A Personal Security Alarm

Sounds a buzzer when it detects intrusions for both inward- and outward-opening doors

By James H. Brown

The Personal Security Alarm described here sounds an audible alert any time someone tries to open a protected door, even if the door is on a cabinet or storage box. It doesn't matter if the door opens inward or outward; the device will work in either case.

You can use this Alarm to monitor any single door, at home, in your office and while traveling. Take it with you when you travel to set against the door of your hotel or motel room. Flip a switch to the appropriate position and arm the alarm to rest assured that the protected entry is secure. The project is simple to use, simple in design and takes up very little extra space in your luggage.

About the Circuit

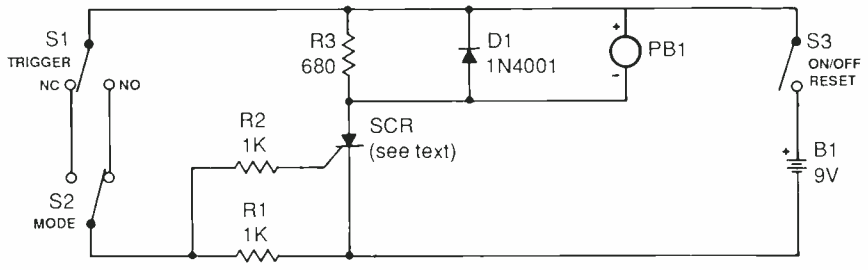
Shown in Fig. 1 is the complete schematic diagram of the Personal Security Alarm. As you can see, this very simple circuit contains very few components. Foolproof in operation, the circuit contains perhaps the simplest of all active elements, silicon-controlled rectifier *SCR1*. This is an electronic "latching switch" that, once activated, must be reset to turn it off.

Power for the circuit is supplied by 9-volt battery *B1*. Closing POWER/RESET switch *S2* feeds power to the circuit as needed. With TRIGGER switch *S1* and MODE switch *S2* set so that the circuit from the positive side of the battery is open to the junction of *R1* and *R2*, no trigger voltage reaches the gate of *SCR1*. (Switch *S2* can be set to allow the project to work with either an inward- or an outward-opening door.) In this condition, the circuit is armed.

Setting either *S2* or *S3* to its alternate position without setting the other to its alternate position delivers a dc voltage to the gate of *SCR1*. When this occurs, the circuit is triggered on. Current flows through *SCR1* and turns on piezoelectric buzzer *PB1*, which now sounds an audible alert.

The alarm continues to sound until power to the circuit is interrupted by setting *S1* to its "off" position. However, even if this is done and neither of the other two switches is set to its alternate position, the circuit to the gate of *SCR1* will remain complete. Therefore, if the Alarm should sound and *S1* is flipped off and then on again, the alert will still sound.

Switches *S2* and *S3* are ordinary slide or toggle types whose functions are fairly obvious, but *S2* is a special type that has a spring-loaded lever at the end of which is a roller bearing. It has both normally-open (NO) and normally-closed (NC) contacts, both of which are used in this project. The Alarm is armed for an outward-open-



PARTS LIST

Semiconductors
D1—1N4001
SCR1—Any general-purpose 1-ampere silicon-controlled rectifier (Radio Shack Cat. No. 276-1662 or similar)

Resistors (½-watt, 10% tolerance)
R1,R2—1,000 ohms
R3—680 ohms

Miscellaneous
B1—9-volt battery
PB1—Electromechanical Buzzer (Radio Shack Cat. No. 273-051 or similar)
S1—Spdt roller-type lever switch (Radio Shack Cat. No. 257-017 or similar)
S2—Miniature spdt slide or toggle switch
S3—Miniature spst slide or toggle switch
Suitable enclosure (Radio Shack Cat. No. 270-233 or similar—see text); 5-lug solder-type terminal strip; epoxy cement; lettering kit; clear spray acrylic; small block of wood (see text); machine hardware; hookup wire; solder; etc.

Fig. 1. Complete schematic of Personal Intruder Alarm circuit.

