

## EMAX DIGITAL SAMPLING KEYBOARD FROM E-MU SYSTEMS

By Dave Frederick

**ROCK AND ROLL HAS ALWAYS** been about style and fashion as well as content and substance. How a band looks may be just as important as how it sounds. Looks are important in keyboard design, too.

E-mu's new Emax immediately sets itself apart from the pack of mid-priced samplers with a bold *Miami Vice* look: pastel colored buttons, rounded corners, matte gray finish. But does its performance match the sleek packaging? That's what we intended to find out.

E-mu's Emulator II has been a tremendous success, but has been out of reach of many musicians who can't afford the \$8,000 price tag. The Emax comes in a good deal lower than the E-II, and yet many of the Emax's features are the same as or superior to those on the E-II. Where do the differences lie? The E-II is available with either two floppy disk drives or one floppy and a hard disk; the Emax is only available with a single floppy disk drive. The E-II supports SMPTE synchronization without the benefit of an external synchronizer; the Emax only offers MIDI and PPQ syncs. Also, large-scale integration makes it possible to combine the functions of many chips of the E-II into one chip in the Emax, which makes for lower production and materials costs.

**Controls.** The front panel of the Emax is arranged in modules. All

the edit controls, including the yes/+1, no/-1, data entry slider, left and right cursors, and ten-key pad, are located just above the lowest notes of the keyboard. The various programming modules are accessed via the buttons to the right of the edit section. Through a pretty slick-looking arrangement of printed menus across the top of the

make the menus easy to read without forcing you to continually reach back and forth along the entire length of the instrument. There are a lot of features in each module, which probably accounts for the relatively small type. In the lower left corner of the front panel are the wheels, and odd ones they are. There is a capsule-shaped bulge in the surface and the notched wheels ride right along the surface of this bulge. There's no playing these wheels from one side or another. You've got to be pretty much right on top of them. We actually thought the wheel design was pretty lame. They're hard to use and force you to adapt to a completely different pitch-bending/mod wheel technique.

The back panel offers an impressive collection of audio outs. As with the E-II, each of the Emax's eight voices has its own output. Unlike the E-II, the Emax offers left and right stereo outputs and extensive panning capabilities, which we'll cover later. The machine can also send a mono audio output. There is a clock input and output, plus one pedal and two footswitch inputs. In addition to the MIDI in and out/thru, there's also a nine-pin Macintosh-style RS-422 port for direct computer interfacing at 17 times the speed of MIDI.

**Sampling.** The Emax is more than just an array of ins, outs, and buttons; it's a sampler. So let's talk sampling. The Emax employs a proprietary data compression scheme which uses 12-bit AD/DA converters, but stores the data in 8-bit words instead of the less

### Emax

**Description:** Proprietary 12-bit data compression and 8-bit storage, selectable rate digital sampling keyboard.

**Keyboard:** 61-note, C-to-C, non-weighted keyboard with velocity sensing.<sup>1</sup>

**Voices:** Eight-voice polyphonic, up to 176 samples per preset, four-voice polyphony in non-dual primary/secondary sample mode.

**Memory:** 524Kbytes of sample/sequence memory (52 seconds at 10kHz), 28kbytes of preset memory, 100 presets per bank (1 bank per disk).

**Interfacing:** MIDI in, out/thru, 1/4" sample audio in, 1/4" left (mono) and right stereo audio outs, 8" individual voice outs, 1/4" clock in and out, 9-pin RS-422 in/out, 2 1/4" footswitch ins, 1/4" pedal in.

**Features:** Up to 42kHz sampling, automatic multi-sample key assignment, cross-fade, cross-switch, positional cross-fade, 13 velocity response curves, cross-fade looping, sample taper, sustain and release looping, individual voice analog and digital processing, built-in disk drive, 10 factory disks included.

