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PRACTICAL SYNTHESIS

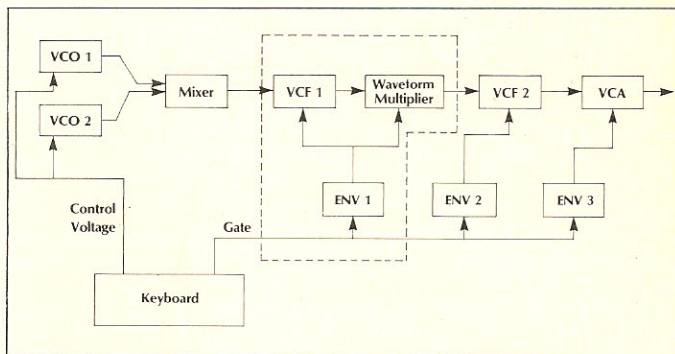
A Lead Synthesizer Dimensionizer

WHETHER YOU OWN AN old, vintage Minimoog or one of the new pocket-sized Electro-Harmonix synthesizers, the challenge of finding unique and exciting lead sounds for solo work is always there. The widespread acceptance of polyphonic synthesizers with their ability to emulate an ensemble of instruments should not deter the player from developing and using a repertoire of monophonic voicings intended for 'out-front' use. A solo voice will have different requirements from a voice that is meant only to blend with other identical voices in a chord structure; it must be strong enough to command musical attention by itself alone.

We will want to develop a handful of solo sounds covering a range of dynamics, from a clear, simple whistle to a breathy reed to a distorted guitar, for example. Not everyone has access to a programmable synthesizer, and since hands-on control is necessary during solos for stylistic inflections, I would like to suggest a flexible solo voice patch which can assume varied personalities. It is a variation on the 'standard patch' that forms the basis for most lead synthesizers, but it includes three additional modules inserted into the signal chain (see diagram). A second filter, a third envelope generator, and a new module called a wave multiplier, available from Serge Modular [572 Haight St., San Francisco, CA 94117], augment the usual setup.

The wave multiplier can be described as a voltage-controlled distortion device. Technical buffs may refer to Serge's data sheet on the module for details of the wave rectification techniques employed. I will simply say that it is a most intriguing sound modifier consisting of three separate sections which may be cascaded. The uppermost circuit is a VCA provided for gain control of the input. An overdrive switch in this section gives a mild distortion effect from the VCA. On the second level down we find a circuit which rectifies the signal into its odd-harmonic components. The sweeping of these harmonics is dependent on the amplitude of the incoming signal and a control voltage input; the effect is not unlike overdriving a large speaker system, except that it is fully manageable via voltage control. The bottom section is a device which can scan the even harmonics of the signal and can also respond to voltage control. Patching an input to the top section, then the output from that to the input of the middle, then from that output to the bottom section input provides a signal path rich in tone colors for exploration. As the input level rises or the voltage control signal changes, some very acoustic-sounding subtleties can be produced — with the simple envelope controls, attacks and decays take on a more 'natural' feel. At the other extreme, heavy-handed control will yield wild, screaming roars.

In accordance with the diagram, the extra three modules could be packaged together in a box and plugged into a patch-point on the average keyboard synth along with a bypass switch. We can call the added section of circuitry a 'dimensionizer,' since we will use it when our voicings need extra character. The settings of the dimensionizer modules may be adjusted while it is bypassed and the user is playing the normal patch. When the section is switched in, the voice suddenly becomes turbocharged! A 12db/octave multimode filter is recommended for use in the dimensionizer, and a simple AR/ramp envelope generator may be used. Since the wave multiplier is so sensitive to level and harmonic content, the multimode filter, with its variety of filtering and resonant effects, makes a perfect processor for the raw oscillator outputs. Even a small amount of tuned resonance close to the fundamental frequency of the oscillator source will cause delightful distorted burbling from the wave multiplier as



Standard lead synthesizer patch with extra modules for dimensionizer shown inside dotted line.

the keyboard moves the pitch up and down around the resonant point. I noticed the importance of this fixed-frequency formant peak by selecting only sine or triangle waveforms from the oscillators; the final output as processed by the dimensionizer was still a rich, complex waveform. This means that we are reversing the usual method of subtractive synthesis by taking a simple waveform and subjecting it to 'distortive' synthesis, where controlled additive distortion effects are used to produce colorful timbres. This technique may bear analogy to mechanical instrument systems — tone color changes are created through physical manipulation. The envelope generator here is used to impart true dynamics to the sound by shaping the distortion trajectory. It is connected to the VCA control input as well as the second-stage rectifier through attenuators. Filter controls do not include the envelope for most voices, since the fixed frequency resonator mode provides the most interesting interaction, but a foot pedal controller for the filter is effective in allowing the peak to be tuned to taste.

The tuning ratio of the VCOs, including any beating, will produce severe results in the wave multiplier, symptomized by radical amplitude swings and loss of fundamental. Fifth or octave tunings work most clearly, and a single oscillator is least confusing. The trend here is to derive the waveform complexity through the multiplier rather than other familiar areas. Of course, portamento and pitch-bending are encouraged; literally, because the forceful personality of the dimensionized sound helps you slip into character and have fun.

After the dimensionizer smoke has cleared, the signal still must travel through the standard VCF/VCA block, so one must be aware of the possible interactions: between the two filters and VCAs it's not too hard to lose the signal entirely for brief periods. Generally, the dimensionizer controls should be biased or driven high enough to allow a significant amount of signal to pass for proper signal-to-noise ratio in the system. When relying on these extra modules to color the sound, you may wish to adjust the remaining controls to a neutral or bypass position, at least when first experimenting. The second filter, normally a lowpass type, will be used to moderate and temper the high-harmonic mixtures coming from the multiplier and associates.

Sounds similar to the 'hard-sync' effect can be achieved with the multiplier, making it valuable to those whose oscillators, alas, lack this feature. By now, everyone has heard the gut-wrenching sound of hard sync and its usefulness in guitar and horn emulations. The dimensionizer is another idea along this line, a recipe for some hot and spicy sounds.