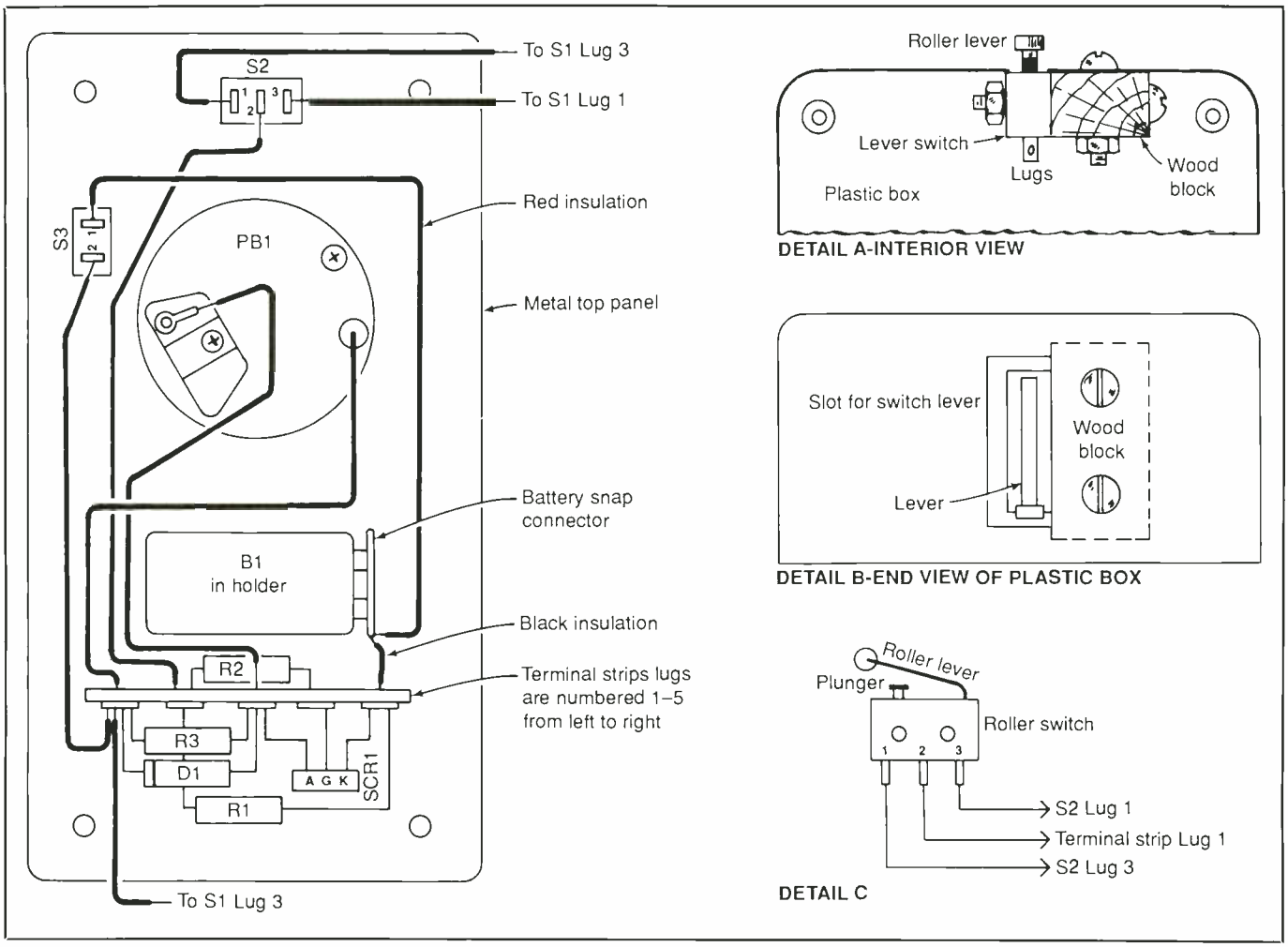


Fig. 2. Construction and wiring details for project.

ing door with the NO contacts held closed by pressing the project's roller switch against the door so that its lever sets the switch to its alternate position. (The project is armed for an inward-opening door by placing it so that the roller is just touching the door and not pushed in.)

Once the project is set so that *S1* is in its armed condition for an outward-opening door, *S3* is flipped to "on." If the Alarm is moved, spring action causes *S1* to go to its other position and the Alarm to sound. Now *S3* must be flipped to off and *S2* to its alternate position. When *S3* is flipped back on, without moving the project, the Alarm will be silent.

For an inward-opening door, the action is just the opposite. That is, when the door is opened, it pushes the lever and causes *S1* to go to its alternate position to complete the trigger circuit.

Should a burglar or intruder attempt to flip *S3* to off and then to on while the buzzer is sounding, he'll find that the alert continues to sound. To rearm the Alarm, he must place it exactly as it was when he found it and flip *S3* to off and then back to on and not touch it again to keep it silent.

