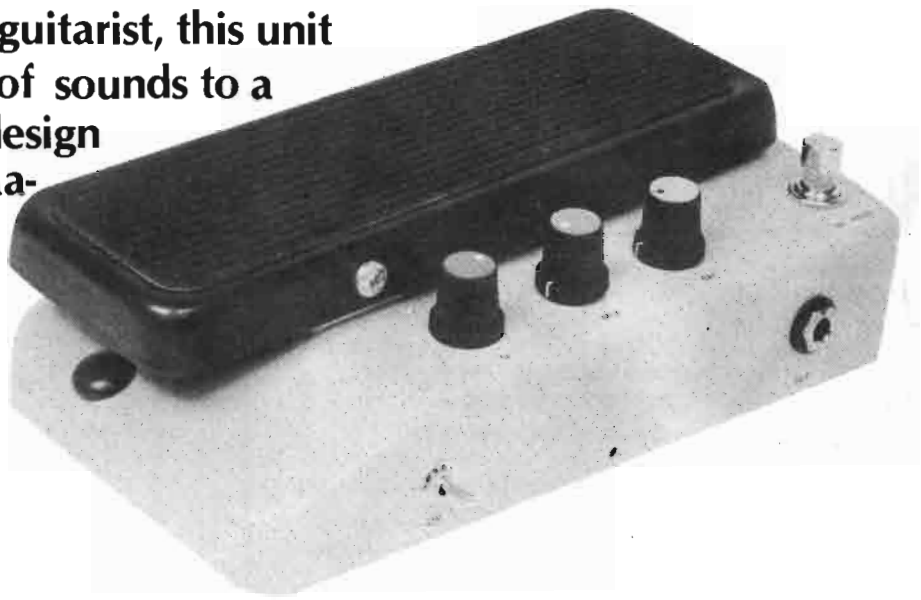
WAA-PHASE UNIT

A superb project for the guitarist, this unit adds a brand new range of sounds to a player's repertoire. The design can produce standard waa-waa or a unique pseudo-phase sound, has built-in mixer and balance controls, and costs a mere £15 or so to build. Design by Ray Marston. Development by Steve Ramsahadeo.



This unique project is yet another first for ETI. The unit looks like a standard foot-controlled Waa-Waa unit and is played in exactly the same way, but is, in fact, designed to produce a conventional waa-waa sound, a brand new pseudo-phase sound, or a range of sounds between these two extremes; the desired type of sound can be selected by a fully-variable 'Q' control. The unit also incorporates a built-in audio mixer, enabling the original guitar signal and the waa-phase signal to be mixed in any desired ratio, and has a balance control so that no apparent shift occurs in the guitar's mean sound level when the unit is switched in and out by a built-in bypass switch.

The completed project is housed inside a neat but robust foot-pedal unit that comes pre-drilled to accept all the control pots, switches and jack sockets that are used in the project, which is powered by a pair of PP3 batteries. We estimate the total building cost of the unit at about £15, including the price of the foot-pedal unit.

Basic Principles

A guitar produces output waveforms that are very rich in harmonics, which gives the instrument its characteristic sound. In a conventional waa-waa unit, the guitar output signal is simply passed through a foot-controlled band-pass filter before reaching the main amplifier. This filter is a low-Q type (typically with a Q of unity) and passes a broad spectrum of basic guitar sounds, but at the same time picks out and accentuates certain harmonics; when the operator sweeps the filter up and down manually using the foot pedal, the characteristic waa-waa sound is produced.

The unique feature of the ETI Waa-Phase unit is that its sweep filter has a Q that is fully variable from unity to eight. When the Q is set to unity, the circuit produces conventional waa-waa sounds. However, when the Q is set to maximum the filter picks out selected harmonics, amplifies them, and converts them to very pure tones that are quite unlike those of a normal guitar. These tones can be added to the original guitar signal via the built-in mixer. When the filter is swept manually with the foot control, the composite output of the unit can sound like that of a phase unit, or like a synthesiser, or like a vocoder, depending on the chosen settings of the variable controls. The unit thus makes a unique range of very attractive sounds available to the guitarist, at very low cost.

Construction

The foot-pedal unit used with this project (see Buylines) is supplied pre-drilled to accept all pots, switches and jack sockets that are used in the design, so construction should present very few problems.

