

E-mu EMAX II 16 - BIT SAMPLER

By Jim Aikin

FOR THE TYPICAL MUSICIAN, the big news about the Emax II isn't really the digital filtering chip. The big news is that at \$3,495, this 16-bit sampler provides both stunning sound and a very attractive alternative to higher-priced rack units like the Akai S1000 and Dynacord ADS. Only the technologically minded are likely to zoom in on the fact that the Emax II represents a real breakthrough in circuit design. While the box is black rather than gray, the front panel is virtually identical to the one on the original Emax, as is the operating system. But the II is far more than another update to an often-updated instrument. (Our original Keyboard Report on the Emax appeared in January '87; the hard disk update was reviewed in Nov. '87 and the SE synth functions option in the May '88 issue.) The sound-generating section is completely new, there are twice as many voices, and a number of subtle but vital features have been added.

Digital Filtering. The digital filter on the Emax II won't necessarily sound to the uninitiated like a breakthrough. The reason: It sounds more or less exactly the way analog low pass filtering sounded 15 years ago, complete with resonance and envelope sweeps. Ah, but this is digital filtering. When the sound of an instrument starts out digital (as is the case on almost all of today's instruments) and is then converted to analog for filtering, noise is added. Analog filtering also adds to the expense of the instrument, since a separate filter is needed for each voice. So an all-digital signal path is desirable. Up to now, though, digital filtering has involved

other compromises. Some digital filters are static - that is, the filter cutoff can be controlled from velocity but will remain at the same level throughout the note. Some digital filters are dynamic but not real-time - that is, you can program a filter sweep from an envelope or LFO, but the sampler has to calculate it and store the result in memory before you can hear it. (This type of filtering can also be

to make a really smooth, clean sound. The digital filters on the Yamaha TX16W were the only ones we can think of offhand that had resonance (also known as Q), and they didn't sound anywhere near this good. Before you can filter anything, you need an oscillator, right? The Emax II starts out with the same oscillator chip used in the E-mu Proteus (see Keyboard Report, Aug. '89). This 16-bit gizmo not only sounds great but also has the unprecedented ability to shift samples either up or down through five octaves without introducing horrible artifacts into the tone. At the output of this has been added a filter chip that handles 32 channels of sound at once, allows for smooth modulation (not granular stepped garbage), and has real, beefy, analog-sounding resonance. When we heard it, our jaws dropped. Not that you need swept resonant filtering every day of the week, but a pinch of resonance, even without enveloping, definitely adds personality to many sounds, especially in combination with the richness of the Emax II's two-voice chorusing (detuning). Filter tracking of the keyboard can be from 0 to 1 .87 (greater than unity).

Other New Features. Like the Proteus, the Emax II has both main stereo outputs and stereo sub-outs that can double as effects send/returns if you use quarter-inch stereo plugs. (The Proteus only has four sub outs, but the Emax has six, for a total of eight outputs in all.) These returns allow you to use the effects devices of your choice and still plug only a stereo output from the [max into the board, or, if you prefer, assign up to eight sounds

Emax II

Description: Sixteen-bit sampler/synthesizer with built-in sequencer.

Memory: 1Mb or 4Mb (shared by sound data and sequences), expandable to 7 or 8Mb in 2Mb blocks. Up to 100 presets.

Features: Dynamic digital filters with Q, 16 two-oscillator stereo voices, dynamic voice allocation, velocity and positional cross-fades and cross-switches. Additive and wave interpolation synthesis functions, arpeggiator, MIDI data analyzer, reconfigurable modulation inputs, disk-handling utilities. Can read Emax presets from disk.

Interfacing: 3.5" floppy drive. Eight 1/4" audio Outs plus mono mix out. Stereo headphone out. Sample in, clock in and out, footpedal and two footswitch ins (all 1/4"). SCSI and computer ports. MIDI in and switchable out./thru.

Suggested Retail Price:

\$3,495.00 with 1Mb internal RAM;
\$6,495.00 with 4Mb internal RAM
and 40Mb internal hard disk;
\$1,195.00 for memory expansion
board (required for expansion from
1 Mb) plus 2Mb RAM; \$995.00
each for 2Mb blocks.

Contact: Emu Systems, 1600
Green Hills Rd., Scotts Valley, CA
95066. (408)438-1921.

performed by some sample editing software.) The digital filters on some instruments are real-time dynamic, but the processor isn't fast enough

to individual outputs. The outputs are dynamically allocated.

The Emax II has 16 voices compared to the eight on the original [max. As on the original [max, these are two-oscillator voices - sort of. That is, if you assign separate sounds to the primary and secondary layer, the polyphony will be cut in half. (For those who insist on 100% technical accuracy, this is true unless the sounds are given the same keyboard range and the preset is put in stereo mode. In the latter case, you get full polyphony.) Stereo chorusing on the original unit also reduced the polyphony, but on the new one the full 16 voices are retained. (Chorus depth is also programmable, which it wasn't before.) Finally, the two oscillators can be used on the Emax II to produce a true phase-coherent stereo image without reducing the polyphony. You'll have to port stereo samples over from your favorite sample editing software, however, as the Emax II still has only a mono sampling input. This is a definite bummer, but we've heard rumors that stereo sampling may be made available as an optional upgrade, so if this feature is important to you, call E-mu and let them know.

