An Automatic Phone Disconnector

Silences telephone when lights are turned off

By Victoria di Zerega

Since I work odd hours, I sleep when most others are active. As a result, I've been disconnecting the phone so that I won't be awakened. Unfortunately, I often forget to reconnect it and miss phone calls.

To preserve my sleep time and to avoid an alternative of simply leaving the receiver off the hook, I designed an electronic circuit that disconnects the phone when my lights are turned off, while simulating a phone that's ringing to a caller instead of a busy signal. I have it connected to the kitchen and bedroom lights. If either or both lights are on, the phone is on. There is also an "override" feature that allows the phone to remain on all the time if I'm expecting a call.

How It Works

The heart of the unit is a 2-input AND gate. The AND gate produces a high output only when both inputs are high, of course. The photocells used for on-off control have a resistance of about 3 Megohms in the dark, decreasing to about 100 ohms or so when light strikes them.

In operation, when either light is on, the resistance of that photocell decreases and pulls the AND gate's input low. Any low input to the AND gate results in the output going low. When the output is low, there is no voltage across the relay coil and the relay is in its normally closed position. Thus, the phone is on. When both lights are off, both inputs to the AND gate are pulled high and its output is high. Now there is voltage across the relay coil. Consequently, the relay pulls in, opening the phone circuit. Resistors *R3* and *R4* are pull-up resistors that keep the inputs to the AND gate high when the lights are off and improve reliability.

Using closed-circuit jacks for the sensor lines enable the unit to work properly when only one sensor is used. Resistors *R6* and *R7* keep the AND gate inputs high when there is no sensor line plugged in to that input. A closed-circuit jack is also used on the phone terminal box so the phone will operate normally when the entire unit is disconnected.

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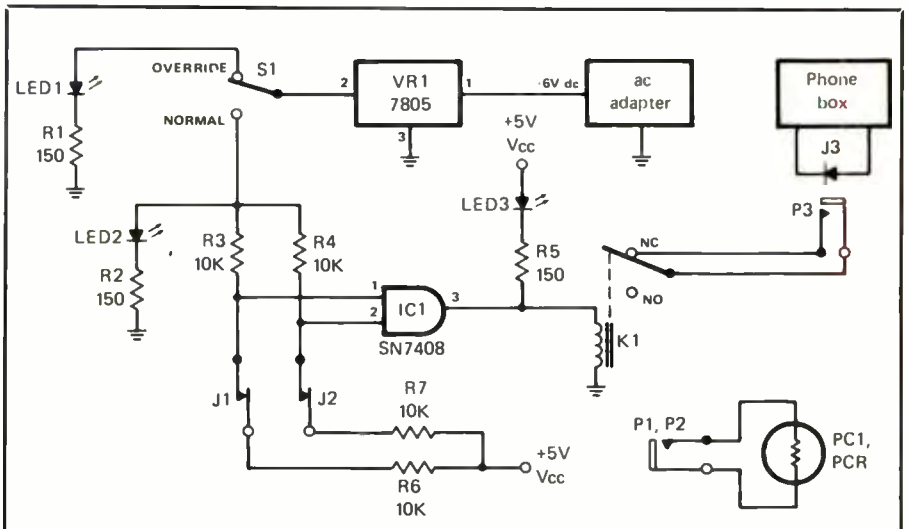

PARTS LIST

IC1—7408 quad 2-input AND gate
J1 thru J3—2-conductor miniature closed-circuit phone jack
K1—5-volt, 72-mA relay (Radio Shack No. 275-243 or similar)
LED1 thru LED3—Jumbo light-emitting diode (one each red, yellow and green)
P1 thru P3—Miniature 2-conductor, closed-circuit phone jack
PC1,PC2—Cadmium-sulfide photocell (Radio Shack No. 276-116 or similar)
R1,R2,R5—150-ohm, ½-watt 10% tolerance resistor
R3,R4,R6,R7—10,000-ohm, ½-watt, 10% tolerance resistor
S1—Spdt slide or toggle switch
VR1—7805 5-volt regulator
Misc.—ac adapter (see text); suitable enclosure; perforated board and solder posts; IC socket; speaker wire (for photocell and phone lines; machine hardware; hookup wire; solder; etc.

Complete schematic diagram of the automatic telephone disconnector circuit.

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Switch *S1* is the "Override" switch. In the "Override" position, V_{CC} is removed from the AND gate, turning it off. Light-emitting diodes *LED1* is the "Override" indicator and *LED2* is for "Normal" operation. *LED3* is used to indicate that the unit is functioning properly. When it is on, the phone is on, and vice-versa. Using different colored LEDs makes it easy to tell at a glance what the status of the unit is. (Also, I like lots of colored lights!) Any "ac adaptor" rated at greater than 6 volts and 125 mA can be used for the power supply. A 7805 regulator is mounted inside the case to provide a regulated 5-volt source.

Construction is simple and parts are widely available.

All jacks, LEDs and the switch are mounted on the case. The 7805 regulator uses a piece of ⅛" aluminum as a heat sink. I used 0.1" perf board to mount the parts. Any "speaker wire" or zip cord can be used for the phone and sensor lines. I simply soldered the sensors to the wire and wrapped the leads and the photocell with electrical insulating tape.

Pin numbers to the IC and the regulator are shown in the schematic. Don't overlook V_{CC} (pin 14) and Ground (pin 7) on the 7408! Also, note that the pin numbers on ICs are the top view, counterclockwise starting from the upper left. I ran a piece of #18 bus bar for V_{CC} and ground.

Since installing this system, my sleep time has never been sounder.