Multi-waveform LFO

Paul White **introduces a simple design providing a versatile modulation source for digital delay units or modular synthesisers.**

This month's project was designed to provide a modulation source compatible with any digital delay unit having a voltage-controlled modulation input.

Units such as the Maxim 1500H (reviewed in *Home Studio Recording* March 84), the Evans digital delay and other budget processors provide excellent results at an affordable price, but in doing so sacrifice the facility of an on-board modulation oscillator. Fortunately, there is usually a rear panel input which allows an external oscillator to be simply connected, and for maximum effect, an oscillator capable of producing a ten-volt sweep is required.

The oscillator described here can produce four different waveforms with variable amplitude and in addition, a DC offset is provided so that the delay time may be modulated – useful for pitch change effects when in Freeze or Hold mode.

Circuitry

The basic oscillator circuit consists of ICs A and B, generating under normal conditions a triangle and a square wave output simultaneously. The charging time of C1 and C2 is dependant on the combined value of R4 and VR1 so that the frequency may be changed simply by altering the setting up VR1.

In addition, placing a diode across VR1, R4 enables the charge and discharge rates to be different, the charge current flowing through VR1 and R4 and the discharge current flowing through R5 and D1 in addition to VR1 and R4. This simple modification enables a ramp waveform with a fairly rapid discharge to be produced and, by reversing the polarity of the diode, the inverse waveform can also be generated.

S2 selects square or ramp waveform outputs, whilst S1 selects the type of ramp or triangle wave to be produced. When the square wave output is selected, S2B removed the diodes from the circuit so that a symmetrical square wave output will be produced regardless of the position of S1. IC2A amplifies the resulting waveform to approximately ten volts peak to peak, and also drives the LED *via* the BC107 transistor. The LED varies in brightness in accordance with the frequency selected and the waveform chosen, sweep rates of between 0·1 and 30 seconds being possible.

VR3 allows an offest voltage of up to plus or minus 10V to be produced at the output of IC2B and, if the DC shift is used without any modulation level (VR2), a change of delay time may be produced without pitch modulation. On the other hand, if a sound is captured in the Hold mode, the offset facility may be used to change the pitch of the stored sound.

The LFO unit is best powered from a dual-rail 12V power supply such as the Twinpack (E&MM Sept 82) although two nine-volt batteries may be used providing that the reduced output level is acceptable. Conversely, if you have several rack mounted projects that need powering, you could wait until next month's E&MM when we'll be publishing the design for our RackPack, which will provide plus and minus 12V at one amp.