**Dimensions:** 43" x 15½" x 5", 20lbs.

**List Price:** Keyboard \$2,895.00  
Rack-mount \$2,695.00

**Contact:** E-mu Systems, Box 66303, Scotts Valley, CA 95066-9985; (408) 438-1921.

<sup>1</sup> The original article incorrectly stated that the Emax has keyboard aftertouch. This was in the design brief, but E-mu Systems couldn't get it to work in production.

instrument and selector buttons on the right side of the silk-screened menu panel, E-mu has managed to

memory efficient 12-bit words. As with any digital sampler with a finite amount of memory, the more samples you take every second, the fewer total seconds you can sample. The Emax offers up to 12.4 seconds at 42kHz, 16.6 seconds at 31 kHz, 18.8 seconds at 28kHz, 26 seconds at 20kHz, 33.5 seconds at 16kHz, and 52 seconds at 10kHz. You can definitely hear the grunge in a 10kHz sample. Many people won't be able to hear the difference between a 42kHz and a 31kHz sample, but for drum kits, where the frequency response is important and you don't need a huge amount of recording time, it's nice to have the higher rate. You should be able to get more than adequate samples using the default rate of 28kHz. We thought the sound was quite good at this rate.

In any of the modules, the various menu pages are randomly accessible, but in the sampling module they follow a logical progression and are probably best used in order. The first menu is a digital VU meter, which allows you to adjust the input gain or attenuation that the Emax will apply to the signal. This can be set between -10 and +40dB in increments of 2dB. This is more than enough to adjust the input of anything from a CD player to a synthesizer to a microphone. We were disappointed to find that the Emax could not pass an audio signal from the sample input to the audio output. This means that if you want to monitor what you're sampling, you'll need to use some kind of a mixing device to send the signal to both the sampler and your speakers. Emax will automatically assign the sound you're about to sample to the next available key area in the preset you're working on. In fact, this is one of the areas where Emax really makes sampling easy. The default

placement for a sample is the low G, with the C below and the B above as the lower and upper transposition limits for the sample. If you accept the default placement, each successive sample in that preset will be placed in the next octave in the same way. The original and upper/lower limit notes can be changed before or after sampling. What's nice is that you can whip six samples into the machine and have them neatly distributed in octaves without even thinking about it.

Each voice can have both a primary and a secondary sample. These two samples can be sent to separate outputs and so processed completely independently of each other. You can then switch between the samples using a number of different methods that we'll discuss below.

You can use up all the available memory in recording a single sample and still regain most of that memory through various digital processing techniques such as truncation, looping, and so on. In order to avoid having to sift through a long sound, however, you can set a sample time up front. As with many of the features of the Emax, the sample time and the sampling rate remain where you set them until you change them. This is real good when you're working with one type of input and don't want to have to keep setting up the sampling parameters. Sampling can be triggered from the front panel, or by using the audio level threshold. Sampling can also be stopped from the front panel, so you won't have to sit there and wait for a 52-second sample to run its course if you make a mistake. As you use up memory, Emax will automatically shorten the maximum recording time available to you. This is one of the easiest, friendliest, and most logical sampling systems we've used to date.

**Digital Processing.** Once you've created a sample, no matter how good it is, you'll probably want to make some changes. You'll want to tweak it with the digital processing module. Entering this module brings us to one of the really great features of the Emax. When you are presented with the instruction to "Select a Voice," all you have to do is play the keyboard until you find the sound you want to edit. Once you enter the edit mode with that sound, all the other sounds distributed across the keyboard are deactivated. This makes it extremely easy to know exactly what sound you're working on at any moment. Another welcome feature comes up here as well. The Emax doesn't force you to save your work to disk before moving from one module to another. This means it's quick and easy to go from sampling to editing to mixing and back to sampling. The manual recommends (and so do we) that you save your work periodically, but it's nice not to have to. The digital processors are, for the most part, standard sample edit functions. Truncation allows you to trim data off the front and end of the sample. You can hear the truncation without making it permanent, and when you do make it permanent, you get back all the memory you didn't use.

