# UNIBOARDS

SIMPLE TRANSISTOR DESIGNS

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**2**

# BURGLAR ALARM

When the loop is closed, even for a tiny fraction of a section, then CSR1 will trigger and operate the alarm. Diode D1 isolates the n.o. loop from R4 and R3. If it were not present then if the n.o. loop were closed, R5, R4 and R3 would form a potential divider holding the gate of CSR1 at exactly 0·5V—not enough to trigger the thyristor.

Capacitor C1 prevents the thyristor from triggering on initial power switch on. This particular design seemed prone to do this. Whilst it will slow down the response time of the circuit, this is not noticeable and the circuit still operates very fast.

Finally, S1 is a normally-closed switch incorporated into the n.c. loop but this switch is mounted in the module. When it is pressed it will cause the warning device to operate. The switch therefore provides an alarm/battery test facility, and enables a rough check on the battery condition to be made.

## CONSTRUCTION starts here

## CIRCUIT BOARD

The module is built into a plastic box type PB1, of dimensions 114×76 ×38mm. The circuit itself is built onto a piece of 0·1 inch stripboard measuring 24 holes×10 strips, see Fig. 2.

Construction is quite straight-forward. Drill two holes as shown to take two 6BA mounting screws. Make all of the breaks in the copper strip using either a spot face cutter or a hand held twist drill, then proceed to solder in the components followed by suitable lengths of lead to reach the case mounted components.

M ANY designs have been published for burglar alarms which give comprehensive protection against intruders. Quite often, however, all that one may require is a very simple system such as the Burglar Alarm Module described here.

This device incorporates one n.c. (normally closed) and one n.o. (normally open) loop for the detection arrangement. Several switches could be placed in series or parallel—depending on the loop used—so that more than one potential break-in point could be monitored with just one loop, see later.

The system described operates from a 9V PP3 battery and as such is not intended for heavy use, although the circuit has been designed to draw as small a quiescent curent as possible (50 microamps). Battery life is therefore quite good, but if the module is to be used regularly, then it is advised that a mains derived power pack is used thereby obviating battery replacements.

## CIRCUIT DESCRIPTION

The circuit diagram of the alarm is shown in Fig. 1. Resistors R1 and R2, being of equal value, form a potential divider clamping the base of TR1 to half the supply rail, i.e. 4·5V. The emitter TR1, therefore, will be 0·6V less than this—3·9V. The normally-closed loop is connected between TR1 base and 0V, so the base is normally grounded and TR1 is off, the emitter being low.

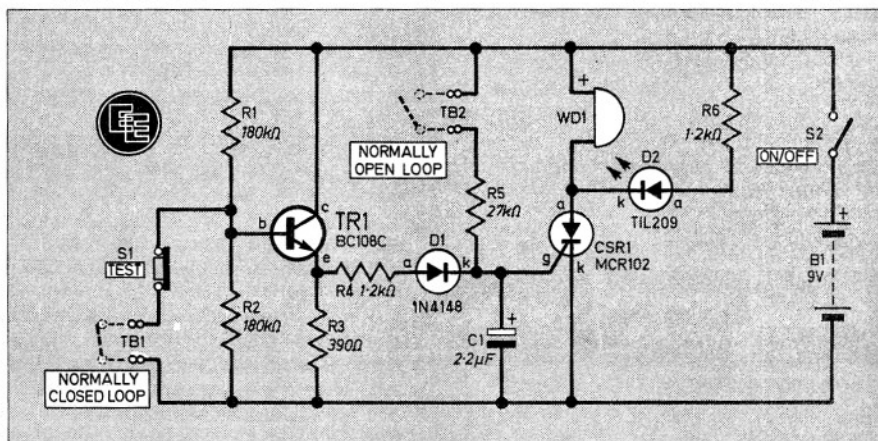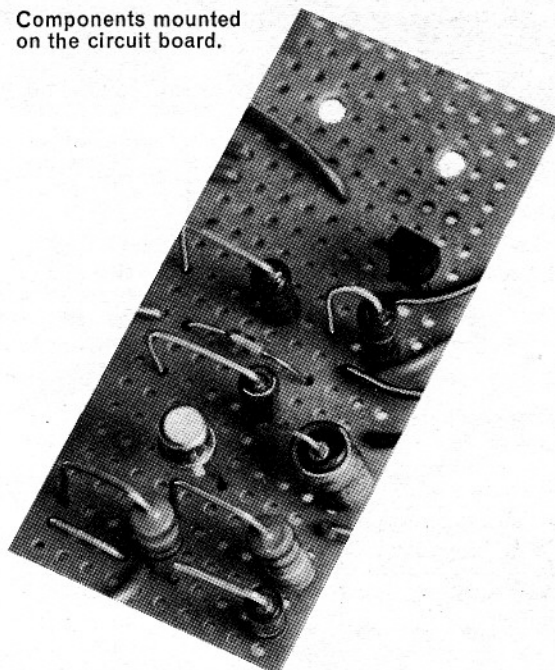When the n.c. loop is broken, the base rises immediately to 4·5V and the emitter "follows" this, rising to 3·9V. This signal is transmitted through R4 and D1 to the gate of CSR1, thereby triggering this thyristor. The thyristor then completes the circuit to WD1 and R6, D2 and so WD1 sounds and D2 illuminates.

