MASTERING RETRO and UNITY

Retrofit your sound library with this dynamic duo from BitHeadz.

Despite some important differences, BitHeadz's flagship products, *Retro* and *Unity*, have much in common. Both are based on the virtual-analog sound-design model, offering oscillators, filters, envelopes, and low-frequency oscillators (LFOs), and both provide the same number and type of effects. *Retro* and *Unity* also have flexible modulation routings and the same support utilities. What distinguishes the two is that *Retro* is a software synthesizer, so its oscillators play waveforms. *Unity*, on the other hand, is a software sampler; it uses samples as its sound source. I'll look at the layout of both programs, using *Retro*'s patch-editing features as a model, and devote the remainder of "Master Class" to *Unity*'s sampling features. If you don't own either program, head to the BitHeadz Web site (www.bitheadz.com) and grab the demos of one or both.

Retro and *Unity* are, in fact, suites of applications: each consists of several modules (that is, separate executable programs) that are designed to handle specific tasks. Additional utility programs are intended for setup and organizational chores. That approach—having an array of programs to deal with—can be confusing to new users. The savings in memory and CPU power that result from using only what you need, however, justify the effort it takes to get accustomed to that strategy.

SUM OF THE PARTS

Retro and *Unity* have four main modules: Editor, Keyboard, MIDI Processor, and Mixer. Both also have a Synthesis Engine, which always runs in the background. The Synthesis Engine is launched automatically by the other modules and handles digital signal processing (DSP) functions transparently. (For details about using the Synthesis Engine's Control Panel, see the sidebar "Taking Control.")

By Len Sasso

MASTERING RETRO and UNITY

The Editor module is used for creating and modifying *Retro* and *Unity* programs. It is the key to building a unique sound palette. The Keyboard module provides onscreen controls for auditioning *Retro* and *Unity* programs, and the MIDI Processor module is designed for live performance—it lets you create keyboard layers and splits, and it contains a built-in arpeggiator/step sequencer. The Mixer module is your window into the Synthesis Engine and shows the settings for each MIDI channel. This article will cover each module, but first, here's how *Retro* and *Unity* manage their programs.

Programs and banks. *Retro* and *Unity* handle program and bank organization slightly differently. *Retro* programs are files on your hard drive, and *Retro* banks are folders containing those program files. The Program and Bank menus in *Retro*'s modules display the program files and bank folders in alphabetical order. *Retro*'s Synthesis Engine uses that order when responding to MIDI Program Change and Bank Change messages. You can control the order in which programs and banks appear in the menus by the names you give them.

In *Unity*, banks are files on your hard drive. *Unity* programs are patch configurations within a bank file, and you can arrange them in a list in any order using the *Unity* Editor module. You can also group bank files into subfolders on your hard drive. You control the order of *Unity* programs by where you place them in the Editor's program list, and you control the order of banks by how you name them and the subfolders that contain them.

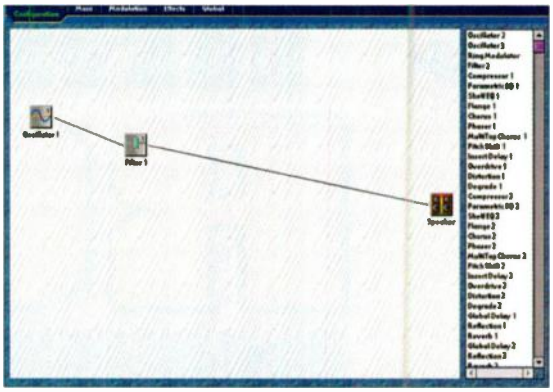

FIG. 2: The Configuration page graphically displays the signal flow. Modules can be added by dragging from the list at the right and dropping onto the work space. Modules can also be deleted, and some modifications to cabling are possible. More control options are available on the other Editor pages, which are accessed with the tabs along the top.

Retro program files and *Unity* bank files must be kept in folders named Retro AS-1 Programs and Unity DS-1 Banks, respectively. On the PC, the Retro AS-1 Programs and Unity DS-1 Banks folders must reside in the System folder, and on the Mac, either folders or their aliases must be placed in the System folder. That is how the Synthesis Engine, Keyboard, MIDI Processor, and Mixer find them. The Editor uses standard Open and Save File dialogs and can open program files in any location.

The Keyboard module. Use the Keyboard module for quickly auditioning sounds. The Keyboard has Bank and Program menus, an onscreen keyboard for playing notes with the mouse, and four onscreen sliders for generating MIDI Control Change messages (CCs). Also included is an automatic-chord feature that lets you select from 21 chord types to be triggered when the onscreen keyboard keys are pressed. The Keyboard does not respond to incoming MIDI; to use a MIDI keyboard to play the sounds selected by the Keyboard, you need to launch one of the MIDI-input utilities that route MIDI to the Synthesis Engine.

Here's a trick: if you load the Editor before loading the Keyboard, you can save time when auditioning sounds because you won't have to load them to hear them. Select Keyboard from the Editor's Synthesizer menu to launch the Keyboard, and use the Keyboard module's Bank and Program menus to select the program you want to hear.

The Keyboard always monitors the Synthesis Engine and adjusts its bank and program selection accordingly. That means that when you use the Keyboard with anything that sends the Synthesis Engine Program Changes (such as a sequencer or a *Retro* or *Unity* module), the Keyboard will reflect the latest program selection. If you use the Editor, the Keyboard always triggers what the Editor is editing (assuming they are set to the same MIDI channel.)

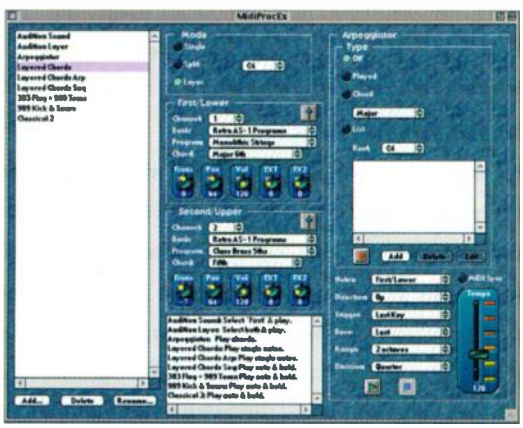

FIG. 1: *Retro*'s MIDI Processor can be used to split or layer two sounds. On the left is a list of Setups, in the center are options for picking and configuring layers, and on the right is the arpeggiator/step sequencer.

The MIDI Processor module. The MIDI Processor is designed for live performance and is the best way to control *Retro* and *Unity* from a MIDI keyboard. It provides for keyboard splits and layers, arpeggiation, automatic chords, and even step sequences. Like the Editor, the MIDI Processor automatically launches the appropriate utility for routing MIDI to the Synthesis Engine.

In the left column of the MIDI Processor file shown in **Fig. 1** are the numerous Setups that each file can hold. Setups include a Mode selector, an arpeggiator/step sequencer, upper and lower Program Selectors, and a comments area; they can be selected using

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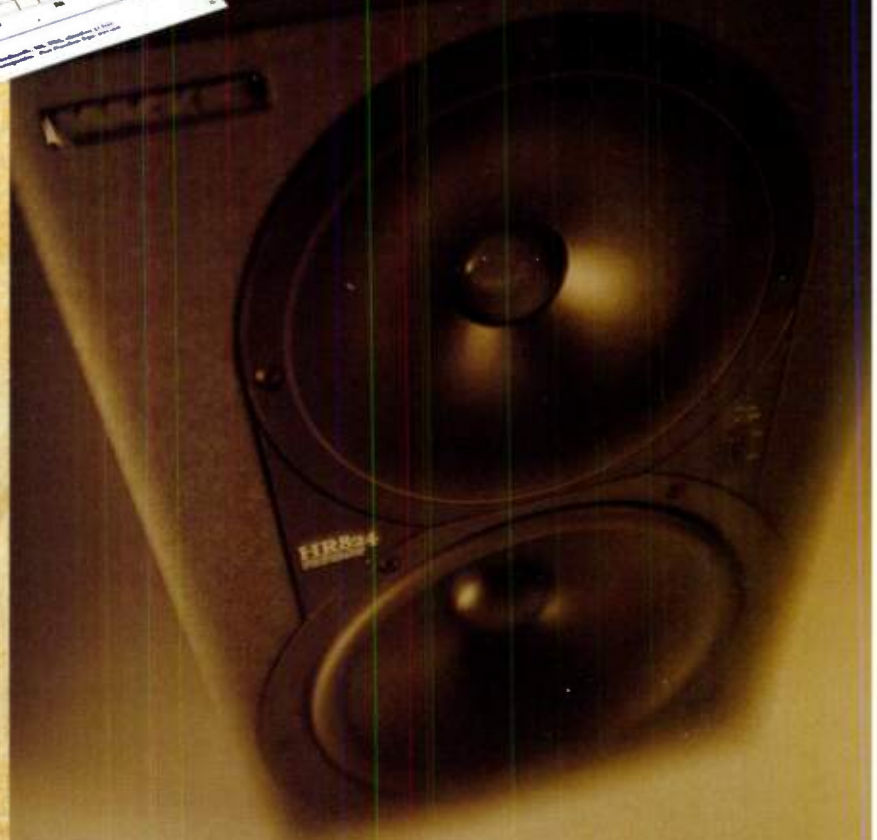

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the mouse or MIDI Program Change messages.

In the MIDI Processor, use the two Program Selectors (First/Lower and Second/Upper) to select two *Retro* or *Unity* programs. The Mode section (at the top center of the screen) then determines whether incoming MIDI triggers both layers, is split by Key number, or plays only the program indicated in the First/Lower Program Selector. It's important to remember that the Program Selectors control what is happening on specific MIDI channels in the Synthesis Engine. The MIDI Processor routes all incoming notes, regardless of their MIDI channel, to the appropriate Synthesis Engine channel.

The Mixer module. The Mixer provides a complete window into the Synthesis Engine's 16 channels. Use it to select programs, control tuning and mixing parameters for each channel, and manage the Global effects. The Mixer comes in handy if you're doing a live performance and intend to use several MIDI controllers, perhaps to control parameters of different *Retro* or *Unity* programs. It's also useful when controlling *Retro* or *Unity* from a sequencer, but in either case, using it does cost some CPU power.

The Mixer is one way you can save song setups when using *Retro* or *Unity* with a sequencer. Once a mix is set up in the Mixer, it can be saved and reloaded each time that the corresponding song is loaded into the sequencer. If you use a sequencer to send MIDI mix data to the Synthesis Engine, the Synthesis Engine will pass that data on to the Mixer. Therefore, the Mixer's control panel will always reflect the state of the mix. The following MIDI controller numbers are used for the channel controls: 7 for Volume, 10 for Pan, 20 for Mute, 21 for Solo, 91 for FX1 Send, and 92 for FX2 Send. To control the global-output parameters (volume, muting, and effects sends) remotely, use MIDI NRPN messages, a complete list of which is published in the *Retro* and *Unity* manuals.

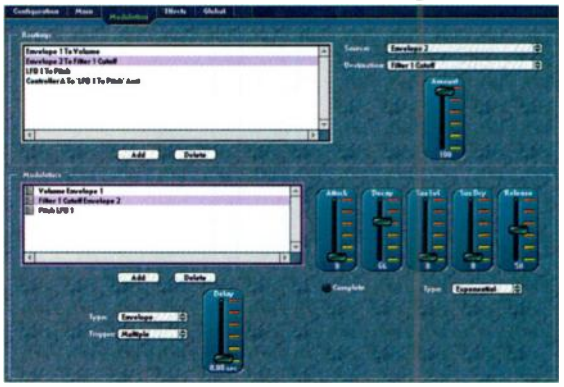


FIG. 4: *Retro* and *Unity* allow 24 modulation routings per voice. Those are defined and controlled from the Editor's Modulation page. Four assignable MIDI controllers are also routed using this page.

Bear in mind that you cannot use the Mixer with the MIDI Processor because the MIDI Processor takes over and routes MIDI input according to its settings.

Who's on first? With three modules performing overlapping functions—many of which can also be performed directly by the Synthesis Engine under MIDI control—there are no hard and fast rules about when to use which module. Here are some useful rules of thumb.

For playing *Retro* or *Unity* from a MIDI keyboard, use at a minimum the input utility that controls MIDI input selection (Open Music System [OMS], serial, FreeMIDI, and so on), found in the Control Panel. That utility routes incoming MIDI by channel to the Synthesis Engine, which responds to MIDI Note, Program Change, and Control Change messages. Some software sequencers (Emagic's *Logic Audio*, for example) have built-in MIDI drivers for communicating with the Synthesis Engine directly. If you use such a sequencer, you don't need to use an input utility.

To set up arpeggiation or keyboard splits and layers, use the MIDI Processor. If you want onscreen mixing, use the Mixer module, but keep in mind that your sequencer may provide

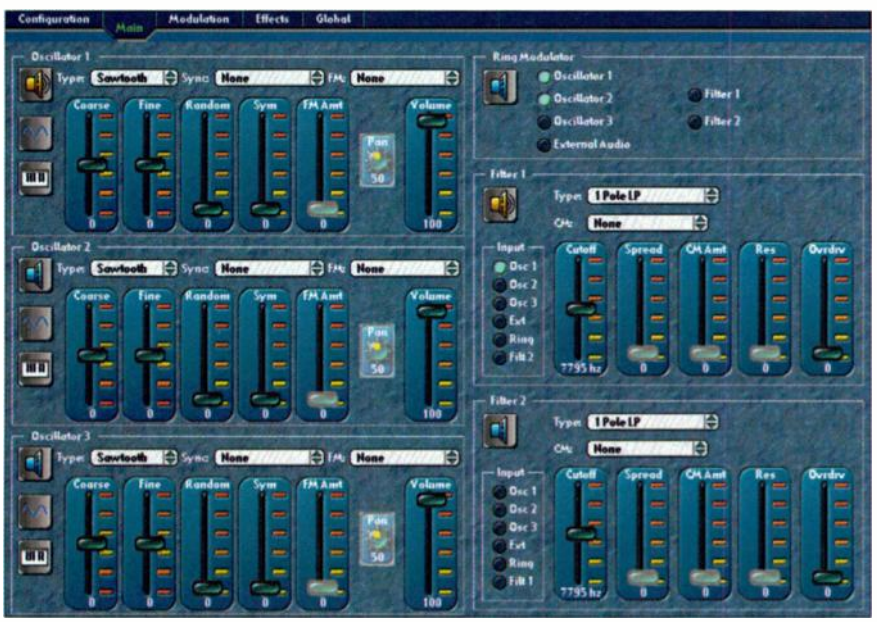
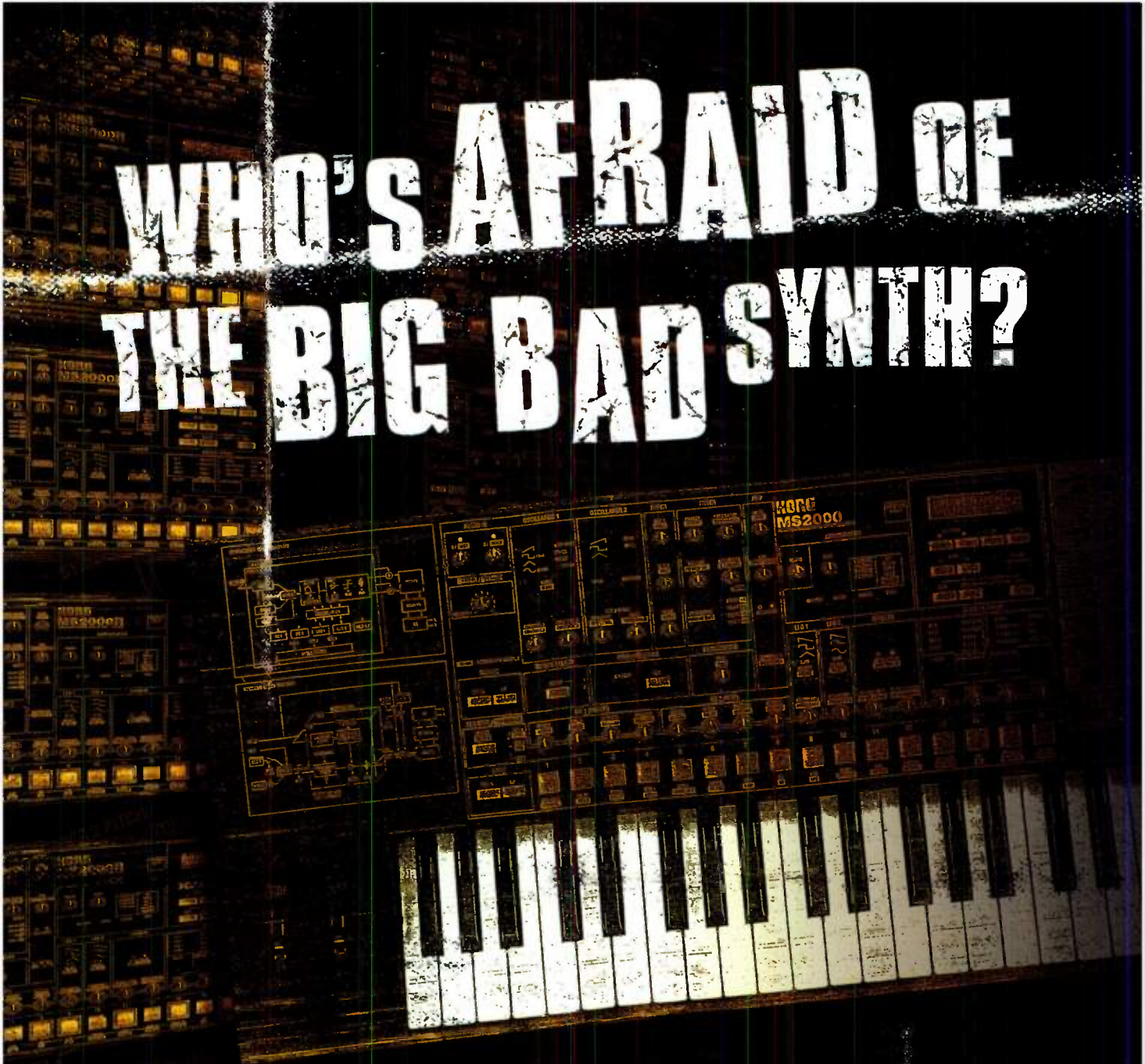


FIG. 3: *Retro*'s Program Editor's Main page is where oscillator, audio-rate modulation, and filter settings are made. The signal path can also be controlled from this page with the Speaker and Input buttons.

WHO'S AFRAID OF THE BIG BAD SYNTH?



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onscreen mixing. If so, you might not want to add the CPU overhead of running the Mixer module. To select programs by name, use the Keyboard module (set to the appropriate channel). You have the option of using it either to select the programs or display the names of programs selected through MIDI.

A PATCH FROM SCRATCH

Use the Editors to create and edit *Retro* and *Unity* programs. Because *Retro* and *Unity* come loaded with hundreds of factory sounds, you may choose never to open the Editors. In this section, I'll create a series of *Retro* programs, each illustrating some aspect of *Retro*'s operation. I'll use the factory default program as a starting point.

The *Retro* and *Unity* Program Editors are not identical. In addition to playing multisamples instead of waveforms, *Unity* has two oscillators instead of *Retro*'s three, and *Unity* has no Ring Modulator or Ext. (external) input. This section will cover the *Retro* Editor, but you can follow most steps in the *Unity* Editor by importing the factory multisample named Waveforms, which may be found in the *Unity* folder. To import a multisample, select Import Multisample from the File menu when the Editor's Multisamples tab is active.

The Editor consists of five pages—Configuration, Modulation, Main, Effects, and Global—which are selected using tabs along the top of the Editor window. Note that the *Unity* Editor has separate Tabs for editing samples, multisamples, and programs; it is the Programs area that applies. The Configuration page is an interactive, graphic signal-flow view of the patch. You can add and delete modules, but you cannot move the modules or their connecting cables. Modulation paths are not displayed. The remaining Editor pages display control panels for the parts of the program indicated by their tabs. Within those pages, you can adjust parameters for the oscillators, filters, envelopes, effects, and so forth. You can also control the signal flow from within each of those Editor pages using buttons that toggle the connections between components. It's not necessary to use the Configuration page to patch components together.

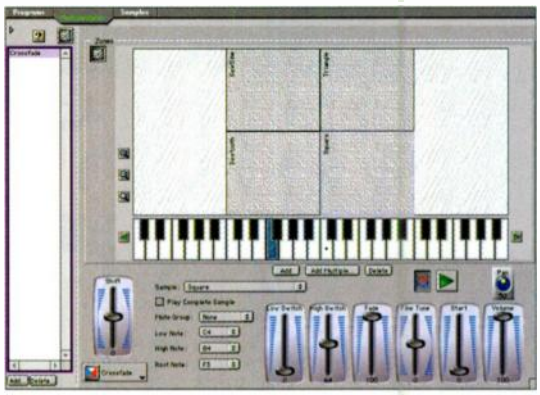

FIG. 6: Within *Unity*'s Multisamples page you can map samples across pitch and Velocity zones. Four zones are displayed here, each containing a waveform sample. The Crossfade menu provides crossfading between close zones for smoother transitions.

Scratch. *Retro*'s default program is a good place to begin building the first patch. **Fig. 2** shows the Configuration page of the default program. Depending on the preferences you have set, you may automatically get the default program when you launch the Editor. If not, select New from the File menu. You should also see a little onscreen keyboard in a floating window. If you don't, select Keyboard from the Windows menu. Click on a key on the keyboard to hear the sound of the program—a raw sawtooth wave. If you set up *Retro* correctly, you should also be able to play it from your MIDI keyboard. (If you use *Unity*, load the Waveforms multisample; then, go to the Main page and select the sawtooth waveform for Oscillator 1.)

Fig. 3 shows the Main page of *Retro*'s Program Editor. Three oscillators are on the left, and a ring modulator (*Retro* only) and two filters are on the right. Note that each component has a Speaker button in the upper-left corner. In *Retro*, Oscillator 1 and Filter 1 are yellow, which means they are enabled. The Configuration page shows only the enabled components, which is why you see only one oscillator. In *Unity*, only Oscillator 1 is turned on. This is a good opportunity to audition waveforms. Before you do that in *Retro*, however, turn off Filter 1 by clicking on its Speaker button. You'll notice that the Sym (symmetry) slider (*Retro* only) is active for some waveforms and inactive (indicated by a gray knob) for others. When it is active, move it around to hear its effect on the selected waveform. The Sym slider changes the selected waveform's symmetry. For example, when a pulse wave is selected, the Sym slider controls the pulse width.

Filter types. After auditioning waveforms, return to the sawtooth and activate Filter 1. Set up a basic filter envelope; then, audition the various filter types. Pull the Cutoff slider in the Filter 1 panel down almost to the bottom of its

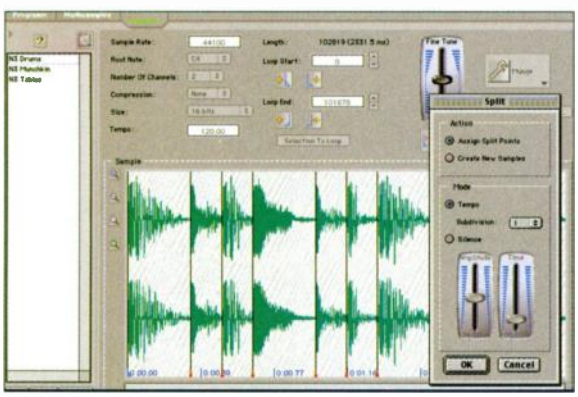

FIG. 5: *Unity*'s Sample page provides a number of DSP functions. The red-handled markers in the Sample window, added with the Split function, can be used to create samples or to mark key points for time stretching.

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range; next, click on the Modulation tab to go to the Modulation page (see Fig. 4). Notice in the Configuration page that Envelope 2 has already been set up for Filter 1's Cutoff, but the default settings are different from those shown in the Modulation page. At this point, change the settings by increasing the Amount to 100 and reducing the Sus Lvl and Sus Dcy to 0. Now play a note, and you should hear a gentle filter sweep. Next, select the other filter types and compare the results. Notice that the all-pass filter types have almost no effect and that the Comb filter has a pitch-bend–like effect.

All-pass filters are frequently found in reverb circuits. Without resonance, they don't attenuate or boost frequencies, but they do introduce a frequency-dependent delay, an effect known as *dispersion*. That effect is most pronounced when applied to percussive sounds, but it can also produce interesting phasing effects when mixed with the unfiltered sound or another all-pass filter. The Comb filter is really just a delay line with feedback; the envelope changes the delay length. Think of pitch-bending as a kind of Doppler effect. You can get a more usable sound

TAKING CONTROL

The *Retro* and *Unity* Control Panels are used to set up the Synthesis Engine (see Fig. A). The Configuration section controls how much computer memory and CPU power the Synthesis Engine can use. The top four settings control CPU usage. You can lower CPU demands by reducing the sampling rate (at the expense of sound quality) and by increasing the buffer length (at the expense of increased latency). *Unity*'s Memory setting controls how much RAM the program tries to seize for sample memory. Remember that the Synthesis Engine needs about 8 MB to run and that the Editor requires enough memory to load the samples for the Banks you are editing.

The Controllers section handles the routing of MIDI Control Change messages. The controllers assigned to A through D and to the Pedal are routed by the Editor's Modulation page—any of those controllers can be used as modulators. Furthermore, by checking the Use Controller Maps checkbox and clicking on the Edit button, you can assign MIDI controllers to a number of *Retro* and *Unity* parameters directly. Finally, you can control every *Retro* and *Unity* parameter with MIDI NRPN messages. There are two assignment schemes for that purpose: the original *Retro* or *Unity* format, which provides access to every parameter, and the GS/XG MIDI standard format, which gives access to a limited number of parameters but is fully implemented by numerous hardware and software manufacturers.

You can assign one of six Velocity curves for *Retro* and *Unity* in the Velocity section. That feature is used mainly to compensate for the Velocity characteristics of your MIDI controller. Start with the Linear setting; then, if you find that Velocity Sensitivity is too high, try one of the Concave Down settings. Alternatively, if you're not getting enough Velocity response, try the Concave Up settings.

Retro and *Unity* have two Global effects buses, and you can control them in two ways. One way to do so is with the Mixer; choose Fixed from the Global Effects Type menu for that option. The other way uses the settings of the program on a MIDI channel; choose Channel from the Global Effects Type menu and select the desired channel number. If you use the MIDI Channel method, you can set up a bank of programs exclusively for assigning and controlling effects. (The Use From Editor checkbox at the bottom of the Control Panel determines whether the Editor controls the Global effects. You'll almost certainly want to leave it checked.)

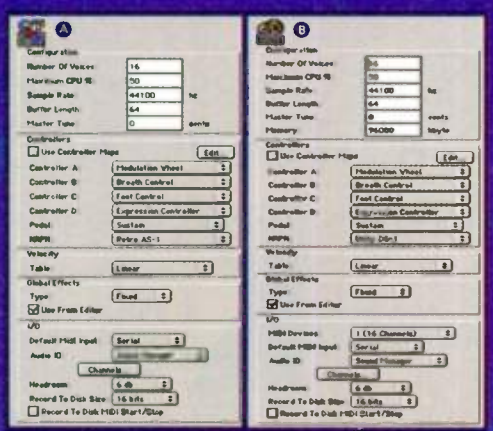
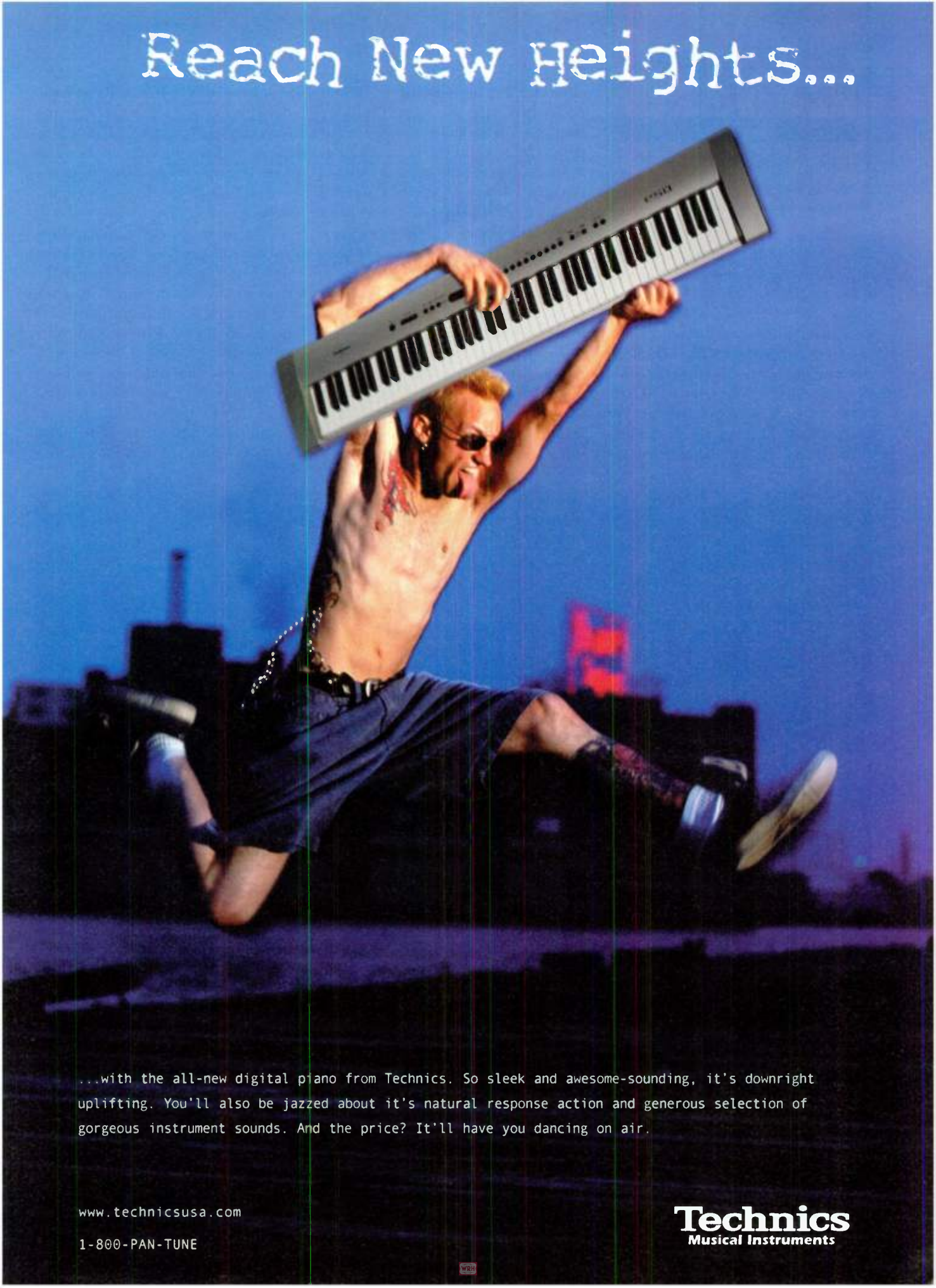


FIG. A: *Retro*'s Control Panel (a) gives you control of the Synthesis Engine, which runs in the background. You can configure CPU usage, MIDI Control Change routings, Global effects control, and MIDI and audio I/O from the menu. *Unity*'s Control Panel (b) is similar to *Retro*'s but has a setting for sampler memory. When using *Unity*'s Editor, additional RAM must be allocated for the samples used by the program being edited.

The I/O section at the bottom of the Control Panel controls MIDI and audio input and output. Settings are straightforward—set them to match your MIDI and audio system. The Headroom setting controls how much headroom is allowed for each voice. If you set it to 0, you get maximum levels, but playing two or three voices simultaneously can cause clipping. A value of 6 dB provides adequate levels without much danger of clipping. The Record to Disk Size options are 8, 16, and 24 bits. If your system supports it, you can use 24 bits for the highest quality (the 24-bit option requires the most CPU power and disk space). At the other extreme, the 8-bit option is a resource saver that may be adequate in some situations.

Reach New Heights...



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from it by reducing the envelope Amount to 1 or 2 and using low Cutoff settings.

Next, we'll add an oscillator and employ it in various ways. First, choose the 4-Pole LP Resonant filter (with the Amount at 100) to get a typical synth-like filter sweep. Then, turn on Oscillator 2 by clicking on its Speaker button and choosing the Sine waveform. While playing a note, move Oscillator 2's Coarse-tuning knob and notice that it has no effect. That's because Oscillator 2 is not in the signal path, which a quick look at the Configuration page will confirm. Under Filter 1's speaker is a box named Input. Click on the Osc 2 button to connect Oscillator 2 to the Filter. Now when you play a note, you will hear both oscillators.

Modulation effects. Some of the more interesting sounds come from using oscillators as modulators. *Retro* provides a number of opportunities to do that. From Oscillator 2's Sync menu, select Oscillator 1. That causes a hard sync of Oscillator 2 to Oscillator 1, meaning that Oscillator 2's waveform will start over whenever Oscillator 1's does. In other words, Oscillator 2 will adopt Oscillator 1's frequency, and changing Oscillator 2's Coarse or Fine tuning will simply change its waveform. Hearing is believing, so play a note and move Oscillator 2's tuning sliders.

Notice on the Modulation page that LFO 1 modulates Pitch. Select LFO 1 to Pitch in the upper window, change the Destination to Oscillator 2 Frequency, and increase the Amount and LFO Speed a bit. If your keyboard controller has a modulation control (for example, a wheel, slider, or knob), you can use it to control the sync modulation you just set up. If you don't have that type of controller handy, simply select and delete the Controller A modulation

SIDE EFFECTS

Retro and *Unity* have four effects buses: two for Insert effects and two for Global effects. The Global effects (Delay, Reflection, and Reverb) apply to the programs on all MIDI channels, but each channel can have its own send amount (for example, you don't need to apply the Global effects to all channels). Each program can have a separate Insert effect. Keep in mind when assigning effects for a particular *Retro* or *Unity* program that they are always in a series, starting with the first Insert effect and ending with the second Global effect. Insert effects can differ from program to program, and in that sense, they can run in parallel. However, for a specific program, the order of effects, both Insert and Global, is always as described.

FIG. B: *Retro* and *Unity* offer two Insert effects per voice and two Global effects. The pop-up menu on the left shows the 12 Insert effects. Global effects include a 2-tap Delay, Diffusion, and Reverb.

Retro and *Unity* have the same collection of Insert effects. Compression, Parametric EQ, and Shelf EQ are standard. The Chorus, Flange, and Phaser all have the same controls with identical ranges, except for Phaser Feedback, which is not bipolar. That makes it easy to audition the differences among those often confused effects. Try each effect separately with the settings shown in Fig. B. When you select a new effect from the menu, it always reverts to its default settings. The best way to do an A/B comparison of two effects is to put one in each insert slot and use their Speaker buttons to toggle between them. For a totally out-of-control chorus effect, try two Multi Tap Chorus inserts; that gives you four feedback-chorus effects in series.

The Pitch Shifter mixes a pitch-shifted version of the original signal with itself to produce intervals adjustable in semitones and cents. For interesting chordal effects, try it with a program that has its oscillators tuned to an interval such as a fifth, or try two Pitch Shifters in series. Pitch shifting can also be interesting when applied to speech.

Both the Insert and Global Delay effects are 2-tap delays with feedback. Each tap position (for example, delay time) can be set in milliseconds or note divisions (when MIDI Sync is active). Interesting rhythmic effects result from setting the delay times as multiples of each other (for example, as a 3:1 ratio). The Global Delay's lowpass filter affects only the delayed signal.

The final three Insert effects, Overdrive (tube-amp simulation), Distortion (analog-amp crossover distortion), and Degrade (bit-reduction and downsampling) add grunge to the signal. They are most commonly associated with guitar sounds but can add variety to any sound. Try extreme settings with percussion sounds, for example.

The Diffusion and Reverb Global effects typically work with Diffusion (which simulates early reflections) coming first in the signal path. Extreme Diffusion Length with Reverse or Random reflections produces interesting effects when applied to percussive sounds.

routing. Otherwise, the modulation amount will be zero, and you will hear no effect.

Oscillator 2 also makes a good FM source. Return Oscillator 2's Sync setting to none, take it out of the signal path by clicking it off in Filter 1's Input section, and set its Volume to 10. Select Oscillator 2 from Oscillator 1's FM menu and change Oscillator 1's waveform to Sine. Next, on the Modulation page, change the Envelope 2 routing from Filter 1 Cutoff to Oscillator 2 Volume. Experiment with the Envelope controls to hear how they affect the amount of FM. Notice that Oscillator 2's tuning has a significant effect on the sound. Finally, try other waveforms for both oscillators.

Go a step further (*Retro* only) by adding ring modulation to the program using Oscillator 3. Turn on Oscillator 3 and the Ring Modulator by pressing their Speaker buttons; then, set Oscillator 3's waveform to Sine and its Volume to 100. Select Ring for Filter 1's input. In the Ring Modulator, turn the Oscillator 1 and Oscillator 3 buttons on and make sure that the other buttons are off. Now change Oscillator 3's tuning while playing some notes. Notice that in many cases the results are clangorous—a characteristic of ring modulation.

As a final example, listen to the effect of dual all-pass filtering. Turn Filter 2 on and set its input to Ring. Set both filter types to 4-Pole AP Resonant using different cutoff frequencies at about 2,000 Hz. Move one of the filter Cutoff sliders or set up an LFO to modulate the Cutoff. You'll notice the filters' frequency-dependent delay, which produces an effect similar to flanging.

Although this is by no means a complete course in *Retro* programming, it should give you a good taste for what you can do and how quickly you can do it. For an even quicker approach to finding sounds, select Randomize from *Retro*'s Edit menu.

The effects are the most important thing yet to be covered (see the sidebar "Side Effects"). Each program can have two Insert effects and two Global effects that affect all *Retro* or *Unity* channels. Those make for a good bit of additional sound manipulation.

ON SAMPLE DUTY

Unity's limitations in Main-page programming (having only two oscillators and no ring modulator or Ext. input) are outweighed by its ability to play samples, which gives you an unlimited number of sounds to begin with. Like all samplers, *Unity*'s oscillators play multisamples—collections of samples mapped across pitch and Velocity zones. *Unity*'s Multisample and Sample editors should be familiar to anyone with a little sampler experience. In this section, I'll concentrate on *Unity*'s more unusual features.

Welcome to the PROSAMPLES series, a combined effort from three of the World's most critically acclaimed Soundware developers, BEST SERVICE, EASTWEST, and ZERO-G, to bring you a series of high quality sample libraries, in six different formats in one package, to ensure that each PROSAMPLES volume is compatible with all of your sampling software and hardware - all for the unbelievable price of $49.95 for each volume! So why is this series so special? As many of you know, BEST SERVICE, EASTWEST, and ZERO-G have collectively dominated the Soundware industry for more than a decade. The PROSAMPLES series includes material from sample libraries that have already received over thirty international awards! During this time BEST SERVICE, EASTWEST, and ZERO-G have received more Keyboard KEY BUY AWARDS, Sound On Sound FIVE STAR AWARDS, Future Music PLATINUM AWARDS, and the highest ratings from Electronic Musician and other leading international magazines, than any other Soundware developer. The color coding above each title indicates which awards the titles, from which the ProSamples version was made, received (the review quotes also come from these titles). Each PROSAMPLES volume (with the exception of the multi-sampled instruments, which do not include ACID) includes the following formats: AUDIO, ACID, AIFF/MAC, AKAI S1000, EXS24 and WAV/PC for $49.95!

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from Fields of Motion
A stunningly innovative sound library from Zero-G which utilises raw and organic sources to create rhythms and soundscapes for those looking for a creative edge. "A truly unique product providing an excellent fusion of dance and industrial styles." FIVE STAR AWARD" (SOS, UK)

VOL 10

House
from Total House
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Classic Orchestra
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Peter Siedlaczek's Classic Orchestra features some of the most useful samples from the worlds best selling Orchestra library, Advanced Orchestra. "The competition is going to have to work very hard to beat this one, because there isn't anything that even comes close." FIVE STAR AWARD (SOS, UK)

VOL 12

Dance Vocals
from Voice Spectral 2
This massive collection of quality vocal samples from Best Service brings you a vast array of vocal hooks, vocal percussion, shouts, atmospheric intro and break vocal lines. The collection is a superb vocal resource for dance, film/multimedia and commercials, produced by professional performers.

VOL 13

Choirs from Classical Choir and Hallelujah
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VOL 14

World Grooves
from Fiesta Latina
This version of the Fiesta Latina library from Best Service includes salsa, samba, merengue and mambo. Loops come in one or two bars, at different pitches, 120 bpm. There is also a superb collection of traditional pop latin pianos and bass loops. This is a MUST for Latin producers.

VOL 15

Dance Drums from Dance Mega Drums 2
"The sound quality throughout this release is very good and most of the sounds are presented well, with just the right amounts of compression and other processing" (SOS, UK). "We've never seen quite so many drums all in one place before. A worthwhile investment." PLATINUM AWARD (FM, UK)

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VOL 16

Guitar & Bass
from GL Guitar & Bass

"Quantum Leap delivers the guitar-and-bass-goods. You can't beat the selection, the sound quality is first rate, the performances are inspirational, and the programming shines. 9/10" (Keyboard, USA). It is truly possible to emulate a real guitar player on a keyboard using these multi-samples.

