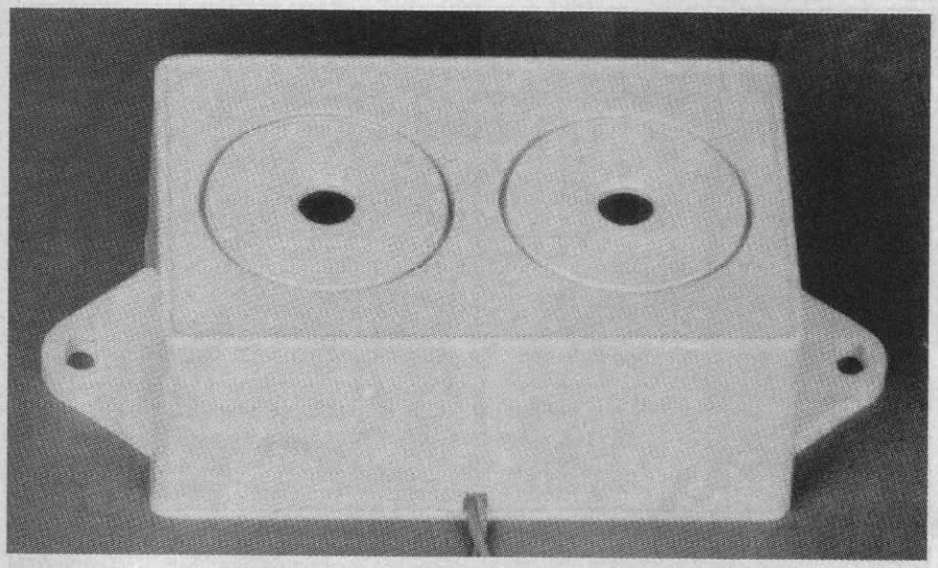


Do you want to know what 110dB of noise sounds like? Well now you can easily find out. This circuit puts out between 108dB and 111dB at a distance of about one metre.

Build a 6-12V alarm screamer module

There are many applications where a low-cost alarm siren is required. This very effective unit from DIY Electronics certainly makes a racket and could serve as the siren in a house alarm system, in a car, or in many industrial applications. For example, you could wire it to a door switch in your car via an external on/off switch to serve as an intruder alarm.

As shown in the photographs, the unit is housed in a specially-designed plastic case fitted with a mounting bracket (which also forms the rear panel). Its overall dimensions are 84 x 55 x 33m (L x W x D), not including the mounting bracket.

What's so special about the case? Well, to make the unit as effective as possible, it features two integral resonant cavities for the two piezo transducers that are used to generate the noise. The unit is supplied with these two piezo transducers pre-glued to the resonant cavities – all you have to do is assemble a small PC board, connect a few leads and a power supply, and stand back to avoid being deafened.

It is interesting to note that without the resonant cavities, the sound generated by the piezo transducers in open air is barely audible. It's a completely different story with the resonant cavities, though.

