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PROTECT YOUR PROPERTY WITH A CMOS GUARDIAN

Lets you know if an unauthorized person has used any electric machines when you weren't present

Wouldn't it be nice to have a device that would tell you when someone has operated any line-powered electrical device in your home or office without your permission? Well, the Sentinel described here does just that. Once coupled to any 117-volt ac line-operated equipment or lighting circuit, the Sentinel constantly monitors the ac power. To determine if the ac circuit has been switched on since the last time you checked, you simply push a button. No telltale lights or alarms sound when unauthorized use occurs; to find out, you must close a switch.

About the Circuit. Although *IC1* in the illustration contains four 2-input NAND gates, the two inputs of each gate are wired in parallel to form four inverters. Gates A and B are wired in a set/reset flip-flop configuration.

A low input to gate B generates a high condition at its output. Because this signal is also present at the input of gate A, its output is forced low. The circuit is completed by feeding the low output of gate A to the input of gate B. Output current from gate A is limited by *R3* during changeover.

The high output from gate B is also routed to the input of gate D, forcing the latter's output, which is connected to *LED1*, low. The low output from gate A is inverted by gate C whose output, connected to *LED2*, goes high. Hence, if *S3* is pressed (closed) at this time, only *LED2* (which is green) can come on. If the input to gate B is forced high, the flip-flop changes states. Now only *LED1* (red) can come on when *S3* is pressed.

In the flip-flop's "normal" state, with no power applied to *T1*, closing *S2* places the flip-flop in the state where only *LED2* can light when *S3* is pressed.

The primary of *T1* connects to either the power line or the primary of the power supply (after the power switch) of the device to be monitored. If *T1*'s primary is energized, the *C1/D1* circuit creates a positive voltage that is applied to the input of gate A via current-limiting resistor *R2*. When this voltage exceeds the switching level of gate B, the flip-flop changes states. Then, pressing *S3* causes *LED1* to light.

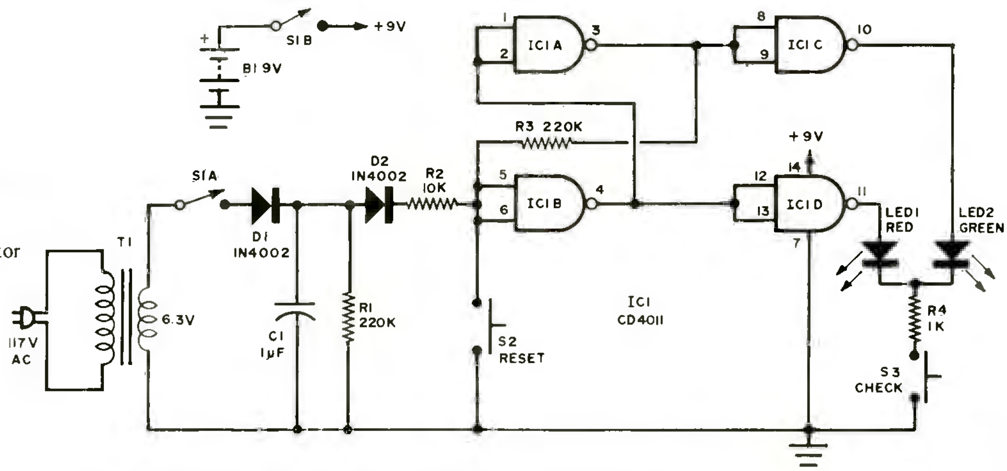
Momentary application of power from the ac line produces enough dc voltage for the flip-flop to change states. When the ac is removed, *R1* discharges *C1*, but *D2*, now reverse biased, keeps the flip-flop from changing states. Once tripped, the circuit does not go into automatic reset.

Once *S2* is pressed to reset the Sentinel, operating *S3* will cause only the green LED to come on. If you press *S3* later and the red LED comes on, someone has applied ac power to the device being monitored. Both ac-line and 9-volt dc power can be disconnected from the sentinel by opening *S1*.

Construction. Although the Sentinel can be assembled with just about any wiring technique, it is best assembled on a piece of perforated board or a printed-circuit board of your own design. Component placement and orientation, wire routing, and lead dress are not critical. Just arrange the circuit neatly. Then house it in an appropriate-size box that is predrilled for the three switches and two LEDs. ◇

PARTS LIST

B1—9-volt battery
C1—1-μF polyester capacitor
D1, D2—1N4002 diode
IC1—4011 quad 2-input NAND gate
LED1—Red light-emitting diode
LED2—Green light-emitting diode
R1, R3—220,000-ohm ¼-W 10% resistor
R2—10,000-ohm, ¼-watt 10% resistor
R4—1000-ohm, ¼-watt, 10% resistor
S1—Dpst switch
S2, S3—Normally open pushbutton
T1—6.3-V transformer
Misc.—9-volt battery and holder; suitable enclosure; machine hardware; line cord; hookup wire; etc.



In normal state of flip-flop IC1/IC2, LED2 glows when S3 is pressed. If flip-flop is toggled, LED1 glows.