PROJECT OF THE MONTH

Dark/Light Detector

BY FORREST M. MIMS

HERE IS a simple but useful circuit that can function as either a light detector or a dark detector. The circuit's photosensor is a standard cadmium-sulfide (CdS) light-dependent resistor. When the project is operating in its light-detection mode and the photosensor is dark, there is no output. When light strikes the sensitive surface of the LDR, the speaker emits a tone. When the circuit is in its dark-detection mode and the LDR is illuminated, the speaker is quiet. It emits a tone when the photosensor is dark.

The circuit is actually an astable oscillator operating as a tone generator. The oscillator is designed around a 555 timer chip whose reset input (pin 4) is the key to the project's two modes of operation. When pin 4 is at or close to $+V_{cc}$, the circuit will oscillate. When pin 4 is grounded, however, *C1* is discharged and the circuit ceases oscillation.

In both the light- and dark-detection modes, the light-dependent resistor and *R3* form a voltage divider whose center node is connected to pin 4 of the timer IC. When *S1*, a dpdt toggle switch, is placed in position L, the photosensor is connected between pin 4 of the IC and $+V_{cc}$. When the level of ambient light increases sufficiently, the resistance of the photosensor decreases to a low value, pin 4 approaches $+V_{cc}$ and the circuit oscillates. This is the circuit's light-detection mode.

When *S1* is placed in position D, the photosensor is between pin 4 and ground and fixed resistor *R3* is between pin 4 and $+V_{cc}$. Now, when sufficient light strikes the photosensor, pin 4 approaches ground potential and the circuit ceases to oscillate. The project thus functions as a dark detector because removing light from the LDR permits the 555 to oscillate.

The circuit is easily modified. For example, increasing the value of *C1* will decrease the frequency of oscillation. Reducing the capacitance of *C1* will increase the frequency. For more volume, the speaker can be driven by an audio amplifier whose input is capacitively coupled to pin 3 of the timer IC. If only light (or dark) detection is desired, *S1* can be eliminated. The photosensor and *R3* should then be permanently in the positions corresponding to the desired operating mode.

This project has many useful applications. In its light-detection mode, for example, it can be used as an open-door alarm for a refrigerator or freezer or an open-drawer alarm for a cash register. The circuit makes a simple annunciator when used in its dark-detection mode. A source of steady light (artificial or sunlight) beamed at the photosensor inhibits the tone. An interruption of the light beam, such as occurs when a physical object passes between the light source and the sensor, stimulates oscillation.

Both operating modes make interesting day/night indicators. In the light-detection mode, the speaker will sound when the sun rises; and in the dark-detection mode, it will sound when the sun sets.

Laser Transmitter. In a previous column, I briefly described a miniature semiconductor laser transmitter I had built. Complete with battery, driver circuit and lens, the transmitter is not much bigger than a lipstick holder. Many readers have requested construction details for this laser. Unfortunately, however, the 4-layer diode which switches current through the laser diode is no longer available in small quantities. If an economical source for a 4-layer diode with a 20-to-25-volt switching level can be found, plans for the transmitter will appear as a future Project.