

BOTH the Burglar Alarm Module and Opto Alarm projects earlier in this series have utilised a miniature audible warning device as the alarm tone generators. Being solid state, these units have the advantage of low current consumption (about 15mA) as well as small size when compared with electromechanical buzzers.

The project described here is a two-transistor circuit which produces an alarm tone via a miniature 8 ohm loudspeaker. It can be used in place of the audible warning device mentioned above.

The Audible Tone Generator is easily constructed from readily available parts and is ideal for beginners. This device incorporates a preset control enabling the frequency of the tone to be varied to a certain extent.

It can be used in any project which operates from a 9 volt rail; 12 volts must be considered the absolute maximum supply voltage for the unit. Being a direct replacement for the audible warning device described earlier, this unit also draws in the region of 15 to 20mA.

CIRCUIT DESCRIPTION

The circuit diagram of the Audible Tone Generator is shown in Fig. 1. Regular readers will recognise this as a unijunction transistor oscillator, TR1, followed by a single-transistor amplifier, TR2.

TR1 has three terminals which, unlike a "normal" transistor, are designated emitter, base 1 and base 2. The transistor is connected to form a relaxation oscillator operating at audio frequencies. When power is applied to the circuit, the capacitor C1 will charge up through the resistors R1 and VR1. Eventually a point is reached when the transistor will switch over, and C1 will discharge itself into the emitter of TR1 and R4 to 0V.

TR1 will then switch back over to its high impedance state, and so C1 starts to charge up again. The whole cycle repeats itself, a constant stream of pulses being present at base 1.

By adjusting the timing components (R1, VR1 and C1), the frequency of the pulses can be altered. In fact by varying VR1 this particular unit was measured as operating between 100 and 350 Hertz.

The output pulses are coupled to TR2 by R3. This second transistor amplifies the audio tone generated by TR1 and associated components, and directly drives the loudspeaker LS1. The speaker used in the prototype was a 45mm diameter type, although a larger size (e.g. 65mm) could be used.

Capacitor C2 decouples the power supply and enables the peak current requirements to be met.

UNIBOARDS

**SIMPLE
TRANSISTOR
DESIGNS**

By **A.R. Winstanley**

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AUDIO TONE GENERATOR

**CONSTRUCTION
starts here**

CIRCUIT BOARD

The circuit can be built onto a standard-sized piece of 0.1 inch matrix stripboard measuring 10 strips x 24 holes, Fig. 2. This particular size is available from suppliers, but it can if necessary be cut out from a larger piece.

Commence by drilling two 6BA clearance holes in the positions B3 and I3 as shown. These will enable the completed board to be fixed down with 6BA hardware and spacers.

There are six breaks to be made in the copper strips, in order to prevent the mounting hardware from shorting together adjacent copper strips. After doing this, the components may be soldered in.

The transistors being semiconductors of course are sensitive to heat, so it is wise to use a heatshunt on the transistor leads being soldered.

Transistor TR2 was fitted with a push-on TO-18 heatsink purely as a precaution, as the transistor temperature did rise slightly after prolonged use with a 12V supply rail. The heatsink can be omitted if it is not available, but if one is used, it must be

fitted to the transistor *before* the device is soldered into position. Otherwise the possibility exists of the leads of the transistor being accidentally bent or deformed, because of the pressure required to push on the tight-fitting heatsink.

The only points to watch are correct orientation of the transistor leads, plus proper polarisation of the electrolytic capacitor C2. Four flying leads connect up the loudspeaker switch and the power supply; these can be made up from standard multi-purpose hook-up wire (preferably stranded) and can either be soldered to terminal pins or straight to the circuit board.

INSTALLATION

The completed unit can either be installed in a separate box (together with the loudspeaker) or it can be fitted into the same case (if there is any room) as the equipment from which it is to be powered.

The miniature loudspeaker is carefully glued to the inside of the case: a smear of Uhu or similar adhesive around the rim of the speaker should be enough to fix down the loudspeaker, but do not apply any glue to the actual cone of the speaker. A series of holes should be made in the case where the speaker is to be positioned, so that the sound of course can get out.

Testing the generator comprises applying 9 volts (from a battery) and setting VR1 until a tone of the desired frequency is obtained.

