I.C. UNIBOARDS

SIMPLE INTEGRATED CIRCUIT DESIGNS

MINI SIREN

No. 4 BY A. R. WINSTANLEY

THIS MONTH'S Uniboard project is a Mini Siren which can produce three distinctive sounds—twin tone, U.S. police-car style siren and a "bleep" alarm signal. The unit makes a good alarm tone generator and perhaps could form a novel toy for a youngster with plenty of imagination.

An integrated circuit type NE556 is used. This i.c. consists of two individual timers similar to the NE555 used in the Uniboard No-Entry Indicator project. In fact the electrical characteristics and method of operation of each timer in the NE556 are identical to those of a normal NE555.

CIRCUIT

The circuit diagram of the Mini Siren is shown in Fig. 1. Integrated circuit IC1 is the NE556 timer chip and this has been shown in the circuit diagram as IC1a and IC1b. Each half of the i.c. can be considered to be just like a standard 555 timer.

One half of the i.c., IC1b, is wired as a slow-running astable multivibrator. It oscillates at approximately 3Hz, and the square wave output from this is obtained at pin 9. More detailed information regarding the function of the astable is given in the "No Entry Indicator", project No.1.

The other half of the i.c., IC1a, is another astable, this time running at about 220Hz, in fact at an audio frequency. This frequency can naturally be changed as required by altering the timing components R1, R2 and/or C1.

CONTROL VOLTAGE

An electronic alternative to this is to impose a voltage at pin 3 of IC1a. This pin is the control voltage input and provides a means of altering the frequency of operation without having to physically change the value of a timing component.

The slow square wave from IC1b is coupled to the control voltage pin of IC1a through S1a, a rotary switch which selects the function of the Mini Siren: bleep, twin-tone or U.S. siren.

EFFECTS

If S1a is set to "twin-tone", the output from IC1b is fed straight through to the control voltage terminal on IC1a. This results in a rapid decrease and then increase in the frequency of oscillation of IC1a. Hence a two-tone effect is created.

By moving the switch to the "U.S. siren" function capacitor C3 is brought into circuit by S1b. In effect this converts the output of IC1b from a square wave into an approximate sawtooth. The sawtooth then passes through to the control voltage terminal of IC1a.

The audio signal from IC1a is then modulated, or varied in sympathy with the sawtooth to produce a characteristic "whooping" tone similar to many American police-car sirens.

With S1 in the "bleep" position, IC1b imposes a 3Hz square wave on pin 4 of IC1a. This is the reset terminal of IC1a. (The reset pin of IC1b has been connected straight to the positive rail, incidentally, because it is not needed.)

By taking pin 4 down to 0V the i.c. is disabled. This means that the astable is prevented from oscillating. When the output from IC1b goes high again, the audio oscillator is enabled again. The overall result is that IC1a is repeatedly prevented from oscillating, producing a "bleeping" tone.

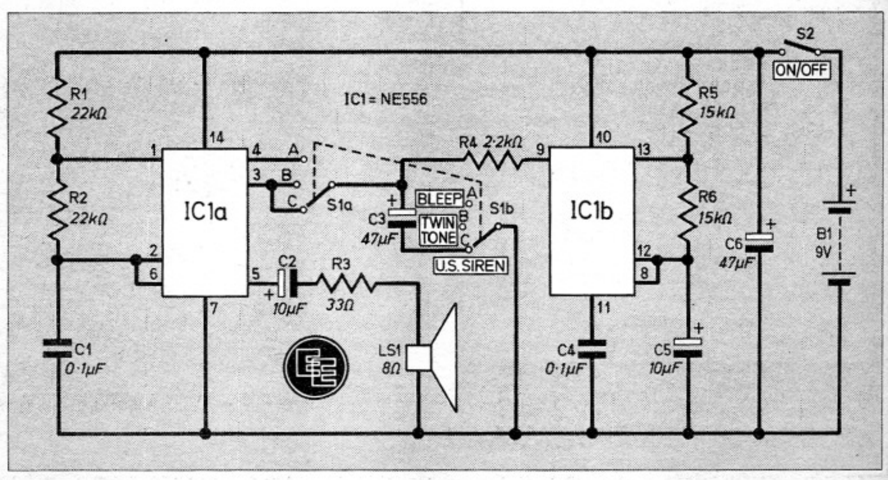
OUTPUT

The audio output from the whole circuit is taken from pin 5 on IC1a and this drives LS1 to generate an audible signal. The alarm tone is quite loud, suitable for burglar alarms and similar applications.

