PE MINISONIC

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PART FIVE

• Making the most of the MINISONIC

IN THIS the final part of the Minisonic series we will look at some of the ways in which the units of the Minisonic can be connected to produce some interesting effects. These are only suggestions, since the ways in which the Minisonic can be used are limited only by the imagination of the user.

THE VOLTAGE CONTROLLED FILTER

There are three principal ways in which the filter may be used as a sound treatment, of which two have been examined during the check-out procedure. Before going into these in any detail however let us look for a moment at what exactly it is that the filter does to the sawtooth waveform.

Fig. 5.1 illustrates a number of waveforms with the filter control voltage at different levels. In stage one the control voltage is very low i.e. with the frequency control just off the minimum end stop. If the sawtooth signal is around 1kHz say, the effect of the filter is to remove virtually all the upper harmonics leaving the fundamental which is almost of sine form.

Stage two and three illustrate the situation which occurs when the control voltage is increased successively; in each case the output waveform is assuming more of the sawtooth characteristic albeit still severely rolled off.

In stage four the control voltage is such as to allow the filter to admit the whole of the sawtooth without any roll-off.

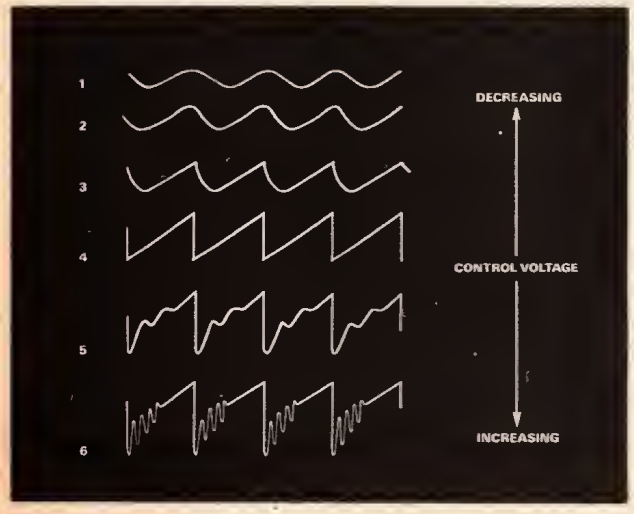

Fig. 5.1. These waveforms illustrate the effect of the VCF on a sawtooth waveform with varying control voltages. The control voltage increases from a minimum at 1 to a maximum at 6

Q CONTROL

The degree of roll-off of the filter is affected very largely by the amount of feedback admitted to the ladder network by means of the Q control. With Q at minimum the roll-off is much less accentuated and, indeed, the signal level from the filter is significantly greater than when the Q is at maximum.

Thus, with the Q at minimum the filter can act very much in the same way as a tone control i.e. passing all those frequencies lying below that set by the control voltage and rolling-off all those which lie above the set value at around 6dB per octave.

Increasing the feedback above a critical point will induce the filter to commence self oscillation. Similarly when operating at high Q the filter will also begin to oscillate when the control voltage is advanced beyond a point where the input signal is wholly accepted. This situation is illustrated in stages five and six of Fig. 5.1, the frequency of oscillation being proportional to the increase in ladder current.

What applies, in general terms, to the changes occurring in a sawtooth waveform also applies to other waveforms which are rich in harmonics. In the case of a sine wave input however the effect of the filter is simply to cause a variable degree of attenuation to the signal in a manner dependent on the input frequency, control voltage and Q control settings.

USING THE FILTER AS A VCA

Fig. 5.2 illustrates schematically the method of patching to enable the filter to act as an automatic Waa-Waa or as a voltage controlled amplifier.

In this case the negative output of the CONTROL ENVELOPE INVERTER is patched into the control input (jack socket) of the filter. The VCA level control on channels 1 and 2 should be turned to minimum level and the output of the filter patched into either one of the PA stages.

Set the INVERTER level control about midway with the attack and decay controls of ES1 set about one third of their full rotation.

Place the stylus momentarily on the keyboard and when the resultant sound has decayed away—say in four or five seconds—adjust the frequency control of the filter so that the VCO signal is just barely audible.

