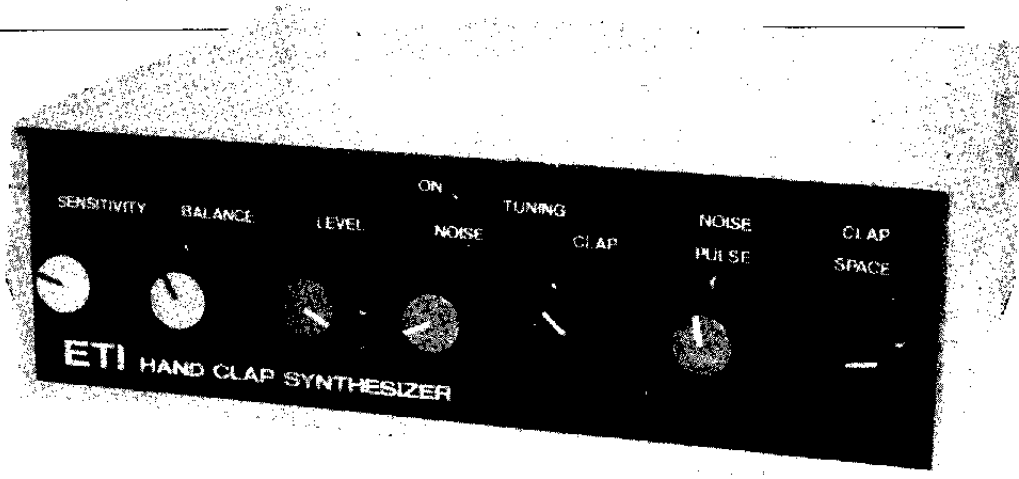
Hand Clap Synthesizer

Does your snare drum suffer from nervous skin tension, lack of timbre? Then revive it with the ETI Hand-clap Synthesiser. Designed to simulate the staccato effect of multiple hand-claps, the unit can be triggered by a microphone or footswitch. Design by Roger Shore. Development by Steve Ramsahadeo.



IT WOULD SEEM that no record is complete without the familiar hand-claps that faithfully accent the snare drum's down beat. One can imagine a group of people centred around a studio microphone, palms reddening, acting like human metronomes. We are happy to report that such a form of torture is now unnecessary in this electronic age!

It's generally accepted that the advent of the synthesizer in the late 60s was the commercial starting point of electronic music, not so much in the way of percussive synthesis but with such effects as tremolo, fuzz, flanging, reverberation and phasing, all of which are added to give expression to a piece of music.

No Applause Please

Multiple or 'ensemble' hand-clapping may be analysed subjectively in two distinct sections:

1. A general 'crash' — which may be simulated with a short burst of tuned noise.
2. Individual claps — this can be simulated by generating pulses which cause a multiple feedback band-pass filter to ring. Several different combinations of individual claps were tried from one to seven, at both regular and irregular intervals, but two provided the best subjective results.

Setting up a unit such as this will depend on personal preferences and also on the type of amplifying system used. It is preferable to use a unit with reverberation where possible as this will greatly enhance the effect.

The problem of which variables should be external and which should remain preset is also one of personal taste. As circumstances dictate different settings we decided to make all seven controls external.

Construction

No problems should be encountered in constructing the Hand-clap Synthesizer. The power supply section should be built first; care should be taken to sleeve the AC terminals on the PCB and the on/off switch.

When this is completed, connect a voltmeter across the output pins of the supply. A reading of +15V and −15V should be available at the output. If all is well the rest of the control circuit can be constructed observing the usual CMOS handling procedure and the orientation of polarised components.