Measurements on the prototype showed that the siren draws about 40mA at 9V, and under 100mA when a 12V rail is used.

A 3·5mm jack socket can be used to connect up an external power supply. You may wish to use the Mini Siren in conjunction with another Uniboard project like the Burglar Alarm

Fig. 1. Complete circuit diagram of the Mini Siren.



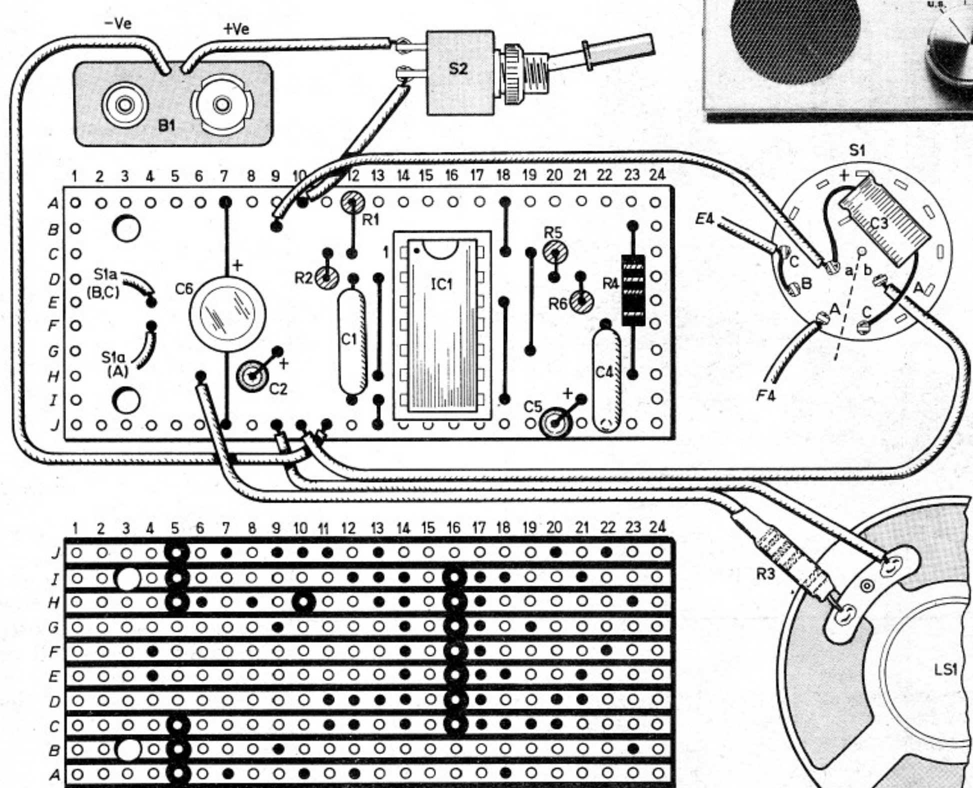


Fig. 2. Circuit board layout and component interwiring.