The keyboard may now be played in the normal way during which time the attack, decay and control envelope controls may be adjusted to achieve the desired effect. Note that the greater the level of the control envelope the harsher will be output signal when the envelope is at its peak.

An inverted Waa-Waa effect can be achieved by setting the filter frequency control to maximum and using the positive going envelope to programme the filter. In this case the output of the filter should be patched into VCA1 external input with VCO1 level control set to minimum.

TRACKING THE VCO's

With the arrangement of patching as shown in Fig. 5.3 the filter may be used to track the frequency of the VCO's. This is because the control input of the filter is directly linked to the output of the HOLD circuit and thus variations in this level will adjust the passband of the filter.

This method of operation is particularly useful if the instrument is being used in an imitative sense or if the constructor wishes to achieve a softer, harmonically reduced output signal. With this mode, the keyboard should be played at the same time adjusting the filter frequency and Q controls until the desired sound is achieved.

It will be found that a number of acoustic instruments can be effectively imitated using this method. For example, wind instruments such as the horn and trombone, string instruments such as the violin and cello and a clarinet tone have all been successfully synthesised with the prototype Minisonic.

THE FILTER AS A TONE CONTROL

In the previous method of operation the passband of the filter was continuously being adjusted as the keyboard was being played such that the proportion of harmonic roll-off was effectively constant regardless of the frequency of the input signal.

If an open circuit jack plug is now placed into the control input socket of the filter the passband is now entirely dependent on the setting of the frequency control. With this at maximum the filter will pass frequencies up to 15kHz (−6dB) more, in fact, than the Minisonic would normally produce in a strictly musical sense.

With the frequency control near its minimum setting the −6dB passband is only 3Hz and thus the greater part of any filtered musical signal from the VCO's would not reach the power amplifier stages.

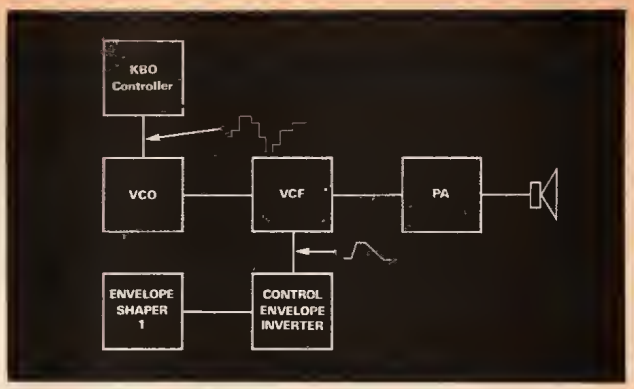

Fig. 5.2. Diagram showing the patching arrangement to use the voltage controlled filter as a Waa-Waa

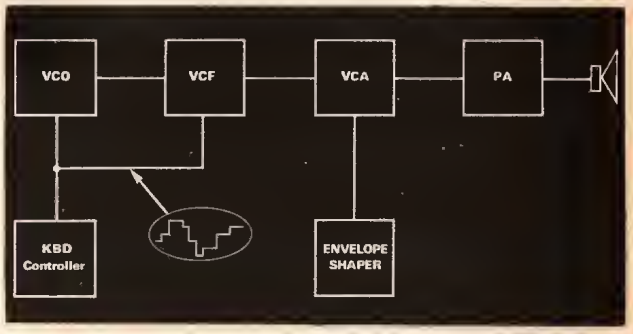

Fig. 5.3. With the patching arrangement shown here the VCF will track the frequency of the VCO's

The filter is now acting as a treble cut system with the degree of cut obtainable being varied by the Q control. With this at minimum the roll-off is about 6dB per octave and at maximum about 15dB per octave.

THE RING MODULATOR

The overall function of the RING MODULATOR has been described elsewhere in this series but it might perhaps be useful to consider some of the uses to which it can be put. In a musical sense the RING MODULATOR can be used to create very rich chord structures.

For example, with both VCO's tuned apart by the interval of a fifth, i.e. the frequency of one oscillator is 1·5 times the frequency of the other, the output from the ring modulator will be, in the case of the sum frequency, 2·5 times, and in the case of the difference, 0·5 times, the frequency of the oscillator producing the lowest pitch.