VOL 17

Guitar Licks
from Skunkworks

Legendary Steely Dan and Doobie Brothers guitarist Jeff "Skunk" Baxter is widely regarded as one of the greatest guitarists of all time. Rarely do you get the opportunity to create music with such a talented artist. Jeff's 'Guitar Licks' features acoustic to heavy metal, and everything in between!

VOL 18

Steinway Grand Piano
from Ultimate Piano

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Pop Brass from
Quantum Leap Brass

A selection of Pop Brass from the most critically acclaimed brass collection ever. "Quantum Leap Brass sounds great, & raises the standard of professional sampling. That, combined with the overall quality, justifies the KEY BUY AWARD." (Keyboard, USA) FIVE STAR AWARD (SOS)

VOL 20

Orchestral Brass from
Quantum Leap Brass

A selection of Orchestral Brass from the critically acclaimed Quantum Leap Brass. "An impressive & versatile brass library. Just the thing for anyone who wants to put some polish on his brass! FIVE STAR AWARD" (Sound on Sound, UK); winner KEY BUY AWARD (Keyboard, USA)

VOL 21

Drum & Bass 2
from Total Drum & Bass

"Total Drum & Bass is a near-perfect example of what dance sample libraries could and should be, combining thought, attention to detail and consistent levels of quality and musicianship. I can't think of another product that comes anywhere close" FIVE STAR AWARD (Sound On Sound)

VOL 22

Hip Hop
from N.Y. Cutz

Zero-G bring you a raw slice of Hip Hop from New York City. "N.Y. Cutz is a winner. With this CD, some creativity, and a little patience and care, you're guaranteed to come up with some great tracks - and that's why we gave N.Y. Cutz our coveted KEY BUY AWARD. It's got the goods." Rating 9/10 (Keyboard, USA)

VOL 23

Trip Hop
from Twisted City

"Delicious tonality, excellent transparent engineering, and fresh playing with 'feel' stamped right through it - spine tinglingly brilliant. FIVE STAR AWARD" (SOS, UK). "A superbly appointed CD. PLATINUM AWARD" (Future Music). "Outstanding variety and value for money. 9/10" (Keyboard).

VOL 24

Breakbeat
from Planet of the Breaks

A new generation of 'Raw-funkin-dirtyass-boogie-beats' from Zero-G. "This CD is at the top of its class." (Keyboard, USA) KEY BUY AWARD. "Pure inspiration - it sounds great & samples like a dream." FIVE STAR AWARD (SOS). "An absolute essential. 91%" PLATINUM AWARD (Future Music, UK)

VOL 25

Pop & Funk Brass
from Phantom Horns

Zero-G's world-class horn library features the dynamic sounds of the UK's most respected horn section - The Phantom Horns (John Thirkell and Gary Barnacle). "Tremendous value - the sheer number and variety of usable riffs and phrases is fantastic." FIVE STAR AWARD (Sound on Sound)

VOL 26

Nu RnB & Hip Hop
from Da Nu RnB Hip Hop

Twistin' construction kits, supablastin' beats, for all ya people out dere who dig da flava of Missy & Busta! "Indispensable for anyone involved in Hip hop." (PC & Sound). "Hard, slamming R&B with nice phat beats, synth bass, piano, guitars, vocals, and various assorted samples. (The Knowledge)

VOL 27

Dancefloor Bass
from XX-Large Bass

This very comprehensive bass sample compilation from Best Service contains bass notes, single bass hits, multi-sampled basses and quick licks. It includes analog synth bass sounds and real, electric basses, acoustic basses, bass licks and slap bass samples - a bass for every occasion!

VOL 28

Vocal House
from Houseworx

Future Music (UK) named Houseworx! it's "Sample CD of the Year 2000" and awarded it a PLATINUM AWARD. Powered by Mousse T, this amazing collection from Best Service will really get your creative juices flowing. "Houseworx is an invaluable resource for the vocals alone." FIVE STARS (SOS)

VOL 29

Dance Drumloops
from XXL Drumloops

Loopaholics take note - this could be your basic tool! Styles include hip hop, rap, hardcore, house, techno; and all loops are in stereo. Dance Drumloops includes happening and hypnotic loops, tuned and carefully sorted. "There's tons of excellent material here for the money." (Keyboard, USA)

VOL 30

World Instruments
from Ethno World

Hear the squeaking and scraping of strings, the breathing of woodwind instruments and the decay of every single note or sound. This version of Ethno World includes: stringed instruments; bell and metal type instruments; woodwinds; and global percussion instruments.

Sample slicing and stretching. You've most likely noticed the oscillators' Speed sliders on the *Unity* Editor's Main page. When you turn on Oscillator Stretching by clicking on the Oscillator Stretching button (the one with the clock icon), the Speed slider adjusts the rate at which slices are triggered within a sample. If you know Propellerhead's *ReCycle* or how to use Rex files, the process will be familiar. The first step in using slices is to create them by setting split points within the sample. You might place those so as to divide the sample evenly (say, into eighth notes) or to separate distinct sound events such as drum hits. Oscillator Stretching changes the rate at which those slices are triggered. (Think of it as slice-sequencing.) The key is that the playback speed of the slices is unchanged—Oscillator Strecching avoids all pitch or time modification of the sample data.

For an example of stretching in action, load the *Unity* factory Bank named OSC Stretch 1.uds. (You'll find it in the OSC Stretch Examples subfolder of the 07 Loops_Riffs & FX folder in the Unity DS-1 Banks folder.) On the Program Editor's Main page, you'll see that Oscillator 1 has Oscillator Stretching turned on, which makes the Speed slider active. The multisample Time Warp has three samples triggered, in turn, by the MIDI notes C3, D3, and E3. Play any of those notes while adjusting the Speed slider to hear the effect.

Notice that as you slow things down to about –25, gaps between the slices are beginning to become audible, and at higher than +50, the individual slices begin to sound clipped or truncated. In most cases, speeds between –25 and +50 work best. When you work with samples such as the word slices triggered by E3 in the previous multisample, in which the sounds are spread far enough apart, extreme settings work fine and often produce interesting effects.

Stretching for effect. Speed changes are typically used to change the tempo of beat loops, but you can also use them to create some unique sounds. As an example, turn on Oscillator 2 on the Main page and set its controls (including the buttons on the left) exactly like those of Oscillator 1. Next, set one oscillator's Speed slider to 100 and the other's to 97. Now play and hold E3 and listen to the speech clips slowly move out of phase.

You can produce a similar effect with the Fine slider, but that changes the pitch of the samples. Set Oscillator 2's Fine slider to 10 with both Speed sliders set to 0; then, play the kick-drum sample on C3. You'll get both phasing and increasing flams as the samples loop because Oscillator 2 plays the sample faster, making it loop more quickly. Now change Oscillator 2's Speed slider to –1. That compensates for the shortening of the sample by spreading the slices slightly apart. The result is phasing without flams.

Slicing your own. *Unity*'s Sample page provides you with the means for making slices and offers some help in doing so. **Fig. 5** shows the Sample page and Split window. The markers in the Sample window mark the slice points *Unity* uses for Oscillator Time Stretching. You can insert and move those markers manually, but the Split function on the Munge menu gives you a head start. You can generate markers in two ways: by tempo and by amplitude threshold. If Tempo is selected, equally spaced markers are inserted according to the Tempo setting in the Sample Editor window and the Subdivision setting in the Split window. If Silence is selected, markers are placed wherever *Unity* finds a segment that is below the amplitude threshold for the amount of time specified by the Time setting. Tempo is a good choice for rhythmic material such as a kick-drum sample. For irregular material such as speech clips, Silence is usually the best choice. You can add, delete, and move the markers by hand as needed.

Cross and double cross. Most samplers offer Velocity crossfading; *Unity* offers crossfading between Velocity and pitch zones. In the Multisamples editor, select the number of zones to use (2, 3, or 4) from the Crossfade menu. *Unity* then decides which zones to mix for each note (see **Fig. 6**). That can be a bit tricky because several factors are at work: the oscillator's Switch setting, the Multisample Crossfade setting, and each sample's Fade setting. Here's an experiment that will give you a feel for how it works.

Create a new *Unity* Bank by selecting New from *Unity*'s File menu. Go to the Samples page, click on the Add button below the sample list, and name the sample "Sine." That gives you a short empty sample. Select Synthesize from the Munge menu; then, click the Sine button to fill the empty sample with a sine wave. Click twice on the Nudge Right button in the Loop End section so that the loop includes two cycles. Select Truncate after Loop End from the Munge menu. You've now seen how to create waveforms. You can use copy, paste, and the Mix operation from the Munge menu to produce an endless variety of new waveforms.

Because you need several samples to crossfade, select the sample Sine in the sample list, copy it, click on an empty section of the sample list (to deselect everything), and paste three times. You now have four samples, all named Sine. Select the three new samples, use the Munge menu to synthesize a different waveform for each one, and rename them accordingly using the Edit menu.

Go to the Multisamples page and click on the Add button under the Multisample list to create an empty multisample. Select that multisample in the Multisample list, click on the Add Multiple button below the Zones area, and add the four samples to the multisample. Position them so that there are two pitch zones, each with two Velocity zones. Finally, go to the

Programs Main page and select that multisample for Oscillator 1.

Play notes across the two pitch zones with different Velocities to hear the hard switching between waveforms. On the Multisample page, set Crossfade to 2 and set each zone's Fade slider to 50. If you play the same notes again, you will hear that farther away from the pitch-transition point you get Velocity crossfading, whereas close to the pitch-transition point you get pitch-zone crossfading. Repeat the experiment with Crossfade settings of 3 and 4 as well as with different Fade slider settings. If you can't hear what is crossfading to what, assign a different Root Note to each of the four samples, and it will become abundantly clear.

QUICK TIPS AND TRICKS

Following are some additional things to explore in *Retro* and *Unity:*

1. In *Unity,* explore the various options provided in the Sample page's Munge menu. You can do quite a bit of basic sample editing right there, without launching a standalone sample editor.

2. In the *Retro* and *Unity* Program Editors, don't limit yourself to the standard signal paths. Try different filter types with the filters and use them in series and parallel. For example, using comb filters in series or all-pass filters in parallel can add a lot of motion to a sound.

3. Don't forget that any oscillator or filter can be a frequency or filter-cutoff modulation source. In *Retro,* that also applies to oscillator sync and ring modulation. Applying envelope or LFO modulation to one of those audio-modulation sources adds another twist.

4. Explore the Modulator pages. You can have as many as 24 routings per voice, and almost anything can be a destination. Don't forget that incoming MIDI can also be assigned as a modulation source. That includes MIDI Pitch Bend, Velocity, Aftertouch, and MIDI Controller messages.

5. Don't neglect the Insert and Global effects. Consider setting aside a MIDI channel just for the control of Global effects. That will allow you to select Global effects configurations by MIDI Program Change.

Retro and *Unity* offer a great deal of programming flexibility. Spend a little time exploring the less-familiar aspects of the Editor pages, and you'll certainly find an array of unique features. A little imagination and the willingness to stray from the beaten path will greatly increase your sound palette.

Len Sasso *writes about various aspects of software synthesis and sequencing. He can be reached through his Web site, www.swiftkick.com.*

We welcome your feedback. E-mail us at emeditorial@intertec.com.

Sackbuts and

Hugh Le Caine's pioneering work changed the face of electronic music.

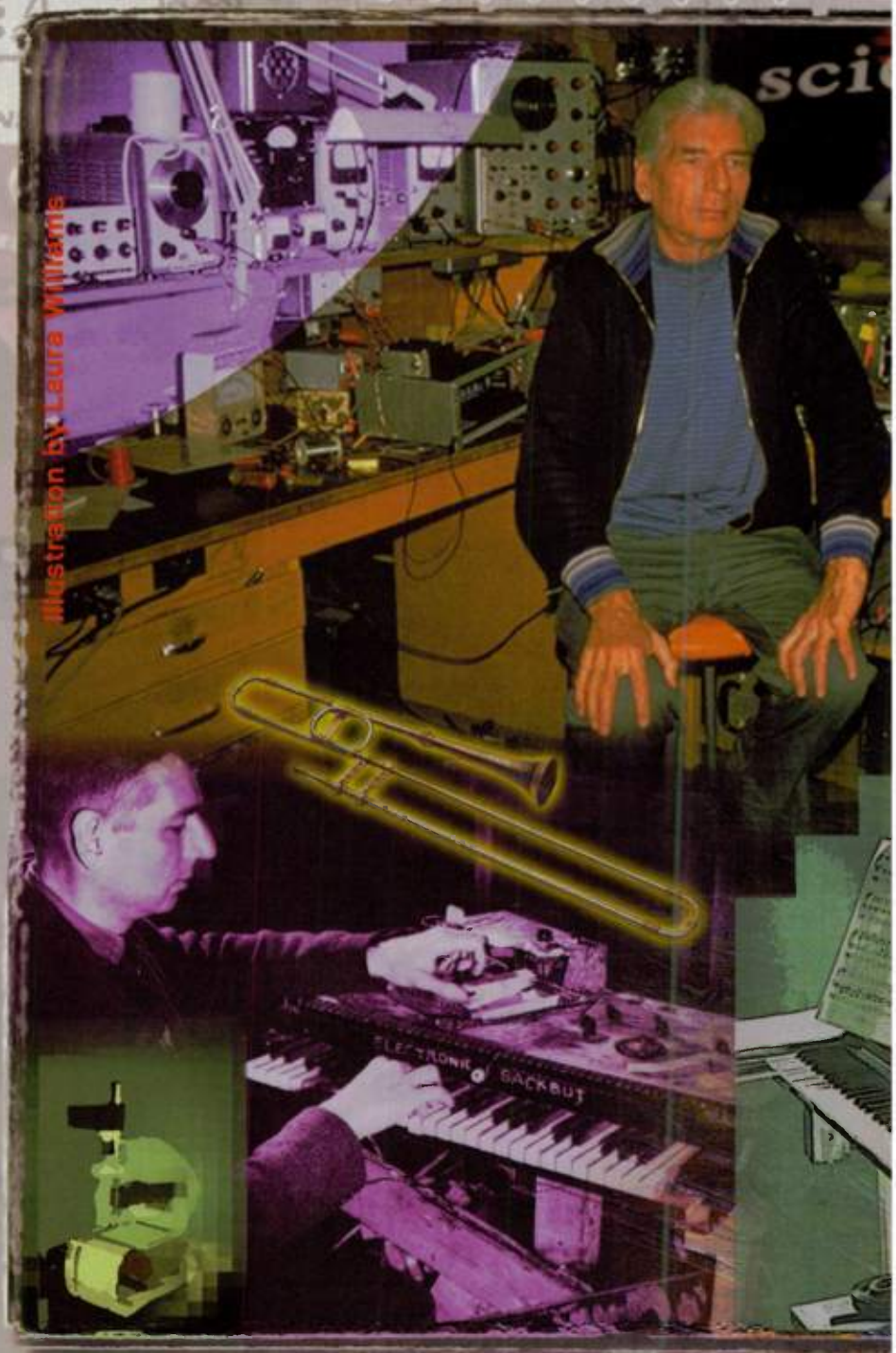
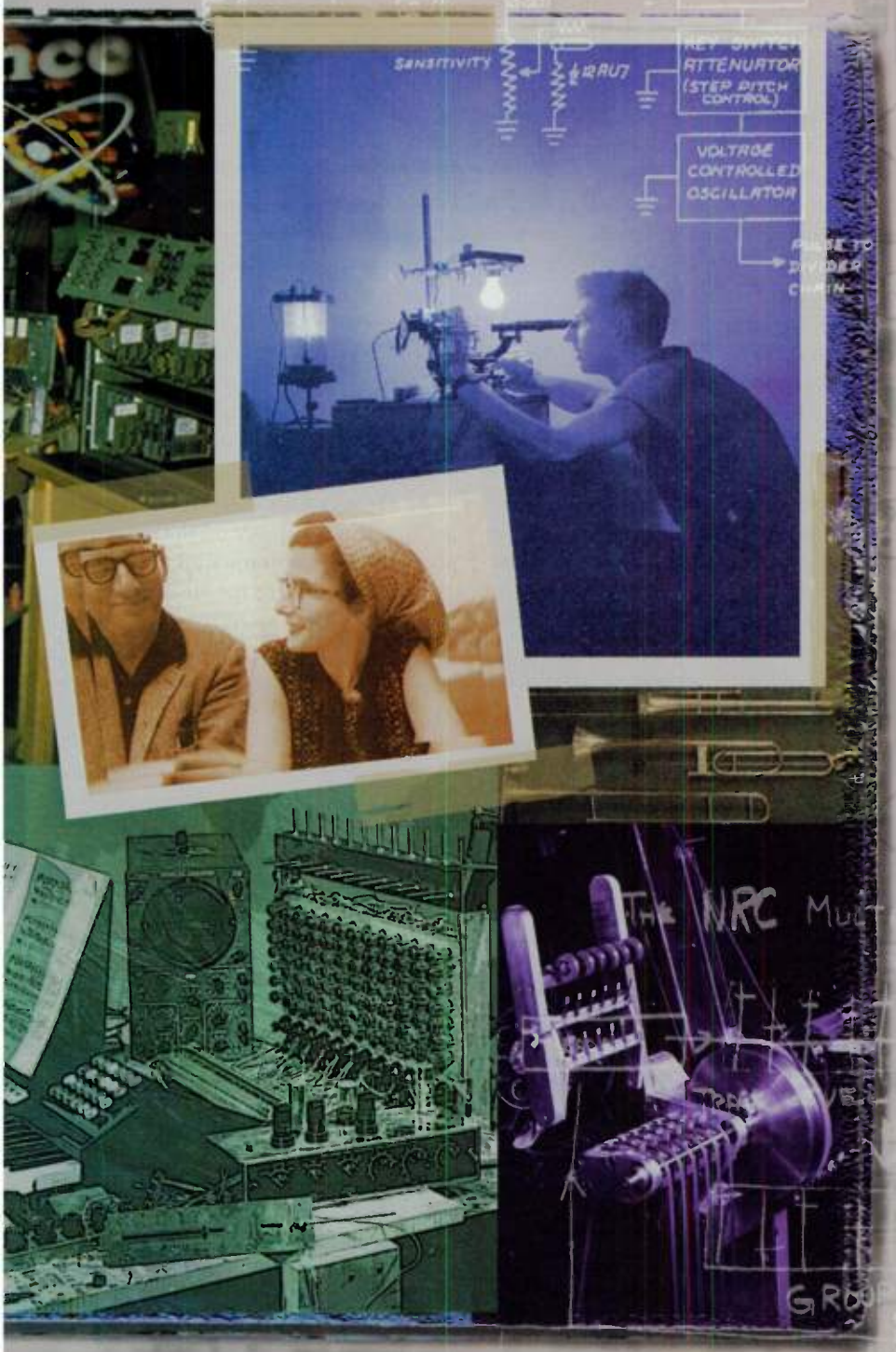


Illustration by Laura Williams

In the history of electronic music, Canadian physicist Hugh Le Caine (1914–77) stands out as an important and somewhat enigmatic figure. A pioneer in radar technology during World War II, and later in microwave transmission and atomic physics, Le Caine used his scientific knowledge to create tools that would give musicians and composers remarkable control over sound production.

His instruments, which included multitrack tape machines and touch-sensitive keyboards, explored important concepts such as voltage control years before that technology entered mainstream electronic music. Le Caine's inventions eventually populated many early electronic-music studios developed in the '50s and '60s. However, none of his inventions went into commercial production, and until

Spectrograms



By Gayle Young

recently, little was known about the inventor, who shunned the limelight to concentrate on research and development.

Le Caine began building musical instruments and experimenting with electronic devices in his youth. He imagined that beautiful sounds could be realized through new electronic inventions. Although he played his instruments, he didn't consider himself to be a musician or composer. Consequently, he left few recorded examples of his work. His 1955 composition *Dripsody* is a tape-music masterpiece and his best known work. His other recordings, compiled on the CD *Hugh Le Caine: Compositions, Demonstrations 1946–1974,* include additional compositions as well as instrument demonstrations and private recordings made on an acetate disc recorder.

Sackbuts and Spectrograms

Le Caine earned his master of science in engineering physics in 1939 from Queen's University in Kingston, Ontario, and joined the National Research Council of Canada (NRC) in Ottawa. He was an ace problem solver who could correct any faulty circuit.

Le Caine began designing electronic musical instruments in his home studio. In 1954, on the strength of his public lectures and demonstrations, he was permitted to work full-time developing new instruments. He created 22 instruments during the next 20 years, and his NRC lab equipped, almost single-handedly, the electronic-music studios at the University of Toronto (opened in 1959) and McGill University in Montreal (opened in 1964).

FREE REEDS AND BEYOND

In the late '40s, Le Caine used voltage-control techniques to vary a sound's harmonic spectrum independently of frequency and intensity. Although the voltage-controlled oscillator (VCO) was already a well-known device, the use of continuously variable voltages to model sound waves was a new approach that anticipated the use of voltage control in analog synthesizers of the '60s.

As early as the summer of 1937, while he was still a student, Le Caine linked his work in atomic physics to his ideas about electronic music: his Free Reed Organ used circuits that were known only to those involved in radio and scientific research. He and his colleagues used those circuits daily, but not within the audio range. It was Le Caine's inspiration to transpose them into the realm of sound and explore the musical characteristics of waveshapes that led to the instrument's development.

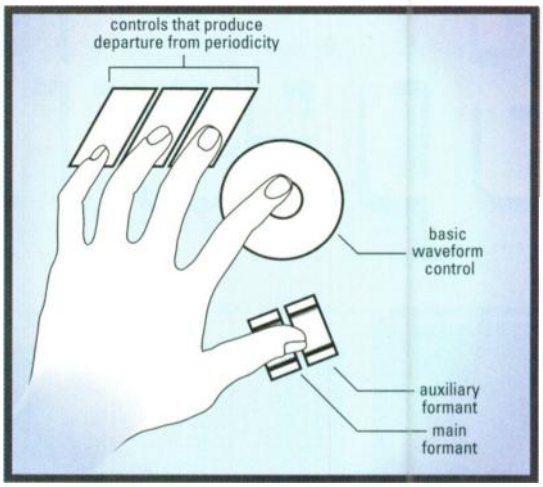


FIG. 2: This diagram from 1956 shows that the Sackbut's six timbre controls were operated by the performer's left hand. All but the waveform control were pressure sensitive.

The Free Reed Organ consisted of a second-hand organ with two ranks of reeds that were blown constantly at low pressure by a vacuum cleaner. The resulting vibrations were picked up electrostatically, because the keys applied a voltage to the vibrating reeds so that they acted as variable condensers. Le Caine also designed a variable attack for the instrument, which anticipated his later touch-sensitive keyboards. Le Caine considered the Free Reed Organ to be his first successful instrument. It was still played ten years later, though no known recordings of it exist.

Le Caine built the instrument partly to test the accuracy of the reed frequencies' electrostatic translation, and he found that the method provided good frequency stability. The design had immediate lab applications. Atomic physics is highly dependent on electronics, and that summer, Le Caine designed an innovative and highly accurate device for measuring tiny electrical charges, the first vibrating reed electrometer. The device worked on the same principle as the condenser microphone, which translates physical movement into an electrical current.

Physical proximity is the basis of that technology, which remained characteristic of Le Caine's designs for many years. One adaptation employed film, graded gradually from light to dark, to control current transfer as the film moved back and forth in front of light sensors. Le Caine preferred to use real-time physical controllers whenever possible, and many of his innovations anticipated today's live-performance interfaces.

COURTESY NATIONAL RESEARCH COUNCIL OF CANADA

FIG. 1: When Hugh Le Caine played the 1948 prototype of the electronic Sackbut, his right hand controlled the touch-sensitive keyboard while his left hand controlled timbre.

SACKBUT COMES ALIVE

Le Caine thought about a monophonic electronic performance instrument for

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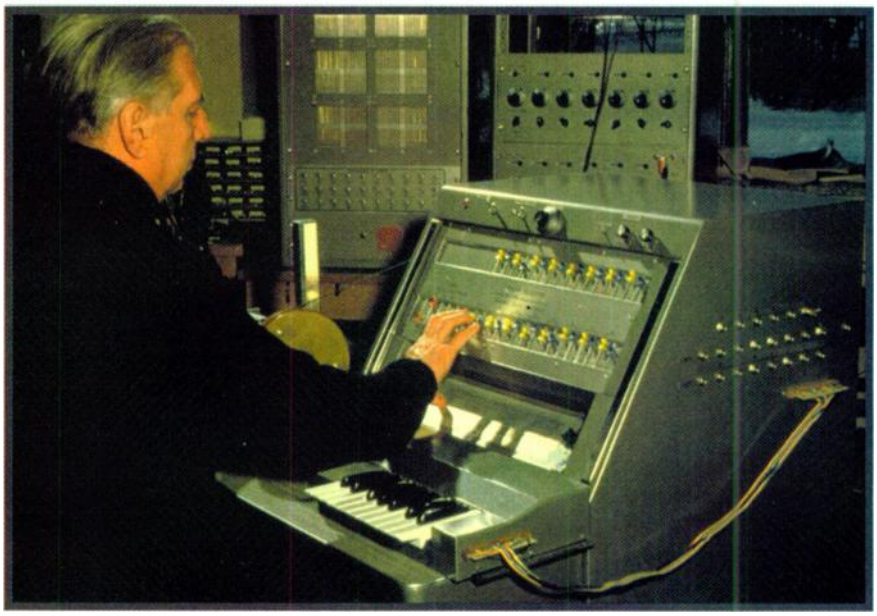

COURTESY NATIONAL RESEARCH COUNCIL OF CANADA

FIG. 4: Hugh Le Caine adjusts his Multi-track Tape Recorder (1967).

some time before he began work on the Sackbut (see **Fig. 1**). "The monophonic instrument is . . . the starting point of all musical thinking, and the polyphonic instrument is simply an expedient," he said. For Le Caine, polyphonic instruments possessed little inherent musical value; they were merely more efficient, enabling one person to play the parts of several monophonic instruments.

He was not interested in redefining music but rather in providing an improved instrument for playing pop standards and classical music. Le Caine believed that musicians needed more control of pitch, volume, and tone quality to avoid the mechanical sound so familiar in electronic organs. He speculated that in spite of the electronic technology's flexibility, instrument designers tended to take control from the player to make their instruments easier to play. But he believed that such instruments merely became easier to play poorly, and that with an inadequate range of musical devices, it became more difficult to play music that would hold a listener's interest.

Le Caine addressed the limitations of conventional keyboards by giving Sackbut performers simultaneous control of pitch, volume, and timbre. At the keyboard, the right hand controlled pitch and volume; the left hand controlled the timbral elements—basic waveform, main formant, and auxiliary formant—using continuously variable voltages (see **Fig. 2**). Timbral vibrato, in which the waveform alternates between two settings, was possible with the waveform controller (see **Fig. 3**).

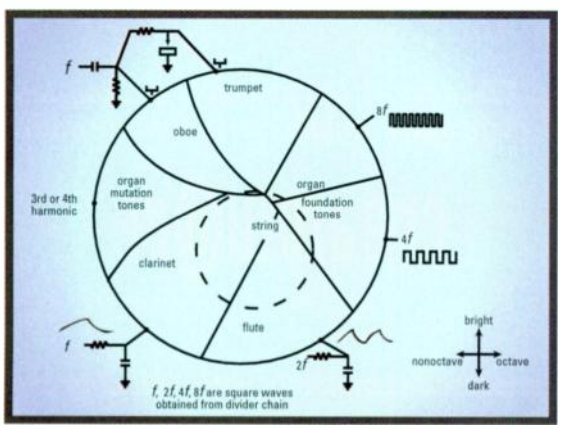

FIG. 3: This diagram shows the Sackbut's waveform control. The circular plate's conductive sections, marked by solid lines, were insulated from each other. A conducting disc (relative size shown by the dotted line) was capacitively coupled to sections of the larger disc it overlapped. The movable pad was controlled by the performer's left index finger, which set the pad's position within the larger circle.

The Sackbut's expanded pitch and volume control depended on Le Caine–designed force-sensitive capacitors, which responded to the physical movement of the keys. The keyboard was mounted on springs so that each key could be moved vertically and horizontally by the performer. Moving a key sideways varied the current to the pitch controller. Similarly, vertical pressure was translated into volume adjustments.

The timbre controls of the Sackbut were crucial in establishing the instrument's musical sound. Le Caine understood that timbre changes constantly in acoustic instruments and that that characteristic cannot be replicated by an organ stop or other switching system. His initial experiments supported his speculation that continuous, detailed control of the waveform was essential in a musical instrument. Unlike pitch and volume, timbre is multidimensional; no matter how complex the pitch and volume controls might be, timbral variability was needed to produce a musically useful sound.

The electrostatic coupling device operated nearly all the Sackbut controls as it did in the Free Reed Organ's keyboard in 1937. In both instruments, a simple connection was made between two electrodes: the current transferred between them increased as they were brought closer together. That was the basis of the Sackbut's advanced timbre controls and its touch-sensitive keyboard, and it was a central feature in many of Le Caine's later models.

SCIENCE MEETS MUSIC

With the Sackbut, Le Caine succeeded in demonstrating the musical possibilities of both touch-sensitive keys and continuous timbre controls. But he also

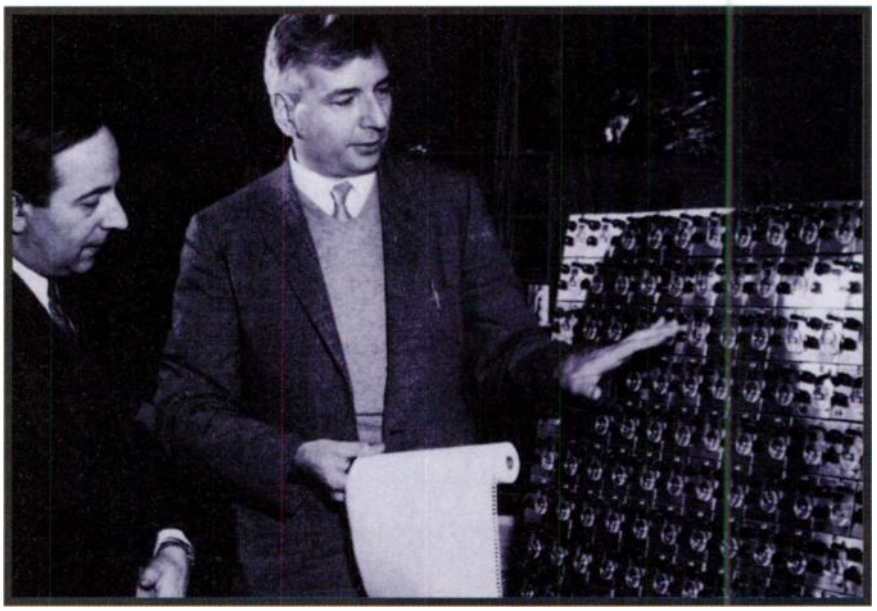

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FIG. 6: Hugh Le Caine displays his bank of 108 oscillators (1959). The graph paper in Le Caine's hand was used in the Spectrogram to control the oscillators.

forged a link between music's subjective, expressive, and intuitive aspects and its physical basis in acoustics and electronics. His research integrated the arts with science and technology.

Le Caine's experiments revealed that people with little formal musical education played the Sackbut best. He concluded that that was because few musicians had a detailed awareness of sound's acoustical properties. "No one of any musical pretension, at least no practicing musician, ever paid any attention to the 'physics of music,'" Le Caine said.

Few scientists had imagined that waveform generators, amplifiers, and frequency controllers could produce interesting musical sounds. To them, the worlds of science and music were separate. By bringing those worlds together in the Sackbut, Le Caine was leading anyone who played the instrument into unfamiliar territory.

To play the Sackbut, a musician had to think about a sound differently. Understanding the circuitry wasn't important, but understanding the nature of sound in acoustic terms—understanding the musical impact of noise, formant frequency, and wave shape—was essential. The Sackbut pointed toward the idea of electronic-music studios, in which composers could build sound waves from scratch.

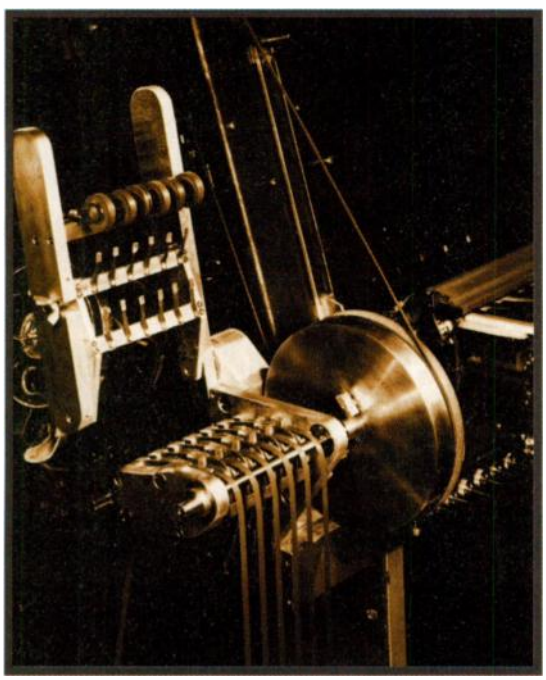

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FIG. 5: The Multi-track tape drive system played six tapes at once, each with a separate volume control. Tape speed changes were controlled by the keyboard.

DROP IN THE BUCKET

From 1948 to 1952, Le Caine earned his Ph.D. in atomic physics at Birmingham University in England. He was awarded an NRC doctoral scholarship to compensate for his education having been cut short by World War II and in recognition of his wartime achievements.

His studies kept him away from his music lab for more than three years. While in England, he heard the BBC broadcast exciting music that was yet to be heard in North America. The field of electronic music was expanding throughout the industrialized world, and many techniques were being developed for recorded and electronically generated sound. Le Caine found musique concrète particularly fascinating.

Soon after he returned to Ottawa, Le Caine bought a tape recorder and spent hours exploring the possibilities of tape editing. The tape recorder made tape loops possible, which he found intriguing because the same sound could be repeated many times, something that never happened in nature.

Late in 1955, Le Caine completed *Dripsody (an Etude for Variable Speed Recorder)*, his first composition using his multitrack playback equipment, the Multi-track Tape Recorder, or Multi-track (see **Fig. 4**). Le Caine made *Dripsody* entirely from the sound of one water droplet falling into a bucket. The piece, which is just 1 minute and 26 seconds long, is a classic because of the incredible musical results Le Caine achieved from such minimal resources.

Le Caine first recorded 30 minutes of individual water drops falling into a water-filled metal bucket. Next, he selected one example from the master tape and created a short tape loop.

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Using more than 1,000 prints of the original source loop and a mere 25 splices, Le Caine created several octaves of scales and arpeggios, which he assembled into the remarkable piece. He completed *Dripsody* in a single evening.

The first version of *Dripsody* was monophonic. By 1957, however, the Multi-track played six tapes simultaneously and included a mixer and stereo outputs (see **Fig. 5**). That inspired Le Caine to rework *Dripsody* in stereo. He also recorded a narrated demonstration of the steps taken in assembling the piece. During subsequent years, Le Caine created several short pieces and a few comic sketches using the Multi-track. Those pieces still display Le Caine's imagination and originality as well as his detailed awareness of the nature of sound.

The Multi-track's playback speed was controlled by a three-octave keyboard. Moving up an octave on the keyboard doubled the playback speed, and the sounds on the recording went up an octave. The keyboard on the later versions of the Multi-track was equipped with a *glide strip*, a conductive strip mounted behind the keyboard for playing wider glissandi than could be accomplished with horizontal key pressure.

Le Caine continually expanded the Multi-track's resources. By 1964 the instrument could play ten stereo tapes in two groups, and each group's speed could be controlled independently. The output could be fed to external devices such as Le Caine's Adjustable Filter, Two-Channel Alternator, and Envelope Shaper. In addition, speed changes of the Multi-track could be controlled automatically by the Serial Sound Structure Generator.

PAUL PEDERSEN

FIG. 8: This later version of the Oscillator Bank (1961) had a touch-sensitive keyboard.

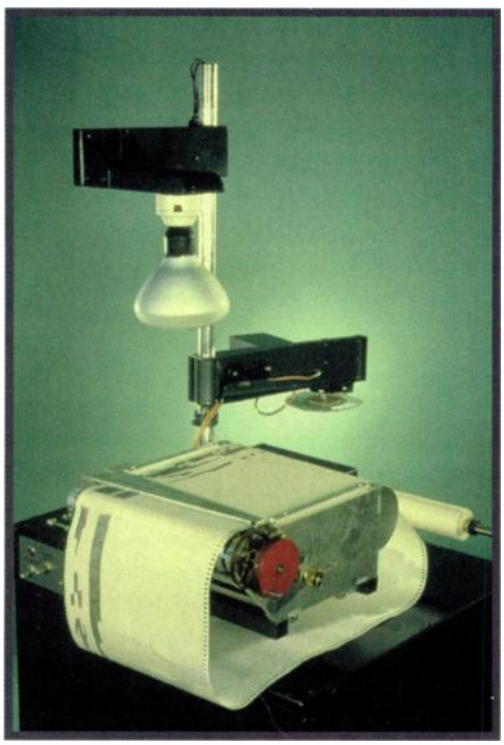

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FIG. 7: The Spectrogram (1966) could control instruments' volume levels, such as Oscillator Banks or the Multi-track. Light-sensitive controllers read the markings on the chart paper.

A STUDIO IS BORN

The Multi-track was not intended for private use but for use in a laboratory or studio. By the late '50s, electronic-music studios were opening at universities and radio stations around the world. In 1959 a studio featuring Le Caine's Multi-track opened at the University of Toronto. A few years later, Le Caine sent a Multi-track to a new studio at McGill University in Montreal. The Multi-track was the central instrument for both studios for many years. Le Caine built five models of the instrument, one of which was sent as a gift from the NRC to a university studio in Jerusalem, Israel.

Several U.S. studios inquired about buying a Multi-track, and the Electronics Associates of Toronto showed interest in manufacturing it. There was a plan to design a modular Multi-track so that a studio could buy a reduced version that would play two to four tapes simultaneously. The studio could add additional capacity and output features, such as mixers, later. But after several years, the design was not complete, and the project was abandoned.

After the Canadian university studios opened, Le Caine completed few compositions. He limited himself to demonstration recordings of new instruments, which he often played when he presented a paper or public lecture. He emphasized the design of equipment for use by those who had formal training as composers, and he designed instruments to facilitate their music. Between 1957 and 1959, for example, Le Caine created a bank of 108 oscillators (see **Fig. 6**), which he designed to work with the Spectrogram. The Spectrogram used 100 photocells to read a graphic score. As darkened sections of the score passed the photocells, the specified oscillators would sound (see **Fig. 7**).

In 1961 Le Caine created two smaller Oscillator Banks, with variable waveforms, operated by touch-sensitive keyboards (see **Fig. 8**). The final version of

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the Spectrogram controlled 25 separate output lines, each of which could be fed to an oscillator or to another device. It was used with the smaller oscillator banks, but the size of the graph paper makes clear that the Spectrogram originally had been designed for a larger number of generators.

NEW MODULES

Le Caine sent several modules, many of which were based on Sackbut components, to the studio in Toronto in 1962. The Level Control Amplifier was essentially a transistorized voltage-controlled amplifier (VCA) and had been used in the Multi-track. The Adjustable Filter had six inputs, each with separate controls for eight different bandwidths, for a total of 48 controllers. The six inputs indicate that the instrument was designed to integrate directly with the six outputs from the Multi-track so that composers could avoid creating extra tape generations in order to process source material. The Tone Shifter was a further development of the Sackbut's frequency modulator. It produced sidebands of great variety and expanded the degree of control by allowing for stepped or gliding changes of pitch.

In 1964 Le Caine sent another group of modules to the Toronto studio. The Function Generator combined a VCO with a staircase generator, which could also be used as a control voltage to shape an external signal. It also had adjustable settings to establish frequency and the timing of the changes. The Two-Channel Alternator could be set to automatically control stereo signals at various rates: the gain in one channel increased as the gain in the other was decreased, resulting in effects ranging from a choir effect to a slow pitch trill, tremolo or vibrato, or at higher rates, a buzz—even a sound resembling a ring modulator. Complex mixing and panning could be accomplished with the Two-Channel Alternator.

PAUL PEDERSEN

FIG. 10: The Polyphone (1970) had an extensive control panel. Each key had waveform and pitch controls.

In 1965 Le Caine built the Envelope Shaper. Le Caine preferred to use manually operated touch-sensitive keys whenever possible, but the device provided a level of precision that could not be obtained manually. Also that year, the Tone Mixture Generator produced transposable clusters of sine waves. It consisted of 13 oscillators, each with pitch and amplitude controls.

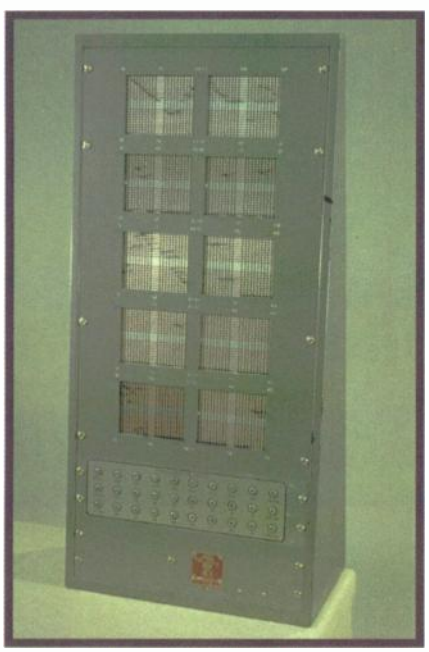

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FIG. 9: The Sonde (1968) could generate 200 sine waves. A slider controlled each waveform's volume.