Two models of the Emax II are being shipped. The first has 1 megabyte of RAM, while the second has 4 Meg RAM and a 40 Meg hard disk, with a price tag to match (\$6,495). Memory is expandable to 7 Meg for the basic unit and to 8 Meg for the turbo. Frankly, we don't think 1 Meg is enough for a 16-bit machine - and since most people will probably want more memory, the \$1,195 price tag for the upgrade from 1 Meg to 3 Meg brings the *real* price of the unit up to \$4,690, which is not horse feathers.

For those with mondo storage needs, the II has a SCSI port that will allow it to access up to seven (!) outboard drives, including E-mu's own HD300 and RM45 hard drives. It's even compatible with the new 600-Meg Sony and Ricoh read/write optical drives. The disk operating system provides a number of new utilities for taking advantage of the storage devices, including user-configurable backup routines.

While its sound data is in 16-bit linear form, the Emax II has 18-bit DAC's, which allow multiple voices to play back without clipping. That's not unusual these days. (The Dynacord ADS, for example, has 20-bit DAC's.) What's unusual is the user adjustable headroom control (0 - 15dB), which allows you to keep more headroom if you're going to be playing dense passages or reduce it for recording solo lines with the best signal-to-noise.

The SE synthesis section, previously available as an option, comes standard with the Emax II, and we're told that the faster processor in the new instrument means that these time-consuming number-crunching routines run twice as fast as before. SE synthesis includes additive, interpolation, and wave form-processing algorithms. If you're willing to devote the time to it, this resource could give your music some unique and beautiful sounds.

The sound banks shipped with the Emax II are thoroughly impressive. The Pop Composer bank contains a wide selection of usable sounds, including percussion, basses, and organ, and the wonderful Bombay Band bank includes sitar, a variety of tabla hits, and several other Indian instruments. Ten 4-Meg banks are included on the hard disk in the turbo model, and a selection from among this material is included on a set of 12 floppies if you buy the basic model. E-mu is making the entire Emulator Three sound library

available for the Emax II, so there's no shortage of high-quality sounds.

The Emax II will read original [max disks - not just the sound data, the way the S1000 reads S900 disks, but all of the data that makes up the presets. The sounds are interpolated up to 16-bit form (though this won't clean up any existing noise in the files) and can be stored in Emax II format. We found that percussion presets sounded slightly punchier but not as crisp on the original [max, presumably because of the analog filters. The cutoff frequencies also seemed to be slightly lower on the II. When high-pitched sounds were being transposed down by several octaves, the II sounded much, much, *much* better than the older unit when playing an identical sound file.

Oh, yeah, and one more thing: LCD contrast can now be adjusted. (Thank kew veddy much.)

Old Features. The Emax has the usual selection of sample-editing utilities. It also has a very nice little modulation routing scheme that lets you reconfigure the wheels, foot pedals, and incoming MIDI controllers to perform the chores of your choice (filter modulation from the pitch wheel, for example). Separate configurations can be stored in each preset. Cross fading and cross switching from velocity and key position are supported. It has velocity curves, a MIDI data analyzer, and an arpeggiator. And hard-disk loading can be automated over MIDI.

Old Non-Features. As with any other tech-no-miracle since the invention of the wheel, the Emax II walks a careful line between hot new selling points and cost-conscious corner shaving. The good news for those who are

already familiar with the [max is that there's almost nothing new to learn in the Emax II, except for the voice output assignments and the disk utilities. (So the tips in our Feb. '89 Emax programming clinic are still valid.) The bad news is that certain aspects of the Emax that weren't exactly state-of-the-art two years ago haven't been updated.

The sequencer should be thought of solely as (a) a scratchpad and (b) a way to carry sequences, downloaded from a *real* sequencer, to your gigs. It doesn't even have punch-in or quantization. The LEO has only one waveform (triangle). The keyboard isn't pressure-sensitive, although channel pressure can be received over MIDI. The instrument is functional but certainly not inspiring as a MIDI master keyboard. And the 32-character LCD is not the largest we've ever seen. We're not going to belabor E-mu about the head and shoulders with a whiffle-bat,

but we do think there's room for improvement here.

Conclusions. The crystal clarity of the sounds on the Emax II gave us a nearly ungovernable case of Hardware Lust. True, it's not a cheap instrument - especially when loaded with RAM - but those multiple outputs make it so flexible that you could easily justify the cost of the extra RAM as eliminating the purchase of another synth. Or two. If you're willing to tote around an external hard drive, you can probably save \$700 to \$1,000 by getting the basic unit and expanding it rather than buying the turbo model.

While we would have liked to see some of the old limitations of the [max overcome on the new unit, our one big complaint is that it really ought to be able to sample in stereo. Balanced against this are the SE synthesis section and the wonderful digital filtering, neither of which is offered by the competition. In sum, the Emax, which up to now has

been the Volkswagen of the E-mu product line, has emerged from its chrysalis (don't you love mixed metaphors?) as the Mercedes. If you're looking for a pro-level sampler, take it out for a test drive.