If the output of this latter oscillator is taken as being the fundamental then the output of the RING MODULATOR may be said to comprise the sub-octave and twelfth with respect to the fundamental.

If this signal is now mixed with the outputs of the VCO's originating the signals then the end result is a four note, musically concordant chord.

Similar effects may be obtained when the VCO's are in unison, an octave apart or tuned to other recognisable musical intervals. In all cases the richness of the resultant sound quite belies the size and complexity of the instrument producing it.

Two methods of patching in the RING MODULATOR to give composite chords are illustrated in Fig. 5.4a and 4b.

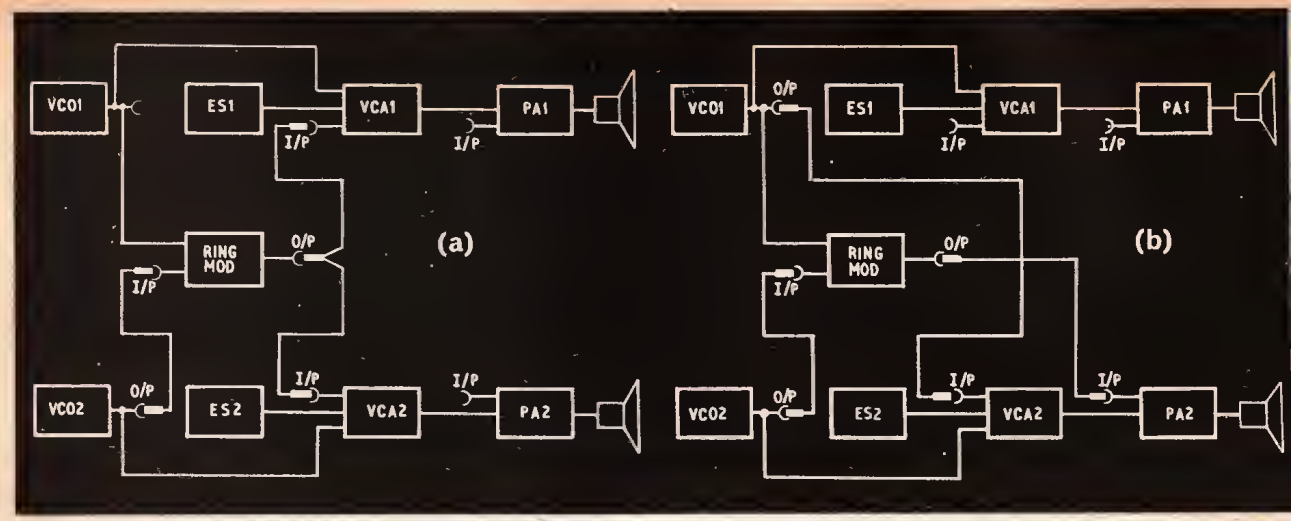

Fig. 5.4a and b. Two methods of patching to give chord effects. In (a) PA1 gives VCO1 + RING MODULATOR output and PA2 gives VCO2 + RING MODULATOR output. In (b) PA1 output is silent and PA2 gives VCO1 + VCO2 + RING MODULATOR. In this case ES1 must be disabled by placing an open circuit jack plug in its control input

OTHER RING MODULATOR EFFECTS

Apart from its musical possibilities the RING MODULATOR may be used extensively in the production of sound effects. For example with white noise patched into the uncommitted input and with VCO1 running at low frequency—say around 10Hz—the reset point of the sawtooth will be differentiated by the RING MODULATOR input decoupling capacitor such that the output of the RING MODULATOR will comprise a series of staccato cracks akin to machine gun fire. Filtering the output of the modulator can ring the changes quite widely over this one, very simple sound.

Dalek type voices can be produced by the patching arrangement shown in Fig. 5.5. The microphone should be of the ceramic cartridge variety having a fairly substantial output of 100mV or so.

Remember to connect the screen of the microphone lead to the body of the DIN socket. A range of effects may be achieved by varying the frequency of VCO1 between about 20Hz and 1kHz bearing in mind that the greater part of the resultant audio signal will be derived from this oscillator.