Start by assembling the components on the PCB, as shown by the overlay, noting that Veropins are used to facilitate the interwiring to the rest of the circuit. When the board is complete, secure it in place inside the foot-pedal unit with a couple of sticky-pads, then proceed with the interwiring to the four pots, two switches, two jack sockets and the two batteries.

When interwiring, take extra care to conform to the circuit diagram. Note, for example, that the two halves of RV3 are contra-connected, so that the output of one half increases as the other decreases. Also note that the action of the foot-pedal unit is such that it sweeps only 200° or so of the available range of RV2, so position this pot carefully so that its value can be swept all the way from zero resistance to some high value.

When construction is complete, fix the two batteries in place (one in the built-in battery holder, the other secured with a sticky-pad) and give the unit a functional check. Simply connect the guitar output to the input of the unit, take the output of the unit to an amplifier, turn the unit on, switch SW1 to IN, and then vary the controls while playing the guitar.

Start by setting the mix, balance and Q controls to mid value while you get the basic feel of the unit, then vary the Q and mix controls to explore the full sound range of the device. In final use, set the Q and mix controls to give the sound that you like best, then set the balance control so that negligible apparent change in sound levels occurs when the unit is switched in and out with SW1. The unit is then ready for stage use.

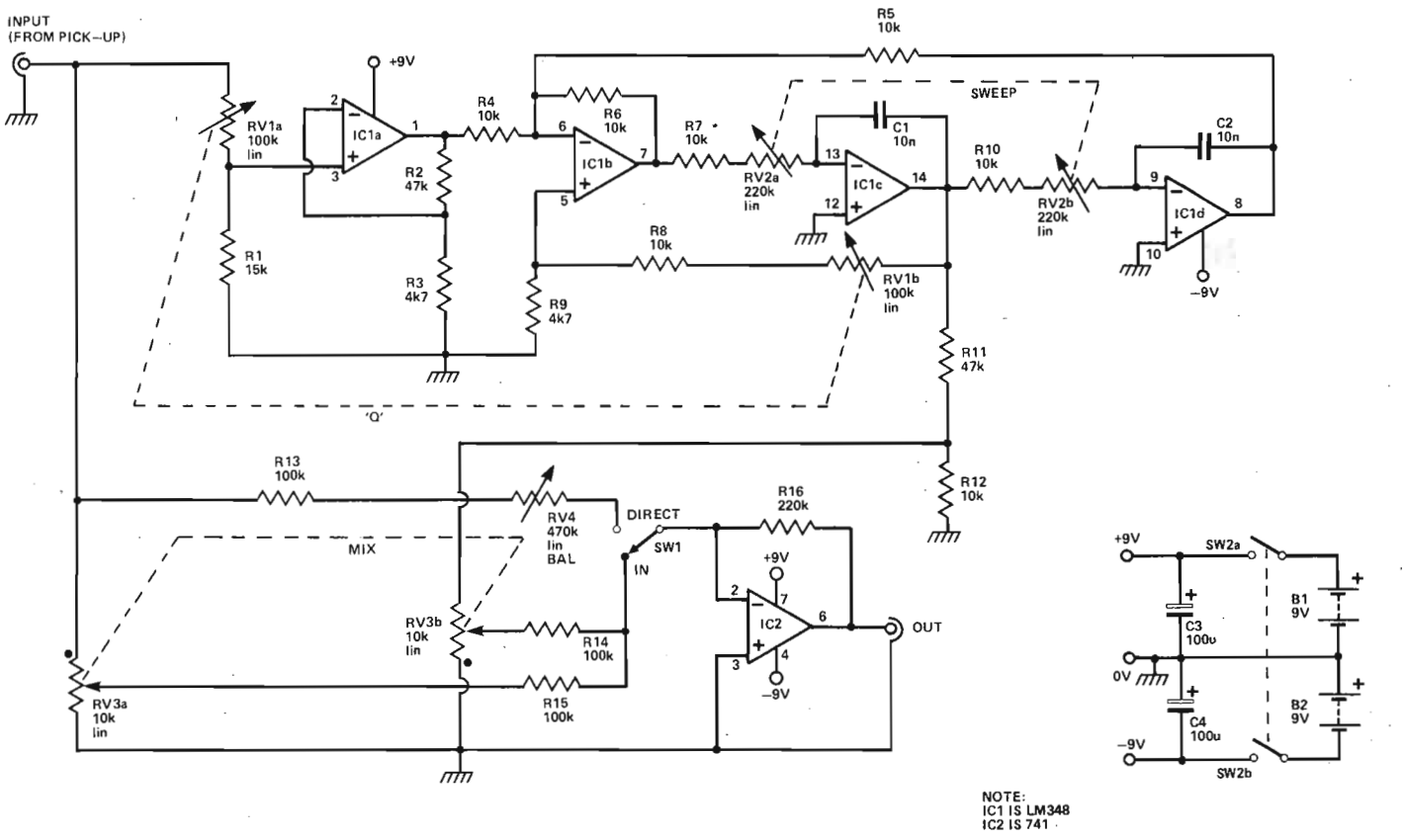
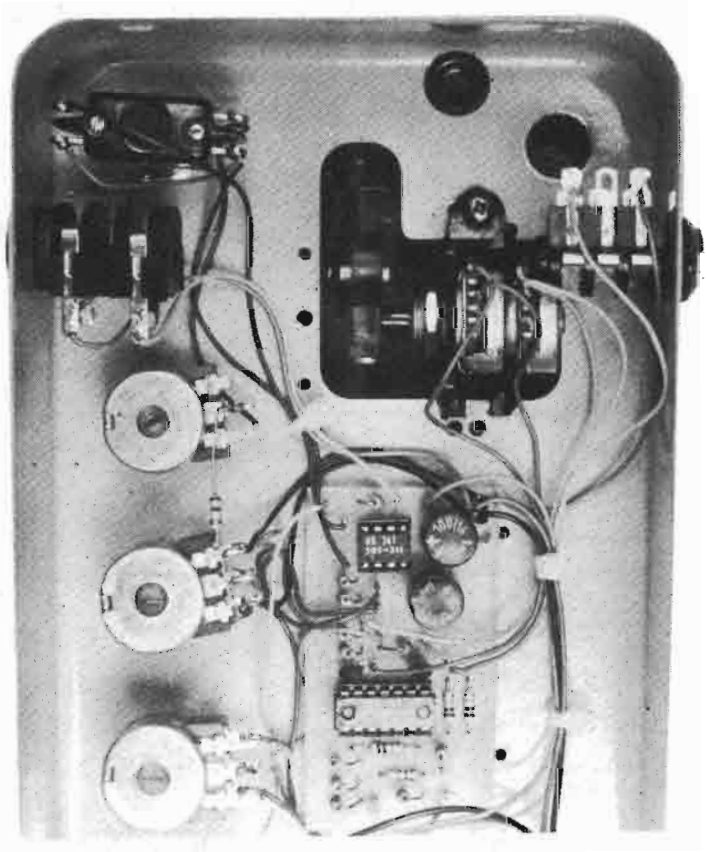