Sample looping is performed on a loop start/loop length basis. If you move the loop start, the loop length will remain constant - both loop points move when you change the start point. This makes it real easy to maintain that rhythmic pulse while trying different start and end points. Naturally, you can't push the endpoint of the loop beyond the last byte in the sample. There is an automatic loop locator and cross-fade looping function, which aids the looping process somewhat. It's

still pretty much a trial-and-error process, but you can save yourself some time by using the auto-loop function. In addition to the standard sustain loop, Emax offers a release loop, which works identically to the sustain loop. Once you set all the loop points, you are given the option of truncating the data after the loops and getting more sampling time back. The two loops can be turned off or on after you define them. Although there's a backwards function provided to play a sample in reverse, there is no provision for back-and-forth looping.

Certain functions in the digital editing module cannot be auditioned and can't be undone. For this reason, it's always a good idea to make a disk copy of the sound you're editing, in case you don't like the results of an edit. These functions include taper, splice, cross-fade looping, and attenuation. The taper function allows you to fade a sample in or out over a certain number of milliseconds. Splice combines two sounds into a beginning and end of a composite sound and then allows you to cross-fade over a number of milliseconds from one to the other. Combining voices simply allows you to play two samples from their start points from a single key. Cross-fade looping is provided in both linear and equal-power formats. Equal-power cross-fade maintains the overall level of the sound as the cross-fade occurs. Finally, there is a post-sample boost or cut of up to 40dB.

**Preset Management.** A preset on the Emax consists of a group of various samples, their arrangement across the keyboard, and their component analog and digital modifiers. The preset management section allows you to load, delete, rename, save, and copy presets, and create blanks. The save function in this menu is the only

save function on the instrument and saves everything in memory to the disk. There's also a preset memory indicator. Preset memory and sample memory are completely independent, but samples and sequences are both stored in the same memory block.

**Preset Definition.** This section allows you to define the individual elements that make up a preset, such as the samples and their ranges. You can copy a sample from another preset, change its note assignment, or erase a sample. This module also contains the Emax's extensive dual sample programming capabilities. First of all, when the Emax is not set to dual mode, each sample takes one voice. If you're using only primary samples, this gives you eight-voice polyphony. If you have a primary and a secondary sample for each key, the Emax is only a four-note polyphonic instrument, but the primary and secondary samples can each have their own independent functions. If you turn the dual mode on, the primary and secondary samples must share functions, but you can play eight notes at a time.

Primary and secondary samples (voices) can be arranged independently on the keyboard. Let's say you've sampled a clean sax note as the primary sample and a grungy sax note as the secondary sample. You can place those two samples as if they were individual samples, on different sections of the keyboard, or they can overlap. How you access the two different sounds when they overlap is determined by how you set up the sample cross-fade or cross-switch parameters. You might want the grungy sound to be heard only when you really belt a key. In that case you'd use a velocity cross-switch. Any velocity over the midpoint value will change from the primary sample to the secondary sample or vice-versa. This midpoint is not user-definable.

A smooth fade from the primary to the secondary sample can be made by programming velocity cross-fade. The harder you play, the louder one sample gets and the softer the other gets. Or you may choose a positional cross-fade, in which one sample gets softer and the other gets louder as you play up and down the keyboard. You can also assign cross-fade or cross-switch to any of the real-time controls, such as the wheels, pedals, or after-touch. These cross-fade settings are mutually exclusive, so you can't have two different cross-fade functions on a single voice. You can, however, have different cross-fade schemes for different voices across the keyboard.

