

Light-Operated Bistable Switch

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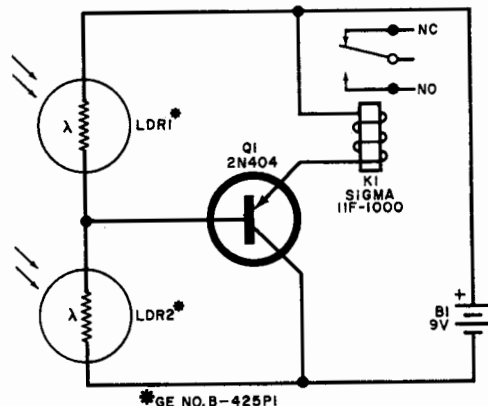
A SWITCH that can be operated by a light beam from remote locations of up to 30 feet is a handy device to have around the house or in the workshop. Such a switch, especially if it can be operated under wide ambient light extremes, is used to turn appliances on and off, silence the audio on a TV receiver during commercials, and serve as a remote switch in a garage or basement. You can readily see how much of a work saver and safety provider a light-operated remote switch can be.

As shown in the schematic diagram, the remote switch described here is a simple device, employing a pair of light-dependent resistors (*LDR1* and *LDR2*) which provide on and off bias for a simple transistor amplifier (*Q1*). The amplifier load is a relay which is energized or de-energized depending on the conduction state of the transistor. The relay has a double-throw contact arrangement so that an appliance or device can be connected to either the normally open or normally closed contacts, depending on the operating condition desired. (These contacts will handle up to 1 ampere of current at 117 volts ac. If higher power is required for a particular device, *K1* can be used as a control relay to drive an appropriately rated power relay.)

In operation, illumination of *LDR2*

causes *Q1* to conduct sufficient current to energize *K1*. Once *K1* is pulled in, it remains energized even after the light is removed from *LDR2* because the solenoid of the relay is normally biased near its pull-in point during its de-energized period. Hence, although the energizing current must exceed a certain level, the holding current is within the biasing current range.

Now, by illuminating *LDR1*, the bias condition at the base of *Q1* changes, causing the transistor to conduct less heavily—this time sufficiently below the holding current of *K1* to allow it to drop out. Again, the situation is such that the normal standby current through *Q1* and *K1* allows the relay to remain de-energized



Relay *K1* closes and opens when *LDR2* and *LDR1*, respectively, are illuminated. Sufficient current is normally available to latch *K1* in desired state.

even after the light is removed from *LDR1*.

Background changes from total darkness to full brightness will not cause false operation of the remote switch since the resistance ratio between *LDR1* and *LDR2* will not change and, as a result, the biasing scheme is unaltered. However, the amount of light reaching both LDR's must be the same at any given time for this to be true.

When assembling the remote switch, bear in mind that the LDR's must be physically separated so that they can be illuminated selectively (by a flashlight, for instance). Experimentally, a separation of about 7 inches provided reliable operation at distances up to 30 feet. —30—