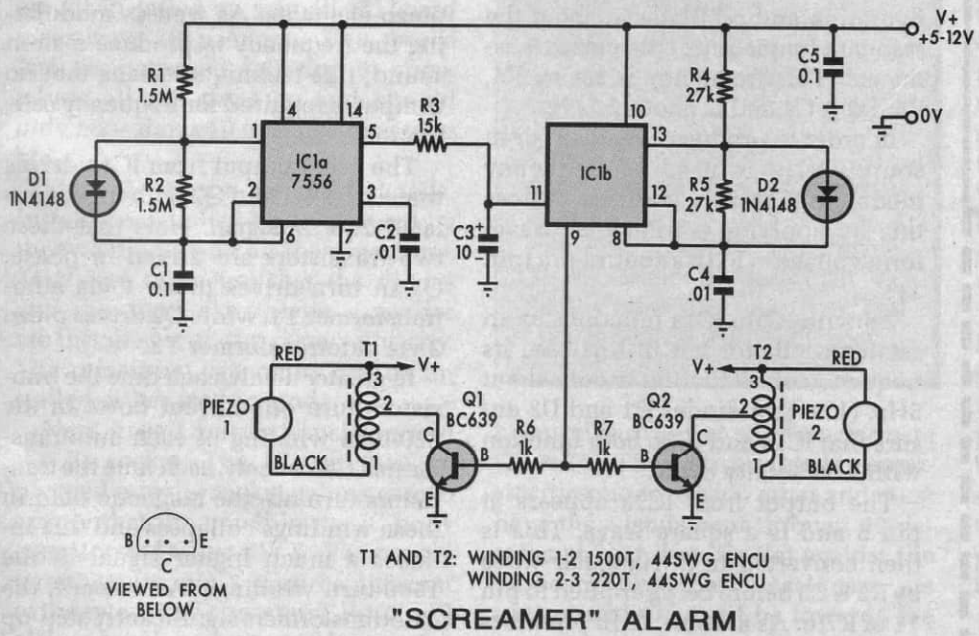
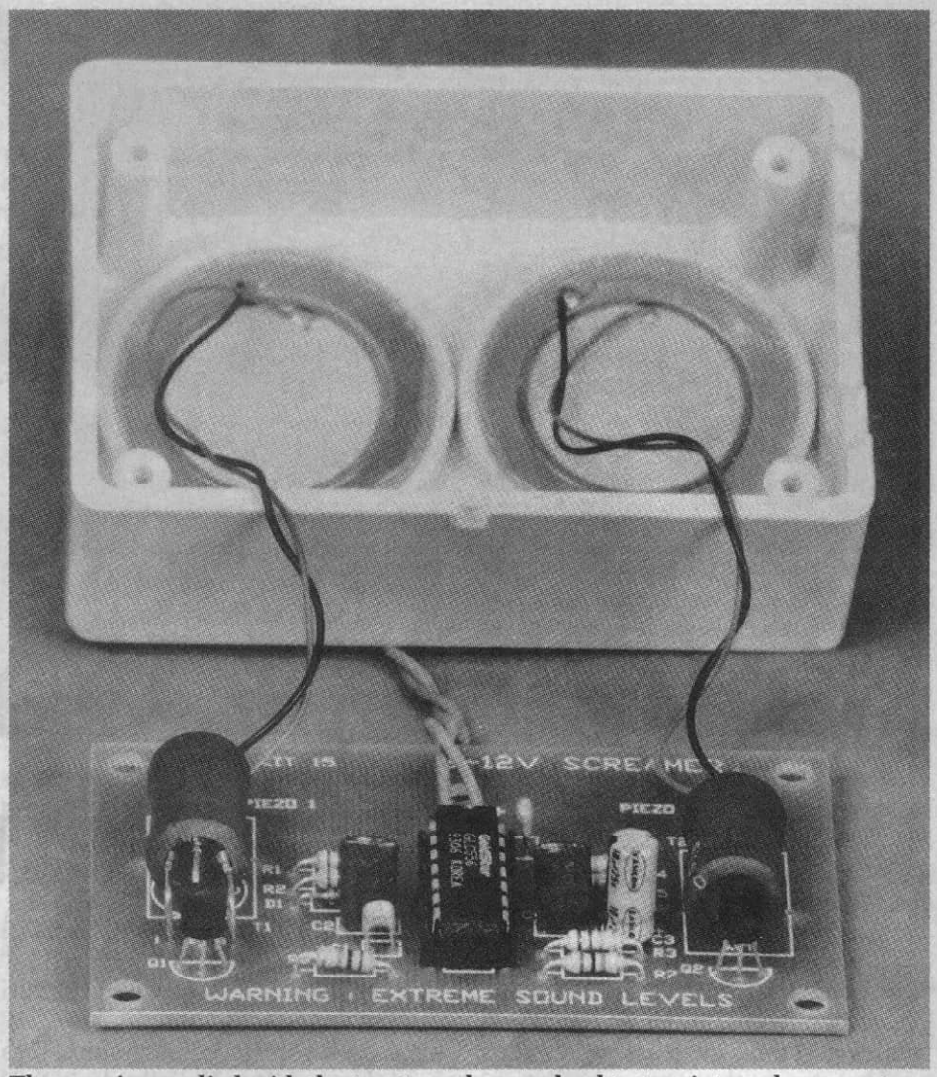


Fig.1: the circuit employs two oscillator stages based on IC1a & IC1b. IC1a frequency modulates IC1b which in turn drives two piezo elements via transistors Q1 & Q2 and autotransformers T1 & T2.