Fig. 1 Circuit diagram of the Waa-Phase unit. The dots at the ends of RV3a and RV3b indicate the left-hand terminal of the pot as seen from the rear. Make sure that this pot is wired correctly.



Close-up of the important bits. This photograph shows how R13 is mounted on the potentiometers. Note that the recommended case (see Buylines) comes with all the necessary holes ready-drilled. There is just sufficient room in the foot-pedal cut-out to accommodate RV2, a dual-gang pot; connecting the latter to the pedal linkage is quite straightforward.

HOW IT WORKS

The unit comprises a combined preamplifier and variable-Q, variable-frequency band-pass filter designed around IC1 (a quad op-amp), plus a simple two-input audio mixer designed around IC2. The guitar output signal is passed through the band-pass filter and the resulting signal is then mixed, in any desired ratio, with the original guitar signal, producing a composite output that can be fed to an external power amplifier.

IC1a acts as the preamplifier and drives the state-variable band-pass filter that is formed by IC1b-IC1c-IC1d and the associated components. The centre frequency of this filter is varied by foot-operated two-gang rheostat RV2. The Q of the filter can be varied from unity to eight by RV1b; to maintain an effectively fixed input-to-output gain at all Q settings, the gain of the preamp stage (IC1a) is varied in opposition to the Q by RV1a, the other half of the Q-control rheostat.