LATER INSTRUMENTS

From the mid-'60s onward, Le Caine's instruments became far more complex and powerful. The Serial Sound Structure Generator (1965–68) was an intricate device incorporating many of the smaller components that had been designed for the studio, including VCOs, amplifiers, filters, waveform generators, and automatic envelope controllers. The instrument used a serial switch similar to that used in early telephone switchboards. Separate modules stored sequences of pitches, durations, envelopes, and wave shapes. Each sequence could have 4 to 13 terms that could be played continuously, forward or backward.

The Serial Sound Structure Generator was a powerful device for serial and repetitive musical forms. In many ways, the device anticipated the simplified sequencers that began to appear on analog synthesizers at about the same time, although no analog sequencers approached the complexity of Le Caine's instrument. A working version of the instrument was installed at the Montreal World's Fair in 1967, where thousands of visitors set up their own sequences and heard them played.

The Sonde (1968) used only 30 oscillators to generate 200 sine waves (see Fig. 9). Combined with 20 regular oscillators were 10 converter-oscillators, which worked to suppress the 20 original frequencies and produced only the difference in tones of each regular oscillator. The system was tuned so that there was a 5 Hz difference between

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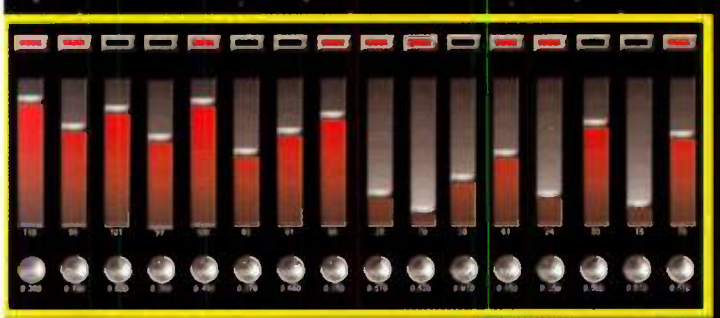

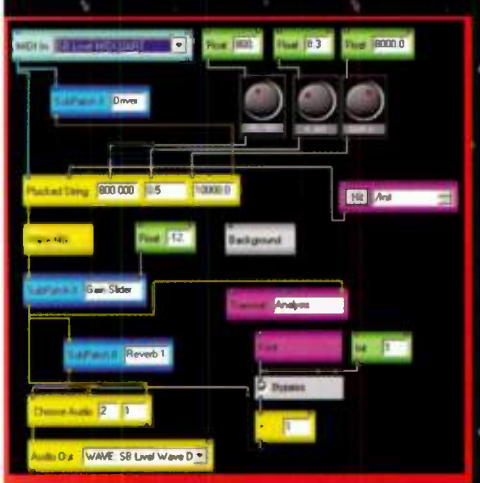

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each of the 200 tones. The first version of the Sonde was built with 200 sliders. A later version, sometimes used for live performances, featured 200 printed-circuit touch-sensitive keys; the sound was activated by the conductivity of a player's finger, which completed the circuit printed on the keys.

The Polyphone (1970) was built for the studio at McGill University (see **Fig. 10**). That instrument had a three-octave polyphonic keyboard with touch-sensitive keys and several independently tunable oscillators and control voltages. The control panel allowed modules to be patched together. At floor level, the Polyphone had pressure-sensitive foot pedals that were operated using photosensitive controllers.

The Polyphone was built before polyphonic synthesizers were commercially available and presented powerful resources. Although it shared the unpredictability of many analog synthesizers, which weakened its usefulness as a performance instrument, a large number of tape compositions made at McGill used Polyphone-generated sounds.

In 1972 work began on the Paramus, one of the first hybrid music systems incorporating both analog and digital controls. It retained analog timbre controls and specially designed VCOs, but the timing and pitch controls were digital. It played four voices at one time. A digital oscillator was designed for the Paramus in 1973, but before the patent was processed, Le Caine retired, and the entire project closed.

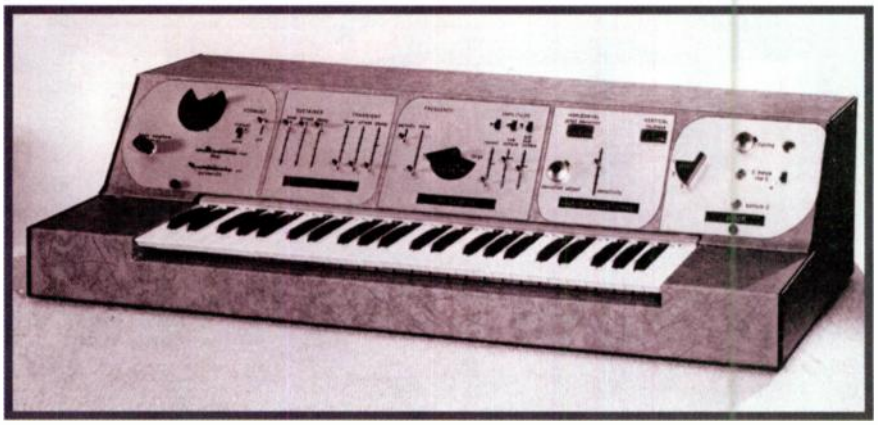

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FIG. 12: The 1971 prototype of the Sackbut was used for public lectures and demonstrations; the production version was intended to be sold as a synthesizer.

COMMERCIAL FAILURE

Despite the decades of work Le Caine devoted to his inventions, their commercial potential was never fully realized. Working in a scientific research environment rather than with a musical-instrument manufacturer, he assumed that the inventions would be patented by the NRC and then made by a separate company. If he had worked directly with a manufacturing company, perhaps his instruments would have become readily available.

In 1954, when Le Caine began working full-time on musical instruments, he concentrated on his two instruments with the most commercial potential—the Sackbut and the Touch Sensitive Organ (see **Fig. 11**). The Touch Sensitive Organ had five electrostatic connectors attached to the bottom of each key. The keys were spring mounted to provide resistance to the performer. As the keys were pushed lower into the instrument's frame and the electrodes of the electrostatic connectors moved closer, the volume increased. The organ was presented at several trade shows and at lectures for the public and for scientific organizations.

Le Caine made detailed demonstration recordings of the advantages of touch sensitivity. In 1955 the Baldwin Organ Company took out the patent, apparently planning to bring out the touch-sensitive keyboard on a new electronic-organ model. The NRC's new music research lab succeeded in placing a patent quickly. Although

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FIG. 11: A prototype Touch Sensitive Organ (1954) included a bank of vacuum-tube oscillators and an oscilloscope for viewing waveforms.

SELECTED DISCOGRAPHY

Hugh Le Caine: Compositions, Demonstrations 1946–1974 (JWD/EMF)

Anthology of Canadian Music: Electroacoustic Music (ACM)

University of Toronto Electronic Music Studio: Electronic Music (Folkways)

Baldwin maintained the patent for several years, the company never manufactured the keyboard.

By 1969 there was a market for the Sackbut, and the instrument was redesigned using contemporary technologies (see **Fig. 12**). A manufacturer was awarded the contract to build the instrument, and it seemed that commercial success was just around the corner. The Polyphone and the Paramus would follow the Sackbut as more advanced models.

However, when the manufacturing company failed to produce an instrument after three years and subsequently refused to let another company take over, the project was abandoned. A general despondency settled over the entire project. NRC's administration made it known that it would not continue to support the lab after Le Caine's retirement, so he decided to leave immediately—he saw no reason to begin a new project under those circumstances.

SACKBUT BLUES

In the end not one of Le Caine's instruments was manufactured commercially. When touch-sensitive keys became available in commercial electronic instruments in the early 1980s, they used a method different from his.

Le Caine's research team was awarded several patents and gave many presentations at conferences and at Audio Engineering Society meetings. Throughout the years, Le Caine gave public lectures and influenced a host of students who worked with his instruments at the university studios. Most people in the electronic-music field knew of Le Caine's work, but it is not known to what degree his instruments influenced other designers.

Perhaps the most important aspect of Le Caine's designs was their playability. His ideal was to enable nuance-filled, expressive performance, and touch sensitivity was an essential ingredient in that. Despite the technological hurdles he was forced to overcome, Le Caine was in fact able to add that ingredient to his keyboards, mixers, and other components, both mechanically and electronically.

Gayle Young *is a composer and musician who works with electronic instruments. She is the author of a book about Hugh Le Caine,* The Sackbut Blues, *and the editor of* Musicworks Magazine. *For more information, visit www.hughlecaine.com.*

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DESKTOP MUSICIAN

Notation and the Internet

Is online distribution the next big thing for printed music?

By Brian Smithers

When horror-meister Stephen King published his book *The Plant,* it didn't appear in hardcover, and it didn't go straight to paperback. Instead, it was available exclusively on the Web. Online publishing has become serious business, so it comes as no surprise that the music-publishing industry has also shown a keen interest in it.

FIG. 1: Sunhawk offers an extensive music catalog in a range of styles from several major publishers.

Downloadable music offers appealing possibilities that traditional printed music lacks, such as the ability to transpose a piece, customize it through editing, and preview it with audio or MIDI clips. Web-based music notation is a different critter from old-school sheet music, and in some cases, it even offers the opportunity for composers to sell their works directly to the public.

A number of companies have recently set up shop online, from major publishers such as Hal Leonard and Warner Brothers to high-end notation software developers, including Coda, Sibelius, and newcomer NoteHeads.

JUST ADD PAPER

A major part of the cost of sheet music, scores, solo parts, and method books is attributable to printing and distributing hard-copy editions of the music. In addition, wholesalers and retailers must maintain adequate stock, which ties up money and shelf space. Unsold copies become a financial drain and a waste of natural resources.

Online distribution shifts the printing cost to the purchaser, cuts out the middleperson, and solves the problem of ending up with insufficient or excess stock. That lets cost savings pass on to consumers (at least in theory), and it

also lowers the startup cost for independent publishers and self-publishers.

Although brick-and-mortar retailers may feel apprehensive, the local music store's demise isn't imminent. Online music publishing still has a few bugs to work out; I experienced minor technical glitches with most programs I tested. In addition, several of the viewer programs are available only for PCs; however, Mac versions are in the works for all of them.

Surprisingly, digital-rights management may not be a troublesome issue. The enterprises I surveyed have restricted the redistribution and reproduction of their wares. Some tag a file so that it won't open on a computer different from the one to which it was originally downloaded; others limit the number of times users can print a piece.

Although it's reasonable to assume that those safeguards are as hackable as other defeated schemes (if not more so), it's unlikely that sheet music will inspire the legions of pirates that digital video and audio have attracted. After all, what hacker wants to brag to his buddies: "I spent six months slicing their watermarking code, but now I can print as many copies of *Für Elise* as I want!"

A look at several online music publishers and options should provide a sense of where the industry is going.

ROCK ME, AMADEUS

The first stop on the tour is the Italian company Allegroassai (www.allegroassai.com), home of the full-feature notation application *Opus* 2.6 (see the review in the May 2001 issue) and its entry-level version, *Amadeus Opus Lite*. Allegroassai has leveraged its code and experience in an effort to become a major music publisher. With more than 1,700 titles already online and a goal of 50,000 works by 2004, the company is well on its way. Allegroassai also plans to make its online publishing technology available to other publishers and to musicians who want to publish their works on Allegroassai's Web site.

FIG. 2: Online music publishers strive to give purchasers a preview of the score without giving away the whole file. Allegroassai's bar-and-a-half preview for some scores is the most conservative; most sites offer a full page.

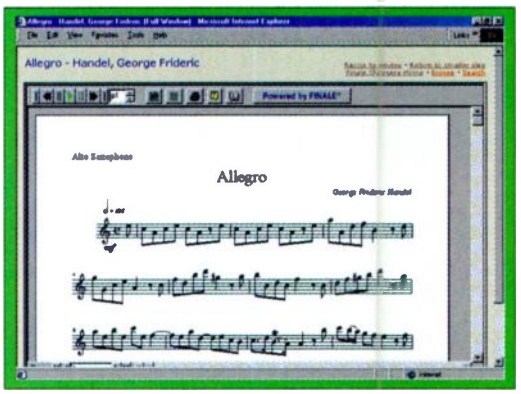

FIG. 3: Coda's *Finale MusicViewer* plug-in offers playback, transposition, and printing of digital scores. The Finale Showcase features the works of registered *Finale* users.

To view, play, and print downloaded digital scores requires one of the four members of the cross-platform *Opus* family. The more you spend, the more control you have over the final result, from adding fingerings, dynamics, and other markings with *Opus Editor* to having complete editing freedom with *Opus*. Although the display-only freeware *Opus Viewer* offers no editing functions, it does allow MIDI playback with complete control of program change assignment, part volume, mute, and solo. You can print as many copies of each document as you need, but each is tagged with the buyer's name, purchase date, and a transaction ID number.

Prices range from less than a dollar to about $15. The complete score to a Bach orchestral suite costs $13.08; a flute part for a single movement is $1.25. Public-domain music from the baroque to the early 20th century makes up the body of Allegroassai's library. You can also purchase scores to Bach's *Brandenburg Concertos*, Joplin's complete rags in four volumes, or Debussy's *Syrinx* for solo flute.

The Allegroassai system's biggest weakness is that many of the works provide only a one- or two-bar preview from which you can make a purchase decision (see **Fig. 2**). Most publishing systems that I've surveyed offer at least a one-page preview, something that Allegroassai recently began implementing for its growing catalog.

O SOLERO MIO

The *Solero* music viewer is your portal into the world of Sunhawk (www.sunhawk.com), purveyor of "downloadable, interactive sheet music" and old-style hard copies, available by mail order (see **Fig. 1**). Sunhawk has much to offer; its catalog is graced with venerable music publishers such as Warner Brothers, EMI Christian, Kalmus, Maranatha Music, and Mel Bay.

Solero is a straightforward, no-nonsense, free Windows application that lets users view and play scores downloaded from Sunhawk. It ran well, printed well, and easily played back through my default MIDI device. With *Solero*, you can change tempo and patches, adjust volume, and solo or mute parts. You can also transpose parts and even change clefs. It took about 30 seconds for short works to download, for authorization to be received, and for the pieces to appear in the viewer.

Solero's print quality is first-rate, but you can print only one copy of a work. (Printing multiple copies is permitted, however, if you purchase multiple-print rights.) Full-page previews are available for most pieces. Sunhawk offers music in a range of genres, from classical works such as a Vivaldi flute concerto to pop songs from the repertoires of artists such as Britney Spears. Dave Brubeck's

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Prices are typically $4.95 for single songs in piano and vocal arrangements; collections of five songs by an artist are $9.95. Although neither price represents great savings over traditional sheet music, you save on shipping, and you don't have to wait.

Currently, Sunhawk won't publish a visitor's work. In fact, it doesn't even indicate which notation program it uses to prepare its collection. The company's real attraction is the stable of writers and artists that it represents. With headliners such as Stephen Sondheim, Diane Warren, the Dixie Chicks, and Twila Paris, there's a lot to like at Sunhawk's Web site, and it's all just a click away.

CLUB CODA

The makers of *Finale* have created a showcase in which customers can display their works. Built around a Windows browser plug-in called *Finale MusicViewer,* Finale Showcase (www.codamusic.com/coda/fs_home.asp) lets you view, print, transpose, and listen to MIDI renditions of works posted by showcase members. The musical content and the caliber of score preparation are therefore a reflection of the members' varied talents, but then again, no payment is involved.

The viewer plug-in allows speedy score downloads and displays them in a window-within-a-window view with double sets of scrollbars (see **Fig. 3**). Performance data is retained during MIDI playback. For some reason, playback stopped every time I clicked on a scrollbar to browse the score, but when I left it alone, the score scrolled to follow playback. *Finale MusicViewer*'s printing is flexible, and the output is top quality.

THINGS2COME

Net4Music (www.net4music.com) takes a different approach from the companies covered so far. With no apparent notation software to leverage, Net4Music simply wrote a cross-platform rights-management plug-in for Adobe *Acrobat,* and it distributes scores as PDFs. That means no MIDI playback, transposition, or editing is provided. To offset those limitations, some works offer a Sample button that plays a MIDI version of the piece. When you purchase a file from Net4Music, it is e-mailed to you as an attachment.

Net4Music offers works from the catalogs of EMI and Schott, among others, and enables musicians to publish their own works. You can submit a score in *Cubase, Finale, Logic, Sibelius,* or *Score* formats to be converted to *Acrobat.* Prices tend toward the $3 to $5 range, with pop tunes by the Commodores or Brandy going for $3.95. The score to Mark O'Connor's *Appalachian Waltz* is $5; the violin, viola, and cello parts are $3 each. Self-publishing musicians get 40 percent of the sale price.

Net4Music almost doesn't belong with the other companies mentioned, because it's selling what amounts to scans of sheet music, not enhanced digital alternatives to sheet music. That seems likely to change, however, now that the company has merged with Coda. Net4Music announced plans to incorporate Coda's SmartMusic intelligent-accompaniment technology, which will provide the missing playback and editing ingredients to its lineup.

FRESH SHEETS

SheetMusicNow.com, like Net4Music, built its system around Adobe *Acrobat* files, but SheetMusicNow.com uses a Windows plug-in called *SafePublish* to secure files. You can print three times within seven days, after which the file expires. Playback and editing functions are not supported, though MIDI excerpts are available for some titles. Graphic previews of about a third of a page are also available.

The site's repertoire covers a range of styles, including pieces by Chick Corea, the guitar and recorder duos of Michala Petri and Lars Hannibal, and trumpet virtuoso Timofei Dokshizer's personal editions of his recorded works. Although it's not yet a huge collection, its eclecticism is commendable. Prices are generally $3.50 to $15. The print quality is excellent, though the page layout is not always top-drawer. *Acrobat* is certainly an important tool and a simple solution for publishers, but it's a shame to see another publisher ignore the power of "real" virtual sheet music.

EAGER IGOR

Swedish software developer NoteHeads (www.noteheads.com) features a nifty little viewer carved from the code of *Igor Engraver,* the company's high-end notation program. *Igor Reader* is a standalone Windows application (a Mac version is in beta) that lets visitors view, play back, and print downloaded works.

Available repertoire leans heavily toward the self-published variety, though a recent deal with the Swedish pop group A-Teens to make its catalog available online shows that NoteHeads intends to broaden its base. Works range from $1 for an arrangement of *Hava Nagila* to $25 for a modern wind composition by the company's founder, Peter Bengtson. Contributors get 50 percent or more of the purchase price and can specify whether viewing, playback, and printing should be allowed prior to purchase.

It's too early to judge NoteHeads' potential, because its catalog has barely more than a hundred works. *Igor Reader* seems solid, and the engraving quality is good. It all comes down to content: if you build it, they will come.

SCORCHED SCORES

From the makers of *Sibelius* comes ScorchMusic (www.scorchmusic.com), a self-publishing venture with promise. The *Scorch* viewer for Mac or Windows (see **Fig. 4**) offers digital sheet music done right: a full-page view of the music, transport controls for MIDI playback, a slider for changing tempo, a button to

print the first page for free, and controls that let you change the first instrument or change keys if the composer permits.

Better still, *Scorch* features *Sibelius*'s Espressivo playback options for intelligent interpretation of dynamics and articulations as well as composer-definable degrees of swing, which is a huge advantage over the competition.

ScorchMusic sets all the prices, which range from free to $9.95, depending on the number of pages. Extracted parts are also available for an additional charge. Contributors receive 50 percent of the net sale price. ScorchMusic tracks MIDI-playback auditions and pays royalties to performing-rights agencies for that use.

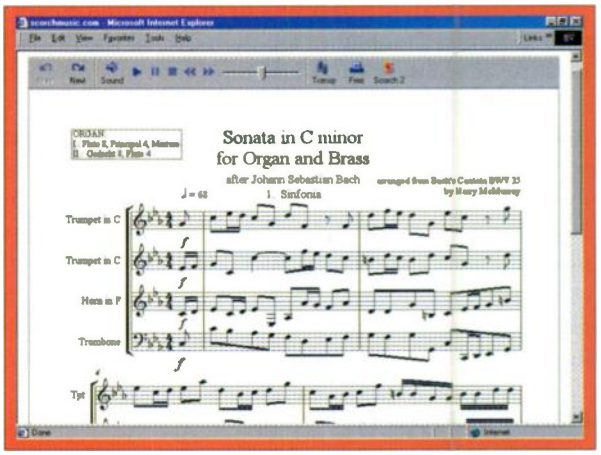

FIG. 4: *Scorch* features an efficient, uncluttered interface with controls for transposition, tempo, and printing. Its intelligent interpretation of expression markings provides exceptional playback.

Scorch's online viewing and playback technology is available to *Sibelius* users, and *Sibelius Internet Edition* extends its capabilities for commercial use. In addition, *Scorch* has been adopted by Sheet Music Direct publisher Hal Leonard (www.sheetmusicdirect.com), retailer J. W. Pepper, and other major forces in the traditional music-publishing arena.

NOTEWORTHY MUSIC

Musicnotes Viewer from Musicnotes.com is your ticket to more than 10,000 works of digital sheet music from Warner Brothers, Mel Bay, Hal Leonard, Boosey and Hawkes, C. F. Peters, and several other publishers. At first glance, Musicnotes.com's Windows-based viewer plug-in, with its window-within-a-window design, is a dead ringer for Coda's *Finale MusicViewer,* but *Musicnotes Viewer* requires a separate player for MIDI playback. That's only a minor nuisance, however, because both programs are small downloads and work well together.

First-page previews are playable and printable. Purchasing a piece means shelling out from $4.95 for Bruce Hornsby's *The Way It Is* to $7.95 for a detailed guitar-tab transcription of Led Zeppelin's *Stairway to Heaven*. The selection is impressive, and the technology is user-friendly.

SCORING BIG

Somebody clearly thinks that digital sheet music is the distribution model of the future. The major notation software developers are leading the way, and some real powerhouses of traditional publishing are getting in on the act. The first wave of technology is promising, with useful features such as MIDI playback and transposition. Moreover, the printed output from the viewer programs is very high quality.

Darwinian reality has finally hit the Web, though, and online music publishers will survive according to the quality and quantity of their content. That certainly favors purveyors of pop piano/vocal parts such as Sunhawk and Musicnotes.com, but the Web's egalitarian nature still leaves plenty of room for niche publishing and self-publishing. Based on what I've seen, the technology for digital music distribution will not be a limiting factor.

Brian Smithers *eagerly awaits the technological breakthrough that will enable online distribution of Diet Mountain Dew. While he waits, he keeps busy as a teacher, woodwind artist, and clinician.*

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RECORDING MUSICIAN

Underground Drum Sounds

Dial in wicked, whacked-out wallops.

By Myles Boisen

Before the Internet, e-commerce, and Napster, if you wanted a record, you had to go to a record store and buy it. If your tastes ran to music more challenging than the Top 40, you might also be faced with some serious research or at least a lot of pawing through dusty record bins. Ah, the good ol' days! Back then it was something to get excited about when a friend turned up, say, a self-pressed 45 of some strange San Francisco band or an import LP from an unknown Belgian progressive-rock group. Such records were called *underground*, meaning that they were noncommercial and often curious releases known only to a select few.

FIG. 1: For percussionist Gino Robair, drums often serve as complex resonators for smaller percussive objects. Note the combination of traditional instruments and found objects—Chinese rice bowls, a measuring cup, a car muffler, the lid of a tea tin, and so on.

K. PERRY

Beyond covering new musical ground, underground records also tended to be interesting from an engineering point of view. Because they were financed and distributed outside the mainstream, they often made use of unorthodox recording and mixing techniques, including experimental approaches that established labels couldn't afford to indulge in. Serendipity played a role, too, in the occasional gem that resulted from the combination of inexperience, second-rate gear, and gleeful abandon. To my ears, even the "dirt" on underground records was interesting.

BURIED TREASURE

The literal meaning of *underground*—subterranean, obscure, buried—pretty much sums up drum recording's early history. Before the refinements of close-miking in 1950s jazz and rock recordings, drums were generally kept as far from the mics as possible. Rudy Van Gelder and other devoted jazz recording

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WRH

BRIAN KNAVE

FIG. 2: Old and unusual microphones are great for capturing lo-fi drum sounds and often can be purchased for a song from flea markets, garage sales, and junk stores. Shown is one of the author's favorites, a Fentone 500-C Dual Crystal microphone.

artists succeeded in capturing a natural, beautifully detailed drum sound in the LP era's early years. But in pop-music recording, an equivalent level of clarity and presence for the drum kit took decades to develop.

Following the murky abandon of the mid-'50s rock 'n' roll classics, occasional flashes of percussive brilliance can be heard on a variety of productions, including cuts from Phil Spector, the Beatles, and James Brown. In the 1960s, the oft-overlooked Zombies helped raise the bar for well-defined and consistent drum sounds. That band's sparse, intelligent creations—"Time of the Season," for example—are some of the era's best. But not until Led Zeppelin's John Bonham came along did rock drum recording reach dizzying peaks. In particular, the band's untitled 1971 album (commonly known as *Led Zeppelin IV*) proved prophetic—check out the spectacular drum sounds of "Misty Mountain Hop" and "When the Levee Breaks"—and to this day is considered by many to be the Holy Grail of rock engineering.

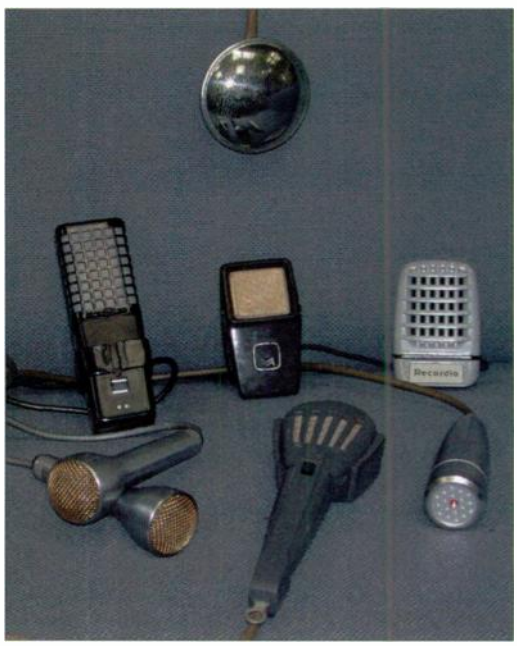
Still, from the late '60s through the early '70s, most pop-music engineers (that is, other than Led Zeppelin engineers Glyn Johns and Eddie Kramer) struggled to get their drums sounding clear, powerful, and undistorted. Attempts to get artistic with drum sounds were heard on records by Jimi Hendrix, Pink Floyd, and others, yet many of those early experiments—flanging an entire drum kit, for instance—haven't aged well and today sound gimmicky or heavy-handed.

Not until the mid-1970s did radical yet truly artful drum-processing ideas bubble up from the underground scene. The richest vein of ideas came not from British or American pop stars but from resourceful Jamaican studio wizards. Engineers such as Lee "Scratch" Perry and King Tubby (Osbourne Ruddock) are often credited as the pioneering forces behind imaginative dub versions of instrumental tracks, which were initially placed on the B sides of reggae singles. Their mixing innovations—characterized by a reliance on timed-echo repeats, spring reverb, EQ sweeping, and clever stripping of tracks to bare rhythmic essentials—typically focused on hallucinogenic embellishments of a mix's bass and drum components.

Cross-cultural U.K. bands such as the Clash, UB40, and the English Beat fell under dub's swirling spell in the 1980s. Today dub's influence permeates numerous subgenres of popular music, including trip-hop, drum 'n' bass, ambient, and contemporary remix. Although my collecting didn't begin until about 15 years ago, old-school dub LPs influenced my aesthetic on many recent recording projects (see the sidebar "Depraved-Drum Discography").

One '70s group that, for me, helped define the term *underground* was Chrome, not only because of the palette of sounds the band employed but also on account of its deliberately obscured do-it-yourself approach to music making. Here was a group not afraid to compress and overdrive an entire drum kit. Chrome's crunchy drum sounds had roots in 1960s garage-rock primitivism but were shockingly edgy and mixed very loud, often alternating with spliced sections of backward tape and other mutated soundscapes. At its best, as on "You've Been Duplicated" and "Mondo Anthem," Chrome sounds fresh and remarkably in step with today's techno music—or it would if techno were played by misfit punkers.

Such were the sounds primarily responsible for opening my ears to the radical possibilities of drum recording and processing. Since those halcyon days, I have kept my ears open for new and exciting drum-recording ideas as they crop up in rock and pop recordings. I have paid particular attention to the brave new sounds of Fred Frith and Chris Cutler; Tom Waits; King Crimson; Public Image Limited; Peter Gabriel; and a number of bands engineered or produced by Tchad Blake, Steve Albini, and Brian



BRIAN KNAVE

FIG. 3: The author's collection of cheap mics includes (from the back row's left) an Oktava ML-17 ribbon; a Voice of Music dynamic; a Recordio; two Voice of Music dynamics; a Webster something-or-other (with on/off switch); and an unmarked, unidentified dynamic. The disclike mic (hanging) is a Wright Zimmerman 300 dynamic.

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Eno (see the sidebar "Recommended Listening").

DANGER, WILL ROBINSON!

Before getting into tips and techniques, a few words of caution are in order. The drum set spans a broad frequency range from the kick drum's low thump to the cymbals' ultrasonic harmonics. Therefore, the drum sounds you dial in (whether straightforward or underground) usually have a major effect on the mix. Putting a wild effect or unusual EQ on the snare, for example, affects the mix's midrange instruments, including the vocal. Likewise, changing the kick drum's sound alters its relationship to the bass guitar, which may in turn modify what happens with the guitars, and so on.

Evaluating new sounds and creative directions definitely takes extra time, so it's important to make sure your clients or musical partners are comfortable with that. Face it: once the novelty wears off, a nonstandard drum sound isn't always appropriate for a particular production. If you have any doubts, cover yourself by also printing an unaffected "straight" mix as a backup or a copy of the unprocessed drum tracks.

Because drums are often the backdrop, if not the canvas and frame, of a pop or rock recording, I prefer to do most of my electronic processing at the mixing stage rather than during the tracking sessions. That way, if I go overboard, I can do another mix easily enough. But a miscalculation on the master tapes could haunt you forever.

Even if I'm making a bold statement, such as running the drum tracks through a guitar distortion box, I prefer to send extreme effects from a mult or prefader aux bus instead of from channel inserts. That allows the option of mixing in clean, unaffected drum sounds to retain the kit's basic flavor while adding a healthy dose of creative seasoning. Aside from that slightly conservative custom, when I'm in the mood to create, I try to ignore the rules; those that I can't ignore, I bend or break.

SORCERY AT THE SOURCE

The simplest and quickest way to get interesting drum sounds is to substitute an unconventional percussion source for a standard kit component. Percussionist and EM associate editor Gino Robair taught me to head straight for the kitchen when I get hungry for new drum sounds. Pots and pans make great surrogate drum kits (remember Spike Jones?), and wire whisks, chopsticks, wooden spoons, and other kitchen implements provide a fresh alternative to standard sticks, brushes, and mallets (see Fig. 1). Large metal mixing bowls can make beautiful, gonglike sounds and issue other fascinating tones when filled with water and swirled while being struck. (Make sure to keep your condenser mics at a safe distance above the splash zone!) A handful of uncooked rice or beans thrown on top of a drum head can add sizzle to an otherwise dull drum part.

One sound I'm partial to is that of an aluminum paint-roller tray on a snare drum. I have also captured distinctive percussion overdubs from a squeaky chair, toy-piano parts, scrap lumber, and a battered Volkswagen Beetle hood. Cardboard boxes and phone books make good substitute drums, especially when miked close and played with the hands or standard brushes. It's also fun to assemble a drum kit in new or just plain wrong ways: piling two or three cymbals on one another, turning the snare drum upside down (to manipulate the snares), or placing objects between the hi-hat cymbals.

For inspiration, Tom Waits's *Bone Machine*—an encyclopedia of underground recording techniques by the talented team of Waits, Biff Dawes, and Tchad Blake—is a great place to start. No cymbals were harmed in the making of that record, and Waits's dark percussion sounds are somehow roomy

DEPRAVED-DRUM DISCOGRAPHY

The following CDs, engineered by Myles Boisen, are recommended listening for the drum-recording and -processing techniques described in the article.

Myles Boisen, *Scrambledisc (Guitarspeak, vol. 2)* (Wiggle Biscuit, 2000)
a combination of extreme analog mixing and computer-based manipulation of drum and guitar processing on all tracks
Web www.wigglebiscuit.com

Phillip Greenlief and Covered Pages, featuring Vinny Golia, Nels Cline, and G. E. Stinson, *Russian Notebooks* (Evander Music, 2000)
"Raskolnikov's Attic": extreme dub-inspired processing
Web www.evandermusic.com

Guerrilla Hi-Fi, *4-20-00* (The Answer to Life Records, 2001)
dub-mixing techniques on all tracks
e-mail yardboom@aol.com

History, *The Virtue of Evolution* (Audible Garden Records, 1999)
"Weather": gating two drum kits in stereo
"The Cliff": dub-mixing techniques
"Puppeteering" and "Track 9": drum distortion and other techniques
e-mail flybear@concentric.net

John Schott and Ensemble Diglossia, *Shuffle Play: Elegies for the Recording Angel* (New World Records, 2000)
"Long Grain": extreme drum gating and compression
Web www.newworldrecords.org

Splatter Trio, *Hi-Fi Junk Note* (Rastascan Records, 1995)
"The Sinatra Variations": gating and dub-mixing techniques
"Clear the Club (dub), maybe . . .": dub-mixing techniques
"Cleveland Beat" and "Ace Dag Bee and Counting": distortion, gating, extreme effects
Web www.rastascan.com

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SloFunk

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Audio & .wav/Acid

Cut'n it Up

$99.95
Audio

From the acclaimed producer of *Wall of Vinyl* & *Loopzilla Underground*, *Cut'n It Up* is jammed full of construction kits, beats, new drums, guitars, bass, keys & some wicked scratching! This is the stuff you've been looking for, but all 100% original & license-free! "...the next best thing to stumbling across several choice crates from *Grandmaster Flash's* vinyl collection at a garage sale." 4.5 out of 5 - *Remix*

Audio

Nu Groove RnB

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Includes Tc .wav/Acid CD-ROM

Here comes the follow-up to the highly acclaimed *Strictly RnB*- but this new generation of loops puts the vibe back in the groove! *Nu Groove RNB* finds its inspiration from *Timbaland*- so be sure to check out these awesome, phat compressed loops! If you're into the sound of the current R&B charts, you can NOT afford to miss this groove euphoria.

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Electric Ghetto

$99.95
Audio
Includes .wav/Acid CD-ROM

Take a trip to the wrong side of the tracks, but be very careful because the *Electric Ghetto* will make you a statistic! This is the toughest Rock/Rap/Industrial disc every produced! Extended construction kits that develop & change for ultimate variation, self-contained songs, guitar, synth, bass, guitar riffs, Hip Hop beats, creepy atmospheres and more!

Audio & .wav/Acid

Drum 'n Bass: Journey to the Light

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Audio
Includes .wav/Acid CD-ROM

When it comes to Drum 'n Bass, Jamie Myerson needs no introduction. America's premiere D&B producer has finally made a sample CD, and it slams! Construction kits & loops, from hard two-step to dreamy Lookin' Good-style beats. There's other Drum 'n Bass CDs out there, but how often do you get someone of Jamie's caliber making one?

Audio

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Audio & .wav/Acid

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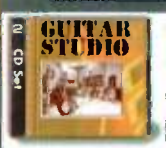

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The "swiss army knife" of guitar loops and performances, *Guitar Studio* gives everything you need to make authentic guitar-based tracks. Whether you need alternative rock grooves, or retro jazz riffs and comps, you'll find them here. Blues, metal, funk, acoustic- it's all here with intros and endings too, so you can make the most realistic guitar performance possible.

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Dread- The Reggae Collection

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Audio & .wav/Acid

Gas Tank Orchestra

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Multi-Samples
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and claustrophobic at the same time. Slit drums figure prominently, miked so that the listener seems to be trapped inside the resonant cavity rather than listening from a safe distance. The use of a metal can ("Such a Scream") and highly compressed scrap metal ("In the Colosseum") expands the haunting masterpiece's percussive palette.

MILKING THE MIKING

The previously mentioned sounds can be captured using standard cardioid condenser and dynamic mics with conventional close-miking techniques. In addition, you can add ambience by employing a room mic and mixing in the resulting track to taste. (An omnidirectional condenser or figure-8 ribbon is great for that application.) Another inexpensive way to color the sound is to mic the instrument in an unusual space—a shower stall, for example, or inside a length of pipe.

For one of my earliest drum-recording experiments, I placed a cheap dynamic mic inside an industrial-grade food tin, secured the lid tightly, and positioned the tin on the floor a few feet from the drum kit. The combination of weird resonance from the tin, audible distortion from the mic, and the absence of direct sound provided a fascinating and unforgettable drum sound. I also tried that technique using a metal garbage can with a condenser mic (Oktava MK 219) hanging inside; however, the thicker walls and the garbage can's larger dimensions considerably dampened the immediacy of the drum sound, resulting in a more diffused echo-chamber effect.

To capture truly twisted drum sounds, nothing seems to work as well as an inexpensive dynamic or crystal microphone. I have an assortment that I pull out for this task, my favorite being a Japanese-made Fentone 500-C Dual Crystal mic that resembles a miniature RCA 77 (see **Fig. 2**). The American D22 dynamic mic, though now a collector's item, is also highly regarded for recording lo-fi drum tracks. Fortunately, similar mics from the '50s and '60s are relatively easy to find at flea markets and thrift stores (see **Fig. 3**). In addition to looking cool, most also plug in easily to a guitar amp for additional coloration.

BACKFIELD IN MOTION

Singers, horn players, and percussionists regularly make use of movement (in relation to microphones) to create dynamic and tonal shifts as well as other interesting effects. But that is hardly an option for kit drummers, who typically are stationary. It is possible, however, for the engineer to move the microphones as the drummer plays. For example, you can hold a stereo pair of ambient mics in a fixed position for the bulk of a performance and then, during a fade-out vamp, walk away from the drums to create a cool-sounding effect. If you try that technique, use windscreens and highpass filters on the mics—especially if you intend to move quickly—to quell wind noise and rumble.

FIG. 4: In addition to its uses as a guitar pedal, the Tech 21 SansAmp GT2 is great for adding grunge to drum tracks.

Unless you're Roger Daltrey, swinging a microphone around by its cable may take some practice. But once you get the hang of that, it's a great way to add swirling Leslie-type effects to a percussion part. Make sure that the connection to the cable is secure and don't forget safety goggles for you and the drummer.

A less extreme variation of mics in motion is explored in composer Karlheinz Stockhausen's *Mikrophonie 1*, which specifies moving a microphone just above the surface of a tam-tam while it is being played. That technique—which can be used as well with a cymbal, gong, or other sustaining percussion instrument—produces a fascinating array of textures as the microphone is bathed in the radiating patterns of ever-changing harmonics emanating from the sound source. Drummer Pierre Tanguay used that trick with a Shure Beta 58 to generate surprisingly deep gonglike tones from a standard hi-hat top cymbal.

Contact mics are another fun and inexpensive tool for capturing resonant sounds from gongs and cymbals. Bay

RECOMMENDED LISTENING

Art Bears, *Hopes and Fears* (ReR, 1978)

Art Bears, *Winter Songs/The World as It Is Today* (ReR, 1987; Art Bears records are hard to find in stores but are available from www.waysidemusic.com.)

Chrome, *Chrome Box* (Cleopatra, 1982)

King Tubby and Friends, *Dub Gone Crazy: The Evolution of Dub at King Tubby's '75–'77* (Blood and Fire, 1995)

Latin Playboys, with Tchad Blake, *Dose* (Atlantic Records, 1998)

Led Zeppelin, untitled (Atlantic Records, 1971)

Lee "Scratch" Perry, *Scratch Attack* (Ras, 1988)

Public Image Limited, *Flowers of Romance* (Warner Brothers, 1981)

Karlheinz Stockhausen, *Mikrophonie 1* (Stockhausen Complete Edition, 1964)

Tom Waits, *Bone Machine* (Island Records, 1992)

Area drummer Jenya Chernoff caught my attention by amplifying transduced signals in that manner and then routing the signals to guitar pedals for a mind-bending assortment of overdrive, wah-wah, and pitch-shifting effects. Blake, a leading proponent of binaural recording and underground timbres, creates many signature sounds using a specially adapted Neumann KU 100 stereo binaural head. Blake modified his KU 100 by attaching plastic "whirly tubes" over the head's anatomically correct ears (see www.binau.com). Both tubes bend around to the front of the head

ART OF ART BEARS

A key influence on my ideas about drum recording and processing was the band Art Bears, a splinter group from the radical music collective Henry Cow. Building on the sonic experiments of the 1975 Henry Cow album *In Praise of Learning*, Art Bears' drummer Chris Cutler, guitarist Fred Frith, and singer Dagmar Krause disregarded many established notions about recording to pursue of sounds on par with their revolutionary musical ideas.

Engineer Etienne Conod recorded and coproduced most of Art Bears' songs at his Sunrise Studio in Kirchberg, Switzerland. His comments about working with Art Bears contain sage advice for any personal-studio operator: "We were a good match because Sunrise did not have the means to be a state-of-the-art studio. So we had to make up for our cheap gear with hard work and creativity, sometimes seeking unorthodox solutions. Art Bears were sick and tired of conventional sounds and eager to keep exploring and inventing."