**Arpeggiator.** The Emax arpeggiator is one of the best we've seen. In fact, only the Prophet VS arpeggiator comes close. All the arpeggiator parameters are stored as part of the patch, and you can restrict the range of keys that trigger the arpeggiator to any portion of the keyboard. The mode is selectable between up, down, up-and-down, forward assign (played in order), backward assign (played in reverse order), or random (any order it damn well feels like). You may choose between three latch modes. With latch off, notes will only arpeggiate as long as they are held. Auto latch continues arpeggiating notes after you release the keys, until new keys are pressed. The Extend latch adds new notes to the existing arpeggio whenever you play. The velocity level of the notes can be set to any value between 1 and 127, or programmed to play whatever velocity you play. These velocities are also transmitted via MIDI for sequencer recording and driving slave keyboards. The arpeggiator allows you to specify an interval between a minor second and an octave and a

number of extensions beyond the note you play. If you select a minor second and seven extensions in up mode, and then play a one-note arpeggio, you'll hear a chromatic scale from the note you played to the perfect fifth above it. You may specify a tempo in beats per minute and a note value of the arpeggiated notes from half notes to 96th-notes. The arpeggiator will sync to an external timing source, including MIDI, 24ppq, 48ppq, and 96ppq. One of the most interesting features of the arpeggiator is Cruz Control. This function reduces the time value of each note in the arpeggio so that no matter how many notes you hold, they always fit in the same time value. If you have one note pinging away on eighth notes, adding a second note will change the note value to sixteenths, adding a third will produce sixteenth triplets, and so on.

**MIDI & Controllers.** Each preset can be assigned to a specific MIDI channel or to omni mode. Whether the MIDI out/thru will act as an out or a thru can also be specified. There are a number of data input filters, including notes, wheels, local control, start/ stop signals, and program changes. Each of the controllers can be configured to send and receive via a different MIDI controller number. Left and right wheels, pedal, aftertouch, and two user definable controllers labeled A and B can all be reassigned. Once these are assigned to a controller number, they will transmit that number and any Emax function assigned to that controller will respond to incoming data of that type. These controller assignments can be different for each patch.

In addition to the alternate controller assignments, the wheels, pedals, footswitch, the two assignable controls, and aftertouch can be mapped to various functions within the Emax.

Continuous control functions are pitch (usually controlled by the left wheel as pitch-bend), filter cutoff frequency, output level, LFO to pitch amount (conventional mod wheel setting), LFO to filter cutoff, LFO to level amount, VCA attack rate amount, stereo image placement, and cross-fade. Switch-type control functions are arpeggiator on/off, sequencer on/off, sustain, release, cross-switch, and preset advance. As on the E-II each destination can only have one control source. Although the modulation routing scheme offers a lot of options, we found ourselves wishing that the instrument would let you assign more than one controller to a given destination.

**Analog Processing.** This module houses all the familiar analog-type controls. Each voice can have its own settings in this area, and if you're not in dual mode, you can assign different parameters to the primary and secondary samples of each voice. Dual mode allows you to use primary and secondary samples in eight-voice polyphony, but you must use the same analog parameter settings for both. The first settings available are attenuation, tuning, and delay. Each voice's level can be decreased up to 46dB. You can tune each voice between -48 cents and +45 cents, and a delay after key press can be specified on an arbitrary scale of 0 - 63. The VCA envelope (remember that there are as many as eight VCA's, LFO's, etc.) uses an AHDSR format. The hold segment between the attack and the decay holds the level at full for a definable length of time before moving on into the decay segment. This type of envelope is also used for the filter. In addition to the standard filter cutoff, Q, and tracking parameters, the Emax allows you to program either positive or negative filter envelope response. The LFO can be set up to affect vibrato, tremolo, filter cutoff, and stereo pan, all at different amounts. Be sure to

take some Dramamine before applying a slow vibrato to pan. A great feature here, called variation, changes the rate of the new voice's LFO each time you hit a new key. The higher the variation value, the more the average change. This is perfect for string vibratos and funky bass random filter cutoff patterns.