The alarm, WD1, is a miniature electronic audible warning device consuming only about 15mA when operating. Conventional electro-mechanical buzzers cannot be used because they can easily draw in excess of 500mA, the maximum forward current allowable in the thyristor. If a heavier alarm load needs to be switched, then WD1 could be substituted by a 9V relay with contacts rated to suit one's needs.

Light emitting diode, D2, indicates that the alarm is operating, but it also provides a minimum holding current for the thyristor, thereby preventing it from resetting undesirably.

The n.o. loop is connected between the positive rail and R5, a current limiting resistor for the gate of CSR1.

Fig. 1. The circuit diagram of the Burglar Alarm with integrated battery supply.

Components mounted on the circuit board.

The finished Burglar Alarm module. The base of the case becomes the "front panel" and components are mounted as shown, including the warning buzzer. Small terminal strips are mounted on the side of the case to take the closed and open loop wiring.
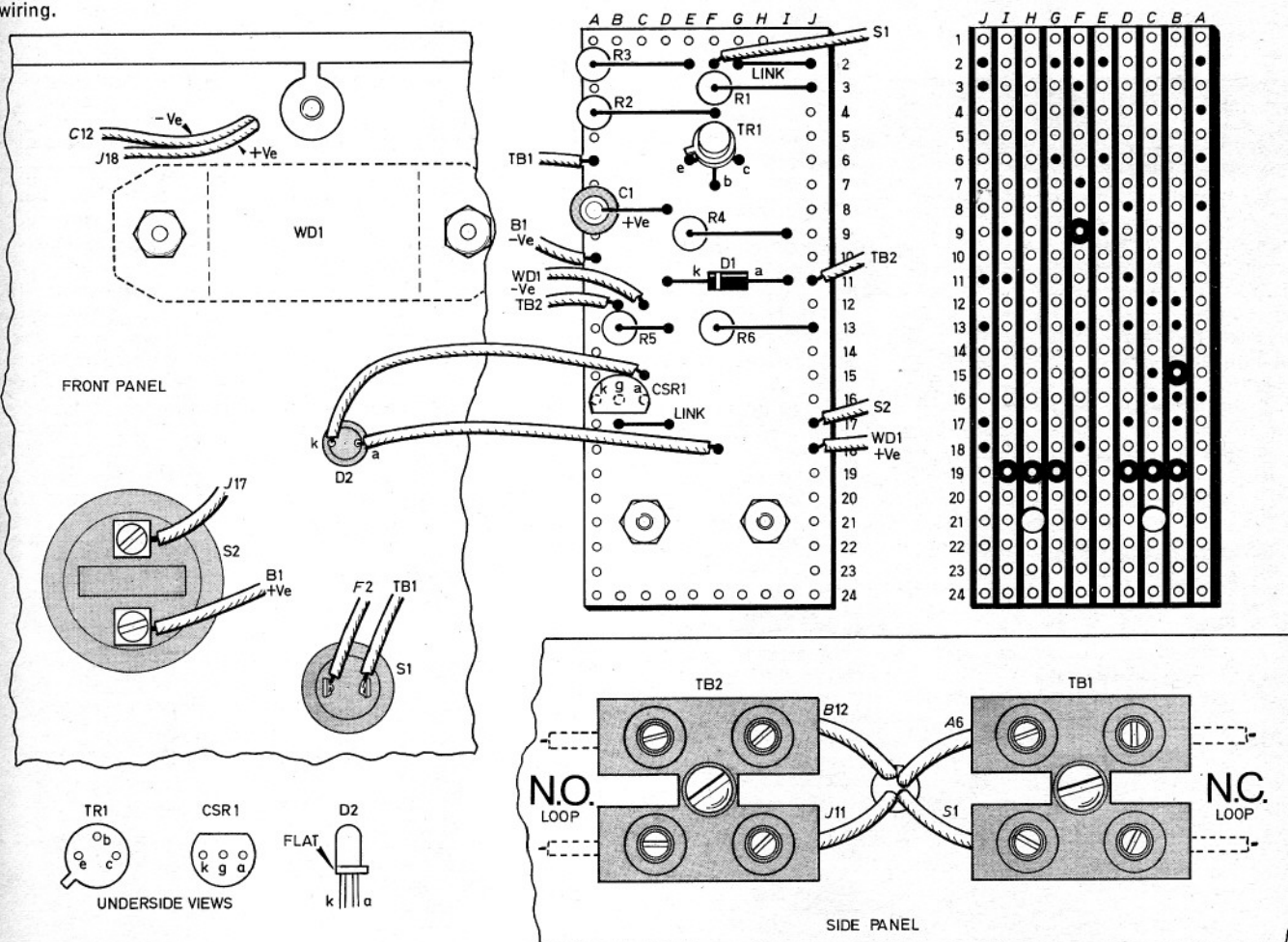


Fig. 2. Complete construction details showing interwiring between board and case mounted components, and layout of the components on the top side of the stripboard.