The output of the filter (taken from the R11-R12 junction) is mixed (added) with the original guitar output signal by the network consisting of RV3-IC2 and associated components. Note here that the two halves of mix pot RV3 are contra-connected, enabling the final output signal to be varied from 'all guitar' to 'all waa-phase' (or any desired mixture) using the single control.

When SW1 is switched from the IN to the DIRECT mode, balance control RV4 can be adjusted to give no apparent change in the mean acoustic output levels between the two modes.

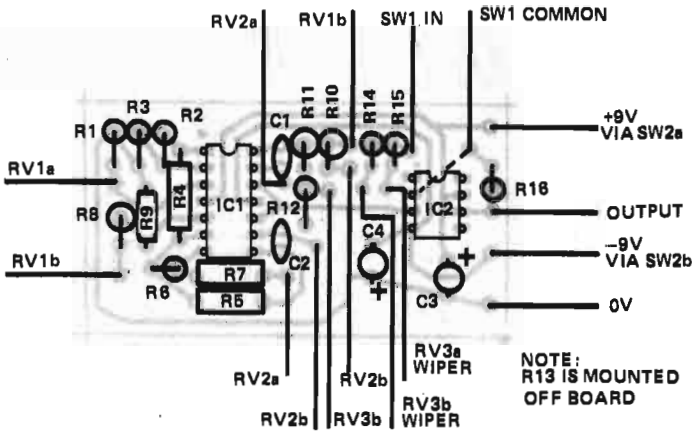
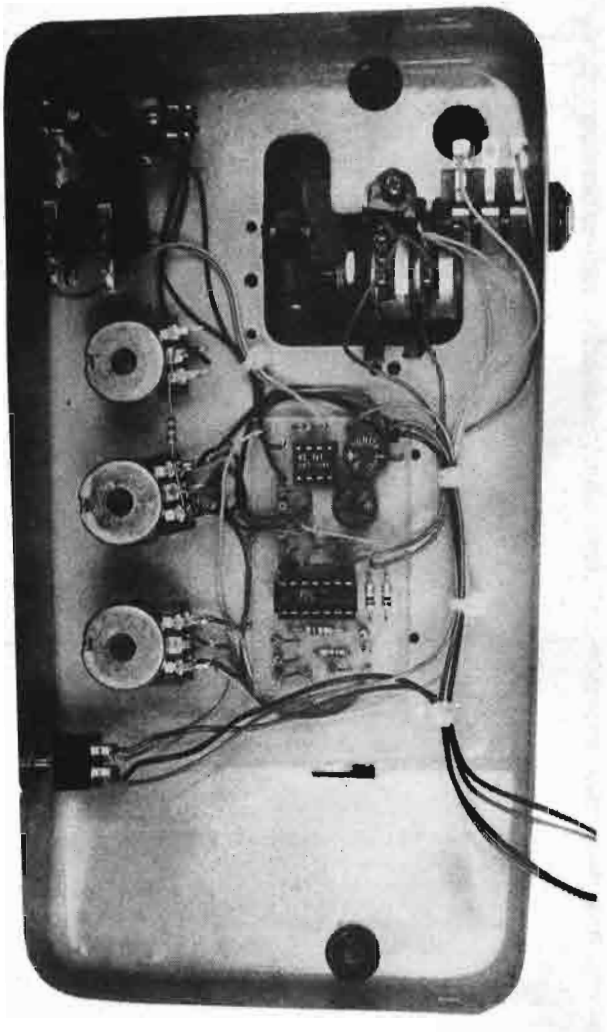


Fig. 2 Component overlay. Don't forget the insulated link between IC2 pin 2 and R16.

BUYLINES

The neat pedal that houses the Waa-Phase circuit is available from Sola Sound Ltd. The pedal gives a professional finish at just half the price of most commercial units. It comes pre-drilled to accept all the panel hardware and is priced at £7.48 including VAT. Order as WFS1.

Sola Sound Ltd,
Unit 6, Leto Works,
off Mead Road,
Edgware, Middlesex HA8 6NE
Telephone 01-952 9661/7989.