Cutler describes some techniques that emerged in those sessions: "The modus operandi for Art Bears was to build the tracks from the voice up. The drums were usually added last. I always worked on the sound as we set up to record the track, with the existing sound of the track already in mind. All effects were added in record mode rather than during mixdown, which, come to think of it, is more musical. The drum sounds were thus designed for each track in real time. Often it would not be drums that I added but percussion elements—for example, treated half-speed tambourines on '(Armed) Peace,' backward cymbals and half-speed gong on 'Three Wheels,' and blown tubular bells on 'The Slave.'"

A particularly striking feature of Cutler's sound in that period is hyper-compressed recording of the entire drum set, often combined with low-cut filtering. That process inverts the dynamics of the drums and cymbals so that attacks are sucked into the background and sustained sounds rush forward. On "The Winter Wheel" (*Winter Songs*, 1978), for example, Cutler employed "extreme expansion followed by extreme compression that was tuned to a point that made the signal-processing chain extraordinarily sensitive to the minutiae of playing differences. The expanders were dbx, heavily driven, and the compressor was a UREI 1176, also heavily driven."

Conod elaborates: "The dbx expander was intended for domestic use for noise reduction on a tape recorder. It featured a compressor section for recording and an expander section for playback. For Chris's drums, we used the dbx expander section and then compressed the sound with the 1176. The dbx had a steady ratio of 2:1, whereas the 1176 could be adjusted. Basically, we played around with the dynamics both before and after a Lexicon reverb, creating a sound similar to what you can get today with a gated reverb program."

Cutler also recalls using an Eventide Harmonizer on his drums at Sunrise Studio. Perhaps most inventively, he and Frith set up noise gates that were keyed to trigger the sounds of radios, hair dryers, vacuum cleaners, and lawnmowers. Those sounds were then mixed back in with the drum tracks. Cutler also used various tape-manipulation techniques such as "recording unison toms at different speeds and then mixing them into one sound, speed alterations including real-time varispeed while recording, and mixing backward and forward sounds together."

More than 20 years old but still inventive sounding, Art Bears' *Winter Songs* is a prime example of the recording artistry that can be achieved despite limited means.

The drum-sound experimentation was not confined solely to electronic processing, either. "From the start," Cutler says, "my modifications were at both ends. I would retune the kit, tape metal trays to the bass drum, cover the surfaces with various materials, and use metal or unofficial objects as sticks. Meanwhile, Simon [Heyworth, engineer on the Slapp Happy and Henry Cow collaboration *Desperate Straights*] messed with the EQ and reverbs in the studio in real time and then relayed the results back to me in the headphones."

where their openings are taped together side by side, forming a set of "sonic binoculars" adorning the head's otherwise grim countenance. That setup not only radically alters the pickup pattern of the mics but also introduces coloration from the resonance of the tubes.

MAGIC IN THE MIX

Once your source sounds are recorded, the control room offers an enormous range of processing options. In addition to reverb, echo, and pitch shifting, try flanging, chorus, and tremolo to dramatically alter the sounds of cymbals, drum rolls, ambience, and other sustained sounds. Standard noise gates or expander gates can also be employed, not only for reshaping attack and delay characteristics of drum and percussion tracks but also for their unique key-gating features. Key gating lets you run any sound through the gate (see the sidebar "Art of Art Bears" for inspirational examples) and, using a drum track as the trigger source, turn the sound off and on in rhythm with the music.

Even low-cost compressors frequently provide gates, making it practically mandatory to experiment with radical gating of drum tracks. That experimentation can be followed by extreme compression of whatever sound is let through. Furthermore, you can adjust the gate's release control (assuming it has one) so that the resulting burst of noise ends in time with the prevailing rhythm. You can also make a track flicker unpredictably, sort of like a shorted connection, by tweaking the threshold control just so.

Here are examples of how I used gates and other effects on recent projects: on the song "Long Grain" from guitarist John Schott's *Shuffle Play: Elegies for the Recording Angel*, I processed Scott Amendola's drums with compression and abrupt gating, with layers of similarly processed backward tracks and reverb. For "Weather" on History's *The Virtue of Evolution*, drummer Mark Quinn recorded two complete stereo drum tracks with slightly differing accents. I panned the kits hard left and

right and gated them mercilessly, which created a chattering backdrop of percussive dialogue between the two speakers. On the Splatter Trio's *Hi-Fi Junk Note*, I applied various types of drum gating as well as dub effects and other extreme forms of processing.

Extreme compression used to be an exciting option on its own, but drum squashing became so rampant in the '90s that it's one of that era's foremost clichés, just as gated-snare reverb has become a dated trademark of '80s productions. To compress radically, take a tip from Cutler and design a unique processing chain for each song.

PORTION OF DISTORTION

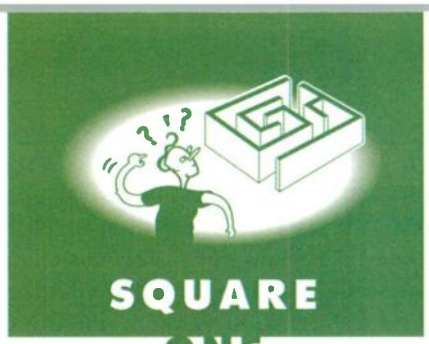
For a still different effect, experiment with a guitar fuzz box on your drum tracks. My favorite "punishment pedal" is the Tech 21 SansAmp GT2 (see **Fig. 4**), a magical box that several other engineers share my raves about. (It's also the only guitar pedal I use regularly. To learn more about the GT2, contact Tech 21; tel. (212) 315-1116; e-mail info @tech21nyc.com; Web www.tech21nyc.com.) The SansAmp GT2 sounds best on clean, low-drive settings. The bass and treble knobs, as well as the three speaker-emulation positions, provide a wealth of timbral control. I run the SansAmp off a bus (rather than an insert), which lets me blend clean and distorted sounds with the faders. I typically gate the output to keep it clean during breaks, and sometimes I apply radical gating so that only the kick or snare opens the gate.

If a distortion box is not available or just sounds too dirty (as is often the case), try sending tracks out of your board to a guitar amp or a pair of headphones and then mic the speaker. An inexpensive graphic equalizer can also do the trick and may even provide usable distortion.

Plenty of lo-fi and vinyl-simulation plug-ins are also available in the computer realm. Digital editing and looping, time-stretching, and pitch-shifting digital signal processing can take you out of real time and into wacky new worlds of processing that simply can't be reached in the analog domain. But no matter where you start—at the source, at mixdown, or in your computer—have fun working underground and don't forget to come up for fresh air once in a while.

Myles Boisen *spends most of his life within the curious and usually noncommercial confines of Guerrilla Recording in Oakland, California. Send tapes and CDs of your craziest drum sounds to him at P.O. Box 8086, Berkeley, CA 94707-8086.* *Thanks to Eithen Fletcher, Fred Frith, Chris Cutler, John Hanes, Bruce Harvie, Etienne Conod, Jenya Chernoff, Karen Stackpole, Gino Robair, and Pierre Tanguay.*

We welcome your feedback. E-mail us at emeditorial@intertec.com.



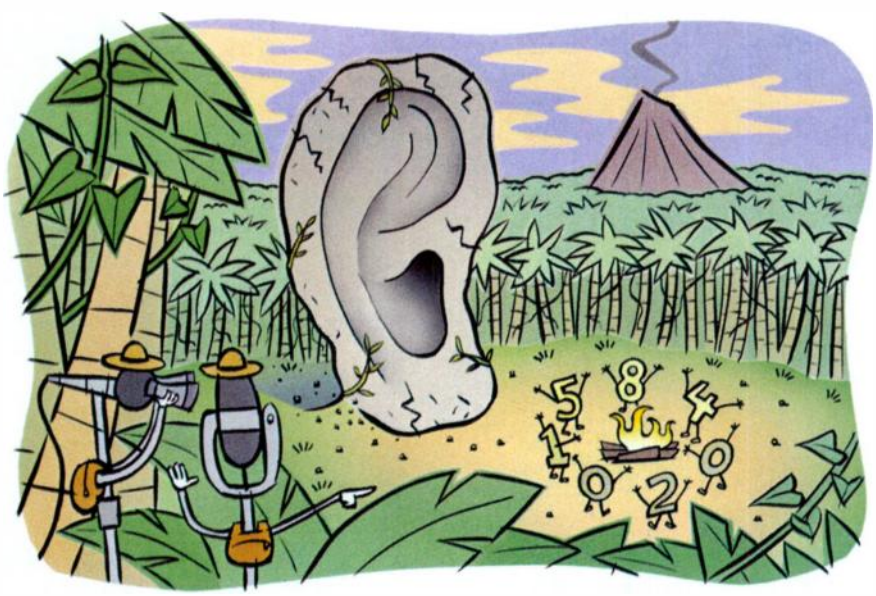
Decibels Demystified, Part 1

To understand decibels, a bit of math is all that's required.

By Scott Wilkinson

During the past 15 years, many fundamental music-technology concepts have been explained in "Square One" (originally titled "From the Top"). In 1997 EM *technical editor Scott Wilkinson combined many of those columns into a comprehensive primer titled* Anatomy of a Home Studio: How Everything Really Works, from Microphones to MIDI, *published by EMBooks, an imprint of Artistpro.com (www.artistpro.com).*

Our readership has continued to grow, and new readers shouldn't be left behind. Rather than try to reinvent the wheel, we will periodically reprint excerpts from the book in the form of "Square One Classics." These articles will clarify the essential, unchanging concepts that make it possible to be an electronic musician.



JACK DESROCHER

You probably have some idea of the notion that decibels measure signal levels. However, most people don't understand exactly what decibels are or how they are used in the audio world. Even audio professionals are often a bit fuzzy about the precise nature of decibels.

That is understandable; decibels can be quite confusing. There are many types of decibels, and manufacturers use them in their specifications with reckless abandon. To clear away the fog surrounding the essential concept of decibels, I'll start with some basic math. It's important to understand the material from "Square One Classics: The Shocking Truth" in the June 2001 issue, so try to have a copy of that issue handy.

EXPONENTS

Thanks to high school math teachers, exponents and logarithms frighten many people, but they're really not that complicated. Exponents provide a way to simply and elegantly represent the result of multiplying the same number

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several times. For example, consider the following equation:

$$2 \times 2 \times 2 \times 2 \times 2 = 2^5 = 32$$

In that example, the 2 is called the *base*, and the 5 is called the *exponent*.

Exponents also help express very large numbers with relatively few digits. For example, 10,000,000 = 10^7. You can even use fractional exponents; for instance, $5^{2.3}$ = 40.52. In fact, you can make a graph of the relationship between exponents and the value they generate for a given base (see **Fig. 1a**).

Exponents also help express mathematical formulas more elegantly. For example, take a look at the DC form of Joule's Law defining electrical power (in the following equations, recall that P = power, V = voltage, I = current, and R = DC resistance):

$$P = V \times I$$

From Ohm's Law relating current, voltage, and resistance, you know that I = V/R. If you substitute V/R for I in Joule's Law, you get:

$$P = V(V/R) = (V \times V)/R = V^2/R$$

You can make a similar substitution for V, which equals $I \times R$:

$$P = (I \times R)I = (I \times I)R = I^2 \times R$$

Now you have three equivalent expressions of Joule's Law:

$$P = V \times I$$
$$P = V^2/R$$
$$P = I^2 \times R$$

LOGARITHMS

Logarithms (or *logs*) are simply the opposite of exponents. In sound applications, the base is assumed to be 10, and logs are defined thus:

$$If\ a = 10^b\ then\ b = log\ a$$

The following is difficult to translate to English, but I'll give it a try. Logarithms identify the exponent *(b)* to which you would raise 10 in order to obtain the number you are taking the logarithm of *(a)*.

For example, 100 = 10^2, so log 100 = 2. That also works with fractional exponents. For example, 20 = $10^{1.301}$, so log 20 = 1.301. If you create a graph of the relationship between numbers and the logs of those numbers, you see that the graph is identical to the exponent graph flipped across a diagonal (see **Fig. 1b**). To calculate logs, use a calculator with a log function.

Logs help you manipulate large numbers more easily. They also help you manipulate large ranges of numbers, which is why they're used in decibels: audio signal levels encompass a large range of possible values. In fact, logs act like "mathematical compressors." Just as an audio compressor accepts a large range of input levels and outputs a smaller range of levels, logarithms accept a large range of numbers and return a much smaller range. The graph even resembles the graph of a compressor's input versus output.

DEFINE YOUR TERMS

I covered voltage, current, impedance, and power in the June 2001 "Square One Classics," and I discussed exponents and logarithms here, so it's time to look at decibels. For now I'll stick with electrical decibels; I'll apply the same principles to acoustic decibels in a future column.

The following information is pretty dense. At first it might seem highly theoretical, but have patience; I'll include some practical examples in the next column.

Many people use the term *decibel* as if it were an absolute unit for measuring the amplitude of electrical audio signals. However, that is not correct. When used with electrical audio signals, decibels express the ratio of two values. Scientists at Bell Labs invented a unit of measurement to compare two power values and called it the *bel* in honor of Alexander Graham Bell. By definition:

$$Number\ of\ bels = log\ (P_1/P_0)$$

P_1 and P_0 are quantities of power in watts, and P_0 is usually a reference power value to which another power value (P_1) is compared.

There are several reasons to work with a power ratio's log instead of the ratio itself. As mentioned previously, logs help you work with large ranges of numbers more easily, and audio ratios can encompass a very large range. For example, the ratio of the loudest sound you can stand to the softest sound

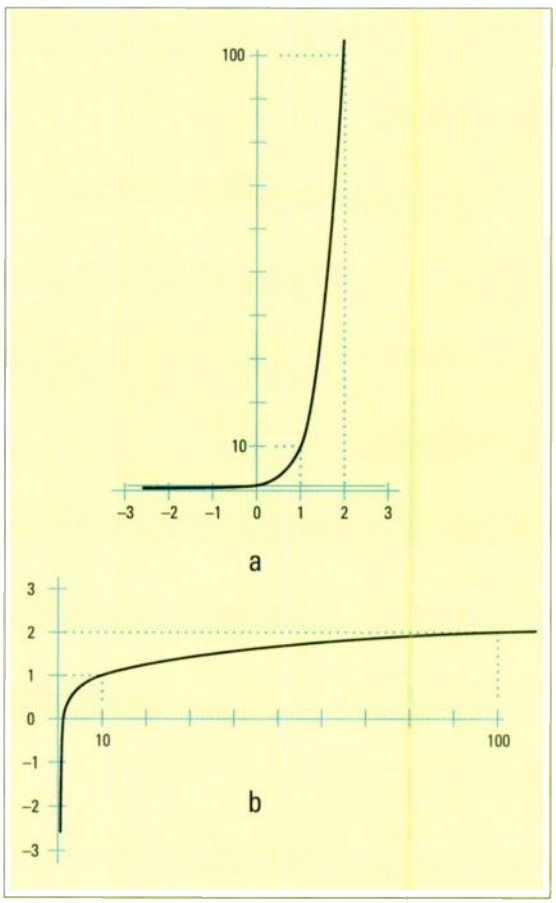

FIG. 1: If you raise a specific number to different exponents, the result grows quickly as the exponent increases (a). In this case, y = 10^x. On the other hand, if you take the log of different numbers, the result grows very slowly as the initial numbers increase dramatically (b). In this case, y = log x. Notice that the graph resembles that of an audio compressor's performance.

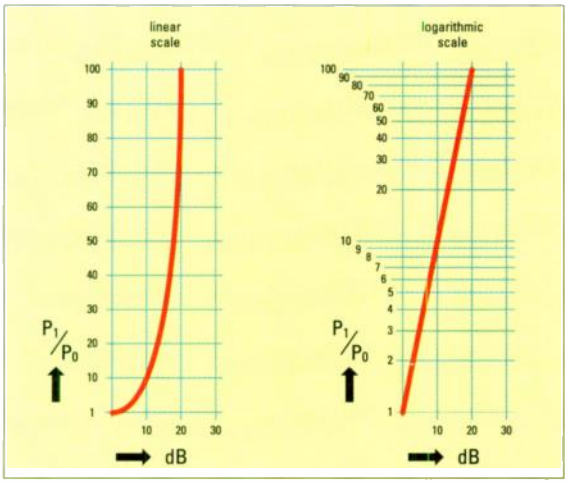

FIG. 2: If you graph decibels with respect to the corresponding power ratios using a linear scale (left), each increase of 10 dB takes ten times more vertical space. However, if you use a logarithmic scale (right), each increase of 10 dB takes the same vertical space, and the curve becomes a straight line.

you can hear is approximately one trillion to one. Logs act as mathematical compressors, reducing a large range of values to more manageable proportions.

In addition, the sensitivity of human hearing to amplitude is generally logarithmic. You perceive equal changes in the percentage of amplitude, not in amplitude itself. For example, if one sound seems twice as loud as another sound, the louder sound's amplitude is more than three times the softer sound's amplitude, not twice the amplitude. That is why logarithmic potentiometers are used in most audio gear instead of linear pots.

As it turns out, bels "compress" power-ratio values too much to be useful in audio circuits. As a result, audio engineers use the *decibel*, which is equal to one-tenth of a bel (that is, there are ten decibels to one bel) and is abbreviated *dB*. By definition:

$$\textit{Number of decibels} = 10 \log (P_1/P_0)$$

Decibels are often plotted on a graph with dB on the *x*-axis and the power ratio from which they arise on the *y*-axis. As you can see in **Fig. 2**, that can be done in two ways. If the graph uses a linear scale, the curve is relatively complex and takes ten times as much physical space to represent the ratio 100:10 as it does for the ratio of 10:1, even though both ratios are equivalent. You would need a very large piece of graph paper to represent a ratio of 1,000,000,000,000:1.

If you use a logarithmic scale, however, the curve becomes a straight line and equivalent ratios (for example, 100:10 and 10:1) occupy the same physical space on the graph. That makes it easy to see that a difference of 10 dB is the same percentage of change in the power ratio, regardless of the power values. It also makes it easier to chart large ranges of numbers in less physical space.

VOLTAGE AND CURRENT

Decibels are also used to compare voltage values, especially with circuits that exhibit high impedance and let little current flow. However, the equation is slightly different. Without going into the mathematical derivation, the formula for voltage-referenced decibels is:

$$\textit{Number of decibels} = 20 \log (V_1/V_0)$$

By the same reasoning, you can apply the same equation to current.

$$\textit{Number of decibels} = 20 \log (I_1/I_0)$$

Decibels are rarely applied to current. If a circuit draws more than a negligible current from a voltage source, units of power are used instead. If a circuit draws very little current (that is, impedance is high and load is small), volts are used.

Now that the basic concepts are out of the way, I can present some more practical information and examples of how decibels are used. But that will have to wait until next time, so stay tuned.

EM *technical editor* **Scott Wilkinson** *has been zapped more than once after carelessly touching the poles of an AC wall outlet.*

We welcome your feedback. E-mail us at emeditorial@intertec.com.

Uncharted Territory

Don't set sail on a musical journey without studying industry charts.

By Michael A. Aczon

One of the coveted positions in the music industry is the No. 1 spot on the charts. Although musicians dream of it and work toward it, many don't fully understand what being No. 1 really means. This column is a guide to deciphering the mysteries of music charts and making a plan for getting your music on them.

Generally, music charts are trade information put out by music and media publications that report on commercial recordings. Most music charts share a few traits. They are periodical, meaning that they are a snapshot of how the music scene looks during a period of time (usually a week but sometimes two weeks or even a month, depending on the publication). Charts also rank or order the music being reported. Some people find that unsettling because it appears to turn art into a popularity contest, but it may be of some comfort to realize it is simply informational.

BEN FISHMAN

The various charts also differ in a number of ways. The main difference is the target market of the publication putting out the chart. For example, a chart found in a publication primarily concerned with the radio industry may be an accurate indicator of radio play but might not pay as much attention to retail sales, Internet downloads, or nightclub popularity. Another difference among charts—even within the same publication—is musical genre. The buying and listening patterns of people who enjoy country music are generally not the same as those who enjoy dance music, so the type and sources of data for those two charts will be different. Encouraging for artists is the fact that charts recognize a wider

Yorkville and the Bluebird - It's All About the Music

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The Bluebird is the room where the most successful songwriters in the business gather together and perform the now famous 'In the Round' sessions and try new material for audience and peers, to meet, to collaborate with and to inspire each other. For more info on Amy Kurland and the Bluebird Café, go to www.yorkville.com and follow the 'real people' link, or go to www.bluebirdcafe.com

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variety of music than they did in the past, so you can find specialty charts such as "Ñ Alternative" (see **Fig. 1**) in *CMJ (College Music Journal)*, "Top Internet Album Sales" in *Billboard*, and "Smooth Jazz" in *Gavin*, a broadcasting industry publication.

HOW DOES IT WORK?

The publications that compile charts use various methods to survey the music heard and purchased by the public. In some cases, the entities being surveyed log the music activity relevant to their business and report the results. Others use tracking services to gather and report the information. Results are submitted to a publication's chart manager, who compiles the data and assembles the chart for print.

For example, *Billboard* compiles its "Hot 100" chart using a combination of the data-tracking services of Broadcast Data Services (BDS) to track radio airplay and SoundScan to track sales. The reporting radio stations and retail stores have their airplay and sales monitored by BDS and SoundScan (now do you see why the UPC on your release is so important?), which in turn send the information to *Billboard*. The chart is assembled and published to *Billboard*'s readers, including a variety of industry professionals.

In contrast, *Gavin*'s "Triple A" chart uses a select number of representative radio stations across the country to determine its list of songs. Likewise, the *CMJ* "Radio 200" album chart relies solely on a reporting panel of several hundred college and noncommercial radio stations for its data, which means the magazine has to take into account the differences among the reporting stations. "The *CMJ* 'Radio 200' album chart is based on airplay reports that are collected from a panel of mostly college and noncommercial stations, but the number of reporters varies from week to week and season to season," explains Colin Helms, *CMJ* editor. "For example, during the summer when colleges are not as populated, our total number of reporting stations can go down to 250 or so; during the school year, it is between 500 and 600 stations. Our stations are weighted, meaning that we assign a number to each station, from 1 to 6, based on its respective potential market impact, the enrollment of the school, its geographical location, et cetera. A high-wattage station in the middle of a densely populated urban area potentially has many more listeners—including nonstudents—than a college station in a remote rural area that only hardwires its broadcast in the dormitories and cafeterias, so they will be weighted differently."

Ñ ALTERNATIVE

Period Ending 4/10/2001 www.cmj.com

Contributing reporters this week: 33 • See page 57 for a complete list of Ñ Alternative airplay reports.

TW	LW	2W	PK	WKS	ARTIST • TITLE	LABEL
1	2	2	1	32	**SOUNDTRACK** Amores Perros	Surco-Universal Latino
2	1	1	1	6	**VARIOUS ARTISTS** Escena Alterlatina	Ark 21
3	4	5	3	10	**NORTEC COLLECTIVE** The Tijuana Sessions Vol. 1	Mil-Palm
4	6	3	3	13	**EL GRAN SILENCIO** Chúntaros Radio Poder	Virgin Mexico
5	5	7	4	29	**JULIETA VENEGAS** Bueninvento	BMG U.S. Latin
6	7	8	1	23	**ORISHAS** A Lo Cubano	Surco-Universal Latino
7	10	11	7	4	**ATERCIOPELADOS** Gozo Poderoso	BMG U.S. Latin
8	3	4	2	15	**VARIOUS ARTISTS** Mexamerica	Angelino
9	14	10	5	15	**ORIXA** 2012 e.d.	DLN-Elegua
10	12	23	10	3	**PERET** Rey De La Rumba	Narada
11	8	6	1	21	**KING CHANGO** The Return Of El Santo	Luaka Bop
					UP 7 POSITIONS	
12	19	–	12	2	**DISTRITO 14** Live In Chicago	DLN-GEM
13	13	18	13	4	**CABULA** Communicate	DLN-Indie Love
14	17	25	14	5	**VARIOUS ARTISTS** Fuerza!	Higher Octave
15	9	17	9	16	**SIDESTEPPER** More Grip	Palm Pictures
					#1 DEBUT	
16	–	–	16	1	**MEXICANO 777** God's Assasins	SMA
17	R	–	1	29	**LOS AMIGOS INVISIBLES** Arepa 3000	Luaka Bop
18	16	9	8	7	**MARIA FATAL** Dermis	DLN-Mofo
19	11	13	3	21	**JUANES** Fijate Bien	Surco-Universal Latino
20	R	–	14	12	**SANTA SABINA** Mar Adentro En La Sangre	Babel Discos
21	–	–	21	1	**HECHOS CONTRA EL DECORO** Los Ritmos Del Espejo	Esan Ozenki
22	21	14	8	13	**VARIOUS ARTISTS** Hijos De Boringuen	DLN-Radical Sonica
23	R	–	15	7	**LA BARRANCA** Rueda De...	Manicomio-Universal Latino
24	R	–	14	11	**AUGE** Jugar	Sirena Music
25	–	–	25	1	**JARABE DE PALO** De Vuelta Y Vuelta	EMI Latin

Chart information is based on combined airplay reports of Ñ Alternative releases from CMJ's panel of college, commercial and non-commercial radio stations.

FIG. 1: Not all trade charts list only the best-selling artists. *CMJ* features an array of specialty charts, including "Hip-Hop," "Loud Rock," and "Loud Rock College." The "Ñ Alternative" chart tracks Spanish-language releases.

WEB TRACKING

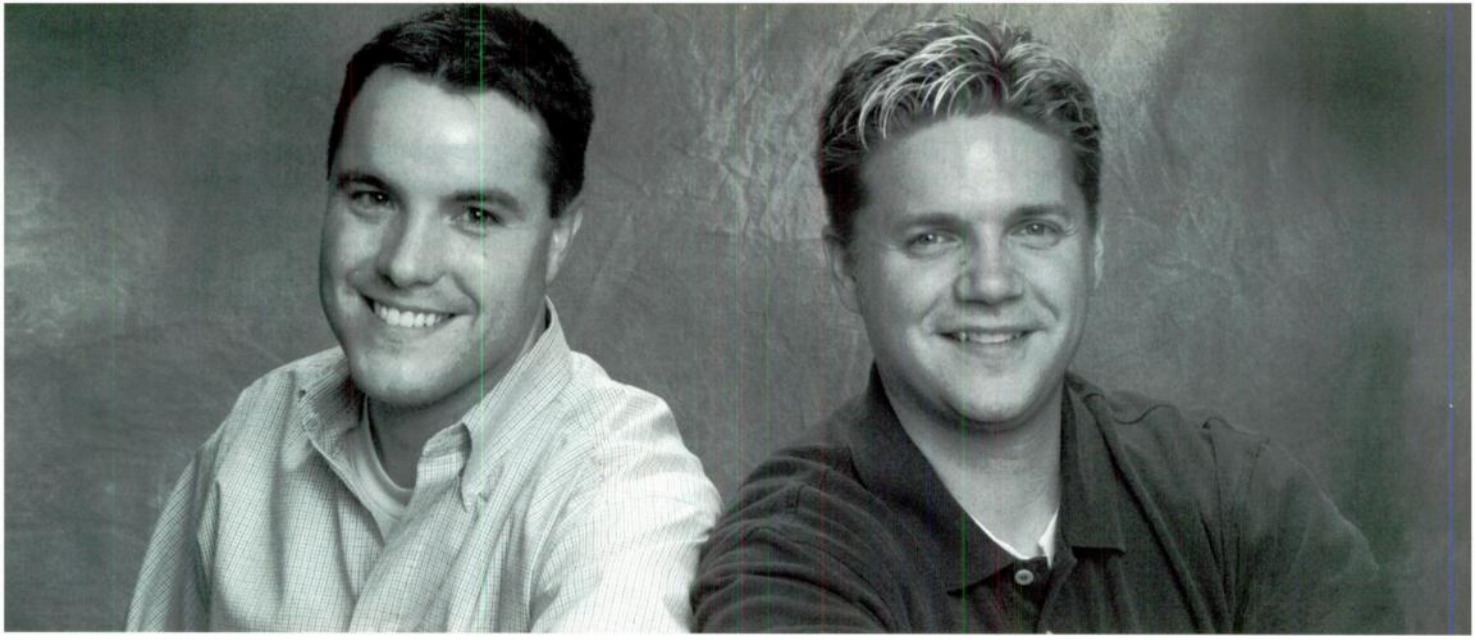
The three music trade magazines discussed in this article all make their charts available on their Web sites. Each chart is accompanied by an explanation of how the data for that chart is compiled.

Billboard www.billboard.com
CMJ www.cmj.com
Gavin www.gavin.com

IS ANYBODY LOOKING?

Depending on the periodical and chart in question, many people important to your career might be looking. For example, if you have music rising on the *CMJ* chart, major labels looking for the next big thing might be interested in how your career is shaping up and will keep a close eye on the buzz you generate on noncommercial stations. If you have a single starting to pick up enough airplay in certain regions to chart in *Gavin*, radio programmers around the country might be interested in playing your song as well. *Billboard*'s "Hot 100" is viewed as the music industry's version of the *New York Times* "Best-Seller List." Portions of *Billboard*'s chart are reprinted in a number of consumer newspapers and broadcast on radio shows, serving as a benchmark for consumers—thus, retail stores—to decide if an artist is the "in thing" to buy.

How well artists fare in the charts can put a label's promotional budgets and payroll, as well as its artists' futures, on the line, which in turn puts pressure on the publications to make sure the information in their charts is accurate and timely. *Gavin*'s music research editor, Jimmy Leslie, explains that each *Gavin* chart is researched differently. "For some charts, we use Mediabase, a computer-based research system that monitors a sample of selected stations," Leslie says. "For others, we receive reports from a combination of commercial and noncommercial radio stations that report their current playlists to us. Reporting days around



"We Had A #1 Hit Because We Joined TAXI"

If you told me that one day I'd co-write the #1 Country song in America, I probably wouldn't have believed you.

My name is Erik Hickenlooper. My writing partner, Jim Funk and I wrote the Kenny Rogers hit, 'Buy Me A Rose.'

We aren't professional songwriters with a string of hits under our belts. Just a couple of ordinary guys who love to write and record our own songs. We live in small towns in Utah, and we both have day jobs.

But, even though we write Country songs, we've never been to Nashville.

'Buy Me A Rose' was recorded on an 8-track in the back bedroom of an old farm house. We only had one microphone. And every time a cow mooed or a plane flew over, we had to stop the tape. Not very high-tech, but it worked.

Jim and I didn't have any music industry connections, so we joined TAXI. It seemed like the smart way to go. Our instincts proved to be right on the money -- literally.

We landed our first publishing deal through TAXI. That resulted in 'Buy Me A Rose' being cut by Kenny Rogers.

Over the next few months, we watched our song climb the charts until that wonderful week when it hit #1 on all three Country Music charts, including Billboard.

Can TAXI do that for you? Maybe. It depends how good your music is.

TAXI proved to us that if your music is great, they really *can* get it to all the right people.

And TAXI's not just for songwriters. They also work with bands and artists, and can get your music in TV shows and films, too.

But TAXI is much more than a way to connect with the music industry. The written feedback you'll get on your material is like having a team of music industry veterans as your personal coaches.

You'll also get TAXI's great monthly newsletter, and a FREE pass to TAXI's private convention, "The Road Rally." This exclusive convention is phenomenal, and worth far more than what your TAXI membership costs.

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here can get really busy, as you can imagine."

CHART VOCABULARY

Understanding the language of industry charts is crucial if you want to use the information they provide to your best advantage. Here is a glossary of some key phrases that will help you interpret charts.

Adds. New releases that are added to a radio station's playlist (see **Fig. 2**).

BDS. Broadcast Data Systems. A tracking service that monitors broadcast music.

Bullets. A chart annotation for music showing extraordinary chart action and rising quickly in popularity. *Heatseekers* and similar terms may also be used.

Most Added

John Mayall and Friends (22) *Along for the Ride* (Eagle)
Marcia Ball (20) *Presumed Innocent* (Alligator)
Various Artists (16) *Bridget Jones's Diary OST* (Island/Def Jam)
Turin Brakes (12) *The Optimist LP* (Astralwerks)
Alejandro Escovedo (11) *A Man Under the Influence* (Bloodshot)

(a)

Spincrease

Lucinda Williams	+259
Cowboy Junkies	+204
R.E.M.	+185
Black Crowes	+141
Blues Traveler	+133
Stevie Nicks	+99

(b)

FIG. 2: *Gavin* provides supplemental data for its weekly "Triple A" album chart. "Most Added" (a) notes the albums that were added by the most stations, with the number of stations shown in parentheses after the artist name. "Spincrease" (b) shows the artists who experienced the greatest increase in spins in the previous week.

Reporters. Key people (or groups) who report to the chart compilers what music is being played or sold. Reporters can include retailers, radio stations, and clubs.

Rotation. A general indicator of how much a song is being played by a radio station or in a club. A song in *light* rotation is being played regularly, but not quite as much as a song in *heavy* rotation.

SoundScan. A computer tracking service that monitors music sales.

Spins. The number of times radio stations play a song during a given period of time. For example, when a song grows in popularity because of simultaneous release of a single and a movie with the same song, radio stations will get tons of requests to play the song, resulting in hundreds of spins in a short period of time.

Tracks. Songs that are treated like singles for chart purposes but have not been released commercially for individual sale by the record company. Examples are an album track or a song from a movie soundtrack.

CHARTING YOUR PATH

Knowing how to increase your visibility and work the charts can do wonders for your career. You can do a variety of things—even at a grassroots level—to get on a chart and keep that chart momentum going.

Familiarize yourself with the chart you are targeting. Research the reporting radio stations, retailers, and clubs for the periodical and the specific chart you are trying to impact. Send those reporting stations your music, along with a specific request that they consider reporting your activity (in the case that they play your music) to the periodical you've identified.

Time your promotional effort. Getting a record on the charts requires a sustained push over time rather than sporadic waves of effort. Mail all of your promotional records at approximately the same time. If you get one or two clubs or radio stations in a geographical area to play your music, give them a reason to keep playing it by doing an interview or scheduling a gig in their area. Simultaneously, work on other reporting clubs and stations in the area, letting them know that their competitors are discovering who you are and what you're capable of.

Get reviewed or interviewed. Be media savvy by preparing your press kit and honing your interview chops so you can be ready to meet the press. Most charts are compiled by companies that are

primarily involved in printed media, so it is key that you are familiar with how to work with that media.

Meet and greet. Some periodicals with charts have conventions or special programs, such as the *CMJ* Music Marathon convention or the *Gavin* radio convention. Meeting face-to-face with the professionals responsible for charting your music can be an invaluable experience.

Hire a professional. Spending the extra money on an independent promoter to handle your promotional effort could be well worth the investment. Someone who has experience and relationships in the industry might be able to keep your charting effort moving forward more efficiently than you could yourself.

Engage in shameless cross promotion. Keep your industry contacts posted on your chart position. Let concert promoters, clubs, record labels, friends, and fans know how you are doing and what they can do to help. If you open for a well-known act, if a college station receives barrage of requests for your song, or if a reporting retailer has a steady stream of buyers, your project can garner much attention.

Create and maintain visibility. Helms offers a bit of advice to up-and-coming artists. "A great way to use *CMJ* effectively is to remember to work on developing a strong local following; an audience will begin to find you from there," he says. "There is some argument as to whether college or noncommercial radio actually translates into sales. Perhaps it won't do it immediately, but if you build your story, buzz, and following with a college audience, you are doing so with the tastemakers of the community. These are people who will be loyal and spread the word about you as an artist."

Be ready to back it up. Preparation will go a long way in sustaining success. Don't let up on your creative efforts, even though you are working hard on your promotional efforts. Stay in contact with radio stations, retailers, clubs, and promoters between projects if possible, keeping them informed as to when your next project will come out.

PEAK PERFORMANCE

Even if you should hit No. 1, find your picture pasted on every magazine cover in the country, and see your song become the most requested hit in the history of humankind, every project peaks and then eventually falls off the charts. Remember that charting (or not charting) is based on an objective reporting of data and is not a subjective editorial about the quality of your artistry. Understanding, planning, and using the charts to your advantage will help you immensely to continue on course.

Frequent "Working Musician" author and entertainment attorney **Michael A. Aczon** *is also a health and fitness enthusiast who can often be found in the gym or on the running trails of Northern California, while sweating out details for his contributions.*

We welcome your feedback. E-mail us at emeditorial@intertec.com.

REVIEWS

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200 Quick Picks: Serato Audio Research *Pitch 'n Time* 2.0.1 (Mac/Win) AudioSuite plug-in; NemeSys Music Technology *Nashville High-Strung Guitars* (GigaSampler) sample CD; BitHeadz *Tubes, Tines, and Transistors* 1.0 (Mac/Win) software synth; DACS Freque II ring modulator; Big Fish Audio *Play the Tango* sample CD; Gear Vision *Logic Audio Basics and Techniques, vol. 1: Getting Started* instructional video

iZ TECHNOLOGY

RADAR 24

Set your sights on this hard-disk recording system.

By Larry the O

There was a time when giants walked the earth and everyone made records on 2-inch, 24-track analog tape. During the decades in which multitrack recording dominated audio, people developed working methods based on the characteristics of the storage medium: tape machines are mechanical and linear.

With the advent of the digital-audio workstation (DAW), many required recording skills changed. In addition the ability to work in a nonlinear fashion opened new doors for creativity. However, the interface between artist and machine was often less than intuitive.

In the personal studio, musicians want a recording device that is as fast and intuitive to use as a tape deck but with the advantages that DAWs provide. iZ Technology wants to be on those musicians' radars. (Some puns are not to be denied.) iZ's founders created the Radar hard-disk recording system in 1993. The Radar and its successor, the Radar II, were distributed by Otari until last year, when their deal expired, and iZ decided to carry on by itself.

Enter the Radar 24, a hard-disk recorder built to operate like an analog tape deck (see **Fig. 1**). The Radar 24 is a self-contained system that has a dedicated Intel 600 MHz Celeron Pentium III running the Be operating system; 24 channels of 24-bit analog I/O; TDIF, AES/EBU, or ADAT Lightpipe digital I/O; and a controller that bears

FIG. 1: The iZ Technology Radar 24 is a hard-disk recording system that was designed to be easy to use and virtually crash proof.

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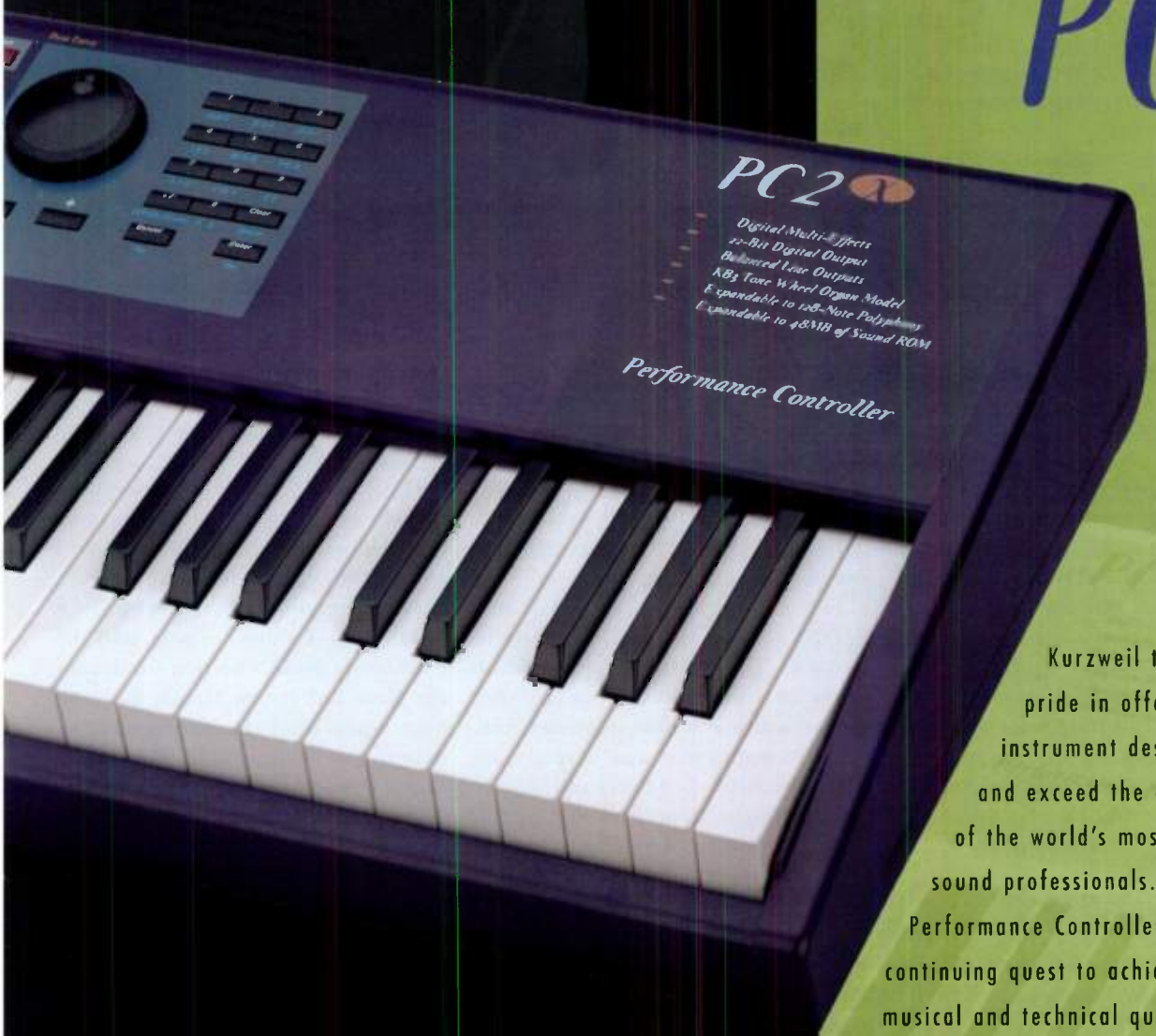

Kurzweil takes great pride in offering an instrument designed to meet and exceed the expectations of the world's most demanding sound professionals. The PC2 Performance Controller represents a continuing quest to achieve the highest musical and technical quality possible. Stunning new sounds, fantastic effects, precise control, and superior audio quality, are only a few of the features that make the PC2 the finest instrument of its kind.