COMPONENTS

Resistors
R1 22kΩ
R2 22kΩ
R3 33Ω
R4 2·2kΩ
R5 15kΩ
R6 15kΩ
All ¼W carbon ±5%

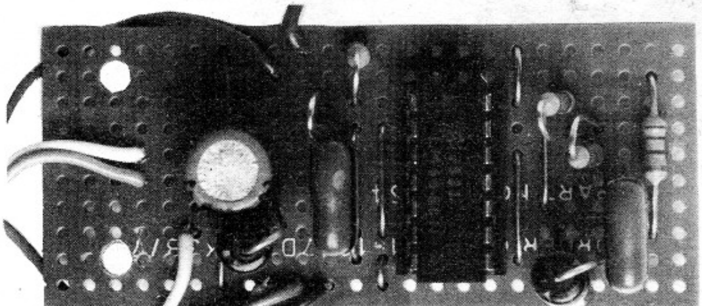
Capacitors
C1 0·1μF C280 polyester
C2 10μF 25V elect.
C3 47μF 25V elect.
C4 0·1μF C280 polyester
C5 10μF 25V elect.
C6 47μF 25V elect.

Semiconductors
IC1 NE556 dual timer i.c.

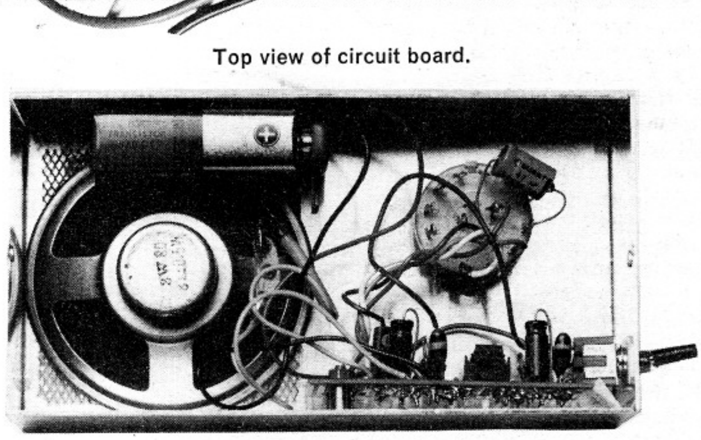
Miscellaneous
S1 2-pole, 3-way rotary
S2 s.p.s.t. toggle
LS1 8 ohm miniature loudspeaker
B1 9V battery, PP3 or PP9 size (see text)

Aluminium case, 130 × 70 × 40mm; 0·1 inch matrix stripboard, 10 strips by 24 holes; 14 pin d.i.l. socket; battery clip; knob; speaker mesh; 6BA nuts, bolts and spacers (for mounting circuit board) (2 off each); connecting wire.

Guidance only Approx cost **£8·00 complete**
See page 159



Top view of circuit board.



Interior of completed unit.

or the Opto-Alarm. This is easily accomplished. Simply wire the Mini Siren in parallel with the audible warning devices (or in place of them) used in the projects.

Beware when using a battery. Because of the high current consumption a PP9 will probably give the most economical service, although the PP3 size is most compact. A battery clip of the appropriate size will of course be required.

CASE

The Mini Siren can be built into any type of case or box, whether metal, plastic or home-made. The prototype was contained within an aluminium box measuring 130×70 ×40mm and this was just wide enough to hold the loudspeaker.

The diagram in Fig. 2 illustrates how the various components are arranged on 0·1 inch matrix stripboard measuring 10 strips × 24 holes. It is best to use a 14-pin d.i.l. socket to carry IC1 and this should be soldered in after making the fourteen breaks in the copper strips.

The i.c. is not a CMOS type and no special handling precautions are needed. Insert the i.c. the right way round into its socket after soldering in all the link wires, resistors and capacitors.

You will see that C3 is mounted on the terminals of the rotary switch and also R3 is soldered onto one of the loudspeaker connectors.

Regarding the rotary switch, a 2-pole 3-way type is not generally available and therefore a 4-pole 3-way version must be used. Half of the switch is disregarded.

LOUDSPEAKER

The loudspeaker used in the author's prototype was an eight ohm 0·5 watt type measuring about 55mm diameter. In the case a large cut-out was made with a tank cutter, and then a piece of aluminium mesh was glued behind the resulting hole.