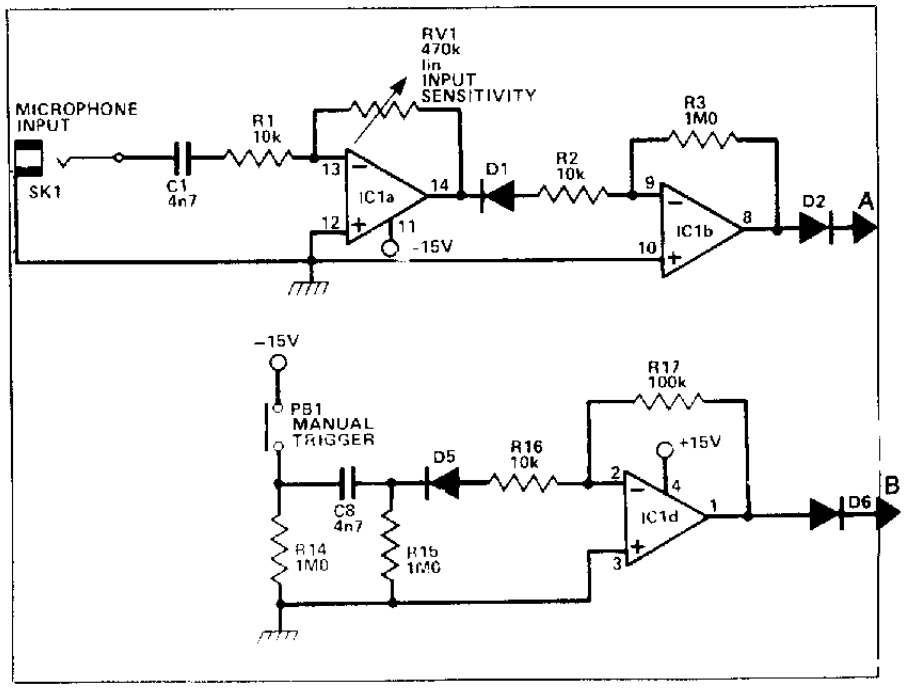


Fig. 1 Circuit diagram of the Hand-clap Synthesizer.

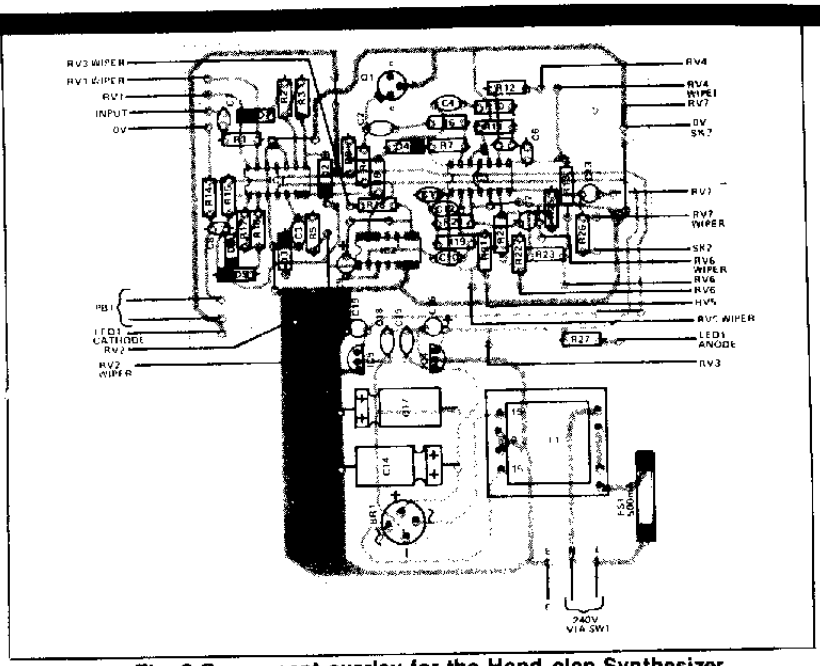


Fig. 2 Component overlay for the Hand-clap Synthesizer.

HOW IT WORKS

The unit can be triggered from either a momentary push-button (PB1) or from a suitable transducer, eg a microphone placed near a snare drum.

In the first case, pressing PB1 causes a negative-going pulse to be developed across C8. This is steered via D5 to the inverting input of IC1d, causing a positive pulse to appear at the cathode of D6.

Alternatively, an input signal from a microphone is differentiated by C1 and R1. This prevents false triggering from other nearby sources. The signal is amplified and inverted by IC1a with RV1 acting as a sensitivity control. Further inversion by IC2b is required to provide a positive pulse at the cathode of D2. These trigger pulses appearing at the cathodes of D2 or D6 are fed to both the anode of D3 and pin 1 of IC2a.