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a deliberate resemblance to a tape-machine transport controller.

ON THE RADAR

Although the Radar 24 is built to record at sampling rates as high as 192 kHz, the 24-track maximum is available only at sampling rates as high as 48 kHz. The higher sampling rates decrease the track count proportionally: each time you double the sampling rate, you cut the number of tracks in half. If you record at 192 kHz, you will have only six tracks to work with.

As many as eight Radar 24 systems can be sample- and phase-locked through iZ's proprietary Radarlink to create a 192-track system. In addition, iZ created an integrated 48-track version of the Radar system.

The Radar 24 consists of a 43-pound, 4U chassis and the KC24, a PS2 keyboard with keycaps labeled with the Radar 24's functions. To get a DAW-like environment, hook up a USB mouse for audio scrubbing and a standard SVGA monitor for a display.

The review unit included the optional Session Controller ($1,195), which can be used with or without the KC24 keyboard, monitor, and mouse. Although the KC24 is entirely adequate as a controller, it's worth buying the Session Controller for its track-select buttons, scrub wheel, and superior layout as a machine controller. With the Session Controller in front of me, I never had an urge to use the keyboard.

MAJOR CONNECTIONS

At the far right of the chassis's rear panel are the slots into which the optional analog I/O cards fit (see **Fig. 2**). At the time of this writing, two kinds of I/O cards are available. Each comes as a three-board, 24-channel set: the Classic card ($1,695 per set) features 24-bit, 128× oversampling Delta Sigma A/D converters that support sampling rates as high as 48 kHz; and the Nyquist card ($2,995 per set), which has 96 kHz recording capabilities. The Super Nyquist 192 kHz card is not yet available, though the 96 kHz Nyquist card boasts 192 kHz D/A converters.

You can't mix and match cards. The review unit had a set of Classic cards, each carrying eight channels on a DB25 connector.

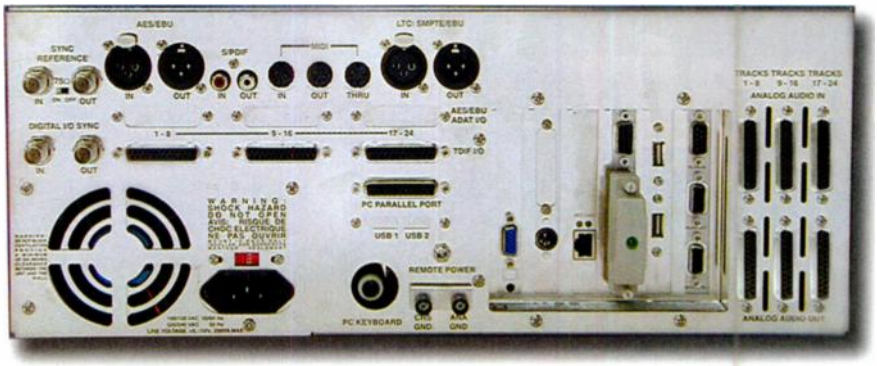

FIG. 2: The rear panel of the Radar 24 is where the action is. With the exception of TDIF digital I/O, 24-channel audio and digital I/O boards are optional.

For digital I/O, the basic unit includes six DB25 connectors for 24 channels of TDIF compatibility. A 24-channel AES/EBU option is also available, and the ADAT Lightpipe I/O should be available by the time you read this. You can choose the AES/EBU or Lightpipe options to supplement the analog and TDIF I/O. The three connector types can be used simultaneously.

Two channels of AES/EBU and S/PDIF I/O are also included with the Radar 24. The formats are independent of the 24-channel option, but only one can be active at a time. However, you are not constrained to send or receive an odd/even pair: each input and output channel can be separately assigned.

In addition to the audio I/O, the Radar 24 has a comprehensive set of time code and sync connections. The unit can send and receive time code as LTC on XLR jacks or as MIDI Time Code (MTC) through the unit's MIDI jacks. The MIDI jacks include a Thru, which is a valuable commodity frequently left off of modular digital multitracks (MDMs).

Clock sync is available as word clock or video sync on BNC jacks. Video sync is confusingly labeled Sync Reference on the rear panel, as if word clock weren't a sync reference too. iZ is well aware of the installed base of the Radar I and II units, and it has put a good deal of effort into making sure that solid compatibility exists between the Radar 24 and its progenitors.

In addition to the Radar 24's extensive sync features, the device has an unusually high degree of integration with Soundmaster, a popular system in post-production for controlling multiple machines of various types. In fact, Soundmaster can control every function of the Radar 24 that can be executed from the Session Controller.

The Radar 24's computer connections include a standard SVGA monitor output, a loosely mounted PS2 keyboard connector (you might want to brace that connection), a parallel port, a 10/100Base-T Ethernet port, and the connectors for iZ's Session Controller and Radarlink system. Finally, there are Sony 9-pin, SCSI (for additional disk drives), and audio ground connections and a detachable IEC power cable. Those should be enough connections for most people.

The rear panel sports a loud fan; think vacuum-cleaner ambience. The Radar 24 also produces a prominent high-pitched whine after being on for a while, though sometimes it goes away after a few minutes. If you have a machine room, you will need to use a longer cable between the chassis and the remote than the one supplied. A 20-meter cable costs $150. If you don't have a machine room, you will be pleased to know that iZ will be using a quieter, more efficient fan by the time you read this.

A CLEAN FACE

The front panel is considerably more spare than the rear panel. It has a power switch, a removable hard-drive bay, a

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DVD-RAM drive, and a floppy drive. The hard-drive bay comes with a 9 GB, 10,000 RPM Seagate Cheetah drive, which yields more than 43 minutes of 24-bit, 48 kHz, 24-track recording time. iZ offers 18 and 36 GB drives as well.

You can add your own removable drives instead of buying them from iZ as long as you use approved drives (visit the iZ Web site for details). The company also reports that it's working with storage specialist Glyph Technologies on additional storage options, including RAID arrays.

The 2× DVD-RAM drive is used for backup by the onboard backup software. Although the Radar 24 ships with the DVD-RAM drive, you may opt instead for an 8 mm Exabyte tape drive or even a Sony AIT tape drive, which, though costly, is an excellent high-speed, high-capacity medium.

TOTAL CONTROL

The Radar 24 is best controlled from the Session Controller (see **Fig. 3**). At 20½ inches wide and 10¾ inches deep, the Session Controller is not exactly the smallest DAW control surface available. That's because it has numerous buttons and a meter bridge with 20-element LED-ladder meters that indicate peak levels. You can also opt for 24- and 48-channel meter bridges.

Along the top of the controller are 48 numbered buttons used to select tracks for any function. With the exception of arming tracks for recording, the Radar 24 works in the reverse of the typical graphical user interface (GUI): in computer applications, you typically select materials and then specify the action to be performed. With the Radar 24, you choose the action and then use the track keys to select the tracks that will be acted upon. A red LED in front of each button illuminates to indicate that it has been selected. The LED blinks when a track is armed for recording.

The Radar 24's layout is not difficult to grasp. However, I was immediately reminded of just how wonderful it is to have large scalloped buttons that feel good to punch and over which you can run your finger to quickly select a group of tracks. With today's emphasis on compactness and pages of submenus, the sheer pleasure and efficiency of that button array has been forgotten. The physicality of the controller is, in fact, one of the Radar 24's major strengths.

Below the track-select buttons are three major groups of function buttons; a QWERTY keyboard with full-size keys; a 10-key number pad; arrow buttons; basic transport controls; a jog wheel flanked by four associated buttons; a two-character LED display showing the current project; and a 32-character, 2-line LCD through which the Radar 24's operations are executed.

One button group is made up of disk, backup, and project-management functions. The top row is reserved for eight programmable macro buttons, each of which can store a sequence of 128 key presses. Given how much the Radar 24's operation centers on button presses, the addition of macro keys adds a good deal of efficiency to the system. Version 3.05 of Radar 24's software lets you export macros to a floppy disk and load them onto another Radar system.

The second button group contains basic edit functions (Cut, Copy, Paste) and record functions (Cycle, Autopunch). The third group contains utilities such as Undo, sync enabling and disabling, and marker placement.

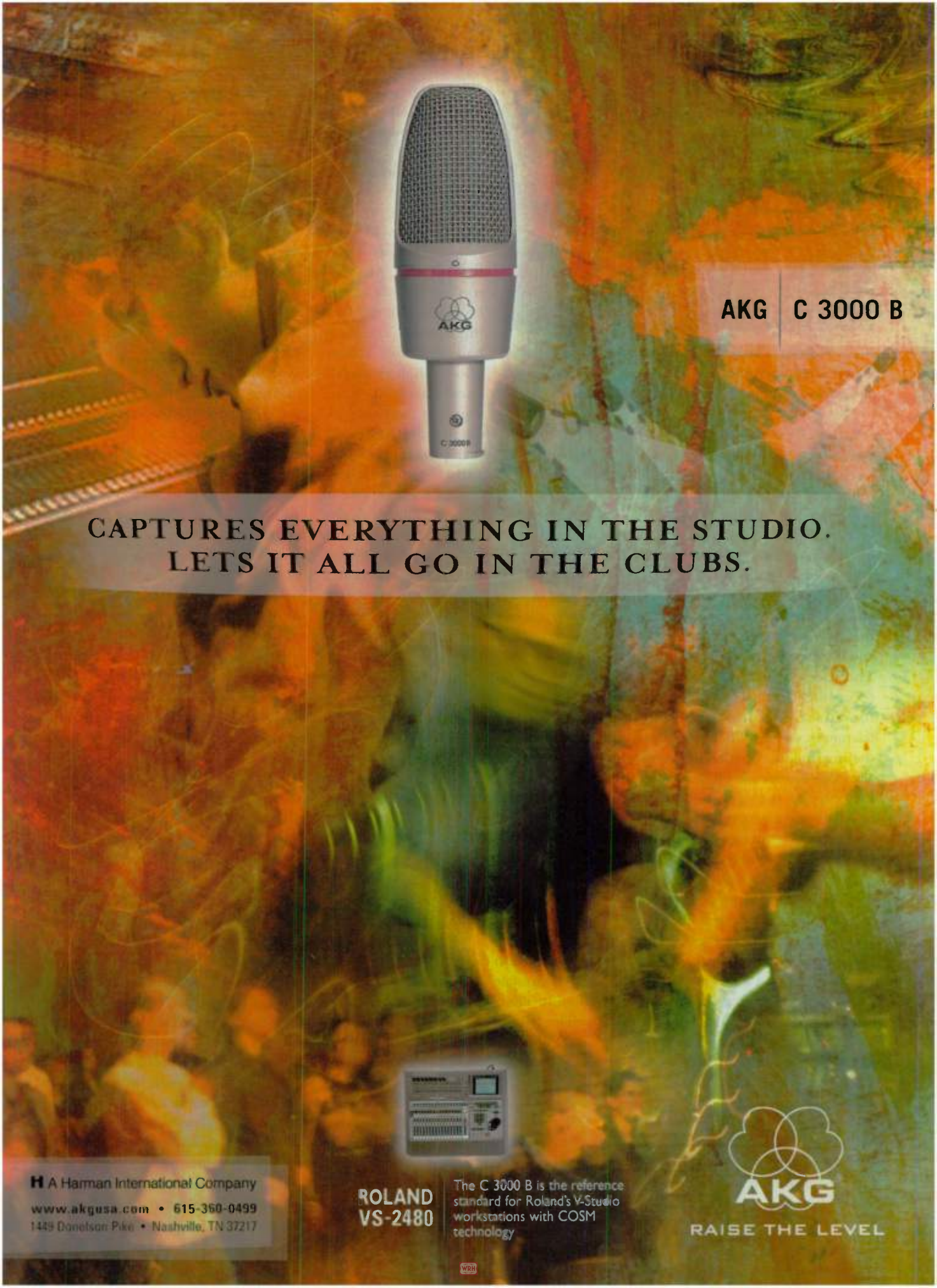
Many configuration functions are accessed through the menu system and by pressing the Menu/Prev button on the 10-key pad. Navigating the menu system on the Session Controller is logical but entails numerous keystrokes to plumb its depths.

PRESSING RECORD

Recording with the Radar 24 is so simple that it hardly requires description. Set your sampling rate, create a new Project, arm the tracks, press Record and Play, and off you go. When you need to set a punch point precisely, go into Jog or Shuttle mode and use the wheel. The Session Controller's jog wheel feels nice, which makes a big difference as you scrub through the audio.

Radar 24 Optional I/O Specifications

Analog I/O	Classic audio board, Nyquist audio board, S-Nyquist audio board (3 boards, 8 channels each)
AES/EBU I/O	standard 2-channel; optional 24-channel
ADAT I/O	optional 24-channel
Sampling Rate	Classic 32–48 kHz; Nyquist 32–96 kHz; S-Nyquist 32–192 kHz
Analog Input Level	+4 dBu nominal
Analog Output Level	+4 dBu nominal
Headroom	selectable up to +24 dBu
Frequency Response: Classic	10–22 kHz (±0.5 dB @ 48 kHz)
Frequency Response: Nyquist	10–22 kHz (±0.5 dB @ 48 kHz); 10–45 kHz (±3 dB @96 kHz)
Frequency Response: S-Nyquist	Not specified
THD+N (A/D/A): Classic	0.004% max., A-weighted
THD+N (A/D/A): Nyquist	0.003% max., A-weighted
THD+N (A/D/A): S-Nyquist	0.003% max., A-weighted
Dynamic Range (A/A)	Classic 101.5 dBA; Nyquist 108 dBA; S-Nyquist 108 dBA
Dynamic Range (A/D)	Classic 106 dBA; Nyquist 114 dBA; S-Nyquist 114 dBA
Dynamic Range (D/A)	Classic 104 dBA; Nyquist 109 dBA; S-Nyquist 109 dBA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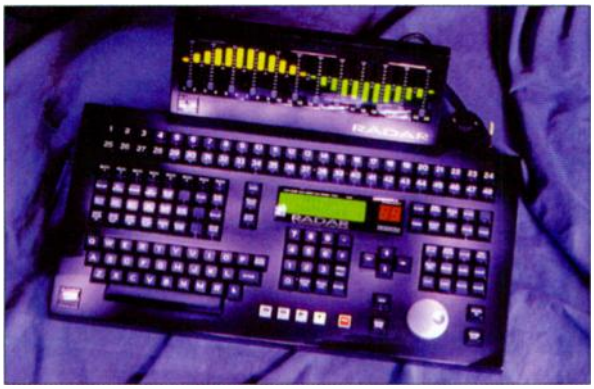

FIG. 3: The Radar 24 Session Controller includes buttons dedicated to most of the important recording functions, which lets you use the DAW as you would an analog multitrack recorder.

Varispeed recording and playback ranges from +71 to –1,199 cents. In fact, Varispeed sounded so good that I found myself spinning the jog wheel just to hear the speed change.

I used the Radar 24 in my project studio to track drums, vibraphone, electric guitar, vocals, and synths. Vibes are always an acid test for microphones, preamps, and recording media because of the attack transients from the mallets and the pure tone of the sustaining bars. The overwhelming majority of vibe recordings I hear lack any softness in the attack and don't have the low-frequency warmth I hear when playing the instrument. I generally record the vibes with Earthworks SR77 mics because they capture the warmth and the softness of the yarn-covered mallets I use. But the final result varies noticeably with the recording medium. The Radar 24 beautifully captured the less aggressive quality I look for, whereas the transients stayed crisp and the harmonics clear.

Cymbals are another telltale source for the recording chain. Again, the Radar 24's sound was very satisfying. It captured the soundstage from the room mics quite well. Vocals also sounded nice and maintained their presence without harsh sibilant artifacts. The only sound the Radar 24 isn't well suited for is an extremely edgy and aggressive "buzz saw" electric guitar.

Throughout most of my work on the Radar 24, I engineered as I played, which is particularly indicative of how easy the system is to use. As long as the Session Controller was within reach, I could quickly and fluidly punch in, record, locate, and tackle other common tracking maneuvers.

iZ focused on making the Radar 24 great sounding, easy to use, and reliable. After recording with the system, I was left with the feeling that the company had admirably accomplished all three goals. I immediately liked the sound of the Radar 24: it has a smooth high end that doesn't suffer from phase problems; a full, round low end; and a distinct soundstage. I do regret that I was unable to record at the higher sampling rates.

Unlike many DAWs I've worked with, I never felt insecure about the Radar 24's stability: it never crashed. When I called iZ's 24/7 tech-support number at ten o' clock one night, the phone was answered in a few rings by a friendly and knowledgeable person who answered all my questions. That inspires additional confidence in the unit.

MASTER OF ONE TRADE

No recording system can do everything well, and the concepts embodied in the Radar 24 cut both ways. Each type of audio work has a set of actions the practitioner employs quickly and frequently. In music recording, those actions include locating, track arming, and going into and out of record. Speed is important, because it's all about capturing the moment.

For modern digital editing, the ability to manipulate files using a GUI is paramount. That's crafting the moment.

The Radar 24 does well in the first of those applications; the functions one needs quick access to while recording, such as the ability to drop auto-locate points or markers (as many as 99) on the fly, are well represented. Unfortunately, when you're done using a function, it's not as easy to make changes to your work. For example, once stored, the placement of the auto-locate points can only be modified by manually entering a new time code; it's not possible, for instance, to overwrite an auto-locate point with the counter-value. To accomplish that, you have to grab the counter of a new marker and swap it with the previous one.

I used the auto-locate points extensively, accumulating more points as I worked through the piece's sections. It would have been easier if I could have reused half a dozen points repeatedly.

THE FLOW

iZ made the Radar 24 easy to use by sticking to a well-established approach that emphasizes a multitude of dedicated function buttons in place of a DAW's icon and menu approach. If the Radar 24 were merely a recorder, the Session Controller would be all you'd need.

But the Radar 24 has random-access and editing capabilities as well. To accommodate those features, iZ included the video monitor output and Radarview software. Although Radar 24's editing facilities are on par with other standalone hard-disk recorders, it is still not as facile for editing as a DAW.

For example, Radarview presents a zoomable waveform display of the tracks, a replica of the Session Controller's track display, and a parameter display area. The screen's layout, however, falls short of a DAW front end in a number of ways. To begin with, there is no mouse interaction within Radarview, neither from the PS2 mouse input on the chassis nor from the nonfunctional serial mouse input on the Session Controller. The only way to select waveforms, tracks, or edit parameter values is with the keyboard or the Session Controller.

The Radar 24 has no onscreen menus other than the replica of the Session Controller's display. There are large areas of unused screen real estate, yet the parameter displays are quite small. You can zoom in vertically until a single track dominates the screen, which is great, but you can't zoom to the sample level horizontally. Crossfades are adjustable in time as high as 100 ms, but the shape is not adjustable. You get the idea.

On the other hand, the time code display, essential for recording, can be

seen from across the room, which is excellent. Additionally, the Session Controller has ¼-inch phone jacks for controlling punch, location, and Play/Stop with footswitches.

Despite that GUI brouhaha, the Radar 24 is what it's billed as: a great recording system. Once you record into the Radar 24, you may have to bump your tracks to another system for editing.

NO FREE TRADE

One of the Radar 24's weak spots is its inability to import or export its EDL/session data and to import or export audio files except WAV files from a 3.5-inch floppy disk. At 96 kHz, that gives you about seven and a half seconds of stereo audio per floppy.

The bottom line is that you can only transfer audio into and out of the Radar 24 in real time, as you would with an analog tape deck. However, iZ is working on adding audio-data transfer capabilities in the Broadcast Wave format and session-data transfer capabilities in the AES31 format. That will allow data interchange with other platforms during production and provide an alternate backup and archiving option using standard file formats.

Another useful upgrade will be the activation of the Ethernet connection. That will let you integrate the Radar 24 into a networked environment.

Radar 24 Specifications

Tracks	24
Digital I/O	(2) channels AES/EBU; (2) channels S/PDIF; (24) channels TDIF
Sampling Resolution (recording)	16-bit or 24-bit linear (switchable)
Internal Processing Resolution	24-bit
Clock Reference Sources	internal crystal; external word clock; video; MTC; LTC; TDIF; AES/EBU; and S/PDIF
Time Code Type and Rate	LTC/MTC: 24, 25, 29.97, 30 drop frame, 30 nondrop
Dimensions	4U × 10.75" (D)
Weight	43 lbs.

ON THE DOCS

Once you step outside the standard recording features, things get a little difficult. The Radar 24 requires a lot of button pushing to step through menus. If you miss a parameter in a menu, the documentation is not very helpful. The Radar 24 is supplied with a set of PDF files on a CD-ROM and a hard-copy *Quick Start* guide that is as much marketing hype as owner's manual.

Unfortunately, each chapter in the PDF manual is a separate file, and nothing ties them together—no hotlinks, bookmarks, or index. Some information, including important key shortcuts such as Jump to Session Start, cannot be found in any chapter. iZ reports that a new manual is in the works. Buy the hard-copy manual; on a number of occasions, the only reason I had my computer on was to look at the manual.

BUT WAIT, THERE'S MORE

The Radar 24 is a superb recording system that combines the essential values of sonics and ergonomics with the priceless virtues of reliability and support. I was impressed with how well iZ "got it" about the real needs and priorities of recording engineers. When I spoke with iZ, my criticisms were almost always met with statements of steps already being taken to address the problems, and in many cases, the solution was already on the verge of release. Company representatives stressed their openness to feedback from users and cited numerous examples of newly released features that were given high priority because of emphatic user requests.

The Radar 24's weaknesses are primarily in its editing capabilities and its inability to exchange file and session data. With a strategic handful of GUI upgrades, iZ could forge an incredible synthesis of an optimized recording device with the generalized front end of a DAW. For the project studio, resolution of the noisy fan issue will also be important.

A realistic purchase of the Radar 24 would include several options, not the least of which is analog I/O. A realistic configuration would be the basic unit ($4,995), the Classic analog I/O card set ($1,695), and analog I/O cables (DB25 to XLR or TRS), which would cost about $750. The Radar 24 is best controlled using the Session Controller ($1,195) with a meter bridge (add $495 for the 24-channel version) and a 20-meter cable ($150). At that point, you're at more than $9,000, which is a bit more than a host-based DAW.

However, if you're interested in multitrack music recording, The Radar 24 is a tough system to beat. It sounds great, is easy to use, and is dependable. That's a potent combination. The Radar 24 is clearly capable of meeting the rigors of real-world professional recording. ●

PRODUCT SUMMARY

iZ Technology
Radar 24
hard-disk recorder
$4,995

FEATURES	3.5
EASE OF USE	4.0
AUDIO QUALITY	5.0
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: Great sound. Multiple I/O options. Highly reliable. Strong support. Excellent tactile controller and operational feel while recording.

CONS: Lack of file exchange. Noisy fan. Poorly implemented GUI. Limited edit functions. Poor documentation.

Manufacturer
iZ Technology
tel. (604) 430-5818
e-mail sales@izcorp.com
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STEINBERG

NUENDO 1.5 (MAC/WIN)

Professional digital-audio workstation for media production.

By David Miles Huber

One of the most anxiously awaited computer-based digital-audio workstations (DAWs) is the latest version of Steinberg's *Nuendo* for Mac and Windows. Aimed at the music, audio-for-film, video, and interactive-media markets, *Nuendo* 1.5 is a fully professional DAW. It's based on a new native software code for recording, editing, and mixing as many as 500 tracks of MIDI and digital audio at rates of up to 192 kHz with 32-bit resolution (if you have the hardware for it).

In addition to handling large numbers of tracks and channel inputs, one of *Nuendo*'s greatest strengths is its ability to mix in a variety of output formats. With support for mono, stereo, and any surround format with a maximum of eight discrete channels, *Nuendo* is a great candidate for producing and mixing music, scoring and placing effects into a film or TV show, or creating a surround-sound design for a new video game.

An important aspect of *Nuendo* is that it works entirely in a native-processing environment. Every function—processing, mixing, routing, the whole works—runs on the computer's host processor or dual processors. Advanced multiprocessor support is included. That approach has the distinct advantage that the software isn't tied down by a preconceived hardware design, but it can be upgraded as computer technology develops and processors get faster. Consequently, the system will grow with you without demanding a massive reinvestment each time your hardware expands.

Minimum System Requirements

Nuendo

MAC: G3/233; 128 MB RAM; OS 9; MIDI interface

PC: Pentium II/266; 128 MB RAM; Windows 98/2000/NT 4; stereo, 16-bit, 44.1 kHz sound card with ASIO, DirectX, or Windows Multimedia–compatible driver; MIDI interface

LAY OF THE LAND

One of the first things you'll notice about *Nuendo* is its resemblance to Steinberg's flagship audio and MIDI sequencer, *Cubase VST* (see **Fig. 1**). I'm not a big fan of German audio-editing software; *Cubase* is a program that I have never felt comfortable with because I don't totally understand it. Fortunately, enough changes have been made to *Nuendo* that I immediately had an intuitive sense of most of what was going on. I was off and running in no time.

Nuendo includes four main functional blocks: the Project window, the VST Mixer, the Transport, and the Pool. The Project window is the main area in which waveform data, track-layout information, and the Ruler are displayed. Tracks can include audio, video, and MIDI Events as well as markers, master output automation, and plug-in automation. Once Events have been brought into the Project window, they can be easily moved to other tracks, looped, sliced, diced, and grouped. *Nuendo* can have more than one Project open at a time, letting you move Events from one Project window into another simply by dragging them.

Double-clicking on an Audio Event pops up a stereo or mono Edit window that offers a simple and rather nice interface for trimming and editing the selected wave file. To select any number of Events to be grouped, moved, and so on, use the mouse's lasso function or hold the Shift key and select individual Events. Once selected, right-clicking on an Event opens a pop-up menu that displays hundreds of categorized edit and processing functions, including Cut, Paste, Splice, Loop, View, and Group.

Extensive support for a mouse with a center scroll wheel greatly simplifies navigating around the Project window. For example, moving the wheel when the cursor is placed over the main Edit

FIG. 1: *Nuendo* is a complete software-based workstation for audio post, interactive media, and music production. Its tools provide recording, editing, processing, and mixing in mono, stereo, and eight channels of surround sound in a variety of formats.

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- Monitor your MIDI gear in playback and record
- Track with 2 headphones and/or monitors

MIDI CAPABILITIES

Because *Nuendo* draws a large part of its heritage from *Cubase,* you might assume that the program would implement MIDI in a big way—and you'd be right. You can directly import Standard MIDI Files (SMFs) and *Cubase* Song files into the program. Upon importing either file type, *Nuendo* automatically opens, names, and sets up the file's tracks in the Project window. New MIDI tracks can be added to a Project at any time. You can name a track and assign a program number and bank, channel input and output ports, and other parameters in the Track List box.

Once you've played or imported a MIDI track into *Nuendo,* it can be easily edited. In the MIDI Editor's Event window, you can enter, edit, and move notes, ranges of notes, or tracks using a familiar set of MIDI Event editing tools. You can view, enter, and edit MIDI Control Change values in the Controller Display at the bottom of the Event window. That window is really simple because only one Control Change is shown at a time, making it easy to graphically edit or redraw its values.

I imported several complex MIDI files, assigned them to my external synths, and routed them back to *Nuendo* 1.5's audio inputs using my Mark of the Unicorn 24i audio interface (which has 24 analog inputs) without major obstacles. Version 1.0 had serious problems with importing MIDI files (some tracks would not import completely). After I upgraded to 1.5, *Nuendo* imported the tracks, but it chopped some off prematurely. I fixed that by grabbing the tail of the chopped-off MIDI tracks and manually dragging the end boundary to the right, revealing the missing measures.

FIG. 3: Channel Settings can be displayed for each VST Mixer channel. In addition to duplicating the selected channel strip, the window affords access to four inserts, eight effects sends, and four EQ modules with an EQ curve display.

SURROUNDED BY SOUND

One of the most exciting aspects of *Nuendo* is working in surround sound. I'll admit it: I'm a surround hound. Being engulfed in a sound field really has me hooked. My bedroom has a full-blown DVD/surround system, and my studio is fully equipped for surround as well, so I was excited about putting *Nuendo* through its paces.

Output formats include stereo, quad, Dolby Pro Logic, three types of

5.1 surround, 6.1 surround, and two types of 7.1 surround. Once you've selected the output format, the next step is to assign those master outputs to the appropriate sound-card outputs in the VST Output dialog box. When I first selected a surround-output format, *Nuendo* displayed only the first two master-output channel strips. I resized the dialog box to the right, which revealed the rest of the channels. Master-out level or pan adjustments are made in that window. Once the output assignments are made, select the surround panners for each track (or select a surround setup when creating a Project), and you're ready to roll.

The surround panners at the top of each surround channel look like stylized pool tables with balls that display the pan position. Double-clicking on a channel strip's panner opens a larger panner dialog box, which can be square or round, depending on your pan-display settings. The larger box lets you fine-tune the surround placement; it's full of configuration options that control relative pan widths within the selected surround-sound field, center speaker level, and subwoofer level.

Conventional stereo effects can be inserted into the surround field in several ingenious ways. A maximum of eight effects sends can be assigned to a Project. Using the master returns, each effect can be assigned to any L/R, LS/RS, or C/Sub output bus. Several reverbs or other plug-ins can be used to re-create a natural, reverberant sound field. Steinberg has released *Nuendo Surround Edition*, a set of six plug-ins offering as many as eight channels of compression, equalization, loudness maximization, reverberation, and LFE management. TC Works also offers an 8-channel reverb for *Nuendo*. In addition, effects can be inserted into the master-output section for final mastering. When a stereo effect is inserted into a surround Project, a routing patch bay pops up to assign the stereo outs to any surround output channels.

One of *Nuendo*'s most exciting features

PRODUCT SUMMARY

Steinberg
Nuendo 1.5 (Mac/Win)
digital-audio workstation
$1,295

FEATURES	4.0
AUDIO QUALITY	5.0
EASE OF USE	3.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Simple, straightforward layout. Plenty of processing and mixing power. Comprehensive surround-mixing capabilities. Wide range of importing, exporting, and control capabilities.

CONS: No features to humanize MIDI timing. No support for SysEx transfers.

Manufacturer
Steinberg North America
tel. (818) 678-5100
e-mail info@steinberg.net
Web www.nuendo.com

is the Matrix Encoder, a Dolby Pro Logic–compatible plug-in that can actually encode a discrete 5.1 mix into a stereo Pro Logic track. That lets you insert the Encoder into the final stage of the master effects outputs (after the master gain stage) and have *Nuendo* create a stereo mixdown of the resulting file in any of several file formats. That's right: you can end up with a stereo mixdown that's Dolby Pro Logic–compatible.

So what? Considering that serious game surround and the television-broadcast surround standard is Pro Logic, this is your chance to create a stereo music, video, or game soundtrack master that can be heard in surround. On several occasions at major production facilities, I've attempted to transfer a 5.1 discrete mix to Pro Logic using a Dolby encoder and failed miserably. I've tried the same thing with *Nuendo*, and it works amazingly well; for some users, that function alone is practically worth *Nuendo*'s price tag.

FORMATS, WE GOT FORMATS!

Nuendo supports more formats than you might expect. It can import AIFF; AIFC; WAV (Normal and Broadcast, which includes embedded text with additional file data); REX; Sound Designer II; and MPEG-1 Layer I, II, or III (also called MP3) audio files at resolutions from 8 to 32 bits. Files can be exported to MP3, RealAudio, AIFF, WAV, and Windows Media Audio. You can also extract audio from a CD by importing the track or tracks into the Project window or Pool. Support for Virtual Studio Instrument (VSI) and ReWire lets software instruments and programs such as *ReBirth* and *Reason* be integrated into *Nuendo*'s multitrack mixer in a real-time environment.

Additional options include the ability to export and import a Project to and from workstations that support the standard Open Media Framework (OMF) cross-platform FTP. That makes it possible to move Projects from DAWs made by Akai, Avid, Digidesign, Fairlight, Soundscape, TimeLine, and others. *Nuendo* 1.5 also offers Open TL importing and exporting, letting you read the content of drives that have been recorded with Tascam's MX2424. If you plug the MX2424's hard drive into a compatible PC bay, *Nuendo* can import the session files and information directly into a Project. You could even edit the session and export the edits back in the MX2424's format.

Video can be imported into a Project using AVI, DirectShow, or QuickTime file types. Once imported, the audio track can be edited, replaced, and then exported back to the source's native format. The ability to import an Adobe *Premiere* Edit Decision List (EDL) into a Project makes spotting and placement of dialog and effects to time code much easier. In addition, *Nuendo* can create a printable track sheet that includes SMPTE start and stop times for each Audio Event that occurs in a post-production Project; that is an important feature for placing and keeping track of Audio Events within a video or film.

Nuendo supports hardware mix controllers such as the Tascam US-428, Steinberg Houston, Radikal SAC-2K, JLCooper MCS-3000 and CS-10, CM Motor Mix, Roland MCR-8, and Yamaha 01V. A nifty option lets you use a simple game joystick for surround panning. I've been using the program with the Tascam US-428, which was functionally designed with *Cubase* and *Nuendo* in mind. It doesn't have moving faders, but the cost-effective addition has made controlling the program and mixing a lot of fun.

MY TWO CENTS

Combined with its editing, mixing, and real-time processing power, *Nuendo*'s sleek design is reminiscent of having an SSL console on your computer screen. My Pentium III/800 MHz PC has yet to complain, even when I'm working with more than 24 tracks, lots of EQ, and several real-time plug-ins. I'm not used to having so much processing and effects power and such robust capabilities in terms of platform crossing, importing and exporting, and surround sound.

On the graphic-display side, *Nuendo* definitely benefits from having lots of monitor real estate. I have a 21-inch screen, and I don't think I'd be comfortable with less than 19 inches. *Nuendo* addresses its need for viewing space by offering support for dual monitors. For example, that feature lets you put the Project window on the left screen and the Mixer on the right.

Nuendo is fairly bug free, though no newly released program is totally free of problems. If the system crashes (as it occasionally did for me), *Nuendo* has a crash-recovery feature that saves your unsaved moves within a projectname .crs file. At the outset, it's a good idea to name the current Project. If you open a new Project and begin a session without having saved it under a file name, you'll have to start from scratch if your system crashes.

Nuendo isn't meant to be an all-in-one music-production tool. Nonetheless, it comes so close that I really wish it included features to humanize MIDI timing and the ability to record and transmit SysEx dumps. It's packed with so many other features that those additions would have made it a one-stop program for music and mixing production.

Two pieces of printed documentation are included with the software: *Basics* and a complete *Operation Manual*. Copy the PDF version of both books from the program's CD-ROM to your hard drive. They're conveniently hyperlinked in an outline form for quick access to many features and functions. In addition to reading the manuals and help files, occasionally browse the *Nuendo* Web site, which provides program updates, features, and tips. If you use *Nuendo* 1.0, go to the Web site and download the free version 1.5 upgrade, because it's functionally better and far more stable.

I've really fallen for *Nuendo*. It's fairly easy to use, and it has a sexy GUI that makes you feel like you're sitting in front of a big-boy console. It has impressive processing and plug-in power right out of the box, and it works in almost any stereo and surround production and mixing environment. If you want a cost-effective powerhouse that will grow with you into the age of surround sound, give *Nuendo* a long, hard look.

David Miles Huber *has finally finished the update of his best-selling book* Modern Recording Techniques, *5th ed. (http://focalpress.com). His musical explorations can be found at www.51bpm.com.*

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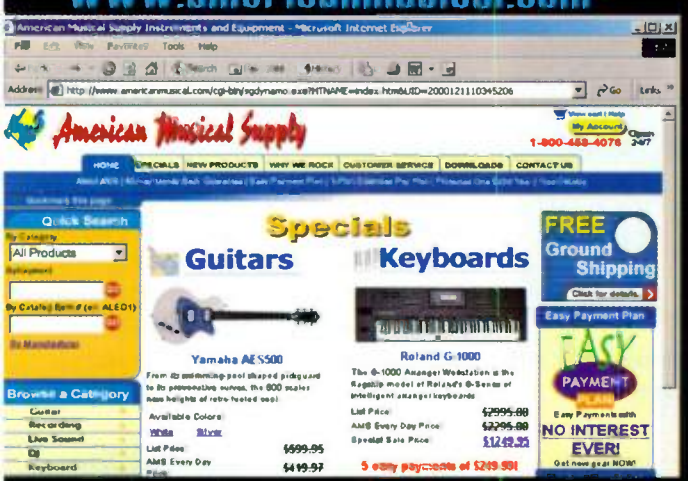

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KORG

CX-3

Korg's most authentic reincarnation ever of the classic Hammond B-3.

By Julian Colbeck

The Hammond players I know fall into two categories. One group likes to discuss the number of notches on a tonewheel and which organs came with a bench and why. The other group doesn't know or care about anything more technical than how to fire up a B-3, grab a fistful of sliders, and wail.

Korg's new Hammond B-3–emulating CX-3, a clever revision of a theme the company first hummed more than 20 years ago, should appeal to both types of players. On one hand, the physical-modeled organ is riddled with "authentic" B-3 niceties and tweaks; on the other, you can simply switch it on and wail away.

In 1979 Korg went for simplicity with the CX-3. (Couldn't someone dream up a different name?) That model was a three-preset, drawbar-laden analog instrument with percussion, distortion, and key click (which Keith Emerson tells me was his idea). The new CX-3 hides a multitude of programming parameters and high technology under its old-school wood-panel hood (see **Fig. 1**).

I'm a great believer in pedal control, and a sturdy volume/swell pedal that plugs in to a jack on the CX-3's back panel is included. There are also two assignable footswitch jacks that let you control the rotary speaker, step through programs, and so on. A pair of unbalanced ¼-inch outputs and the usual trio of MIDI jacks complete the back-panel connections (see **Fig. 2**).

With 64 notes of polyphony, the CX-3 offers 64 Programs in Normal mode. You can alter the sound in real time with two sets of nine drawbars. In addition, you can split the keyboard to use the Upper and Lower tone generators. If the keyboard isn't split, only the Upper tone generator is used. The drawbars can govern two simultaneous sounds in a split configuration, or they can be toggled to provide two sets of sounds that can be altered in real time for, say, just the upper half of the keyboard.

One feature definitely not found on a real B-3 is the CX-3's EX mode, which uses both drawbar sets and produces a new range of weird, digital timbres using both tone generators. (Happily, that doesn't reduce the CX-3's polyphony; each tone generator can produce 64 notes, which are blended in EX mode.) The first set of drawbars works as usual, whereas the second set controls higher harmonics and additional percussion harmonics. Purists will probably give EX mode a wide berth. The adventurous will gain 64 additional Programs in EX mode and a new range of cool, non–B-3 (but still organlike) sounds.

LOOK AND FEEL

Whichever school of thought you subscribe to, a Hammond-simulating organ needs to have a certain look and feel, and the CX-3 has it. A dark wood veneer is pleasingly sculpted at the sides, with a handy, flat 6-inch-wide top surface. The only cheesy construction is on the instrument's underside, which is particleboard—strong, no doubt, but hardly the stuff you want to see on a $2,600 instrument.

Two complete sets of click-stopped drawbars sprout from a ledge above the keys; they look and feel authentic. Possessing a smooth, positive, fluid feel, their quality is better than the drawbars on most Hammonds I have played.

To the right of the drawbars is a large 20-character, fluorescent display, with characters formed of pale blue dots, that encourages you to investigate and tweak. The display is extremely easy to read under a variety of lighting conditions; I tested it in the studio, on a dimly lit stage, and under bright lights. Aside from showing the current Program's name, the display reveals default drawbar configurations and myriad parameters for sounds and effects processing. Although there are multiple pages for each group of parameters, I never seemed to get bogged down. It's a great piece of design.

LED-indicated buttons for controlling Percussion and Vibrato and two knobs for Vibrato/Chorus and Expression/Overdrive take up the remainder of the panel. Everything is clearly labeled and self-evident to anyone with even the most rudimentary Hammond knowledge.

Adjacent to the 61-note keyboard, a second panel contains four knobs for Master Level, Treble, Bass, and Reverb Offset. The latter knob controls the reverb depth relative to its programmed value. Turning it clockwise from straight up increases reverb; turning it counterclockwise attenuates reverb. If a Program doesn't include reverb, the control has no effect.

Undoubtedly, the most crucial left-hand controls govern the rotary (Leslie) effect's speed. Three white buttons are labeled On, Stop, and Fast; On is effectively "slow," and Stop is effectively "off." Because those buttons are only a quarter of an inch apart, it's much too

FIG. 1: This is not your parents' CX-3. Korg's total revision of an instrument first introduced in 1979 is the closest thing to a Hammond B-3 weighing less than 40 pounds that you can find.