Velocity may be applied to output level, filter cutoff, filter Q (positive or negative), pitch, VCA attack time, filter attack time, and pan simultaneously at different amounts. The default pan setting for the voice can be set to either the center or one of seven positions on either side. There is a built-in chorus, which sounds a little heavy on the feedback to our taste, but it's a nice effect. And you can set each voice to solo mode for single-note lines and to non-transpose mode for multi-key samples which don't change pitch. One of the best functions of the analog module is the ability to program certain voices to ignore any or all of the real-time controllers. Being able to do this on a voice-by-voice basis is a real boon, because it allows you to pitch-bend one area of the keyboard without affecting another.

**Sequencing.** The Emax sequencer isn't a full-function sequencer by any stretch of the imagination, but then it wasn't meant to be. It does have some great features, which make it more than just a vanilla on-board sequencer.

Unfortunately, sequencer memory is inversely proportional to how many samples you have in memory. With well-crafted bass, guitar, and drum samples in memory, you should be able to sequence 8,000-10,000 notes. Therefore, it's a good idea to use as few samples as possible if you

plan to do a lot of sequencing. The sequencer can sync to the ppq or MIDI external timing source. If you use the internal clock, the tempo is variable from 40 to 240 bpm. You can, of course, load, save, delete, and rename sequences on the disk without disrupting other disk info. Each of the sixteen tracks of the sequencer can be assigned to any of the presets available in memory at the time. Also, each track is assignable to its own MIDI channel (1-16); alternatively, all tracks can be automatically assigned to individual channels using Supermode. By using the sequencer's track assign mode you can set up the Emax to respond to an external sequencer in a dynamic voice allocation manner. If the drum part, assigned to track one, is only playing two notes, this leaves six other notes to be played by other presets. There's no need to determine how many voices you'll need for each sound before you begin. This same function allows you to download a sequence from an out board sequencer into the Emax's memory all at once and still retain the preset to track assignments. This is nothing short of amazing. Within the internal sequencer you can record in real time, bounce tracks, mute tracks, re-record over previously used tracks, change a track's preset assignment, or erase a track. When you record a track to an existing sequence, the recorder will automatically stop at the end of

the sequence. There is an auto extend function which allows you to record beyond the end of the existing sequence. The Master Module. This module is where you set up some of the overall controls of the Emax. Master tune can be set between +45 and -48 cents, and you can alter the velocity response curve to one of 13 different scales. The velocity curve is stored along with the other preset information and affects the Emax's sounds as well as the outgoing MIDI data.

This module also performs the various disk handling procedures. You may format a blank disk, copy the system software to a disk, or copy an existing disk for back-up purposes. There is a "bird run" feature, which is explained in the manual as, "This function aligns Emax's internal stabilizers and prevents excessive gyrocosmic relativation." You be the judge.

Finally, the Special menu in this module allows you to perform some of the most powerful Emax functions. MIDI overflow mode allows you to play more than eight notes on your Emax and have the first eight notes sound on the Emax and the rest on the MIDI instrument it's connected to. If you plan to record from the Emax to an external sequencer, make sure this is off; otherwise, you may waste a lot of time sending data only when you exceed the eight-note internal limit. You can also recalibrate all of the

controllers to change their upper and lower limits. In the case of the left wheel, which has a center detent, the midpoint can also be programmed.

**Conclusions.** What can we say - it looks as if E-mu did everything right. The Emax is even going to be available as a rack-mount unit for those who don't need the keys. Sampling is so easy; you could practically fall on the thing and make a good sample. And since you're always working in memory, you don't have a lot of different kinds of data to be saving to disk and confusing you along the way. We feel that moving the wheel design away from a standard configuration is need less; the amount of performance comfort and control you have to give up isn't worth the improved appearance. A lot of the features, which initially just seem kind of cool, such as controller recalibration and mapping, MIDI overflow, dynamic voice allocation, and being able to download an entire outboard multi-track sequence all at once, become more and more useful until you get to the point where you wonder how you ever got along without them. All this, and it looks great, too.

E-mu has managed to prove that beauty is definitely more than skin deep.