Construction

Fit all the components to the PCB, taking care to fit the electrolytics, diodes

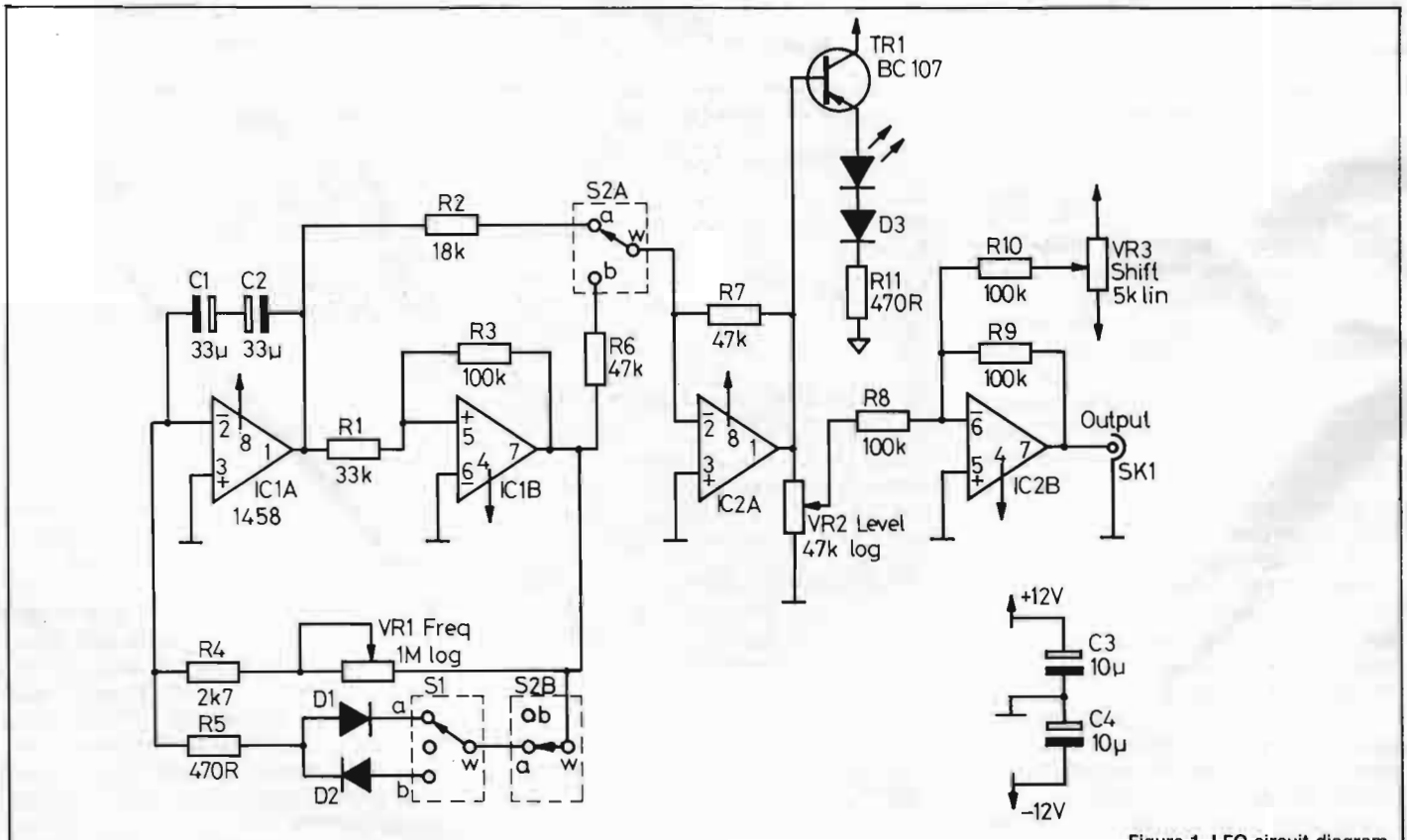

Figure 1. LFO circuit diagram.