"REASONS NOT TO BUY A MACKIE D8B...ZERO." —Roger Nichols, EQ Magazine

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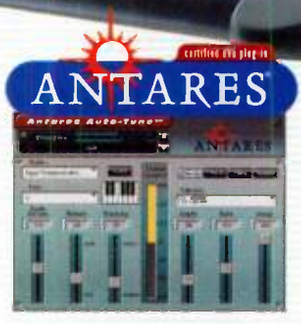
- **Time Offset** (delay) adds a delay of up to 255 samples to the signal at the pre-DSP (dynamics / EQ) point in the signal path.
- **New surround capabilities** including depth-of-center control (LCR mixing with divergence), multiple surround panner window, individual LFE channel level control.
- **Multiple direct outs** per channel.
- **Optional level to tape** fader control.
- **Assignable, bidirectional MIDI control** of all parameters.
- **Cross patching** allows substitution of channels between various banks.



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Massenburg Parametric EQ. MDW 2x2 High-Resolution Parametric Equalizer plug-in from Grammy-winning engineer/producer George Massenburg. Mono/stereo EQ at 96kHz sample rate for unprecedented clarity and high frequency smoothness.

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3 1999 TEC AWARD WINNER!

Normally we don't name competitors in our ads. But in this case, Mix Magazine published the other nominees for the 1999 TEC Award for Outstanding Technical Achievement in Small Format Consoles: Allen & Heath's GS-3000, Digidesign's ProControl, Panasonic's WR-DA7, Spirit's Digital 328 and Yamaha's 01V. Thanks to all who helped us win this prestigious award.

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easy to hit the wrong one. If I owned a CX-3, I'd assign the rotary controls to footswitches; fortunately, the instrument makes that easy.

Above the rotary controls, six gray buttons manage the instrument's configuration. The buttons are divided into two groups of three, which are assigned to the Upper and Lower tone generators. The buttons determine whether the tone generator uses a drawbar configuration as defined in the current Program (Drawbar Preset) or one of the two drawbar sets (Drawbar 1 and Drawbar 2), which are adjustable in real time. The buttons that control the Upper tone generator are larger because they control the entire keyboard unless it is split.

Organs, especially Hammond types, are hands-on instruments. You expect to switch this in and that out, tweak an effect, and adjust a sound. For that reason, the controls should be in appropriate locations, and they shouldn't present too much of an opportunity for accidents. For players who demand authenticity, the CX-3 has more controls in the same locations as a real B-3 than other Hammond clones. For the rest of us, however, those locations aren't always the most convenient.

Korg opted (a little slavishly) to place the Percussion buttons on the instrument's top-right side; authentically enough, that is their placement on a real Hammond. Because they are tone controls, I prefer a location where you can operate them with your left hand.

Although Korg could have made the layout of the controls a little easier, playing the CX-3 is a joy. The controls, the drawbars, and the keyboard operate smoothly and professionally.

A Hammond keyboard is light, fast, and not Velocity sensitive. It's the same here, though you can enable Velocity sensitivity for when you're stuck in a studio with only a CX-3 and a bunch of MIDI modules and you need to play a piano part, for instance. That feature is thoughtful.

Immediately after my first stab at the CX-3, two things were apparent. First, the keyboard is ultrafast, triggering long before I reached the bottom of the key travel, which makes it superb for playing choppy, skittering parts, such as glissandi. The keys are smooth and nicely rounded at the edges, which also greatly facilitates smears and glissandi. Second, the keyboard retriggered as I took my fingers off the keys. That is not good; in fact, it's downright annoying. Mercifully, that release retriggering is a bug only on early models, and anyone who purchased one of those units will surely have had Korg fix it by now.

THE PROGRAMS

A real Hammond B-3 has presets; you call them up using a dummy set of reverse-color keys on the left side. Presets are nothing to be ashamed of. The CX-3's Programs—assembled by canny Korg programmers and big-name organ players such as Brian Auger, Bill Champlin, and Tom Coster—range from full-throttle distortion to restrained tones suitable for a funeral.

The Programs are organized into eight banks of eight. When appropriate, their names are prefixed with a star player's initials. Some names pay homage to whatever song the setting seeks to replicate (Deep Hush, Gimme Some, OnionBook, Whyter Shade), and others are purely descriptive (NicePerc, BestSolo, Smoothie).

After a happy 30 minutes playing "Whiter Shade of Pale" (something I got away with playing on the chapel's pipe organ at boarding school) and "Gimme Some Lovin'" (which I wanted to play in the chapel but certainly couldn't), I selected Quiet Hymn 2 as my favorite Program. Its glistening sound has a pure undertone and strong percussive harmonics. (Hey, I'm getting older, okay?)

The Programs offer only a glimpse into the world of possibilities the CX-3 offers. You can call up a Program and hit the Drawbars button to rebuild the sound in real time using the drawbars (see **Fig. 3**). If you press the Display button, the display reveals the current Program's drawbar configuration; that is a great way to learn about using drawbars.

The Expression/Overdrive knob adjusts the tone generator's output level and therefore the input level to the internal amp simulator. As you turn the knob, it progressively adds distortion and volume or simply volume, depending on how a Program was configured. Controlling volume and distortion simultaneously may be authentic, but it can be impractical at times; ideally, you should be able to add grit without bumping up the level at the same time. However, if you route a pedal to control the level of the amp simulator's preamp, you can add distortion without increasing gain quite so much.

It may seem odd that with a rotary speaker in tow, the CX-3 needs something as comparatively lightweight as vibrato or chorus. But real Hammonds do, and so does the CX-3. In almost identical fashion as its inspiration, the CX-3 has a large multiposition knob marked V1 through V3 for three vibrato intensities, and C1 through C3 for three chorus intensities. Those settings are preset; you can't dive into the edit pages and change their speeds or relative depths but neither can you on a Hammond.

To add player-generated dynamics to the sound, Hammond devised the percussion effect. Two harmonics—one an octave higher than the played pitch

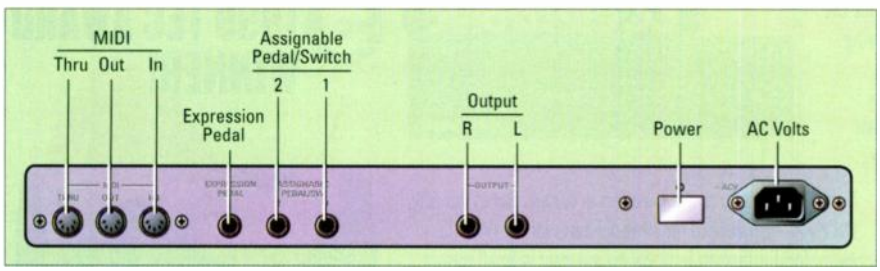

FIG. 2: The CX-3's uncluttered back panel sports one pair of audio outputs, two footpedal jacks, an expression pedal jack, and three MIDI ports.

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(the second harmonic) and the other an octave and a perfect fifth higher than the played pitch (the third harmonic)—are triggered by a note's initial attack, adding a transient tone color. On the CX-3, that feature was copied faithfully, with Soft and Fast (for a fast decay) options. Instead of two mutually exclusive buttons for the second and third harmonics, like on the B-3, the CX-3 toggles between them with a single button labeled 3rd. The system is a little obscure, but it suffices once you are familiar with it.

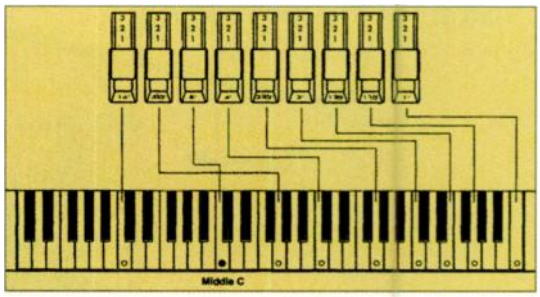
The percussion effect can be fine-tuned in terms of relative levels and decay speeds within the edit pages. Percussion only works with the upper drawbars, just like a real Hammond. The Lower tone generator, or left-hand part in a split, remains unaffected.

EDITING, DOWN AND DIRTY

The CX-3 uses Korg's Resonant Structure and Electronic Circuit Modeling System (REMS). With that sound-modeling technology, the makeup of the essential sound and the amplification and processing of that sound (amp types, mic simulations, and so on) can be selected and adjusted.

In practice, what does that mean? It means you can create or customize almost every aspect of the Hammond organ experience, from selecting an organ's vintage and model (along with its accompanying foibles) to tailoring percussion levels, amplifier type, tone, and gain, along with every imaginable rotary-speaker setting. You'll also find a smattering of reverb parameters.

Although most of those functions are probably going to appeal to only my first category of Hammond players, I was impressed that none of the in-depth editing is offered in a complex or overly technical fashion. The instrument and the owner's manual use plain English, and even if you are the plug-in-and-play type, it's fun to experiment with things such as the virtual Leslie's mic-distance parameter.



COURTESY KORG USA

FIG. 3: Like the original B-3, the CX-3 is a type of additive synth. Its tones' harmonic content is determined by the configuration of its drawbars. Each drawbar controls one harmonic.

The Wheel Type parameter offers two options: Vintage and Clean. Older B-3s tend to produce crosstalk between the pickups; that phenomenon is called *leakage*. Providing an example of Korg's attention to detail, the CX-3 can progressively add that sound-diffusing, high-pitched background noise on the Vintage setting. The Clean setting is always, well, clean.

The sonic difference between Clean and Vintage is quite clear, but the difference between a Leakage Level of 0 and 99 didn't grab me by the throat. When you play a fat chord, especially with some overdrive and the rotary effect pounding away, most people will hear little difference either way. If you're a purist, I suspect the difference will be far more noticeable. Mid to low notes are the best for testing and hearing differences in Leakage Level. Considering Korg's clear interest in that type of nicety, it would have been helpful to see some background or tips printed in the owner's manual. Korg obviously knows a lot about leakage, so why not pass along some of that knowledge?

Click Level is a far more clear-cut parameter. In addition to progressively adding more dirt and spike to the attack, you can do the same to the release. Considering that my review unit provided enough release material on its own (the retriggering problem noted previously), I was unable to test the value of adding or subtracting it deliberately. Key click is not a Hammond feature per se, but that's the name people use to describe the Hammond keyboard's hallmark trait of noisy or dirty electrical key contacts. The Hammond Organ Company tried for years to get rid of it. If its efforts had truly succeeded, the B-3 would probably never have taken the rock world by storm.

GET YOUR ROTOR RUNNING

The Hammond B-3 story is filled with serendipity. Perhaps the most important association is with Don Leslie and his rotary-speaker cabinets. The Leslie cabinet includes a spinning high-frequency horn and a separate spinning drum containing a bass speaker, which is normally called the rotor. Both can be set to rotate slowly or quickly, and because it is a mechanical device, it takes time to speed up or slow down. The beguiling

CX-3 Specifications

Keyboard	61-note unweighted, transmits Note-On and Note-Off Velocity
Polyphony	64-note
Multitimbral Parts	2
Sound Engine	tonewheel organ modeling
Drawbars	9×2
ROM/RAM Programs	0/128 (64 normal, 64 EX)
Effects	rotary speaker; vibrato/chorus; overdrive; reverb
Analog Audio Outputs	(2) ¼" TS unbalanced; (1) ¼" stereo headphone
Control Inputs	(1) expression pedal; (2) assignable footswitch
MIDI Ports	In; Out; Thru
Display	20-character × 1-line vacuum fluorescent display (VFD)
Dimensions	42.6" (W) × 5.83" (H) × 15.87" (D)
Weight	37.5 lbs.

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Knobs: 26 Endless Rotary with LED's

Polyphony: 24 Voices

Presets: 1,024

Performances: 256

Multitimbre: 4 Part

FM Operators: 4

Morphing: 26 Parameters x 4 Groups per Sound

Waveforms: 6, Shapable per Oscillator

LFO's: Can Act as Envelopes, Hard Syncable

Unison: 5 Virtual Voices per Note in Stereo, Retains Full Polyphony

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combo adds wonderful movement to the sound, and for most people, a Leslie cabinet is as vital to the Hammond as a pair of hands.

Mimicking a device predicated on physical movement is tricky (the Doppler effect is a reasonable example), and few Leslie simulators come close to the blood-pressure-raising movement of air and sound waves exuded by the real thing. On the CX-3, you can feel the sound wheeze and breathe in true Leslie style. Korg provides a full complement of editing parameters, including horn and rotor balance, individual speed, and individual speed-up and slow-down times (see Fig. 4).

The simulated horn and rotor each has a stereo pair of virtual mics that can be adjusted in several ways. The Mic Distance parameter lets you adjust the mics' proximity separately for the horn and rotor, increasing or decreasing the organ sound's closeness. At a setting of 99, the horn sounds very close to the mic; you're practically inside the horn. At 0, the high-end sparkle is quite distant but the stereo image is far more evident.

PRODUCT SUMMARY

Korg
CX-3
combo organ
$2,600

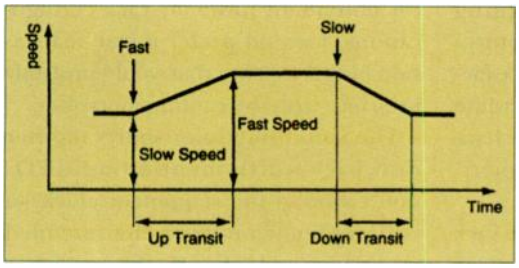
FEATURES	4.5
AUDIO QUALITY	5.0
EASE OF USE	5.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Almost slavishly faithful simulation of a real Hammond B-3 in terms of sound, features, and foibles. Enormous fun to play, with a huge range of sounds you can really use. Full keyboard polyphony.

CONS: No 11-pin Leslie connector. Rather expensive.

Manufacturer
Korg USA
tel. (516) 333-09100
e-mail product_support@korgusa.com
Web www.korg.com



COURTESY KORG USA

FIG. 4: The Korg CX-3 provides control of almost every rotary-speaker parameter, including the time it takes to transition from slow speed to fast and back again.

When you increase the Mic Spread parameter, which simulates the distance between the mics, the stereo effect is pronounced. It's been a few years since I mucked around with miking a Leslie, but I don't think that miking a real cabinet displays stereo quite so dramatically as the Mic Spread's highest settings. Values from 30 through 60 offer the most plausible range. Similar parameters are offered for the horn and bass rotor.

You can play around for hours simulating a close-miked, wide-stereo rotor combined with a room-miked, narrow-stereo horn. It is fun to play with those parameters, but I always come back to more natural settings.

Some Hammond clones provide the real Leslie 11-pin connector. Whether it's because of confidence in the Leslie simulation or simply economics, the CX-3 does not.

B-3 OR BE SQUARE

Naturally, the CX-3 offers MIDI capabilities, and a compelling application might be to connect a second keyboard to emulate the two manuals of a B-3. The upper and lower halves of the CX-3's keyboard can be transmitted on two MIDI channels. If you're into sequencing (and I suspect many potential CX-3 owners are not), note that drawbar movements (as well as chorus, overdrive, percussion, rotary, and vibrato parameters) can be recorded through MIDI.

You can use MIDI to control the gimmicky (though splendid at the right moment) Wheel Brake effect. The effect mimics the life-draining sound of a Hammond turned off in midplay. The pitch swoops down and then swoops up again as you power back up. To my ears, though, using that effect more than once a month is excessive.

I really like the instrument. It's fun to play, it offers a vast amount of control, and it sounds fantastic. It has some quirks but fewer than half as many as a real B-3, and the CX-3 weighs a fraction of its inspiration's weight. The price is considerable, but if Hammond authenticity is your bag, the new CX-3 represents the pinnacle of technology.

As far as owning a Hammond goes, **Julian Colbeck** *only ascended to the heights of an L100. However, he played B-3 on "Roundabout" on* Symphonic Music of Yes, *when Uncle Rick took one of his sabbaticals.*

PROPELLERHEAD

REASON 1.0 (MAC/WIN)

A new player hits the dance floor.

By Jeff Burger

Never has cutting-edge technology played such a critical role in the creation of music as with today's electronic-dance genres. When it comes to software, Propellerhead has been at the forefront of the movement, with products such as *ReBirth* and *ReCycle*. The Swedish company started a new wave of excitement and anticipation more than a year ago when it demonstrated a new, comprehensive music-making system called *Reason*. The software finally shipped for Mac and PC, and the ballots are in: Propellerhead continues to redefine how modern music is made.

Reason 1.0 is a rack of remix gear implemented in software. Synths, samplers, drum boxes, sequencers, mixers, sliced-loop players, and effects are part of an integrated environment. The user interface resembles a rack into which you place the various components needed to build a song. Memory and your CPU's speed are the only factors that limit the number of simultaneous instances you can have of those devices.

Several shortcuts help prevent endless scrolling when navigating a complex rack. For example, a module scrolls into view automatically when you click on the sequencer track it's associated with. You can also "fold" a device to take up a single rackspace. Try doing that with hardware!

ON THE RACK

Reason's user interface is a work of art (see **Fig. 1**). Everything has a photorealistic, retro look. The alphanumeric LEDs even look real. Controls have rollover tool tips that include readouts of the settings, which is handy because some labels are pretty small at high-resolution settings. Shift-dragging knobs and sliders provide finer control over any parameter. One touch I especially like is the use of virtual torn white tape to label devices and mixer channels on the faceplates. The designers' attention to detail is amazing.

Your keyboard's Tab key flips the rack to reveal patch points and cables (see **Fig. 2**). The cables even swing gently to rest when you flip. Beautiful! In addition to audio jacks, just about every module has smaller jacks for control voltage (CV) or gate—which illustrates just how much control *Reason* gives you. You make a connection by dragging an input to an output or vice versa. Holding the mouse down when the cursor is over a jack evokes a pop-up list of available patch points. Cables are color coded, with slight differences in gradation to delineate the left and right cables in stereo pairs. You can hide the cables if things get too messy.

You can designate the number of voices per patch (from 1 through 99) for most of the sound-generating modules, although *Reason* uses CPU cycles only when simultaneous notes are played. Most modules have a low-bandwidth toggle that can also save some CPU cycles. Two modules, Redrum and Dr. Rex, have a switch for high-quality interpolation, which requires more advanced number crunching but provides optimal fidelity when needed.

The sequencer can trigger pattern changes in pattern-based modules, but you cannot switch sounds using program changes, and the sound modules aren't multitimbral. To work around those limitations, you must run multiple instances of the modules. Doing that doesn't appear to affect processing much, but it can make for potentially unwieldy rack configurations. I would prefer a true matrix-switching setup, but that would probably interfere with the cabling metaphor.

The sound modules share another drawback worth mentioning: LFOs don't sync to the sequencer clock—a baffling omission given the intended use (dance and other rhythmic genres) and the amount of thought that obviously went into *Reason*. You can, however, get some similar effects by using CVs and gates from the Matrix Pattern Sequencer to modulate parameters in the modules.

INS AND OUTS

The Hardware Interface at the top of the rack is *Reason*'s only permanent fixture; it's riveted rather than screwed in like the other modules. The 64 meters on the front of the Interface match the 64 inputs on the back. The inputs accept connections from the audio outs of any device in the rack The number you can use depends on the rest of your

FIG. 1: *Reason*'s visual interface is a scrolling rack of modular gear. The Hardware Interface at the top and the sequencer at the bottom are staples. Modules occupy differing amounts of space in the rack, but individual modules cannot be resized. You can minimize a module by clicking on the small gray triangle in its upper-left-hand corner.

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audio setup. For multichannel audio hardware, *Reason* is geared for an ASIO world. Otherwise, you have to rely on Sound Manager on the Mac or Direct Sound or MME on the PC. Disappointingly, there's no direct support for Pro Tools audio hardware.

When using ASIO drivers, you can adjust latency to compensate for slower CPUs. With Sound Manager, latency is fixed at 11 ms. On the PC, if you're limited to MME or DirectSound, latency can run from 40 ms to hundreds of milliseconds of latency—not a good thing when it comes to recording tracks from an external controller. But with luck, you can get ASIO drivers for your sound card, which improves the situation dramatically. Also note that *Reason* relies heavily on floating-point arithmetic calculations internally. For PC users, Propellerhead recommends running *Reason* on an Intel processor because of the poor floating-point operations on most bargain CPU chips.

Reason is also enabled for ReWire, Propellerhead's protocol for communicating multichannel audio between software applications. ReWire lets you do things such as run *Reason*'s audio outs directly into the inputs of a digital-audio sequencer. *Reason* also supports ReWire 2, a new protocol offering 256 audio channels (increased from 64); unidirectional MIDI communication of as many as 256, 16-channel devices; and automatic querying and linking for displaying the parameters belonging to slave devices by name. (As a special implementation of ReWire, *Reason* also includes a ReBirth Input Machine, which lets users of Propellerhead's popular *ReBirth RB-338* software route 18 *ReBirth* channels to *Reason* with sample-accurate resolution.)

The Hardware Interface also handles MIDI input. (*Reason* offers no MIDI output.) The Mac version requires Open Music System (OMS) and supports the IAC protocol for communicating between concurrently running MIDI apps. Under Windows, *Reason* recognizes available MIDI ports on your system and handles interapplication communication with the included *Hubi's Loopback Device (HLD)* MIDI router. (Propellerhead claims that other MIDI routing utilities may also work. Note that *HLD* does not run under Windows NT or 2000.)

Reason includes seven MIDI input ports. Primary among them is the sequencer input, which is used to record MIDI data from an external source. Four ports are external 16-channel MIDI control-bus inputs, which are designed mainly for use with a multiport MIDI interface to play *Reason*'s modules from an external sequencer or multiple live devices. For corresponding banks on the Hardware Interface each have 16 channel slots to which you can assign rack modules. The two remaining ports are for slaving to external MIDI clock and live remote control.

Speaking of control, clicking on most knobs, sliders, and other controls opens a dialog box from which you can assign a MIDI controller to the selected parameter. (*Reason* comes with an extensive MIDI Implementation Chart.) You can set up a single slider on a MIDI fader box to control multiple parameters on multiple rack devices simultaneously for some pretty wild effects. An associated "learn" feature even simplifies mappings by automatically identifying incoming controllers as you play them. You can also create a remote map for the QWERTY keyboard, although such a map is intended mainly for on-off controls or for setting variable controls to their minimum or maximum values.

Minimum System Requirements

Reason

MAC: PPC 604/166; 64 MB RAM; OS 8.6

PC: Pentium II/233; 64 MB RAM; Windows 98/ME/NT 4.0/2000

MIXING IT UP

In most instances, you start a session by adding a Mixer module to your rack. That way *Reason* automatically connects all new modules you add to it. (Otherwise, devices automatically connect directly to open ports in the Hardware Interface.) The Mixer has a 14×2 configuration, and you can chain two or more Mixers for additional channels. The main outputs of the master Mixer typically go to the first two audio inputs on the Hardware Interface.

Each channel strip has a fader, LED level meter, pan, mute, solo, treble and bass (±24 dB at 80 Hz and 12 kHz respectively), EQ on/off, and four aux sends. The strip of label tape runs sideways, so you can enter a name of respectable length in a narrow channel strip. There are levels for the four aux returns in addition to the master fader. Each channel on the Mixer's rear panel has stereo ins and CV ins (with matching trim pots) for external control of level and pan.

Besides the main outs and mixer-chaining ports, there are also four mono

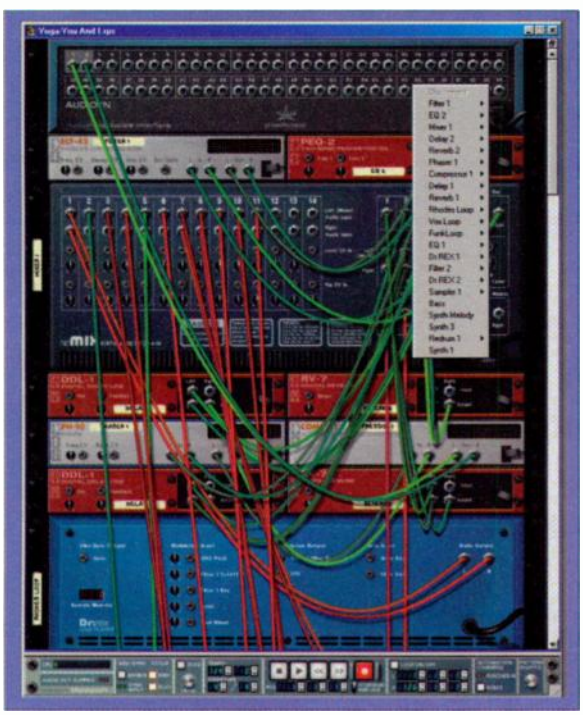
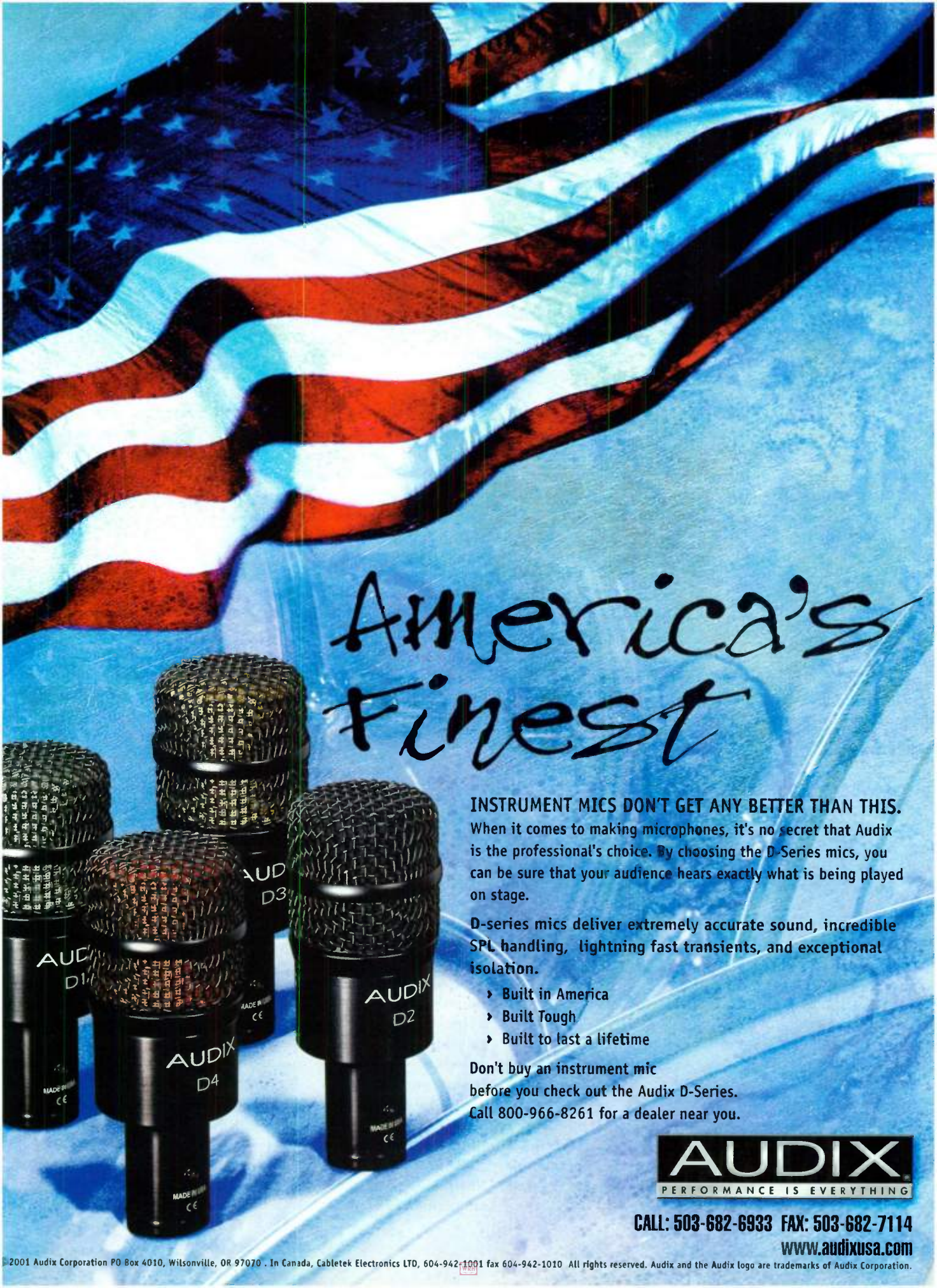


FIG. 2: Audio and CV routings are made on the rear of the rack. Shown is the back of the rack in Fig. 1. The menu in the inset at top right appears when you click on an input jack.



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aux outs fed by the channel strip aux levels and four matching stereo returns. You can even chain the aux signals between multiple mixers. A CV jack and trim pot for controlling the master level round out the rear-panel complement. There are no channel inserts, but you can easily route a device through an effect on its way to the Mixer.

MODULE MADNESS

Subtractor. Subtractor is *Reason*'s polyphonic analog-synth module (see **Fig. 3**). Each of Subtractor's two oscillators offers 32 waveforms ranging from standard fare (sine, sawtooth) to bell-like tones and other more complex harmonic structures. One particular point of interest: although *Reason* lacks pulse waves, pulse modulation, and oscillator sync, you can simulate those techniques and a lot more using the unique Phase Offset Modulation feature. Each oscillator can generate a duplicate of its basic waveform, and you can control the copy's phase in relation to the original.

Within each oscillator, you can multiply the twin waveforms or subtract one from the other to create a variety of results. LFO modulation of the phase gets you pulse-width modulation, and Oscillator 2 can also frequency-modulate Oscillator 1 for FM effects. Ring modulation rounds out the scenario. *Reason*'s form of oscillator interaction takes a bit of getting used to but offers a lot of flexibility. You can't hard sync oscillators, though you can approximate a softer sync effect with phase settings.

The color of Subtractor's noise generator is variable from white noise to a dark rumble. A dedicated decay control affects noise level, letting patches that have a brief percussive onset exhibit a longer envelope—nice. Because the Noise source is mixed with Oscillator 2, noise can be used as some or all of the FM-modulation source. That technique is helpful, for example, when used to simulate the short noise burst in the attack of a flute sound.

FIG. 3: The Subtractor polyphonic synthesizer and NN-19 sample player are the typical modules of choice for pitched instruments and sound effects. An oscillator phase and a second filter help distinguish Subtractor from most software synths. The sonic architecture of the NN-19 is similar but simpler.

Subtractor has two filters. Filter 1 is multimode and offers 24 dB lowpass à la Moog and Sequential Circuits, 12 dB lowpass à la Oberheim and early Korgs, 12 dB bandpass, 12 dB highpass, and notch. The main filter's output feeds the second filter in series. Filter 2 is a straight 12 dB lowpass and, unlike the main filter, has no independent modulation or keyboard tracking. The Link button slaves the frequency of Filter 2 to changes in the frequency of Filter 1. Several factory patches, such as Singing Synth and Fozzy Funk, illustrate the musical usefulness of that filter arrangement.

Subtractor's modulation complement has three ADSRs, two LFOs, extensive Velocity control, and plenty of CV/gate ins and outs. Although Subtractor does not offer unlimited matrix modulation, it's definitely no slouch of a synthesizer.

NN-19 Sampler. The NN-19 is *Reason*'s stereo sample-player module.

FIG. 4: Most rhythmic material is created using Redrum (top) and Dr. Rex (bottom). Redrum enhances the standard drum-machine model by offering special control effects on different channels. Dr. Rex is a powerful sliced-loop player and offers extensive control over slices and the global loop.

Samples can be in WAV or AIFF format at practically any sampling rate or bit depth. The NN-19 supports multisampling and comes complete with a simple visual interface for defining zones. Some nice automapping parameters make mapping easier, especially if the samples are loaded with root notes, and if tuning is already assigned. On the downside, the NN-19 has no provision for Velocity zones or loop-point editing.

The oscillator section has a sample-start parameter that lets you skip a portion of the sample, and you can also modulate the start point in various ways in real time. Beyond that, the NN-19 sports a pared-down version of Subtractor s synth controls, including a single multimode filter and LFO among other common features. Also like Subtractor, a good amount of control is afforded by CV/gate connections and Velocity. Note that the NN-19 is a sample player only—you have to do your sampling elsewhere.

Dr. Rex. Dr. Rex plays sliced loops created in Propellerhead's popular *ReCycle* and supports the new REX 2 stereo format being introduced with *ReCycle 2*'s release (see **Fig. 4**). You can load loops during playback to easily audition them against other tracks. Once a loop is loaded, each slice corresponds to a MIDI note. You can select a slice using MIDI or the Slice knob or by simply clicking on its waveform. You

broadjam

Artist: Katrina Carlson
Genre: Pop

Song: I Know You By Heart
LO-FI MP3 | HI-FI MP3 | REAL AUDIO

Artist: Kodac Harrison
Genre: Blues

Song: Love Turned On The Light
LO-FI MP3 | HI-FI MP3 | REAL AUDIO

Artist: Faye
Genre: Alternative

Song: What's Right
LO-FI MP3 | HI-FI MP3 | REAL AUDIO

Artist: Bill Epps
Genre: R & B

Song: Sign On In
LO-FI MP3 | HI-FI MP3

Artist: Derrick Procell
Genre: Country

Song: Same Plan
LO-FI MP3 | HI-FI MP3

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608-527-3653

→ www.broadjam.com

then have control over the pitch, pan, level, and decay of the selected slice.

When your loop is properly configured, press the To Track button, and *Reason* generates a sequence containing a note for each slice. Then you can get really creative: change the groove using note editing or quantization, transpose notes to change playback order, or scramble the notes (while preserving timing) with the Alter Notes function. You can further apply the rhythm of a perfected groove to other tracks.

Dr. Rex also offers global loop controls, such as transposing the entire loop or applying the filter envelope to the master pitch. Furthermore, the filter, ADSRs, LFO, real-time controllers, and CV/gate patch points mirror the NN-19's.

Reason ships with about 300 high-quality REX loops organized into a variety of categories. Although most factory loops appear to be two bars in length, the third-party one- and four-bar loops played just fine. All in all, Dr. Rex offers considerable playback flexibility and may be just the module loopers dream of.

Redrum. Redrum is *Reason*'s pattern-based drum machine. Anyone familiar with units such as the Roland TR-808 and TR-909 will be right at home with Redrum and will appreciate its updated features. In addition to loading preset kits, you can assign a sample to each of the ten instruments. The sound specs are the same as the NN-19, and more than 75 kits and 600 percussion sounds ship with the product.

Each of Redrum's ten channels has a separate hardware output that you can route directly to the Mixer or one of the rack's audio outs. The module also sports a pair of rear-panel sends that automatically patch to the first two chaining aux ins on the Mixer. Each channel has a pair of send amounts that route the associated sound into the bus for processing by whatever effects you patched at the Mixer's master sends. Each channel also has controls for level, pan, pitch, and Velocity sensitivity. A Length control dictates the length of the sound's decay in Decay mode and determines how the sound is cut off in Gate mode. Different channels have special functionality added: two have Pitch Bend controls, three have a lowpass filter with Velocity sensitivity, five have Velocity-controlled sample start times, and two are wired so that triggering one shuts off the other.

A dedicated Run button lets you audition your Redrum setups without using the transport and sequencer channels associated with the rack. There are 32 programmable pattern slots per song. A row of illuminated buttons represents the steps in the selected pattern and instrument. You can change the pattern length, from 1 through 64 steps, which allows you to create odd meters, but you can see only 16 steps at once; I'd prefer to see the interface expand to view them simultaneously. The Velocity level of each note is determined by the Velocity of a MIDI Note On during live performance or by one of three preset Velocity levels you select during step entry. The Velocity knob on each drum channel governs that channel's overall sensitivity to the programmed levels. You can also add a flam to a step, though the amount can only be controlled globally.

Redrum's pattern sequencer can play its pattern using durations between half notes and 128th notes. (Redrum itself has no tempo control; the master Tempo control in the Transport governs the tempo of all modules. Tempos range from 1 through 999.) If shuffle is engaged, the pattern is subject to the shuffle amount set in the master transport. You can shift the pattern forward or backward, which is handy because great experimental grooves aren't lined up with the downbeat. Overall, Redrum's features offer substantial creative possibilities, and when you rig up two or more Redrum modules, the potential for wild polyrhythmic passages expands even further. Very cool.

Matrix Pattern Sequencer. Although *Reason* has a master sequencer for the rack, that sequencer lacks a step-entry option. But creators of dance music needn't worry, because the Matrix Pattern Sequencer (MPS) offers that common input method (see Fig. 5). The MPS, which is often patched as a control source for a Subtractor or NN-19, offers the same timing options for patterns as

FIG. 6: *Reason* includes a variety of standard half-rack effects that can be patched in-line between modules and the mixer or used as send destinations.

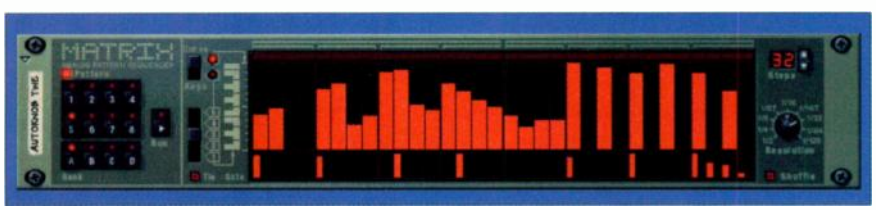

FIG. 5: The Matrix Pattern Sequencer generates notes, gates, and control voltages that can be routed to the CV and gate inputs of any other *Reason* module for extraordinary control. Gates are in the bottom row. The top half of the display toggles between discrete note values and control-voltage curves, shown here.

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LED screen. Looping works in playback and record modes, so you can do drum-machine–style pattern entry. For navigating through a song, you can drag the Play marker, rewind or fast-forward one measure at a time, or enter the desired location into the counter numerically. Auto-locate points are not implemented.

The tempo control offers a resolution in thousandths of a bpm. You can't program tempo or meter changes, however. A metronome click is provided with its own dedicated sound and front-panel volume control, but you can't tell *Reason* to automatically use the click only for record and not playback (or vice versa) nor is there preroll, postroll, or a count off—you just have to set the counter ahead of where you want recording to start. I wish Propellerhead hadn't used the same small mock LEDs for the master counter as found elsewhere for the display of parameter values. That makes reading the counter position at a quick glance difficult.

PRODUCT SUMMARY

Propellerhead
Reason 1.0 (Mac/Win)
software synthesizer/sampler
$399

FEATURES	4.0
EASE OF USE	4.0
DOCUMENTATION	4.0
VALUE	4.0

RATING PRODUCTS FROM 1 TO 5

PROS: Great sound quality and example library. Ideal for composing and performing most dance-music styles. Flexible rack metaphor. Most modules have excellent features. Utilizes CPU cycles efficiently.

CONS: No plug-in architecture. No MIDI output. ASIO and native drivers only. No polyphonic step sequencer. LFOs can't sync to clock. Oscillators don't hard sync. No MP3 export. No event editing.

Manufacturer

Propellerhead/Midiman
tel. (800) 969-6434 or (626) 445-2842
e-mail sales@midiman.net
Web www.midiman.com

The sequencer offers many standard features and a few less-common options. One particularly nice addition is the ability to copy a groove from Dr. Rex, apply it to a sequencer track, and route that track to play other modules. The sequencer also lets you quantize to the global shuffle amount that's set in the transport. Note that *Reason* lacks an event-list editor.

FUN WITH FILES

Reason has a few tricks when it comes to file management, which is helpful because a *Reason* session might reference many file types, including songs, samples, REX loops, and patches. The program has a database that lets you specify four search paths; all folders within a specified search folder are included. Although you can specify the roots of your attached volumes as a search path, doing so defeats the purpose of the database and can slow your searches down.

Reason uses a special file called a ReFill. ReFills are somewhat like ROM banks in a synthesizer or sampler and can hold songs, patches, samples, and REX files simultaneously. *Reason* ships with one gigantic 508 MB ReFill on a separate CD-ROM, a circumstance that is a bit unwieldy because *Reason* demands to see the file (from your hard disk or CD-ROM drive) when loading. Third-party ReFills, both commercial and free, are starting to appear online.

Reason also uses a custom browser in place of traditional file dialogs. The browser lists each database folder's contents and can even help you locate missing files by automatically grabbing them from the Internet if they are available. It also has a Find All ReFills button that searches the roots of the database folders and mounted CD-ROMs.

Reason also provides some great options for sharing songs. You can create self-contained songs that bundle the resources used into a single entity, making transporting or sharing songs a no-brainer. Moreover, you can publish songs with certain features disabled (cut, copy, and paste, for example) so that nothing can be added, removed, or

extracted. Your songs can even include customized graphic splash screens and author ID and contact information—a nice touch. Propellerhead also maintains an online *Reason* Song Archive for sharing songs and inspiration, and the program disk includes a half dozen tasty demo songs from real-world users. Although you can't lift anything from them, I found it educational to examine the rack setups and sequencing techniques used by those artists.

In most cases, the final output of a *Reason* session is a mix you render as a stereo audio file. AIFF and WAV formats are supported at 16 and 24 bits and a variety of sample rates. You have to convert your mix to MP3 format elsewhere, however. *Reason* also imports and exports MIDI files.

HERE'S WHY

Reason is destined to win lots of hearts and awards. The vintage-rack metaphor is excellent conceptually, sonically, and graphically. Some of the program's interconnectivity features, such as the ability to control modules through voltages generated in the Matrix Pattern Sequencer, really move the program beyond other hardware-emulation plug-ins. At times I missed having true matrix modulation—the addition of small CV and audio mixer modules would go a long way toward addressing that omission. *Reason* also lacks an arpeggiator, a factor you have to weigh for yourself.