Next Month: Voltage Converter

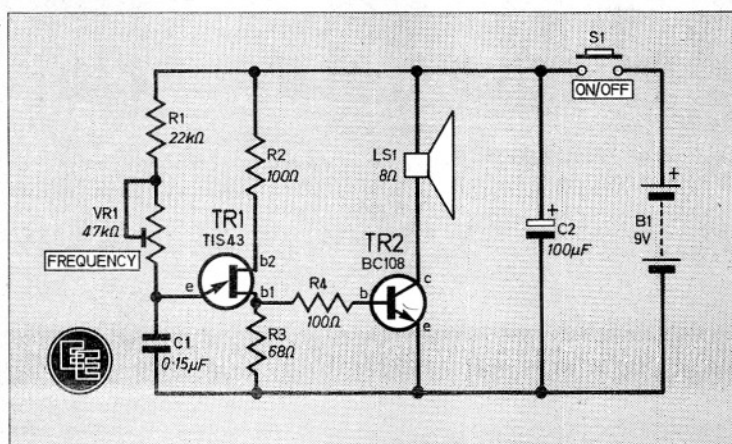
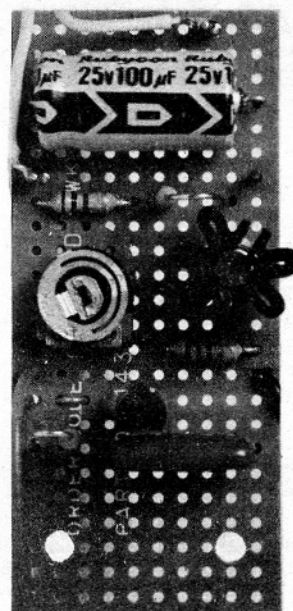


Fig. 1. Circuit diagram for the Audio Tone Generator.



(above) The completed circuit board. The use of a heatsink for TR2 is optional.

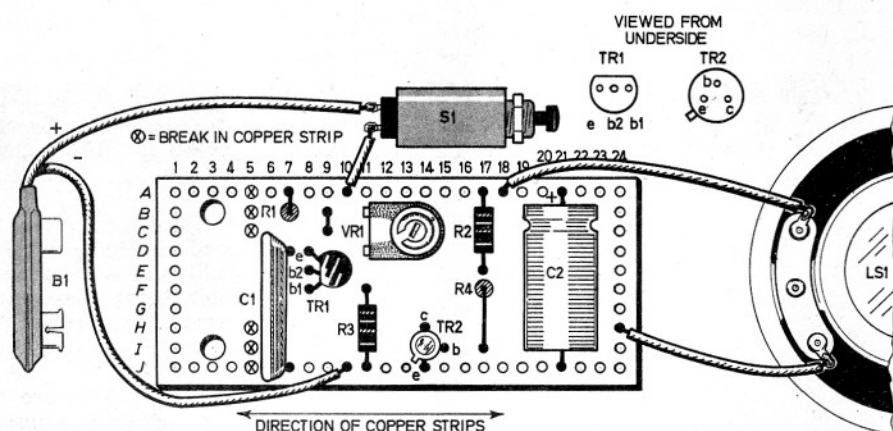


Fig. 2. Layout of components on the topside of the circuit board together with interwiring to loudspeaker, on/off switch and battery connector. Note that there are six breaks to be made in the copper strips on the underside.

COMPONENTS

Resistors

R1	22kΩ
R2	100Ω
R3	100Ω
R4	68Ω

All ¼ W carbon ± 5%

Capacitors

C1	0.15μF polyester type C280
C2	100μF 10V elect.

Semiconductors

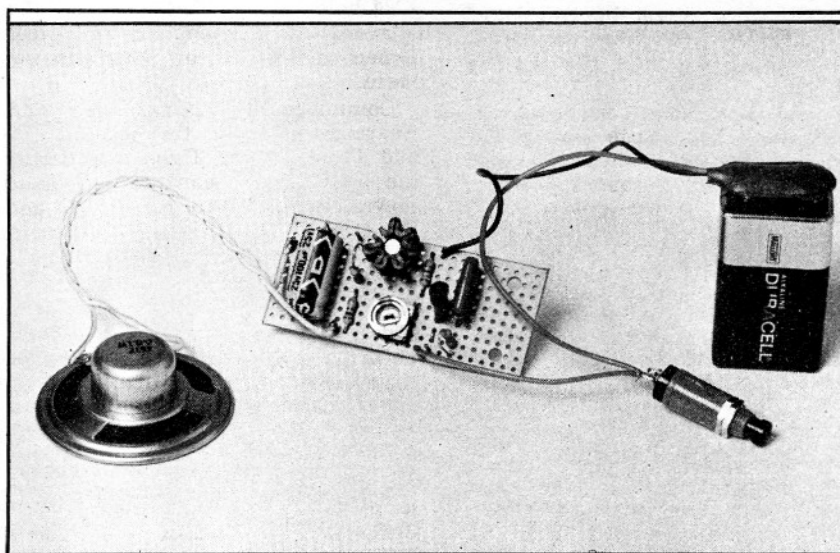
TR1	TIS43 <i>n</i> -channel unijunction transistor
TR2	BC108 <i>n</i> p <i>n</i> silicon

Miscellaneous

VR1	47kΩ miniature horizontal preset
LS1	miniature 8-ohm moving coil loudspeaker
S1	push-to make pushbutton switch
B1	9V type PP3 or in-built supply—see text

Stripboard 0.1 inch matrix size 10 strips × 24 holes; push-on TO-18 heatsink (optional, see text); 6BA mounting hardware; case to suit; PP3 battery clip.

Approx. cost
Guidance only **£2.20**



The completed Audio Tone Generator. The method of housing the finished unit is left to individual choice.