How it works

Refer now to Fig.1 for the circuit details. In addition to the piezo transducers, it's mainly based on a dual 7556 timer IC, two transistors and a couple of autotransformers.

IC1b is wired in astable con-



The case is supplied with the two transducers glued to two internal resonant cavities. All you have to do is assemble the PC board, connect a few leads and apply power.

figuration and oscillates at about the resonant frequency of the piezo transducers. This frequency is set by R4, R5, D2 & C4 and is about 2.7kHz.

In order to produce a realistic siren sound, IC1a is used to frequency modulate IC1b at a low rate. It does this by applying a triangular waveform voltage to IC1b's control pin (pin 11).

As with IC1b, IC1a functions as an astable oscillator but in this case its frequency of oscillation is only about 5Hz. Note that diodes D1 and D2 ensure that IC1a and IC1b both function with a 50% duty cycle.

The output from IC1a appears at pin 5 and is a square wave. This is then converted to a triangular wave by R3 & C3 before being applied to pin 11 of IC1b. As a result, IC1b produces a modulated output at its pin 9 which constantly sweeps back and forth through the resonant frequency of the piezo elements. As well as modulating the frequency to produce a siren sound, this technique means that no trimpot is required for frequency calibration.

The pin 9 output from IC1b drives transistors Q1 and Q2 with the modulated 2.7kHz signal. Note that these two transistors are driven in phase. Q1 in turn drives piezo 1 via autotransformer T1, while Q2 drives piezo 2 via autotransformer T2.

In greater detail, each time the transistors turn on, current flows in the 220-turn winding of each autotransformer. Conversely, each time the transistors turn off, the magnetic field in these windings collapses and this induces a much higher signal in the 1500-turn windings. As a result, the autotransformers significantly step-up the signal voltage that's used to drive the piezo transducers.

In fact, a potential of over 200V is

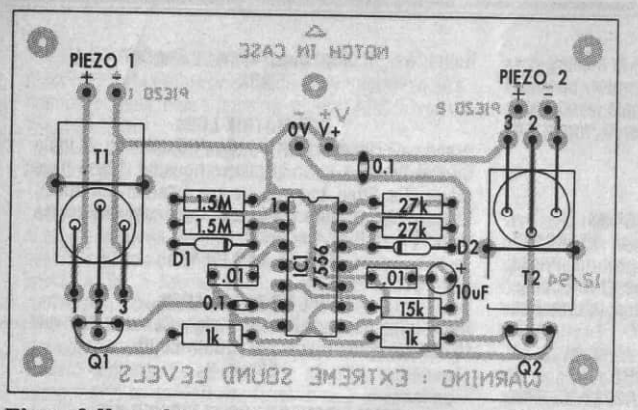
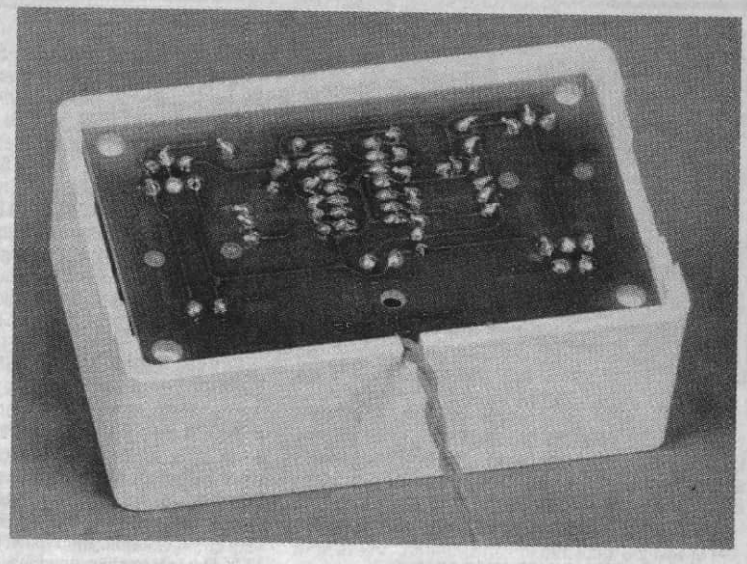