Installation and operation on my Mac G3/300 MHz went without a hitch (though I lament the inability to connect it effectively to my Pro Tools system). The installation process thankfully requires only the serial number included with the package. Performance and latency were fine on my machine using Sound Manager. The CPU usage never exceeded 60 percent, even with complex racks and tracks.

Reason's concepts and controls are simple to grasp, so you can start making music right away. Such ease of use will appeal especially to the novice user. The software ships with a printed 90-page *Getting Started* manual, and the full 207-page PDF manual will help you get the most out of the package. *Reason* is a great composition tool and offers plenty of fun in live scenarios as well as in the studio, particularly when it's paired with a MIDI control surface. The quality and flexibility of the rack and its components are up to professional standards across any dance-music genre.

Reason is not a toy and is pricier than most DJ-oriented software. But you get more than what you pay for with *Reason*. It's not just a great software package; its song-publishing feature and extensive, open Web support make it a platform that should gain a community of dedicated followers. Few products can make that claim. Propellerhead clearly has another winner on its hands—download a trial version and see for yourself.

Jeff Burger *is a songwriter and producer based in Sedona, Arizona.*

TRUTH AUDIO

TA-1P

Are your mixes ready for the truth?

By Rob Shrock

In an era when powered near-field monitors have become commonplace, Truth Audio demonstrates its faith in your discretion in amplifiers by introducing the passive TA-1P. For professional as well as project studios, the TA-1P provides high-quality near-field monitoring at an affordable price.

The TA-1P designers spent more than two years tweaking crossovers and auditioning components. Although a lot of test equipment was employed during the development of the TA-1P, the ultimate criteria used to finesse the monitors were the designers' ears. Production did not begin until the designers were convinced that the TA-1P was accurate and reliable and could produce great mixes that translate well on other playback systems.

WHEN MORE REALLY IS MORE

The first thing you will notice about the TA-1P is that it has two 5-inch woofers instead of the single driver commonly found in near-field monitors. Although they are small speakers, the sound emanating from the cabinet is anything but small. The dual drivers produce a solid low end, due in part to a well-constructed rear-ported cabinet.

I began my listening tests using a pair of TA-1Ps in my downtown office studio. The room is set up primarily for MIDI production and is not treated acoustically for mixing; the studio has plenty of reflective surfaces, including the vocal booth, windows, outboard equipment, keyboards, and a mixer. I consider it a good real-world test facility for the TA-1Ps.

While listening to a few familiar CDs with two of my associates, my first impressions of the TA-1Ps were a bump in the low midrange and a slightly veiled but not awkward top end; the speakers sounded full, with an extended low end. Material I knew was recorded and mixed well sounded great on the TA-1Ps. However, the flaws of some overly processed pop recordings were very obvious. I also perceived a throaty character in some recordings, which I attributed to the presence in the low midrange.

One of my associates agreed that the TA-1Ps' low-end presence was outstanding. He also immediately liked the fact that the monitors sustained an even frequency response at practically all volume levels. I agree; even at low listening levels, the TA-1Ps maintain a solid low end—almost (but not quite) as if there were a subwoofer in the signal path.

The excellent imaging in the sweet spot was apparent to everyone in the room; however, the off-axis response was notably inferior to the sweet spot.

Truth Audio loosely recommends placing the TA-1Ps horizontally, but I also received good results with them set up vertically with the tweeters to the outside. The vertical setup yielded virtually the same results in terms of imaging, frequency response, and overall character.

I left the TA-1Ps set up at the office for several weeks, during which I sequenced various MIDI-based projects. If you've spent long hours wrestling MIDI tracks into submission, you know how much more difficult it can be to work with monitors that fatigue the ears. The TA-1Ps, however, are monitors you can work on for hours at a time without feeling burned out.

TRUTH WITHSTANDS SCRUTINY

I also brought the TA-1Ps to my personal studio, which is set up for critical recording and mixing. Because I enjoyed having the TA-1Ps in my office, I was eager to hear how they would sound in a different listening environment. In my studio, I placed the TA-1Ps beside several of my favorite monitors.

I again began by listening to familiar CDs. Most of my initial impressions were confirmed; there was still a small rise in the low-end frequency response. However, the frequency response remained consistent at almost any volume level. The imaging was great in the sweet spot—even better than at my office.

The top end of the TA-1P's frequency response is not exaggerated, so you may think that it sounds somewhat veiled in the high frequencies. I'm not fond of high frequencies that take your head off, so the neutral characteristics of the TA-1Ps will appeal to musicians looking

The Truth Audio TA-1P is a passive near-field monitor with great imaging and accurate sound reproduction.

for an accurate set of monitors. If you have balance or frequency problems in your mix, the TA-1Ps will let you know.

MIX BAG

The true test of a monitor is in the mixing. A number of current, popular nearfield monitor brands make nearly anything sound good, but those speakers are practically useless for critical decision making. The TA-1Ps weren't designed to be hi-fi speakers that flatter your audio; they were built to reveal what's really happening in a mix.

With accuracy as my priority, I started remixing cuts from various recent projects. One was a big-band project cut in Los Angeles with a top-call group of players. We had originally tracked the project to analog 24-track on a Studer machine with Dolby SR at 15 IPS. After the sessions, we spent a day creating stem mixes in *Pro Tools*, and I imported the stems into *Digital Performer* for remixing.

The performances on tape sounded great, but listening to the stems on the TA-1Ps revealed subtle flaws. Most notably, the lowest lows were missing from the drum submix, and saxes and trumpets had too much energy buildup in the upper midrange, without enough "air" on top. (In defense of the engineer who mixed the stems, those particular submixes were not destined for CD release but for playback over a theater sound system, which requires different treatment.) Concerned that the dulled high frequencies were a result of the TA-1Ps, I immediately checked the stems on my other monitor sets, which confirmed that the submixes had an overall moderate upper-midrange buildup due to EQ and filtering. Knowing that the CD mix would come from the original 24-track masters, I moved on to another project.

THE ULTIMATE DEMO TEST

Have you ever had a song demo that wouldn't die? I'm currently on the third version and ninth mix of one such song. I generally don't overdo demos, but this one has yet to be roped in properly. The first version's arrangement is still my favorite, but I have yet to nail the mix, so I had been looking to reevaluate it on different speakers. Sure enough, after the first listen through the TA-1Ps, my notes read: a dead spot in the bass frequencies; too much 2 kHz on the piano patch; the guitar line in the second verse is buried; too much bus compression from the bridge to the end—the list went on and on.

I listened to the same mix once more through my other monitors, and I heard the same problems. For some reason, though, I hadn't heard them when I mixed it two months ago. This method isn't exactly a scientific way to compare monitors, but the point is worth making: if I had been monitoring on the TA-1Ps, I could have fixed some of the problems in my original mix.

ALL THINGS BEING EVEN

There was still the nagging boost in what I estimated to be the 200 to 500 Hz range, which made some things sound a little thick. The top end seemed balanced when I sat in the sweet spot but dropped off noticeably when I was off axis. Although the TA-1Ps have a pretty good "other room" sound to them—for example, when you're down the hall or in the next room—I consistently caught myself leaning into the sweet spot when I was in the same room as the monitors.

PRODUCT SUMMARY

Truth Audio
TA-1P
passive monitors
$999 per pair

AUDIO QUALITY	4.0
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: Excellent imaging. Accurate frequency response. Not fatiguing to the ears after long monitoring sessions. Mixes translate well to other speaker systems.

CONS: Slight boost in the lower midrange.

Manufacturer
Truth Audio, Inc.
tel. (334) 678-0082
e-mail truthaudiopres@netscape.net
Web www.truthaudio.com

Nonetheless, practically every mix I created with the TA-1Ps translated well on other playback systems. The TA-1Ps are almost completely neutral from top to bottom. The small bump in the lower midrange actually prevented me from creating mixes that sounded muddy on other systems.

The tame high end on the TA-1Ps didn't artificially gloss the high frequencies; if a particular track was dull, I could hear it. That resulted in tracks that had a clear top end bright enough to cut through but not so bright as to be harsh.

TRUTHS REVEALED

Knowing I can work long hours and create good mixes on the TA-1Ps, I consider these monitors to be both an asset and a bargain. Although I believe in multiple monitoring setups for critical mixing, I would have no problem working with the TA-1Ps alone. The designers have hit their mark: the TA-1Ps reveal the truth in your mixes without tiring your ears in the process.

Producer and keyboardist **Rob Shrock** *is the music director for Burt Bacharach and has worked with a Who's Who of top artists. He is on the Board of Governors for the Texas Chapter of NARAS (National Academy of Recording Arts and Sciences).*

TA-1P Specifications

Inputs	(1) combination screw-mount/banana plug
High-Frequency Driver	(1) 1" cloth dome, dynamic
Low-Frequency Driver	(2) 5" polycone woofers
Impedance	4Ω nominal; 3.2Ω minimum
Peak Output	160W
Frequency Response	48 Hz–20 kHz (±3 dB)
Dimensions	14" (W) × 10" (H) × 10" (D)
Weight	21 lbs. (per cabinet)

CES SOFTWARE

VST INSTRUMENTS (MAC/WIN)

Four budget VST soft synths that cover the basics.

By Len Sasso

Ces has released four VST instruments that cover a range of synthesis methods. They include a subtractive virtual-analog synthesizer (*cesSynth1* 1.4), an additive synth modeled after a drawbar organ (*cesSynth2* 1.3), a drum synth (*cesSynth5* 1.0), and a frequency modulation (FM) synth (*FMHeaven* 1.1). The first three plug-ins sell for $20 each and differ from the demo versions in that they offer sample-accurate synchronization. *FMHeaven* ($50) also adds sample-accurate sync, and lets you load Yamaha DX-7 patches. The commercial and demo versions can be downloaded at the Ces Web site.

A LITTLE BIT OF HEAVEN

FMHeaven is the newest and most sophisticated of the Ces synths. It offers six oscillators and a full modulation matrix, which means each oscillator can modulate any other one, including itself. That amounts to billions of algorithms—quite an enhancement to the original DX-7's 32 FM algorithms. However, as you'll quickly see when exploring the factory patches or third-party DX-7 banks, a little FM goes a long way—a typical patch uses only a few modulation routings.

Like the DX-7, *FMHeaven* uses a variant of frequency modulation called phase modulation (PM). The results are nearly identical, but for technical reasons, PM is much easier to control. However, I will refer to the synthesis method as FM throughout this review.

FMHeaven's control panel is organized in six rows corresponding to its six oscillators. The two knobs on the left control coarse- and fine-tuning, and the small button at the far left turns keyboard tracking on and off. When keyboard tracking is off, the tuning value is shown in hertz; with tracking on, it is shown as a semitone value offset from the note being played. For example, in **Fig. 1**, tracking is off for Oscillator 4 and the value is 4 Hz, while tracking is on for Oscillator 1, which is set to a 19.01 semitone offset.

The grid next to the tuning buttons represents the modulation matrix. The grid is organized by row and column; each row represents one of six possible carrier waveforms and each column represents one of six modulators. The number showing in each cell represents how much the row's carrier waveform will be modulated by the column's waveform; in the example, Oscillator 2 modulates Oscillator 1 by 82 percent. *FMHeaven*'s modulation scaling has been designed to match the DX-7.

Each oscillator includes a four-stage, Velocity-sensitive envelope with separate level and rate controls for each stage. Each oscillator also has keyboard scaling of volume, which is very useful for damping artifacts caused by aliasing in the upper registers. (FM can easily produce harmonic components above one half the sampling rate.) Finally, there are separate level knobs and mute buttons for each oscillator. Enveloping and keyboard scaling are premodulation, while output level is postmodulation.

Each patch has its own tuning, Pitch Bend range, and LFO. The LFO can be mono or multi. (Multi uses a separate LFO for each voice.) When mono, the LFO can run free or retrigger with each Note On. There are three LFO waveforms: sine, square, and random. The random LFO in multimode produces interesting polyphonic sample-and-hold effects. The Depth knob or MIDI CC 1 (Mod Wheel) controls the LFO amount.

FMHeaven is multitimbral and polyphonic. Each of 16 MIDI channels can have a program and 64 notes of polyphony. The front panel always shows Channel 1's program; the programs on Channels 2 through 16 must be selected by MIDI Program Change messages. With 16 channels each playing 64 notes, *FMHeaven* could theoretically play more than 1,000 notes—of course,

Minimum System Requirements

Ces VST Instruments

MAC: 604e/200 processor; 64 MB RAM; host software supporting VST instrument format

PC: Pentium II/100 or Athlon-class processor; 64 MB RAM; host software supporting VST instrument format

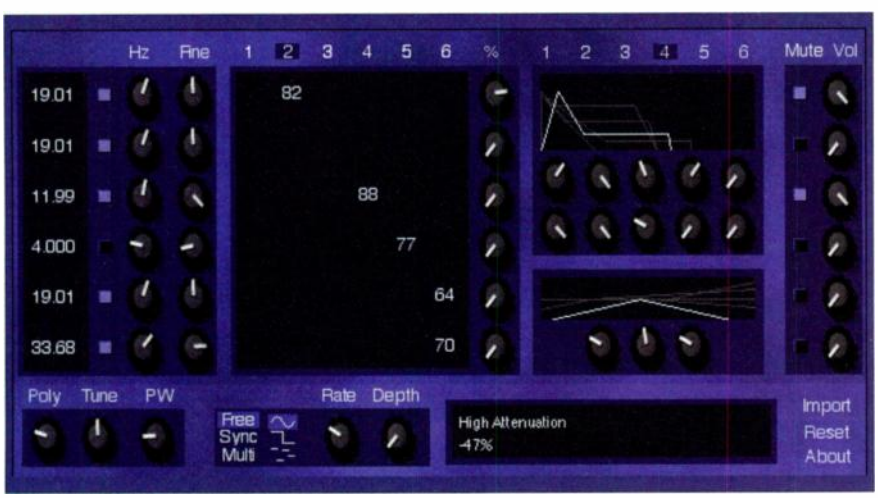

FIG. 1: *FMHeaven* is the latest and most sophisticated of the Ces soft synths. It features a 6-by-6 modulation matrix that lets an oscillator modulate any other and can also load Yamaha DX-7 patch banks.

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PRODUCT SUMMARY

Ces Software

VST Instruments (Mac/Win)
software synth plug-ins
$20–$50

FEATURES	4.0
EASE OF USE	4.0
QUALITY OF SOUNDS	4.0
VALUE	4.5

RATING PRODUCTS FROM 1 TO 5

PROS: Easy to use. Cost-effective. Can produce a wide variety of sounds.

CONS: Panel controls often difficult to fine-tune. Limited documentation.

Manufacturer

Ces Software
e-mail cferrari@dial.pipex.co.uk
Web www.loftsoft.co.uk

your CPU would have something to say about that.

FMHeaven can import DX-7 banks. It reads banks in packed bulk dump format, which is the format used by thousands of online patch banks. (You can download a Zip archive containing a large selection of DX-7 banks at ftp://byrd.math.uga.edu/pub/music/dx7/dx7patch.zip.) I imported and played dozens of DX-7 patches while writing this review. They sounded authentic (though I did not have a DX-7 for comparison). In some cases, high Velocity values caused noticeable aliasing, but I edited that out of the patches by adjusting the Velocity sensitivity of one or more envelopes or by altering the oscillators' keyboard scalings.

FIG. 2: *CesSynth1* is a virtual-analog subtractive synth featuring mixed waveform oscillators, envelopes with adjustable level and rate for each stage, and a 4-pole resonant lowpass filter. Most filter and oscillator parameters can be modulated by the LFO and either envelope.

THE VIRTUES OF ANALOG

Ces includes a few unusual twists for *cesSynth1*, its virtual-analog, subtractive synth (see **Fig. 2**). For starters, each oscillator's waveform is a mix of pulse, sawtooth, and triangle waves. Furthermore, the pulse wave's width and the sawtooth's symmetry (from ramp-up through triangle to ramp-down) are variable. Finally, Oscillator 2 can be synched and frequency modulated by Oscillator 1.

Each oscillator has a voltage control section for varying its pitch by any combination of MIDI Pitch Bend, triangle LFO, and two four-stage envelope generators. The oscillators have separate voltage-controlled amplifier sections, and any combination of the LFO and envelope generators controls the amplifier's level. Finally, there is a 4-pole resonant lowpass filter with a cutoff frequency that can be controlled by the LFO or either envelope generator. The final output is a mix of the filter and oscillator signals.

The envelope generators are more flexible than standard ADSRs because the ramp times and the sustain levels can be varied. There are separate Velocity sensitivity controls for level and ramp time, and all level controls are bipolar. (The instrument uses a three-dimensional envelope graphic to indicate the Velocity range.) *CesSynth1* offers three modes of operation: mono (with variable portamento), polyphonic (64 notes), and arpeggiated (with variable portamento).

GOING ORGANIC

CesSynth2 is a drawbar-organ simulation, but like *cesSynth1*, it has a few added special features (see **Fig. 3**). Those include an ADSR amplitude envelope, a resonant lowpass filter, and an auto-panning feature (for example, a pan LFO). When auto panning is off, a drawbar's pan position can be set independently. Finally, the nine harmonics can be doubled, which adds a second, detunable oscillator.

FIG. 3: *CesSynth2* is a 9-harmonic drawbar organ that offers a second, detunable oscillator for each harmonic. Click and percussion controls are provided, as are lowpass filtering and a panning LFO.

Among *cesSynth2*'s more traditional features are Click and Percussion controls. The Click effect is preattack and ranges from 0 to 30 ms; using it adds noise to the start of each note, which simulates a drawbar organ's switching noise. The Percussion effect gives a sound a slightly wooden quality and can be applied to the 4-foot or 2⅔-foot pipe. Percussion applies a fast attack/slow decay envelope to all notes played with times ranging from 0 to 500 ms. If you have a Leslie-simulation plug-in or external effect, try it with *CesSynth2*'s effects.

CesSynth2 provides 64-note polyphony, but like all additive synths, it can suck up CPU cycles fast. Setting all detuning and pan controls to zero reduced this load by nearly 30 percent on my G3/300 MHz system.

IN THE POCKET

The final synthesizer in the Ces collection is *cesSynth5*, a drum synth capable of playing 16 user-programmable drum sounds (see **Fig. 4**). It operates in a slightly

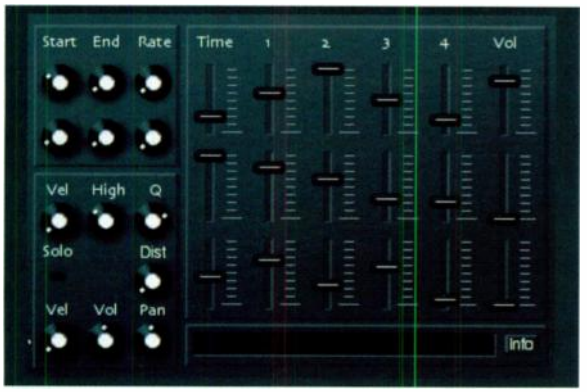

FIG. 4: *CesSynth5* is a drum synthesizer with 16 sounds. Each sound features two oscillators with pitch glide, a four-stage output envelope, and a noise generator.

unusual way in that its drum sounds are automatically mapped to the 16 MIDI channels—the MIDI note number used to play the sound is irrelevant. That makes programming drum sounds a little tricky, because selecting a sound for display on the control panel does not automatically change the sound.

Each *cesSynth5* drum sound consists of two variable-waveform oscillators plus a noise generator. Each oscillator has a start and end pitch control with an additional control for the pitch-change rate. The oscillators and the noise generator all have volume envelopes with sliders for total duration and for the level at four equally spaced intervals. Those controls allow you to develop interesting sounds with pitches and levels that evolve over time.

A sound's output stage features a resonant lowpass filter as well as controls for output volume and pan position. There are also controls to adjust the effect that note Velocity has on filter cutoff and output volume.

TEAM PLAYERS

The Ces synths are 64-note polyphonic except the drum synth, which offers 32 notes of polyphony. Each synth's control panel is clearly laid out, but fine-tuning the knobs and sliders can be a delicate task. One nice feature is the information display, which shows each parameter's description and numerical value as it changes. The synths' documentation is sufficient to get you up and running, although a bit more detail would be helpful in some cases.

FMHeaven is obviously the star performer of the Ces VST-instruments show, and the fact that it's able to read DX-7 patches alone makes it a worthwhile addition to your soft-synth toolkit. But all of the synths can make interesting sounds, and all of them offer low latency, which makes them extremely playable. The affordable price and the demo versions of these software synthesizer plug-ins make them well worth considering.

SHURE

KSM44

A smooth, solid workhorse mic with multiple personalities.

By Sean Carberry

For the past five years, microphone companies have peppered the U.S. market with large-diaphragm, multipattern condensers, many from the same foreign factories but sporting different monikers and trim—sort of like Lincoln and Mercury. However, one of the biggest players in the mic industry has refrained from entering the fray—until now. Behold the KSM44, Shure's first large-diaphragm, multipattern condenser mic.

A few years ago, Shure Incorporated (formerly Shure Brothers) tested the waters with the KSM32, a medium-diaphragm condenser mic featuring a ¾-inch–diameter capsule and a fixed cardioid polar pattern. A solid mic that has been well received by personal and professional studios alike, the "budget" KSM32 laid the groundwork for its sibling. The KSM44 provides three polar patterns: cardioid, figure-8, and omnidirectional. Unlike much of the competition, the KSM44 is designed and built in the United States.

The versatile KSM44, Shure's first multipattern condenser mic, was worth the wait and could prove a new standard as studio workhorse.

FAMILY TRAITS

The KSM44 clearly borrows heavily from the KSM32: the two microphones share the same exoskeleton, and except for the pattern-selection switch on the front of the 44, they look identical. Internally, however, they are very different beasts; whereas the capsule in the 32 was based loosely on the Shure SM81 capsule, the 44 boasts an all-new Shure design. The capsule comprises dual 1-inch–diameter diaphragms with ultrathin, gold-vapor–deposited membranes.

Like the 32, the 44 utilizes transformerless output circuitry, which provides a quieter and more transparent output than transformer-based designs. The self-noise in cardioid pattern is a scant 7 dB SPL, making the mic usable for voice-overs and critical recordings of quiet sources.

Also like the 32, the 44 provides two highpass filters: an 18 dB/octave filter at 80 Hz and a 6 dB/octave at 115 Hz. The first is a standard low cut found on many condenser mics. The second is designed to counteract excessive bass boosting from the proximity effect. (The mic also has an internal 17 Hz subsonic filter—in case you record near a herd of rhinoceroses.) The 44 also has the same 15 dB attenuation pad as the 32. Even without the pad engaged, the mic can handle a healthy 132 dB SPL.

The pad and rolloff switches are well designed and click into place with authority. The small metal switch ends are easy to move with a fingertip, and they feel more solid than the switches on most mics. They protrude from the body casing only slightly, so it takes more than an accidental bump to move one. My only nitpick is that on the test mic, one switch wasn't perfectly centered; it worked fine, however.

Like its forebear, the KSM44 ships in a rugged aluminum flight case and comes with a standard swivel-mount and a very effective shock-mount. (The 32's shock-mount is black; the 44's is the same champagne color as the mic.) The mic is also ensconced in a protective and stylish maroon velveteen pouch.

Like most Shure mics, the KSM44 is built like a tank and feels solid. According to Shure, the mic's durability test involved dropping the prototype ten times in a row onto a hard floor from a height of 6 feet. After ten falls, the mic had to exhibit the exact same performance as before the abuse. (As tempted as I was to repeat that test, it violated my sensibilities to intentionally drop a condenser mic.) In addition to the 44's rigid body, the mic also utilizes an internal capsule shock-mount that helps buffer the capsule from sound-inducing vibration. Even when I used the mic without the shock-mount, I noticed very little handling or "foot stomp" noise.

Popping is kept at bay by a three-stage integrated system: the external screen and two internal foam layers. Together they effectively neutralize the majority of plosives. In most cases, I could have used the mic without an external pop filter.

Whereas the KSM32 was designed to be flat sonically, Shure wanted to add a touch of color to the KSM44. The designers dialed in a slight high-midrange presence boost, primarily to enhance vocal recording. With the 44 in cardioid pattern, the two mics sound noticeably different from each other: the 32 sounds a touch "honky" and the 44 a bit more forward and open. However, the 44 is not nearly as bright or edgy sounding as most of the Chinese-manufactured knockoffs that have flooded the market in recent years.

IN THE TRENCHES

I was merciless in testing the KSM44. Not only did I audition it on a wide range of instruments but I also put it up against a variety of microphones. I usually have a bunch of lovely mics at my disposal, so my standards are quite high. Because Shure describes the KSM44 as a professional studio mic but has priced it within reach of the personal studio, I thought it

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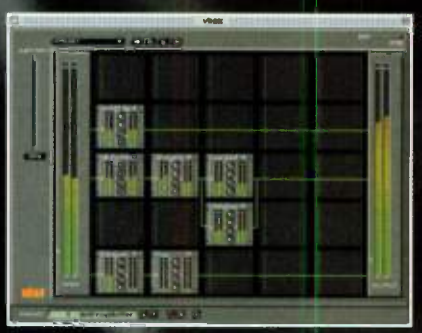

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only right to compare it with professional-level mics (including some that cost several times as much) as well as similarly priced ones. The test sessions covered a range of styles, including rock, pop, roots, and the ubiquitous folk/rock/pop singer-songwriter thing. I recorded to 2-inch analog tape as well as to Digidesign Pro Tools/24 using the 888 interface in 24-bit mode.

My first session with the 44 was at Room 9 from Outer Space, in Boston. There I tested the KSM44 alongside the following microphones: Neumann U 87; AKG C 414 B/ULS, C 414 TLII, and 414 EB; Audio-Technica AT 4050, AT 4047, and AT 4033; and the KSM32. I compared overall sounds, polar patterns, off-axis responses, proximity effect, and rolloffs. Each model was patched through the same channel of a Vintech 1272 preamp, and I recorded all tracks into ProTools so I could edit the segments together for back-to-back comparisons.

Although the KSM44 has a noticeable yet smooth peak in the 6 kHz region and another bump around 12 kHz, it sounded considerably less colored than the other mics. The low mids and bottom end are quite full and lush—very Neumann-like—and yet the top end was more open and natural sounding than the U 87s. In fact, compared with the other mics, the KSM44 exhibited the best overall balance of detail, presence, body, and thickness. It also proved the best mic for my voice, sounding clear and full and providing a nice forward nudge without excessive rasp or edge. (Second and third picks for my voice were the 4047 and 4050, respectively.)

I also tried the KSM44 through some different preamps. Each imparted its own character, and the 44 worked well with all of them. The mic sounded fairly neutral through a console preamp in the studio's Trident 80B. The sound was similarly smooth through the Vintech 1272 and an API 512C—and it was downright luxurious through a Telefunken V72. On the lower end, through a PreSonus MP20, the KSM44 sounded a tad edgier. A nice bonus is that the 44's high output level minimizes preamp noise—helpful if you don't have access to superquiet, high-end mic preamps.

As for off-axis response, I was pleased not to hear any particularly nasty peaks or notches. At 180 degrees in cardioid pattern, the microphone exhibited the typical large-condenser low-frequency bump; but at 90 degrees to either side, the frequency response was pretty even. The figure-8 pattern was nicely consistent, with the rear capsule sounding slightly darker than the front (like the other mics I tested). Also typical of the microphones I tried, the figure-8 sound was a little darker overall, with a more pronounced midrange. (Interestingly, the KSM44 sounded the most like the KSM32 when it was in the figure-8 pattern.)

Bass boosting from proximity effect on the KSM44 is comparable to that on most other dual-diaphragm mics I have used. In addition, the proximity filter does a great job of evening out the response without excessive thinning of the sound source.

VERY VOCAL

On a male singer, I auditioned the 44 against a gorgeous-sounding Neumann U 47, an AKG C 12A, and an Earthworks SR69 (a small-diaphragm cardioid condenser designed for stage use). Pick of the litter came down to the U 47 and the KSM44. Although the 44 didn't have the depth and austerity of the U 47, it had a similarly rich low end. However, the KSM44 had a little more high-end detail—presence and articulation—which helped the track sit nicely in the mix and ultimately led to my preferring it. But I was surprised and delighted by how much the Shure evoked the character of the Neumann in this test.

I next auditioned the 44 on a male singer with a hearty voice. During previous sessions I used a Neumann TLM 103 on him, which sounded great, but because of the singer's propensity to crowd the mic, the bass boosting was a little too severe and the sound too thick. I switched to the KSM44 in omni, which sounded wonderfully clear, but then the room reflections were a bit much. Finally, with the 44 in cardioid and the rolloff in the second position, I achieved perfection for the mic-eating singer. I still received a nice, full sound, but trimming off some proximity bump with the 115 Hz filter made him sound much more present and intelligible.

The KSM44 also sounded good on female vocals, and under other circumstances, I would have been happy to use it for that application. In this case, though, I had a wonderful AKG C 12A at my disposal, and anything C 12-like normally kills on female vocals. Again, the 44 sounded fine, but it didn't have the lush, velvety quality of the C 12A. However, that's comparing apples with oranges.

PRODUCT SUMMARY

Shure
KSM44
large-diaphragm condenser mic
$1,340

AUDIO QUALITY	4.5
VALUE	5.0

RATING PRODUCTS FROM 1 TO 5

PROS: Smooth, clear, full sound. Moderate, appealing presence boost. Versatile. Extremely rugged. High SPL handling. Comes with flight case, shock-mount, swivel-mount, and velveteen pouch. Built in the United States.

CONS: Not ideal for overly bright or strident sound sources. Could be said to lack personality or a defining, signature sound.

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Web www.shure.com

WHAM BAM SLAMMIN'

I tested the KSM44s on a drum set at Rear Window Studio in Brookline, Massachusetts, first as overheads and then for close-miking. For overheads, I prefer warm sounds and not a tremendous amount of high end, so I regularly use ribbon and tube mics. I especially like the smooth and focused sound of my Neumann KM 84s, particularly in the room at Rear Window, so I put the 44s next to the Neumanns. The KSM44s captured considerably more high-end detail and more bottom than the Neumanns. They were also faster and crisper sounding, which took some getting used to, and the off-axis response sounded a bit rough in that room. In the end, I stayed with the KM 84s.

Next, I tried close-miking the toms with the 44s. I was astounded by the results. The toms sounded full and round, with plenty of attack and body. I often use large condensers (Neumann FET 47s, AT 4047s) on toms, but the Shure mics set a new benchmark.

I was also impressed with the 44 on snare drum. More often than not, large condensers sound somewhat muted or overly compressed on snare drums. But the KSM44 sounded huge and true to the sound of the drum. The hi-hat bleed was a little more pronounced than what you would get with a dynamic mic, but the character of the bleed was much more musical. Many dynamic mics commonly used on snare drums sound ragged off-axis, giving the hi-hat bleed a nasty midrange honk. With the KSM44, the bleed sounded just like the hi-hat, only at a lower level. The downside was the bulk of the microphone, which made positioning a bit of a challenge.

On kick drum I did something I've never done with a large condenser—mine or anyone else's. I stuck the 44 inside the drum, about three inches from the batter head. Initially, I had the mic's pad switched off and instead used 30 dB of external padding at the preamp. Not surprisingly, the mic overloaded—but not nearly as drastically as I expected. I then engaged the pad, and the sound was not only distortion free but it was also much better than I expected. In fact, it was darn good, with plenty of attack and thump.

I then put the pair of KSM44s in omni pattern and positioned them seven to eight feet from the drum set and about 15 feet from each other. I ran both through a Joemeek VC7 mic pre and slammed the signal with a Joemeek SC2 compressor. Huge yet defined drum sounds leaped from the speakers.

THE LOWDOWN

For miking bass cabinets, I favor the Royer R-121 ribbon microphone for a good reason: it sounds great. So I put the KSM44 in figure-8 mode (to match the Royer's inherent pattern and to darken the 44's sound a bit) and placed both mics about six inches from a vintage Ampeg B-15N—the classic flip-top combo bass amp.

The two mics sounded more similar than I expected. However, the Royer was a bit more even and focused sounding overall, and the 44 provided a little more high-end information than I wanted for bass guitar. But I'm sure that had I put up the 44 by itself, I wouldn't have complained. The sound was smooth, punchy, and true to what was coming out of the amp.

GUITAR HERO

On acoustic guitar, I put the KSM44 against a U 47, Royer R-121, and Earthworks SR69. I compared the results blind, and I rated the KSM44 as first pick, followed by the 47. I then put up a Neumann KM140, which is one of my favorite acoustic-instrument mics, and it won hands down. Again, though, the KSM44 captured a nice, broad sound with full mids and plenty of high-end detail yet no brittleness. During another session, I tried some stereo-miking setups, including XY, Blumlein, and Middle-Side. The 44s worked wonderfully in each but especially so in the M-S configuration (because of the well-defined figure-8 pattern), providing excellent imaging and definition.

For close-miking electric-guitar amps, my first-call mics are the Royer R-121, Coles 4038, AT 4047, and, occasionally, SM57. The KSM44 didn't thrill me when close-miking a Vox AC30. However, when I positioned the mic approximately 18 inches in front of the amp, the sound came alive. The mic captured the overall character of the amp and made for a perfect blend in the track.

Not surprisingly, the 44 delivers more detail than any dynamic mic I've used on a guitar amp and also more deep bottom. It combined well with the other mics I usually use—the Shure and the Royer made for an especially deadly combination.

KEY NOTES

On grand piano, I set up the KSM44s against my standard KM 84s, and I

KSM44 Specifications

Element	externally polarized (DC bias) capacitor ("true" condenser)
Diaphragm	dual 1", 2.5-micron, 24k-gold-sputtered Mylar
Polar Patterns	cardioid; figure-8; omnidirectional
Attenuation Pad	15 dB
Highpass Filters	(2) 18 dB/octave @ 80 Hz; 6 dB/octave @ 115 Hz
Frequency Response	20 Hz–20 kHz (±3 dB)
Dynamic Range	125 dB (cardioid)
Sensitivity	–31 dBV/Pa (cardioid)
Signal-to-Noise Ratio	87 dBA
Self-Noise	7 dBA (cardioid)
Maximum SPL	132 dB (149 dB with pad) into 2,500Ω (for <1% THD; cardioid)
Dimensions	7.37" (H) × 2.2" (D)
Weight	1.08 lbs.

received the same results I had in the drum-overhead comparison: the 44s had a wider frequency response, but the Neumanns had a more focused and elegant sound. I liked both sounds and could have gone either way, but for the track in question, the 44s gave the piano a little more cut, which it needed.

I also compared the 44s to a pair of AKG C 414 B/ULSs, which many people regard as default piano mics. But good as the 414s sounded, the KSM44s were less colored and more to my liking.

I was surprised by the KSM44's response to horns. As I expected, it did not react well to trumpet. However, it worked nicely on tenor sax and trombone, and it really shone on clarinet.

I usually lean toward ribbon mics and other darker- or flatter-sounding mics when recording horns. But overall, the 44 worked wonderfully in that difficult application—thanks again to its mild, rather than excessive, presence boost.

REGAL BEARING

The KSM44 is a versatile, workhorse-type mic with three distinctly useful sounds based on its polar patterns. It delivered very good to excellent results on every instrument I tested it on, including vocals, drums, acoustic guitars, bass and guitar cabinets, and even certain horns and wind instruments. That's a major accomplishment for any mic. The only thing I flat out didn't like it on was trumpet. In addition, the KSM44 is superbly quiet, solidly built, and handles high sound-pressure levels (SPLs) with aplomb. The mic comes with a full complement of amenities, including an aluminum flight case, a swivel-mount, and a very effective shock-mount.

Anyone who has been in the studio game for a while knows that no microphone works in every situation, and only a few seem to shine in a wide range of applications. The Shure KSM44 is one of the latter. I'm always looking for new mics to replace the classic workhorses, many of which have been around for 20 to 30 years, and the KSM44 is the best new all-purpose large-diaphragm condenser I've heard. In fact, if I could have only one large-diaphragm, multipattern (nontube) condenser mic in the less-than-$2,000 price category, the KSM44 would be it.

The only negative thing I can say about the KSM44 is that, workhorse that it is, it's somewhat lacking in character; it doesn't really have a signature sound that makes your jaw drop. The KSM44 isn't your Spinal Tap, "goes to 11"–type mic. But then, if it were, it probably wouldn't be so versatile—you can't have it both ways. However, what the KSM44 does do is cover a lot of recording applications in regal fashion—yet you don't have to be royalty to afford one.

Sean Carberry *is an assistant professor of production and engineering at Berklee College of Music, production engineer at WBUR-FM, and freelance recording engineer in Boston. He can be reached at www.carpedonut.com.*

TC WORKS

MERCURY-1 (MAC/WIN)

A VST synth packed with screaming leads and biting sound effects.

By Len Sasso

Mercury-1 is an analog-modeled, monophonic, VST plug-in instrument. Its synthesis architecture (dual oscillators as well as a suboscillator, a resonant lowpass filter, dual ADSR envelopes, and an LFO with a choice of waveforms) holds few surprises. Nonetheless, its sound can shake the walls, break the windows, and unilaterally declare World War III. Its four voices cannot be played simultaneously on a single MIDI channel, but they can be layered, split, or sequenced independently using separate MIDI channels. *Mercury-1* is easy to program, and with support from your host program, its front panel can be automated through MIDI.

The front panel displays the settings for the active voice (see **Fig. 1**). Across the top, four Voice Tabs let you select the active voice, which is indicated by a silver tab. Each voice has its own MIDI channel, key range, Velocity range, and VST audio-output channel, and each of the voice parameters can be set by the user. (It's nearly impossible to find the sweet spot for scrolling the Output numerical, but you can double-click on the number to type in a value.)

Mercury-1 processes notes with high-note priority and without retriggering; if you hold one note and play a note below it, the lower note won't sound. If you hold a note and play a note above it, the pitch will change to the higher note, but the envelopes won't retrigger. That arrangement lets you play trills like you can on a Minimoog.

CHOOSING A VST HOST

Mercury-1's latency and demand on your CPU depends on your platform, sound card, and audio drivers. On my Macintosh G3/300 with an Emagic Audiowerk8 sound card, *Mercury-1* was quite playable using Emagic's *Logic Audio* 4.7 and Steinberg's *Cubase VST/24* 4.1. For many VST plug-ins, your choice of host applications doesn't make much difference, but it does affect *Mercury-1*'s feature set. To see why, here's a quick look at how *Mercury-1* manages its four voices.

Logic Audio doesn't support multiple VST audio outputs for single instances of a VST plug-in, so you can't apply different effects to *Mercury-1*'s four voices. However, you can use *Logic*'s Environment to distribute MIDI note messages across several MIDI channels and simulate last-note priority with retriggering; that lets you play *Mercury-1* in real time with four-note polyphony.

Cubase supports independent processing of each *Mercury-1* audio output, letting you apply separate effects to each voice. That is extremely nice for sound-effects design. For example, you can put a delay after some voices to control their timing in the overall sound effect. On the other hand, you're stuck with monophonic real-time performance; you can play polyphonically only by multitracking separate MIDI channels.

Minimum System Requirements

Mercury-1

MAC: G3/233; 64 MB RAM (128 MB for OS 9.0 or higher); OS 8.6 or higher; VST-instrument–compatible host program

PC: Pentium II/200; 64 MB RAM; Windows 95/98/2000/NT 4; VST-instrument–compatible host program

IN ACTION

Mercury-1's signal path starts with two analog-modeled oscillators. Osc 1 offers sine, sawtooth, and square waveforms as well as white noise. Osc 2 offers square, sawtooth, triangle, and variable-width pulse waveforms. Each oscillator can be octave-shifted, and Osc 2 can be detuned in cents or semitones. The Sub slider in the Mixer section adds a square wave an octave below Osc 1.

Osc 2 can be hard-synched to Osc 1 by clicking on the Sync button. You can also route the two oscillators through a ring modulator by clicking on the Ring button. When ring modulation is on, the Mixer's Osc 2 slider controls the level of the ring-modulated signal, and the Osc 1 slider controls Osc 1; that is equivalent to amplitude modulation of Osc 1 by Osc 2.

The Xylophone program uses that technique; with a little tweaking of the detune and envelope parameters, you can create viable marimbas, steel drums, and other one-hand mallet instruments.

FIG. 1: On *Mercury-1*'s front panel, four Voice Tabs across the top let you select the active voice for programming and playing with the onscreen keyboard. If you're using Steinberg's *Cubase VST*, the sliders, buttons, and knobs can be automated on playback.

get RIGHT TO THE POINT...

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RADIUS 3 FAT MAN

Smooth, warm compression at an affordable price.

By David Ogilvy

Although digital signal processing has improved in recent years, compression remains one area in which it falls short—especially emulated tube compression. Not surprisingly, even the best plug-ins can't replicate the sound of true analog tube compression. But not every personal-studio owner can afford the typical outboard tube compressor.

Fortunately, there's an affordable alternative: the HHB Radius 3 Fat Man tube compressor. A fixed-stereo unit, the Fat Man can also function as a mono compressor and a tube DI box. The unit provides 15 presets, making it especially attractive for novice users. A manual setting is also provided.

FULL FIGURED

As the name suggests, the Fat Man is unusual in size and shape: three rackspaces tall and a half rackspace wide with a top panel that slopes downward from front to rear. Indeed, you may wonder where to put the Fat Man in your studio. Racking the unit in HHB's optional rack panel ($79) is one solution—that is, if you have three rackspaces to spare. (The rack panel holds one Fat Man, centered or to one side, or two.) Otherwise, the unit's four rubber feet let it sit on a desk or table without marring the surface.