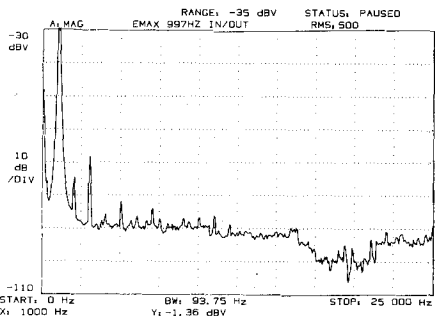
Pros & Cons

Pros: 16-bit sound, dynamic digital filtering, dynamic voice allocation to multiple outputs, optional internal hard disk.

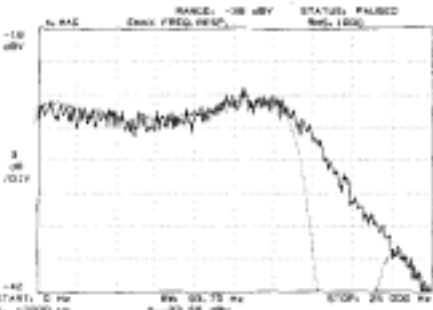
Cons: Very limited sequencer, no pressure sensing on keyboard, limited memory on basic stock unit, small LCD.

E-MU SYSTEMS EMAX II : AUDIO SPECIFICATION TESTS
By Michael Marans

The original version of the Emax contained a VLSI chip called the E-chip that was capable of driving eight voice channels with 12-bit resolution. At the heart of two of [-mu's current products, the Proteus and our test subject, the Emax II, lies the 16-bit G chip, a sliver of silicon that serves as the basic sound generating mechanism for 32 voice channels. The instrument's analog filter section has been replaced by digital filters courtesy of the H chip. Judging from the Emax II test results, we can safely presume that as long as E-mu continues to work their way through the alphabet, each generation of samplers they manufacture will continue to advance the state of the art.

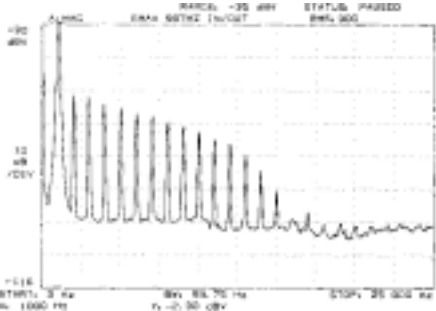


Frequency Response. The Emax II's input-plus-output response curve is relatively flat up to 16kHz. The response then drops sharply to 17kHz, where the signal level is 6dBV below the level measured at 1 kHz. The output stage-only curve is nearly identical except that the drop off is much more gentle, extending all the way to 19kHz before the -6dBV level is reached. There are small deviations (± 1 dBV) in the 2.5kHz-to-12kHz range, but these shouldn't prove to be significant in musical applications. The Emax II ranks fourth in over all frequency response in our ongoing series of tests behind the Dynacord ADS, the Akai S1000, and E-mu's own Emulator Three.



Frequency response: Input-plus-output (gray), output stage (black).

Dynamic Range. The Emax II boasts residual noise characteristics that are below -100dBV, beating our previous first place winner, the Dynacord ADS. The Emax II places third in the quiescent noise category, just behind the ADS and the S1000.



E-MU SYSTEMS EMAX II											
SAMPLING RATE (Hz)		DYNAMIC RANGE (dB)				INPUT + OUTPUT STAGE DISTORTION (%)			OUTPUT STAGE DISTORTION (%)		
ACTUAL		QUIESCENT NOISE FLOOR	SILENT SAMPLE OUTPUT STAGE ONLY	SILENT SAMPLE INPUT+OUTPUT STAGES	OUTPUT LEVEL 997Hz FULL-CODE SINE(dBV)	97 Hz	997 Hz	10,007 Hz	97 Hz	997 Hz	10,007 Hz
39,065	WEIGHTED	-99.49	-100.86	-101.07	+0.46	.172	.065	1.07	.032	.037	1.06
	UNWEIGHTED	-92.85	-94.52	-94.38	+0.46	.403	.231	5.31	.087	.226	5.26

PITCH-SHIFT DISTORTION (%)									
UP					DOWN				AVERAGE PITCH-SHIFT DISTORTION
MINOR 2nd	MINOR 6th	OCTAVE	AUGMENTED 11th		MINOR 2nd	MINOR 6th	OCTAVE	AUGMENTED 11th	
WEIGHTED	.037 (+.000)	.045 (+.008)	.046 (+.009)	.073 (+.036)	.037 (+.000)	.039 (+.002)	.039 (+.002)	.043 (+.006)	.044 (.007)
UNWEIGHTED	.239 (+.013)	.362 (+.136)	.456 (+.230)	.684 (+.418)	.216 (-.020)	.163 (-.063)	.135 (-.091)	.114 (-.112)	.296 (.135)