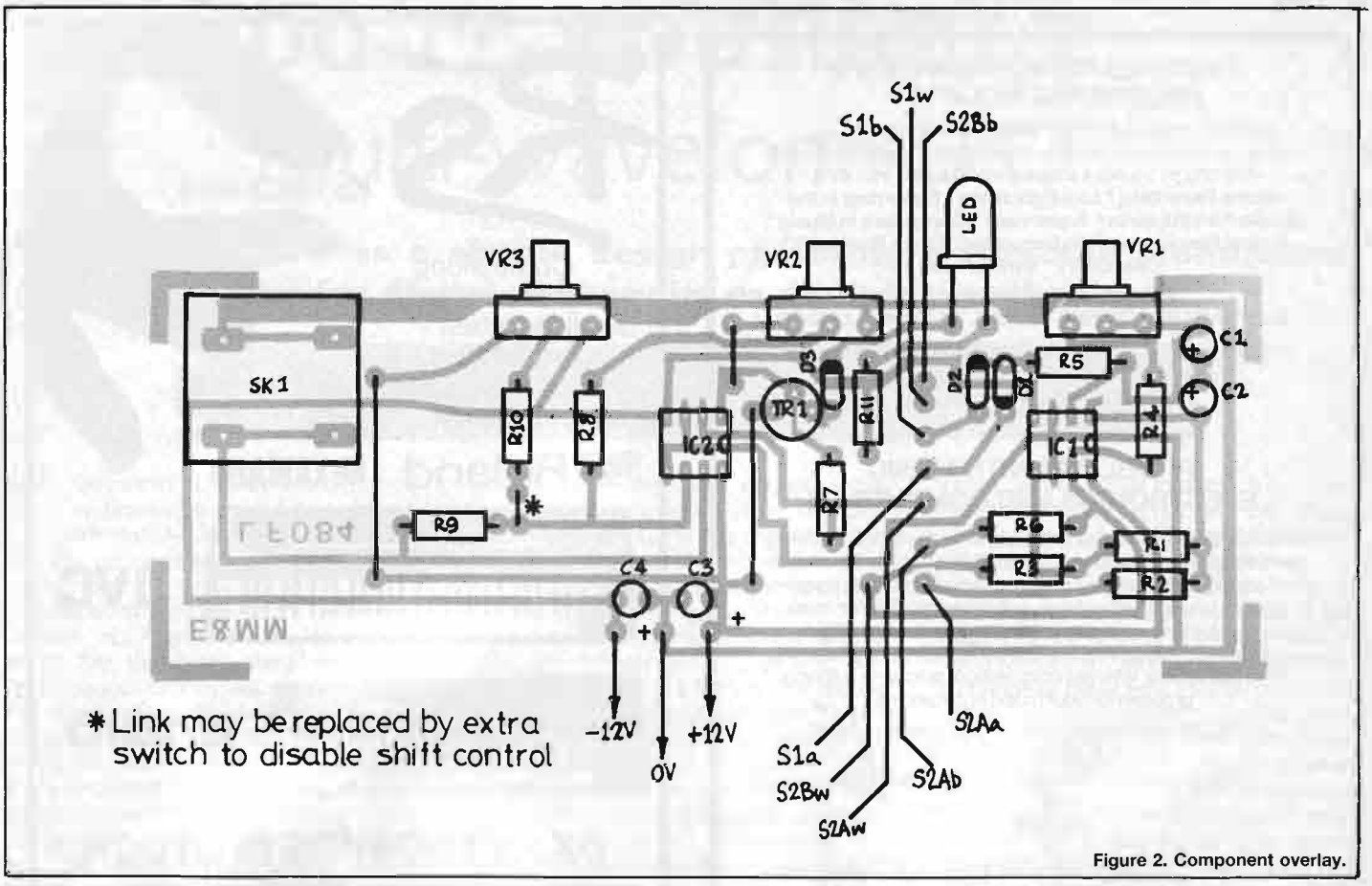

Figure 2. Component overlay.

and semiconductors the right way round. The wiring for the switches is shown on the layout diagram and should present no great problem, providing that you double check everything before you switch on.

The prototype was built on a 1U rack-mounting panel, the PCB being supported by means of the pots and the jack socket. A complete case is not essential providing precautions are taken to prevent the circuitry from shorting out to nearby metalwork.

Once completed, the unit is ready to test, and no setting up is required. If a voltmeter is available, the output may be verified providing that the frequency is set fairly low, thus enabling the needle to follow the contours of the output waveform.

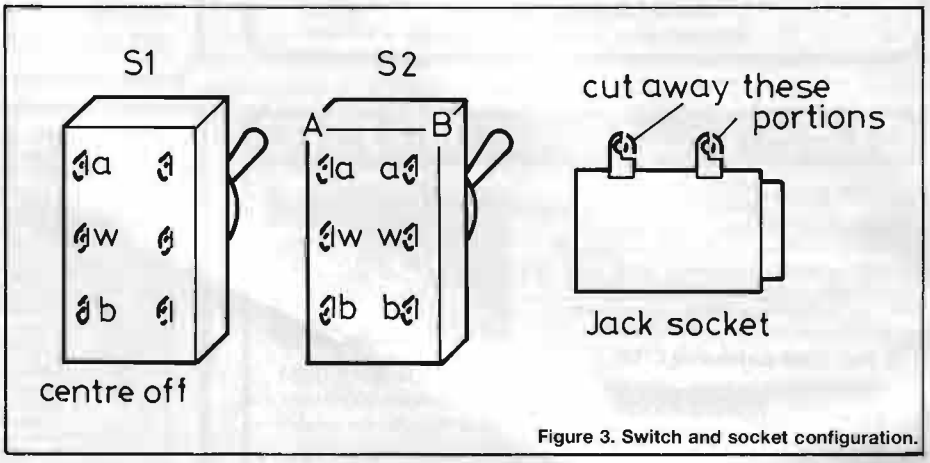

Figure 3. Switch and socket configuration.

In Use

To produce chorus effects, a triangle wave would normally be used to modulate a delay of several tens of milliseconds, using little or no feedback. The LFO level will affect the chorus depth and, in general, a modulation frequency of 2-3Hz will be a good starting point for experimentation.

Different effects may be produced by using the other waveforms and, by increasing the feedback on the delay unit, typical flanging may be produced. Try freezing a sound in the Hold mode and then, using offset control to change its pitch, add a little LFO level to modulate the sound.

One limitation must be remembered, and that is that the output capability of the circuit is about ten volts. It follows therefore that if you use the full ten volts of offset and full level on the LFO, the output waveform will be chopped off as it attempts to cross the ten-volt line. This *can* be used to produce interesting waveforms which may be used to create imaginative effects but, to prevent this happening by accident, an extra switch may be fitted as indicated in the layout diagram to disable the offset function when not required.

A square wave modulation may be used to produce trill-like sounds, whilst a slow ramp will produce a gentle pitch sweep followed by a more dramatic effect as the ramp resets.

Paul White **E&MM**

LFO Parts List

Resistors (all ½w metal film)

R1	33K
R2	18K
R3,8,9,10	100K
R4	2K7
R5,11	470R
R6,7	47K
VR1	1M log
VR2	47K log
VR3	5K lin

Capacitors

C1,2	33u 16v
C3,4	10u 16v

Semiconductors

TR1	BC107
IC1,2	1458
D1,2,3	1N916

Miscellaneous

S1	dpdt centre-off mini toggle
S2	dpdt mini toggle
SK1	¼" jack socket
PCB	
LED	
19" 1U panel	