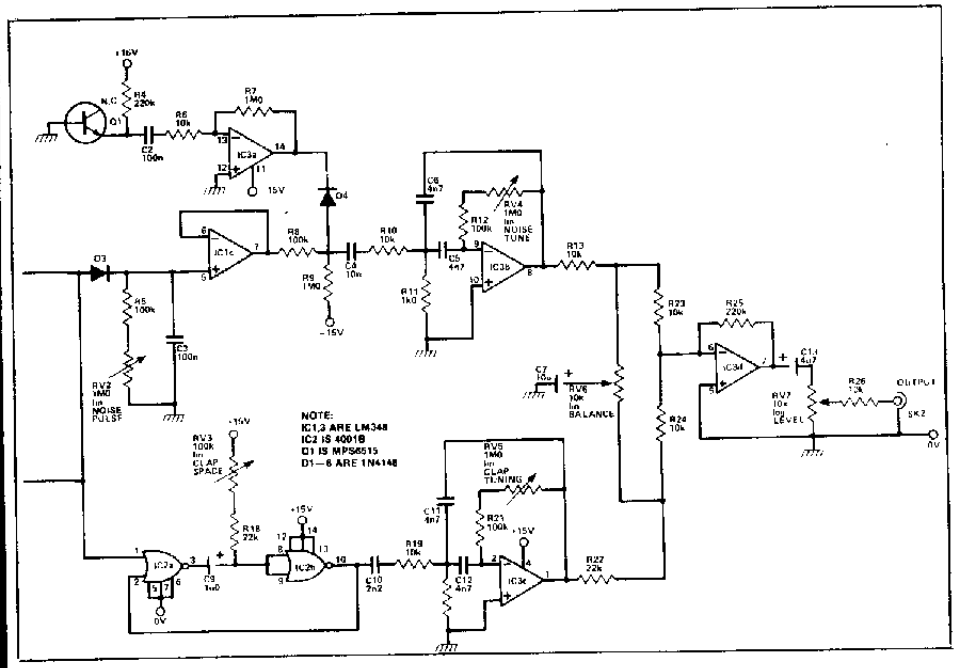
When D3 is forward biased by the trigger pulse it allows C3 to charge positively. The rate of discharge is determined by R5 and the setting of RV2; this ramp is buffered by IC1c, the output of which is connected to D4 and C4 via R8.

The base-emitter junction of Q1 is reversed biased to produce the required noise. A low noise transistor is chosen to give a cleaner noise source. This noise is amplified by IC3a and fed to the cathode of D4. When a trigger pulse causes a positive ramp to appear at the output of IC1c, D4 conducts allowing noise to pass via D4 and C4 to the band-pass filter formed by IC3b and associated components. The length of this noise pulse is determined by the setting of RV2, the ramp discharge time.

R9 normally holds the anode of D4 at approximately −1V5 to prevent noise peaks from turning D4 on intermittently.

The band-pass filter is tuned over the 'useful' part of the noise spectrum for this application. Although the Q of the filter network will vary (because RV4 is not 'ganged' with R10), this does not pose any problem in this non-critical situation.

At the same time as the noise pulse is generated, the trigger pulse is applied to pin 1 of IC2a, turning on the monostable formed by IC2a and IC2b and allowing pin 10 to assume a high state. This positive voltage is developed across C10, causing the band-pass filter formed around IC3c to ring at a frequency determined by the position of RV5. (The two band-pass filters are of identical design.) At a time determined by RV3 and C9 the monostable will reset and the negative-going edge at pin 10 of IC2b allows a second ringing pulse to be generated by the band-pass filter. These two ringing pulses are the individual claps and are mixed with the noise pulse via the balance control RV6 and through R23, R24 to the output amplifier IC3d.