The Fat Man's purple front panel provides five continuously variable knobs for Input Gain, Output Gain, Gain Make-Up, Threshold, and Ratio. The Input and Output knobs have center detents at zero gain. A larger, stepped knob selects from 15 presets—Vocal 1, Vocal 2, Vocal 3, Keyboards, Bass 1, Bass 2, Ac. Guitar, Electric Guitar 1, Electric Guitar 2, Snare, Kick, Kit, Mix 1, Mix 2, and Mix 3—and a manual setting.

Centered above the knobs is a nice VU meter. Beneath the knobs are five push-button switches: Compressor On (or bypass when not engaged), Meter (switchable between output level and gain reduction), Knee (for selecting hard or soft knee), and Attack and Release (both of which provide slow and fast settings). A rocker switch on the lower right turns on the power, and two LEDs on either side of the VU meter indicate whether the power is on and the compressor is engaged. On the lower left side of the faceplate are two instrument-input jacks (unbalanced) labeled Left/Mono and Right.

The Fat Man's rear panel provides balanced/unbalanced ¼-inch inputs and outputs (see **Fig. 1**). A switch for choosing either +4 dBu or –10 dBu operating levels is between the input and output jacks.

The Fat Man's sloping, ventilated top panel provides a view of the unit's single tube, a Russian-made 12AX7WA. An additional panel beneath the top one prevents dust from falling onto the electronics. Removing the top panel reveals a neatly laid-out printed circuit board with accessible fuses and adjustable pots for meter calibration and tube bias. Instead of using a voltage-controlled amplifier (VCA), the Fat Man has a transconductance amplifier—the same kind used in HHB's more expensive line of products.

HHB's Radius 3 Fat Man is a compressor, DI box, signal splitter, and tube stage rolled into one.

STRUNG OUT

I worked with the Fat Man's presets first, beginning with Ac. Guitar. I miked an acoustic guitar with a tube mic and solid-state preamp and patched the signal into the Fat Man. The preset worked well. It increased the low mids and sustain; emphasized the strumming; and even controlled a few loud, errant strums without noticeable compression. The highs were also fairly well retained, and overall, the processed track provided more *oomph*. I also received good results with the two electric-guitar presets.

I patched the Fat Man through console inserts to test it on electric bass. On miked and DI tracks, the unit did what I desired, adding sustain, controlling the dynamic range, and evening out the performance. Both bass presets worked well. I adjusted the input and output gain to get the desired amount of gain reduction and was also able to add some nice tube sound. I really liked the quality of distortion that the tube stage provided.

SPEEDING BULLETS

Certain sounds (drums, for example) have very fast attacks, and I have never found an affordable compressor that effectively controls them. The same

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goes for certain vocals, especially in extreme styles, such as punk, that may involve screaming.

The Fat Man's presets for kick and snare drum worked fine—quite well, in fact, considering the unit's price—and sounded transparent to as high as 3 dB of gain reduction; beyond that, the compression started getting noticeable (which is not necessarily a bad thing). Yet I couldn't get the sound I wanted from those sources using the Fat Man's presets. The kick sounded beefier, but it had too much sustain. The snare sound wasn't to my liking, either—I'd prefer a good ol' dbx 160 compressing snare drum.

I tried manual mode, too, but still couldn't find optimal settings for those difficult sounds. Sure, I had warm, usable sounds; but I'd still have to spend a lot more money ($2,000 to $3,000 per channel) to get a compressor that can showcase the nuances of, say, a long, quiet snare drumroll, or one that perfectly controls every aspect of a vocal track.

HIGHS, HOW ARE YOU?

Most compressors—especially budget ones—chop a little off the top end of signals, which is especially noticeable when processing cymbal tracks. Indeed, it is a commonly accepted practice for users to insert compressors pre-EQ so that they can boost the high end after the dynamic control takes place. Unlike many of the other compressors in its price range, the Fat Man does a good job of retaining high frequencies.

One of my favorite mix tricks is to compress the room mics or stereo drum overheads before sending them through a reverb device. That helps tighten up the sound, which limits peaks that can jolt or jangle a spring or plate reverb. The Fat Man did a fine job in that application (in Manual mode and with Mix 1, Mix 2, and Kit presets) and left overhead and room sounds fairly unscathed. I heard a slight high-end loss, but the cymbals maintained sufficient crispness.

I also tried the application in a live situation, patching the Fat Man into the drum-overhead inserts. During sound check I switched the compressor in and out and was pleased by how it controlled the drums' dynamic range yet retained considerable brightness.

WHOLE ENCHILADA

I also tested the Fat Man as a stereo-program compressor. One source was a DAT of a live rock band recorded without compression from the console. I set the unit to Manual mode, soft knee, and slow attack and release times, and then adjusted the threshold and ratio for approximately 6 dB of gain reduction. The VU meter's needle danced with the snare hits, but the Fat Man's action was smooth and didn't punch holes in the rest of the mix. Although I could hear the compression, the Fat Man produced the desired effect: a nice addition to the tone; a thicker, more even sound; and overall, a more listenable tape.

PRODUCT SUMMARY

HHB
Radius 3 Fat Man
stereo tube compressor
$469

FEATURES	4.0
AUDIO QUALITY	4.0
EASE OF USE	4.5
VALUE	5.0

RATING PRODUCTS FROM 1 TO 5.

PROS: Affordable. Presets allow quick setup. Provides soft- and hard-knee processing. Useful as instrument DI. Tube provides warmth to signal.

CONS: No XLR connectors. Linked stereo channels prohibit independent channel processing. Inconvenient size and shape.

Manufacturer
HHB Communications USA
tel. (310) 319-1111
e-mail sales@hhbusa.com
Web www.hhbusa.com

I dialed in a similar amount of gain reduction on an acoustic-band mix with equally good results. The acoustic instruments (mandolin, guitar, upright bass, and banjo) sounded punchy, cohesive, and dynamically controlled while retaining a live quality. Feedback and pops were also well tamed.

On more critical sources—final mixes of studio recordings, for example—I liked the overall sound of the Fat Man, but the loss of high-frequency content was more problematic. Although the Fat Man is more than adequate as a stereo-program compressor in live situations (including broadcast) and even for fattening up personal-studio demo mixes, I wouldn't recommend it for mastering critical record projects.

PRIME TIME

I often mix sound for bands on the air live at radio station KDVS in Davis, California. The Fat Man excelled in that environment. Strapped across the stereo output of the console, it provided tighter, warmer-sounding mixes than what I was accustomed to, and the sound I heard in the control room was

FIG. 1: The Fat Man's rear panel provides balanced/unbalanced ¼-inch inputs and outputs. The operating level is switchable between +4 and –10 dBu.

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more similar to the broadcast sound than usual. In addition, the compressor normally used for broadcast didn't have to work as hard. (Radio stations compress their output before transmission in order to broadcast more efficiently; at KDVS, the house compressor is permanently installed as the last stage before the transmitter.)

Though I mostly worked in manual mode when using the Fat Man at the station, the presets came in handy one night when I had to mix and record—to DAT and ADAT simultaneously—a broadcast of the band Lazybones. I had little setup time and a lot to attend to, so the presets saved the day. I patched the unit into the vocal-channel insert, dialed up the Vocal 1 preset, and just went with it. The results were impressive. I had originally intended to do a multitrack mix sometime after the broadcast, but the band members loved the sound of the live mix so much that they decided to do a release directly from the stereo DAT. They mentioned how good the vocals sounded; indeed, the vocal track sat nicely in the mix, sounding fat and warm.

MANUAL LABOR

A compressor with presets and a manual mode brings up an interesting question: which should you use? That is, do the presets somehow coax performance out of the box that you can't get using the manual controls? Or are they merely for convenience?

The Fat Man's operating manual provides a chart detailing the parameter settings for each preset, so it was relatively easy to compare manual settings to presets. The Fat Man's presets are certainly a handy feature, especially for novice users or situations that preclude time for tweaking; nonetheless, experienced engineers will probably want to skip the presets. Not surprisingly, the unit provides more control in Manual mode. Besides, the action of the compressor and the tone induced by the tube ultimately depend upon input levels and gain settings, neither of which is under control of the presets. Even if a quick preset is all that's desired, you still have to consult the preset chart if you hope to approximate the results the manufacturer had in mind. After all, the folks at HHB have no way of knowing the input level of a given instrument.

In general, the chart provides good starting points for gain settings when using the presets; however, I was surprised by the amount of makeup gain suggested for certain presets. For example, the chart recommends 12 dB of makeup gain for the Bass 2 preset—an amount that added too much hiss. It sounds as if the makeup gain circuit may have a boost in the high frequencies, perhaps to restore some top end lost

Radius 3 Fat Man Specifications

Inputs	(2) unbalanced ¼" TS (instrument); (2) balanced/unbalanced ¼" TRS (line)
Outputs	(2) balanced/unbalanced ¼" TRS
Operating Level	+4 dBu or –10 dBu (switchable)
Input Gain Range	±20 dB
Output Gain Range	±20 dB
Makeup Gain	+20 dB
Frequency Response	5 Hz–40 kHz (+0, –3 dB)
Total Harmonic Distortion	0.5% (typical) @ nominal level
Threshold	+10 to –20 dB
Ratio	1:1.5–1:30
Attack Time	0.5 ms or 5 ms (switchable)
Release Time	0.2 sec or 1.5 sec (switchable)
Dimensions	5.2" (H) × 8.4" (W) × 8.3" (D)
Weight	5.5 lbs.

during the compression process. Even if that's so, it's no problem. Makeup gain is typically the last thing you fine-tune, and you don't have to use as much as the chart suggests. However, I used the hiss from the makeup gain to good effect, as a sort of high-end restoration feature, a great deal more than I worried about the circuit details.

MISSING IN ACTION

For sound quality, it would be hard to find a better unit in the Fat Man's price range; still, certain features are absent, probably to save costs. The Fat Man doesn't have a sidechain input, for example, which means no de-essing of vocal tracks. Without a sidechain, it's impossible to set up guitars so they duck in level when vocals come in.

Another feature I missed was control of left and right channels. The Fat Man is stereo linked, so it's not really appropriate for processing two separate instruments. However, in the interest of pushing the envelope, I tried using it that way. Everyone gets into a tight mix now and then with too few compressors at hand, so I wanted to hear if the Fat Man could sit on two sounds at once. Kick and snare drums were good candidates for that work-around because they often alternate rhythmically.

I began with the Kit preset but eventually settled on Manual mode, which let me adjust the threshold for the desired amount of gain reduction. The results were quite good—until the kick drum hit during a slow snare roll, causing the snare to dip in volume. I would not recommend trying to process two different instruments through the Fat Man, though it's good to know it can be used that way in a pinch on kick and snare—as long as the song tempo and drum pattern allow for it.

UNTIL THE FAT MAN SINGS

I was pleased with the Radius 3 Fat Man's sound quality and versatility. The unit has many uses besides the usual mono/stereo compressor duties. Its DI inputs, for instance, let the unit act as a tube stage with compressor and as a splitter (for example, to send a bass signal to an amp and direct to tape simultaneously through the rear-panel outputs). You can also use the Fat Man simply as a tube stage for adding drive and harmonic distortion to a signal.

Thanks to its 15 presets, the Fat Man is a great box for first-time compressor owners. The presets not only make setup easy but also cover a range of applications and are, for the most part, well formulated. The manual explains compression well and details the settings of each preset, which should prove helpful for educating novice users. Despite its unusual size and shape, the Fat Man is solidly built and a cinch to operate.

David Ogilvy *is a producer and engineer in Northern California.*

Quick Picks

SERATO AUDIO RESEARCH

Pitch 'n Time 2.0.1 (AudioSuite, Mac/Win)

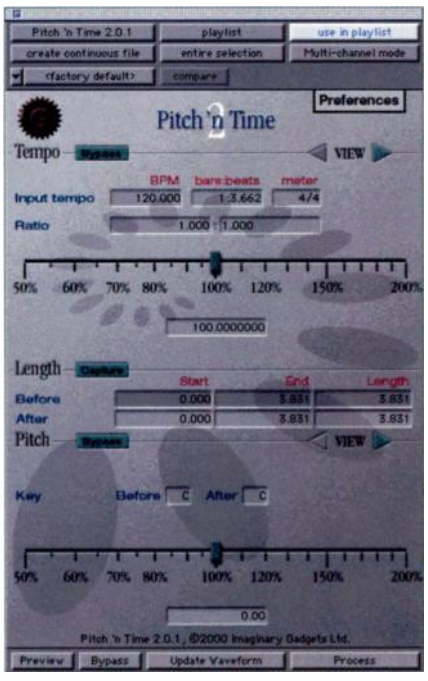
By Jeff Burger

Serato's acclaimed *Pitch 'n Time* AudioSuite non–real-time plug-in has been around for a few years. As expected, version 2.0.1 ($799) offers additional features such as multipoint control and the ability to process 48 tracks simultaneously. *Pitch 'n Time* works with Mac and Windows versions of *Pro Tools* 4.0 and higher.

Stretching Out

A product such as *Pitch 'n Time* is commonly evaluated on the quality of the technology and the user interface. *Pitch 'n Time* rated well in both departments, though the sonic-quality results varied depending on the material I processed.

The user interface is divided into three sections: Tempo, Pitch, and Length. The Tempo section offers three time-stretch modes. Fixed mode is the simplest and lets you specify temporal changes in terms of bpm, ratio, or percentage. The ratio fields provide an easy way to change tempo when translating from one frame rate to another. The bars and beats field also calculates the tempo of the selected passage. You can set the preferences to display units in terms of samples; hours, minutes, seconds, and milliseconds; SMPTE time code; or feet, frames, and subframes.



***Pitch 'n Time* 2.0, from Serato, is an AudioSuite plug-in for audio files that gives you independent control over the pitch, tempo, and length.**

Variable mode controls the rate at which tempo changes occur and is useful for making gradual changes in tempo. The panel provides a graph of the selected waveform, letting you grab the handles on the display's horizontal line to ramp the tempo up or down over time. Mouse clicks add more movable points in the ramp, so you can adjust the tempo throughout a musical passage. The continuously variable zoom controls for each axis are a nice feature that I'd like to see added to other applications.

Morph mode lets you create instantaneous tempo changes. For example, you can lengthen or shorten a single note within a passage. The Morph panel contains two waveform displays: Source and Guide. The Source graph shows the waveform that you want to process and allows you to place markers delineating the desired transition points. You adjust the markers in the Guide graph. An outline of the new waveform is superimposed over the guide waveform's image. You can also load a guide waveform as a visual reference when matching different segments to one another.

Pitch 'n Time's Pitch section includes three pitch-shifting modes. Fixed Pitch-Shift mode has simple controls for making global pitch changes according to key, percentage, or semitones and cents. The Variable Pitch-Shift mode works in the same way as the Variable Time-Stretch mode: it lets you create changes in pitch over time. The third mode, Varispeed, behaves like analog tape by changing pitch and tempo in tandem.

The final section, Length, has only one mode. It shows the start, end, and length of a selection, before and after processing.

Pitch 'n Situation

I tested *Pitch 'n Time* on a variety of production tasks. In general, I found the audio quality good; however, the further you are from the original tempo, the more artifacts you hear. The artifacts have a grainy quality with a digital edge reminiscent of flanging. Discerning ears will notice a difference at any setting, but artifacts become more obvious at a deviation of about 10 percent.

The problems were most noticeable when I processed standalone tracks, such as a 24-second narration I shortened to 20 seconds and lengthened to 28 seconds. Other source material—including percussion, guitar, bass, and even full mixes—was more charitable to *Pitch 'n Time* in terms of range; the changes became questionable at around 20 percent. Generally, increases in tempo and pitch seemed to be more forgiving than decreases.

I also tested *Pitch 'n Time*'s Capture feature, which allows you to capture the tempo of one passage and stretch another passage to match it. That easy-to-use feature worked better in *Pitch 'n Time* than on some dedicated slice-and-dice looping packages.

Time Out

Pitch 'n Time is impressive. The graphs are useful, and the ability to specify morph points provides creative options beyond simple global tempo and pitch changes.

The audio quality is as good as anything I've heard, though artifacts can occur depending on the degree of change and the source material you process. Nevertheless, those problems reflect the state of the technology rather than the product itself. Overall, *Pitch 'n Time* is an excellent addition to your collection of Pro Tools plug-ins.

Overall EM Rating (1 through 5): 4

Serato Audio Research, Ltd.; tel. 64-9-480-2396; e-mail info@serato.com; Web www.serato.com

NEMESYS MUSIC TECHNOLOGY

Nashville High-Strung Guitars (GigaSampler)

By Zack Price

Jim Corrigan's *Nashville High-Strung Guitars* ($149) re-creates an accompaniment sound that has become a Nashville recording-scene staple in recent years.

Jim Corrigan's *Nashville High-Strung Guitars* re-creates a popular guitar accompaniment technique for producing more transparent mixes with an authentic Nashville sound.

The high-strung guitar sound is produced with two six-string acoustic guitars on which the lower four strings (E, A, D, and G) are replaced with strings of a lighter gauge and tuned an octave higher than normal. The sixth string remains wound; whereas the other strings are replaced with unwound steel.

Each guitar is recorded in mono on a separate track. One guitar includes a capo set several frets higher on its neck than on the other guitar. The two guitars are then mixed hard left and hard right to create a stereo image. The result is a lighter, more airy guitar sound that lets vocals and lead instruments stand out unobstructed in the final mix and reduces the muddy midrange sound that often develops with standard bass-and-guitar rhythm tracks.

The Nashville Sound

To create the ideal Nashville tuned-guitar sound, Corrigan used a 1963 Martin D-18, a clean-sounding dreadnought guitar with low resonance. For the first guitar, he placed a capo at the first fret to eliminate buzzing at the nut. To produce the higher guitar sound with the second guitar, he placed the capo a perfect fourth higher on the fretboard.

Corrigan played each chord with an open tuning; no fingers touched the fretboard to create the chords. He retuned the guitar to produce each chord as an open strum without loops. Corrigan wrote a computer program to generate the 84 tunings and to calculate the proper string gauges and tensions needed for each chord to create a balanced sound. That resulted in a cleaner and more uniform sound that lacks the finger, fret, and string noises commonly found in guitar samples. Furthermore, he recorded separate downstroke and upstroke samples of each chord and provided chord damps for every chord to make the strums sound as realistic as possible. You can adjust the damp volume with the Mod wheel.

Load and Play

You "strum" the guitar by playing the chord root note and its alternating octave on your MIDI keyboard while holding down the sustain pedal. The downstroke strums for each chord span from C4 through B4; the upstroke strums span from C5 through B5. Before switching chords, release the sustain pedal, which causes the Damps patch to sound; select the next root note and begin strumming again. The Help file includes an AVI video that demonstrates the proper performance technique.

By default, selecting the root note plays a major chord for that key. To play other chord types—including minor, seventh, diminished, and augmented—select the appropriate key from a group of Chord Trigger keys. For example, to play a C-minor chord, press the E-flat key in the trigger group before playing the C strum notes; the same chord type continues until you press a different Chord Trigger key.

Pickin' and Grinnin'

In addition to its chordal strums and damps, *Nashville High-Strung Guitars* includes a Martin D-18 Single String patch that offers individual notes over a five-octave range. You can use it to play acoustic guitar solos, but it's especially effective for producing alternating bass note patterns and passing notes when combined with the chord strums. Simply sequence the chords in one pass and the bass lines and fills in another pass.

That patch also works particularly well for reproducing Travis-style guitar picking. The left hand plays an alternating bass pattern while the right hand fills in the melody notes. The Help file provides an AVI video that demonstrates how to play the technique on the keyboard.

City and Country

Don't be misled by the CD's title. Jim Corrigan's *Nashville High-Strung Guitars* could be an appropriate choice anytime you need a strummed-guitar sound that doesn't get in the way of the vocalist or other midrange soloists in the mix. Moreover, the Martin D-18 Single String patch is effective for reproducing many fingerpicking techniques other than Travis-style. If you use acoustic-guitar sounds in your work, you owe it to yourself to check out *Nashville High-Strung Guitars.*

Overall EM Rating (1 through 5): 4.5

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By David Rubin

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the more affluent segments of Argentine society. By the 1920s, fueled in large part by its reputation as a subversive dance, the tango quickly spread to New York, London, and Paris; it wasn't long before tango clubs appeared in major cities all over the world.

The new European or "international" style of tango dancing, with its exaggerated postures and rapid head jerks, actually bears no resemblance to the original Argentine tango, which relies on sensual fluid movements, intricate leg work, and close body contact. After several years of decline, the traditional Argentine tango has recently undergone a tremendous rebirth, as touring productions such as *Forever Tango* and *Tango Argentino* have introduced the art form to enthusiastic audiences worldwide.

Tango Sounds

Creating the sound of a true Argentine tango ensemble is no mean feat for a desktop musician. For starters, tango music always includes the reedy sound of the bandoneon. A small accordion with an array of buttons on each end, the bandoneon is notoriously hard to play and not easily imitated.

Fortunately, Big Fish Audio has opened a door into the world of the Argentine tango with its new sample CD, *Play the Tango* ($99.95; audio CD). *Play the Tango*'s first half mainly consists of short phrases performed by a three-piece ensemble of Argentine musicians. The bandoneon, piano, and acoustic guitar work well together, forming a tight combo that offers tidbits of tango ranging from energetic and upbeat to graceful and nostalgic.

After a nicely performed introductory demo track, the CD offers seven characteristic phrases that typically last 10 to 14 seconds. Each phrase is presented in six keys: A minor, A major, C minor, C major, F minor, and F major. (The last phrase is only in the minor keys.) In addition to the combo performances, individual instrument parts are broken out in each key, so you can easily mix and match any parts within a phrase. Joining together different phrases is a bit trickier, because each phrase is in a different tempo (from 110 to 175 bpm).

Following the main phrases, *Play the Tango* offers four short openings (one to four seconds long) and three great endings (four to seven seconds long). As with the phrases, the openings and endings are presented in various (though fewer) keys and with the individual instruments broken out.

Bandoneon Bonus

The CD's second half provides individual bandoneon notes for creating your own multisampled instruments. Short notes, sustained notes (five to six seconds long), and sustained tremolos (six to eight seconds long) are provided in separate groups for the left and right hands. The left-hand notes cover a 35-note range, from C1 through B3. The right-hand notes cover a 38-note range, from A2 through B5.

The set of samples offers a rare chance to create an excellent bandoneon patch. The digital recording is clean, and the mic placement is close enough to capture the breathing of the instrument—nice. Several samples of bellows sounds are also included on the disc along with a string of fills and ornaments. The tremolo notes are especially valuable because that characteristic effect cannot be properly emulated with a keyboard's Mod wheel and LFOs.

Tango bands often have more than one bandoneon player, so adding your own solo part on top of the combo phrases or thickening the texture with added chords would be entirely appropriate. Furthermore, large tango ensembles may include woodwinds,

BitHeadz's *Tubes, Tines, and Transistors* features the *Unity DS-1* playback engine and a wide selection of ready-to-play vintage keyboard sounds.

strings, and other instruments, so the phrases on the CD could serve as the underpinning of a more complex arrangement.

Unfortunately, the CD's documentation lacks explanatory text and doesn't offer a hint about properly using the bandoneon samples; it doesn't indicate any timings for the phrases either. Nevertheless, the dramatic piano, supportive guitar, and soulful bandoneon are nicely performed and well recorded in stereo, providing desktop musicians with a welcome chance to delve into the exotic world of the Argentine tango.

EM Overall Meter Rating: 4

Big Fish Audio; tel. (800) 717-FISH or (818) 768-6115; e-mail info@bigfishaudio.com; Web www.bigfishaudio.com

BITHEADZ

Tubes, Tines, and Transistors 1.0 (Mac/Win)

By Len Sasso

Tubes, Tines, and Transistors 1.0 ($199) is an extensive collection of vintage keyboard sounds on CD-ROM in BitHeadz *Unity DS-1* format. It emphasizes a number of electronic organs and classic synthesizers from ARP, Gleeman, Moog, Oberheim, Roland, Sequential Circuits, and Waldorf. For good measure, BitHeadz includes Chamberlin and Mellotron strings, Fender and Wurlitzer electric pianos, Hohner D6 Clavinet, and a pipe organ. In all, you get 116 sound banks. Each bank contains variations of an instrument.

To use the collection, you need not own the full version of *Unity DS-1. Tubes, Tines, and Transistors* includes the free *Unity DS-1 Player* (which is *Unity* without the Editor module) as well as the MIDI and audio drivers necessary for playing *TT&T* from your MIDI sequencer or keyboard controller. If you have *Unity DS-1*, you can expand the collection by adding your own programs. *Unity* owners must install the program's content portion using the Custom Install option. If you have a *Unity* version prior to 1.31, download the free update from the BitHeadz Web site.

Most banks are based on two or three multisamples assembled from a vintage keyboard. The programs within a bank typically start with single-oscillator versions of an instrument, followed by two-oscillator

combinations, and end with modifications using *Unity*'s filters, modulation routings, and effects, giving a large number of unusual variations on each instrument. A *Unity* oscillator is simply a multisample player.

Going Organic

The collection of Hammond B-3 and Korg CX-3 banks dominates the organ department. The B-3 multisamples include bass pedals and various drawbar sets with and without Leslie. There are slow and fast Leslie sets and a valiant—if imperfect—attempt to simulate Leslie acceleration by crossfading the two. Finally, there is a clicks multisample and a drawbar set with percussion. The result is a collection of several hundred serviceable B-3 sounds.

Six CX-3 banks are based on multisamples of three normal CX-3 presets and presets with key click, percussion, and overdrive (one preset each). The organ collection rounds out with two Farfisa banks, two Vox Continental banks, a Lowrey bank, and a full-stop pipe-organ bank (think Bach).

The collection's strength is in the use of *Unity*'s synthesis techniques to combine and stretch the multisamples beyond the norm. As an organ collection, the offerings are limited, though they are functional for recording.

The Synth Zone

Eighty-three of *TT&T*'s 116 banks are devoted to vintage synthesizers, with an emphasis on Sequential Circuits' Pro-One and Prophet-5 banks. You'll find banks from a few rare units such as the Gleeman Pentaphonic (about 60 were produced in the early 1980s) and venerable classics such as the ARP Solina (aka String Ensemble) from the late 1970s.

The vintage synth section's patches are roughly divided into basses, pads, and leads. For example, 8 of the 10 Moog patches are basses derived from the Moog Taurus, 9 of the 11 Oberheim patches (from the Oberheim SEM) are pads, and the Pro-One and Prophet-5 patches tend toward leads and effects. The programmers obviously paid close attention to what characterizes a particular synth's sound and what it does best.

Like the organs, the synth banks take advantage of *Unity*'s synthesizer architecture. All banks start with a vintage synth's raw sound and then add *Unity*'s filtering and effects. If you're looking for a specific vintage sound, you're likely to find something close in that section. If you're into programming *Unity*, you can add your variations.

Bank for the Buck

The *TT&T* collection wraps up with five banks of Chamberlin and Mellotron sounds, Rhodes and Wurlitzer electric pianos, a Hohner D6 Clavinet, and a Fender Key Bass. The Chamberlin and Mellotron banks are mostly strings, but an amusing Chamberlin flute and trumpet bank is included. In some cases, the multisamples could have been mapped more carefully; using more sample zones could have smoothed some abrupt transitions between pitches, especially because the necessary samples are already available in the bank. In other cases, *Unity*'s Zone Crossfade function could have been used to smooth the transition. If you have *Unity*, those problems are easy to overcome with a little tweaking.

Tubes, Tines, and Transistors provides an excellent selection of vintage keyboard sounds and a number of interesting twists on an often overplayed theme. At $199, it offers a lot of bang for the buck.

Overall EM Rating (1 through 5): 4

BitHeadz; tel. (401) 886-7045; e-mail info@bitheadz.com; Web www.bitheadz.com

DACS

Freque II

By Alex Artaud

The Freque II ($1,400) is the flagship of the DACS (Digital Audio and Computer Systems) line of ring modulators. It includes wonderful enhancements made to the original Freque (reviewed in the November 1999 issue) that raise the profile of the processor while retaining the original's sonic signature.

A Sea of Controls

Like its predecessor, Freque II combines two ring modulators, which are essentially two of DACS's ColOSCil single-channel ring modulators. The Freque II includes two built-in oscillators, CV inputs for external control, internal frequency modulation, and a frequency shifter. In addition, Freque II keeps the wild color scheme of the first-generation device but with front-panel labeling that is easier to read.

Gain controls are now available for each of the four audio inputs. The controls range from –6 dB to +12 dB. DACS also added separate controls for output level—an item that was on my wish list—that allow you to mix the modulated signal and the music at the inputs. As before, you can visually gauge input levels by observing the input LEDs on the far left of the front panel. If the LED is green, you've hit –40 dB; if it's yellow, you're around +2 dB.

The original Freque's plastic chassis has been replaced with sturdy brushed metal, and balanced TRS jacks come standard. There is a CV input and oscillator output for each ring-modulator module as well as independent carrier (labeled Mod) and program (labeled Mus) inputs for each channel. The outputs are labeled FS Up and FS Down.

Freque II features Weight and Edge controls that boost or cut the audio signal at 80 Hz and 8 kHz, respectively, at the Mus inputs before processing occurs. It has two built-in sine-wave oscillators that, when activated with the front-panel buttons, will bypass signals present at the Mod input. Each oscillator comes with controls for fine and coarse tuning as well as a four-position Range switch. The four ranges are 0.1 to 28.5 Hz, 5 to 153 Hz, 30 to 1.3 kHz, and 111 Hz to 16.5 kHz. The wide range of pitches provides useful LFO frequencies for tremolo effects at the low end and crisp high-end definition in the upper ranges.

The Freque II from the United Kingdom's DACS is a dual ring-modulator boasting CV inputs, frequency shifting, and FM capabilities.

Super Freques

Pressing the Osc 2 to RM 1 button disconnects Oscillator 1 and routes Oscillator 2 to the Mod 1 input, converting the Freque II into a 2-channel, dual-mono processor controlled by a single channel's knobs. By the Osc 2 switch is the FM Depth switch and its associated knob. When FM Depth is engaged, Oscillator 1 is routed to the CV input of Oscillator 2, and the knob controls the amount of modulation. As you turn the knob clockwise, the increase in sidebands adds grittiness to the sound; counterclockwise settings yield phasing effects.

The final front-panel button is Freque, which engages the frequency shifter and deactivates the Osc 2 to RM 1 switch. The Freque setting requires that Oscillators 1 and 2 be active and that both outputs be in use. Freque shifts frequencies by a fixed number of cycles per second upward at the FS Up output and downward at FS Down output. The degree of modulation is determined by Oscillator 2, which can be controlled manually or externally with a CV. I used the Freque feature to give wonderfully subtle treatments to string sounds.

It's About Process

I processed a number of instruments with the Freque II, including analog synths, electric guitar, bass, and drum loops. While editing arrangements for a hip-hop project, I dropped the Freque II into the mix for quick, dissonant metallic effects.

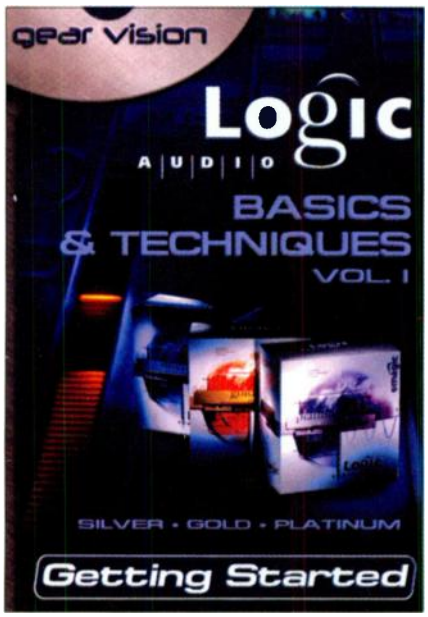
I also spun orchestral records slowly backward by hand, sending the signal first through Freque II and then through a spring reverb. That created a weird, crackly, deep-space vibe that I couldn't achieve any other way. I highly recommend using a MIDI-to-CV converter to control both oscillators from your sequencer to get more predictable results.

Freque Out

Freque II is truly a sound designer's dream. It'll chew up program material like nothing else out there. In a world filled with plug-ins that do everything, the Freque II is a processor that few, if any, plug-ins can emulate. In my opinion, it's worth every penny.

Overall EM Rating (1 through 5): 4.5

DACS/Independent Audio (distributor); tel. (207) 773-2424; e-mail info@independentaudio.com; Web www.independentaudio.com



Gear Vision's *Logic Audio Basics and Techniques, vol. 1: Getting Started* is a fast-paced, hands-on tutorial video that demystifies the workings of Emagic's *Logic Audio*.

GEAR VISION

Logic Audio Basics and Techniques, vol. 1: Getting Started

By Alex Artaud

Gear Vision's first educational video for Emagic's *Logic Audio* users is titled *Logic Audio Basics and Techniques, vol. 1: Getting Started* ($24.95). A seamlessly produced tutorial written and presented by Gear Vision's Phil Jackson (with coproduction and direction by David Mauch), the video offers a comprehensive introduction to setting up and customizing *Logic Audio*.

Whereas books, downloadable tutorials, and online discussion groups exist to help new users learn *Logic Audio*, Gear Vision's video is an exceptional resource because it takes a fast-paced, hands-on approach. How fast paced? Less than three minutes into the video, Jackson demonstrates how to record multiple MIDI lines in *Logic Audio*'s Arrange window. Keep the remote control nearby for quick rewinds. You should be up and running by the tutorial's end, with your *Logic Audio* setup intelligently organized.

Configure This

Basics and Techniques, vol. 1 focuses on creating and configuring an Autoload Song, essentially a *Logic Audio* template that reflects your studio setup and working style. Jackson shows you how to configure *Logic Audio*'s drivers, including how to set disk and processor buffer size, enable disk-read handling, and select Universal Track mode (a *Logic Audio* convention for handling stereo-interleaved files).

The video introduces the Default Song—with its instruments, nine basic screen sets, and audio objects—addresses basic MIDI-communication setup, and shows examples of user-designed templates that can serve as device editors and controllers within the program. Because *Logic Audio* is a dual-platform application, the video alternates between formats when showing screen commands. An inset screen shows Windows and Mac key commands.

You get a wealth of useful information, such as how to create custom instruments and use icons and colors for organization. At the end, Jackson briefly looks at key commands in *Logic Audio* and how to find and redefine specific actions. Closing the video with that topic is appropriate because key commands streamline *Logic Audio* and make the program feel more like a musical instrument than a digital-audio sequencer.

To the Point

Unfortunately, *Basics and Techniques, vol. 1* lasts only 40 minutes. But tallying the times you reach for the remote to view something again makes you realize that you're getting your money's worth.

The video also includes a glimpse of what's in the next two volumes, *Recording and Editing MIDI* and *Recording Audio*. For now, *Basics and Techniques, vol. 1* is an auspicious beginning loaded with useful tips and fulfilling its promise to help musicians with their *Logic Audio* setups. Even seasoned users will benefit from the range of material covered. ❀

Overall EM Rating (1 through 5): 4

Gear Vision; tel. (916) 434-1199; e-mail info@gearvision.com; Web www.gearvision.com

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MOTU Dream Studio 1

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CM Labs

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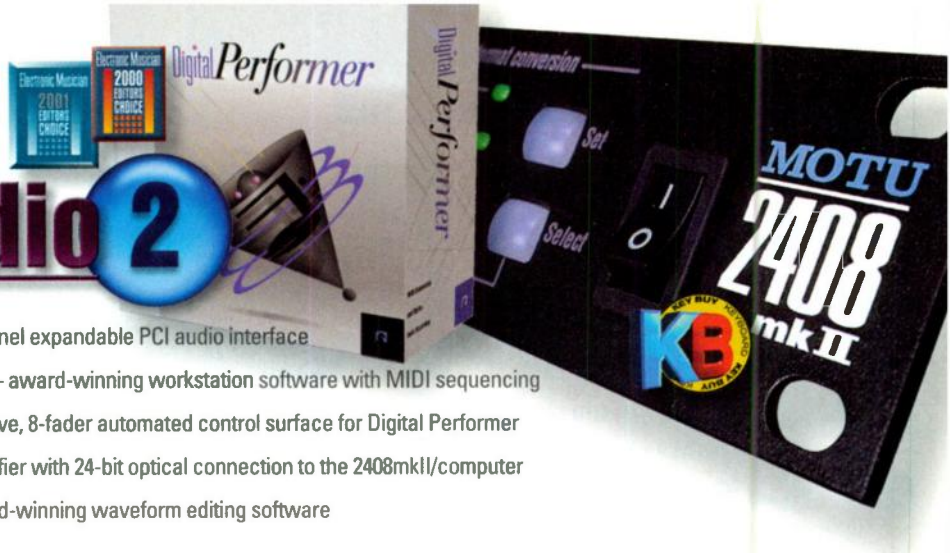
MOTU Dream Studio 2



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- **Digital Performer™ 3.0** — award-winning workstation software with MIDI sequencing
- **SAC-2K™** — expandable, touch-sensitive, 8-fader automated control surface for Digital Performer
- **DigiMax™** — 8-channel mic pre-amplifier with 24-bit optical connection to the 2408mkII/computer
- **Bias Peak 2.5 VST™** — award-winning waveform editing software

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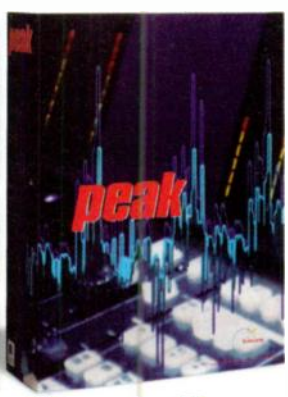

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MOTU Dream Studio 3

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- **HUI™** — automated, touch-sensitive control surface for Digital Performer
- **PowerCore™** — DSP accelerator for TC Works MAS plug-ins (and other advanced 3rd-party MAS plug-ins)
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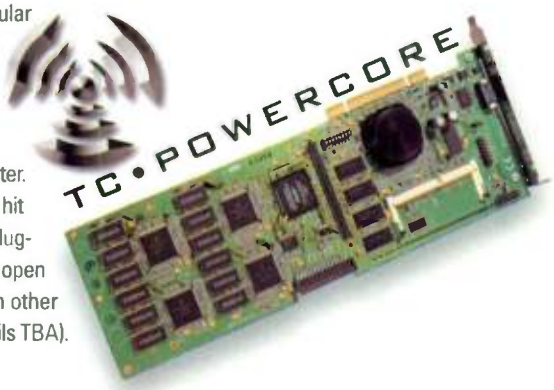

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FINAL MIX

By Larry the O

You Say "Potato," and I Say "Tomato"

They tell me that this is the information age, and I can believe it: I have piles of magazines I don't have enough time to read, Web sites I haven't gotten around to surfing, and mail lists I can't keep up with. Many just coming out of school and entering the field have grown up with this glut of data, and the brightest I've seen are in command of huge quantities of it. Want to know the latest incompatibilities resulting from a recent OS upgrade? How about obscure driver or extension conflicts only affecting certain audio hardware or software? Perhaps you want to know the current version of your favorite utility. That stuff flows right out of those folks.

In spite of the great power that can stem from this mastery, there is a downside, a confusion that crops up regularly. Today's humongous body of information can form a seductive cloud that makes it easy to miss the forest for the trees. I'm talking about the difference between information and knowledge.

What is the difference, and why is the distinction important? To start, let me state that this is a semantic distinction of my own creation; old Noah Webster doesn't differentiate the two ideas as strongly. Webster's first definition of *information* is "the communication or reception of knowledge or intelligence," though his second definition (part 3a of it, to be exact) is closer to mine: "facts, data."

Of *knowledge*, Noah says, "the fact or condition of knowing something with familiarity gained through experience or association," which is pretty close to how I think of it.

To me, information consists of mere facts and data, essentially descriptive or documentary in nature and holding no intrinsic meaning. Knowledge, on the other hand, is the casting of that data into a meaningful context, which is far more useful. Knowledge is obtained by drawing on perspective and experience to enable inference, extrapolation, deduction, and intuition, among other interpretive processes. This knowledge is to be applied productively (hopefully), resulting in an understanding of the significance of the information presented.

For example, being able to spout off every fade shape available from your DAW software shows that you have information. Reaching for the right one to make an edit in a delicate Stravinsky oboe solo *and* making the crossfade the correct length, starting it at the right time, and using a different shape for the fade-out from the fade-in to make it truly seamless requires knowledge. Now, let me be clear: knowledge does not have to be strictly of fades; it could be ear training at work—knowledge of what sounds good.

Another illustration can be found in the annals of disparities between what should be and what is. As one of my favorite expressions says, "The difference between theory and practice is that, in theory, there is no difference."

In their earliest days, CDs were touted as providing "perfect reproduction" with "no measurable distortion," statements based on information provided by measurements. Yet many insisted that LPs and analog tape sounded better. Manufacturers of digital equipment showed graphs and analyses demonstrating the ruler-flat frequency response of CDs. After a while, however, it emerged that the A/D and D/A converters were using analog brickwall filters to prevent aliasing, and those filters created extreme phase shifts in the high frequencies, resulting in a disagreeable sound. Instead of relying on knowledge of what sounded good, established from years of comparative listening, those insisting that there was "perfect" reproduction based their claims on information, which turned out to be incomplete.

Often, semantics are of no consequence, and only the message matters. However, semantic distinctions can be useful when drawn to highlight a difference of ideas. But I doubt that's new information to you; it's knowledge you probably already had. ❀

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