NEW IDEAS

Light-sensitive timing circuit

MANY LIGHTS AROUND THE HOUSE ARE turned on at sunset and kept on for say three or four hours, and then turned off. Because the same routine is followed almost every day, the lights can be automatically controlled by a light-sensitive circuit combined with a timer. The circuit could be used to turn on not only lamps or security lights; it could also turn on an electric blanket or any other electrical device when the light level falls to a predetermined point. Then, the timer could keep that device turned on for a pre-set time period before it shut it off. Figure 1 shows such a circuit.

How it works

The circuit is powered by a single-ended 12-volt DC supply (not shown) consisting of a 12.6-volt transformer and a 7812 voltage regulator. Though a regulated supply isn't really necessary, it does improve the timer's accuracy. The 741 op-amp is used to form a comparator with *hysteresis* that monitors the outside light level using a photoresistor. That means that the comparator's output goes high only after the input to pin 3 crosses a certain DC value (determined by R2). The feedback applied to pin 3 of the comparator causes the output to remain high until a negative voltage of sufficient quantity to overcome the feedback is applied. Only then will the output change states. Note that there are two switching voltages. In the *dead zone* (the area between the two switching voltages), the output will remain in the same state that it was previously set to. In other words, if the output is high, it will remain so as long as the input is in the dead zone.

Resistor R1 and photoresistor SR1 form a voltage divider. R1 should be selected to have the same resistance as SR1 at the light level at which the lamp is to be turned on. The photoresistor should be mounted near a window and shielded from the lamp that it is to control; or it can be mounted in the same enclosure as the other components if the device is to be mounted near a window. As the light level drops, the photoresistor increases in resistance. That increased resistance causes a greater voltage drop across the photoresistor; an equal voltage is applied to the non-inverting input to the comparator through the 120-kilohm resistor. When the voltage at the non-inverting input reaches a level that's about equal to the voltage at the inverting input of the op-amp, its output goes from low to high. The level at which that change occurs is controlled by R2.

When the comparator's output goes high, a pulse is generated through capacitor C1 that triggers the 2240 timer. The timer stays on for a set period that is determined by capacitor C_t (10 μF) and resistor R_t (8.2 megohm). With the component values shown, the timer period is about 3 hours with switch S3 open and about twice as long with it closed.

The timer's output is sent to the inverter, transistor Q1. The output of that transistor, taken from the collector, is used to turn transistor Q2 on and off. When Q2 is turned on it completes a path to ground through the MOC3010 optocoupler for an internal LED. That LED triggers a triac driver or diac and that, in turn, triggers the triac in the lamp circuit. When the triac is turned on current flows to the lamp.

The LED in series with the optocoupler serves as a pilot light. The LED lights to indicate that the circuit is in operation.

Switch S1 is used to manually start the timer by applying a high input to the timer at pin 11; while, S2 is used to stop its operation by applying a high to the timer's reset at pin 10. Any or all of the switches can be eliminated if the functions they control are not needed. The optocoupler and triac can be replaced by a relay if desired.—*John A. Wert* **R-E**

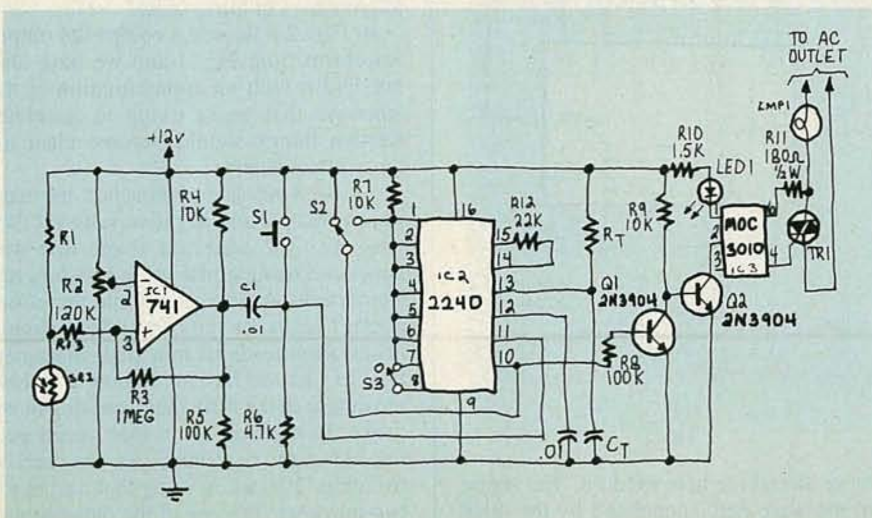

FIG. 1