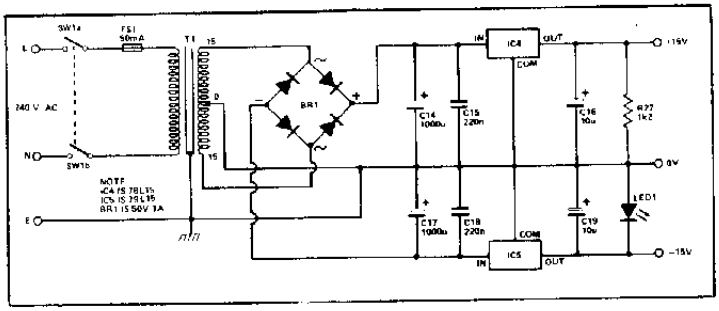
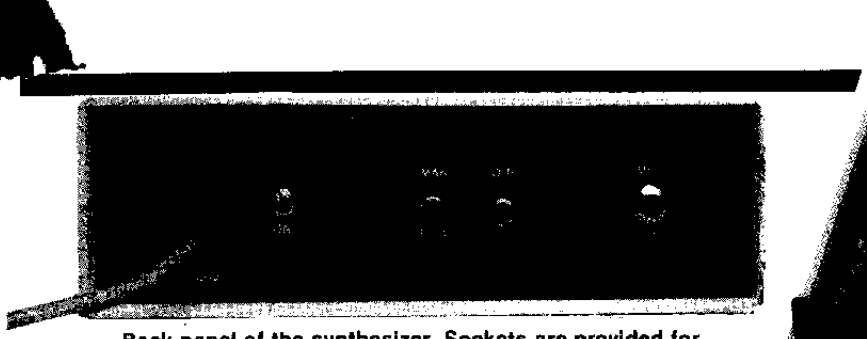
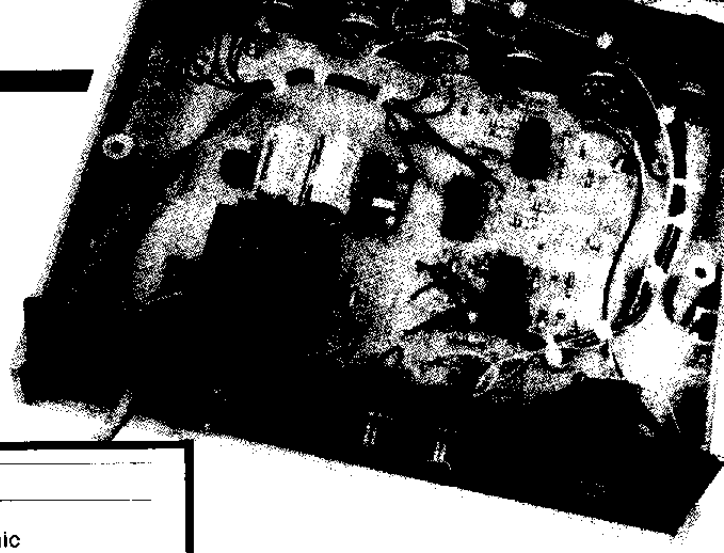


Fig. 3 Circuit diagram of the power supply for the synthesizer.





Back panel of the synthesizer. Sockets are provided for the manual trigger (an external footswitch) or a microphone, triggered by the snare drum for example.

PARTS LIST

Resistors (all ¼W, 5%)

R1,2,6, 10,13,16, 19,23,24,26	10k
R3,7,9,14,15	1M0
R4,25	220k
R5,8,12, 17,21	100k
R11,20	1k0
R18,22	22k
R27	1k2

Potentiometers

RV1	470k linear
RV2,4,5	1M0 linear
RV3	100k linear
RV6	10k linear
RV7	10k logarithmic

Capacitors

C1,5,6,8, 11,12	4n7 ceramic
C2,3	100n polycarbonate
C4	10n polycarbonate
C7,16,19	10u 35V tantalum
C9	1u0 35V tantalum
C10	2n2 ceramic
C13	4u7 35V tantalum
C14,17	1000u 25V axial electrolytic
C15,18	220n polycarbonate

Semiconductors

IC1,3	LM348
IC2	4001B
IC4	78L15
IC5	79L15
Q1	MPS6515
BR1	50V, 1A bridge rectifier
D1-6	1N4148
LED1	0.125" red LED

Miscellaneous

T1	15-0-15, 3V A transformer
SW1	DPDT miniature toggle
PB1	momentary push-button
SK1	¼" jack socket
SK2	phono socket
FS1	50 mA fuse and holder.

Case, seven collet knobs.