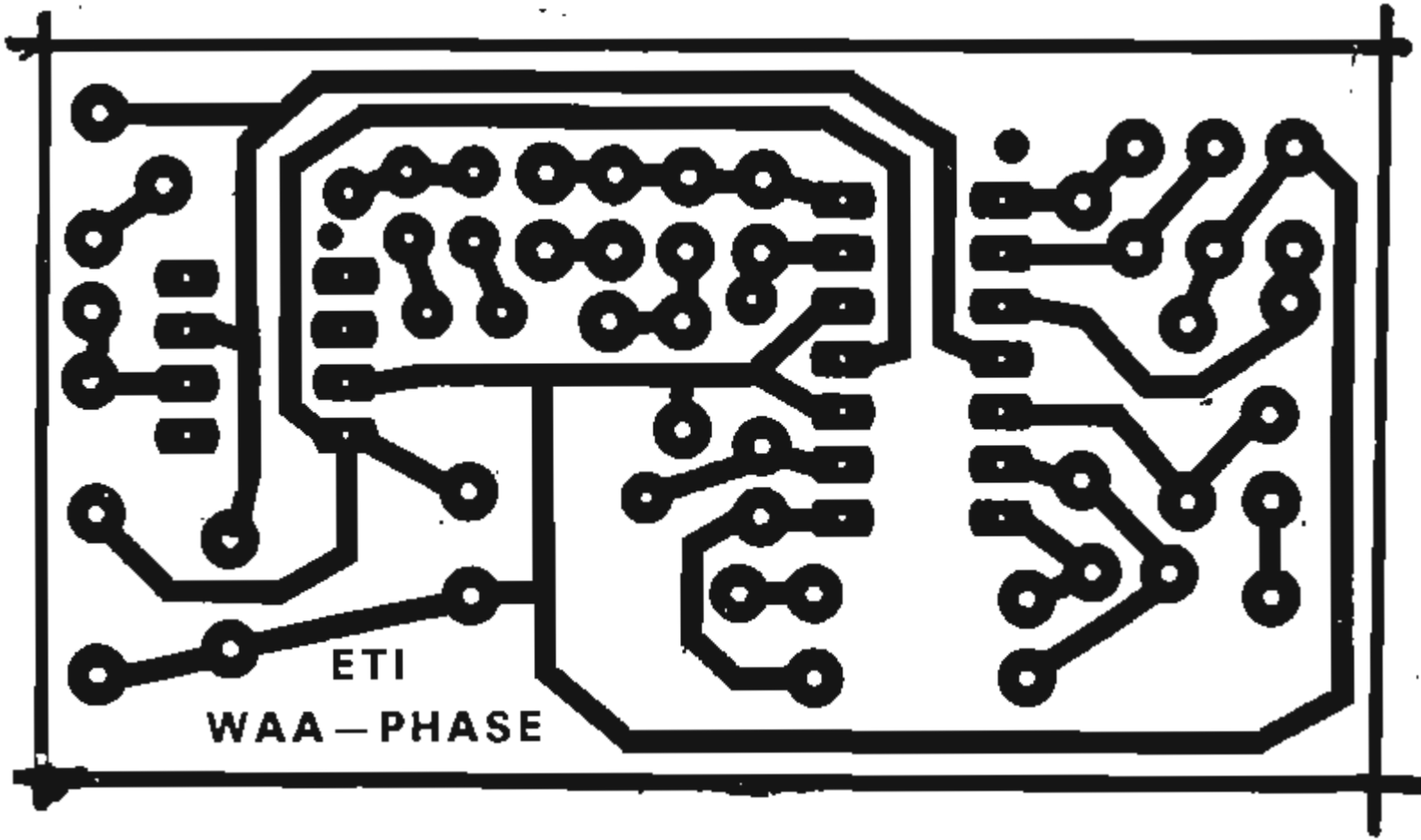


PARTS LIST

ETI

Resistors (all ¼W, 5%)	
R1	15k
R2,11	47k
R3,9	4k7
R4,5,6,7,8,10,12	10k
R13,14,15	100k
R16	220k
Potentiometers	
RV1	100k linear, dual gang
RV2	220k linear, dual gang
RV3	10k linear, dual gang
RV4	470k linear
Capacitors	
C1,2	10n ceramic
C3,4	100u 16 V electrolytic, PCB-mounting
Semiconductors	
IC1	LM348
IC2	741
Miscellaneous	
SW1	SPDT footswitch
SW2	DPDT miniature toggle

PP3 batteries (2 off), jack sockets (2 off), waa-waa pedal (see Buylines).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