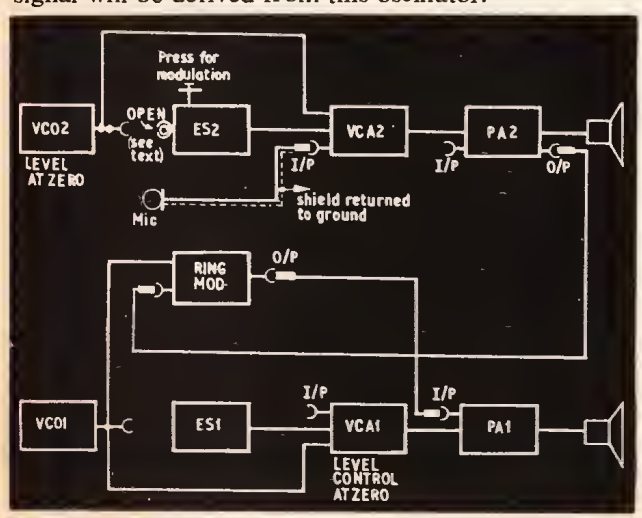

Fig. 5.5. Patching arrangement to give "Dalek" voices. Place open circuit jack plug in ES2 jack socket

If the microphone output appears to be insufficient to fully drive the RING MODULATOR a tape recorder can be employed by first of all taping the required speech and replaying through the Minisonic from the external speaker or earphone output.

NOISE GENERATOR

Other forms of sound effects may be derived from the NOISE GENERATOR in conjunction with the filter. With VCO2 level control at zero and the NOISE GENERATOR patched into the audio input of the VCF, set the Q control to maximum and manually swing the frequency control between half and full rotation. The resultant sound will be closely akin to that of howling wind.

Resetting the Q control just off its zero point and swinging the frequency control within its lower half rotation will simulate the sound of heavy, squally rain.

Another interesting experiment with the NOISE GENERATOR and filter combination is to play the passband of the filter from the keyboard. Set Q to a maximum and adjust the keyboard span control so that there is a wider than normal voltage span between consecutive notes. Patch the output of the filter into VCA1 and set VCO1 level control to zero.

While playing the keyboard adjust the filter frequency control and keyboard span control until there are distinct pitch changes in the audio signal resulting from the playing of successive keys. Pure tones cannot be achieved of course but the ability to change the noise pitch rapidly and predictably comes in very useful when creating say a brush accompaniment line to a pre-recorded melody.

SIMPLE "MULTI-TRACKING"

Those fortunate owners of reel-to-reel recorders with "sound-on-sound" facilities will need no introduction to the methods whereby so-called "multi-tracking" may be employed to produce composite recordings. It is not generally realised however that the humble cassette recorder can also be employed in this way if a second recorder is available.

Fig. 5.6 shows schematically how the "hook-up" may be accomplished bearing in mind that with the

2mm input socket on the PA stage it will be necessary to connect the screen of CR1 output lead to either the DIN socket casing on the Minisonic or to the jack plug shield of the input lead to CR2.

Let us assume that the composite recording is to comprise a simple melodic line punctuated by sound effects of various kinds. The method is as follows:

1. Set the recording level of CR2 and switch to "Record."
2. Play the melodic line as required and check the recording by replaying.
3. If satisfactory, rewind the cassette and transfer to CR1.
4. Set up the patch for the required sound effect and check it.
5. With a fresh cassette in CR2 switch to "Record". Switch CR1 to replay and, at the appropriate time, bring in the required sound effect. This is not as difficult as it might seem because, in order to get the sound effect on to the tape in CR2, the PA level control has to be set fairly high and thus the signal coming from CR1 can be quite clearly heard on the Minisonic loudspeaker. (Remember to set the replay level on CR1 to zero).
6. Repeat steps three to five as necessary until all the required effects have been recorded.

The number of transfers which can be made in the above manner with a cassette recorder is fairly limited due to the generally poor signal to noise ratio of these machines. Nevertheless, if the operation is carried out with care and with regard to recording levels and so on the results are likely to surprise even the most cynical.

ELECTRONIC REVERBERATION

Reverberation in an acoustic sense implies the presence of a series of multiple echoes each following rapidly on the heels of the other, each with a phase difference relative to the other and each, on successive returns, having a diminished intensity.