Fig.2: follow this wiring diagram when installing the parts on the PC board and take care to ensure that the two autotransformers are correctly oriented (see text). The photograph at right shows how the PC board is installed in the case.



induced which can give you quite a shock if you are careless enough to touch the autotransformer leads or the transducer terminals. This also means that the piezo elements are overdriven and this has been done deliberately to give maximum noise output. This causes no harm to the piezo elements and test circuits have been run for several hours at a time without component failure.

Power for the circuit can come from any 5-12V DC source; eg, batteries or a 9V DC plugpack supply. Do not use a 12V DC plugpack as this could deliver more than 16V when lightly loaded.

Assembly

The parts for the Screamer Alarm are all installed on a small PC board measuring 78 x 48mm. This board features screened lettering to show where all the parts go and should only take about 10 minutes to assemble.

Fig.2 shows the assembly details. Install the resistors first, followed by the two diodes and all the capacitors. Take care to ensure that the diodes and the 10µF electrolytic capacitor are installed with the correct polarity. The remaining capacitors can be installed either way around.

Next, install the two transistors and the IC socket. The IC can then be plugged into the socket, taking care to ensure that the notch in the IC body goes towards the 0V & V+ supply terminals (ie, pin 1 must be adjacent to the two 1.5MΩ resistors). Pin 1 will also generally be indicated by an adjacent dot in the IC body.

Now complete the board assembly by installing the two autotransformers (T1 & T2). These are oriented in opposite directions to each other and must have their leads bent through 90 degrees so that they lie flat against the PC board. Note that in each case, the centre terminal must be towards the top of the device (see photo).

Two "tie-down" pads have been provided next to the body of each autotransformer and you can loop wire links over the autotransformers at these locations. In practice, the leads on the autotransformers will usually be strong enough to stop them from moving.

Finally, solder the six leads to the PC board at the designated locations. There are two each for the piezo transducers (red to positive, black to negative), plus two more for the power supply connections. This done, the board can be mounted upside down inside the case, with the supply leads exiting from the notch, and the cover secured using the screws supplied.

PARTS LIST

1 case with two piezo elements plus 4 screws
1 PC board (DIY Kit 15)
1 16-pin IC socket
2 autotransformers
2 150mm-lengths of hook-up wire (red, green)

Semiconductors
1 GLC556, 7556 dual CMOS timer (IC1)
2 BC639 NPN transistors (Q1,Q2)
2 1N4148 diodes (D1,D2)

Capacitors
1 10µF 16VW electrolytic
2 0.1µF monolithic
2 .01µF greencap

Resistors (0.25W, 5%)
2 1.5MΩ
2 27kΩ
1 15kΩ
2 1kΩ

Where to buy the kit
A complete kit of parts for the 12V Screamer Alarm (DIY Kit 15) is available from: DIY Electronics, 22 MacGregor St, Numurkah, Vic 3636. Phone (058) 62 1915. The price is $23.50 plus $3.50 p&p.

Testing

Before applying power, wrap the unit in a towel to muffle the sound level (so that you won't be deafened). After that, all you have to do is connect the power supply and the unit should immediately start. It's best to start with a supply of about 5V and then test the unit at higher supply voltages – up to 12V. Exercise caution, though – this unit puts out ear-splitting sound, so keep it well wrapped up.

If the unit doesn't work, the most likely reason is poor soldering. Check all solder joints carefully under a good light and reheat any that appear suspect (disconnect the power supply before starting work). Next, check that all the parts are in their correct locations and that the IC, electrolytic capacitor, transistors and autotransformers are all correctly oriented.

If only one piezo transducer works, then check the transistor and autotransformer associated with the non-functioning transducer. SC