Construction

Because of the very low component count in this project's circuit, it easiest to build the Alarm using a five-lug solder-type terminal strip and point-to-point wiring. The most difficult part about building the project is machining its enclosure. The Parts List specifies a Radio Shack plastic enclosure that has a removable top panel, but any other type of enclosure can be used as well.

Except for roller switch *S1*, all components mount on the metal top panel of the enclosure, as illustrated in Fig. 2. Begin machining this panel by drilling mounting holes for *S2* and *S3*, the holder for *B1* and for mounting the five-lug terminal strip. This done, place the piezoelectric buzzer on the panel, centering it between the two long sides and about 1 inch away from the hole drilled for *S2*. Scribe the outline of the buzzer onto the panel. Set aside the buzzer and drill a ¼-inch or larger hole near the scribed

line inside the circle. Then use a nibbling tool to cut the round hole needed for mounting the buzzer in place. Deburr all holes.

Mount the switches, buzzer, battery holder and terminal strip in place. Use fast-setting epoxy cement to secure the buzzer in place. Then, trimming their leads as needed, mount the resistors, diode and SCR on the terminal strip as shown. Crimp each lead tightly to the appropriate lug to assure a good mechanical joint in each case. Make absolutely certain that the diode is properly oriented and that the leads of *SCR1* are properly based. Do *not* solder any connection just yet.

Strip ¼ inch of insulation from both ends of five 6-inch lengths of hookup wire. If you're using stranded wire, tightly twist together the fine conductors at all ends and sparingly tin with solder. Do the same for the free ends of the wires connected to the battery snap connector and piezoelectric buzzer.

Crimp the free end of the battery connector's black-insulated wire to terminal strip lug 5 and solder the three-point connection. Solder the two-point connection of terminal strip lug 4. Crimp one end of the indicated wire coming from *PB1* to lug 3 of the terminal strip and solder this four-point connection. Crimp one end of a prepared hookup wire to terminal strip lug 2 and solder this three-point connection. Then crimp one end of two of the remaining three hookup wires and the free end of the other *PB1* wire to lug 1 of the terminal strip and solder this five-point connection.

Now crimp and solder the free end of the red-insulated lead of the battery snap connector to lug 2 of *S3*. Crimp and solder the free end of one of the hookup wires connected to terminal strip lug 1 to lug 1 of *S3*. Locate the wire coming from terminal strip lug 2 and crimp and solder its free end to lug 2 of *S2*. Crimp and solder one end of the remaining two hookup wires to lugs 1 and 3 of *S2*. The free end of the remaining wire coming from lug 1 of the terminal strip and two wires coming from *S2* will be connected later.

Referring to Details A and B in Fig. 2, cut a rectangular slot in the end of the plastic case opposite that where *S2* will be located. Make this slot just slightly longer and wider than the dimensions of the switch itself. Use a small block of wood to mount the roller switch in place as shown. When properly mounted in place, the switch should be aligned with the wall through which its lever protrudes.

When you finish mounting *S1*, check out its operation. Connect one probe of an ohmmeter or audible continuity checker to lug 2 and the other probe to either lug 1 or lug 3. Stand the project's case on-end on a tabletop so that the lever of *S1* is pushed in and turn on the meter or checker. If you get an indication of continuity, lift the case. If the indication doesn't change, you'll have to reposition the switch so that its lever protrudes far enough out of the case to set the switch to its alternate condition.

When you're satisfied that the switch is properly located, place the plastic case and metal top-panel assembly side by side, orienting them as shown in the main drawing and Detail A in Fig. 2. Now, referring to Detail C and taking careful note of the orientation of the roller switch, crimp and solder the free end of the wire coming from lug 1 of *S2* to lug 2 of *S1*. Then, to complete the construction phase, crimp and solder the free end of the wire coming from lug 3 of *S2* to lug 1 of *S1*. This done, snap a 9-volt battery into the connector and snap the battery into its holder.

Use a dry-transfer lettering kit to label the two positions of *S2* but not the function of POWER switch *S3*.

Checking it Out

Turn on your Personal Security Alarm by setting *S3* to its "on" position. If the buzzer sounds, label the position to which MODE selector switch *S2* is set OPEN OUTWARD. Turn off the Alarm and set *S2* to its alternate position. Turn on the alarm once again. This time, the buzzer should remain off until you push the lever on *S3* in, which means that you label this position of *S2* OPEN INWARD. Do not label the function of roller switch *S1*. Use tape to mask around the legends for *S2* and *S3* and spray several coats of clear acrylic over the lettering to protect it from abuse. Allow each coat to dry before spraying on the next, and don't let any acrylic touch anywhere else on the panel. **ME**