on earlier and earlier in each half-cycle of the supply voltage when we want to increase current through the load that is connected to socket SO1. On the other hand,

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