SIGNAL HORN

Although designed as a warning horn for use with the 'Albar' ultrasonic alarm system described elsewhere in this issue, the signal horn may of course be used with any system requiring an audible warning. The parts outlay is small but the sound produced is loud and extremely penetrating.

It was decided at the outset that to keep the cost down the output transducer should be a cheap loudspeaker such as might be cannibalised from an old TV set, radiogram or other equipment. In view of the limited power handling capacity of such speakers it was decided that the best drive waveform would be a rectangular waveform with a low duty-cycle. In this way a high peak sound level could be obtained whilst staying within the average power rating of the speaker. This short duty-cycle also keeps down the current consumption of the circuit.

The circuit

The basis of the circuit is an astable multivibrator using the ubiquitous 555 timer.

With the control input (R1) open-circuit the output of the 555 is high, so T1 is turned off, as is T2. When the input is grounded the circuit begins to oscillate at a frequency of about 400 Hz (determined by R3, P1 and C4). The duty-cycle of the waveform T is given by

$$T = \frac{P_1 + R_2}{R_3 + 2(P_1 + R_2)}$$

The duty-cycle may be varied between about 1% and 10% by means of P1. Since P1 is part of the frequency determining network this will also cause the frequency to vary slightly.

The output of the 555 switches T1 on and off, which in turn switches T2. In order to ensure fast rise and fall times at the output, the base resistors of T1 and T2 are kept small. The loudspeaker is connected in series with the collector of T2, and diodes D1 and D2 protect T2 against the back e.m.f. from the speaker.

The supply voltage to T1 and the multivibrator should not exceed 12 V, but the supply to the loudspeaker may be up to 60 V (with an 8 Ω loudspeaker) to obtain a louder signal. Alternatively if the entire circuit is to be run from a single 12 V supply (e.g. a car battery) then several speakers may be connected in parallel (minimum 1 Ω paralleled resistance) to obtain a louder signal.

Construction

A p.c. board and component layout for the signal horn are given in figure 2. T should be provided with a clip-on heat sink for cooling. T2 may or may not require a heatsink depending on the number of loudspeakers driven and the supply voltage, but plenty of space is reserved on the board for the 'multi finger' type heatsink.

Operating Hints

To make the maximum amount of noise, the loudspeaker should be mounted in a box made of a suitably resonant material (e.g. a biscuit tin). If the unit is intended for mounting outside then the enclosure should be watertight and the loudspeaker cone should be waterproofed with a few coats of

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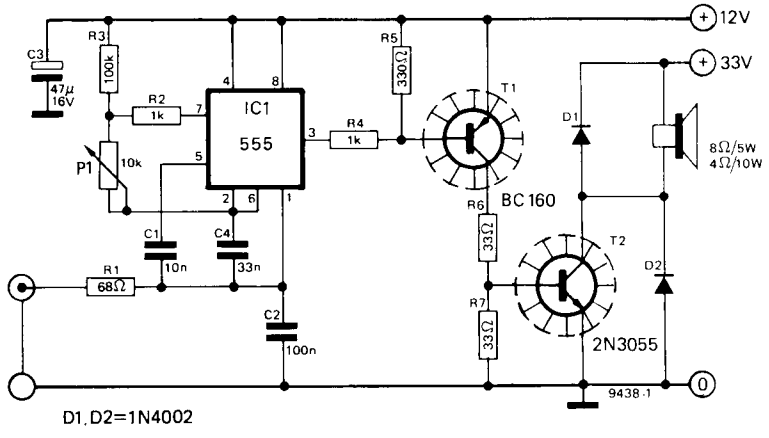

Figure 1. Circuit diagram of the signal horn. The duty-cycle may be adjusted by means of P1.

Figure 2. Printed circuit board and component layout. Note the cooling clip on T1 and the heatsink on which T2 is mounted.

Figure 3. An automatic interrupter for the signal horn, which may be required in some areas to comply with local regulations.

model aircraft dope or somethin similar.

Before mounting the signal horn on th outside of a building it is advisable t check the local laws concerning the us of alarms. In some areas continuou operation of an alarm may be pro hibited and only intermittent operatio is permitted.

Figure 3 shows the circuit of an auto matic interrupter consisting of a 1 H astable multivibrator and a switchin transistor. When point B is grounded th multivibrator will switch the horn o and off at one second intervals. Thi circuit may satisfy local regulations and in addition the on-off switching o the alarm is more likely to attrac attention.

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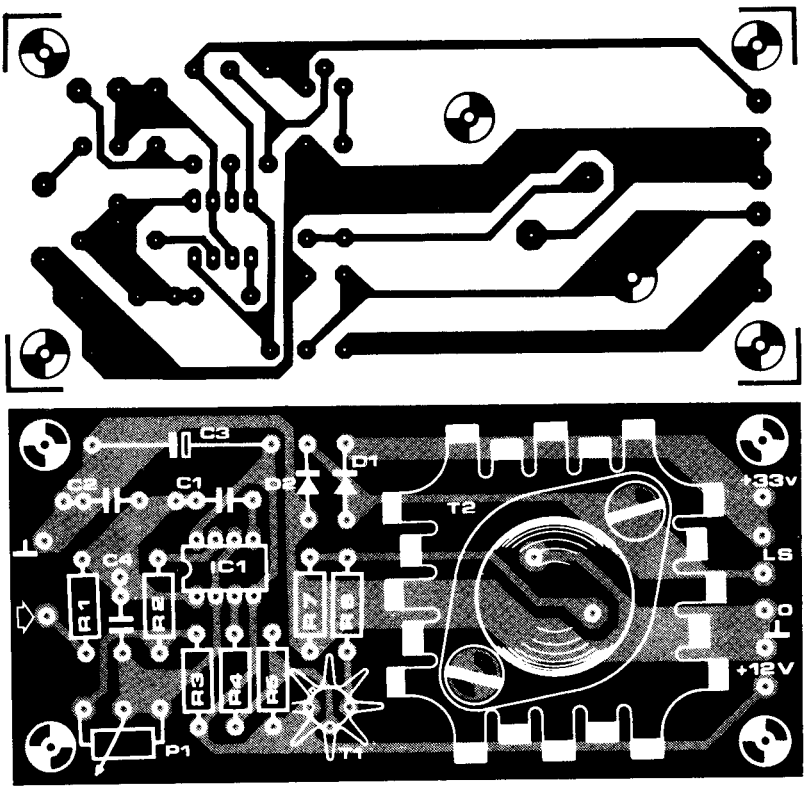


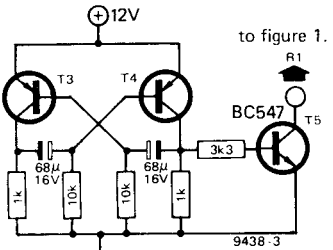
Parts list for figure 1:

Resistors:
R1 = 68 Ω
R2,R4 = 1 k
R3 = 100 k
R5 = 330 Ω
R6,R7 = 33 Ω
P1 = 10 k

Capacitors:
C1 = 10 n
C2 = 100 n
C3 = 47 µ/16 V
C4 = 33 n

Semiconductors:
T1 = BC160, BD132, BD140, MPS U51
T2 = 2N3055
D1,D2 = 1N4002
IC1 = 555

3



Ⓑ T3,T4 = BC557, 2N3906
T5 = BC547, 2N3904