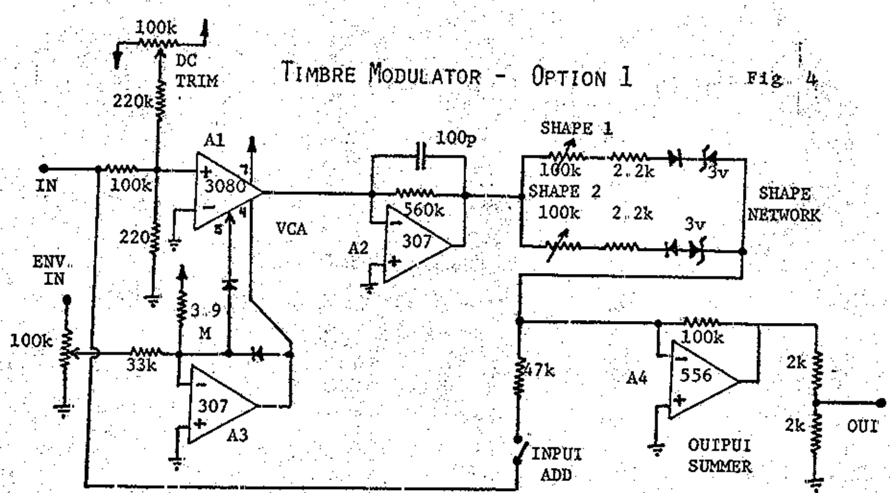
TIMBRE MODULATOR - OPTION 1

Like a variable-slope filter, the "Timbre Modulator" is not your everyday type of synthesizer module. Also like a VCF, the timbre modulator is concerned with controlling the tone color of a signal. In fact, a VCF is a timbre modulator. The present device is a special type of timbre modulator - one which adds harmonics to a waveform of low harmonic content (such as a sine or triangle). If truth be known, we developed this circuit while attempting to do something else (which we will decline to mention to avoid looking unduly foolish). When we found that it imparted variable harmonic content to sines and triangles, it was obvious that we had arrived at a timbre modulator that was in many ways the counterpart of the VCF (which works best for sawtooth waves and pulses). The circuit is quite simple as can be seen by studying Fig. 4. It is basically a VCA which drives a zener diode input stage to an op-amp. The zener diodes prevent signals of less than about 3.5 volts from reaching the output of the module. Alternatively, the signal from the VCA can be added to the input for more complex waveforms. With the input added in, the most dramatic timber modulations are achieved, but the VCA action is blocked, so another VCA is needed somewhere in the circuit (and is of course, usually available).



TIMBRE MODULATOR - OPTION 1 Fig. 4

The VCA circuit of the timbre modulator is formed by A1, A2, and A3 in a manner similar to that described in EN#63. A couple of things have been added. The 3.9M resistor holds the VCA on slightly in the absense of an envelope. This assures that the CA3080 is not cut off when the envelope is low, as this condition would otherwise pin the output of A2. The capacitor in the feedback loop of A2 is just to prevent a slight oscillation that appeared on occasion, but otherwise has no function. The output of A2 drives the input signal (as controlled by the VCA) through the shaping network into the output summer A4. In order for a signal to get through this network, the amplitude must be in excess of about 3.5 volts. Thus we are center clipping the input waveform as can be seen from Fig.5a which shows a sinewave input. Here we have assumed that the two shape controls are set to approximately the same value, otherwise the output would not be symmetrical. A case where the two controls are not set the same is shown by Fig. 5b.

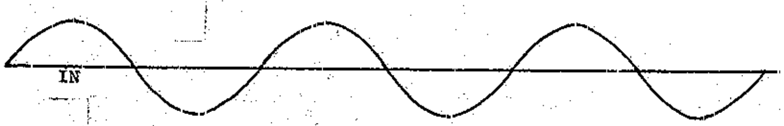
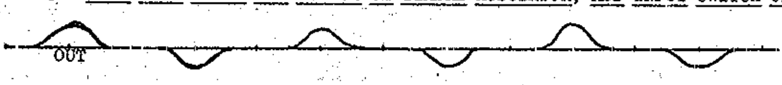


FIG. 5a SINE WAVE INPUT AND OUTPUT OF TIMBRE MODULATOR, ADD INPUT SWITCH OPEN



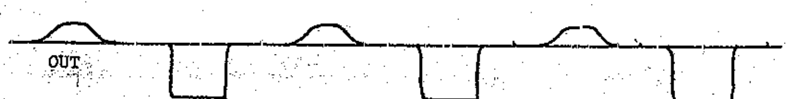


FIG. 5b SINE WAVE INPUT AND OUTPUT, ADD INPUT SWITCH OPEN, SHAPE CONTROLS UNEQUAL

By far, the most interesting effects with the timbre modulator are achieved with the INPUT ADD switch closed. With the switch closed, and the envelope at zero, the input waveform is passed to the output. Now, as the envelope rises, what is basically an inverted version of the input begins to appear at the output of A2. This would normally cancel the input if it were added to the output summer, but here it must first pass through the shape network. This leads to some very interesting results. An example of what one can expect is shown in Fig. 6 below.

When the envelope is low, the input triangle passes through unaltered. When the envelope rises, the first thing that will get through the shape network is the peak of the triangle. With the shape control pots set to about 10k each, this means that the peak of the triangle will start to cancel (and indeed cut deeper into) the peak of the input triangle, resulting in the waveform seen in the second line of Fig. 6. With a further rise of the envelope, we eventually arrive at the middle waveform of Fig. 6. While this is not a perfect waveform, it is very close to being a triple frequency version of the original triangle input. [This of course suggests a method of frequency tripling a triangle with a non-voltage-controlled version of this circuit.] As the envelope continues to rise, the output takes on the form shown by the fourth and fifth lines of Fig. 6. The fifth line is not unlike a square wave, and can be made to look more and more like a square wave by decreasing the resistance of the two SHAPE pots.

Thus, we have a device which starts with a waveform of low harmonic content, and greatly increases and alters this content as a control envelope rises. The effect is much like that achieved with a low-pass VCF and a waveform of high harmonic content. The harmonic evolutions are not the same as one gets with a filter however, so the timbre modulator should be a useful addition. It can also be used in parallel with a VCF (using the neglected sinewave output for example) and the two results can be mixed.

FIG. 6 OUTPUT OF TIMBRE MODULATOR, ADD INPUT SWITCH CLOSED