The speaker was then stuck down with a fairly generous application of glue around the rim. Try not to get any glue onto the loudspeaker cone itself.

If you do not have a tank cutter, you could drill a regular pattern of holes in the front panel. Alternatively, you can make a large cut-out by drilling a ring of holes and then punching out the middle.

The edge of the hole can then be filed with a half round file until a smooth finish is achieved. In practice it is not easy to achieve a presentable finish with this method.

FINISHING OFF

Dry transfer lettering can be applied as required to the front panel. The prototype was finished off by fixing a large aluminium knob onto the spindle of the rotary switch.

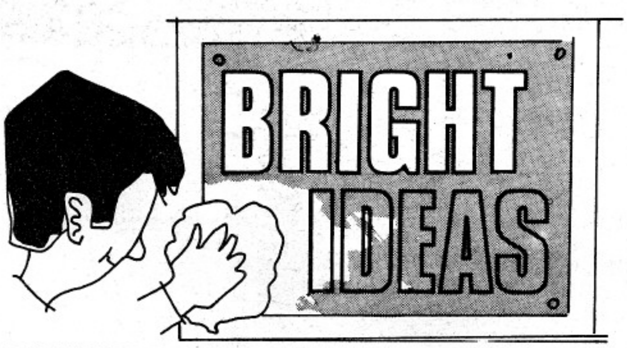
Once construction is finished check all wiring for errors or omissions. Take a look at the stripboard and check for dry joints or whiskers of solder bridging neighbouring strips.

USING THE SIREN

No setting up is needed so connect up a battery and switch on. It is important to wire up the power the right way round. This can come from a 9V Power Pack if a battery is not available.

Then you should hear the appropriate alarm tone depending on the positon of S1. If this is satisfactory, then construction is complete and the unit is ready to use.

Readers who like experimenting can try altering timing components R1, R2 or C1; R5, R6 or C5; R4 or C3 to see what effect this has on the sound produced. By doing this you can alter the tone of the alarm, the frequency of the bleeps and so on. ⌑



Readers' Bright Ideas; any idea that is published will be awarded payment according to its merit. The ideas have not been proved by us.

PENCIL PROBE

I have discovered an inexpensive way of making probes for equipment. All that is needed to make one probe is a pencil (preferably the HB or B type). Just cut off the wood from the top with a blade or carving knife leaving the lead (graphite) and tie the wire around it. The wire can be secured to it by encapsulating in plastic resin or with a crocodile clip.

I have been using these probes for the *E.E. Continuity Tester* in the January '80 issue and on other pieces of equipment for many months and find its performance excellent! A series resistance of about 5 ohms is introduced with this probe which may need to be accounted for in some measurements.

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Perivale,
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BOOK REVIEWS

AMATEUR RADIO TECHNIQUES

Author Pat Hawker G3VA
Price £5·00 Paperback (£6·08 by post from RSGB worldwide)
Size 246 × 184 368 pages
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As the preface states, this is basically an ideas book and a source book and is intended to supplement standard handbooks. Some 50 new pages are included in this latest edition—the popularity of this publication is indicated by its reissue every two years since the second edition.

The material has largely been collected from the Technical Topics columns in *Radio Communication*, the Journal of the RSGB, and is arranged in nine chapters: Semiconductors, Components and Construction, Receiver Topics, Oscillator Topics, Transmitter Topics, Audio and Modulation, Power Supplies, Aerial Topics, and Fault-finding.

A number of "quick guides" have been incorporated in certain parts of the book to provide concise introductions to more recent devices and techniques. They cover (in Chapter One) topics such as Integrated Circuits, Digital Electronics, VMOS Power f.e.t.s, Microprocessors and (In the Audio and Modulation Chapter) Pulse Modulation, RTTY and SSTV.

There are over 800 diagrams, some 600 of these are circuits. The author's profound practical knowledge of the subject is obvious, and he has interlaced his text with comments on various amateurs' experiences and suggestions as well as references to published information in manufacturers' literature or in periodicals. F.E.B.