While the Minisonic does not possess any of the accoutrements normally associated with the production of artificial reverberation, it is nevertheless possible to utilise the long decay characteristic of the ENVELOPE SHAPERS together with the filter to provide a kind of reverberant quality which can be quite pleasing.

REVERBERATION PATCHING

One possible method of patching to achieve this effect is illustrated in Fig. 5.7. Two acoustic channels are used. Channel 2 carries the output from VCO2 together with that of the VCF and has a relatively short envelope decay period. Channel 1 carries the output of VCO1 and the output of the VCF and has a prolonged decay.

If the oscillators are tuned nominally in unison but with a slow beat between them the effect at the VCF is that when the outputs of both oscillators are in phase the total input signal level at the VCF is greater, and therefore more harmonically enriched than when the signals are in antiphase.

Thus when the outputs of the Minisonic are played through the domestic hi-fi system which has the loudspeakers placed reasonably far apart the effect is for the onset of the sound to be central to the listener with a sighing decay to one side or the other.

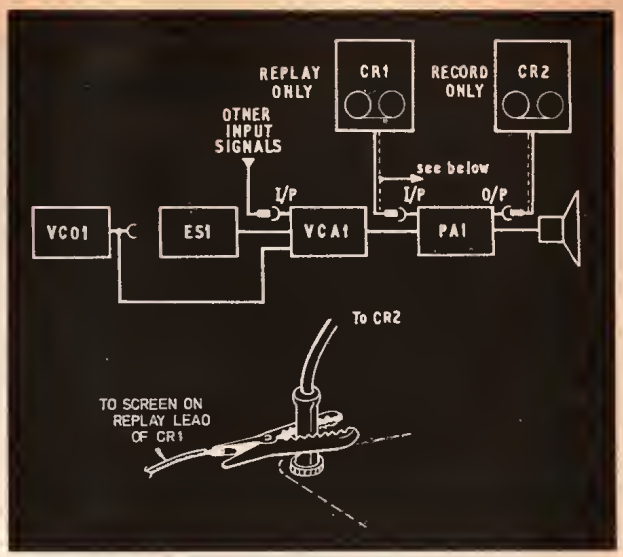

Fig. 5.6. Using two cassette recorders to obtain "multi-tracking". The inset shows how the screen of the replay load can be earthed to the lead from CR2 if metal jack plugs are used

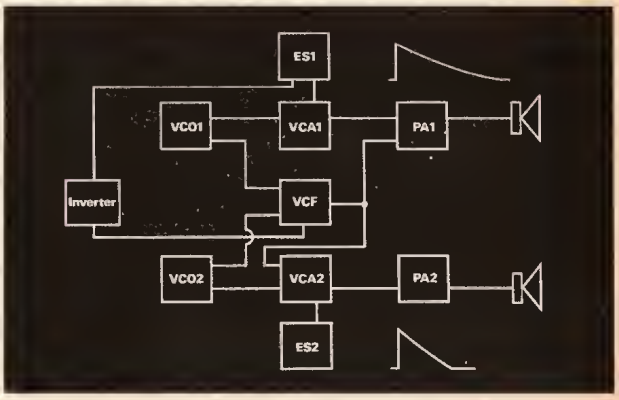

Fig. 5.7. A suggested patching arrangement to give a reverberation effect

With some adjustment to the controls the reverberant quality and spatial movement of the sound can be strikingly effective.

PLAYING THROUGH POWER AMPLIFIERS

The recorder outputs of the Minisonic can be considered to be compatible with the high level inputs to almost all makes of domestic power amplifier. In fact, the playing of the instrument through the domestic system is preferable to using the small monitoring speakers which only have a poor low frequency response. ★

ERRATA:

In Fig. 2.8 (*December 1974*), breaks shown in column 40 should be repeated in column 21

In Fig. 3.10 and 3.11 a 470μF 16V electrolytic should be connected between +9V rail and 0V. It may be conveniently placed on the Veroboard panel between the two power amplifiers

In Figs. 3.5 and 3.11 (HF DETECTOR), the cathode of D1 should go to −9V not ground