## COMPONENTS

**Resistors**
R1  180kΩ    R4  1·2kΩ
R2  180kΩ    R5  27kΩ
R3  390Ω     R6  1·2kΩ
All ¼W carbon ±5%

**Capacitors**
C1  2·2µF 10V elect.

**Semiconductors**
TR1   BC108 *npn* silicon
D1    IN4148 or similar silicon diode
D2    TIL209 or similar red l.e.d.
CSR1  MCR102

**Miscellaneous**
S1    s.p.s.t. push-to-break, release-to-make
S2    s.p.s.t. rocker
B1    9 volt PP3 (preferably Duracell)
WD1   miniature 9V audible warning device
Stripnoard: 0·1 inch matrix, 10 strips × 24 holes; 4-way 2 Amp terminal block; PP3 connector; retaining clip for D2; case type PB1, approximately 110 × 73 × 35mm; 6BA nuts (8 off) bolts (6 off); washers (10 off), spacers (2 off); wire and switches for loops.

**Approx. cost  Guidance only**
**£4.00**  excluding loop components

The usual rules regarding soldering apply. Do not overheat any semiconductors and take care not to bridge adjacent copper strips with whiskers of solder, etc.

Prepare the case to accept the case mounted components and fix these in position and wire up to the board as shown in Fig. 2.

In the prototype, the board was fitted to the case by two 18mm long 6BA nuts and bolts and 12mm long spacers.

The audible warning device (WD1) is mounted on the front of the box using two 8BA bolts. A small hole is

Positioning of components, battery and circuit board within the case. The circuit board should be mounted on two small spacers. The battery can alternatively be held in place by glueing some sponge to the lid which when fitted, the sponge will compress and hold the battery in position.
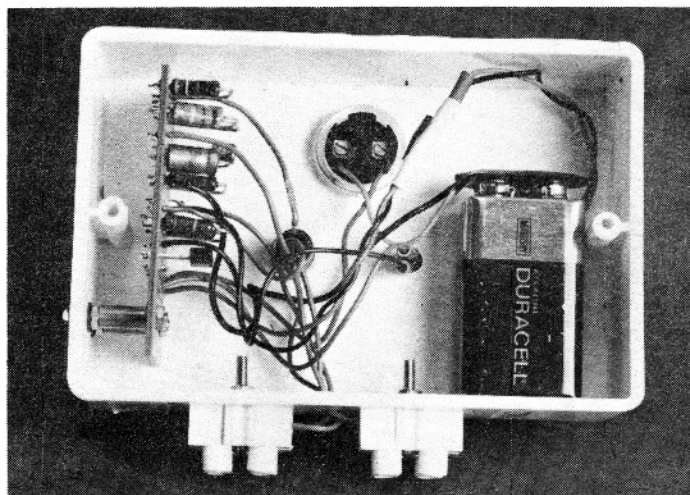


drilled nearby to take the leadouts from the buzzer to the circuit board.

The two "loops" are connected to the circuitry by means of terminal blocks mounted on the side of the case. The interior layout can be arranged to suit one's requirements but enough room must of course be left to take the battery which, incidentally, can be stuck down using a small piece of doublesided foam strip.

Complete the construction of the module and check the wiring carefully. If satisfactory, the panel mounted controls can then be lettered as required to indicate their functions.

### TESTING

Short out the n.c. terminal block connector with a short piece of wire, clip on the battery and switch on. Press S1; this will cause the buzzer to operate and D2 should also illuminate. Reset the circuit at S2 and short the n.o. loop connector—this again should also operate the alarm. The device is then complete and ready to be connected to the "loops".

If the device is to be used with the *9V Power Pack* (to be described later in this series) then the battery clip will be omitted and a suitable con-

nector used instead (e.g. a 3·5mm jack socket). However with a quiescent current of only 50 microamps, it might pay to try battery operation before building the power pack, to see if the battery power is feasible.

### LOOPS AND SWITCHES

The alarm offers double loop protection but only a single loop can be used if desired. If the normally open version is chosen alone, then a permanent shorting link across TB2 is necessary.

The switches in the n.c. loop must have normally closed contacts and all be wired in series. In the n.o. loop, all the switches must have normally open contacts and be wired in parallel.

The constructor will have his own ideas regarding the type of switch to use but can be either miniature push-button, microswitch, reed/magnet, a pressure mat or home-made from brass strip or conductive tape.

For security reasons the switches and wires should be concealed. The framework between the hinges is a safe place to site the switches for doors and windows.

**Next Month: 9V Power Supply.**

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## The Adventures of Tanty Bead                                    By Matthew Reed